# RECOMMANDATION UIT-R BT.1614

## Identification de la charge utile vidéo pour interfaces de télévision numérique

(Question UIT-R 20/6)

(2003)

L'Assemblée des radiocommunications de l'UIT,

*considérant*

a) que de nombreux pays se dotent actuellement d'installations de production de télévision numérique à composantes vidéo numériques conformes aux prescriptions figurant dans les Recommandations UIT-R BT.601, UIT-R BT.656, UIT-R BT.709 et UIT-R BT.799;

b) que l'on installe actuellement des systèmes de production de télévision à haute définition (TVHD) utilisant des interfaces TVHD numériques conformes aux prescriptions figurant dans la Recommandation UIT-R BT.1120;

c) qu'un signal conforme aux prescriptions de la Recommandation UIT-R BT.1120 a la capacité nécessaire pour acheminer d'autres formats source sur ces connexions numériques série;

d) que l'on peut tirer des avantages en termes d'exploitation et de coûts de l'utilisation d'une infrastructure unique pour l'acheminement de divers formats source;

e) qu'il est nécessaire d'identifier les charges utiles acheminées sur une interface qui peut être utilisée pour de multiples formats source,

*recommande*

d'utiliser l'identification de charge utile vidéo définie dans la norme SMPTE 352M-2002 «Video Payload Identification for Digital Interfaces» pour spécifier le format source particulier en cours de transmission sur l'interface numérique série à haute définition conforme à la Recommandation UIT-R BT.1120.

NOTE 1 – La norme SMPTE 352M comporte une référence normative à la norme SMPTE 296M «1280 × 720 Progressive Image Sample Structure – Analog and Digital Representation and Analog Interface». Les formats suivants énumérés dans le Tableau 1 de cette norme ne sont pas considérés comme faisant partie de la présente Recommandation:

| Elément du Tableau 1 | Désignation du système | Fréquence d'image |
|---|---|---|
| 3 | 1280 × 720/50 | 50 |
| 6 | 1280 × 720/25 | 25 |
| 7 | 1280 × 720/24 | 24 |
| 8 | 1280 × 720/23,98 | 24/1,001 |

*Note du Secrétariat:* La norme SMPTE 352M-2002, dont la version électronique était disponible sur un site web, a été annexée au texte de la présente Recommandation.

La norme SMPTE 352M contient une référence normative à la norme SMPTE 292M «Bit-Serial Digital Interface for High-Definition Televisions Systems». Le format 1250 lignes/50 Hz indiqué dans la colonne C du Tableau 1 de cette norme SMPTE 292M n'est pas considéré comme faisant partie de la présente Recommandation.

La norme SMPTE 352M contient une référence normative aux normes SMPTE 344M «540 Mb/s Serial Digital Interface», SMPTE 347M «540 Mb/s Serial Digital Interface – Source Image Format Mapping», SMPTE 359M «Dynamic Documents» et SMPTE 372M «Dual Link 292M Interface for 1920 × 1080 Picture Raster». Ces quatre normes SMPTE et toute spécification se rapportant exclusivement à celles-ci ne sont pas considérées comme faisant partie de la présente Recommandation.

**Résumé de la norme SMPTE 352M-2002**

Cette norme définit un identificateur de charge utile à quatre octets qui peut être ajouté aux interfaces de télévision numérique pour les besoins d'identification de la charge utile vidéo. Cet identificateur doit s'appliquer à toutes les interfaces de télévision numérique actuelles et futures. La norme définit la manière dont cet identificateur est placé dans le paquet de données auxiliaires conformément à la norme SMPTE 291M. Elle spécifie la position de l'échantillon, le ou les numéros de ligne ainsi que le taux de répétition du paquet de données auxiliaires pour différentes interfaces de télévision numérique. La norme comporte en outre des définitions pour l'interprétation de chaque octet de l'identificateur, bien que des valeurs pour de nombreuses interfaces de télévision numérique puissent avoir des attributions particulières. Les valeurs d'identificateur de charge utile pour les interfaces de télévision numérique existantes sont définies; elles établissent des lignes directrices pour l'attribution des valeurs d'identificateur de charge utile appropriées aux futures interfaces de télévision numérique.

NOTE 1 – La norme SMPTE 352M-2002 figure à l'Annexe 1.

La norme SMPTE 352M-2002 et son résumé renvoient uniquement à la version 2002, qui est celle qui a été approuvée, le 4.01.03 en application de la Résolution UIT-R 45, par les Administrations des Etats Membres de l'UIT et par les Membres du Secteur des radiocommunications participant aux travaux de la Commission d'études 6 des radiocommunications. Comme convenu entre l'UIT et la SMPTE, ladite version a été fournie par la SMPTE qui en a autorisé l'utilisation et l'UIT-R a accepté de l'inclure dans la présente Recommandation. Toute version ultérieure de la norme SMPTE 352M-2002, qui n'aurait pas été agréée et approuvée par la Commission d'études 6, n'entre pas dans le cadre de la présente Recommandation. Pour des versions ultérieures de documents SMPTE, le lecteur est prié de consulter le site web de la SMPTE à l'adresse URL suivante: http://www.smpte.org/.

SMPTE 352M-2002
Revision of SMPTE 352M-2001

# SMPTE STANDARD

## for Television (Dynamic) — Video Payload Identification for Digital Interfaces



## 1 Scope

This standard defines the specification of a 4-byte payload identifier which may be added to digital interfaces for the purpose of identifying the video payload. The payload identifier is intended for application to existing and future digital interfaces.

The standard defines how the payload identifier is placed into an ancillary data packet according to SMPTE 291M. It specifies the sample position, line number(s), and repetition rate of the ancillary data packet for different digital interfaces.

The standard also includes definitions for the interpretation of each byte of the 4-byte payload identifier although the values for many video payloads may have custom definitions. Payload identifier values for existing video payloads are defined and these establish guidelines for the assignment of appropriate payload identifier values to future video payloads.

This standard is a dynamic document which allows individually defined parts of this document to be extended according to the procedures laid down by SMPTE 359M. This standard does not allow revisions to this standard which are not backwards compatible with the original document or any prior extension.

NOTE – SMPTE 352M was first trial published in the July 2001 issue of SMPTE Journal; although it did not reach final approval, it has been implemented and equipment is now in use. In order to distinguish this version from this newly defined dynamic document version, bit 7 of byte 1 has been set to 1 (see clauses 5.1 and 5.2, and annex A and B). The first trial publication version should not be used for new implementations.

## 2 Normative references (dynamic)

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publications, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

This clause is dynamic to allow new standards to be added only as a result of the addition of new video payload standards or a new digital interface standards to this document in accordance with the type 1 procedures defined in SMPTE 359M. The addition of such new reference standards must retain backwards compatibility with earlier versions of this document.



Approved
June 19, 2002

SMPTE 259M-1997, Television — 10-Bit 4:2:2 Component and 4*f*sc Composite Digital Signals — Serial Digital Interface

SMPTE 274M-1998, Television — 1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates

SMPTE 291M-1998, Television — Ancillary Data Packet and Space Formatting

SMPTE 292M-1998, Television — Bit-Serial Digital Interface for High-Definition Television Systems

SMPTE 296M-2001, Television — 1280 x 720 Progressive Image Sample Structure — Analog and Digital Representation and Analog Interface

SMPTE 344M-2000, Television — 540 Mb/s Serial Digital Interface

SMPTE 347M-2001, Television — 540 Mb/s Serial Digital Interface — Source Image Format Mapping

SMPTE 349M-2001, Television — Transport of Alternate Source Image Formats through SMPTE 292M

SMPTE 359M-2001, Television and Motion Pictures — Dynamic Documents

SMPTE 372M-2002, Television — Dual-Link 292M Interface for 1920 x 1080 Picture Raster

SMPTE RP 211-2000, Implementation of 24P, 25P and 30P Segmented Frames for 1920 x 1080 Production Format

ITU-R BT.1358 (02/98), Studio Parameters of 625 and 525 Line Progressive Scan Television Systems

ITU-R BT.1362 (02/98), Interfaces for Digital Component Video Signal in 525 and 625 Line Progressive Scan Television Systems

## 3 Glossary of terms

**3.1 channel:** In some cases, a digital interface offers sufficient capacity to be able to carry more than one video payload. In this case, each video payload becomes a channel of the digital interface.

**3.2 interface transport:** The data structure defined by an interface for the purpose of synchronizing the transport words at the receiver. This comprises primarily of the EAV and SAV words. The transport data is usually expressed as a word of 10 bits although the physical interface is usually serialized.

**3.3 link:** In some cases, the picture raster exceeds the capacity available at the digital interface. In these cases, two or more digital interfaces can be used to provide the total capacity required where each digital interface is a single link of the combined interface set.

**3.4 picture raster:** The matrix of samples that represents a digital video picture.

**3.5 picture rate:** The rate at which the pictures were intended to be presented. The picture rate value is the *display* rate and may differ with the *source* picture rate and the *interface* rate. A hypothetical example is a motion picture having a source rate of 24 Hz, whose intended display rate is 25 Hz (for 625-line transmission) that is transported over a 540-Mb/s SDI transport at twice speed by mapping each picture frame onto a transport field operating at 50 Hz. In this case, the intended picture rate value is 25 Hz. It would not be set to the value of the source picture rate or the value of the transport rate.

**3.6 sampling:** Refers to the horizontal arrangement of picture samples, notably the arrangement of multiplexing the various luminance, chrominance and other signal and data samples.

**3.7 scanning:** This is the action of reading the data structure of the interface in a predetermined order for transmission. It also refers to the mapping of the picture raster to the interface for transmission. The scanning of the picture raster and the interface transport are often closely related, the notable exceptions being the PsF scanning (progressive picture on an interlaced interface) and 3:2 pull-down scanning (used to map a 24/1.001-Hz picture scan onto a 30/1.001-Hz interlaced interface).

**3.8 video payload:** The picture carried by a digital interface and comprising a matrix of horizontal and vertical pixels. The matrix usually comprises a multiplex of luminance and color components.

## 4 Introduction

The video payload identifier may be applied equally to both the parallel and serial forms of digital interface transports. For convenience, this standard generally refers to the serial (SDI) form. Where this standard refers only to a SDI transport, it shall be assumed to apply equally to both the serial and the associated parallel transports.

This standard will first explain the structure of the proposed 4-byte video payload identifier. It will then define how the video payload identifier is placed in an ancillary data packet according to SMPTE 291M. The last clause will define the position and timing of the ancillary data packet for various interfaces.

Annex A will define the video payload identifier values for the following video payload and digital interface combinations:

– 483/576-line interlaced video payloads on a 270-Mb/s or 360-Mb/s digital interface;

– 483/576-line extended video payloads on a 360-Mb/s single-linkdigital interface or a 270-Mb/s dual-link digital interface; digital interface;

– 483/576-line video payloads on a 540-Mb/s digital interface;

– 720-line video payloads on a 1.485-Gb/s (nominal) digital interface;

– 1080-line video payloads on a 1.485-Gb/s (nominal) digital interface;

– 483/576-line video payloads on a 1.485-Gb/s (nominal) digital interface;

– 1080-line video payloads on a 1.485-Gb/s (nominal) dual-link digital interface.

Annex A is a dynamic annex which means that new video payloads and interface combinations not mentioned above can be added according to the type 1 procedures defined in SMPTE 359M.

Annex B is a historical record of the video payloads and interface combinations as defined by the first version that was trial published in the July 2001 edition of the SMPTE Journal. This annex is provided to allow new decoders to recognize payload identifiers encoded according to the first trial publication version and should not be used by new encoding equipment.

Annex C shows the mapping of the video payload identifier from the ancillary packet data structure of SMPTE 291M to the K-L-V data structure of SMPTE 336M as a fixed-length data pack.

Annex D identifies why a video payload identifier is now needed for the identification of a video payload on a digital interface transport and explains why the video payload identifier is 4 bytes in length.

## 5 Video payload identifier

The video payload identifier shall be used to identify the video payload carried on a digital interface transport.

The video payload identifier shall be 4 bytes long where each byte has a separate significance. The first byte of the video payload identifier shall have the highest significance and subsequent bytes shall be used to define lower order video payload information. A precise definition of each video payload identifier shall be provided for each interface based on the following guidelines.

### 5.1 Common video payload identifier format

The descriptions of each byte may be summarized as follows in table 1:

**Table 1a – Generalized video payload identifier byte definitions for digital transports**

<table>
<tr><th>Bits</th><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>Bit 7</td><td>Version identifier</td><td rowspan="4">Application specific<br>(line or picture related information)</td><td rowspan="4">Application specific<br>(sampling or aspect ratio related information)</td><td rowspan="8">Application specific<br>(channel assignment, dynamic range, bit depth related or other information)</td></tr>
<tr><td>Bit 6</td><td rowspan="7">Video payload and digital interface standards<br>(mandatory)</td></tr>
<tr><td>Bit 5</td></tr>
<tr><td>Bit 4</td></tr>
<tr><td>Bit 3</td><td rowspan="4">Picture rate</td><td rowspan="4">Sampling structure identification</td></tr>
<tr><td>Bit 2</td></tr>
<tr><td>Bit 1</td></tr>
<tr><td>Bit 0</td></tr>
</table>

**Table 1b (dynamic) – Default video payload identifier field definitions**

<table>
<tr><th>Bits</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>Bit 7</td><td>Interlaced (0) or progressive (1) transport</td><td>Image aspect ratio<br>4:3 (0) or 16:9 (1)</td><td rowspan="2">Channel assignment<br>Single-link or ch1 of multi-link ($0_h$),<br>ch2 of multi-link ($1_h$),<br>ch3 of multi-link ($2_h$),<br>ch4 of multi-link ($3_h$)</td></tr>
<tr><td>Bit 6</td><td>Interlaced (0) or progressive (1) picture</td><td>Reserved</td></tr>
<tr><td>Bit 5</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><td>Bit 4</td><td>Reserved</td><td>Reserved</td><td rowspan="2">Dynamic range<br>100%($0_h$),200%($1_h$)<br>or 400%($2_h$)<br>Reserved ($3_h$)</td></tr>
<tr><td>Bit 3</td><td rowspan="4">Picture rate</td><td rowspan="4">Sampling structure identification</td></tr>
<tr><td>Bit 2</td><td>Reserved</td></tr>
<tr><td>Bit 1</td><td rowspan="2">Bit depth<br>8 bit ($0_h$), 10 bit ($1_h$)<br>or 12 bit ($2_h$),<br>Reserved ($3_h$)</td></tr>
<tr><td>Bit 0</td></tr>
</table>

Byte 1 provides a mandatory definition of the video payload and digital interface standard. The remaining 3 bytes, as defined in tables 1a and 1b, provide default definitions for individual fields, although these may vary on a case by case basis depending on the value given in byte 1.

The default meaning of the reserved bits of table 1b may be assigned in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such assignment must retain backwards compatibility with earlier versions of this document.

### 5.2 Byte 1: Video payload and digital interface identification

This first byte has the highest significance and shall be used to identify the combination of video payload format and digital interface transport.

Note that some digital interfaces can carry a number of different video payload formats at the same transport bit rate by changing the timing and repetition rates of the timing reference signals embedded in the digital interface synchronization words. Furthermore, video payload formats can now be mapped onto several digital interface transports. Thus, the first byte identifies the combination of both the video payload format and its associated digital interface.

The first byte of the video payload identifier shall have a non-zero value for all valid video payloads. Thus, the first byte can be used to address up to 127 video payload and digital interface standards.

Bit 7 of byte 1 shall be used to define the payload identification version:

– 1 identifies version 1 based on this standard (see annex A);

– 0 identifies version 0 based on SMPTE 352M as trial published in the July 2001 issue of the SMPTE Journal (see annex B).

### 5.3 Byte 2: Picture rate and scanning method

The second byte can be used to identify the picture rate and the picture and transport scanning methods as shown in table 1b.

By default, bit b7 is used to identify whether the digital interface uses a progressive or interlaced transport structure. The default value of b7 is 0 which identifies an interlaced transport.

NOTE – Bit b7 is provided for rapid and reliable detection of the transport scanning structure. The digital interface scanning structure can be found through the detection of the F bit which has a static 0 value for progressive transports, and toggles between 0 (first field) and 1 (second field) for interlaced transports. This detection may take several transport frames to ensure accuracy whereas this single bit, b7, can provide the information on a per-frame basis.

By default, bit b6 is used to identify whether the picture has been scanned as progressive or interlaced. The default value of b6 is 0 which identifies an interlaced scanned picture.

NOTE – PsF video payloads are identified by a progressive scanning of the video payload transported over an interlaced digital interface transport carrying the progressive video payload as a first and second picture segment within the transport frame duration. These first and second picture segments are indicated by the first and second field indicators in the digital interface transport.

By default, bits b3 to b0 of byte 2 are used to define the picture rate in Hz. The 4 bits allow values of $0_h$ to $F_h$ which shall be as defined in table 2.

**Table 2 (dynamic) – Default assignment of picture rate values**

| Value | Picture rate | Value | Picture rate | Value | Picture rate | Value | Picture rate |
|---|---|---|---|---|---|---|---|
| $0_h$ | No defined value | $1_h$ | Reserved | $2_h$ | 24/1.001 | $3_h$ | 24 |
| $4_h$ | Reserved | $5_h$ | 25 | $6_h$ | 30/1.001 | $7_h$ | 30 |
| $8_h$ | Reserved | $9_h$ | 50 | $A_h$ | 60/1.001 | $B_h$ | 60 |
| $C_h$ | Reserved | $D_h$ | Reserved | $E_h$ | Reserved | $F_h$ | Reserved |

The unassigned values of table 2 may be assigned in a future revision of this document in accordance with type 1 procedures defined in SMPTE 359M. Such assignment must retain backwards compatibility with earlier versions of this document.

### 5.4 Byte 3: Sampling structure identification

The third byte can be used to identify aspects of the sampling structure of the video payload as shown in table 1a. By default, bit b7 of byte 3 can be used to identify the image aspect ratio where the default value of 0 indicates a 4:3 aspect ratio and 1 indicates a 16:9 aspect ratio.

By default, bits b3 to b0 of byte 3 are used to identify the horizontal sampling structure. The 4 bits allow values of $0_h$ to $F_h$, which are defined as shown in table 3.

**Table 3 (dynamic) – Default assignment of sampling structure values**

| Value | Sampling | Value | Sampling | Value | Sampling | Value | Sampling |
|---|---|---|---|---|---|---|---|
| $0_h$ | 4:2:2 [default] ($Y/C_b/C_r$) | $1_h$ | 4:4:4 ($Y/C_b/C_r$) | $2_h$ | 4:4:4 (G/B/R) | $3_h$ | 4:2:0 |
| $4_h$ | 4:2:2:4 ($Y/C_b/C_r/A$) | $5_h$ | 4:4:4:4 ($Y/C_b/C_r/A$) | $6_h$ | 4:4:4:4 (G/B/R/A) | $7_h$ | Reserved |
| $8_h$ | 4:2:2:4 ($Y/C_b/C_r/D$) | $9_h$ | 4:4:4:4 ($Y/C_b/C_r/D$) | $A_h$ | 4:4:4:4 (G/B/R/D) | $B_h$ | Reserved |
| $C_h$ | Reserved | $D_h$ | Reserved | $E_h$ | Reserved | $F_h$ | Reserved |

The unassigned values of table 3 may be assigned in a future revision of this document in accordance with type 1 procedures defined in SMPTE 359M. Such assignment must retain backwards compatibility with earlier versions of this document.

NOTES

1 The term 4:4:4 identifies the ratio of component sampling independently of the resolution. These values apply to all picture sampling definitions including high definition pictures.

2 In the 4:2:2:4 and 4:4:4:4 fields, the A nomenclature refers to a picture channel, whereas the D nomenclature refers to a non-picture (i.e., data) channel.

### 5.5 Byte 4: Special options

By default, the fourth byte is used to identify extended aspects of the video payload providing information about the channel assignment, dynamic range and bit-depth of the video payload as defined in table 1b.

By default, bits b7 and b6 are used to identify channel identification information where the following values are defined:

- $0_h$ identifies a single channel video payload or channel 1 of a multi-channel video payload;
- $1_h$ identifies channel 2 of a multi-channel video payload;
- $2_h$ identifies channel 3 of a multi-channel video payload;
- $3_h$ identifies channel 4 of a multi-channel video payload.

By default, bits b4 and b3 are used to identify the dynamic range of the sample quantization where the following values are defined:

- $0_h$ identifies quantization where the value range is normal;
- $1_h$ identifies quantization where the value range is extended to 200% of normal (i.e., has 1 overhead bit in the MSB location);
- $2_h$ identifies quantization where the value range is extended to 400% of normal (i.e., has 2 overhead bits in the MSB locations).

By default, bits b1 and b0 are used to identify the bit depth of the sample quantization where the following values are defined:

- $0_h$ identifies quantization using 8 bits per sample;
- $1_h$ identifies quantization using 10 bits per sample;
- $2_h$ identifies quantization using 12 bits per sample.

## 6 Video payload identifier specification and carriage

The 4-byte video payload identifier shall be carried in a SMPTE 291M H-Ancillary data packet. This ensures a consistent approach to data handling for all digital interface transports.

### 6.1 Ancillary data specification

The ancillary data packet used by the video payload identifier shall use the type 2 data identification having a first data identification (DID) word followed by a secondary data identification (SDID) word.

The DID word shall be set to the value $41_h$. The SDID word shall be set to the value of $01_h$.

Table 4 outlines the ancillary data packet words with values where appropriate. The total size of the ancillary data packet is 11 words.

**Table 4 – Ancillary data packet structure for the video payload identifier**

| Name | Acronym | Value |
|---|---|---|
| Ancillary data flag (10-bit words) | ADF | $000_h$, $3FF_h$, $3FF_h$ |
| Data identification | DID | $41_h$ |
| Secondary data identification | SDID | $01_h$ |
| Data count | DC | $04_h$ |
| SDI video payload identifier | 4 words | — |
| Checksum | CS | — |

### 6.2 Placement of the ancillary data packet (dynamic)

As this packet defines a basic video payload type, the preferred horizontal placement of the ancillary data packet is immediately following an EAV word sequence.

The line number of the packet will vary according to the digital video interface to meet with existing equipment practice. The details below summarize the line numbers for different interfaces.

This clause is dynamic and allows new subclauses (6.2.x) to be added to this clause (6.2) to support digital interfaces not already defined in this clause. Such new subclauses shall be added according to the type 1 procedures defined in SMPTE 359M. It is not permissible to alter any existing subclause (6.2.x) in this clause in order to preserve backwards compatibility. Neither is it permissible to add any new subclause (6.2.x) in this clause that overrides any existing subclause already defined.

NOTES

1 The line numbers given in the remainder of this clause are interface line numbers which may differ from the video payload line numbers. These line number differences may occur when using special raster mappings such as PsF, multi-link and multi-channel.

2 All the line numbers below are three lines later than the switching point line.

#### 6.2.1 525- and 625-line digital interfaces, interlace scanned

For digital interfaces having 525 or 625 lines with an interlaced (I) scanning structure, the ancillary data packet shall be added once per field on the following lines:

525I (field 1): Line 13
525I (field 2): Line 276
625I (field 1): Line 9
625I (field 2): Line 322

NOTE – These line numbers also apply when using a 4:2:0 progressive payload on a 360-Mb/s serial digital interface, a 270-Mb/s dual link serial digital interface, or a 1.485-Gb/s serial digital interface (SMPTE 349M). When using the SMPTE 349M serial digital interface, the ancillary data packet shall be added once per frame on only the Y-channel of the defined line, because the video payload IDs are always mapped on the Y-channel of the 1.485-Gb/s serial digital interface.

#### 6.2.2 525- and 625-line digital interfaces, progressively scanned

For digital interfaces having 525 or 625 lines with a progressive (P) scanning structure, the ancillary data packet shall be added once per frame on the following line:

525P: Line 13
625P: Line 9

#### 6.2.3 750-line digital interfaces, progressively scanned

For digital interfaces having 750 lines with a progressive (P) scanning structure, the ancillary data packet shall be added once per frame on only the Y-channel of the following line:

750P: Line 10

#### 6.2.4 1125-line digital interfaces, interlace and segmented-frame scanned

For digital interfaces having 1125 lines with interlaced (I) and progressive segmented-frame (PsF) scanning structures, the ancillary data packet shall be added once per field on only the Y-channel of the following lines:

1125I (field 1): Line 10
1125I (field 2): Line 572

NOTE – These line numbers also apply to dual-link HD-SDI when using interlaced and progressive segmented-frame scanning.

#### 6.2.5 1125-line digital interfaces, progressively scanned

For digital interfaces having 1125 lines with a progressive (P) scanning structure, the ancillary data packet shall be added once per frame on the Y-channel only of the following line:

1125P: Line 10

NOTES

1 These line numbers also apply to dual-link HD-SDI when using progressive scanning.

2 The line numbers defined above for the 750-line and 1125-line interfaces in the SMPTE 292M based serial digital interface avoids the lines used by SMPTE 299M for the carriage of the digital audio control data packet.

## **Annex A (dynamic)** (normative)
## Video payload identifier definitions for existing interfaces

The definition of the video payload identifier uses the first word to identify the relevant standards and there are already several current and emerging standards where the video payload identifier could be beneficial. The tables below identify the current video payload and interface combinations and define the values in the 4 bytes of the video payload identifier.

This annex is dynamic and allows new tables and supporting descriptive text to be added to support new combinations of video payloads and digital interfaces not already defined in this annex. Such new tables shall be added according to the type 1 procedures defined in SMPTE 359M.

Furthermore, existing tables and their supporting descriptive text may be extended to support parameter values not already defined in this annex. Such extensions shall be added according to the type 1 procedures defined in SMPTE 359M.

#### A.1 483/576-line interlaced video payloads on 270-Mb/s and 360-Mb/s serial digital interfaces

The unassigned values of table A.1 and the descriptive text that follows may be extended in a future revision of this document in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.1 (dynamic) – Video payload identifier definitions for 483/576-line interlaced video payloads on 270-Mb/s and 360-Mb/s serial digital interfaces**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Reserved | Image aspect ratio<br>4:3 = 0, 16:9 = 1 | Reserved |
| Bit 6 | 0 | Interlaced (0) picture | Horizontal Y sampling<br>720 = 0, 960 = 1 | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Picture rate<br>(see table 2) | Sampling structure identification<br>(see table 3) | Reserved |
| Bit 2 | 0 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 1 | | | Bit depth: 8 bits (0) or 10 bits (1) |

When identifying 483/576-line interlaced video payloads on 270-Mb/s and 360-Mb/s serial digital interfaces, the following limitations shall apply:

– The picture rate shall only use the values $5_h$ (25 Hz) and $6_h$ (30/1.001 Hz) in accordance with table 2;

– Bit 6 of byte 2 shall be set to a value of 0 to identify an interlaced video payload;

– The Sampling structure identification shall only use the value of '0h' to identify a 4:2:2 (Y/Cb/Cr) video payload;

– Bit 6 of byte 3 shall be used to identify 720 active luminance samples (0) or 960 active luminance samples (1) as defined by the horizontal luminance sample count;

– When bit 7 of byte 3 is 0, the image aspect ratio shall be 4:3 and when bit 7 of byte 3 is 1, the image aspect ratio shall be 16:9;

– Identification of the quantization resolution in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.2 483/576-line extended video payloads on 360-Mb/s single-link and 270-Mb/s dual-link serial digital interfaces**

The unassigned values of table A2 and the descriptive text that follows may be extended in a future revision of this document in accordance with Type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.2 (dynamic) – Video payload identifier definitions for 483/576-line extended video payloads**
on 360-Mb/s single-link and 270-Mb/s dual-link serial digital interfaces

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Reserved | Image aspect ratio 4:3 = 0, 16:9 = 1 | Reserved |
| Bit 6 | 0 | Interlaced (0) or progressive (1) picture | 0 | Channel assignment (see figure 1b) |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Picture rate (see table 2) | Sampling structure (see table 3) | Reserved |
| Bit 2 | 0 | | | Reserved |
| Bit 1 | 1 | | | Reserved |
| Bit 0 | 0 | | | Bit depth: 8 bits (0) or 10 bits (1) |

When identifying 483/576-line progressive video payloads on 360-Mb/s single-link and 270-Mb/s dual-link serial digital interface transports, the following constraints shall apply:

– The picture rate shall only use the values $9_h$ (50 Hz) and $A_h$ (60/1.001 Hz) in accordance with table 2;

– Bit 6 of byte 2 shall be set to a value of 1 to identify a progressive video payload;

– The sampling structure identification shall only use the values $3_h$ (4:2:0) for single link 360-Mb/s transports and $0_h$ (4:2:2) for 270-Mb/s dual-link transports;

– When bit 7 of byte 3 is 0, the image aspect ratio shall be 4:3 and when bit 7 of byte 3 is 1, the image aspect ratio shall be 16:9;

– In the case of dual-link 270-Mb/s transports, the channel assignment value in bit b6 of byte 4 shall be set to a value of ‘’ for the first link and to 1 for the second link. In the case of single-link 360-Mb/s SDI, the channel value shall be set to a value of $0_h$;

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

When identifying 483/576 -line 4:4:4:4 interlaced video payloads on 270Mbps dual-link serial digital interface transports the following constraints shall apply:

– The picture rate shall only use the values $5_h$ (25 Hz) and $6_h$ (30/1.001 Hz) in accordance with table 2;

– Bit 6 of byte 2 shall be set to a value of 0 to identify an interlaced video payload;

– The sampling structure identification shall only use the values $5_h$ (4:4:4:4 Y/$C_b$/$C_r$/A), $6_h$ (4:4:4:4 G/B/R/A), $9_h$ (4:4:4:4 Y/$C_b$/$C_r$/D) or $A_h$ (4:4:4:4 G/B/R/D);

– When bit 7 of byte 3 is 0, the image aspect ratio shall be 4:3 and when bit 7 of byte 3 is 1, the image aspect ratio shall be 16:9;

– The channel assignment value in bit b6 of byte 4 shall be set to a value of 0 for the first link and to 1 for the second link;

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.3 483/576-line video payloads on a 540-Mb/s serial digital interface**

The unassigned values of table A.3 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this document.

**Table A.3 (dynamic) – Video payload identifier definitions for 483/576-line video payloads on a 540-Mb/s serial digital interface**

<table>
<tr><th>Bits</th><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th></tr>
<tr><td>Bit 7</td><td>1</td><td>Reserved</td><td>Image aspect ratio<br>4:3 = 0, 16:9 = 1</td><td>Reserved</td></tr>
<tr><td>Bit 6</td><td>0</td><td>Interlaced (0) or progressive (1) picture</td><td>0</td><td>Reserved</td></tr>
<tr><td>Bit 5</td><td>0</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><td>Bit 4</td><td>0</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><td>Bit 3</td><td>0</td><td rowspan="4">Picture rate<br>(see table 2)</td><td rowspan="4">Sampling structure<br>(see table 3)</td><td>Reserved</td></tr>
<tr><td>Bit 2</td><td>0</td><td>Reserved</td></tr>
<tr><td>Bit 1</td><td>1</td><td>Reserved</td></tr>
<tr><td>Bit 0</td><td>1</td><td>Bit depth: 8 bits (0) or 10 bits (1)</td></tr>
</table>

When identifying 483/576-line interlaced and progressive video payloads on a 540-Mb/s digital interface, at least the following list of picture rates and sampling structures are supported:

– The picture rate shall be set to the value of the 483/576-line video payload as defined in SMPTE 347M.

– The sampling structure shall be set to the value of the 483/576-line video payload as defined in SMPTE 347M. This shall include the use of the alpha channel as a carrier of data as well as video.

The following bit-fields are used:

– Bit 6 of byte 2 shall be set to a value of 0 to identify an interlaced video payload and to a value of 1 to identify a progressive video payload.

– When bit 7 of byte 3 is 0, the image aspect ratio shall be 4:3 and when bit 7 of byte 3 is 1, the image aspect ratio shall be 16:9.

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.4 720-line video payloads on a 1.485-Gb/s (nominal) serial digital interface**

The unassigned values of table A.4 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.4 (dynamic) – Payload identifier definitions for 750-line progressive video payloads on a 1.485-Gb/s (nominal) serial digital interface**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Progressive (1) picture | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Picture rate (see table 2) | Sampling structure (see table 3) | Reserved |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 0 | | | Bit depth: 8 bits (0) or 10 bits (1) |

When identifying 720-line Progressive video payloads on a 1.485Gbps (nominal) interface, the following limitations shall apply:

– The picture rate shall only use the values as defined in SMPTE 296M;

– The sampling structure shall be set to $0_h$ (4:2:2);

– The progressive picture flag bit shall be set to 1;

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.5 1080-line video payloads on a 1.485-Gb/s (nominal) serial digital interface**

The unassigned values of table A.5 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.5 (dynamic) – Payload identifier definitions for 1080-line interlaced and progressive video payloads on a 1.485Gbps (nominal) serial digital interface**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Interlaced (0) or progressive (1) transport | Reserved | Reserved |
| Bit 6 | 0 | Interlaced (0) or progressive (1) picture | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Picture rate (see table 2) | Sampling structure (see table 3) | Reserved |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 1 | | | Bit depth: 8 bits (0) or 10 bits (1) |

When identifying 1080-line Interlaced and Progressive video payloads on a 1.485Gbps (nominal) interface, the following limitations shall apply:

– The picture rate shall only use the values as defined in SMPTE 274M;

– The interlace/progressive picture flag bit shall be set to 0 or 1 as defined by the video payload format;

– The interlaced/progressive transport flag shall be set to 0 or 1 as defined by the digital interface transport. Note that PsF video payloads, as defined in SMPTE RP 211, set the video payload bit to a value of 1 (progressive) and the transport bit to a value of 0 (interlaced).

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.6 483/576-line video payloads on a 1.485-Gb/s (nominal) digital interface**

The unassigned values of table A.6.1 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.6.1 (dynamic) – Video payload identifier definitions for 483/576-line video payloads on a 1.485-Gb/s (nominal) serial digital interface**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Reserved | Reserved | Channel assignment:<br>Ch 1 active (0) or<br>Ch1 and Ch2 active (1) |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Total line number:<br>483 (0) or 576 (1) | Reserved | Image aspect ratio:<br>4:3 (0) or 16:9 (1) |
| Bit 3 | 0 | Picture rate<br>(see table 2) | Sampling structure<br>(see table A.6.1) | Mapping mode:<br>Normal mapping (0) or<br>whole-line mapping (1) |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 1 | | | Reserved |
| Bit 0 | 0 | | | Bit depth: 8 bits (0) or 10 bits (1) |

The unassigned values of table A.6.2 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.6.2 (dynamic) – Assignment of combination of sampling structure and interlaced or progressive picture**

| Value | Picture rate | Value | Picture rate | Value | Picture rate | Value | Picture rate |
|---|---|---|---|---|---|---|---|
| $0_h$ | 4:2:2i ($Y/C_b/C_r$) (No.1 or 7) | $1_h$ | 4:2:2i ($Y/C_b/C_r$) (No.2 or 8) | $2_h$ | 4:2:0p ($Y/C_b/C_r$) (No.6 or 12) | $3_h$ | 4:4:4:4i ($Y/C_b/C_r/A$) (No.3 or 9) |
| $4_h$ | 4:4:4:4i (G/B/R/A) (No.3 or 9) | $5_h$ | 4:2:2p ($Y/C_b/C_r$) (No.4 or 10) | $6_h$ | 4:2:2p ($Y/C_b/C_r$) (No.5 or 11) | $7_h$ | 4:2:2i × 2ch ($Y/C_b/C_r$) (No.1 or 7) |
| $8_h$ | 4:2:2i × 2ch ($Y/C_b/C_r$) (No.2 or 8) | $9_h$ | 4:2:0p ×2ch ($Y/C_b/C_r$) (No.6 or 12) | $A_h$ | Reserved | $B_h$ | Reserved |
| $C_h$ | Reserved | $D_h$ | Reserved | $E_h$ | Reserved | $F_h$ | Reserved |

When identifying 483/576-line video payloads mapped onto a 1.485Gbps serial digital interface, the following limitations shall apply:

– Bit b4 of byte 2 shall be used to define the video payload line count value as the total number of video payload lines in the frame. Bit b4 shall be set to 0 to identify 483 lines and to 1 to identify 576 lines;

– The picture rate in table A.6.1 shall be set to the value of the 483/576-line video payload as defined in table 1 of SMPTE 349M;

– The sampling structure in table A.6.2 shall be set to the value as defined in table 1 of SMPTE 349M;

– Bit b6 of byte 4 shall be used to identify whether only channel 1 is active or both channel 1 and 2. Bit b6 shall be set to 0 to identify channel 1 is active and shall be set to 1 to identify both channel 1 and channel 2 are active;

– Bit 4 of byte 4 shall be used to identify the image aspect ratio. Bit 4 shall be set to 0 to identify that the image aspect ratio is 4:3 and to 1 to identify that the image aspect ratio is 16:9;

– Bit 3 of byte 4 shall be used to identify the mapping mode. Bit 3 shall be set to 0 to identify normal mapping and to 1 to identify whole line mapping. SMPTE 349M defines the details of these mapping modes;

– Identification of the quantization value in bit b0 of byte 4 is optional. The default value is 0 identifying a video payload quantization resolution of 8 bits.

**A.7 1080-line video payloads on dual-link 1.485-Gb/s (nominal) digital interfaces**

The unassigned values of table A.7 and the descriptive text that follows may be extended in a future revision of this standard in accordance with type 1 procedures defined in SMPTE 359M. Such extensions must retain backwards compatibility with earlier versions of this standard.

**Table A.7 (dynamic) – Video payload identifier definitions for 1080-line video payloads on dual-link 1.485-Gb/s (nominal) digital interfaces**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 1 | Interlaced (0) or progressive (1) transport | Reserved | Reserved |
| Bit 6 | 0 | Interlaced (0) or progressive (1) picture | Reserved | Channel assignment of dual link: Ch1 (0) or Ch 2 (1) |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Dynamic range: 100% ($0_h$), 200% ($1_h$), 400% ($2_h$), Reserved ($3_h$) |
| Bit 3 | 0 | Picture rate (see table 2) | Sampling structure (see table 3) | |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 1 | | | Bit depth: 8 bit ($0_h$), 10 bit ($1_h$), 12 bit ($2_h$), Reserved ($3_h$) |
| Bit 0 | 1 | | | |

When identifying 1080-line video payloads mapped onto dual-link 1.485-Gb/s digital interfaces, the following limitations shall apply:

– The picture rate shall be set to the value of the 1080-line interface as defined in SMPTE 372M;

– The sampling structure shall be set to the value as defined in SMPTE 372M. This shall include the use of the alpha channel as a carrier of data as well as video;

– The channel number in bit b6 of byte 4 shall be set to a value of 0 for the first link and to 1 for the second link;

– Extended dynamic range of the sampling quantization shall be identified by bits b4 and b3 of byte 4 having the following values:

  – $0_h$ identifies quantization where the value range is normal;
  – $1_h$ identifies quantization where the value range is extended to 200% of normal;
  – $2_h$ identifies quantization where the value range is extended to 400% of normal;

– The bit depth of the sample quantization shall be identified by bits b1 and b0 of byte 4 having the following values:

  – $0_h$ identifies quantization using 8 bits per sample;
  – $1_h$ identifies quantization using 10 bits per sample;
  – $2_h$ identifies quantization using 12 bits per sample.

## **Annex B** (normative)
## Payload identifier definitions for existing interfaces

The payload identifier values defined in this annex should not be implemented in new encoder designs. The inclusion of this annex is solely to allow decoders conforming to this standard to be able to identify and decode payload identifiers that have been implemented according to the trial publication version as published in the July 2001 issue of the SMPTE Journal.

### B.1 ITU-R BT.601 payloads on SMPTE 259M SDI (525/625-line payloads)

**Table B.1 – Payload identifier definitions for ITU-R BT-601 payloads on SMPTE 259M SDI**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Reserved | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | 4:3/16:9 | Reserved |
| Bit 3 | 0 | Frame rate | Sampling structure | Reserved |
| Bit 2 | 0 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 1 | | | Reserved |

When identifying ITU-R BT.601 video payloads on SMPTE 259M SDI, the following limitations shall apply:

– The frame rate shall only use the values $5_h$ (25 Hz, 625I) and $6_h$ (30/1.00 1Hz, 525I) in accordance with the payload frame rate;

– The sampling identification shall only use the following values:

  – $0_h$ to identify 4:2:2 I, 720 active luminance pixels per line, 270-Mb/s SDI;
  – $1_h$ to identify 4:2:2 I, 720 active luminance pixels per line, 270-Mb/s SDI;
  – $F_h$ to identify 4:2:2 I, 720 active luminance pixels per line, 270-Mb/s SDI;

– Bit 4 of byte 3 shall only be used for sampling structures based on payloads with 720 active luminance samples. In these cases, if the bit is 0, then the source image aspect ratio is 4:3, and if the bit is 1, then the source image aspect ratio is 16:9 (i.e., anamorphic).

### B.2 ITU-R BT.1358 payloads on ITU-R BT.1362 SDI (525/625-line payloads on 360-Mb/s single-link SDI and 270-Mb/s dual-link SDI)

**Table B.2 – Payload identifier definitions for ITU-R BT.1358 payloads on ITU-R BT.1362 SDI**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | Reserved | Channel number | Reserved |
| Bit 6 | 0 | Reserved | | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | 4:3/16:9 | Reserved |
| Bit 3 | 0 | Frame rate | Sampling structure | Reserved |
| Bit 2 | 0 | | | Reserved |
| Bit 1 | 1 | | | Reserved |
| Bit 0 | 0 | | | Reserved |

When identifying the ITU-R BT.1358 525/625P video payload on the ITU-R BT.1362 SDI, the following limitations shall apply:

- The frame rate shall only use the values $9_h$ (50 Hz) for 625P systems and $A_h$ (60/1.001 Hz) for 525P in accordance with ITU BT.1358;
- The sampling structure shall only use the values $2_h$ for single link 360-Mb/s SDI and $3_h$ for 270-Mb/s dual-link SDI;
- In the case of dual link 270-Mb/s SDI, bits b7 and b6 of byte 3 shall define a count value in the range 0 to 3 where 0 defines single-link operation, 1 defines channel 1 of dual-link operation, and 2 defines channel 2 of dual-link operation. The value of 3 is reserved but not defined.
- Bit 4 of byte 3 shall be used to define the source image aspect ratio for payloads with 720 active luminance samples per line. If the bit is 0, then the source image aspect ratio is 4:3 and if the bit is 1, then the source image aspect ratio is 16:9 (i.e., anamorphic).

**B.3 N26.480 (525/625-line payloads on 540-Mb/s SDI)**

**Table B.3 – Payload identifier definitions for 525/625 progressive and interlaced payloads on 540-Mb/s SDI**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Reserved | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | 4:3/16:9 | Reserved |
| Bit 3 | 0 | Frame rate | Sampling structure | Reserved |
| Bit 2 | 0 | | | Reserved |
| Bit 1 | 1 | | | Reserved |
| Bit 0 | 1 | | | Reserved |

Only the following list of frame rates in combination with sampling structures shall be supported:

- Frame rate = $5_h$ (25 Hz, 625I) and sampling structure = $6_h$ (4:4:4:4 I; Y/$C_b$/$C_r$/Key);
- Frame rate = $6_h$ (30/1.001 Hz, 525I) and sampling structure = $6_h$ (4:4:4:4 I; Y/$C_b$/$C_r$/Key);
- Frame rate = $5_h$ (2 Hz, 625I) and sampling structure = $7_h$ (4:4:4:4 I; R/G/B/Key);
- Frame rate = $6_h$ (30/1.00 1Hz, 525I) and sampling structure = $7_h$ (4:4:4:4 I; R/G/B/Key);
- Frame rate = $9_h$ (50 Hz, 625I) and sampling structure = $4_h$ (4:2:2 P, 4:3);
- Frame rate = $A_h$ (60/1.001 Hz, 525I) and sampling structure = $4_h$ (4:2:2 P, 4:3);
- Bit 4 of byte 3 shall be used to define the source image aspect ratio for payloads with 720 active luminance samples per line. If the bit is '0', then the source image aspect ratio is 4:3 and if the bit is '1', then the source image aspect ratio is 16:9 (i.e. anamorphic).

**B.4 SMPTE 296M (750-line payloads) on SMPTE 292M HD-SDI**

**Table B.4 – Payload identifier definitions for 750-line video interfaces on SMPTE 292M**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Reserved | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Frame rate | Sampling structure | Reserved |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 1 | | | Reserved |

– The frame rate shall only use the values as defined in SMPTE 296M.

– The sampling structure shall be set to $5_h$ (4:2:2 P, 16:9).

**B.5 SMPTE 274M and SMPTE RP 211 (1125-line payloads) on SMPTE 292M HD-SDI**

**Table B.5 – Payload identifier definitions for 1125-line payloads on SMPTE 292M**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | P, I and PsF Identification | Reserved | Reserved |
| Bit 6 | 0 | | Reserved | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | Reserved | Reserved |
| Bit 3 | 0 | Frame Rate | Sampling structure | Reserved |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 0 | | | Reserved |
| Bit 0 | 0 | | | Reserved |

When identifying the video payload on SMPTE 274M interfaces, the following limitations shall apply:

– The frame rate shall only use the values as defined in SMPTE 274M;

– Bits b7 and b6 of byte 2 shall define a number to identify the scanning format. The following values shall be used to define the scanning format:

  – $0_h$ = Interlace (I). In this case, the sampling structure shall be set to $1_h$ (4:2:2 I, 16:9);
  – $1_h$ = Segmented frame (PsF). In this case, the sampling structure shall be set to $5_h$ (4:2:2 P, 16:9);
  – $3_h$ = Progressive (P). In this case, the sampling structure shall be set to $5_h$ (4:2:2 P, 16:9);

– The value $2_h$ is reserved but not defined.

**B.6 SMPTE 349M (SD video payload mapping into SMPTE 292M)**

**Table B.6 – Payload identifier definitions for mapping SD interfaces into SMPTE 292M HD-SDI**

| Bits | Byte 1 | Byte 2 | Byte 3 | Byte 4 |
|---|---|---|---|---|
| Bit 7 | 0 | Reserved | Reserved | Reserved |
| Bit 6 | 0 | Reserved | Mapping mode | Reserved |
| Bit 5 | 0 | Reserved | Reserved | Reserved |
| Bit 4 | 0 | Reserved | 4:3/16:9 | Reserved |
| Bit 3 | 0 | Frame rate | Sampling structure | Reserved |
| Bit 2 | 1 | | | Reserved |
| Bit 1 | 1 | | | Reserved |
| Bit 0 | 0 | | | Reserved |

When identifying SD video payloads mapped onto SMPTE 292M, the following limitations shall apply:

– The frame rate shall be set to the value of the SD interface as defined in table 1 of SMPTE 349M;

– The sampling structure shall be set to the value as defined in table 1 of SMPTE 349M;

– Bit 6 of byte 3 shall be used to identify the mapping mode. Setting bit 6 to 0 shall define normal mapping and setting bit 6 to 1 shall define whole line mapping (see SMPTE 349M for details on the mapping modes);

– Bit 4 of byte 3 shall only be used for sampling structures based on payloads with 720 active luminance samples. In these cases, if the bit is 0, then the source image aspect ratio is 4:3 and if the bit is 1, then the source image aspect ratio is 16:9 (i.e., anamorphic).

**Annex C** (informative)
## Mapping the video payload identifier from an H-Anc packet to a KLV packet according to the data encoding protocol defined in SMPTE 336M.

It should be noted that the H-Anc data packet has a key–length–value (KLV) construct like that of SMPTE 336M. The packet starts with start code; the ADF word sequence, which is a defined start code in digital video interfaces. This is followed by DID and SDID words which define the data type, a data count and the data itself (the video payload identifier value). The packet is completed with a check sum to detect possible errors. If the ADF and CS words are removed, then the data structure is a key–length–value. Thus, the value of the H-Anc packet (i.e., the video payload identifier words) can be mapped into the KLV protocol of SMPTE 336M, as follows:

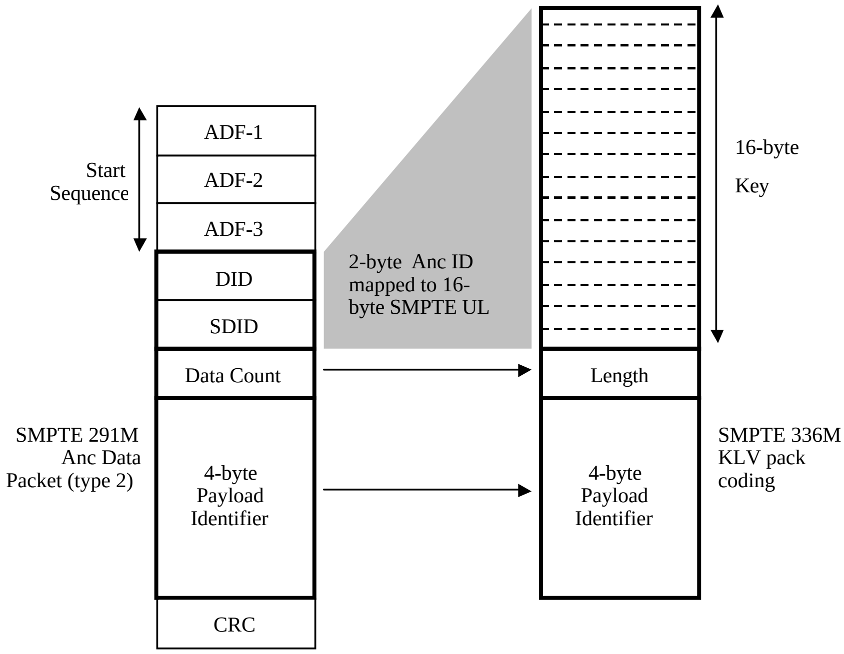


**Figure C.1 – Mapping the video payload identifier from an H-Anc packet into a KLV packet**

**Table C.1 – Mapping the components of an H-Anc packet to a KLV packet**

| Data structure | H-Anc packet | KLV protocol |
|---|---|---|
| Key | DID + SDID | 16-byte Universal label |
| Length | DC | Variable length |
| Value | 4-byte SDI video payload identifier | 4-byte SDI video payload identifier |

In mapping H-Anc packet data into a KLV data packet it is, of course, possible to consider mapping the whole H-Anc packet as the value, but this is a tunneling process in which there are two layers of overhead, one from the H-Anc packet structure and one from the KLV data construct. This adds no value so the concept of heterogeneous operation where the video payload is mapped into the local data construct is preferred to that of tunneling.

The 4-byte video payload identifier is a data pack comprising multiple metadata parameters in a preassigned form. This data pack should be added to any SMPTE data pack registry which may be created in the future with the following guidance for the SMPTE Universal label (UL) as the pack key:

**Table C.2 – Recommended value for the SMPTE UL**

| Byte No. | Description | Value (hex) |
|---|---|---|
| 1 | Object identifier | $06_h$ |
| 2 | Label size | $0E_h$ |
| 3 | Designation: ISO | $2B_h$ |
| 4 | Designation: SMPTE | $34_h$ |
| 5 | Registry category: Sets and packs | $02_h$ |
| 6 | Registry designator: Fixed length packs | $05_h$ |
| 7 | Standard: Pack standard | $01_h$ |
| 8 | Version number | $01_h$ |
| 9 | SMPTE registered data | $01_h$ |
| 10 | Defining document: Anc packets | $01_h$ |
| 11 | Ancillary data packet DID | $41_h$ |
| 12 | Ancillary packet SDID | $01_h$ |
| 13 | Zero fill | $00_h$ |
| 14 | Zero fill | $00_h$ |
| 15 | Zero fill | $00_h$ |
| 16 | Zero fill | $00_h$ |

NOTE – The above 16-byte UL value is shown for guidance only. Users should consult an appropriate registry for a definitive value.

## **Annex D** (informative)
## Why do we need a video payload identifier and why is it 4 bytes long?

The first component digital video interface specifications were based on a unique mapping of the picture raster onto a synchronous transport mechanism. Thus, the 525 and 625 variants are vertical standards which encompass all levels of the ISO/OSI 7-layer reference model. At the time of developing these standards, the technology was in its infancy and manufacturers had to use the fastest chips available at the time to achieve the 270Mbps serial data rate.

However, even in those early days, some 15 years ago, there were already users who wished to use the interfaces in more creative ways. In particular, the use of two digital video interface channels with one channel carrying the baseband 4:2:2 sample structure and the second carrying a linear key channel and the missing chrominance samples to make a so-called 4x4 system. Such developments were used by only a small number of users and, thus, the problem of labelling the twin connections was a matter of physically tagging the cables to ensure the channels were connected correctly.

A further development was that of the 360-Mb/s SDI which extended the horizontal bandwidth by a third for use with widescreen television based on 960 active luminance samples per line rather than the 720 pixels in 270-Mb/s SDI. This, however, was still manageable and compatibility with 270-Mb/s SDI was relatively easily maintained.

The next major milestone in SDI history was the extension to carry data which, in its various forms, is now known as the transport for data carriage, SDTI (SMPTE 305.2M). This distinguishes itself from SDI by adding a video payload identifier in the H-blanking to identify itself as SDTI and to identify the video payload packet structure carried by the transport.

The initial development of HD-SDI (SMPTE 292M) was again an exotic technology at the time having a data rate which has finally settled at 1.485 Gb/s (nominal). It too carried a single video payload initially based on a single video sampling structure. However, new developments produced two sample structure variants:

– A first system bases on 1080 active lines in an interlaced picture with 1920 horizontal luminance samples, and

– A second system based on 720 active lines in a progressive picture with 1280 horizontal luminance samples.

Both used the HD-SDI interface as a common carrier. Now that HD is considered as a worldwide production format, the list of sampling variants in the 1080-line family has reached 13 and that of the 720-line family has reached 8 to accommodate the different picture rates used throughout the world.

A further development is that of 540-Mb/s SDI which is designed to carry a number of video payloads including progressive scan 59.94/60 Hz (and potentially 5 0Hz) systems.

The latest development is the mapping of standard definition video onto HD-SDI with the aim of using one interface to carry many video payloads.

These ongoing developments are possible because the technology now allows such capability and the HD-SDI interface in particular has the capacity to carry almost every video system in use today and the near future.

The problem is that it is now becoming difficult for equipment to recognize the video payload type as it is no longer intimately related to the interface. We are moving inexorably to the horizontal model of standards where each horizontal layer is becoming detached from the layers immediately above and below.

**Why is the video payload identifier 4 bytes long?**

The video payload identifier has been proposed as a 4-byte length for a number of reasons:

– 1 or 2 bytes does not give sufficient flexibility for possible future (unforeseen) applications;

– A 16-byte SMPTE Universal label is a gross excess of capability. Universal labels are conventionally in multiples of 4 bytes up to 64 bytes maximum;

– A 4-byte video payload identifier allows both easy parsing and can accommodate all foreseen requirements with adequate room for further expansion for unforeseen requirements in the future;

– It is relatively easy for this identifier to be encoded and decoded by hardware intensive equipment.

A video payload identifier could be used to identify core sampling parameters such as H and V resolutions, luminance and chrominance sampling structures, and more. It would then encompass information which is provided by the SMPTE video index (SMPTE RP 186). Taking this approach to its logical conclusion means that the video payload identifier becomes a lengthy metadata set rather than an identifier.

The above approach was rejected as being too complex for relatively simple digital video interface connections and replicates information which would be better placed elsewhere; such as the video index.

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The simple approach used in this standard uses the video payload identifier to identify the relevant SMPTE standard and any options within that standard. An example would be to use the first byte of the video payload identifier to point to SMPTE 274M (1080-line video payloads) and then use the remaining parts to identify the table entry in the standard. Since the number of digital video interface standards is limited and the number of tables in each entry is typically restricted to a few entries, this process can be simply defined and easily parsed by decoders.

## **Annex E** (informative)
## **Bibliography**

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