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*ETSI Standard*

**Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Dynamic synchronous Transfer Mode (DTM); Part 11: Mapping of video streams over DTM**

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# Intellectual Property Rights

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# Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN), and is now submitted for the ETSI standards Membership Approval Procedure.

The present document is part 11 of a multi-part deliverable covering the Dynamic synchronous Transfer Mode (DTM), as identified below:

Part 1: System description;

Part 2: System characteristics;

Part 3: Physical protocol;

Part 4: Mapping of DTM frames into SDH containers;

Part 5: Mapping of PDH over DTM;

Part 6: Mapping of Synchronous Digital Hierarchy (SDH) over DTM;

Part 7: Ethernet over DTM Mapping;

Part 8: Mapping of Frame relay over DTM;

Part 9: Mapping of ATM over DTM;

Part 10: Routeing and switching of IP flows over DTM;

**Part 11: Mapping of video streams over DTM;**

Part 12: Mapping of MPLS over DTM;

Part 13: System description of sub-rate DTM;

Part 14: Network management.

# 1 Scope

The present document specifies:

- the functional requirements for transport of ITU-R Recommendation BT.601 [7] encoded video over DTM;
- the functional requirements for transport of DVB/MPEG-2 TS encoded video over DTM;
- the characteristics of transport of ITU-R Recommendation BT.601 [7] encoded video over DTM;
- the characteristics of transport of DVB/MPEG-2 TS encoded video over DTM.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] CENELEC EN 50083-9: "Cable networks for television signals, sound signals and interactive services - Part 9: Interfaces for CATV/SMATV headends and similar professional equipment for DVB/MPEG-2 transport streams".

[2] ETSI EN 300 421: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".

[3] ETSI EN 300 429: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for cable systems".

[4] ETSI ES 201 803-1: "Dynamic synchronous Transfer Mode (DTM); Part 1: System description".

[5] ETSI ES 201 803-2-3: "Dynamic synchronous Transfer Mode (DTM); Part 2: System Characteristics; Sub-part 3: Transport network and channel adaptation aspects".

[6] ITU-R Recommendation BT.470: "Conventional television systems".

[7] ITU-R Recommendation BT.601: "Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios".

[8] ITU-R Recommendation BT.656: "Interfaces for digital component video signals in 525-line and 625-line television systems operating at the 4:2:2 level of recommendation ITU-R BT.601 (Part A)".

[9] ITU-R Recommendation BT.709: "Parameter values for the HDTV standards for production and international programme exchange".

[10] ITU-T Recommendation H.222.0: "Information technology - Generic coding of moving pictures and associated audio information: Systems".

[11] SMPTE 240M: "Television - Signal Parameters - 1125-Line High-Definition Production Systems".

[12] SMPTE 259M: "Television - 10-Bit 4:2:2 Component and 4fsc Composite Digital Signals - Serial Digital Interface".

[13] SMPTE 260M: "Television - 1125/60 High-Definition Production Systems - Digital Representation and Bit-Parallel Interface".

[14] SMPTE 274M: "Television - 1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates".

[15] SMPTE 292M: "Television - Bit-Serial Digital Interface for High-Definition Television Systems".

[16] SMPTE 295M: "Television - 1920 x 1080 50 Hz - Scanning and Interfaces".

# 3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| AES/EBU | Advanced Ebcryption Standard/European Broadcasting Union |
| AGC | Automatic Gain Control |
| AI | Adapted Information |
| AIS | Alarm Indication Signal |
| AP | Adaptation Point |
| ASI | Asynchronous Serial Interface |
| CI | Characteristic Information |
| CP | Connection Point |
| DCAP-0 | DTM Channel Adaptation Protocol 0 |
| DTM | Dynamic synchronous Transfer Mode |
| DTV | Definition TeleVision |
| DVB | Digital Video Broadcasting |
| EAV | End of Active Video |
| HD | Header Data |
| HDTV | High Definition TeleVision |
| IF | In Frame |
| MI | Management Information |
| MP | Management Point |
| MPEG | Moving Pictures Experts Group |
| NTSC | National Television System Committee |
| OOF | Out Of Frame |
| PAL | Phase Alternating Line |
| SDI | Serial Digital Interface |
| TI | Timing Information |
| TNRM | Transport Network Reference Model |
| TP | Timing Point |
| TRS | TRansmission Siwtch |
| TS | Transport Stream |

# 4 Overview

The digital transmission of video exists in numerous uncompressed formats and a few compressed formats. Within the present document the mapping of the digital encoding of PAL and NTSC (see ITU-R Recommendations BT.470 [6] and BT.601 [7]) in 4:3 (270 Mb/s) and 16:9 (360 Mb/s) (see ITU-R Recommendation BT.656 [8] and SMPTE 259M [12]) as well as a variety of HDTV (see ITU-R Recommendation BT.709 [9], SMPTEs 260M [13], 295M [16] and 274M [14]) signals (1,485 Gb/s and 1,4835 Gb/s) (see SMPTE 292M [15]) over DTM will be specified. These formats are listed in tables 1 and 2.

Further will the transport of MPEG-2 Transport Streams and DVB streams (see EN 300 429 [3]) be specified. The MPEG-2 TS/DVB streams can be accessed over a number of physical interfaces such as DVB-ASI.

This provides the professional transport formats in studio, contribution networks as well as distribution networks a transport service over a DTM network. In order to aid the modelling and understanding of the broadcast standards for digital television, annexes A and B provides the SDI TNRM model while annexes C, D and E provides the DVB/ASI TNRM model as an informative part of the present document. This modelling does not include all functions and options, but a framework for which further modelling can be done.

NOTE 1: While modelling of physical interfaces have been done for electrical interfaces only, similar modelling may be performed for optical interfaces or other electrical interfaces.

NOTE 2: Additional services can be transported over SDI using auxiliary data, including AES/EBU signals etc.

NOTE 3: Additional forms of DVB/MPEG-2 TS transport interfaces exist. The present document provides the transport mapping of the DVB/MPEG-2 transport stream regardless of the type of interface.

**Table 1: Standard definition serial digital interface mapping properties**

| System | PAL 4:3 | NTSC 4:3 | PAL 16:9 | NTSC 16:9 |
|---|---|---|---|---|
| Analogue standard | BT.470 | BT.470 | BT.470 | BT.470 |
| Digital format standard | BT.601 | BT.601 | BT.601 | BT.601 |
| Digital interface standard | BT.656 | BT.656 | BT.656 | BT.656 |
| Active lines | 576 | 486 | 576 | 486 |
| Active samples | 720 | 720 | 960 | 960 |
| Total lines | 625 | 525 | 625 | 525 |
| Lum samples | 864 | 858 | 1 152 | 1 144 |
| Total samples | 1 728 | 1 716 | 2 304 | 2 288 |
| Frame rate | 25 | 30 | 25 | 30 |
| Drop-frame ratio | 1 | 1,001 | 1 | 1,001 |
| Fields/frame | 2 | 2 | 2 | 2 |
| Blanking codewords | 140 | 134 | 188 | 180 |
| Bitrate (Mb/s) | 270 | 270 | 360 | 360 |
| x (Physical/DataLink type) | 1 | 1 | 2 | 2 |
| Blocks/line | 54 | 53,625 | 72 | 71,5 |
| EAV alignments | 1 | 8 | 1 | 2 |
| Blocks/frame | 33 750 | 28 153,1 | 45 000 | 37 537,5 |
| Blocks/s | 843 750 | 843 750 | 1 125 000 | 1 125 000 |
| Blocks/DTM frame | 105,469 | 105,469 | 140,625 | 140,625 |
| Slots/DTM frame | 528 | 528 | 704 | 704 |
| Overcapacity (kb/s) | 336 | 336 | 448 | 448 |

**Table 2: High Definition Serial Digital Interface mapping properties**

| System | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV | HDTV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analogue standard | SMPTE 240M | SMPTE 240M | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 | ITU-R BT.709 |
| Digital format standard | SMPTE 260M | SMPTE 260M | SMPTE 295M-2 | SMPTE 274M-4 | SMPTE 274M-5 | SMPTE 274M-6 | SMPTE 274M-7 | SMPTE 274M-8 | SMPTE 274M-9 | SMPTE 274M-10 | SMPTE 274M-11 |
| Digital interface standard | SMPTE 292M-A | SMPTE 292M-B | SMPTE 292M-C | SMPTE 292M-D | SMPTE 292M-E | SMPTE 292M-F | SMPTE 292M-G | SMPTE 292M-H | SMPTE 292M-I | SMPTE 292M-J | SMPTE 292M-K |
| Active lines | 1 035 | 1 035 | 1 080 | 1 080 | 1 080 | 1 080 | 1 080 | 1 080 | 1 080 | 1 080 | 1 080 |
| Active samples | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 | 1 920 |
| Total lines | 1 125 | 1 125 | 1 250 | 1 125 | 1 125 | 1 125 | 1 125 | 1 125 | 1 125 | 1 125 | 1 125 |
| Lum samples | 2 200 | 2 200 | 2 376 | 2 200 | 2 200 | 2 640 | 2 200 | 2 200 | 2 640 | 2 750 | 2 750 |
| Total samples | 4 400 | 4 400 | 4 752 | 4 400 | 4 400 | 5 280 | 4 400 | 4 400 | 5 280 | 5 500 | 5 500 |
| Frame rate | 30 | 30 | 25 | 30 | 30 | 25 | 30 | 30 | 25 | 24 | 24 |
| Drop-frame ratio | 1 | 1,001 | 1 | 1 | 1,001 | 1 | 1 | 1,001 | 1 | 1 | 1,001 |
| Fields/frame | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Blanking codewords | 272 | 272 | 448 | 272 | 272 | 712 | 272 | 272 | 712 | 822 | 822 |
| Bitrate (Mb/s) | 1 485 | 1 483,5 | 1 485 | 1 485 | 1 483,5 | 1 485 | 1 485 | 1 483,5 | 1 485 | 1 485 | 1 483,5 |
| x (Physical/Data Link type) | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3 |
| Blocks/line | 137,5 | 137,5 | 148,5 | 137,5 | 137,5 | 165 | 137,5 | 137,5 | 165 | 171,875 | 171,875 |
| EAV alignments | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 8 | 8 |
| Blocks/frame | 154 687 | 154 687 | 185 625 | 154 687 | 154 687 | 185 625 | 154 687 | 154 687 | 185 625 | 193 359 | 193 359 |
| Blocks/s | 4 640 625 | 4 635 989 | 4 640 625 | 4 640 625 | 4 635 989 | 4 640 625 | 4 640 625 | 4 635 989 | 4 640 625 | 4 640 625 | 4 635 989 |
| Blocks/DTM frame | 580,078 | 579,499 | 580,078 | 580,078 | 579,499 | 580,078 | 580,078 | 579,499 | 580,078 | 580,078 | 579,499 |
| Slots/DTM frame | 2 901 | 2 898 | 2 901 | 2 901 | 2 898 | 2 901 | 2 901 | 2 898 | 2 901 | 2 901 | 2 898 |
| Overcapacity (kb/s) | 312 | 259,516 | 312 | 312 | 259,516 | 312 | 312 | 259,516 | 312 | 312 | 259,516 |

# 5 DTM SDI Video transport application layer model

The SDI 270 Mb/s, 360 Mb/s, 1 483 Mb/s and 1 485 Mb/s transport over DTM is specified as the adaptation function on top of the DCAP-0 (see ES 201 803-2-3 [5]) application trail terminators.

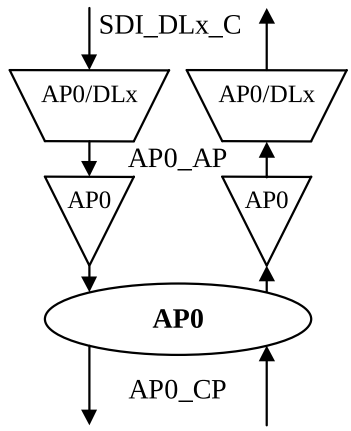


**Figure 1: SDI Video transport atomic functions**

## 5.1 Access point information

### 5.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the 10 bit wide data signal for data link type x DLx_CI_D;
- the clock signal for data link type x DLx_CI_CK;
- the TRS Frame Start type x DLx_CI_FS;
- the server signal failure signal for data link type x DLx_CI_SSF.

NOTE: See annexes A and B for additional information on SDI modelling and signals.

### 5.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is described in (see ES 201 803-2-3 [5]) as the Application 0 adapted information.

### 5.1.3 Management Information

The Management Information (MI) of the Management Point (MP) is:

- the 1 second timer signal AP0/SDI_DLx_A_So_MI_1second;
- the positive frequency justification 1 second performance counter AP0/SDI_DLx_A_So_MI_pFJ+;
- the negative frequency justification 1 second performance counter AP0/SDI_DLx_A_So_MI_pFJ-;
- the loss of justification cause signal AP0/SDI_DLx_A_Sk_MI_cLOJ;
- the alarm indication signal cause signal AP0/SDI_DLx_A_Sk_MI_cAIS.

### 5.1.4 Timing Information

The Timing Information (TI) of the Timing Point (TP) is:

- the Application 0 data clock timing indication AP0_TI_CK;
- the Application 0 frame start timing indication AP0_TI_FS.

## 5.2 Connection function (AP0_C)

Not applicable. There is no connection functions defined for this layer.

## 5.3 Trail Termination functions

The trail termination functions are empty mappings between AI and CI.

### 5.3.1 Application 0 Trail Termination function (AP0_TT)

The Application 0 trail termination functions are empty mappings between AI and CI.

#### 5.3.1.1 Application 0 Trail Termination Source function (AP0_TT_So)

**Symbol**

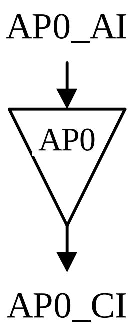


**Figure 2: Application 0 Trail Termination Source (AP0_TT_So)**

**Interfaces**

**Table 3: AP0_TT_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| AP0_AI_D | AP0_CI_D |
| AP0_AI_CK | AP0_CI_CK |
| AP0_AI_II | AP0_CI_II |
| AP0_AI_PSI | AP0_CI_PSI |
| AP0_AI_TSF | AP0_CI_SSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

AP0_CI_D ← AP0_AI_D.

AP0_CI_CK ← AP0_AI_CK.

AP0_CI_II ← AP0_AI_II.

AP0_CI_PSI ← AP0_AI_PSI.

AP0_CI_SSF ← AP0_AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

### 5.3.1.2 Application 0 Trail Termination Sink function (AP0_TT_Sk)

**Symbol**

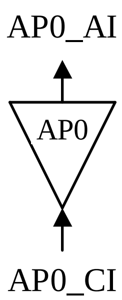


**Figure 3: Application 0 Trail Termination Sink (AP0_TT_Sk)**

**Interfaces**

**Table 4: AP0_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| AP0_CI_D | AP0_AI_D |
| AP0_CI_CK | AP0_AI_CK |
| AP0_CI_II | AP0_AI_II |
| AP0_CI_PSI | AP0_AI_PSI |
| AP0_CI_SSF | AP0_AI_TSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

AP0_AI_D ← AP0_CI_D.

AP0_AI_CK ← AP0_CI_CK.

AP0_AI_II ← AP0_CI_II.

AP0_AI_PSI ← AP0_CI_PSI.

AP0_AI_TSF ← AP0_CI_SSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# 5.4 Adaptation functions

## 5.4.1 Application 0 to SDI Data Link Adaptation function (AP0/SDI_DLx_A)

This clause describes the SDI adaptation using Application 0 trail terminators.

### 5.4.1.1 Application 0 to SDI Data Link Adaptation Source function (APO/SDI_DLx_A_So)

**Symbol**

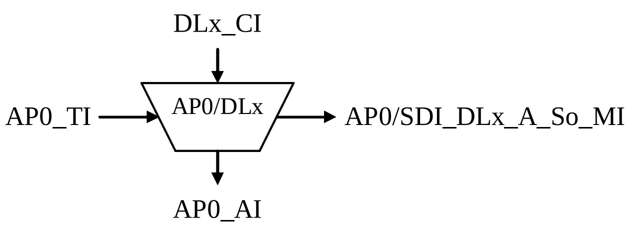


**Figure 4: Application 0 to SDI Data Link Adaptation Source (AP0/SDI_DLx_A_So)**

**Interfaces**

**Table 5: AP0/DLx_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | AP0_AI_D |
| DLx_CI_CK | AP0_AI_CK |
| DLx_CI_FS | AP0_AI_II |
| DLx_CI_SSF | AP0_AI_PSI |
| AP0_TI_CK | AP0_AI_TSF |
| AP0_TI_FS | AP0/SDI_DLx_A_So_MI_pFJ- |
| AP0/SDI_DLx_A_So_MI_1second | AP0/SDI_DLx_A_So_MI_pFJ+ |

**Processes and anomalies**

The division of the DLx word stream into segments as specified in clause 7. See ES 201 803-2-3 [5], clause 6.1.13.

The multiplexing of 32 DLx words in the segment into 5 data slots. See ES 201 803-2-3 [5], clause 6.1.13.

The multiplexing of data slots into a slot stream on AI_D. See ES 201 803-2-3 [5], clause 6.1.13.

sII: The indirect multiplexing (performed by the TT_So) of 1 idle marker in between segments (see clause 6) by assertion of the Idle Insertion signal (sII). The number of idle markers is given by the frequency justification process, see ES 201 803-2-3 [5], clauses 6.1.12.1 and 6.1.13.6.

sPSI: The Performance Supervision Insertion signal (sPSI) is asserted when the performance supervision special marker of a segment is to be transmitted according to clause 6, else it is de-asserted. See ES 201 803-2-3 [5], clause 6.1.13.6.

The continuous monitoring of the deviation in phase between the incoming signal and the transmitted signal is performed in order do perform frequency justifications. See ES 201 803-2-3 [5], clause 6.1.8.1.

The performance of positive justification when the incoming signal rate is above the nominal signal rate, by the transmission of a data in replacement of an idle-marker where positive justification is allowed. See ES 201 803-2-3 [5], clause 6.1.8.1. For justification opportunity, see clause 6.1.

The performance of negative justification when the incoming signal rate is below the nominal signal rate, by the transmission of an idle-marker in place of data where negative justification is allowed.
See ES 201 803-2-3 [5], clause 6.1.8.1. For justification opportunity, see clause 6.1.

nFJ+: The positive frequency justification anomaly (nFJ+) is asserted when a positive frequency justification has occurred, else it is de-asserted. See ES 201 803-2-3 [5], clause 6.1.8.1.

nFJ-: The negative frequency justification anomaly (nFJ-) is asserted when a negative frequency justification has occurred, else it is de-asserted. See ES 201 803-2-3 [5], clause 6.1.8.1.

AIS: The Alarm Indication Signal (AIS) insertion into AI_D instead of received signal when the CI_SSF signal is asserted. See ES 201 803-2-3 [5], clause 6.1.5.1.

**Defects**

None.

**Consequent actions**

aAIS: The Alarm Indication Signal action (aAIS) is asserted when the Server Signal Fail (SSF) is asserted.
See ES 201 803-2-3 [5], clause 6.3.1.1.

aAIS ← CI_SSF.

**Defect correlation**

None.

**Performance monitoring**

pFJ+ (A_So): The Positive Frequency Justification performance (pFJ+) is the number of positive frequency justifications anomalies (nFJ+) that has occurred during 1 s. See ES 201 803-2-3 [5], clause 6.5.3.1.

pFJ+ ← Σ nFJ+.

pFJ- (A_So): The Negative Frequency Justification performance (pFJ-) is the number of negative frequency justification anomalies (nFJ-) that has occurred during 1 s. See ES 201 803-2-3 [5], clause 6.5.3.2.

pFJ- ← Σ nFJ-.

**Output mapping**

AP0_AI_D ← AI_D.

AP0_AI_CK ← AP0_TI_CK.

AP0_AI_II ← sII.

AP0_AI_PSI ← sPSI.

AP0_AI_TSF ← S4_CI_SSF.

AP0/SDI_DLx_A_So_MI_pFJ+ ← pFJ+.

AP0/SDI_DLx_A_So_MI_pFJ- ← pFJ-.

**Fault management**

None.

**Long term performance monitoring**

FJ+(t-10) (A_Sk): The delayed positive Frequency Justification performance counter (FJ+(t-10)) is the 10 s delayed value of the positive Frequency Justification performance counter (pFJ+). See ES 201 803-2-3 [5], clause 6.8.5.2.

FJ-(t-10) (A_Sk): The delayed negative Frequency Justification performance counter (FJ-(t-10)) is the 10 s delayed value of the negative Frequency Justification performance counter (pFJ-). See ES 201 803-2-3 [5], clause 6.8.5.2.

### 5.4.1.2 Application 0 to SDI Data Link Adaptation Sink function (AP0/SDI_DLx_A_Sk)

**Symbol**

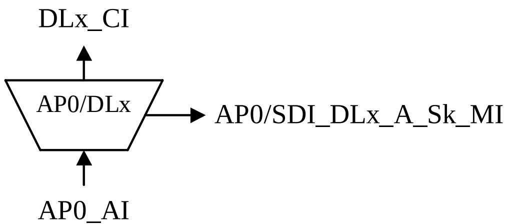


**Figure 5: Application 0 to SDI Data Link Adaptation Sink (AP0/SDI_DLx_A_Sk)**

**Interfaces**

**Table 6: AP0/DLx_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| AP0_AI_D | DLx_CI_D |
| AP0_AI_CK | DLx_CI_CK |
| AP0_AI_II | DLx_CI_FS |
| AP0_AI_PSI | DLx_CI_SSF |
| AP0_AI_TSF | AP0/SDI_DLx_A_Sk_MI_cAIS |
| | AP0/SDI_DLx_A_Sk_MI_cLOJ |

**Processes and anomalies**

The monitoring of frame alignment pattern in order to identify the initial data word of a segment in the SDI transport stream according to clause 7. See ES 201 803-2-3 [5], clause 6.1.9.4.

sFS: When the initial segment is detected and the first of its data words is transmitted on CI_D shall the Frame Start signal (sFS) be asserted, else it shall be de-asserted. See ES 201 803-2-3 [5], clause 6.1.9.4.

nLOJ: If the initial segment does not occur after the specified justification, then the Loss Of Justification anomaly (nLOJ) is asserted, else nLOJ is not asserted. See clause 6.2.1 and ES 201 803-2-3 [5], clause 6.1.9.4.

The demultiplexing of data slots from the slot stream on AI_D. See ES 201 803-2-3 [5], clause 6.1.13.6.

The demultiplexing of 5 data slots into 32 DLx data words. See ES 201 803-2-3 [5], clause 6.1.13.6.

The clock smoothing process in order to reduce phase deviations on the transmitted signal. The clock smoothing must comply with the jitter and wander requirements as defined in ITU-R Recommendation BT.656 [8] and SMPTE 259M [12]. The resulting clock is delivered as CI_CK. See ES 201 803-2-3 [5], clause 6.1.11.3.

The elastic buffering of the transported signal such that the buffer output is being clocked by the smoothed clock. See ES 201 803-2-3 [5], clause 6.1.11.3.

AIS (A_Sk): The Alarm Indication Signal (AIS) insertion into CI_D instead of received data when the Alarm Indication Signal defect (dAIS) is asserted. See ES 201 803-2-3 [5], clause 6.1.5.1.

nAIS: The Alarm Indication Signal anomaly (nAIS) is asserted when a AIS-marker is being detected in the AI_D stream. See ES 201 803-2-3 [5], clause 6.1.5.1.

**Defects**

The justification persistence state machine monitors the Loss Of Justification anomaly (nLOJ). The default state is Out Of Frame (OOF). When in the OOF state the nLOJ is not asserted on three consecutive justification opportunities, the state of the machine shall change to In Frame (IF). When in the IF state the nLOJ is asserted on five consecutive justification opportunities, the state of the machine shall change to OOF. See ES 201 803-2-3 [5], clause 6.2.4.2.

dLOJ: The Loss Of Justification defect (dLOJ) shall be asserted when the justification persistence state machine is in the OOF state. See ES 201 803-2-3 [5], clause 6.2.4.2.

dAIS (A_Sk): The Alarm Indication Signal defect (dAIS) is asserted when the Alarm Indication Signal anomaly (nAIS) is asserted for more than three consecutive DTM frames, else it is not asserted. See ES 201 803-2-3 [5], clause 6.2.6.1.

**Consequent actions**

aAIS: The Alarm Indication Signal action (aAIS) is asserted when the Loss Of Justification defect (dLOJ), the Alarm Indication Signal defect (dAIS) is asserted or the Trail Signal Fail (AI_TSF) is. See ES 201 803-2-3 [5], clause 6.3.1.1.

aAIS ← dLOJ or dAIS or AI_TSF.

aSSF: The Server Signal Fail action (aSSF) is asserted when the Alarm Indication Signal defect (dAIS) is asserted, the Trail Signal Fail (AI_TSF) is asserted or the Loss Of Justification defect (dLOJ) is asserted. See ES 201 803-2-3 [5], clause 6.3.1.2.

aSSF ← dAIS or AI_TSF or dLOJ.

**Defect correlation**

cLOJ: The Loss Of Justification cause (cLOJ) is asserted when the Loss Of Justification defect (dLOJ) is asserted, the Alarm Indication Signal defect (dAIS) not asserted and Trail Signal Fail (AI_TSF) is not asserted.
See ES 201 803-2-3 [5], clause 6.4.4.2.

cLOJ ← dLOJ and (not dAIS) and (not AI_TSF).

cAIS: The Alarm Indication Signal cause (cAIS) is asserted when the Alarm Indication Signal defect (dAIS) is asserted and the Trail Signal Failure (AI_TSF) is not asserted. See ES 201 803-2-3 [5], clause 6.4.6.1.

cAIS ← dAIS and (not AI_TSF).

**Performance monitoring**

None.

**Output mapping**

DLx_CI_D ← CI_D.

DLx_CI_CK ← CI_CK.

DLx_CI_FS ← sFS.

DLx_CI_SSF ← aSSF.

AP0/DLx_A_Sk_MI_cLOJ ← cLOJ.

AP0/DLx_A_Sk_MI_cAIS ← cAIS.

**Fault management**

fAIS (A_Sk): The Alarm Indication Signal fault (fAIS) is asserted when the Alarm Indication Signal cause (cAIS) is asserted consistently for $2{,}5 \pm 0{,}5$ seconds and not asserted when the cAIS have been not asserted for 10 s ± 0,5 s.
See ES 201 803-2-3 [5], clause 6.6.1.3.

fLOJ (A_Sk): The Loss Of Justification fault (fLOF) is asserted when the Loss Of Justification cause (cLOJ) is asserted consistently for $2{,}5 \pm 0{,}5$ seconds and not asserted when the cLOJ have been not asserted for 10 s ± 0,5 s.
See ES 201 803-2-3 [5], clause 6.6.1.6.

**Long term performance monitoring**

None.

# 6 DTM DVB Video transport application layer model

The MPEG-2 TS and DVB RS-encoded MPEG-2 TS transport over DTM is specified as the adaptation function on top of the DCAP-1 ES 201 803-2-3 [5] application trail terminators.

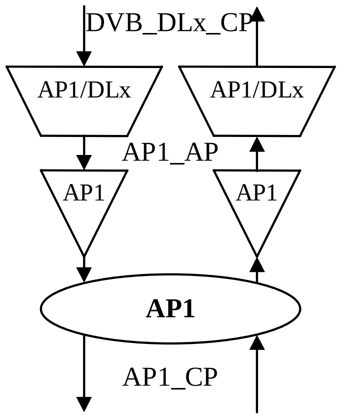


**Figure 6: DVB Video transport atomic functions**

# 6.1 Access point information

## 6.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the DVB data link type x octet data DVB_DLx_CI_D;
- the DVB data link type x data clock DVB_DLx_CI_CK;
- the DVB data link type x packet frame start DVB_DLx_CI_FS;
- the DVB data link type x server signal failure DVB_DLx_CI_SSF.

NOTE: See annexes C, D and E for further DVB/MPEG-2 transport modelling.

## 6.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is described in ES 201 803-2-3 [5] as the Application 1 adapted information.

## 6.1.3 Management Information

The Management Information (MI) of the Management Point (MP) is:

- the Channel Multiplex Identifier AP1/DVB_DLx_A_So_MI_CMI;
- the Priority field AP1/DVB_DLx_A_So_MI_PRI.

## 6.1.4 Timing Information

Not applicable. There is no timing information defined for this layer.

# 6.2 Connection function (AP1_C)

Not applicable. There is no connection function defined for this layer.

# 6.3 Trail Termination functions

The trail termination functions are empty mappings between AI and CI.

## 6.3.1 Application 1 Trail Termination function (AP1_TT)

The Application 1 trail termination functions are empty mappings between AI and CI.

### 6.3.1.1 Application 1 Trail Termination Source function (AP1_TT_So)

**Symbol**

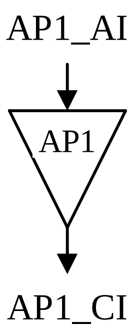


**Figure 7: Application 1 Trail Termination Source (AP1_TT_So)**

**Interfaces**

**Table 7: AP1_TT_So Input and output signals**

| Input(s) | Output(s) |
| --- | --- |
| AP1_AI_D | AP1_CI_D |
| AP1_AI_CK | AP1_CI_CK |
| AP1_AI_FS | AP1_CI_FS |
| AP1_AI_LEN | AP1_CI_LEN |
| AP1_AI_CMI | AP1_CI_CMI |
| AP1_AI_PRI | AP1_CI_PRI |
| AP1_AI_TSF | AP1_CI_SSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

AP1_CI_D ← AP1_AI_D.

AP1_CI_CK ← AP1_AI_CK.

AP1_CI_FS ← AP1_AI_FS.

AP1_CI_LEN ← AP1_AI_LEN.

AP1_CI_CMI ← AP1_AI_CMI.

AP1_CI_PRI ← AP1_AI_PRI.

AP1_CI_SSF ← AP1_AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

### 6.3.1.2 Application 1 Trail Termination Sink function (AP1_TT_Sk)

**Symbol**

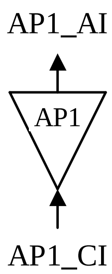


**Figure 8: Application 1 Trail Termination Sink (AP1_TT_Sk)**

**Interfaces**

**Table 8: AP1_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| AP1_CI_D | AP1_AI_D |
| AP1_CI_CK | AP1_AI_CK |
| AP1_CI_FS | AP1_AI_FS |
| AP1_CI_LEN | AP1_AI_LEN |
| AP1_CI_CMI | AP1_AI_CMI |
| AP1_CI_PRI | AP1_AI_PRI |
| AP1_CI_SSF | AP1_AI_TSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

AP1_AI_D ← AP1_CI_D.

AP1_AI_CK ← AP1_CI_CK.

AP1_AI_FS ← AP1_CI_FS.

AP1_AI_LEN ← AP1_CI_LEN.

AP1_AI_CMI ← AP1_CI_CMI.

AP1_AI_PRI ← AP1_CI_PRI.

AP1_AI_TSF ← AP1_CI_SSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# 6.4 Adaptation functions

## 6.4.1 Application 1 to DVB Data Link type x Adaptation function (AP1/DVB_DLx_A)

This clause describe the MPEG-2 TS (x = 1) or DVB RS (x = 2) adaptation using Application 1 trail terminators.

### 6.4.1.1 Application 1 to DVB Data Link type x Adaptation Source function (AP1/DVB_DLx_A_So)

**Symbol**

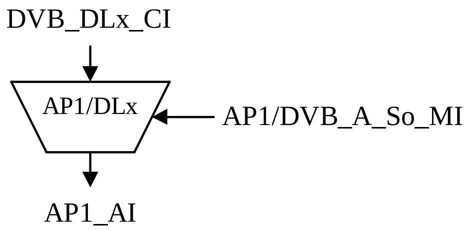


**Figure 9: Application 1 to DVB Data Link type x Adaptation Source (AP1/DVB_DLx_A_So)**

**Interfaces**

**Table 9: AP1/DVB_DLx_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | AP1_AI_D |
| DLx_CI_CK | AP1_AI_CK |
| DLx_CI_FS | AP1_AI_FS |
| DLx_CI_SSF | AP1_AI_LEN |
| AP1/DVB_DLx_A_So_MI_CMI | AP1_AI_CMI |
| AP1/DVB_DLx_A_So_MI_PRI | AP1_AI_PRI |
| | AP1_AI_TSF |

**Processes and anomalies**

The monitoring of packet frame start (CI_FS) and determination of packet length (1 to 8 packets per DCAP-1 packet). See clause 8.

sFS: The Frame Start signal (sFS) is asserted when CI_FS is asserted and the packet length state requires a new DCAP-1 packet. See clause 8.

sLEN: The generation of a 188 (x = 1) or 204 (x = 2) multiple of the determined packet length. See clause 8.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

AP1_AI_D ← CI_D.

AP1_AI_CK ← CI_CK.

AP1_AI_FS ← sFS.

AP1_AI_LEN ← sLEN.

AP1_AI_CMI ← MI_CMI.

AP1_AI_PRI ← MI_PRI.

AP1_AI_TSF ← CI_SSF.

**Fault management**

None.

**Long term performance monitoring**

None.

#### 6.4.1.2 Application 1 to DVB Data Link type x Adaptation Sink function (AP1/DVB_DLx_A_Sk)

**Symbol**

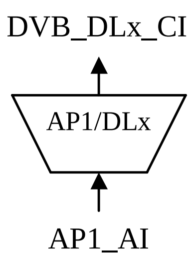


**Figure 10: Application 1 to DVB Data Link type x Adaptation Sink (AP1/DVB_DLx_A_Sk)**

**Interfaces**

**Table 10: AP1/DVB_DLx_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| AP1_AI_D | DLx_CI_D |
| AP1_AI_CK | DLx_CI_CK |
| AP1_ÄI_FS | DLx_CI_FS |
| AP1_AI_LEN | DLx_CI_SSF |
| AP1_AI_CMI | |
| AP1_AI_PRI | |
| AP1_AI_TSF | |

**Processes and anomalies**

The monitoring of AI_D for sync bytes. See clause 8.

sFS: The Frame Start signal (sFS) is asserted when AI_D contains a legal sync byte. See clause 8.

The monitoring of the MPEG-2 TS PCR timestamps. See ITU-T Recommendation H.222.0 [10].

The clock smoothing process based on PCR in order to reduce phase deviation on the transmitted signal. The clock smoothing must comply with the jitter and wander requirements as defined in ITU-T Recommendation H.222.0 [10]. The resulting clock is delivered as CI_CK for each program stream. See also ES 201 803-2-3 [5], clause 6.1.11.3 and ITU-T Recommendation H.222.0 [10].

The elastic buffering of the transported signal such that the buffer output CI_D is being clocked to the smoothed clock CI_CK. See ES 201 803-2-3 [5], clause 6.1.11.3 and ITU-T Recommendation H.222.0 [10].

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DVB_DLx_CI_D ← CI_D.

DVB_DLx_CI_CK ← CI_CK.

DVB_DLx_CI_FS ← sFS.

DVB_DLx_CI_SSF ← AP1_AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# 7 SDI Transport mapping

The 10-bit words of the BT.656 and SMPTE 292M [15] digital formats does not evenly align to the 64-bit data slot word format of DCAP-0. This causes an alignment cycle of 32 10-bit words over 5 64-bit data slot words.

In order to synchronize the demultiplexing of the 64-bit slot words into 10-bit words will the EAV pattern be detected. This pattern is defined in the relevant digital format standards according to table 11.

**Table 11: EAV encodings**

| Digital Format | BT-656 | SMPTE 292M |
|---|---|---|
| EAV length | 40 | 80 |
| Word 0 | 1111_1111_11 | 1111_1111_11 |
| Word 1 | 0000_0000_00 | 1111_1111_11 |
| Word 2 | 0000_0000_00 | 0000_0000_00 |
| Word 3 | 1xx1_xxxx_00 | 0000_0000_00 |
| Word 4 | | 0000_0000_00 |
| Word 5 | | 0000_0000_00 |
| Word 6 | | 1xx1_xxxx_00 |
| Word 7 | | 1xx1_xxxx_00 |

Depending on the number of total samples per line will there be 1, 2, 4, 8, 16 or 32 valid alignment positions. As can be found in tables 1 and 2 only the alignments of 1, 2 and 8 exists. By restricting which alignment positions is valid can hardware complexity be reduced. The valid alignment positions in a block of 5 data slot words is numbered 0 through 31 and is given in table 12. The individual bits are mapped in a one-on-one correspondence of the given ranges in table 12.

NOTE 1: The principle is that the highest bit number of a 10-bit word is assigned first to the highest free bit number in the data slot. The following bits are assigned in falling numbers. If a data slot is filled prior to the last bit of a word has been assigned, the next bit is assigned to the highest bit of the following data slot. Table 12 thus contains the condensed form where ranges have been given.

For a given number of valid EAV alignment positions (as found in table 2) has defined EAV positions as given in table 13.

NOTE 2: Since the number of legal positions for EAV is known for a certain digital format, the receiver detector may use this fact in order to implement a simplified alignment detector than a full-blown 32-alignment position detector. I.e. if the formats supported only require 1 or 2 EAV positions, the detector only requires to implement detection of EAV alignment positions 0 and 16.

**Table 12: Alignment positions**

| Word | Block Bits | Block word | Bits |
|---|---|---|---|
| 0 | 9 to 0 | 0 | 63 to 54 |
| 1 | 19 to 10 | 0 | 53 to 44 |
| 2 | 29 to 20 | 0 | 43 to 34 |
| 3 | 39 to 30 | 0 | 33 to 24 |
| 4 | 49 to 40 | 0 | 23 to 14 |
| 5 | 59 to 50 | 0 | 13 to 4 |
| 6 | 69 to 66 | 0 | 3 to 0 |
| 6 | 65 to 60 | 1 | 63 to 58 |
| 7 | 79 to 70 | 1 | 57 to 48 |
| 8 | 89 to 80 | 1 | 47 to 38 |
| 9 | 99 to 90 | 1 | 37 to 28 |
| 10 | 109 to 100 | 1 | 27 to 18 |
| 11 | 119 to 110 | 1 | 17 to 8 |
| 12 | 129 to 122 | 1 | 7 to 0 |
| 12 | 121 to 120 | 2 | 63 to 62 |
| 13 | 139 to 130 | 2 | 61 to 52 |
| 14 | 149 to 140 | 2 | 51 to 42 |
| 15 | 159 to 150 | 2 | 41 to 32 |
| 16 | 169 to 160 | 2 | 31 to 22 |
| 17 | 179 to 170 | 2 | 21 to 12 |
| 18 | 189 to 180 | 2 | 11 to 2 |
| 19 | 199 to 198 | 2 | 1 to 0 |
| 19 | 197 to 190 | 3 | 63 to 56 |
| 20 | 209 to 200 | 3 | 55 to 46 |
| 21 | 219 to 210 | 3 | 45 to 36 |
| 22 | 229 to 220 | 3 | 35 to 26 |
| 23 | 239 to 230 | 3 | 25 to 16 |
| 24 | 249 to 240 | 3 | 15 to 6 |
| 25 | 259 to 254 | 3 | 5 to 0 |
| 25 | 253 to 250 | 4 | 63 to 60 |
| 26 | 269 to 260 | 4 | 59 to 50 |
| 27 | 279 to 270 | 4 | 49 to 40 |
| 28 | 289 to 280 | 4 | 39 to to 30 |
| 29 | 299 to 290 | 4 | 29 to 20 |
| 30 | 309 to 300 | 4 | 19 to 10 |
| 31 | 319 to 310 | 4 | 9 to 0 |

**Table 13: Valid EAV alignment positions**

| Number of positions | Valid positions |
|---|---|
| 1 | 0 |
| 2 | 0,16 |
| 8 | 0,4,8,12,16,20,24,28 |

# 8 DVB/MPEG-2 TS transport mapping

The DVB/MPEG-2 TS stream consists of 188 byte MPEG-2 TS packets (see ITU-T Recommendation H.222.0 [10]) or 204 byte DVB RS wrapped MPEG-2 TS packets (see EN 300 421 [2]). These are transported in DCAP-1 as single packets or contiguously concatenated with up to 8 packets per DCAP-1 packet. Each DCAP-1 packet starts with the sync byte of the first MPEG-2 TS/DVB RS wrapped packet. When contiguous packets exist in the same DCAP-1 packet, the sync byte of the following packet follow on the first free byte after the previous packet.

NOTE 1: The size of the DCAP-1 packet is either an multiple of 188 bytes or 204 bytes, depending on which packet form is being transported.

NOTE 2: This transport service is roughly equivalent to the DVB/ASI interface, and timing is represented in the MPEG-2 TS PCR timestamps.

# Annex A (informative): SDI Physical type x model (SDI_PHx)

The SDI Physical x Layer provides a transport of 10-bit digital video of SD (see ITU-R Recommendation BT.601 [7]) and HD (see ITU-R Recommendation BT.709 [9]) type. The resulting signal is either 270 MBd (x = 1), 360 MBd (x = 2), 1,4835 GBd (x = 3) or 1,485 GBd (x = 4) over electrical or optical interface.

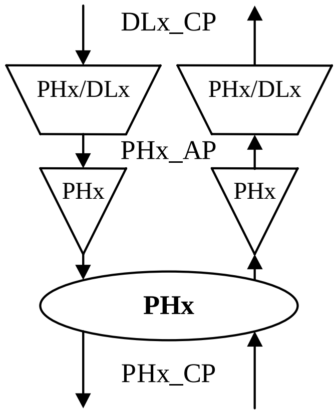


**Figure 11: SDI Physical type x Layer atomic functions**

# A.1 Access point information

## A.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the electrical signal for interface type x PHx_CI_D;
- the 10 bit wide data signal for data link type x DLx_CI_D;
- the clock signal for data link type x DLx_CI_CK;
- the TRS Frame Start type x DLx_CI_FS;
- the server signal failure signal for data link type x DLx_CI_SSF.

## A.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is:

- the digital signal of data bits for interface type x PHx_AI_D;
- the Trail Server Failure signal PHx_AI_TSF.

## A.1.3 Management Information

The Management Information (MI) of the Management Point (MP) is:

- the Loss Of Signal cause signal PHx_TT_Sk_MI_cLOS;
- the Loss Of Framing cause signal PHx/DLx_A_Sk_MI_cLOF.

### A.1.4 Timing Information

Not applicable for this layer.

# A.2 Connection function (PHx_C)

Not applicable. There is no connection functions defined for this layer.

# A.3 Trail Termination functions

## A.3.1 Physical type x Trail Termination function (PHx_TT)

The SDI physical trail terminators provide the physical signal adaptation and signal level supervision.

### A.3.1.1 Physical type x Trail Termination Source function (PHx_TT_So)

**Symbol**

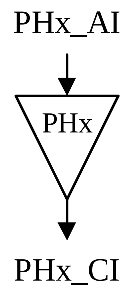


**Figure 12: Physical type x Trail Termination Source (PHx_TT_So)**

**Interfaces**

**Table 14: PHx_TT_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PHx_AI_D | PHx_CI_D |

**Processes and anomalies**

The signal conditioning of the PHx_AP_D for transmission over the electrical medium at CI_D according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.1.1.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

PHx_CI_D ← CI_D.

**Fault management**

None.

**Long term performance monitoring**

None.

### A.3.1.2 Physical type x Trail Termination Sink function (PHx_TT_Sk)

**Symbol**

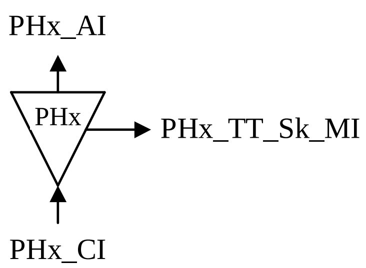


**Figure 13: Physical type x Trail Termination Sink (PHx_TT_Sk)**

**Interfaces**

**Table 15: PHx_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PHx_CI_D | PHx_AI_D |
| | PHx_AI_TSF |
| | PHx_TT_Sk_MI_cLOS |

**Processes and anomalies**

The signal conditioning of the electrical signal at PHx_CI_D and conversion into the digital format of AI_D. The signal conditioning includes an Automatic Gain Control (AGC) loop which monitors the average signal level of the received electrical signal at PH_CI_D. See ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.1.1.

nLOS: The average signal level is being monitored (by the signal conditioning Automatic Gain Control loop). The Loss Of Signal anomaly (nLOS) is asserted when the monitored signal level is below the LOS threshold level.
See ES 201 803-2-3 [5], clause 6.1.2.1.

NOTE: The reaction time for a complete loss of signal is due to the AGC loop reaction time.

**Defects**

dLOS: The Loss Of Signal defect (dLOS) is asserted when the Loss of Signal anomaly (nLOS) have been asserted, else it is deasserted. See ES 201 803-2-3 [5], clause 6.2.1.1.

**Consequent actions**

aTSF: The Trail Signal Fail action (aTSF) is asserted when the Loss Of Signal defect (dLOS) is asserted. See ES 201 803-2-3 [5], clause 6.3.1.3.

aTSF ← dLOS.

**Defect correlation**

cLOS: The Loss Of Signal cause (cLOS) is asserted when the Loss Of Signal defect (dLOS) is asserted. See ES 201 803-2-3 [5], clause 6.4.1.1.

cLOS ← dLOS.

**Performance monitoring**

None.

**Output mapping**

PHx_AI_D ← AI_D.

PHx_AI_TSF ← aTSF.

PHx_TT_Sk_MI_cLOS ← cLOS.

**Fault management**

fLOS: The Loss Of Signal fault (fLOS) is asserted when the Loss Of Signal cause (cLOS) is asserted consistently for 2,5 s ± 0,5 s and deasserted when the cLOS have been deasserted for 10 s ± 0,5 s. See ES 201 803-2-3 [5], clause 6.6.1.1.

**Long term performance monitoring**

None.

# A.4 Adaptation functions

## A.4.1 Physical type x to Data Link type x Adaptation function (PHx/DLx_A)

The SDI Physical to Data Link adaptation function provides the multiplexing, alignment and demultiplexing of the 10 bit words, the clock smoothing and clock recovery and the line encoding/decoding through scrambling.

### A.4.1.1 Physical type x to Data Link type x Adaptation Source function (PHx/DLx_A_So)

**Symbol**

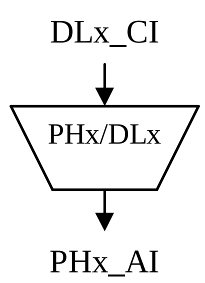


**Figure 14: Physical type x to Data Link type x Adaptation Source (PHx/DLx_A_So)**

**Interfaces**

**Table 16: PHx/DLx_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | PHx_AI_D |
| DLx_CI_CK | |

**Processes and anomalies**

The smoothing of the received clock (CI_CK) in order to ensure a maximum output jitter of 0,2 UI as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.11.1.

NOTE: For some interfaces different values may be given for maximum output jitter. The value may also be specified for different frequency ranges. Make sure to read the details in the appropriate relevant standard.

The multiplexing of bits in DL_CI_D into the bitstream of AI_D1. The bit multiplexing is according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.13.1.

The scrambling of the unscrambled bit stream AI_D1 into the scrambled bit stream AI_D2 using a self-synchronous scrambler with the polynomial $X^9 + X^4 + 1$ according to ITU-R Recommendation BT.656 [8], SMPTEs 259M [12] and 292M [15]. See ES 201 803-2-3 [5], clause 6.1.6.1.

The scrambling of the unscrambled bit stream AI_D2 into the scrambled bit stream AI_D using a self-synchronous scrambler with the polynomial X+1 according to ITU-R Recommendation BT.656 [8], SMPTEs 259M [12] and 292M [15]. See ES 201 803-2-3 [5], clause 6.1.6.1.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

PHx_AI_D ← AI_D.

**Fault management**

None.

**Long term performance monitoring**

None.

### A.4.1.2 Physical type x to Data Link type x Adaptation Sink function (PHx/DLx_A_Sk)

**Symbol**

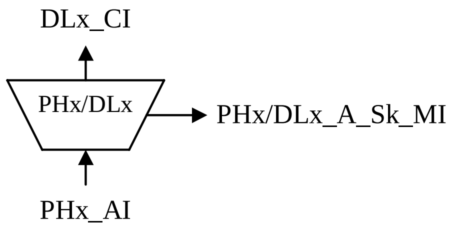


**Figure 15: Physical type x to Data Link type x Adaptation Sink (PHx/DLx_A_Sk)**

**Interfaces**

**Table 17: PHx/DLx_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PHx_AI_D | DLx_CI_D |
| PHx_AI_TSF | DLx_CI_CK |
| | DLx_CI_FS |
| | DLx_CI_SSF |
| | PHx/DLx_A_Sk_MI_cLOF |

**Processes and anomalies**

The timing recovery from PHx_AI_D to form the regenerated clock CI_CK as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.10.

The descrambling of the scrambled bit stream PHx_AI_D into the unscrambled bit stream AI_D1 using a self-synchronous descrambler with the polynomial X+1 according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.6.1.

The descrambling of the scrambled bit stream AI_D1 into the unscrambled bit stream AI_D2 using a self-synchronous descrambler with the polynomial $X^9 + X^4 + 1$ according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.6.1.

The bit alignment is achieved by detection of the TRS sequence in the AI_D2 bitstream. The bit alignment is according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.9.1.

sFS: If a TRS is detected, then the Frame Start signals (sFS) is asserted, else is sFS deasserted. See ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.9.1.

The slot/frame alignment is achieved and maintained by a state machine process. The slot/frame alignment is according to clause 7. See ES 201 803-2-3 [5], clause 6.1.9.3.

nLOF: If the frame synchronization state machine is in the Init or Verify states, then the Loss Of Frame anomaly (nLOF) is asserted, else is nLOF deasserted. See ES 201 803-2-3 [5], clause 6.1.9.3.

The demultiplexing of the bitstream AI_D2 into the 10 bits of CI_D. The bit demultiplexing is according to ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4). See ES 201 803-2-3 [5], clause 6.1.13.1.

**Defects**

The justification persistence state machine monitors the Loss Of Frame anomaly (nLOF). The default state is Out Of Frame (OOF). When in the OOF state the nLOF is deasserted on three consecutive justification opportunities, the state of the machine shall change to In Frame (IF). When in the IF state the nLOF is asserted on five consecutive justification opportunities, the state of the machine shall change to OOF. See ES 201 803-2-3 [5], clause 6.2.4.1.

dLOF: The Loss Of Frame defect (dLOF) shall be asserted when the justification persistence state machine is in the OOF state. See ES 201 803-2-3 [5], clause 6.2.4.1.

**Consequent actions**

aSSF: The Server Signal Fail action (aSSF) is asserted when the Trail Signal Fail (AI_TSF) is asserted or the Loss Of Frame defect (dLOF) is asserted. See ES 201 803-2-3 [5], clause 6.3.1.2.

aSSF ← AI_TSF or dLOF.

**Defect correlation**

cLOF: The Loss Of Frame cause (cLOF) is asserted when the Loss Of Frame defect (dLOF) is asserted and the Trail Signal Fail (AI_TSF) is deasserted. See ES 201 803-2-3 [5], clause 6.4.4.1.

cLOF ← dLOF and (not AI_TSF).

**Performance monitoring**

None.

**Output mapping**

PHx_CI_D ← CI_D.

PHx_CI_CK ← CI_CK.

PHx_CI_FS ← sFS.

PHx_CI_SSF ← aSSF.

PHx/DLx_A_Sk_MI_cLOF ← cLOF.

**Fault management**

fLOF: The Loss Of Frame alignment fault (fLOF) is asserted when the Loss Of Frame cause (cLOF) is asserted consistently for 2,5 s ± 0,5 s and deasserted when the cLOF have been deasserted for 10 s ± 0,5 s.
See ES 201 803-2-3 [5], clause 6.6.1.5.

**Long term performance monitoring**

None.

# Annex B (informative): SDI Data Link type x model (SDI_DLx)

The SDI Data Link type x layer provides the transport service for digital video, timing reference and Auxiliary data in type x format.

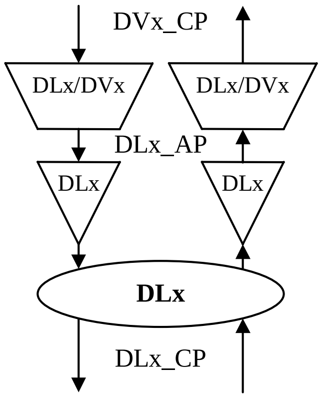


**Figure 16: SDI Data Link type x Layer atomic functions**

# B.1 Access point information

## B.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the digital video type x 10-bit wide data samples DVx_CI_D;
- the digital video type x data clock DVx_CI_CK;
- the digital video type x first Line Frame Start DVx_CI_LFS;
- the digital video type x first Sample Frame Start DVx_CI_SFS;
- the digital video type x server signal failure DVx_CI_SSF.

## B.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is:

- the digital video type x 10-bit wide data DVx_AI_D;
- the digital video type x data clock DVx_AI_CK;
- the digital video type x Timing Reference Signal Frame Start DVx_AI_FS;
- the digital video type x Trail Signal Failure DVx_AI_TSF.

## B.1.3 Management Information

Not applicable. There is no management information defined for this layer.

### B.1.4 Timing Information

Not applicable. There is no timing information defined for this layer.

## B.2 Connection function (DLx_C)

Not applicable. There is no connection functions defined for this layer.

## B.3 Trail Termination functions

### B.3.1 SDI Data Link type x Trail Termination function (DLx_TT)

The SDI Data Link type trail termination functions does not contain any functionality at this point.

NOTE: This is the ideal place to insert error detection mechanisms of ITU-R Recommendation BT.1304.

#### B.3.1.1 SDI Data Link type x Trail Termination Source function (DLx_TT_So)

**Symbol**

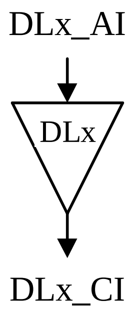


**Figure 17: SDI Data Link type x Trail Termination Source (DLx_TT_So)**

**Interfaces**

**Table 18: DLx_TT_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_AI_D | DLx_CI_D |
| DLx_AI_CK | DLx_CI_CK |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_CI_D ← AI_D.

DLx_CI_CK ← AI_CK.

**Fault management**

None.

**Long term performance monitoring**

None.

## B.3.1.2 SDI Data Link type x Trail Termination Sink function (DLx_TT_Sk)

**Symbol**

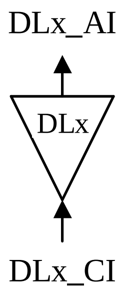


**Figure 18: SDI Data Link type x Trail Termination Sink (DLx_TT_Sk)**

**Interfaces**

**Table 19: DLx_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | DLx_AI_D |
| DLx_CI_CK | DLx_AI_CK |
| DLx_CI_FS | DLx_AI_FS |
| DLx_CI_SSF | DLx_AI_TSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_AI_D ← DLx_CI_D.

DLx_AI_CK ← DLx_CI_CK.

DLx_AI_FS ← DLx_CI_FS.

DLx_AI_TSF ← DLx_CI_SSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# B.4 Adaptation functions

## B.4.1 SDI Data Link type x Adaptation function (DLx/DVx_A)

### B.4.1.1 SDI Data Link type x to Digital Video type x Adaptation Source function (DLx/DVx_A_So)

**Symbol**

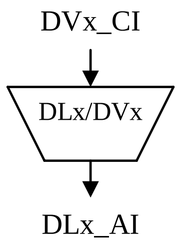


**Figure 19: SDI Data Link type x to Digital Video type x Adaptation Source (DLx/DVx_A_So)**

**Interfaces**

**Table 20: DLx/DVx_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DVx_CI_D | DLx_AI_D |
| DVx_CI_CK | DLx_AI_CK |
| DVx_CI_LFS | |
| DVx_CI_SFS | |

**Processes and anomalies**

The multiplexing of the two luminance samples and the two chrominance samples of CI_D into the data stream of AI_D as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

The maintenance of line state and sample state as indicated by CI_CK, CI_LFS and CI_SFS.

The insertion of Timing Reference Signal (TRS) into the AI_D data stream as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

The generation of TRS protection bits P0, P1, P2 and P3 as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_AI_D ← AI_D.

DLx_AI_CK ← DVx_CI_CK.

**Fault management**

None.

**Long term performance monitoring**

None.

### B.4.1.2 SDI Data Link type x to Digital Video type x Adaptation Sink function (DLx/DVx_A_Sk)

**Symbol**

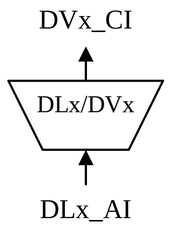


**Figure 20: SDI Data Link type x to Digital Video type x Adaptation Sink (DLx/DVx_A_Sk)**

**Interfaces**

**Table 21: DLx/DVx_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_AI_D | DVx_CI_D |
| DLx_AI_CK | DVx_CI_CK |
| DLx_AI_FS | DVx_CI_LFS |
| DLx_AI_TSF | DVx_CI_SFS |
| | DVx_CI_SSF |

**Processes and anomalies**

The correction of TRS bits F, V and H based on F, V, H, P0, P1, P2 and P3 as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

The maintenance of line state and sample state as indicated by AI_CK, AI_FS and TRS bits F, V and H as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

The assertion of CI_LFS when first line is active, else deasserted.

The assertion of CI_SFS when first sample on line is active, else deasserted.

The demultiplexing of AI_D into the two luminance samples and two chrominance samples of CI_D as specified in ITU-R Recommendation BT.656 [8] (for x = 1 or 2), SMPTE 259M [12] (for x = 1 or 2) and SMPTE 292M [15] (for x = 3 or 4).

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DVx_CI_D ← CI_D.

DVx_CI_CK ← DLx_AI_CK.

DVx_CI_LFS ← CI_LFS.

DVx_CI_SFS ← CI_SFS.

DVx_CI_SSF ← DLx_AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# Annex C (informative): DVB Physical interface model (DVB_PH)

The DVB/MPEG-2 TS physical interface is represented by the DVB/ASI interface (see EN 50083-9 [1]) layer 1 and 2.

NOTE: Additional physical interfaces may be defined in a similar fashion. DVB/SPI, SVB/SSI and SDTI may be equivalent.

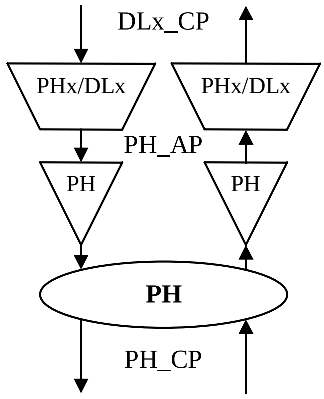


**Figure 21: DVB Physical interface atomic functions**

# C.1 Access point information

## C.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the DVB physical interface electrical signal DVB_PH_CI_D;
- the DVB data link type x octet data DVB_DLx_CI_D;
- the DVB data link type x data clock DVB_DLx_CI_CK;
- the DVB data link type x packet frame start DVB_DLx_CI_FS;
- the DVB data link type x server signal failure DVB_DLx_CI_SSF.

## C.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is:

- the DVB physical interface data signal DVB_PH_AI_D;
- the DVB physical interface trail signal failure signal DVB_PH_AI_TSF.

## C.1.3 Management Information

The Management Information (MI) of the Management Point (MP) is:

- the DVB physical interface loss of signal cause DVB_PH_TT_Sk_MI_cLOS.

### C.1.4 Timing Information

Not applicable. There are no timing information defined for this layer.

## C.2 Connection function (PH_C)

Not applicable. There are no connection function defined for this layer.

## C.3 Trail Termination functions

### C.3.1 Physical interface Trail Termination function (PH_TT)

The DVB physical interface trail termination functions represent the DVB/ASI (see EN 50083-9 [1]) layer 1 functionality.

#### C.3.1.1 Physical interface Trail Termination Source function (PH_TT_So)

**Symbol**

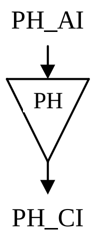


**Figure 22: Physical interface Trail Termination Source (PH_TT_So)**

**Interfaces**

**Table 22: PH_TT_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PH_AI_D | PH_CI_D |

**Processes and anomalies**

The signal conditioning of the PH_AP_D for transmission over the electrical medium at CI_D according to EN 50083-9 [1], clause B.3.1. See ES 201 803-2-3 [5], clause 6.1.1.1.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

PH_CI_D ← CI_D.

**Fault management**

None.

**Long term performance monitoring**

None.

## C.3.1.2 Physical interface Trail Termination Sink function (PH_TT_Sk)

**Symbol**

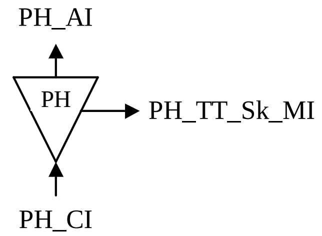


**Figure 23: Physical Trail Termination Sink (PH_TT_Sk)**

**Interfaces**

**Table 23: PH_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PH_CI_D | PH_AI_D |
| | PH_AI_TSF |
| | PH_TT_Sk_MI_cLOS |

**Processes and anomalies**

The signal conditioning of the electrical signal at PH_CI_D and conversion into the digital format of AI_D. The signal conditioning includes an Automatic Gain Control (AGC) loop which monitors the average signal level of the received electrical signal at PH_CI_D. See EN 50083-9 [1], clause B.3.1. See ES 201 803-2-3 [5], clause 6.1.1.1.

nLOS: The average signal level is being monitored (by the signal conditioning Automatic Gain Control loop). The Loss Of Signal anomaly (nLOS) is asserted when the monitored signal level is below the LOS threshold level.
See ES 201 803-2-3 [5], clause 6.1.2.1.

NOTE: The reaction time for a complete loss of signal is due to the AGC loop reaction time.

**Defects**

dLOS: The Loss Of Signal defect (dLOS) is asserted when the Loss of Signal anomaly (nLOS) have been asserted, else it is deasserted. See ES 201 803-2-3 [5], clause 6.2.1.1.

**Consequent actions**

aTSF: The Trail Signal Fail action (aTSF) is asserted when the Loss Of Signal defect (dLOS) is asserted.
See ES 201 803-2-3 [5], clause 6.3.1.3.

aTSF ← dLOS.

**Defect correlation**

cLOS: The Loss Of Signal cause (cLOS) is asserted when the Loss Of Signal defect (dLOS) is asserted.
See ES 201 803-2-3 [5], clause 6.4.1.1.

cLOS ← dLOS.

**Performance monitoring**

None.

**Output mapping**

PH_AI_D ← AI_D.

PH_AI_TSF ← aTSF.

PH_TT_Sk_MI_cLOS ← cLOS.

**Fault management**

fLOS: The Loss Of Signal fault (fLOS) is asserted when the Loss Of Signal cause (cLOS) is asserted consistently for 2,5 s ± 0,5 s and deasserted when the cLOS have been deasserted for 10 s ± 0,5 s. See ES 201 803-2-3 [5], clause 6.6.1.1.

**Long term performance monitoring**

None.

# C.4 Adaptation functions

## C.4.1 Physical to Data Link type x Adaptation function (PH/DLx_A)

The DVB physical interface adaptation functions represent the DVB/ASI (see EN 50083-9 [1]) layer 2 functionality. The transport support native MPEG-2 TS (x = 1) and DVB RS encoded (x = 2) traffic.

### C.4.1.1 Physical to Data Link type x Adaptation Source function (PH/DLx_A_So)

**Symbol**

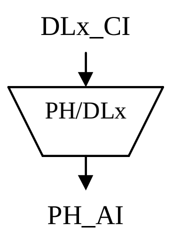


**Figure 24: Physical interface to Data Link type x Adaptation Source (PH/DLx_A_So)**

**Interfaces**

**Table 24: PH/DLx_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | PH_AI_D |
| DLx_CI_CK | |
| DLx_CI_FS | |

**Processes and anomalies**

The 8B10B encoding of bits in DLx_CI_D into the 10-bit code group of AI_D1 according to EN 50083-9 [1].
See ES 201 803-2-3 [5], clause 6.1.7.1.

The smoothing of the received clock (CI_CK) in order to ensure a maximum output jitter of 0,1 UI as specified in EN 50083-9 [1], clauses 8 and 6.1.11.1.

The multiplexing of bits in AI_D1 into the bitstream of AI_D. The bit multiplexing is according to EN 50083-9 [1], clause B.3.2. See ES 201 803-2-3 [5], clause 6.1.13.1.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

PH_AI_D ← AI_D.

**Fault management**

None.

**Long term performance monitoring**

None.

## C.4.1.2 Physical interface to Data Link type x Adaptation Sink function (PH/DLx_A_Sk)

**Symbol**

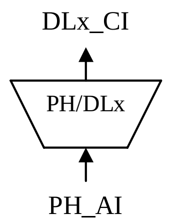


**Figure 25: Physical interface to Data Link type x Adaptation Sink (PH/DLx_A_Sk)**

**Interfaces**

**Table 25: PH/DLx_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| PH_AI_D | DLx_CI_D |
| PH_AI_TSF | DLx_CI_CK |
| | DLx_CI_FS |
| | DLx_CI_SSF |

**Processes and anomalies**

The timing recovery from PH_AI_D to form the regenerated clock CI_CK as specified in EN 50083-9 [1].
See ES 201 803-2-3 [5], clause 6.1.10.

The bit alignment is achieved by detection of the comma sequence (1111100) in the PH_AI_D bitstream. The bit alignment is according to EN 50083-9 [1], clause B.3.2. See ES 201 803-2-3 [5], clause 6.1.9.1.

sFS: If a comma sequence is detected, then the Frame Start signal (sFS) is asserted, else is sFS deasserted.
See EN 50083-9 [1] clause B.3.2 and ES 201 803-2-3 [5], clause 6.1.9.1.

The demultiplexing of the bitstream PH_AI_D into the code group bits of AI_D1. The demultiplexing is according to EN 50083-9 [1], clause B.3.2. See ES 201 803-2-3 [5], clause 6.1.13.1.

The decoding of the 10 bit code group of AI_D1 into the 8 + 1 bit code group of CI_D1 according to EN 50083-9 [1], clause B.3.2.

The monitoring of the MPEG-2 TS PCR timestamps in the CI_D1 octet stream. See ITU-T Recommendation H.222.0 [10].

The clock smoothing process based on PCR in order to reduce phase deviation on the transmitted signal. The clock smoothing must comply with the jitter and wander requirements as defined in ITU-T Recommendation H.222.0 [10]. The resulting clock is delivered as CI_CK for each program stream. See ES 201 803-2-3 [5], clause 6.1.11.3 and ITU-T Recommendation H.222.0 [10].

The elastic buffering of the transported signal such that the buffer output CI_D is being clocked to the smoothed clock CI_CK. See ES 201 803-2-3 [5] clause 6.1.11.3 and ITU-T Recommendation H.222.0 [10].

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

PH_CI_D ← CI_D.

PH_CI_CK ← CI_CK.

PH_CI_FS ← sFS.

PH_CI_SSF ← AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# Annex D (informative): DVB Data Link type x model (DVB_DLx)

The DVB/MPEG-2 TS Data Link type x layer provides either no (x = 1) error correction, or the DVB RS error correction (x = 2) (see EN 300 421 [2] and EN 300 429 [3]) for the basic MPEG-2 transport stream (see ITU-T Recommendation H.222.0 [10]) in the DVB/MPEG-2 Transport Layer.

NOTE: The DVB transport layer and further modelling of the MPEG-2 layers is out of the scope for the present document.

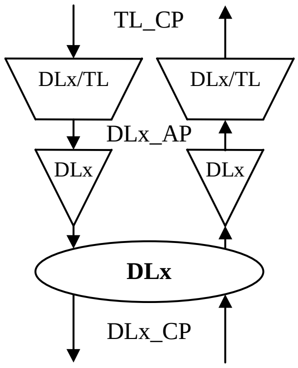


**Figure 26: DVB Data Link type x atomic functions**

# D.1 Access point information

## D.1.1 Characteristic Information

The Characteristic Information (CI) of the Connection Point (CP) is:

- the Transmission Layer data signal TL_CI_D;
- the Transmission Layer data clock TL_CI_CK;
- the Transmission Layer Server Signal Failure signal TL_CI_SSF.

## D.1.2 Adapted Information

The Adapted Information (AI) of the Adaptation Point (AP) is:

- the Data Link type x data signal DLx_AI_D;
- the Data Link type x data clock DLx_AI_CK;
- the Data Link type x frame start DLx_AI_FS;
- the Data Link Trail Signal Failure DLx_AI_TSF.

## D.1.3 Management Information

Not applicable. There are no management information defined for this layer.

### D.1.4 Timing Information

Not applicable. There are no timing information defined for this layer.

# D.2 Connection function (DLx_C)

Not applicable. There are no connection function defined for this layer.

# D.3 Trail Termination functions

## D.3.1 DVB Data Link type x Trail Termination function (DLx_TT)

### D.3.1.1 DVB Data Link type x Trail Termination Source function (DLx_TT_So)

**Symbol**

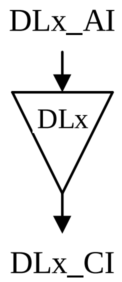


**Figure 27: DVB Data Link type x Trail Termination Source (DLx_TT_So)**

**Interfaces**

**Table 26: DLx_TT_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_AI_D | DLx_CI_D |
| DLx_AI_CK | DLx_CI_CK |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_CI_D ← DLx_AI_D.

DLx_CI_CK ← DLx_AI_CK.

**Fault management**

None.

**Long term performance monitoring**

None.

## D.3.1.2 DVB Data Link type x Trail Termination Sink function (DLx_TT_Sk)

**Symbol**

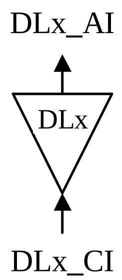


**Figure 28: DVB Data Link type x Trail Termination Sink (DLx_TT_Sk)**

**Interfaces**

**Table 27: DLx_TT_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_CI_D | DLx_AI_D |
| DLx_CI_CK | DLx_AI_CK |
| DLx_CI_FS | DLx_AI_FS |
| DLx_CI_SSF | DLx_AI_TSF |

**Processes and anomalies**

None.

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_AI_D ← DLx_CI_D.

DLx_AI_CK ← DLx_CI_CK.

DLx_AI_FS ← DLx_CI_FS.

DLx_AI_TSF ← DLx_CI_SSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# D.4 Adaptation functions

## D.4.1 DVB Data Link type x Adaptation function (DLx/TL_A)

### D.4.1.1 DVB Data Link type x to Transport Layer Adaptation Source function (DLx/TL_A_So)

**Symbol**

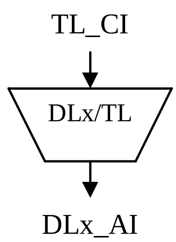


**Figure 29: DVB Data Link type x to Transport Layer Adaptation Source (DLx/TL_A_So)**

**Interfaces**

**Table 28: DLx/TL_A_So Input and output signals**

| Input(s) | Output(s) |
|---|---|
| TL_CI_D | DLx_AI_D |
| TL_CI_CK | DLx_AI_CK |

**Processes and anomalies**

For x = 1, the mapping of TL_CI_D to AI_D.

For x = 2, the error correction code encoding of TL_CI_D to AI_D according to EN 300 421 [2].

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

DLx_AI_D ← AI_D.

DLx_AI_CK ← TL_CI_CK.

**Fault management**

None.

**Long term performance monitoring**

None.

### D.4.1.2 DVB Data Link type x to Transport Layer Adaptation Sink function (DLx/TL_A_Sk)

**Symbol**

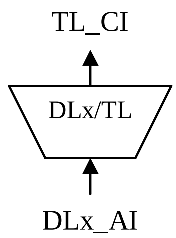


**Figure 30: DVB Data Link type x to Transport Layer Adaptation Sink (DLx/TL_A_Sk)**

**Interfaces**

**Table 29: DLx/TL_A_Sk Input and output signals**

| Input(s) | Output(s) |
|---|---|
| DLx_AI_D | TL_CI_D |
| DLx_AI_CK | TL_CI_CK |
| DLx_AI_FS | TL_CI_SSF |
| DLx_AI_TSF | |

**Processes and anomalies**

For x = 1, the mapping of DLx_AI_D to CI_D.

For x = 2, the error correction of DLx_AI_D into corrected data CI_D according to EN 300 421 [2].

**Defects**

None.

**Consequent actions**

None.

**Defect correlation**

None.

**Performance monitoring**

None.

**Output mapping**

TL_CI_D ← CI_D.

TL_CI_CK ← DLx_AI_CK.

TL_CI_SSF ← DLx_AI_TSF.

**Fault management**

None.

**Long term performance monitoring**

None.

# Annex E (informative): Bibliography


- DVB Document A010 rev. 1: "Interfaces for CATV/SMATV Headends".
- ETSI TR 101 290: "Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems".
- ITU-R Recommendation BT.1304: "Checksum for Error Detection and Status information in interfaces conforming with recommendation ITU-R Recommendation BT.656 and ITU-R Recommendation BT.799".
- ITU-R Recommendation BT.1364: "Format of Ancillary Data signals carried in digital component studio interfaces".
- ITU-R Recommendation BT.1381: "SDI-Based Transport Interface for compressed television signals in networked television production based on recommendation ITU-R Recommendation BT.656 and ITU-R Recommendation BT.1302".
- SMPTE 310M: "Synchronous Serial Interface for MPEG-2 Digital Transport Stream".

# History

| Document history | | |
|---|---|---|
| V1.1.1 | July 2004 | Membership Approval Procedure MV 20040910: 2004-07-13 to 2004-09-10 |
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