

for Television —
**Vertical Ancillary Data Mapping
for Bit-Serial Interface**



Page 1 of 4 pages**1 Scope**

This standard defines a method of coding which allows data services to be carried in the vertical ancillary data space of a bit-serial component television signal conforming with SMPTE 292M or ANSI/SMPTE 259M.

This includes data broadcast services intended for the public as well as broadcaster internal control and communications.

Despite the reference to the bit-serial interface, nothing in this specification precludes its use in a parallel digital interface for component digital video signals.

The data described in this standard may also be transported in KLV format according to SMPTE 336M, or via other means.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, 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.

ANSI/SMPTE 125M-1995, Television — Component Video Signal 4:2:2 — Bit-Parallel Digital Interface

ANSI/SMPTE 259M-1997, Television — 10-Bit 4:2:2 Component and $4f_{sc}$ Composite Digital Signals — Serial Digital Interface

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

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

ANSI/EIA-608-1994, Recommended Practice for Line 21 Data Service

EIA-708-B, Digital Television Closed-Captioning (DTVCC)

EIA-766-1998, U.S. Region Rating Table (RRT) and Content Advisory Descriptor for Transport of Content Advisory Information Using ATSC A/65 Program and System Information Protocol (PSIP)

3 Location of vertical ancillary data

The data packets are located in the active line portion of one or more lines in the vertical ancillary space. Data may be located in any lines in the area from the second line after the line specified for switching to the last line before active video, inclusively.

Individual data services are not assigned to any specific data lines; receiving equipment should identify and select services on the basis of their ANC DID and SDID fields.

Because ANC data may be located in the lines immediately preceding active video, manufacturers of video compression equipment should ensure that these data bits are not included in video compression calculations.

The chrominance (C_b/C_r) and luminance (Y) data are carried in two separate streams within the SMPTE 292M signal with their own ANC data flags and CRCs.

Defined data services shall be carried in the Y stream. Other data services may be inserted into either one of these streams without restrictions.

In the 259M/125M signal, the chrominance and luminance data are carried in a single stream. In this case, all data services shall be carried in this stream with a single ANC data flag and CRC.

4 Format of VANC data packets

Each data packet follows the format defined in SMPTE 291M for a type 2 ANC packet. It consists of the ancillary data flag (ADF), the data ID (DID), the secondary data ID (SDID), the data count (DC), the user data words (UDW), and the checksum (CS). The UDW consists of the data payload plus forward error correction overhead.

4.1 ANC packet header format

The ADF has the value 000_h 3FF_h 3FF_h.

The following value of DID is used for the closed-captioning services defined in this standard: 161_h (61_h plus parity bits per 291M). A second value of DID (162_h = 62_h plus parity) is used for other services which are identified by this standard, and whose format is specified by recommended practices.

Other data services which are internal to a broadcast network may use DID values in the ranges specified for user application data (40_h-5F_h and C0_h-DF_h). These DID values are not registered.

The specified values of DID (61_h and 62_h) identify type 2 ANC packets. In each packet, the SDID code identifies the type of data. Table 1 shows the values of DID and SDID for services defined within this standard. Table 2 shows the values of DID and SDID for other services.

DC is a count of the number of words in the UDW; bits b7-b0 of DC represent the number of words of user data; bits b8 and b9 are parity per 291M.

For defined services such as captioning, the format of the data in the UDW is defined in this specification or in a normative reference. For other data services, the data content is not specified here, and the value of DC is variable.

4.2 UDW format

All data services consist of 8-bit data bytes, which are transmitted in bits b7-b0 of the 10-bit data word. Bit b8 is even parity for b7 through b0, and b9 = not b8. In addition to providing a simple error detection capability, this avoids transmitting data which match one of the code words 0-3 and 1020-1023 which are prohibited by SMPTE 292M and ANSI/SMPTE125M.

Table 1 – Defined data services

Service	DID	SDID	DC
Closed captioning (EIA-708-B)	61 _h (161 _h)	1 (101 _h)	Variable
EIA-608 data	61 _h (161 _h)	2 (102 _h)	3 (203 _h)

Table 2 – Variable-format data services

Service	DID	SDID	DC
Program description (DTV)	62 _h (162 _h)	1 (101 _h)	Variable
Data broadcast (DTV)	62 _h (162 _h)	2 (102 _h)	Variable
VBI data	62 _h (162 _h)	3 (203 _h)	Variable

The data payload for each service is inserted into the UDW of the ANC packet as a sequence of 10-bit words. The number of words is indicated in the DC field of the ANC packet header.

4.3 Defined services

The services shown in table 1 have their format defined in this clause. The values in parentheses for DID, SDID, and DC include parity bits b8 and b9.

4.3.1 Format of the closed captioning (EIA-708-B) packet

The payload of the closed captioning (EIA-708-B) packet is the caption distribution packet (CDP) defined in EIA-708-B. This packet has a variable length.

4.3.2 Format of the ANC EIA-608 (VBI) packet

In NTSC video, the closed captioning, content advisory, and other services are carried in a format defined by the EIA-608 standard. Closed captioning may be carried in line 21 of either field. Content advisory and other data may be in line 21 of field 2 only.

These can be carried in an ANC packet in a 292M stream to allow the EIA-608 data waveform to be recreated and reinserted into an NTSC signal produced by converting the DTV signal into an analog signal at a station. The format of this ANC packet is defined in annex A.

Annex A (normative) Format of the ANC EIA-608 packet

The data payload for EIA-608 data is 2 bytes per line. The ANC packet encapsulates these two bytes without modification, and adds a byte which identifies the VBI line and field to be used for insertion. The data count (DC) is therefore 3 (203_h).

The format of the packet is as follows:

Header:

ADF (3 words)
DID = 161_h
SDID = 102_h
DC = 203_h

UDW:

LINE (1 word)
EIA-608 data (2 words)

4.4 Other data services

Table 2 lists other data services whose format is not specified by this standard. Their DID and SDID values are specified here to ensure that they can be correctly and consistently recognized and routed.

The DTV program description service carries data which pertain to the video and audio programs. Its contents are defined in the forthcoming SMPTE RP 207.

The DTV data broadcast service carries data intended for broadcast to the public along with the video and audio programs. Its contents are the subject of a future recommended practice.

The VBI data service is intended for use in reconstituting data in the VBI of a standard-definition analog video signal produced from the digital video program. Its contents are defined in the forthcoming SMPTE RP 208.

5 Timing of data and video

There is no specific provision in this standard for ensuring that the relative timing between the video and its embedded VANC data is correct. The only timing relationship that exists is created when the data are embedded in the video. Once that relationship is established, the deterministic nature of 292M or 259M transport ensures that the relationship is preserved.

Suffix:

CS (1 word)

The LINE value at the start of the UDW represents the field number and VBI line where the data are intended to be carried. Bit b7 of the LINE value is the field number (0 for field 2; 1 for field 1). Bits b6 and b5 are 0. Bits b4-b0 form a 5-bit unsigned integer which represents the offset (in lines) of the data insertion line, relative to the base VBI frameline (line 9 of 525-line field 1, line 272 of 525-line field 2, line 5 of 625-line field 1, line 318 of 625-line field 2).

Annex B (informative)

Bibliography

ANSI/SMPTE 296M-1997, Television — 1280 × 720 Scanning, Analog and Digital Representation and Analog Interface

ANSI/SMPTE 299M-1997, Television — 24-Bit Digital Audio Format for HDTV Bit-Serial Interface

ATSC A/53, ATSC Digital Television Standard

ATSC A/65, Program and System Information Protocol for Terrestrial Broadcast and Cable

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

Forthcoming SMPTE 336M, Television — Data Encoding Protocol Using Key-Length-Value

Forthcoming SMPTE RP 207, Transport of Program Description Data in Ancillary Data Packets

Forthcoming SMPTE RP 208, Transport of VBI Packet Data in Ancillary Data Packets