Transmitting Data in TV Signal

DTMF Cue-Tones

DTMF cue-tone is a sequence of DTMF signals (Dual-Tone Multi-Frequency) used for automating insert of commercials and blocks of regional broadcasting to the air of the main channel. The sequence is sent within an audio track at the audible range frequency.

Configure Receiving DTMF by SL NEO Server.

VBI Data

Digital data in the video-signal of broadcasting TV is placed between two adjacent fields within the vertical blanking interval (VBI). It fringes the synchronizing impulse of beginning of a new field and contains 25 empty raster lines with a constant black level for turning off the beam. First six VBI lines are necessary to synchronize scanning of TV receivers, and the next (7-22) lines are used to insert digital data.

VBI is used only in the SD signal of analogue and digital broadcasting.

The type of data sent in VBI:

Wide Screen Signaling

The 23rd line coinciding with the moment of pulse, includes the 14bit WSS (Wide Screen Signaling) code containing information on aspect ratio of the image and additional mattes.

VITC Time Code

Vertical Interval Time Code – the time code using the VBI time interval, recorded instead of the pulse. Sending horizontal sync pulses during VBI is non-stop, in order to prevent failures of horizontal retrace. That being said, VBI has a complex structure with horizontal sync pulses and 2.35 μsec duration equalizing pulses. The latter are used to precisely combine rasters of odd and even interlacing fields.

Teletext

Transmitting teletext signals is implemented in VBI non-picture regions of the frame. The transmission speed is 7175 bps. Information is organized as fullscreen text pages transmitted by turns.

Teletext data is sent as packets. In accordance with GOST R 50861-96, normal functioning of a teletext decoder requires digital data packets to be placed between 6th and 22nd lines of the first field, and 319-335th line of the second field within a composite colour signal.

Receiving and Rebroadcasting Teletext Packets

ANC Data (VANC, HANC)

Ancillary data (ANC data) can be located in non-picture portions of horizontal scan lines (HANC), or in non-picture regions of the frame (VANC).

HANC is used to embed uncompressed audio data in the SDI or HD-SDI stream. VANC is used to embed low-bandwidth data – information updated on a per-field or per-frame basis. Closed caption data (CCD) and Active Format Description (AFD) are examples of metadata stored as VANC. SMPTE 291m describes the details of Ancillary data packet structures.

Different formats (525, 625, 720 and 1080) can use different VANC lines for embedding the same metadata. Using the line number to search for certain metadata may lead to a false result, so it is important to use DID/SDID identifiers for various types of ancillary data, as some data packets may not have a line number.

Examples: Dolby-E audio Metadata - DID: 145h AFD and Bar Data - DID: 141h, SDID: 105h

The type of data sent in ANC for SD/HD signals:

Embedded audio

HANC is used to embed uncompressed audio data in the SDI or HD-SDI stream. VANC is used to embed low-bandwidth data – information updated on a per-field or per-frame basis. Closed caption data (CCD) and Active Format Description (AFD) are examples of metadata stored as VANC. SMPTE 291m describes the details of Ancillary data packet structures. Embedded audio is audio payload which is (typically) the soundtrack (music, dialogue, and sound effects) for the video program. Two standards, SMPTE 272M (for SD) and SMPTE 299M (for HD and 3G) define how audio is embedded into the ancillary space. The SD and HD standards provide for up to 16 channels of PCM audio, while 3G allows up to 32 channels, typically encoded in the AES3 format. In HD, the embedded audio data packets are carried in the HANC space of Cb/Cr (chroma) parallel data stream.

Teletext

Teletext/EU (SMPTE RDD08, Free TV OP-47) Free TV Operational Practice (OP-47) describes technical/operational practices associated with the storage and distribution of closed caption/subtitling data in the VANC space of the 10-bit serial HD-SDI Signal. This complies with ITU-R BT.1120-7. 

Receiving and Rebroadcasting Teletext Packets

LTC Time Code

Longitudinal Time Code, or LTC

Closed Captioning (608, 708)

Closed captions are used for TV broadcasting and home video in the NTSC format. Captions may be transmitted as teletext.

Active Format Description (SMPTE 2016)

Active Format Description (AFD) is a standard set of codes that can be sent in the MPEG video stream or in the baseband SDI video signal that carries information about their aspect ratio and active picture characteristics. AFD has been used by television broadcasters to enable both 4:3 and 16:9 television sets to optimally present pictures transmitted in either format. It has also been used by broadcasters to dynamically control how down-conversion equipment formats widescreen 16:9 pictures for 4:3 displays

SCTE-104 Messages

SCTE-104 messages are part of the technology for automated insert of commercials and contain control information for regional broadcasting systems. SCTE-104 data is formed in the output SD/HD SDI signal of the SL NEO server, in the 12th line of the VANC interval. SCTE-104 messages are usually generated directly before transitions to commercials, and before the end of every regional block. In case of manual transitions to commercials during live broadcasts at the central station, generating messages with frame-by-frame accuracy is still available.

SDI Capture activates receiving messages in VANC data, if:

- The Debug VBI is on (see below).
- Added action for receiving and processing SCTE-104 messages (the function doesn't require additional licensing).

An example of displaying a retrieved message in Capture service logs:

```
SCTE104 command received:
  Reserved: 0x00 0x03
  MsgSize: 21
  Protocol Version: 0xFF
  AS_index: 255
  MsgNumber: 255
  DPI_PID_index: 65280
  SCTE35 Protocol version: 0x00
  TimeStamp TimeType: 123
  Numops: 3
    OpID: 0x0900
    OpSize: 0
    OpID: 0x0000
    OpSize: 0
    OpID: 0x0000
    OpSize: 0
SCTE104: unsupported OpID: 2304
```

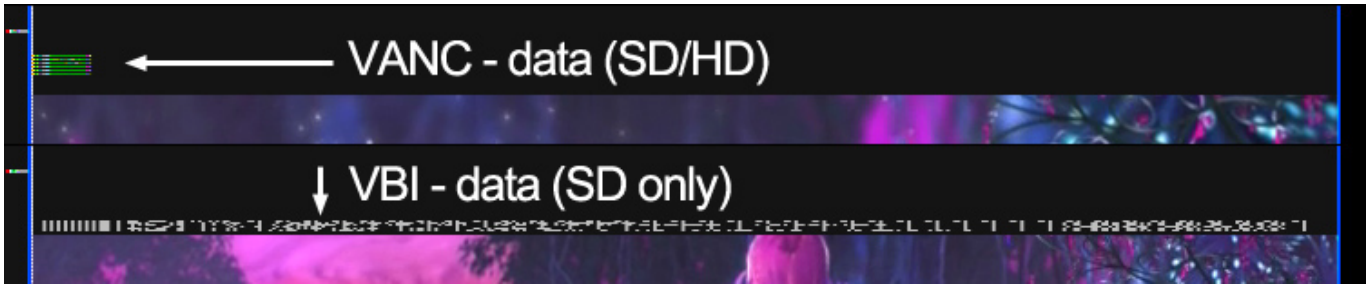
```
SCTE104: unsupported OpID: 0
SCTE104: unsupported OpID: 0
```

Debug VBI Mode

The mode allows recording to the file all input data sent during VBI. Recording data is possible only if the avi container is selected, or if recording is implemented to the media database.

If a file was recorded in the **Debug VBI** mode, all data will be sent to the Playout output during playback, but only if the **Debug VBI** option is activated in Playout (`Administrator Control Panel→Manage→Video IO Boards→Playout_N→General→Debug VBI`).

In case of transmitting teletext packets, the **Use VANC** parameter is used for generating VANC data. If the parameter is inactive, data will be formed in VBI lines, according to ITU-R BT.653.



This article needs updating.