Ancillary Time Code (ATC) according to SMPTE 12M-2

V2 - October 15, 2013

Overview

The standards SMPTE 12M-2-2008 and ITU-R BT.1366-2 define the “Transmission of Time Code in the Ancillary Data Space” and replace the SMPTE RP 188. In the past there were different methods of implementations regarding ATC. This note describes the implementation of ATC according to the latest standards and what are the changes regarding Alpermann+Velte time code modules.

The following specifications are concerned with ancillary time code:

Standard	*DID*	*DBN/SDID*	*DC*	*Time Code Type*	*Remark*
RP 196	64h 64h	64h 7Fh	8h 9h	HANC LTC HANC VITC	No longer listed!
SMPTE 291M	F5h	00h	8h	LTC	Specification unknown!
RP 188 SMPTE 12M-2 ITU-R BT.1366-2	60h	60h	10h	ATC	RP 188 led to different implementations!

It is strongly recommended to implement ATC according to SMPTE 12M-2/ ITU-R BT.1366-2!

Introduction

There are four transport methods of time code known (regarding only “12M” time codes, so not dealing with MPEC, film, digital audio, midi etc.):

LTC	Transported as a serial (analogue audio) signal independent of any video signal.
VITC	Inserted in an active line within the VBI of an analogue video signal.
D-VITC	Similar to the VITC inserted in an active line within the VBI of a digital video signal.
ATC	Ancillary data packets carried in the ancillary data space of a digital data stream.

Remarks regarding the D-VITC: There is no specification of D-VITC for HD digital video! ATC can be used for SD digital video as well.

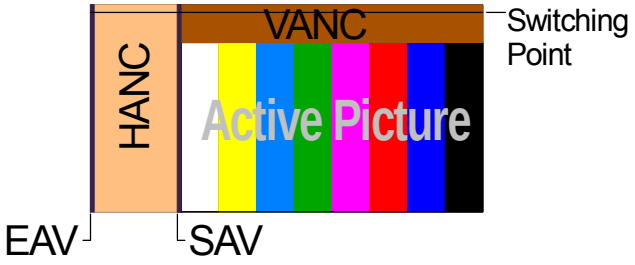
For HD digital video ATC should be used.

ATC can be of type ATC_LTC and ATC_VITC.

The ancillary data spaces of a digital television data stream are HANC in the horizontal blanking area and VANC in the vertical blanking interval.

HANC: All lines after EAV but before SAV.

VANC: In the vertical blanking region after SAV but before EAV.



Ancillary data packets should not be located in the lines identified as a switch point – defined by SMPTE RP 168.

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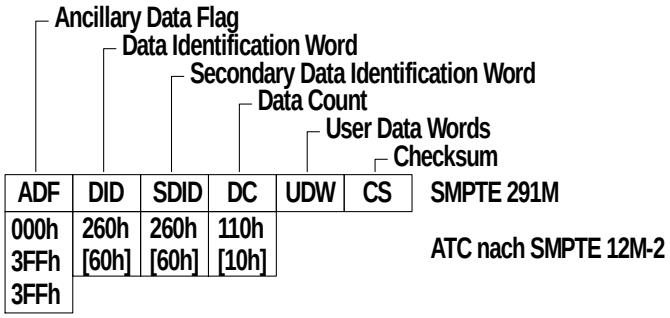
Format of Ancillary Time Code Packets

SMPTE 291M defines the format for a type 2 ANC packet.



16 User Data Words consist of time code data and the type of time code, i.e. LTC or VITC or further user defined time codes.

For HD digital video the ANC packets shall be carried in the Y stream.

ATC is applicable to 8-, 10-, or 12-bit television systems.

ATC Packet Transmission Rate

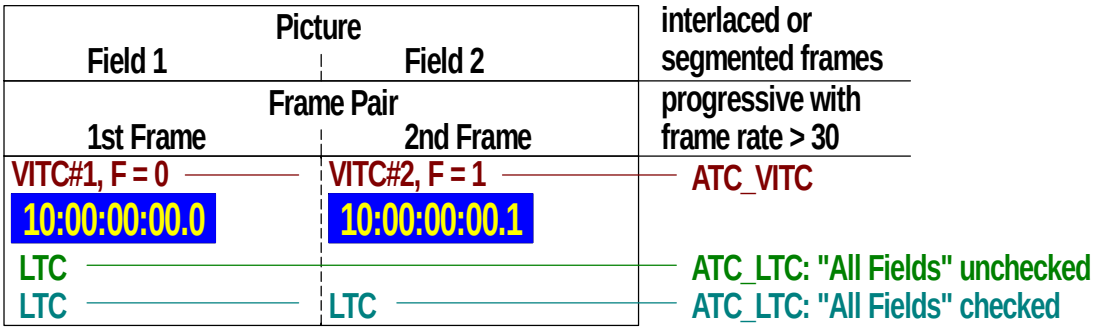
VITC (vertical interval time code) is defined as VITC#1 (ATC_VITC1) and VITC#2 (ATC_VITC2). This will be denoted as ATC_VITC for the user of our RUBIDIUM modules. VITC addresses each video field by nature, so it is inserted field-wise and includes a field mark flag ("F").

LTC (linear time code) is defined as ATC_LTC. LTC addresses each video picture by nature (frame rate = picture rate), but ATC packets can be treated as a kind of video time code and can be inserted field-wise. Using the "*All Fields*" set-up of our RUBIDIUM modules, the transmission rate of ATC_LTC can be selected: field-wise or frame-wise.

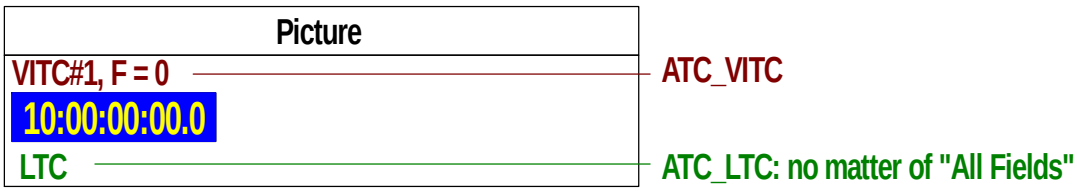
Counting frames up to 50 or 60 is not provided, so for progressive systems running at greater than 30 frames-per-second each time code count references a frame pair. The 1st frame of the frame pair receives the new time address which then will be repeated at the 2nd frame.

The following transmission rates are provided depending on video formats:

Interlaced and segmented frames formats, as well as progressive formats with frame rates > 30. In the latter case, pairs of frames are regarded.



Progressive formats with frame rates ≤ 30:



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Preferred Locations of ATC Data Packets

The preferred locations are based on the vertical interval switching point defined in SMPTE RP 168. Regarding HDTV interlaced and segmented frames video formats, the line specified for switching in the 2nd field differs from the line in the 1st field. This will be taken into account using set-ups "*On (Standard)*" of our RUBIDIUM modules.

Basically, ATC may be inserted in HANC or VANC space located within vertical blanking after the line specified for switching and before the beginning of active video. If set-up "*On (Standard)*" is used, ATC will be inserted in the recommended lines with automatic adaption to the video format.

These are the video format-dependent locations of the ATC data packets:

	SD Video			
	SD 525/59.94/I (NTSC)		SD 625/50/I (PAL)	
	1st Field	2nd Field	1st Field	2nd Field
Switching point	10	273 [10]	6	319 [6]
ATC_VITC "*On (Standard)*"	VANC 13	VANC 276 [13]	VANC 9	VANC 322 [9]
ATC_LTC "*On (Standard)*"	VANC 13	VANC 276 [13] if "*All Fields*"	VANC 9	VANC 322 [9] if "*All Fields*"

	HD Video				
	1125 lines interlaced or segmented frames		1125 / 750 lines progressive with frame rate > 30		1125 / 750 lines progressive with frame rate ≤ 30
	1st Field	2nd Field	1st Frame	2nd Frame	
Switching point	7	569 [6]	7	7	7
ATC_VITC "*On (Standard)*"	HANC 9	HANC 571 [8]	HANC 9	HANC 9	HANC 9
ATC_LTC "*On (Standard)*"	HANC 10	HANC 572 [9] if "*All Fields*"	HANC 10	HANC 10 if "*All Fields*"	HANC 10

Note

Please use latest firmware for your RUBIDIUM modules together with latest version of the configuration tool. You can download the latest versions from:

http://www.alpermann-velte.com/serv_e/software_e/software_e.html