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3G FUSION Application Note

# About Timecode Formats

Fusion3G® and most Compass™ cards offer robust and flexible timecode processing and conversion to meet the needs of almost any application. At the present time in the industry, several legacy and contemporary formats may need to be handled all within a given plant (and even within a given stream).

This paper describes the timecode formats likely to be encountered, and how to handle converting these formats for various situations and applications.

## Contemporary Timecode Formats

Current HD-SDI streams support only two timecode formats: ATC_VITC and ATC_LTC. These are both packet-based, and are located on unique lines in the ancillary space and can typically be assigned to any line within a range of line 9 to line 20. (SMPTE 12-M recommends ATC_VITC and /or ATC_LTC timecode be located at lines 8/9 (for interlaced formats) and line 10 (for progressive formats). Packet-based formats like these provide a more efficient use of overhead.

Note that if the SDI stream is up, down, or cross-converted, the timecode will be stripped from the output stream. Fusion3G® and Compass™ conversion cards have controls that allow acquiring the timecode and allowing it to be re-inserted into the output.

**Plant Internal, IRD, Server HD-SDI** → **ATC_VITC ATC_LTC** →

Other than setting controls for re-insertion after scaling (if applicable), these formats are fully applicable for all HD-SDI streams. If scaling is not done, the timecode settings do not require any modification. Note that either or both formats can be present on a given HD-SDI stream.

## Legacy SD Timecode Formats

Legacy SD formats consists of “VITC waveform” timecode formats that are not packetized. The name is derived from the timecode data being an actual waveform that is present on a composite (or Y-channel of component) analog video. In SDI, the non-packetized data is typically placed on lines 14 and 16 to provide timecode data on both odd and even fields. For up-conversion to HD, this format must be converted to a packet-based ATC timecode such as ATC_VITC or ATC_LTC. Even when not up-converted, this timecode should be converted to SD ATC_VITC (the only packet-based timecode format directly usable with SD-SDI). Note that any scaler will strip these formats from the output unless somehow re-inserted. All Fusion3G® and Compass™ converter cards are capable of performing this conversion by acquiring and then re-inserting legacy or packet-based timecodes (as appropriate) on the output (**see the example in Figure 2** on the next page).

**Local/deck/server SD-SDI, Analog SD** → **SDI VITC Waveform Analog VITC Waveform** → **Conversion to Packet-based Timecode** →

The packet-based ATC_VITC or ATC_LTC timecode is now directly compatible with HD-SDI streams (For SD-SDI, ATC_VITC is available).

## Legacy Tape Deck Timecode Formats

Many tape systems require support for a separately carried format typically called “Audio LTC”. It is so-called because unlike vertical interval timecodes that reside on the video signal, this timecode data uses a spare analog or digital audio channel as its transport, or a dedicated RS-485 serial port. The data is sufficiently slow enough to be reliably carried over balanced audio. Legacy plant systems may require Audio LTC to be received and then placed on the video stream, or conversely require video timecode data to be converted to Audio LTC. Fusion3G® and Compass™ with the +LTC option are capable of bidirectionally performing this conversion between audio LTC and legacy/comtemporary video timecode formats (**see the examples in Figures 3 and 4** on pages 3 and 4).

**Deck Audio LTC** → **Audio LTC (Anlg balanced, Emb/AES, or RS-485)** → **Conversion to Video Timecode** →

**Plant Video Timecode** → **VITC Waveform, ATC_VITC, ATC_LTC** → **Conversion to Audio LTC Timecode** →

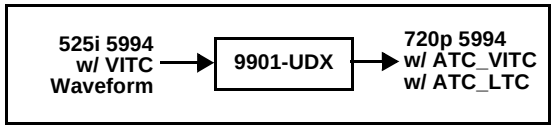
Audio LTC-to-Video Timecode conversion between contempory and lagacy systems/equipment can be performed using card equipped with +LTC option.

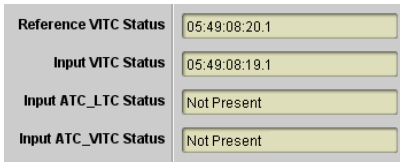
***Figure 1 Timecode Formats and Interchangeability***

## Up-convert, with Legacy SD Timecode Formats Converted to Contemporary HD Formats

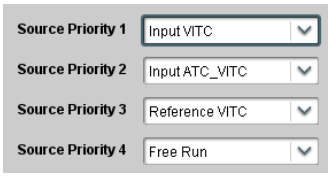
Figure 2 shows an example of using Fusion3G® **Timecode** tab controls to look for legacy SD formats on the input video and convert to HD formats by re-inserting ATC timecodes in the up-converted output video.

Shown below is an example in which received 525i 5994 SDI video is being up-converted to 720p 5994. To re-format and insert the timecode data, the following can be performed using the Timecode function.




Noting that the incoming video contains VITC waveform timecode data (as shown in the status display), set the Source Priority drop-down lists to include VITC Waveform timecode data (**Input VITC**) as a choice. This extracts VITC Waveform timecode data from the incoming video.




In this example, it is desired to provide both SDI ATC_VITC and ATC_LTC timecode data in the converted HD output video. As such, set both **HD ATC VITC Insertion** and **HD ATC LTC Insertion** to **Enabled**.

In the example here, the line numbers are set to the default SMPTE 12M-2-2008 recommended values.

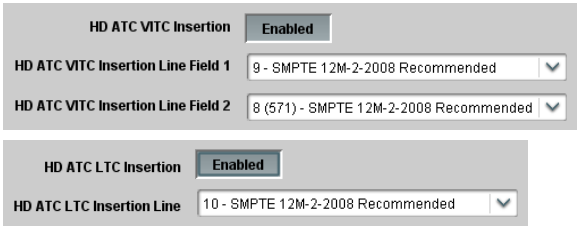
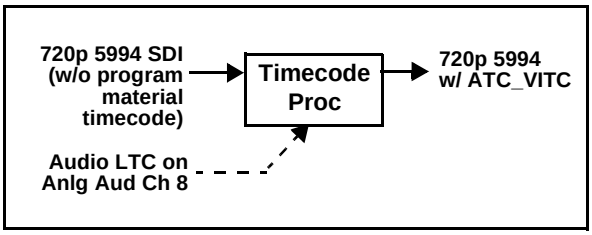



***Figure 2 Conversion to Contemporary Timecode Formats on Up-converted SD Stream***

## Audio LTC-to-Video Timecode Conversion

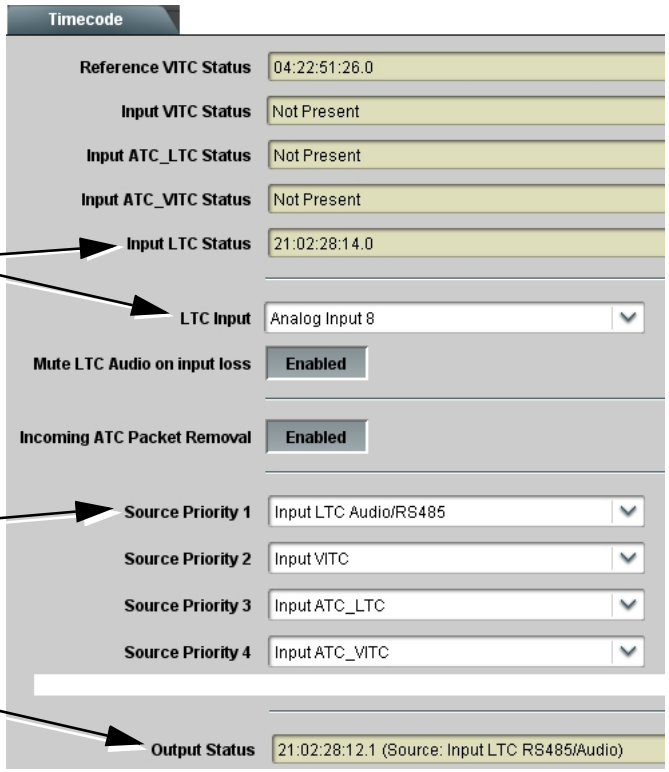
Figure 3 shows an example where legacy tape deck Audio LTC is to be inserted into the HD program video stream. This example would apply where the timecode outputted by a legacy tape deck must be retained and exist in the downstream program video.

Shown below is an example in which received 720p 5994 SDI video without timecode is to receive audio LTC. The audio LTC is converted to ATC_VITC timecode and inserted into the SDI video as shown below.




Noting that the incoming material contains audio LTC on Anlg Aud Ch 8, **LTC Input** is set to receive audio LTC via Anlg Aud Ch 8.

**Input LTC Status** verifies that LTC is being received on selected audio source.




**Source Priority 1** is set to prioritize Audio LTC as the preferred choice. Therefore, when audio LTC is present, it will be considered as the source that will eventually be outputted on the video stream.

**Output Status** shows audio LTC is being used as timecode source.

Received audio LTC is converted to ATC_VITC and inserted into the SDI output video as shown here using **HD ATC VITC Insertion** set to **Enabled** (in this example, the SMPTE recommended line number are used)

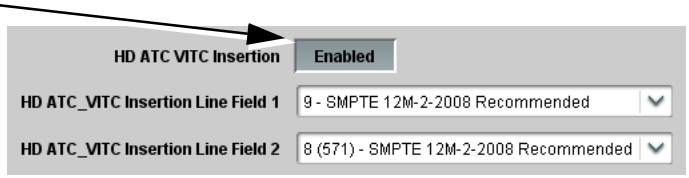
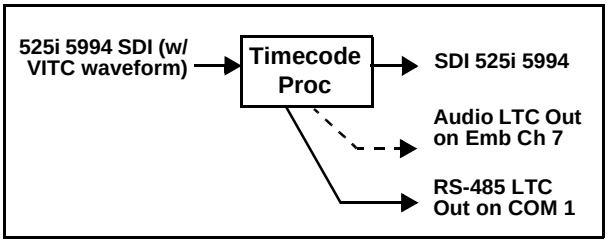



***Figure 3 Insertion of Audio LTC Timecode On Program Video Stream***

## Video Timecode-to-Audio LTC Timecode Conversion

Figure 4 shows an example where a downstream legacy system requires timecode from video in the form of either audio LTC or audio LTC over an RS-485 interface.

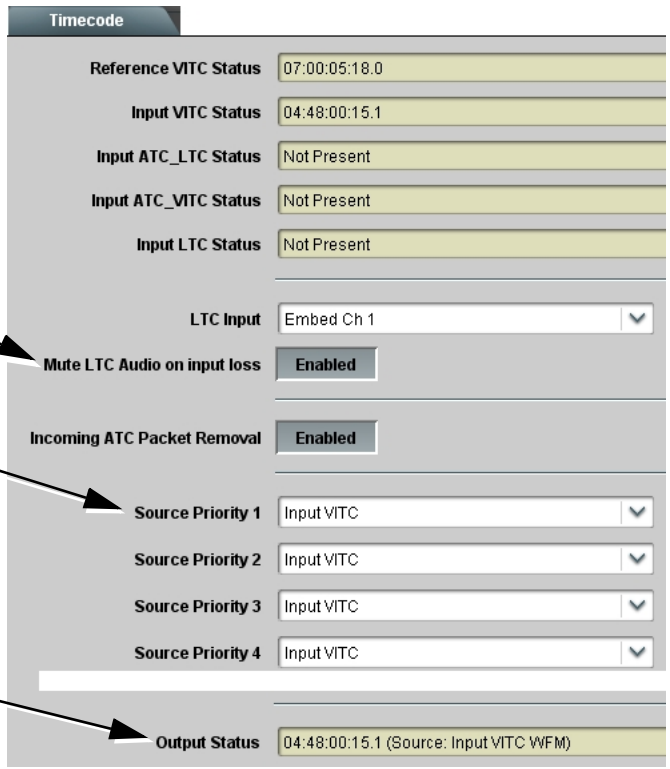
Shown below is an example in which received 525i 5994 SDI video with VBI VITC waveform timecode is converted to LTC and outputted on Emb Ch 7 and an RS-485 port.



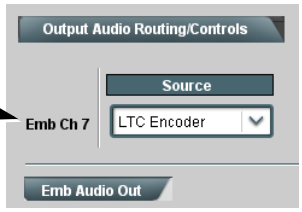

Some Audio LTC systems require that the audio LTC output mute upon loss of input signal. Setting **Mute LTC Audio** here mutes the audio LTC if selected input timecode is not being received.

Noting that program material VITC waveform timecode is only to be used, **Source Priority 1** is set to prioritize SDI VITC as the only choice. Therefore, when VITC waveform is present, it will be considered as the source that will eventually be outputted by the card regardless of output format selected.

**Output Status** shows VITC waveform is being used as timecode source.




Using the **Output Audio Routing/Controls** tab controls, **LTC Encoder** is selected as the source for Emb Ch 7, thereby outputting LTC on this channel.




Because COM 1 is to be used for the RS-485 LTC output in this example, **COM 1** is set to **Out - LTC Encoder** on the **COM and Metadata Routing** tab.

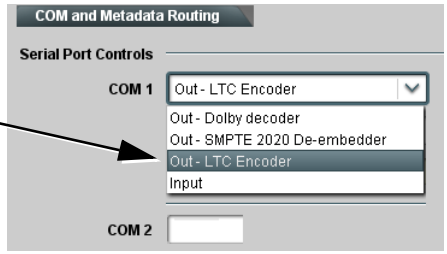



***Figure 4 Generation of Audio LTC Timecode From Program Video Stream***