
About free run audio time code in Cantar X3 / Cantar Mini

1 – The time inside Cantar

There are 2 internal clock inside a Cantar.

A clock, like your watch, to keep calendar time, with a standard watch accuracy.

A very precise TCXO (Temperature Controlled Crystal Oscillator) clock dedicated to keep an accurate time during 10 hours (with less than 0,5 frame difference). The initial calibration in Aaton's factory is performed using a GPS time base. There is no need to tune it afterwards.

NB: Be careful, as some other time code devices can be tuned manually by the user, their internal time base can differ from the GPS time base.

The internal Cantar time code gets his accuracy from the Cantar TCXO. This time code will be used to stamp the sound files recorded in the Cantar and to generate the LTC (Longitudinal Timecode).

When running on its internal time code, there is no need to add extra device to keep a Cantar audio time code in sync with other accurate devices, its embedded TCXO is extremely accurate.

The time code is recorded into the sound file as a time-stamp of the first sample. This time-stamp represents the number of elapsed samples since midnight.

Example of a sound file starting at 02:00:30+07 (at 24 Fps) and digitized at 48000 sample/sec.

The time-stamp value = $2*48000*3600 + 30*48000 + (7*48000/24) = 347,054,000$ samples.

You may note that the audio sample rate is involved in the time-stamp value.

2 - The audio time code frame rate

There are 2 time bases for the TCXO. The frame rate selection defines the choice of the audio time code time base. This choice will be embedded as a fps metadata in a dedicated field of the sound file.

2.1 – The time base accurate to real time:

The 24 / 25/ 29,97df and 30 fps correspond to a real time accurate time base.

It matches a situation where the camera speed runs at 24,00f/s 25,00f/s, 30,00f/s (e.g. HDTV 24, 25...).

2.2 – The time base accurate to “NTSC time”.

The NTSC time = Real time * 1,001.

The term “NTSC time” is used to indicate its historical origins and to describe the common frame time base but it is used today with some HDTV system which operate at 24/1.001, 30/1.001, or 60/1.001 frames per second.

Inside a Cantar, 23,98ndf (24/1,001) and 29,97ndf (30/1,001) are dedicated to these situations. Even if it is labeled as 23,98/29,97, there is no approximation in the time base calculation.

Three modes are available A, B or C. These modes change the way the time code and the audio sampling rate are recorded as metadata into the sound file. They do not affect the NTSC time base.

Mode C: This mode is today the reference in post production.

Sound file metadata example: the digitizing sample rate is 48K, the sample rate noted at the file's head is 48K, the Time-stamp noted at the file's head is calculated using 48048.

Mode A: This mode is designed as a work around for non linear editing systems, that are not able to manage the audio sample rate conversion between 47952 and 48000. It is dedicated to provide accurate audio when you shoot on set at 23,98/29,97 (based on “NTSC time”) and work in post production in a non linear editing project based on real time (e.g, true 24,00 Fps project).

Sound file metadata example: the digitizing sample rate is 48K, the sample rate noted at the file's head is 48048, the Time-stamp (time code) noted at the file's head is calculated using 48048.

Mode B: This mode maintains consistency between all the sample rate metadata fields and the digitizing clock sample rate.

Sound file metadata example: the digitizing sample rate is 48K, the sample rate noted at the file's head is 48K, the Time-stamp noted at the file's head is calculated using 48K.

2.3 – Remark:

Once the time code is initialized, and if you stay in the same time base (accurate to real time or to NTSC time), then you can switch from one FPS to the another: inside the Cantar, the audio time code accuracy will be preserved.

Be careful, other time code devices may not behave in the same way; a frame rate change may often require a time code resynchronization.

3 - The audio time code initialization.

There's a whole set of possibilities to initialize the audio time code value inside a Cantar.

- Start the audio time code by initializing it with the internal time of day clock.
- Start with a value entered manually set by the user
- Grab an LTC time code generated by an external device connected to the Cantar LTC time code input.

In the event of a Cantar power OFF and power ON, the time code accuracy will be preserved accurate during several minutes.