SMPTE Timecode

Whenever more than one device - software, hardware, computer etc. - are used simultaneously to create one final thing - e.g. a movie with music, or a lightshow running in sync to music or to a video - then a way to synchronize all devices is required. SMPTE Timecode is something like the standard for such a task: the timecode master sends a continuous stream of data which permanently states the time the master has advanced into the show/track/clip. And all other devices - here: timecode slaves - are to react to the very time as programmed in each device.

More info on Linear Timecode	https://en.wikipedia.org/wiki/Linear_timecode
More info on SMPTE Timecode	https://en.wikipedia.org/wiki/SMPTE_timecode
Signal	digital audio signal, 80 bit per frame
Framerate	24, **25**, 29.97, 30 fps
Connector/Cables	usually 3 pin XLR. Other connectors are possible.
Value range	from 00:00:00.00 to 23:59:59:23 (frames as per framerate)

From https://en.wikipedia.org/wiki/Linear_timecode#Generation_and_Distribution:

> In broadcast video situations, the LTC generator should be tied into house black burst, as should all devices using timecode, to ensure correct color framing and correct synchronization of all digital clocks. When synchronizing multiple clock-dependent digital devices together with video, such as digital audio recorders, the devices must be connected to a common word clock signal that is derived from the house black burst signal. This can be accomplished by using a generator that generates both black burst and video-resolved word clock, or by synchronizing the master digital device to video, and synchronizing all subsequent devices to the word clock output of the master digital device (and to LTC).
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> Made up of 80 bits per frame, where there may be 24, 25 or 30 frames per second, LTC timecode varies from 960 Hz (binary zeros at 24 frames/s) to 2400 Hz (binary ones at 30 frames/s), and thus is comfortably in the audio frequency range. LTC can exist as either a balanced or unbalanced signal, and can be treated as an audio signal in regards to distribution. Like audio, LTC can be distributed by standard audio wiring, connectors, distribution amplifiers, and patchbays, and can be ground-isolated with audio transformers. It can also be distributed via 75 ohm video cable and video distribution amplifiers, although the voltage attenuation caused by using a 75 ohm system may cause the signal to drop to a level that can not be read by some equipment.
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> Care has to be taken with analog audio to avoid audible 'breakthrough' (aka “crosstalk”) from the LTC track to the audio tracks.
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> LTC care:
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> * Avoid percussive sounds close to LTC
> * Never process an LTC with noise reduction, eq or compressor
> * Allow pre roll and post roll
> * To create negative time code add one hour to time (avoid midnight effect)
> * Always put slowest device as a master

Practical Handling

Usually the timecode signal comes as extra audio signal. It is not uncommon to record it as extra track on a multitrack system. For rehearsing/preprogramming your lights you can even have the producers mix all audio together e.g. on the left audio track, and have timecode on audio right channel. If you remember how a fax machine or a computer modem sounds: this is how SMPTE timecode sounds as well.

The signal needs to be sent to all devices which need to be synced. In a very basic environment feed the timecode from your video playback or digital audio workstation into your lighting console.

For testing purposes you can even find audio files with timecode online or generate it, e.g. at http://elteesee.pehrhovey.net/.

Titan Consoles and timecode

Not every Titan console has the hardware to handle SMPTE timecode:

- the Titan One and the T1 do **NOT** support timecode input
- the T2 does support timecode, and can be used as timecode input for other consoles
- the Titan Mobile, Quartz, Tiger Touch, Tiger Touch Pro, Pearl Expert and Pear Expert Pro do **not** support timecode input but
    - if running Titan v12 or above: can be extended with a T2 in order to be used as timecode input
    - do understand MIDI timecode so that you can use an external converter box to convert LTC to MTC, see below (Converters)
- Tiger Touch 2 and Sapphire Touch both have a designated LTC (SMPTE) input

Converters

There are some converters on the market which can translate between SMPTE timecode and MIDI timecode. They have different feature sets - some can convert from everything to everything, some can generate timecode themselfes, some converte to/from USB MIDI as well etc. Just some examples:

- the Rosendahl Mif-4 is the gold standard for timecode converters in the AV industry
- various MOTU interfaces, e.g. the MOTU micro express [1)]
- the Kissbox TC2TR

This list will never be complete. I believe I used a Fostex or Roland interface many years ago but I don't know for sure - this market is in constant movement.

1)

a few yeears ago there was a firmware issue in some MOTU interfaces, resulting in 1 second jumps in special situations, depending from frame rate and start time. Don't know if this has been resolved - we made MOTU aware of this.