

# THE TRILEVELSYNC LOCKIT BOX

Timecode, Videosyncs, Trilevelsync, Wordclock  
Generator

ACL202C/ACL202CT Trilevelsync option

Description and instructions for use. Update2005



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## The Locket synchroniser ACL 202 CT

### Description

The Ambient Locket ACL 202CT is a highly accurate portable timecode and video sync generator. Audio and video machines such as DAT, harddisc and DVD recorders and HD and Digibeta cameras can be synchronised to the Locket box, thus giving very low drift between machines, thus allowing multicamera shoots to be carried out without cables or timecode radio links.

Typically, the drift will be less than one half frame a day, giving problem free editing and syncing in Post Production.

The Locket can be used in any recording situation where the accuracy of the TC generators in the different machines is not known and where a cable connection is not possible. Each machine is jamsynced and Genlocked, (if possible,) to its own Locket which is synced to a common source before the machines start. The Locket can be jam synced with external timecode or set with Aaton "Origen C" ASCII code.

### Special Features

- Clockit tunable reference oscillator for timecode generation gives typically less than one half frame a day timecode drift.
- Highly accurate DTCXO reference oscillator. Can be calibrated in the field to 0.2ppm using Clockit Controller ACC101.
- Crystal oscillator for Video and trilevelsync locked to reference oscillator low jitter high stability signals.
- 24, 23.98, 25, 29.97, 30 Frame Timecode Locked to PAL, NTSC, 30 Frame NTSC and Sony HD and Panavision Varicam standards and Wordclock 48kHz
- Drop frame timecodes can be selected
- Extensive unit monitoring through 2 Leds
- DC/DC converter for Long life. Over 17hrs (24 hrs\*\*) with 2 penlite cells and 75 Ohm video input connected.

\*\*Note: With new modification Standard from July 2004. See black battery Contact cap for mechanical polarity reversal protection.

## 1.1 Controls

### DIP Switches behind battery slider ( note towards switch numbering is on)

Switch	24	25	30	29.97 Frames
1	on	off	off	on
2	off	off	on	on
3	on Dropframe (30, 29.97Fps sw 1,2) or 23.98 Fps(sw 1,2, 4) off no Dropframe			
4	Mode switch (see tables)			
5	Set standard progressive off/ interlaced on / special (see tables)			
6	Set standard normal video rate off / double video rate on/ special (see tables)			
7	Insert userbits in timcode / or old Colour Lockit, trickle charge nicads			

- Top red switch mode switch B: Left, Composite Video.  
Right, Trilevel sync/ reserved
- Bottom red switch mode switch A: Left, Composite Video.  
Right, Trilevelsync/Wordclock
- Yellow Switch Main On/Off

### Selection Tables for Timecode rates and sync output

#### Detailed Description of switches

- The Lockit box has various switches which can be accessed by sliding the battery door in the direction of the batteries to expose the slot with the switches. Looking at the slot with the BNC output sockets to the right you will see. Dipswitch 1 to 7. Two red/black switches one above the other .  
Yellow on/off switch
- When the lockit is switched on the switch positions are entered into the microcontroller to select timecode framerate and sync output. After that changing the switches will not change the internal settings. However it is recommended not to move the switches after the Lockit box has been switched on.
- Dipswitch 1 to 3 are for selecting the timecode Framerate. Dipswitch 3 has a special function in that it selects dropframe mode when 30 or 29.97 fps timecode is selected and if 24 fps is selected then this switch on selects 23.98 fps.

- **Dipswitch 4 is a mode switch.**  
When composite video is selected off is PAL and on is NTSC  
When trilevel sync is selected Off is Panasonic VaricamHD (SMPTE 296) , only 59.94P and 60 P. On is Sony HD (ITU R BT 709. SMPTE 274), all rates.

- **Dipswitch 5 and 6 are video format switches in trilevel mode**  
Note:Dipswitch 5,6 have no function when composite video is selected.

When Trilevel sync, switch 4 On (Sony HD) is selected they have the following function.

Dipswitch 5 Off is progressive mode, On is Interlaced / segmented frame. eg 24 Psf or 60I.

Trilevel sync mode, switch 4 off ( Panasonic Varicam): no function

Note: Interlaced I and progressive segmented frame, (Psf) trilevelsync signals are identical for genlock purposes.

- **Dipswitch 6 selects doubleTrilevel sync video rate**  
For example: When 30 fps timecode is selected in trilevel mode and dipswitch 4 is on (Sony HD) and switch 6 is on, 60P SMPTE 274 will be selected. Please note that these rates although set out in the spec are not available on the Sony HD camera. Only segmented frame, Psf, or interlaced, I, modes are used

**Dipswitch 5,6 have a special function when both on. When Sony HD is selected.**

- Only Trilevelsync 24, 23.98 Psf will be output sync to timecode ( every full second) when full integer or pull down timecode framerates are selected respectively. For example if 30, 24, 25 fps timecode is selected then 24Psf will be output. If 23.98, 29.97 fps timecode are selected 23.98 Psf will be output.

Note:This allows one to put for example a 29.97 fps timecode on a camera audio track while genlocking the camera which is running at 23.98 Psf.

- When dipswitch 4 is off (Panasonic Varicam) switch 5 and 6 must be off for trilevel sync to be generated. See notes on Panasonic Varicam.

**Dipswitch 7 has a special function.**

- In older lockit models this was trickle charge Nicad batteries. In the Trilevel Lockits the charge function is eliminated
- In the latest software this switch has a jam lockout function and inserts userbits from external TC into Running timecode. It functions as follows. The Lockit is set as usual then the timecode is withdrawn from the TC in socket. Switch 7 is put on then external TC reinserted. Userbits from the external code will be inserted asynchronously into the lockit's timecode without rejam. **See new software notes**

## **DIPSWITCH SETTINGS**

### **48Khz Wordclock with timecode**

1	2	3	4	5	6	7
off	off	off	off	off	off	off

X	
	X

**25 fps timecode 48Khz wordclock**

1	2	3	4	5	6	7
off		off	off	off	off	off
	on					

X	
	X

**30 fps timecode 48Khz wordclock**

1	2	3	4	5	6	7
off			off	off	off	off
	on	on				

X	
	X

**30fps dropframe timecode 48Khz wordclock**

1	2	3	4	5	6	7
	off	off	off	off	off	off
on						

X	
	X

**24 fps timecode 48Khz wordclock**

1	2	3	4	5	6	7
	off		off	off	off	off
on		on				

X	
	X

**23.98 fps timecode 48Khz wordclock,**

1	2	3	4	5	6	7
		off	off	off	off	ff
on	on					

X	
	X

**29.97fps timecode 48Khz wordclock**

1	2	3	4	5	6	7
			off	off	off	off
on	on	on				

X	
	X

**29.97fps dropfr. timecode 48Khz wordclock**

**Timecode with composite video (Black and burst)**

1	2	3	4	5	6	7
off	off	off	off	off	off	off

X	
X	

**25 fps TC PAL composite video**

1	2	3	4	5	6	7
off		off		off	off	off
	on		on			

X	
X	

**30 fps TC with 30Fps NTSC composite sync**

1	2	3	4	5	6	7
off				off	off	off
	on	on	on			

X	
X	

**30 Fps dropframe TC. 30 fps NTSC comp. sync**

1	2	3	4	5	6	7
		off		off	off	off
on	on		on			

X	
X	

**29.97 Fps TC. 29.97 fps NTSC comp. video**

1	2	3	4	5	6	7
				off	off	off
on	on	on	on			

X	
X	

**29.97 Fps Dropfr TC. 29.97 fps NTSCcomp. video**

1	2	3	4	5	6	7
	off	off		off	off	off
on			on			

X	
X	

**24 fps timecode 30 fps NTSC comp. sync**

1	2	3	4	5	6	7
	off			off	off	off
on		on	on			

X	
X	

**23.98 fps timecode 29.97 fps NTSC comp.video**

**Timecode with Trilevel sync Sony HD ( ITU- R BT 709). switch 4 on**

1	2	3	4	5	6	7
	X				X	X
X		X	X	X		

	X
	X

**23.98 Fps TC with 23.98Psf Trilevel sync**  
**note switch 5 off is 23.98P progressive**

1	2	3	4	5	6	7
	X	X			X	X
X			X	X		

	X
	X

**24 fps TC with 24 Psf Trilevel sync**  
**note switch 5 off is 24 P progressive**

1	2	3	4	5	6	7
X	X	X			X	X
			X	X		

	X
	X

**25 fps TC with 25 Psf /50 I Trilevel sync**  
**note 1: switch 5 off is 25P , switch 5 off 6 on is 50P**  
**note 2: switch 5 and 6 on is 24Psf**

1	2	3	4	5	6	7
X		X			X	X
	X		X	X		

	X
	X

**30 fps TC with 30 Psf /60 I Sony HD trilevel sync**  
**note 1: switch 5 off is 30P switch 5 off 6 on is 60P**  
**note 2: switch 5 and 6 on is 24 Psf trilevel**  
**note 3: switch 3 on is 30 Drop TC.**

1	2	3	4	5	6	7
		X			X	X
X	X		X	X		

	X
	X

**29.97 fps TC with 29.97Psf/ 59.94 I Trilevel**  
**note 1: switch 5 off is 29.97P switch 5 off 6 on is 60P**  
**note 2: switch 5 and 6 on is 23.98 Psf trilevel**  
**note 3: switch 3 on is 29.97 Drop TC.**

**Timecode with Trilevelsync Panasonic Varicam. (SMPTE 296) switch 4 off**

1	2	3	4	5	6	7
	X	X	X	X	X	X
X						

	X
	X

**24 fpsTC with 60 P Panasonic trilevel sync**

1	2	3	4	5	6	7
	X		X	X	X	X
X		X				

	X
	X

**23.93 fps TC with 59.94 P trilevel sync**

1	2	3	4	5	6	7
X	X	X	X	X	X	X

	X
	X

**25 fpsTC with 60 P Panasonic trilevel**

1	2	3	4	5	6	7
X		X	X	X	X	X
	X					

	X
	X

**30 fpsTC with 60 P Panasonic trilevel**

**note 1: dipswitch 3 on is 30 Dropframe timecode!**

1	2	3	4	5	6	7
		X	X	X	X	X
X	X					

	X
	X

**29.97 fps TC with 59.94 P trilevel sync**

**Note 1: dipswitch 3 on is dropframe timecode**

**NOTES ON PANASONIC VARICAM MODE**



The Panasonic Varicam has 2 fixed recording rates

60P in Europe and PAL countries and 59.97P in USA and NTSC countries

All Integer timecode framerates (24, 25, 30 fps) will fit with 60 P

All non integer (pull down) framerates ( 23.97, 29.97Fps) will fit with 59.97P

The steady blink of the green Led on the Lockit will only occur when the TC framerate selected exactly fits the video rate divided by two.

30 Fps timecode with 60 P  
29.97 Fps timecode with 59.97P.

All other rates only match the video frame once every full second so the green led will blink erratically as it measures out of phase. See Note 2

Note: also the camera will only accept these above framerates respectively on the timecode input ie

In USA it must be 29.97 fps TC  
In Europe it must be 30 fps.TC

This creates a difficulty in Europe as the most used framerate is 25 fps TC (PAL compatible). The camera running at 60 P will not accept this framerate. It needs 30 fps TC!

NOTE 1:

If one needs to use 25fps TC for syncing sound to picture the Lockit can be set to 25Fps TC with 60 P trilevelsync and the timecode put on an audio track. The Varicam camera will then use record run TC at 30 Fps and the audio track code at 25 Fps can be used in Avid for syncing sound to picture. Note in this mode the green led will blink erratically!  
( 25fpsTC, 60P video)

NOTE 2:

This has been correctd on the december 2004 software update. The measurement is done at the beginning of the second which is a valid sync point even if video framerate is different form TC rate. Off course pull down rates will not be sync with full integer frame rates. For example: 24 fps TC with 50l trilevel ---sync!  
29.97 fps TC with 50l trilevel----no sync!

## **TRILEVEL LOCKIT ACL 202CT Hardware and software update January 2005**

As of November 15<sup>th</sup> 2004 all Trilevel Lockits will be issued with the following hard and software, Version 9.02, updates.

### **Hardware: REVERSE POLARITY PROTECTION ETC**

Reverse polarity protection was implemented up to now with a diode in the positive battery line. This diode has a voltage drop of 0.6 Volts.

In order to increase battery life the diode has been removed or bridged. The reverse polarity protection is now a plastic snap cap on the positive pole of the battery contacts. Batteries inserted the wrong way round will not make contact.

In tests using alkaline cells of normal quality (Duracell etc) we now get running times of over 24 Hrs with video connected to a 75 Ohm load. Previously, running times of about 15 hours were normal.

### **Software: NEW TIMECODE JAM MODE**

Up to now after jamming the Lockit to timecode the timecode source had to be removed or the Lockit would rejam every 5 seconds with a restart of the video. The new software allows the TC source to remain connected to the Lockit box and functions in the following way.

With TC connected the Lockit will jam only once and not rejam until the TC source is disconnected for over 3 seconds. After 3 seconds of no TC at the input, the redetection of a readable TC at the input will induce a rejam. Also Aaton ASCII is locked out for 3 seconds.

Of course Timecode can be disconnected after jamming when the LED has gone green.

- The Lockit box can be used as a TC gearbox in a jam once and run configuration that will hold sync for about 0.5 hours. The Lockit box can be set to desired frame rate and be jammed from another framerate. Most Crystal controlled machines are not more than 10 ppm different. In a jam and run situation in which the Lockit and source were 10 ppm different, a jam and run would lead to 0.5 Frame difference after half an hour at 30 Fps. In practice this will probably be much less especially if the TC source used for jam also comes from a Lockit box.. Sync will only work if integer and Pull down framerates are used together respectively. ie 24,25 30 Fps together, and 29.97. 23.98 Fps together.
- This feature can be used to jam the lockit once to a playback timecode. Using a transmitter and receiver on the Lockit box. The lockit will jam once

to the incoming playback timecode and also ignore RF dropouts of up to 3 seconds. Note Playback TC of a Video player is often jittery and cannot be read by a camera. The Lockit delivers smooth code and sync

- Remote rejam of all Lockits can be implemented in a multicamera shoot using a TC transmitter and receivers on all cameras.

**Software: INSERT USERBITS IN TC**

- In normal operation dipswitch 7 is off and timecode jam is enabled. If after jamming TC dipswitch 7 is set on then the Lockit will not rejam to externally connected timecode but will extract userbits from this TC and insert them in the Lockits running code without disturbing sync. The Led will blink green in long bursts. In this way using an event number in the userbits of an external timecode, all cameras can be userbit updated without rejamming.
- The following timecode configurations will extract Userbits from external TC

<u>Lockit box TC</u>	External TC	Lockit box TC	External TC
24	24, 25, 30	23.98	23.98, 29.97
25	24, 25, 30	29.97	23.98, 29.97
30	24, 25, 30		

**1.2 Lemo socket**

- pin 1      Ground
- pin 2      LTC in
- pin 3      ASCII in/out
- pin 4      6-16 volt input      Tune reference out 1.92 MHz
- pin 5      LTC out

**1.3 LED Indicators**

A. RED led on continuous. no blink. Battery empty or in rare cases latchup after receiving false TC or ASCII signal. Change batteries or switch off/on to remove latchup.

B. When Lockit is switched on Red led blinks normal 1 second intervals as diagram D. This means generator time has started from 00.00.00.00. and has not been set from an external source.

C. When lockit is set from external source Leds go to green with one second Blink. when the unit is set again or TC jam sync repeats the Leds will go red then green again.

**D. LED blink Table** (Note: See new software notes for new jam and userbit transfer)

**The red or the green Led show the state of the lockit unit**

blink secs.	1s	2s	3s	4s
Normal	X	X	X	X
Batt. Low	X			X X
Video not sync w. TC*	X X	X	X	X X X
Video. TC async + Batt low	X X X	X	X	X X X X
New! Jam lockout				
Userbit insert	x	x-----x		x ( long, short,long)

== 5 Frames  
 ====10 Frames  
 =====1 Second

\*When the Lockit is set it takes the video sync up to 10 seconds to sync up with the timecode. During this time the lockit may show out of sync. the Xtal frequency is shifted till the TC and Videosignal line up.

**1.5 Batteries. Powering.**

The Lockit is powered by 2 Mignon cells (3volts). It is recommended to use Alkaline cells. The external power is connected directly to a 5 volt regulator and can have a voltage of 6-16 volts.

If the Lockit is being powered externally, the internal batteries can be fitted and act as backup if the external power is removed. With external power and batteries switched on. the LED will blink normal 1sec if batteries are good, doubleblink if batteries are bad (no backup)

Also note: Double blink with external supply and no batteries. Check batteries are inserted for use with external powering and battery backup.

## 1.6 Setting the Lockit TC generator from external source

### A. External timecode. See new Software notes for new jam mode

Insert an external timecode source 0.5 volts up to 5 volts pp. With successful Jamsync the leds will go from red to green or if they were on green will show shortly red then green. If the external TC source is not removed on the green Phase then the Jam sync will repeat every 5 seconds. Remove Ext TC early on the green phase and make certain the green led blinks.

If Leds do not go red then green, Check cable and TC voltage Level. Note: Xjam only time transferred timecode as selected with dipswitches.

Note: NEW SOFTWARE from December 2004. in the new software the tc can remain connected. The Lockit will not rejam until the TC has been absent for 3 seconds. See New software notes for details.

Note: If the lockit loses sync through loss of power one can use the machine it is coupled to, to resync with timecode. Even if the machine has a drift of several frames an hour, there will not be a frame lost if the Lockit is rejammed within one minute. However it is best to rejam the lockit with one of the clockit units running in the system to avoid errors.

### B. Setting with Aaton Origen C. or Ambient Controller\*\*.

The Lockit and all clockit units are Aaton compatible. The Lockit is connected to the Origen C or Ambient Controller with an Ascii cable and setting and time code comparisons can be carried out. After setting the led goes green. Remove Ascii cable.

\*\*The ASCII protocol does not transfer Framerates only time. Thus when setting with Aaton the Dipswitch framerate must be set to the Framerate required. The timecode will be generated at the framerate set by the dipswitches.

## 1.7 Dimensions Input/output voltages

- Size 100mm X 74mm X 26mm
- Weight 250 Grms without batteries
- TC input 0.1 to 5 volts pp
- TC output 1 volts pp
- Video out 0.4volts pp on 75 Ohm

## 1.8 Accessories

- Timecode Cable in XLR F / Lemo 5. Timecode Cable out XLR M / Lemo 5
- Timecode Cable in BNC / Lemo 5 (To jam from Digibeta camera with BNC output socket)

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← Wordclock 48 KHz  
→ Trilevel sync

**VIDEO/WORD**

- 24 ○ ● ●
- 23.98 ○ ● ○
- 25 ● ● ●
- 29.97 ○ ○ ●
- 29.97 drop ○ ○ ●
- 30 ● ○ ●
- 30 drop ● ○ ○

← Composite video  
→ Trilevel sync & Word

**OUTPUTS**

ON Charge Nicads  
Trilevel sync only, Off normal Fps, On double Fps  
Trilevel sync only, Off Progr. P, On Interlaced, I/Psf  
Composite video, Off PAL, On NTSC  
Trilevel sync, Off Reserved, On Trilevel sync

**TIMECODE**

TC Fps

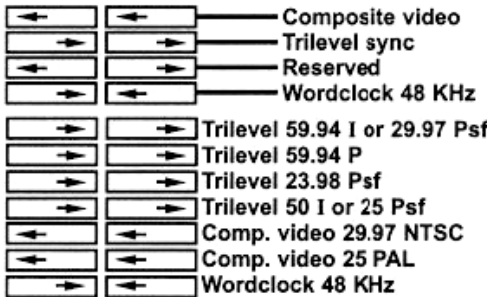
1 2 3 4 5 6

**S E L E C T**  
● = OFF ○ = ON

**EXAMPLES**

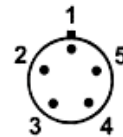
- ○ ● ○ ○ ●
- ○ ● ○ ○ ○
- ● ○ ○ ○ ○
- ● ● ○ ○ ●
- ○ ● ○ ○ ●
- ● ● ● ● ●
- ● ● ● ● ●

A B



Lemo Socket

- 1 = GROUND
- 2 = TC IN
- 3 = AATON ASCII
- 4 = 12V IN / TUNE
- 5 = TC OUT



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**CLOCKIT** TIMECODE TRILEVEL SYNC LOCKIT ACL 202CT