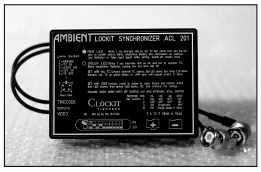
CLOCKIT TIMECODE PRODUCTS BY AMBIENT

Pictured on the right is the ACD 301 slate that displays 23.97 as well as 29.97 NTSC and PAL.



LOCKIT ACL 202C (blue label) is a video sync and TC generator that generates NTSC 29.97 and 23.97 and PAL timecode with NTSC sync. Proper 23.97 TC and Trilevel sync is generated by the new 202T.

Once A Day Jamming
Ambient wrote: The Lockit box 202C and 202T produce timecode at under one frame in 24 hours drift. Video sync is locked to that. Accuracies between boxes are better than 0.5 ppm from minus 10 to plus 40 degree C (14F-104F). Calibration will hold to under one ppm for over one year. The Lockit box is unique because its crystal can be calibrated in the field to better than 0.2 PPM to match other generators. This is important when you want to hold sync between several recorders (audio and video) for longer than 10 minutes. Ambient Lockit synchronization between cameras and sound will be as good as the accuracy of the calibration between Ambient Lockits and other generators.

The Lockit box is used extensively with video multicamera shoots when cameras and sound cannot be fed TC and sync by cable. It is enough to sync the Lockit to a reference once a day. The reference can be another source of TC, or another Lockit or the Master Controller.

All Lockits are set from one master be that a camera, a sound recorder (DAT, DEVA) or the Ambient Master Controller. The Lockits are permanently kept connected to individual cameras feeding the cameras with video sync and timecode. One Lockit can also be used by the sound man to get TC and feed a **48K word clock** input that stays in step with the TC to the audio recorder. The 48K will be the base frequency of the recorder.

The advantage of locking the cameras video sync to external timecode is that timecode and the sync of video frame are locked in step and do not drift relative to another. Without this lock, timecode phase offsets can and will occur between TC and sync. This may lead to various problems in post situations. The picture may not be stable when TC and video sync get too far apart or even jump. Another problem may be occasional muting of the DAT audio if it has good TC but 48K word clock that drifts in relation to TC.

TC Rates of 202C
With version 202C the video sync produced is now sync and color-burst (= composite sync). Timecode output is always kept in step with video sync.

The Color Lockit box provides sync with color burst and timecode in proper relationship at following rates:

- 23.97, 24, 25, 29.97, 30 Fps at drop or ND
- 48 KHz Wordclock, 3 volts for 110Ω termination, proper TTL voltage for DAT, etc., Wordclock inputs
- Future option: Zero level AES/EBU Digital Audio Signal in stead of 48 KHz for syncing Zaxcom Deva. Not available by 2002.
- No trilevel sync available in 202C you need the 202T for that

Lab Adjustment
Technical note: Burst phase (the offset of color burst from sync tip) can be adjusted through two holes under the label. Hole nearest the BNC connectors is NTSC, the other PAL. A very tiny ceramic screwdriver must be used. Look down the hole to locate the slit before screwing around (!!) which may damage the pot. Caution: do not attempt to do this unless you have the instruments for measuring phase (Peter Pierce box). Correct phase is in degrees and nanoseconds!! This is not a field adjustment.

Lemo Connector (LEMO Part FGG-OB 5 pole)

1. Ground
2. LTC in
3. ASCII in/out
4. 6-16 volt external powering / Tune frequency of signal out put with ACC 101
5. LTC out

Battery Powering
It is recommended to use alkaline cells. The two AA cells feed a DC/DC converter that makes 5 volts internally. If external power is fed to Lockit, it is controlled by a linear regulator that can take from 6-16 volts. If the Lockit is being powered externally, the internal batteries can be fitted and act as a backup to external power. With external power and batteries fitted and switched on, the red LED will blink normally at one second intervals if batteries are good, double blink if batteries are bad or not fitted. Always fit batteries when running external power. This will assure instantaneous backup power if the cable fails or camera turns off or battery is changed on Camera. Note: the **batteries will last for at least 15 hours** with TC and video sync out connected and terminated with 75Ω. With timecode only connected and with wordclock switch on to feed a DAT batteries last about one week!

There is a NiCad charging option but no end of battery capacity shut off is provided, so NiCads not turned off overnight will self-destruct by over-discharge within a week. There is no good reason now to use NiCads that are more expensive and not as predictable as good fresh alkaline AA.

Jam To External TC

Normally when powering Lockit up with the on switch, it will start counting from zero time 00:00:00:00, HH:MM:SS:FR. The Lockit can also be jammed to external TC code. The jamming process is automatic and its progress is signaled by the LEDs.

Connect the external LTC using the Lemo socket. The red LED will light followed by the green, which will soon blink in the same rhythm as the red LED (once per second). Remove the external TC when the green LED blinks, the Lockit has been jammed to external code.

If the external TC is left connected, the jamming process will repeat every five seconds. Always remove input cable on the green LED flashing. You may introduce jumping TC to a DAT that follows external TC if you keep cable connected for too long. The consequences of this are not known. If you figure it out, let all of us know. Don't do any experimenting with TC, sync or 48K! You have no way to check what a playback deck will do in post. Shortcuts never pay off! Also remember, TC has nothing at all to do with PNO's – nothing!

Note: If you think something went wrong, just turn the unit OFF and ON. If blink is irregular, something is wrong! Rejam.

Cross Syncing

When jamming 202C or 202T from external code, only the time code (TC) and userbits (UB) are transferred from in to output. The framerate generated and put out is as selected by the dipswitches on the Lockit. Framerates in and out do not have to match. The Lockit will "cross sync" on the full second. That means you can feed a Lockit 23.9 and it will pick up TC and UB numbers on the full second.

When there is continuous TC, but TC values jump (as in the Lockit being fed by Record Run from a Beta), Lockit will look for new TC every five seconds. This really does not work as the Lockit will resync every five seconds. But while syncing, no value code is output so TC is intermittent every five seconds. That's why you must unplug Lockit from any source once it has grabbed the code. It will then continue nicely.

The Lockit is a one time jam device with repeat jam every five seconds to a continuously inputted code. It does not jam and stay there till new code arrives as one would need to jam a DAT to Rec Run camera. It is not made to cross jam continuously.

SETTING TC WITH AATON ORIGIN C OR AMBIENT MASTER CONTROLLER
The Master clock and all Clockit units are Aaton compatible. Aaton uses an ASCII serial communication protocol to jam TC and check errors. This is different from anybody else in the known universe. The Lockit can be connected to the Origin C with an ASCII cable and setting and comparisons can be carried out. Use the Aaton instructions. (See Wolf Seeberg's Sync Sound Manual, advertised at the end of this book.) After setting the LED of Lockit, it blinks green. Remove the ASCII cable quickly.

The ASCII protocol does not transfer framerate, only time and userbit values. Note the userbits must follow the Aaton format or ASCII setting method or it will not work!
Userbits format is: DD MM YY PP.
D=day, M=month, Y=year, P=production number or roll number
The advantage of using a Master clock instead of a Aaton origin C is that the speed of the Clockits can also be adjusted with the Master clock.

Field Calibration with Master Controller ACC 101

The ACL 202C and 202CT and all Clockit units can be crystal calibrated in the field . That means all Clockits can be made to run as closely together possible. With rental units from different sources this is a must.

The calibration is be carried out with the Ambient Controller ACC 101 and takes about 2 minutes per unit. No mechanical skills are required.

1. Set the ACC 101 to proper TC speed.
2. Connect Lockit to Ambient controller ACC 101 with spiral ASCII cable.
3. Press LTC, then tune.
4. After 10 milliseconds controller displays difference in ppm and tune number for Xtal oscillator if the difference is more than 0.2ppm.
5. Press enter twice.
6. The controller will then program a new number into the oscillator to compensate for the error, and will redisplay the calibration result.
7. If it's now OK, remove cable. If the tuning could be better, repeat the process.
8. If the units are more than 2ppm out of tune you may have to repeat the process up to three times.

Tune all Lockits on one shoot so that they are within 0.2ppm. This calibration is the best you can achieve. The resolution of the tuner in the Masterclock is 0.5ppm per step.

Lockit ACL 202T

This is the new Trilevel Sync Generator. This generator has a silver label (March 2000) but it will have a green label. The manufacturer says: Ambient Trilevel Sync option for their Lockit box provides a way to genlock (Trilevel) and send matching (timecode) for the new HD cameras. The Trilevel sync signal, in step with timecode, is an alternate output to the composite video sync that has been used by PAL and NTSC for the last 50 years. Most functions are the same as the older 202C, except for new switch settings.

Future Proof
Although true progressive and double framerate standards are not used as genlock signals (PSF/I is used) in the manufactured HD cameras in 2002, these standards are available in the Lockit box for future use. This appeases the SMPTE standard of 50, 60, 59.97 progressive that is not in use yet.

Audio settings and LED indicators are the same for 202C and 202T.
There is irregular blinking if trilevel is out in any way. Turn OFF/ON and rejam.

Lockit Start Delay
When the Lockit is powered up, all internal Xtal VCOs must lock in. This takes up to ten seconds from a cold start. During this time, there is no sync output. When all oscillators are properly set up, sync output starts. When re-jamming TC only while the Lockit is on, the oscillators are already properly set up so sync and jamming starts almost immediately.

Dimensions and Technical Specs

Size:	100 x 74 x 26mm
Weight:	250 grams without batteries
TC input:	1 to 5 volts pp
TC output:	3 volts TTL at Lemo socket, 1.2 volts pp at BNC
Video out:	0.3 volts on 75Ω
Battery life:	min. 15 hours w/ 2 AA cells internal

Switch Settings For 202T – Video Use

Timecode FPS output	DIPSWITCHES							Modeswitch			Sync. Standard output
	1	2	3	4	5	6	7	A lower	B upper		
							If nicads=On If alkaline=Off				
23.98 PsF	On	Off	On	On	On	Off		®	®	PsF	Trilevel
24 PsF	On	Off	Off	On	On	Off		®	®	PsF	Trilevel
25 PsF	Off	Off	Off	On	On	Off		®	®	PsF	Trilevel
29.97 PsF	On	On	Off	On	On	Off		®	®	PsF	Trilevel
30 PsF	Off	On	Off	On	On	Off		®	®	PsF	Trilevel
50 I	Off	Off	Off	On	On	Off		®	®	I	Trilevel
59.97 I	On	On	Off	On	On	Off		®	®	I	Trilevel
60 I	Off	On	Off	On	On	Off		®	®	I	Trilevel
23.98	On	Off	On	On	Off	Off		〈	〈	Comp. Video	NTSC
24 NTSC	On	Off	Off	On	Off	Off		〈	〈	Comp. Video	NTSC
25 PAL	Off	Off	Off	Off	Off	Off		〈	〈	Comp. Video	PAL
29.97 ND NTSC	On	On	Off	On	Off	Off		〈	〈	Comp. Video	NTSC
29.97 drop NTSC	On	On	On	On	Off	Off		〈	〈	Comp. Video	NTSC
30	Off	On	Off	On	Off	Off		〈	〈	Comp. Video	NTSC B/W
30 drop	Off	On	On	On	Off	Off		〈	〈	Comp. Video	NTSC B/W

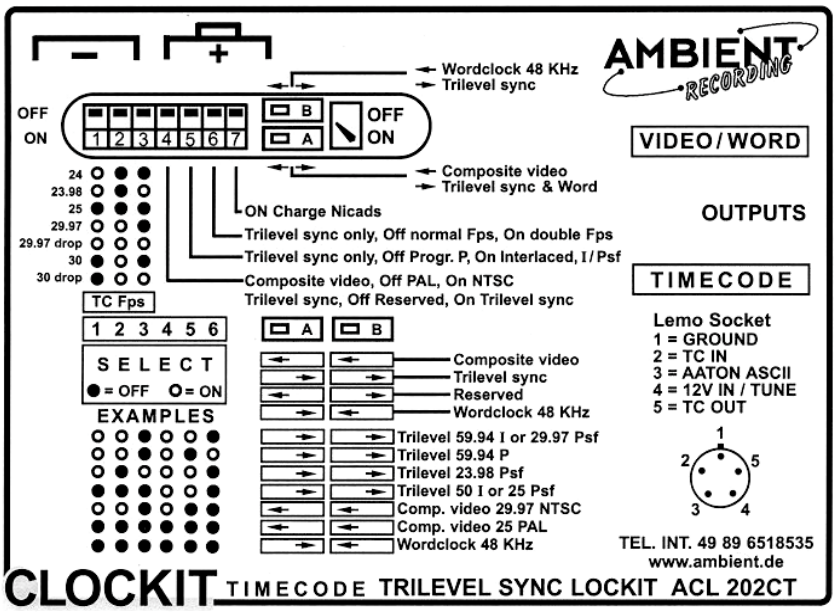
PsF = Recorded Progressive on tape,
output (component interlaced, segmented frame)
FPS = Frames per second
P = Recorded Progressive, output progressive not available, monitors flicker
I = Recorded interlaced -- output, component interlaced
® = Mode switch to right
〈 = Mode switch to left

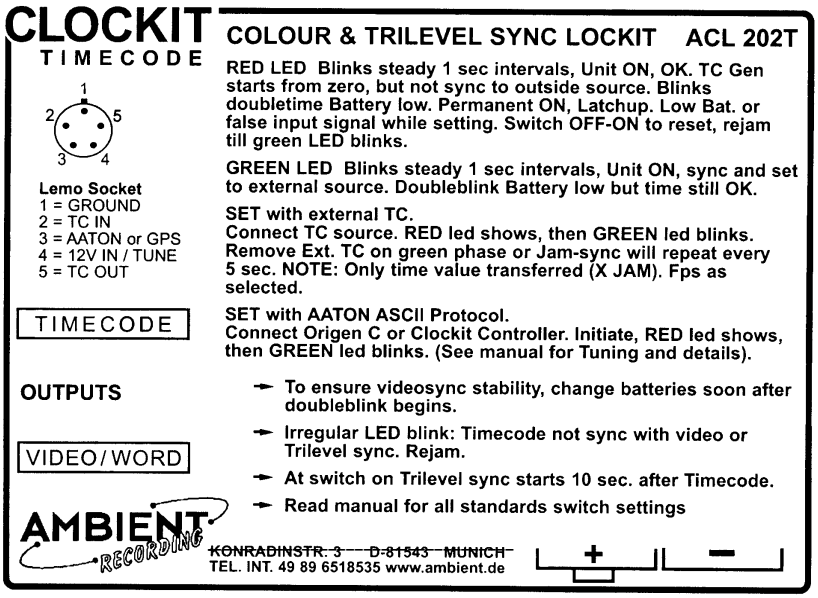
Note 1. Dipswitch 6 on. gives double Trilevel progressive rates only with TC FPS 25, 29.97,30 Fps. (50P 59.94P 60P). Dipswitch 5 (Interlace) must be off.

Note 2. Dipswitch 5 is interlace /PsF switch. When off, P format is produced

The trilevel sync waveforms are as specified in SMPTE 274- 1998 and ITU-R BT.709-4.

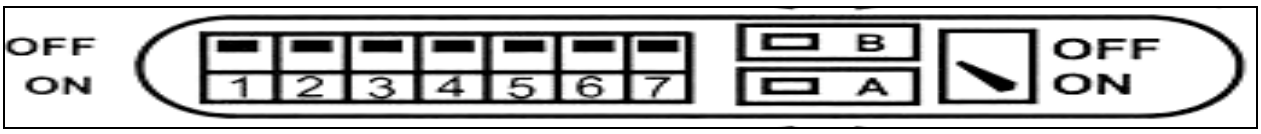
These two images are the green card label issued with the 202T March 2002:





Ambient promised an earth people friendly version soon.
There are no conflicts between the cards and this book. The info presented here is more readable than anything else. (March 2002)

Switch Settings for 202C and 202T for 48K Wordclock – Audio use



Timecode FPS output	DIPSWITCHES							Modeswitch			Sync. Standard output
	1	2	3	4	5	6	7	A lower	B upper		
							If NiCads=On If alkaline=Off				
23.98	On	Off	On	Off	Off	Off		®	〈	Word-clock	48K
24 NTSC	On	Off	Off	Off	Off	Off		®	〈	Word-clock	48K
25 PAL	Off	Off	Off	Off	Off	Off		®	〈	Word-clock	48K
29.97 ND NTSC	On	On	Off	Off	Off	Off		®	〈	Word-clock	48K
29.97 drop NTSC	On	On	On	Off	Off	Off		®	〈	Word-clock	48K
30 NTSC	Off	On	Off	Off	Off	Off		®	〈	Word-clock	48K
30 drop	Off	On	On	Off	Off	Off		®	〈	Word-clock	48K

Chris Price (the designer) from Ambient Recording, Munich, Germany Tel: +49 89 6518535 has reviewed this table personally and you can be assured there are no errors. 03/22/02

Switch Settings For 202C NTSC and PAL -- Video Use

Timecode FPS output	DIPSWITCHES							Modeswitch			Sync. Standard output
	1	2	3	4	5	6	7	A lower	B upper		
23.98	On	Off	On	On	Off	Off		〈	〈	Comp. Video	NTSC
24	On	Off	Off	On	Off	Off		〈	〈	Comp. Video	NTSC
25 PAL	Off	Off	Off	Off	Off	Off		〈	〈	Comp. Video	PAL
29.97 ND	On	On	Off	On	Off	Off		〈	〈	Comp. Video	NTSC
29.97 drop	On	On	On	On	Off	Off		〈	〈	Comp. Video	NTSC
30	Off	On	Off	On	Off	Off		〈	〈	Comp. Video	NTSC B/W
30 drop	Off	On	On	On	Off	Off		〈	〈	Comp. Video	NTSC B/W

® = Mode switch to right
〈 = Mode switch to left
The newer 202C can be updated to 202T by the factory.

The above was written by Wolf Seeberg wolfvid@attbi.com and fact checked by Chris Price from Ambient. Please note Wolf Seeberg's 2 publications: