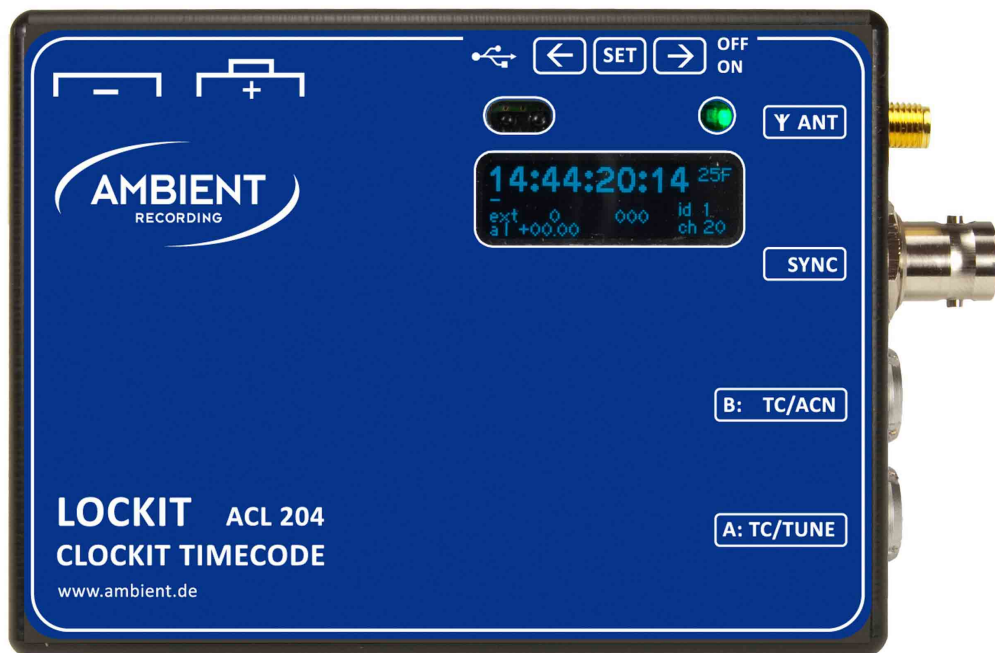




# Lockit Timecode Lockit

ACL 204



Rev. 5.0

experience quality.

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## 1. Introduction

The Ambient ACL204 Lockit box continues the line of our highly accurate portable synchronizers, which have become an indispensable tool in modern workflows where multi camera shoots and dual system sound is the rule.

Like its predecessors, it provides timecode with a deviation of less than +/- 0.1 ppm of a given reference and a sync signal locked to this. The Lockit timecode products can be calibrated to this reference in the field using the Clockit Controller ACC501, providing the same accuracy still after years, compensating the usual aging of the crystals, and opening possibilities which are unique to the Lockit approach.

What counts on a set is that all recording devices run on the same speed, and with the Lockit method of being able to tune the devices, this goal can be achieved.

The reference for tuning may be a GPS signal, but just as well the timecode of the master recorder or camera or a video reference signal generated by the studio / OB-truck's synchronizer.

In addition to those classical features of the Lockit product range, the ACL204 features a wireless network module and a serial data port, so the status of each unit on set can be monitored and metadata of the connected devices can be communicated to the Ambient Lockit Network ACN Master. ACN also permits to sync the ACL204 remotely and write back metadata to the recorders.

## 2. Package Contents

- ACL204 synchronizer
- ACL-T204, protective leather pouch
- LTC-OUT cable, Lemo JGG.305 to BNC right angle connector
- BNC cable, BNC to BNC right angle connector
- Manual

### 3. Powering

The ACL204 can be powered:

- 2 Mignon type (size AA) Alkaline, Li-Ion, or NiMH rechargeable cells. This will be indicated by a battery icon in the upper right corner of the OLED that also serves as a battery status monitor. Set correct battery type in Sys/Config menu for reliable low voltage warning.

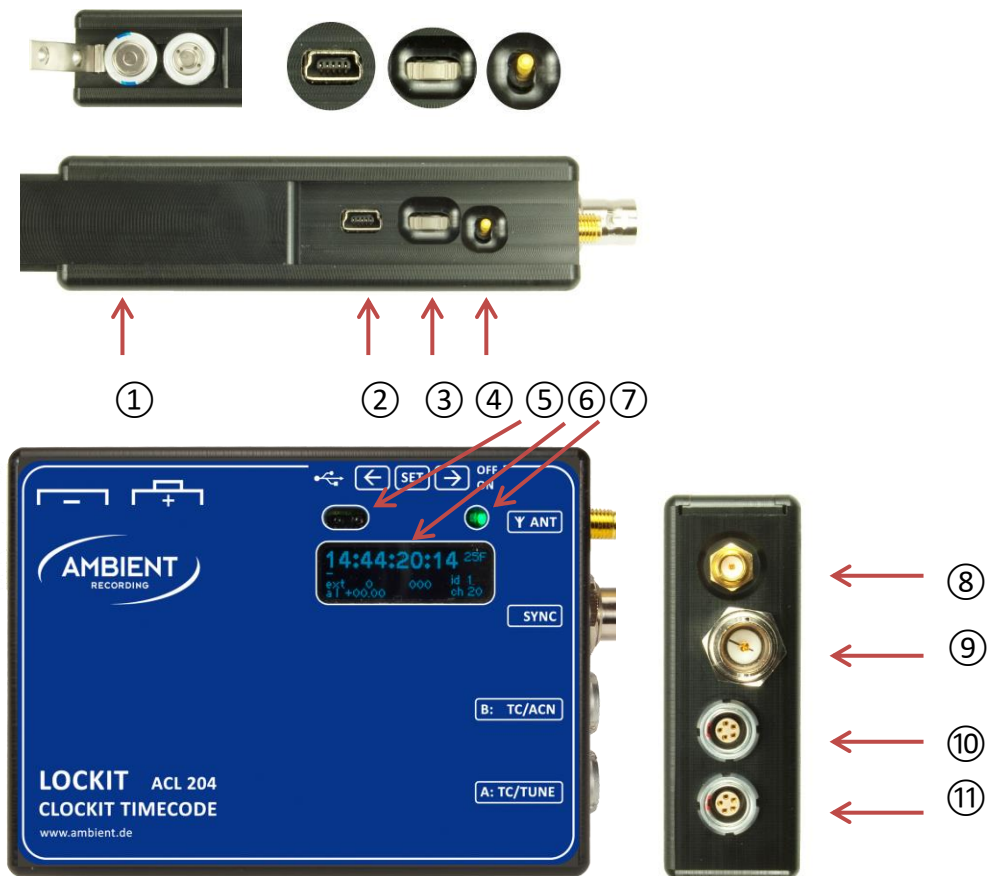
*Important: Batteries loaded under spring pressure! To avoid risk of injury through batteries being rapidly ejected keep contact hinge firmly pressed when opening slider and softly release. Obey correct polarity as shown on label. Push down battery hinge and close slider.*

- 6 to 18 Volts DC via pin 4 of "A: TC/Tune" Lemo socket.
- 5 Volts DC via USB (under the slider near to power and configuration switch).

Applying powering from either Lemo or USB will bypass the power switch and turn on the unit. The OLED screen will override the battery symbol with "EXT" to indicate external power.

You may leave the batteries in the unit in this condition to seamlessly switch over and keep the generator running on power loss. External power has always priority over battery, so unit will automatically switch over to external and no battery will be drained. However, there is no charging function for rechargeable batteries when powered from external.

## 4. Unit Description

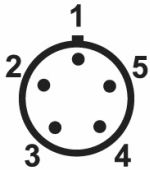


- ① Battery compartment slider to be pushed left/right for access to switches or batteries
- ② USB socket type Mini-B 5-pin
- ③ Configuration switch (further "config switch", ↓ for pushing in, ↔ for toggle left/right)
- ④ Power switch
- ⑤ IR transceiver, used to set and check the ACL204 from the ACC501 controller
- ⑥ Display
- ⑦ Signal LEDs
- ⑧ External antenna connector
- ⑨ Sync signal connector
- ⑩ Lemo 5-pin socket "B": "Blue" socket, timecode and metadata port.  
Connect blue coded cables here.
- ⑪ Lemo 5-pin socket "A": "Red" socket, timecode, ext. DC in and Tune.  
Connect cables with ext. power supply here.

## 5. Connectors

Lemo connectors: series 0B 5-pin (matching connector FGG/JGG.0B.305.CLADxx)

“A: TC/Tune”



“Red” socket, connect cables with ext. power supply only here  
Timecode, ext. DC and tune port.

pin 1: GND

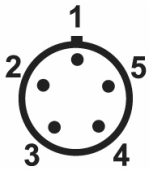
pin 2: LTC IN

pin 3: ASCII IN / OUT

pin 4: Tune reference 1.92 MHz out / DC-IN 5 to 18 Volts

pin 5: LTC OUT

“B: TC/ACN”



“Blue” socket, connect blue coded cables here.

Timecode and metadata port.

pin 1: GND

pin 2: LTC IN

pin 3: ACN / RS232 TX

pin 4: ACN / RS232 RX

pin 5: LTC OUT / 3.3 Volts DC OUT

“SYNC”:

BNC coax 75 Ohms / 37.5 Ohms selectable, Sync out genlock, word clock or AES black audio sync out

“ANT”:

SMA-F, unpopulated, for optional external antenna, use only genuine manufacturer equipment parts ANT-2.4-SMA-M(90).

“USB”:

Mini USB type “B”

## 6. Menu Description

The graphical interface of the Lockit Menu combines ease of use with maximum flexibility for experienced users and mostly consistent through all devices. Consecutive, interactive menus ease fail safe configuration, guiding the user step by step through initial configuration.

Each menu pane with submenus features a “Home” symbol which will be preselected, allowing the user to quickly move up one level when pressing the wheel erratically or just checking the settings.

Complexity of adjustments is defined by a 2 step menu depth which can be set from the System setting Menu. Additionally you can “Lock” the graphical interface here after setup has been completed. To unlock, follow the prompt and hold the configuration wheel left for 3 sec until an according message appears.

*Note: Due to the power logic on ACN-TL, ACN-LS, and ACN-ML, this message will also pop up when shutting down these units with the required long press to the configuration wheel. It is however not necessary to unlock the menu to power down. Just keep the button pressed for 3 seconds and the unit will shut down as desired.*

**“Standard”** view will show the settings that have proven practical for the majority of productions, so we highly recommend leaving it sitting here unless you run in apparent limitations to your required configuration. In the above example of ACL204, when selecting and confirming a video sync format the only applicable TC frame rate will automatically be applied. When starting with TC frame rate and then moving to Sync and choose Video the first matching project rate will be suggested for each video format. However, as video is on a higher priority, changes applied here will result in TC FPS being accordingly adjusted again.

*Note: Only exception are “NTSC area” video rates of 29.97 and 59.94 which will give you the option between 29.97 (non drop) and 29.97DF (drop frame).*

*Important: When using 29DF make sure the whole set does. NEVER run a setup with units mixed on non drop and drop! 29DF will neither sync with 29.97, 30, or any other non drop rate.*

**“Extended”** will disclose all available options and allow for the most complex configurations to suffice even the most avid TC and Sync Supervisor.

E.g. this mode will unlock more uncommon sync and TC formats such as of PAL and NTSC SD, 720P at 30 or 60 fps, variable word clock and black audio, PPF, sync output for 3D rigs, and applying an Offset to the TC output for compensation of frame processing delay. Clearly, these are options not required for most applications and there will be hardly reason to unleash this level.

*Note: Settings are persistent through a level change which allows you to start off with guided default depth and tweak in “Extended” if required.*

The menu description below will use these conventions:

Underlined: marks a (sub) menu, pressing the navigation wheel will open the next lower level, which may contain submenus or parameters.



*"Quoted Italic"*: marks a parameter setting. This is the lowest level of a menu. Depending on the available options these will be listed visible or can be scrolled (separated by "/" in the explanation below). Active values will be highlighted. To change use the navigation wheel to select and press to apply, to keep current settings just press. Both will automatically jump up one menu level with *"Home"* selected. So, intentionally or accidentally, you will always quickly find your way back home.

**Bold**: marks the factory default setting of a parameter, the unit will load these values on performing a Sys/Reset.

(E): Only available when *"Extended"* is selected in Sys/Menu.

Some menus, parameters, or settings will also be exclusive to different devices and marked accordingly

(1) ACL204 Lockit, (2) ACN-TL TinyLockit, (3) ACN-LS LockitSlate, (4) ACN-ML MasterLockit

## Main Menu

↑	Mode	TC	Sync (1, E 2) / Slate (3)	ACN	Sys
---	------	----	---------------------------	-----	-----

Sync menu only available on ACL204 Lockit and ACN-TL TinyLockit (*"Extended"*), Slate Menu only on ACN-LS LockitSlate

To open the Main Menu press the 3-directional configuration wheel in home screen, navigate by toggling left/right. Menus are rotational, so you can go from the first to the last setting by moving left. Pressing the highlighted selection will open its submenu, pressing the arrow up/house symbol will take you back again. When there is no further submenu the current active setting will be highlighted. If you do not want to apply changes just press on the highlighted selection and you will fall back to main menu without alterations.

## Mode Menu

↑	int TC (E)	C-Jam	TRX	ext TC (E1,2,3 )	Reader (3)
---	------------	-------	-----	------------------	------------

Selecting the operation Mode will allow for one step configuration when initializing your Lockits for a new project. Just pick your application and all necessary adjustments will be performed automatically under the hood. Together with the "Full" Jam mode and auto frame rate setting there is hardly anything left to do but choose your sync option on ACL204 if applicable and Jam sync your units via cable or ACN after having put one unit into C-Jam Master mode. Each mode has a dedicated LED blink code of the two colored LEDs above the OLED display, which will also show selected mode and active transmission direction.

**"Int TC":** "Classic" Lockit mode without ACN enhancements. The unit will run on its internal generator with standalone accuracy of .1ppm.

**"C-Jam":** Same as "Int TC" but with ACN features enabled. This is the default and recommended setting when running any combination of ACN ready units. The devices can wirelessly be jammed and TC framerate applied, and metadata transferred to a MasterLockit. Additionally the units will automatically adopt their pace to a "Master" unit for unprecedented zero drift accuracy and divergence down to 10uS.

On powering up, Lockit devices will generally start up with unset generator and thus in idling slave mode with a red flashing LED. Then assign one (and only one) deliberate unit as *"Master"* in its ACN menu and never worry about TC for the rest of the day as long as this Master keeps running. This Master will be identified by a dedicated blink pattern and "M" will show up in the lower right corner of the OLED. The other units will then jam their generators and framerate and follow as *"Slaves"* indicated by "S" and an according blink code. The intelligent C-Jam algorithm will automatically improve the accuracy and establish zero latency, zero drift lock between units within the ACN.

With an active *"Master"* in range *"Slaves"* will automatically re-jam after powering on or a battery swap. As ACN broadcasts only happen every 6 seconds, it may take this long for a freshly booted *"Slave"* to pull in. If *"Slaves"* lose connection to a previously present *"Master"* they will keep their loyalty for 30 seconds and then switch over to "(S)" which means you can assign another unit as *"Master"*.

For more detailed information please refer to the dedicated ACN background chapter.

*Note: Always make sure just one unit is set to "Master".*

**"TRX"** transforms the unit into an ACN based TC radio link with a twist. Without TC source the units will idle slowly blinking red and wait for either physical TC injection or signal via ACN. On detection of an external SMPTE LTC or MIDI TC source the device will automatically transform into transmitter (indicated by "TX" on OLED and according blink code) and send TC status and frame rate to other units (now marked "RX") which will again automatically follow. Source detection is fully automated, including bidirectional MTC/LTC conversion: No TC output with no TC connected or stopped, "standing" TC (repeating frame at frame rate) with standing TC on TX input and running TC with TC source running. This combines the transparent action of a "classic" timecode radio link with the drop-out proof concept of a freewheeling generator and the intelligent, adjustment-free ACN algorithm.

**"Ext TC"**: In this mode the device serves as a bidirectional LTC to MIDI TC convertor. TC will be displayed on LED display of Lockit Slate. Useful in studio environments to sync TC between external equipment and digital audio workstation where ACN is a not required feature.

**"Reader"**: Only available on LockitSlate, this mode allows to visualize external LTC on the slate. No MTC conversion, no output, no ACN, but the slate will follow TC playback in low or high speed and even reversed which makes it the preferred mode for special effect shots.

*Note: As these modes are not suited for proper synchronization selecting a sync output is not available in "TRX", "Ext TC" and "Reader".*

## TC Menu

↑	Set	FPS	Jam	Output	UB
---	-----	-----	-----	--------	----

### Set

Sets the generator timecode. To edit **hh:mm:ss:ff** successively change the blinking value, press to confirm, and proceed. TC generator will start on from selected value after confirmation, so you can exactly trigger a certain TC start. After confirming the edited timecode you can also start a C-Jam Master if desired.

### FPS

FPS: 23.98/24/ <b>25</b> /29.97/29.97 DF/30 (E)
---

Select timecode framerate, toggle and press. When changing an existing setting you will be asked to confirm or discard the new selection. If video sync output is already enabled on ACL204 available values may be limited or even locked depending on menu depth.

*CAUTION! Switching between PAL and NTSC or Non-Drop and Drop rates will restart the generator from zero with the new time base and interrupt the video or audio sync signal, doing this while recording will result in a corrupted file.*

### Jam

Full	Auto	Once	Lock
------	------	------	------

Determines how the generator can be jammed.

**"Full"**: Automatic setting, unit will jam timecode value and frame rate to jamming source except video sync output has been enabled on ACL204, in which case TC frame rate is locked to video and only cross compatible rates are accepted for jam.

In that case the Jam mode will automatically fall back to Auto (see next parameter). Still, jam mode will be kept active, so if you disable video sync "Full" will be hot again. This will effectively prevent misadjust during operation while bringing maximum of ease on initial configuration.

**"Auto"**: Unit will only jam TC value but not frame rate to cross jam compatible frame rates.

**"Once"**: Unit can be jammed once and then lock inputs (cursor moves to **"Off"**). Unlock again by selecting **"Full"** or **"Auto"**.

**"Off"**: defeats jamming of the internal generator from external. Still, you can manually edit timecode as per below.

*Note: The active jam mode will be visualized upper left to the running TC on the main screen by indicating "F", "A", "O" or a lock symbol for "Off".*

## Output

Level (2)	Mute	Offset (E)
-----------	------	------------

This menu configures the TC output signal. If Level is not applicable and Offset hidden while in "Standard" view, entering Output will directly access the Mute submenu as only option.

## Level

Select TC level: 0/-3/--6/-9/-12/-15/-18/-21/-24/-27/-30/-33/-36/-42 dB
---

Only available for ACN-TL TinyLockit

Adjusts TC level on the "TC" socket in -3dB steps from 0 to -36dB plus -42dB. Useful when recording timecode to audio tracks of DSLRs or non-TC capable recorders with mic sensitivity.

## Mute

Mute on Gen Not Set: No/Yes
-----------------------------

Disable the physical output of timecode in case the generator is not set (flashing red every 2 seconds). This can be useful to leave the Lockit connected to your audio recorder with a bidirectional cable and jam it to time of day from the recorder after start up and then seamlessly becoming the timecode source. Also with no TC output most cameras will display a warning in the viewfinder monitor which provides immediate visual troubleshooting.

*Note: No TC is as good or bad as inconsistent TC. While one won't necessarily notice a non-synced TC a non-present TC will give you a clear warning on the targets display for immediate indication of an incomplete/incorrect configuration.*

## Offset

Offset: +/-00.00
------------------

Extended Setting

Shifts the TC output up to +/- 10 frames in .05 increments on physical outputs and also LED display on ACN-LS LockitSlate against the generator. This allows for compensation of frame processing delay on cameras and TC offset to 3<sup>rd</sup> party equipment (e.g. delayed TC out from audio track on playback).

## UB

↑	Show (t)	Jam	Edit
---	----------	-----	------

## *Show*

Toggles userbits to be displayed in main screen, will reduce the font size of TC.

Jam**On****Off**

**"On"**: Userbits will be jammed on change. This will happen on TC Jam but also on every change without the TC generator being interrupted. When C-Jam is enabled this can be used to increment scene/take on the fly via ACN.

*Note: Update will occur with up to 6 seconds delay on the next C-Jam broadcast.*

**"off"** Userbits will be locked. Use this mode to apply a fixed ID through userbits.

Edit

Allows manual changes to userbits on the fly, enter 8 UB digits with hex-code values 0-F. On changing existing UB value a prompt will pop up to confirm or discard the new value. This will override the current value but not change jam mode itself. So, for static ID set Jam to "Off"

## Sync Menu

↑	Video (1)	Audio (1)	PPF (E 1, 2)	Off
---	-----------	-----------	--------------	-----

Sync Menu and output only available on ACL204 and ACN-TL (Extended mode).

### Video

480i(E)/576i(E)/720P(E)/1080i/Psf/P	23/24/25/29/30 (E)/50/59/60(E)	Single/Dual/3D(E)
-------------------------------------	--------------------------------	-------------------

Available only on ACL 204. Selectable frame rates depend on selected video format. (E) only in Extended mode

Consecutive, interactive menu: "Genlock" video sync output on BNC. Select video line count first and then choose from matching framerates. In Extended mode you will then be able to select single or dual camera load (required for 3D rigs).

After setting video sync, the matching TC frame rate will automatically be applied and possibly override previous TC frame rate selections. On 29.97 Or 59.94 video rates you will have the selection between 29 non drop and drop TC.

*Note: Genlock and TC output are hard locked against each other. If TC FPS has been set before entering the sync options, the first matching video frame rate will be preselected. However, there are multiple video formats applicable for each TC framerate but just one native TC frame rate to each video format. So, if you need genlock out, it is advised to simply select the correct format.*

### Audio

Wordclock/Black Audio (E)	31968 (E)/.../48000/.../192192 (E)
---------------------------	------------------------------------

Only available on ACL204

In Standard mode the only available option 48.000KHz wordclock will be preselected for confirmation.

In Extended choose between **"Wordclock"** (50% duty cycle clock at SR) or **"Black Audio"** (AES3 carrier signal with no signal) and then pick sample rate from **32kHz** through **192kHz** incl. pull up/down rates.

### PPF

1/2/4x	High/Low
--------	----------

Only available in Extended mode

**Pulse Per Frame**) is used to steer industrial cameras. Rarely used, hence Extended. Pick between **1, 2**, or **4** pulses per frame with rising (**"High"**) or falling (**"Low"**) slope at frame start.

### Off

If not required, disable sync output to reduce current draw and unleash all TC frame rates.

## Slate Menu

This menu is exclusive to the ACN-LS LockitSlate

↑	Display	LEDs	Sensor
---	---------	------	--------

### Display

Userbits: 0*...20s →	Clapped TC: 0... <b>10s</b> ...20s →	Running TC: 0*...20s/inf
----------------------	--------------------------------------	--------------------------

Defines the slate displaying on clap. Successively apply 0 to 20 seconds for *Userbits*, *Clapped TC* and *Running generator TC*. Selecting a time will automatically move on to the next parameter and the selected value will display in the line above, led by the parameter indicator ("**UB**", "**CT**", "**TC**").

### LEDs

Flash LED: <b>Clap</b> /Clap+Seconds/Off
--

Configures the flash LEDs on front.

**"Clap"** will light up the 2 bright LEDs only when the slate is operated, allowing for clear identification of the slated frame.

**"Clap+Seconds"** also flashes LEDs on every second transition.

**"Off"** defeats the flash LEDs.

### Sensor

↑	Tilt	Brightness
---	------	------------

Adjusts **Tilt** and **Brightness** sensors

**Tilt "On/Off"** enabling will revert the 7 digit display when the slate is operated upside down for special markers like end slate e.g.

**Brightness**, choose between *"Man"*, *"Low"*, *"Medium"* and *"High"*.

**"Manual"** lets you adjust the display brightness in 9 steps during operation by flicking the 3-function wheel. Looking from the back, flicking left will de- and moving right increase brightness.

**"Low"** enables the environment light sensor with a dim setting usefull for late night shoots. Still, when light falls on the slate it will increase brightness for better reading and dim down to not interfere with the shoot.

**"Med"** is automatic dimming with maximum medium brightness.

**"High"** is applicable for outdoor shoots in bright light but still with a concern about battery life.



## ACN Menu

↑	Slave	Jam	Master	Ant
---	-------	-----	--------	-----

Only visible in ACN enabled modes "C-Jam" and "TRX". "Slave", "Jam", and "Master" options are only available in C-Jam mode

**"Slave"**: receive mode. This is the default and on power cycling it will fall back to this. If the unit once had been jammed from a "Master" and initiated the dynamic C-Jam tune this will be indicated by "S" on the main screen lower right. If that master is lost but C-Jam tune is still in operation "S" will alter to "(S)". Keep this mode for all units but the dedicated C-Jam master.

**"Jam"** fires off a One-Time-Jam burst, used best when only setting the free running TC generator is required. Quite similar to the classic jam using a cable, you will need to re-jam units after battery change or power cycle. As this is a singular operation the unit will fall back to the "Slave" mode in idle.

**"Master"**: The unit will resend timecode pulses every couple of seconds. "Slaves" will automatically rejam their generator if not set and dynamically adjust their clock reference to best match the speed of the "Master". Thus, an accuracy window of 10us is achieved, reflecting synchronicity on video line level. After replacing the batteries on either slave it will automatically jam to the set TC.

*Note: Sending out single or continuous jams requires the generator to be set. If not done so already you will be prompted to either accept the current TC (additionally to edit to preference for Master) before sending out the jam. Also, as just one unit is allowed as Master within ACN, enabling will be blocked with an according message if the unit receives broadcasts from another Master. Master is exclusive to C-Jam mode, selecting any other mode will immediately stop C-Jam broadcasts.*

## Ant

Select C-Jam ACN/TRX channel: <b>18/11</b>	LNA: <b>Off/On</b>	Ant: <b>Int/Ext</b> →	Power : <b>8 dBm</b>
→	→	(E1, E2)	(E , PIN protected)

This menu is also available under [Sys/Config](#).

Sequentially adjust the ACN RF settings. First, select the ACN channels for the current active mode. Frequencies refer to channels 11 through 26 of the IEEE 802.15.4 LR-WPAN standard (see Appendix for details). "C-Jam" and "TRX" can have different preference channels assigned and the selection will be persistent for each mode until a factory reset.

Afterwards enable the Low Noise Amplifier if required. This will improve the reception with a slight impact on battery life.

In "Extended" menu view on ACL204 and ACN-TL you can persistently select between internal and external antenna and lastly increase the radiated power. Since this may not be legal depending on your local regulations the last setting is PIN protected. Please consult your dealer if in doubt.

*Note: Fitting an external antenna will give you the most noticeable range boost of all tweaks and comes at no cost of battery life. If you plan on using the ACN intensively, retrofitting an external SMA antenna to Lockit and TinyLockit is highly recommended. LockitSlate and MasterLockit come with external antenna and do not offer the option of an internal antenna.*

## SYS Menu

↑	Menu	Config	Reset	Info
---	------	--------	-------	------

### Menu

Lock/ <b>Standard</b> /Extended
---------------------------------

Defines the level depth and sophistication of available options.

**“Lock”** prevents unwanted alterations to the settings. It is recommended to lock the unit after configuration. To unlock you will be prompted to hold the configuration wheel left for 3 seconds after which a unlock message will appear.

*Note: Due to the power logic on ACN-TL, ACN-LS, and ACN-ML, this message will also pop up when shutting down these units with the required long press to the configuration wheel. It is however not necessary to unlock the menu to power down. Just keep the button pressed for 3 seconds and the unit will shut down as desired.*

**“Standard”** will only show valid settings that have proven practical for the majority of productions, so we highly recommend leaving it sitting here unless you run in apparent limitations to your required configuration.

**“Extended”** gives you all available configuration options. This mode will unlock sync output for **3D** rigs, more uncommon video and TC rates of **30** and **60** fps, **PAL** and **NTSC SD** sync. Additional options include enhanced **Audio** and **PPF** sync options, apply an **Offset** to the TC output for compensation of frame processing delay.

### Config

Display	Ant	USB (1, 3) / LemoACN (2)	Bat (1, 2, 3)	IR (E)
---------	-----	--------------------------	---------------	--------

### Display

Brightness: 1... <b>3</b> ...10 →	AutoOff: 5sec... <b>30sec</b> ... never
-----------------------------------	---

Consecutively adjusts the OLED in brightness and timeout.

## Ant

Select C-Jam ACN channel: <b>18</b>	Select TRX ACN channel: <b>11</b>	LNA: <b>Off/On</b>	Ant: <b>Int/Ext</b>	Power
→	→	→	(E1, E2)→	(E , PIN protected)

The consecutive antenna sub menu is restricted to Extended menu and offers sequential tweaks to the ACN radio.

**“LNA: Off/On”** enables/defeats the Low Noise Amplifier. This may improve receiving range on the sacrifice of battery life time, default is **“Off”**.

**“Select ACN Antenna: Int/Ext”** this option switches between built-in and the optional available SMA antenna for increased range (available on Tiny Lockit and Lockit ACL204 in Extended menu only, ACN-LS and Master Lockit do not have internal antenna).

*Note: To accommodate for retrofitting of external antenna this choice will be permanently stored and be maintained through a factory default restore. Only enable with genuine manufacturer part firmly attached to unit.*

**“Select ACN tx power: 8dBm”** restricted to Extended mode and additionally PIN protected. As per default the ACN is set to the globally maximum allowed ERP level for LR-WPAN of +8dBm. Consult your supplier only if your application legitimizes higher settings up to 18dBm. Increasing output power will strongly affect battery life time, so even if applicable use with good consideration.

## USB / LemoACN

MTC	COM
-----	-----

Not available on ACN-ML Master Lockit

Sets the data port mode this is a dedicated USB port on ACL204 and ACN-LS (hence labelled “USB”) and available on pins 3 & 4 on the Lemo “ACN” connector on ACN-TL, see pin out appendix for reference. ACN-ML Master Lockit has no USB option for ACN and does not show this menu.

**“MTC”** puts USB into MIDI mode. Connected to a computer the device will be mounted as a standard USB audio/MIDI device and recognized by supporting software. No drivers or configuration required on both, PC or MAC.

**“COM”** sets the data port to USB serial. This is usually only necessary for updating.

*Note: Although the setting is mode dependent and default to “COM” on “C-Jam” and “int TC” for easy firmware update, you can enable “MTC” in this mode to make the device a MIDI TC generator. If you only want to convert LTC to MTC and vice versa, simply select “TRX” or “Ext TC” as mode without alterations here.*

Bat

Li	Alk	NiMH
----	-----	------

Not available on ACN-ML MasterLockit

This menu lets you tweak the battery telemetry read out to the cell type in use. Pick from Lithium, Alkaline primary cells, and NiMH rechargeables. Readout follows typical discharge curve and accuracy may vary over different manufacturers and battery types, so take with grain of salt.

IR

Off	On
-----	----

Enables the infrared port above the OLED. Only useful in combination with ACC501 controller. However, leaving the IR port open increases interference sensitivity and compromise reliability of the unit in normal operation, so it is off by default and can only be enabled through "Extended" mode.

Reset

Factory Defaults: Yes	No*
-----------------------	-----

Resets the devices to factory defaults as marked bold in this description

Info

DEV info	Debug1	Debug2	Screen test
----------	--------	--------	-------------

First screen will show critical device information for serial number, firmware and FPGA software revision, and MAC address, followed by 3 debug screens for developer use only.

## 7. LED Blink Codes

### Code Legend

- flash (generator sync)
- double flash (low batt warning every 2 seconds)
- • double blink (active ACN transmission)
- blink (generator free lock)
- long blink (ACN reception)

Red: Generator Not Set, no ext TC present

Green: Generator Set, running ext/ACN TC detected

Red & green simultaneously: standing ext/ACN TC detected

Mode/Seconds	1	2
--------------	---	---

IntTC/C-Jam		
Gen Not Set Mute		•
Gen Not Set Mute, lo Bat		••
Generator Not Set	•	•
Generator Not Set, loBat		••
Generator Set	•	•
Generator Set, loBat		••

Additionally active C-Jam shows the following codes every 6 sec:

C-Jam Master	••
C-Jam Slave, Master present	•--•
C-Jam Slave, Master lost	•--•

TRX		
no TC	••	••
no TC, loBat	••	••
TX (ext. LTC/MTC detected)		
TC running	••	•
TC running, lo Bat	••	••
TC standing	•• ••	• •
TC standing, loBat	•• ••	•• ••
RX (TC over ACN detected)		
TC running	••	•
TC running, loBat	••	••
TC standing	•• ••	• •
TC standing, loBat	•• ••	•• ••

Reader (Ext TC)		
no TC	••	••
no TC, loBat	••	••
TC running	•-----	-----•
TC running, loBat	•-----	-----••••
TC standing (Ext TC)	•----- ••	-----• ••
TC standing Lo Bat (Ext TC)	•----- ••	-----•••• ••

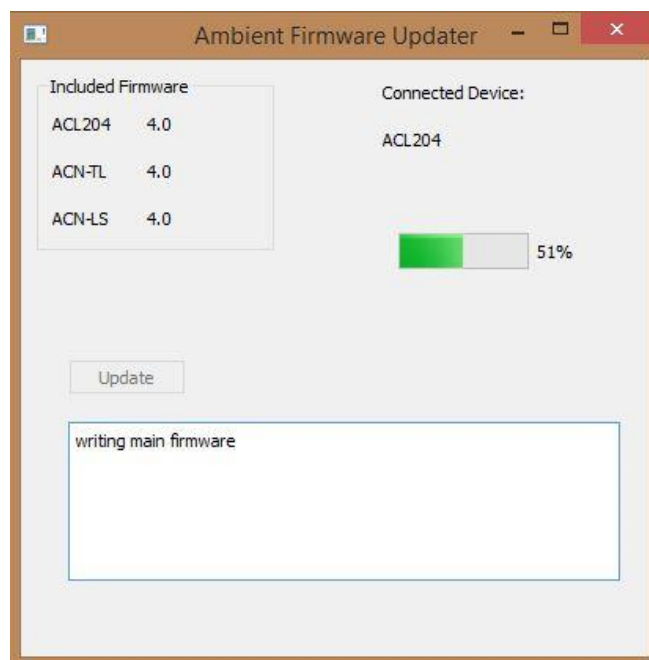
## 8. Firmware Update

To Update your Lockit devices ACL 204, ACN-TL, and ACN-LS download the Lockit Firmware Updater from

<http://ambient.de/en/downloads/>

Unzip or install the version suited for your platform, PC or MAC. Power on your Lockit, go to Sys/Config/USB or LemoACN menu and select "COM" mode. Connect Lockit or slate via mini USB cable, Tiny Lockit requires ACN-USB cable. Start the tool and watch the connected unit is listed correctly on the upper right corner. Below you will see the available firmware options.

On clicking "Update" the unit will upload and restart the unit with red and green LEDs flashing alternating while the progress bar fills up until it reaches 100% after which the unit will reboot with new firmware and a success message will appear in the status window. This completes the Firmware update and you can disconnect your unit. Possible major changes under the hood always require a factory restore after updating the firmware.



## 9. Application Notes

### Basics of TC, Sync, ACN and their use cases

Please also watch our video tutorials online: [www.ambient.de/en/university](http://www.ambient.de/en/university)

and join the Lockit Timecode User Group: <https://www.facebook.com/groups/lockitusersgroup/>

### Timecode & Sync

One of the most common misconceptions is that timecode *is* sync and this is simply not true. It is just one of 2 but both still essential components of synchronization.

“Synchronous” means same time. Now, while timecode is a required information to *jam sync* several units together and hence *make* them synchronous, it will not take care to *keep* them synchronous over a longer time as it will not synchronize the internal clocks. This is usually done via a blank SD or HD video signal, commonly referenced to as genlock. This is why (except for the ARRI Alexa) cameras do have dedicated inputs for timecode *and* sync and to achieve proper sync setup one should connect both signals. The ACL 204 Lockit provides both and contrary to other existing solutions timecode and sync are always hard locked against each other making it an integral part of the camera.

### Choosing the correct video sync format and TC frame rate

Camera market is moving fast and the latest technology of today may be obsolete by tomorrow. Also, manufacturers frequently update the firmware on their products, so it is nearly impossible to give a comprehensive and bullet prove advice which setting is 100% correct for a specific production.

**As a rule of thumb, it's always useful to refer to the project frame base.** Terms like system rate may also apply. This is not only the frame rate the camera is internally working at but also post production and editing will be performed at. It is important that this project rate should not be confused with the sensor speed/frame rate. Also, e.g. in case of Panasonic, the camera may run at 29.97 system frame rate but still record 23.976 – again, it is the system rate that matters and video sync and TC should be set accordingly.

**TC should always follow the video frame rate.** There are very few cases that you really would need to cross sync a video to a differing TC rate (e.g. apply 30 or 25 fps TC to 24fps video sync).

What lead to some confusion is the fact, that there are no TC framerates higher than 30 fps. This lies in the specification by the SMPTE. As a result when shooting with “double rates” such as 1080i or P at 48, 50 or 59.94 the correct timecode frame rate will be the according single rate of 24, 25, or 29.97(DF).

To simplify the complex setup the Lockit will preselect the first logical corresponding setting when making adjustments to either TC or video sync. As one particular video format has exactly one matching timecode frame rate, but a TC rate may work with multiple video formats it is recommended to first set the video sync. The correct TC value will automatically be enabled and presented for confirmation. The only choice you will have in Standard mode is to pick from Non Drop vs. Drop (DF) when shooting with a TC rate of 29.97.

*Note: Do NEVER mix and match DROP with NON DROP or NTSC area with PAL area rates!*

To even further ease the setup process we have condensed the following guideline for the most common camera types. Again, this list does not result in claim or liability to be complete or generality, so if in doubt, please always refer to the specific camera's manual. If you find inconsistencies or can provide additional information, we would welcome your input to further improve this list.

**ARRI Alexa:** being the one and only camera on the market that can actually sync its internal clock to TC, it doesn't have or require options for external sync. To *sync* it, set TC to "external regenerate", attach TC with project frame rate and leave it permanently attached.

**ARRI Amira:** use project video format.

**Canon:** the manuals for EOS cinematic cameras are unfortunately quite sparse about external sync, but "*When a reference sync signal (analog blackburst or tri-level signal) is input through the GENLOCK terminal, the phases of the camera's V and H sync will automatically be synchronized to it.*" hint that using the exact project settings should work. Also, it seems 1080p sync is accepted for shooting in 720p. XF legacy cameras or mode will require 59.97i/60i when shooting at 23.98/24.

**Panasonic:** 1080i @ double or single project (system) frame base for 1080P & PsF, follow project (system) format for 720P or SD.

**RED One:** set the sync format according to the project frame rate

**RED DSMC:** always 1080P @ project frame base (23.976/24 on HFR rates), set HDSDI out to auto except when shooting 47.5/48 HFR select 23.976/24.

**Sony:** 1080i or PsF @ project frame base, as 1080i double completely corresponds to 1080PsF single rates you may stick with either (e.g. 1080i 50 for 25 or 50fps, 1080i 29.97 for 29.97 and 59.94 fps).

*Note: Sony won't operate at 24 but 23.98, so always use 1080i 47.95 on cinematic productions.*

**Panasonic:** 1080i or PsF @ project (system) frame base for 1080P & PsF, follow video format for 720P or SD.

## ACN

ACN is a proprietary wireless protocol, specifically engineered for highest reliability, data integrity, and range. It operates on 2.4GHz using channels 11-26 of the IEEE 802.15.4 LR-WPAN standard.

Aside time code and sync, ACN is the key feature of the current Ambient Lockit range. Building up on the unrivalled tunable oscillator it can be used to enhance the accuracy from better than frame accurate down to video line level grade.

All that is needed is an arbitrary number of Lockit devices set to C-Jam mode and one of them configured to be the C-Jam master. The C-Jam master will then send out broadcast pulses which the slaves will respond to and in case they detect a discrepancy automatically correct their pace. This will, however, in no way sacrifice the unparalleled, self-contained accuracy. In case the radio cuts out, all units will continue to operate as used to.

*Note: Only ONE C-Jam master is allowed! Make sure no other unit is set to send sync broadcasts.*

Also the ACN can be used to set up a metadata network on the set to collect, con- and distribute metadata between different units and departments. At the core will be one Master Lockit which is acting as server and can be used to monitor and control all other ACN enabled devices remotely via a web interface that is accessible from any modern unit with internet browser.

A second mode, TRX, will allow the units to operate as an enhanced TC radio link. Again, this is not your ordinary timecode over wireless but instead the transmitter will jam a free running generator in the receiver(s) to incoming TC with auto frame setting and then send information whether the source is running, stopping with standing TC or has stopped altogether. The receiving unit will then duplicate the



TC source's status as it would directly be connected without danger of drop outs compromising the desired functionality.

On top, this not only works with "classic" SMPTE TC but also MIDI timecode (MTC) with the Lockit device connected to MAC or PC via USB acting as a USB MIDI interface.

As all current products including the Lockit Slate come equipped with ACN transceiver any device can serve as transmitter or receiver. This dramatically cuts down costs for additional equipment at a maximum of flexibility.

## 10. Physical Specifications

Dimensions: (L / W / H): 91 x 64.5 x 33 mm  
(overall length with WiFi and SMA antenna detached: 102.5mm)

Weight: 275g

## 11. ACN Radio

Specification including channel assignment follows IEEE 802.15.4 LR-WPAN Standard on 2.4GHz band. Equivalent ARRI remote focus equivalents listed to help avoiding interferences.

ACN		ARRI EMIP WRS
Channel	Center Frequency [MHz]	Channel
11	2405	
12	2410	0
13	2415	1
14	2420	
15	2425	
16	2430	2
17	2435	3
18	2440	
19	2445	
20	2450	4
21	2455	5
22	2460	
23	2465	
24	2470	6
25	2475	7
26	2480	

Antenna socket SMA-F, leave supplied antenna attached. In case of lost only substitute with original genuine manufacturer replacements parts ANT-2.4-SMA-M (straight) and ANT-2.4-SMA-M90 (angled).

## 12. Accessories, Cables, and Spares

### ACM-204

Ambient Lockit Mount is a quick release mount with a fixable 3/8" male thread.



### ACM-TL

Quick release mount with a fixable 3/8" male thread for older Lockits and/or other Ambient Lockit units.



### ACM-FS

Adapter 3/8" to cold shoe



### TC-SYNC/EPIC

Lockit TC & Sync output split cable, for RED Epic/Scarlet  
Lemo 0B 5-pin/BNC 90° to Lemo 00 4-pin, 40 cm



### RCP-I/O

Meta data interface cable for RED cameras 5-pin Lemo  
to 4-pin Lemo, 40 cm



### LEP

External Lockit power cable 4-pin Hirose plug to 5-pin Lemo, 50 cm



### LEP/ALEXA

Lockit extern power cable for Alexa 12 V output 2-pin Lemo plug to 5-pin Lemo, 50 cm



### LEP/PC

Lockit extern power cable D-Tap to 5-pin Lemo, 50 cm



### ACL-T

Pouch for Ambient Lockits, old designs (ACL202 & ACL203). Pleather with polythene foil window



experience quality.

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