ACN-ML/ACN-MLP

experience quality**.**

Rev. 6.10

Table of Contents

1.   Introduction

The ACN-ML MasterLockit combines the state of the art, high-accuracy Lockit timecode technology by Ambient with advanced metadata administration and sharing over the Lockit Network.

It implements a dual-system design through a full-featured ACN Lockit circuitry with adapted software for no-compromise, fail-safe timecode integrity and a powerful multi-core CPU platform for unsurpassed mobile metadata processing. Providing local and set-spanning, line-level accurate timecode and metadata over ACN plus WiFi routing for Lockit Network apps and certified devices it can work both autonomously as hub or satellite in your timecode and metadata network.

An integrated backup cell with automatic charge-when-supplied will keep both systems alive for even lengthy set reconstructions or breaks and secure a coordinate shutdown on power drain.

2.   Package Contents

- ACN-ML MasterLockit
- ACN Antenna (attached to ACN-ML)
- USB WiFi Stick (attached to ACN-ML)
- Manual

3.   Powering

> **ATTENTION! NEVER POWER DIRECTLY THROUGH UNSWITCHED D-TAP ON CAMERA BATTERIES!**
>
> **Some power plates and/or cameras switch off power to camera by interrupting ground which will route supply current through the ML with irreversible damage to the unit and accessories connected.**

The ACN-ML(P) can be powered by 6 to 24 Volts DC via a Hirose 4-pin connector, pin 1 carrying GND pin 4 positive voltage. Supply ratings and typical values in operation:

6V DC min. rating 2A, typ. 500mA - 850mA

12V DC min rating 1A typ. 250mA - 400mA

24V DC min rating .5A, typ. 150mA - 200mA

On he ACN-ML a second, loop-through connector ios avcailable for powering other equipment, like your sound recorder. The power source must be capable of supplying combined min. rating for both units.

> *Note: The two Hirose sockets are wired in parallel. It is mandatory that supply voltage is supplied to only one socket at any given time!*

With power applied, red LED over the display will slowly blink to indicate charging of the integrated backup cell. Fully charged, red and green LED will be lit permanently.

While in operation, LEDs signal the timecode staus and power staus is available on the OLED screen. **EXT** with alternating battery symbol means external power is applied and the internal backup cell charging, whereas **INT** indicates that the unit is running on backup. The internal battery is not intended for operation but only for short interruptions of will keep the unit only powered for 2 hours max.

4. Unit Description
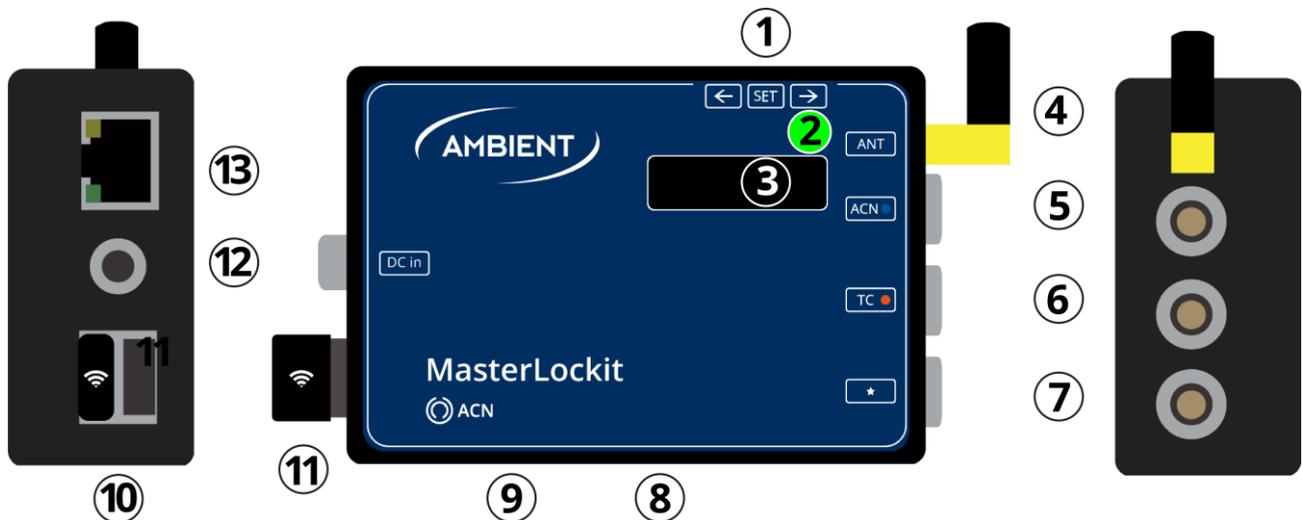
①   Configuration wheel (↓ push, ↔ toggle left/right)

②   Status LEDs (see page 26)

③   OLED display (see page 14 ff)

④   ACN antenna (do not remove, only substitute with original replacement)

⑤   ACN A, blue socket (see page 5)

⑥   TC, red socket (see page 5)

⑦   MasterLockit*Plus*: ACN B, grey socket with DC through (see page 5)

⑦   MasterLockit: DC through port (see page 6)

⑧   1/4"/ 3/8" thread mount

⑨   Reset button (see page 13)

⑩   WiFi adapter, only substitute with original replacement

⑪   USB A ports (see page 6)

⑫   DC IN (see page 6)

⑬   RJ45 Ethernet port (see page 6)

5. Connectors

⑥

TC ●

1
2   5
3   4

"Red" socket,

SMPTE 12M Timecode in/out

Lemo series FGG/JGG.0B.305 or compatible

pin 1:   GND

pin 2:   TC in

pin 3:   ACC com

pin 4:   Reference out, ext DC In 6-18V on ACL204, ACN-TL and ACN-LS

pin 5:   TC out (SMPTE 12M)

⑤

ACN ●

1
2   5
3   4
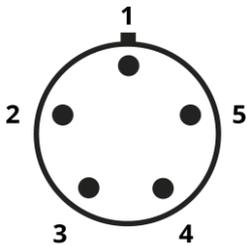
"Blue" socket, connect blue coded cables here

SMPTE 12M Timecode in/out

Metadataport for RED cameras and Sound Devices 788T and 6series

Lemo series FGG/JGG.0B.305 or compatible

pin 1:   GND

pin 2:   TC IN

pin 3:   ACN A TX (RS232)

pin 4:   ACN A RX (RS232)

pin 5:   TC OUT (SMPTE 12M, 3Vpp)

⑦

ACN ●

1
2   5
3   4
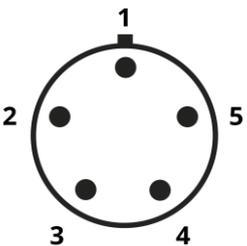
"Grey" socket, connect grey coded cables here.

SMPTE 12M Timecode out

Metadataport for ZEISS CP.3 XD

Lemo series FGA/JGA.0B.305 or compatible

only available on MasterLockit*Plus*,

pin 1:   GND

pin 2:   ext. DC through

pin 3:   ACN B TX (RS232)

pin 4:   ACN B RX (RS232)

pin 5:   TC OUT

④

ANT
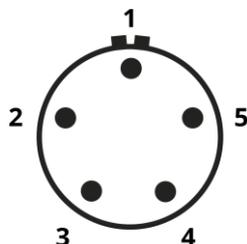
SMA type F, leave supplied antenna attached, only substitute with original replacements ANT-2.4-SMA-M(90)

⑫

Primary DC port, connect your external power supply here

Hirose HR10-7P-4P or compatible

pin 1: GND

pin 2: NC

pin 3: NC

pin 4: 6 -24V DC

⑦
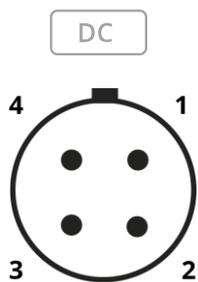
DC through socket, only available on MasterLockit

Hirose HR10-7P-4P or compatible

Use to daischain recorders and accessories

Unfused and in parallel to DC IN

Warning: always apply power through either socket only!

⑪

USB A ports, 1 populated with WiFi Stick, 2nd to download reports and logs to USB sticks

⑬

Ethernet port, RJ45, metadata interface to ARRI ALEXA classic

6.   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

7.   Quick Start Guide

Prepare for a new project

When preparing for a project with multiple MasterLockits it is advised to start with the unit that is planned to become the timecode and metadata Master. As only one device is allowed as Master, units will only allow activation of Master if not receiving C-Jam broadcasts from another device.

1. **Supply adequate power source**. The internal battery is for backup purpose only and not suited for operating the unit over longer time. The red LED should blink slowly in a 2 seconds interval. This indicates charging of the internal backup battery is in progress. If battery is fully charged red and green LED will come on solid.

2. **Switch on the MasterLockit** by pressing down the 3-function wheel and holding it until the OLED display comes on. If unsure about the configuration and you're starting for a new project/production it is advised to perform a system reset first. Using the navigation wheel navigate to Sys/Reset and select "All"

3. **Wait approx. 40 seconds** until the square indicator on the left bottom of the display has turned from outlined to solid blue to indicate the metadata server has completed booting.

4. **Log in to the MasterLockit's WiFi** using a smartphone, tablet or computer. On factory default, this SSID is in the format **ml-rssss** (where "r" indicates the hardware revision and "s" consists of the last 4 digits of the unit's serial number). This can be changed by the user, so your WiFi Name will be different. However, the password for log is always the same as the WiFi name. If you do not see any WiFi it may be the unit has been configured as WiFi client. You can find the configuration under Sys/WiFi

5. **Open a browser and enter http://10.0.0.1** (or http://masterlockit.local) in the address bar.

Tip: you may want to create a favorite for this IP or make this your browser's homescreen.

6. If the unit has been used previously in a project it is recommended to purge the database. Go to the system menu (gear wheel in the upper right corner) and select "System Reset". Note that the WiFi name may now have been changed to default as per 4. Log back in and proceed with 6.

7. First, check the **Timecode screen** and select the **Project Frame Rate (FPS)**. If you need to change from current, unlock by clicking the pencil, select the desired rate from the drop down list and confirm by clicking the orange OK tickbox. Then, you may **Set Timecode** manually or **to Time of Day**.

Note: timecode will reset when switching between integer (A.K.A "PAL") and non-integer (A.K.A. "NTSC") frame rates and Master will be stopped. Hence it is important to select FPS first on a new project.

8. **Select the ACN screen** on the unit to become the timecode masterclock. If your unit is new or has been reset it is configured as ACN slave which will be highlighted blue in the dialogue box "Local MasterLockit" configuration box. Click on **Master**. The unit will change its state, the header will become orange and immediately send out C-Jam broadcasts with current timecode.

9. **Power on your other Lockit devices**. ACN enabled Lockit devices on the same channel will automatically jam to the hub's TC value and framerate and listed in the **ACN Radar** for status monitoring.

Note: default channel is 18. Slaves will try to follow a channel change of their Master. However, if the Master's channel has been changed while Slaves were powered down or out of range you may need to change their channels manually. Slaves will be loyal to their Master even if another ACN set on the same channel is in range, so it will be very rarely necessary to go from default to another channel.

10. **Congratulations**, you have successfully configured your ACN! If you switch on the units every morning, the Master will remember its state and automatically start to send out timecode. All you need to do is set TC again to time of day and occasionally monitor the battery status of the remote units within the ACN Radar to know when replacement is required.

8.   Web Interface

The interface of the MasterLockit can be accessed through any WiFi equipped device using a common browser. Log in to your MasterLockit's WiFi. The required **password** always reflects the **SSID**. Default SSID follows pattern **ml-rssss** where "r" indicates the hardware revision and "s" consists of the last 4 digits of the unit's serial number.

Header

Color depend on the MasterLockit's configuration as **Slave** (blue) or **Master (orange)**. The setting also determines accessible features of the interface.

While Slaves are basically limited to configuring the nature and access of a physical connected devices including metadata and remote control functions, a Master additionaly serves as global metadata and timecode hub to all Slaves. As it is mandatory only one Master is present within an ACN, default setting is Slave. When changing this to Master, A unit will always remember its state on next boot. So, if changed to Master, it will become Master again and start sending timecode jams. If another unit is already present as suchthe status will automatically revert to Slave.

From left to right you have interactive areas, timecode, ACN, Sound Recorder, Clip Data, Lens Data, MetaSlate. Clicking on either will open the respective view. For larger area on mobile devices you can send the view to full screen and all to the right you find the system menu for configuration and maintenance. Clicking on the timecode and icons will open the repective screens of the interface.

On devices with limited screen resolution (e.g. portrait mode) access to the screens is only available through a "burger menu".

Note: "Lens Metadata" tab only available on ACN-MLP MasterLockitPlus

Timecode
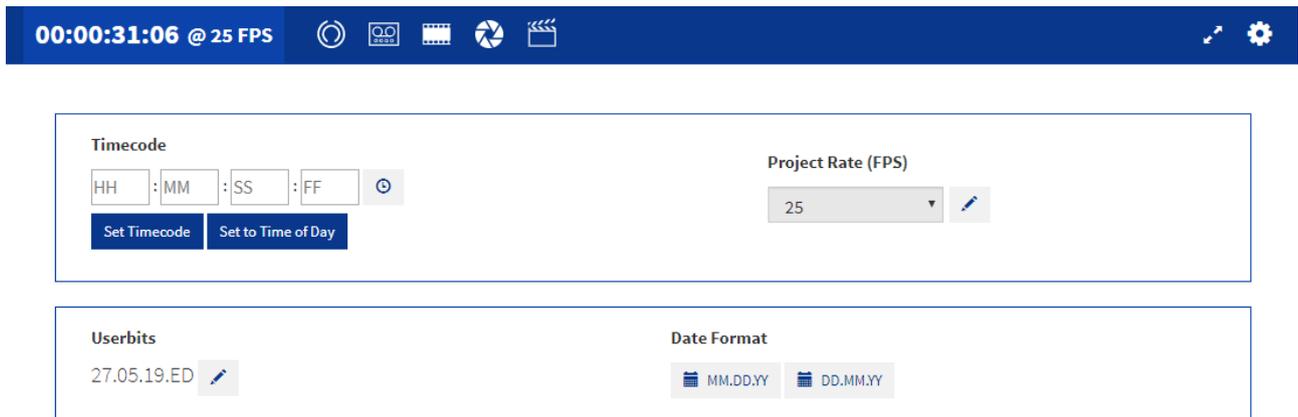
In this page you can select the **Project Frame Rate (FPS)** and manually **Set Timecode** of the generator to a deliberate value or automatically **Set to Time of Day** synchronized by the system clock of the device through which accessing the interface. Setting to Time Of Day will also insert the current date in the **Userbits** and set the realtime clock of NanoLockits on the channel. If using the **Userbits** for displaying the date e.g. on a LockitSlate, you can switch here between American (MM.DD.YY.AD) and European (DD.MM.YY.ED) date scheme. To make any changes, first click on the pencil symbol, apply desired settings and confirm by ticking the mark.

ACN

Here you can configure settings of the device related to the ACN: The mode the unit runs on, Master or Slave, the ACN channel the unit operates on, and metadata devices connected physically and remotely to the unit.

Local MasterLockit
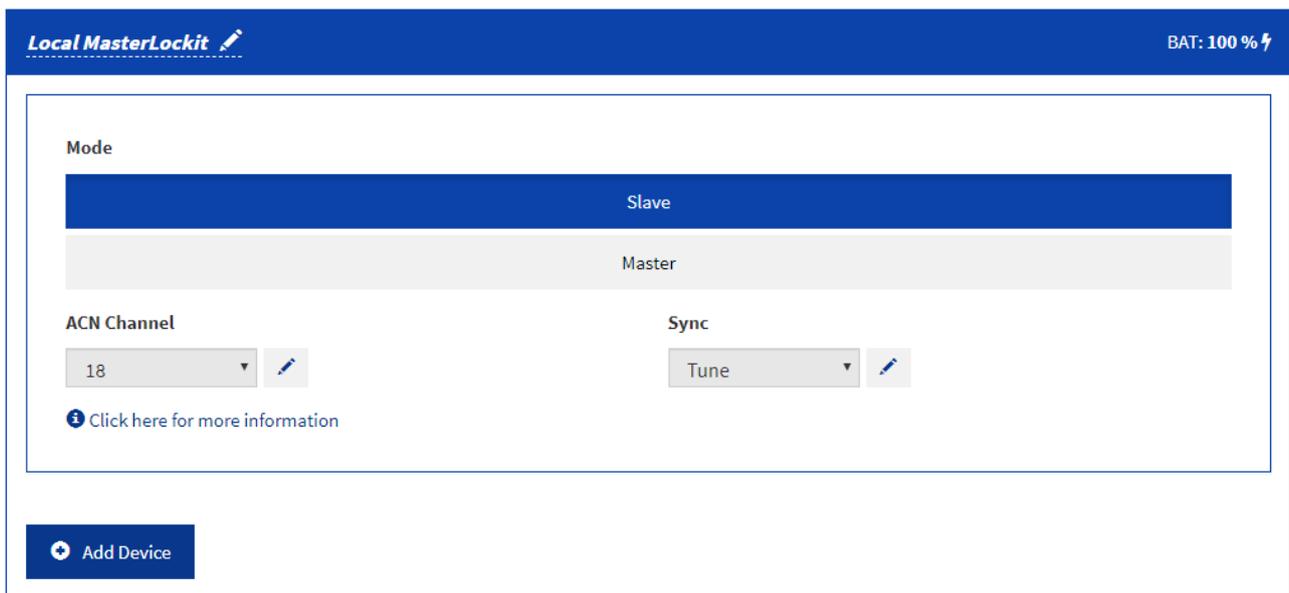
Most importantly, you can switch the state of the local device between Slave and Master. On enabling "Master", the generator will be activated and the unit will send out C-Jam broadcasts indicated by a green flash on each second followed by a double blink every 6th second. Please refer to chapter "LED Blink Codes" for detailed description. A Master will remember it's state and attempt to retain that state on reboot. If a Master is detected on boot, the unit will revert to "Slave".

> *Note: only one unit within one ACN is allowed to be Master. Multiple ACNs can coexist on one channel as Slaves will only listen to their initial Master as long as receiving it's C-Jam broadcasts.*

ACN Channel lets you edit the RF chaneel from 11 through 26 (see ACN Radio for details)

Connected Slaves will automatically follow a channel change of their Master, so this will only be required when connecting to a Master which cannel has been previously edited from default.

Sync will switch pin 4 of TC (red) Lemo between **Tune** and **48KHz** word clock to sync a sound recorder. If you want to tune your device via ACC501 this must be changed to **Tune**.

Add Device

Select from drop down list and optionally rename it. With 6.10 MasterLockit supports ARRI ALEXA classic range, ARRI CAP2 (ALEXA Mini and Amira), RED DSMC 1 & 2, plus Sound Devices' 788T and 6-series audio recorders. On ARRI ALEXA you will need to enter the last 4 digits of the serial number found on the top-mounted plate or within the camera's system menu while on CAP2 the password may need to be changed from the default "arri".

This will require special cables to physically link MasterLockit to the respective device over the blue ACN port. On physical connection the device will now show up active and green on the "Local MasterLockit" frame. Supported lenses (Cooke /i and Zeiss XD) connected to the grey ACN socket will appear automatically on connection without configuration.

When communication is lost to a configured device it will be greyed out and can be deleted if no longer in the active setup.

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ACN Radar

When set to "Master" this is "ground control" over units on the same ACN channel.

ACN Radar

Show Details

ACL 204 ✏
50 FPS | BAT: 100 %

Cam A ✏
23.976 FPS | Ext. Power

Lockit Slate ✏
25 FPS | Ext. Power

Lockit ✏
25 FPS | BAT: 80 %

Master Lockit ✏
25 FPS | Ext. Power

Nano Lockit ✏
48 FPS | BAT: 80 %

Devices connected to Master Lockit

🎤 SD 664 (offline) ✏
43:4C:00:0A:00:00:00:00

Devices connected to Nano Lockit

📹 Nano Lockit – RED ✏
AB:D9:25:86:00:00:00:00

Tiny Lockit ✏
50 FPS | BAT: 70 %

📟 Yke (offline) ✏

All Lockit devices in C-Jam mode on the same ACN channel in range will automatically appear in this section. Units on the same or directly compliant frame rate (e.g. 25 and 50 FPS) will appear green, units in cross jam (eg. 23.976 and 59.94) yellow, units unjammed with incompatible frame rate red, units offline greyed out. You may rename active units for better identification, on units with OLED screen this name will be displayed there. To clear that indication edit and erase the name or perform a reset on the respective unit.

Note: The hub will remember all Lockits ever logged in. To remove individual units that are not or no longer in your active setup click on the trash can, or purge the complete list via the "Clear ACN Radar Screen" after unlocking.

Frame rate must be consistent on all units on a set. Full Jam will automatically take care of this on initial jam with the only exception being Lockits with enabled video sync. Still, you can easily check these units and make changes accordingly.

Note: If known present units do not show up, check the Master is actively broadcasting C-Jam and ACN channel is consistent on all units.

Show / Hide Details

Show Details will expand each device in the radar for additional information.

Clear Radar Screen and Tune Slaves

Activation needs to be unlocked and will relock after action.

Project Tune Slaves is a special function to further improve accuracy. Based on the former tuning using the ACC controller via cable, calibration can now be done over ACN and tune multiple units simultaneously. The process will take approx. 2 minutes during which the slaves will rapidly blink red green. After tuning the LEDs will revert to nrmal blink and you can start syncing connected devices again. This process is intended for preparing productions and only needs to be performed very occasionally in a fixed setup. Tune value will be overwritten by the factory value on a factory reset.

> *Attention: Contrary to the gentle C-Jam units will alter their clock speed rapidly during tuning, also, there will be a hard reset of the sync pulse when the process is finished. This will potentially bring cameras in operation out of clock and compromise active recordings NEVER initiate wth active shoots or when on standby for a take.*

Clear Radar Screen a MasterLockit will remember all Lockits ever logged in until a system reset. To conveniently purge the list of all current and previous connected ACN devices.

> *Note: The hub will remember all Lockits ever logged in until a system reset. To remove individual units that are not or no longer in your active setup click on the trash can in detailed view, or purge the complete list via the "Clear ACN Radar Screen" after unlocking.*

Orphaned Devices

🎥 **ALEXA Mini** (offline) ✏️　　　　　　　　　　　　　　　　🗑️
00:00:00:00:02:D7:3D:9A

🎥 **Alexa** (offline) ✏️　　　　　　　　　　　　　　　　　　🗑️
CB:0A:10:D3:00:00:00:00

🎤 **SD 688** (offline) ✏️　　　　　　　　　　　　　　　　　　🗑️
43:4C:00:0C:00:00:00:00

The MasterLockit will also preserve previous connected cameras and sound recorders. In case you want to remove those without a complete reset, you can delete them here.

Sound Recorder

00:00:28:17 @ 25 FPS

Soundmixers working with either 788T or 6 series recorders from Sound Devices have a convenient remote control and sound reporting tool with the MasterLockit.

Note: For consistency, the recorder must be set to external timecode and slaved to the MasterLockit. A respective warning will show if the MasterLockit reads different timecode from the recorder.

Your sound recorder's timecode is not configured properly. Please check the timecode settings and verify that your recorder is properly connected to a Lockit Timecode device via a timecode cable.

When configured correctly you can prepare and edit scene, take, notes, arm and rename tracks, remote roll your recorder, circle takes and in the end create comprehensive sound reports without losing control over your timecode setup.

Note: the available options and behavior strictly depend on the protocol made available by Sound Devices. E.g. reading meter status is only available for 788T.

Transport Control

■ Stop

● REC
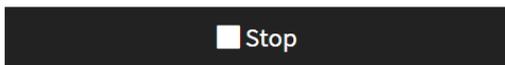
Remote roll your recorder with record start and stop. On hitting record the button will change color from grey to red.

Tracks

Tracks		
L MixL-MS ✎	R MixR-MS ✎	
A BoomM ✎	B BoomS ✎	
C MKH50 ✎	D PlantMikeTable ✎	
E Radio1Bruno ✎	F Radio2Sergio ✎	
G Radio3Antonio ✎	H Radio4Domenico ✎	
X1 Aux1 ✎	X2 Aux2 ✎	

By expanding this tab you can arm tracks by clicking on the track index and rename them by clicking on the pencil. On 788T the tracks will also show the current signal level.

Note: Naming tracks will only apply for the "Next Clip" and not be available during record. If you need to make corrective changes you can do so by editing the take in the "History" after finishing the recording.

Next and Last Clip Quick Edit

Next Clip (14BT04.WAV)

Scene
14B ✏

Take
4 ✏

Notes
room tone ✏

☑ **Insert Slate Info**

Last Clip (14BT03.WAV)

Scene
14B ✏

Take
3 ✏

Notes
test note ✏

Circled
✖

False take

You can enter slating information, apply notes, and circle the last clip or mark it as false take.
During record "Next Clip" will change to "Recording Clip" and "Last Clip" move into "History".
When "Insert Slate Info" is ticked, slate changes on the MetaSlate screen or a connected LockitScript app will automatically apply to the Next Clip.

History

History ⌃

🎤 23-NTT10.WAV ✏

🎤 23-NTT09.WAV ✏

🎤 @23-NTT08.WAV ✏

🎤 23-NTT07.WAV ✏

🎤 23-NTT06.WAV ✏

🎤 23-NTT05.WAV ✏

In this section you will find previous recorded takes. To edit, click on the pencil icon of the respective take and apply the changes.

Import More Clips for Sound Report

Import More Clips for Sound Report ⌃

Number of Clips (to Load): | 100 | Go!

On connecting a recorder, the last 18 clips will be loaded into the History. If you require more clips top be included in the daily report you can manually increase the number here.

Editing Clips from the History

Clicking on a clip will expand it for retrospective editing. After finishing your shooting day, you can export your daily sound report by clicking the button at the bottom. This will automatically open the **Clip Metadata** tab with clips created by your audio recorder preselected.

Clip Data

02:02:25:03 @ 25 FPS				

Filter Your Clips

Devices

Select ▾

Camera Rolls

Select ▾

Shooting Days

Select ▾

Timecode Range

| HH | : | MM | : | SS | : | FF |

| HH | : | MM | : | SS | : | FF |

Creation Date

Refresh	Show All Clips	Delete Selected Clips

Export Matching Clips as...

Shot Log (Excel)	Sound Report (Excel)	Slate Log (Excel)
CSV	JSON	ALE

3 Matching Clips

🎬 Slate Clap 3 🗑	🎬 Slate Clap 2 🗑	🎬 Slate Clap 1 🗑
Source Device 54:10:EC:FF:FE:3D:CD:31	Source Device 54:10:EC:FF:FE:3D:CD:31	Source Device 54:10:EC:FF:FE:3D:CD:31
TC 00:00:31:16	TC 00:00:30:00	TC 00:00:27:23
Click here for more metadata	Click here for more metadata	Click here for more metadata

This is your gateway for all kind of reports and logs like camera shot logs, slate logs etc. You can narrow your reporting choiceby selecting devices, shooting day, timecode range and download or export to an USB stick attached to the MastertLockit.

Sound Report

Note: that when coming from "Sound Recorder" tab, the correct files have already been preselected. Just pick your current date or narrow in by timecode and click "Sound report (Excel)" this will open your reports cover sheet template, where you can fill in the desired information.

Creating a sound report will give you the title sheet. Permanent values once entered will be stored, so you just need to aplly minimal choices every day. Download the Excel file directly to your accessing device for immediate editing and emailing or to a USB stick attached to the free USB port of your MasterLockit.

Lens Data

Only Available on MasterLockit*Plus*. Export data from supported Cooke /i and ZEISS XD lenses and enable live recording to an atrtached USB media.

Note: this requires a dedicated cable, MLC-CP between ACN (grey) Lemo and lens. On PL mounts, powering will be either through MasterLockitPlus with external power or camera. On cameras with EF mounts, power to the lens will only be through looped through power applied to. Supply voltage must range between 12 and 24 V to ensure reliable power to the lens.

MetaSlate

Cam/Roll	Date	SD

Production

Episode	Scene	− Slate +	− Take +

Director:

Camera:

Sound Mixer:

MOS	PU
INT	EXT
D	N

MetaSlate transforms any tablet into a connected, virtual slate. Conveniently send it into fullscreen by clicking the 2 arrows right in the header bar to eliminate browser window and tabs. The fields can be edited directly by clicking on the pencil which will also open the icon to switch between slating with separated (EU) or combined (US) scene and slate scheme.

With an iPad running LockitScript* app connected to the MasterLockit over WiFi, information entered on the app will directly be displayed on the screen and also be available on the Soound Recorder screen when accepting the ACN slating.

Note: LockitScript app is available for purchase on the Apple AppStore for iPad. On registering your Lockit under https://lockitnetwork.com/registration/ you will be granted a promo code to download LockitScript app for free.

System Menu

The gear wheel on the right opens a drop down menu for maintenance.
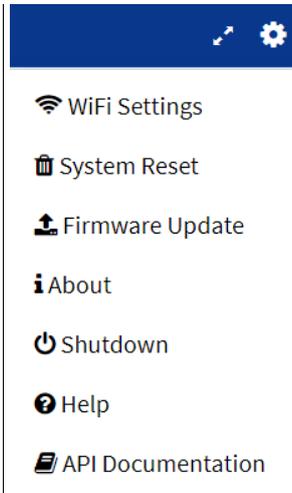
WiFi Settings

WiFi State

Mode: Host

SSID: ml0ad000

IPv4 address: 10.0.0.1

Refresh

WiFi Host

WiFi Name	ml0ad000

The WiFi name will also be set as the password. The WiFi name must consist of at least 8 characters.

WiFi Channel	11 ▾

Reconfigure WiFi

WiFi Client

WiFi SSID	mlpa0023 ▾	⟳
WiFi Password	WiFi Password	

Join WiFi

Shows info of the current WiFi configuraton. When running as host you can rename WiFi SSID and change the channel. After hitting reconfigure WiFi, the MasterLockit will immediately apply the new **SSID** so you will lose connection and need to log in again with new credentials.

Note: The password always coincides with the SSID. As such, it must be at least 8 digits long. Make sure you use a name that identifies the unit uniquely. Names like "soundcartHUB", "camera-1", or simply ascending numbers can later greatly help to better identify the individual units. This works well with the option to assign unit names in the ACN Radar.

Alternatively, you can join existing WiFis as client. The host can be another MasterLockit(Plus) or any DHCP host/access point/router. Scan for available networks using the circle icon, select from the drop down list and enter the credentials. You need now to reconnect by logging into the host WiFi and entering the IP briefly displayed. Info on the joined network is also available on the device OLED menu under Sys/WiFi.

System Reset

This will purge the database and clear all settings. The unit will restart as slave with default WiFi SSID and ACN Channel 18. Indicated when the unit needs to be attached to a different camera or was in use before on a different set.

Note: We recommend a reset at the start of a project especially when using the metadata network.

Firmware Update

Select a File…

| Firmware File | Datei auswählen | Keine ausgewählt | | Upload & Restart |

The firmware update file must look like this: "Ambient-MasterLockit-xxx.ml-upgrade"

… or drop it in the box below

Important: Always make sure your unit is powered from a reliable external source. Loss in power during update may render your Master Lockit a service case.

Select a File through your local file browser or drag 'n' drop a file through open explorer/finder. Navigate the update file, then click **Upload & Restart**. A 5 minute countdown will initialize after successful upload after which you need to log back in to the WiFi. If the page doesn't refresh automatically, hit the reload button on your browser. If the firmware update involves an update to the Lockit firmware (which will be the case mostly) the unit will automatically power down after a while. Press and hold the config wheel until the LEDs rapidly flash alternating, then release and let the Master Lockit boot through.

About

See detailed information of your system environment such as code revisions and the unit's serial number. Debug logging for diagnostics and testing can be activated.Shutdown

Shutdown

Power down the unit after confirmation. Shutdown takes about 30 seconds. When unit blinks in charge mode you can safely disconnect from external power.

Help

Clicking here will open this very file

9.   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.

Adjustments are available in 2 complexity levels which can be set from the System setting <u>Menu</u>.

"Standard" is reduced to settings that have proven practical for the vast majority of productions. We highly recommend leaving it sitting here unless you run in apparent limitations to your required configuration.

 "Extended" discloses additional, complex configuration options to suffice even the most avid TC and Sync Supervisor.

Depending on the devices capability this includes PAL, NTSC SD, and 720P sync formats, sync output for *3D* rigs, PPF, 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.*

"Lock" select this after applying desired settings will prevent from accidentally making changes to the preconfiguration. To unlock, keep the wheel held left for 3 seconds until the notification that the menu has been unlocked again.

> *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.*

Description below will use these conventions:

<u>Underlined</u>: 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.

Default settings are marked **Bold** in the menu bar. These values are restored after performing a <u>Sys/Reset.</u>

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

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

L: Lockit ACL204, TL: TinyLockit ACN-TL, LS: LockitSlate ACN-LS, ML: MasterLockit(*Plus*) ACN-ML(P)

Main Menu

↑	Mode	FPS	TC	Sync (L, TL(E)) / Slate (LS)	ACN	Sys

Sync menu only available on Lockit and TinyLockit (*"Extended"*), Slate Menu only on 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

↑	**C-Jam**	TRX	Reader (LS)

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.

"C-Jam": This default setting combines the "classic" Lockit mode with ACN functions. Jammed once via cable or ACN the unit will run as autonomous TC generator with standalone accuracy of .1ppm.

With a C-Jam Master in the network the devices will automatically adopt their pace to a "Master" unit for unprecedented zero drift accuracy and divergence down to 10uS.

Jamming over ACN:

On powering up, Lockit devices will generally start up in idling slave mode with a red flashing LED and output muted. You can jam the units now via cable, a single ACN Jam or a continuous master broadcast. This can be triggered from the ACN menu of any unit. While a single "Jam" will absolutely suffice for frame accurate sync over 30hrs and beyond, assigning one deliberate unit as *"Master"* you'll never have to worry about TC for the rest of the day as long as this Master keeps running. The other units will automatically jam their generators 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.

 "Slaves" will also 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: the system only allows one unit set to "Master". If two sets bump into each other, timecode consistency will be preserved by the units keeping "faith" to their last known 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.

In this mode the devices also serve 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.

> *Note: with no "Master" or "TX" there is no RF activity and no further steps required to comply with situations that do not allow for radio presence. If you still want to disengage the ACN functionality you can do so by selecting "Off" under ACN/RF.*

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

FPS Menu

FPS: 23.98/24/**25**/29.97/29.97 DF/30/47.95/48/50/59.94/59.94 DF/60

Toggle to select the project framerate and press. When changing an existing setting you will be asked to confirm or discard the new selection. As with firmware 6.xx Lockits now support double project rates to be synchronized via ACN and automatically select double frame sync settings with genlock/PPF activated. However, as not part of the SMPTE specification, this will have no effect on timecode frame rate and also cannot be transferred via cable.

> *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. Also genlock output will be changed or even disabled on selecting an incompatible frame rate for SD genlock (only available on ACL 204 in Extended menu). While the ACN or cable jam effectively prevents these critical changes applying these manually while recording may result in a corrupted file. Important: When using Drop frames make sure the whole set does. NEVER run a setup with units mixed on non-drop and drop! 29.97DF will neither sync with 29.97, 30, or any other non-drop rate.*

TC Menu

↑	Set	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.

Jam

Auto	Man

Determines how the generator can be jammed.

*"Auto"***:** Automatic setting, suitable for most applications. With video sync disabled, the unit will initially jam timecode value and frame rate form source. When video sync is activated, frame rate will be locked and only timecode will be jammed from compatible frame rates. This method effectively prevents misadjusting the unit during operation while bringing maximum of ease on initial configuration.

When the generator has been jammed already, applying external timecode will display the aberration of the 2 devices with the option to manually force a full rejam or timecode value only.

*"Man"***:** Basically the same behavior as "Auto" with video sync enabled, the frame rate will be locked and only compatible frame rates are accepted for jam over ACN. Cable jam always requires confirmation to jam only TC, TC and frame rate or quit.

Note: If the mode prohibits a change of frame rate an "X" will be displayed before the frame rate indicating compatible frame rates allowed for jam. On jamming with a coherent FPS the "X" will disappear.

Output

Level (TL)	Mute (E)	Offset (E)

This menu configures the TC output signal. In Standard view Output is only available on TinyLockit and will directly access the Level setting.

Level

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

Only available on 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.

Note: a reduced level will prevent a successful jam of regular timecode devices.

Mute

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

On default the physical output does not supply a signal if the generator has not been set (flashing red every 2 seconds). This is most 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, 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.

> Note: Inconsistent TC is as good or bad as no TC at all. There is practically no use in having a unit supplying a non-synchronized timecode.

Offset

Offset: +/-00.00

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 3rd party equipment (e.g. delayed TC out from audio track on playback).

UB

↑	Show	Jam	

Show

Toggles userbits to be displayed in main screen below the TC reduced in size.

Jam

Auto	Man

"Auto": Userbits will be continuously jammed. This will happen on TC Jam but also on change of user bits only without the TC generator being interrupted. This can e.g. be used to increment scene/take on the fly or insert the date from an ACN master.

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

"Man": Use this mode to apply fixed userbits eg. a unit ID. On selecting you can load the 8 userbit slots with hex-code values 0-F.

> Note: selecting manual userbits will automatically enable "Show" for display underneath the timecode.

Sync Menu

↑	Video (L)	Audio (L)	PPF (TL (E))	**Off**

Only available on Lockit and TinyLockit (Extended mode)

Video

480i(E)/576i(E)/720P(E)/1080i/Psf/P	Single/Dual/3D(E)

Only available on Lockit

Enables Genlock video sync output on BNC. Standard menu only offers 2 options applicable for current cameras: 1080P or i/PsF with i/PsF being automatically selected depending on FPS. Extended mode also allows for 720p and SD formats 480i (NTSC) or 576i (PAL). Also only in Extended you can match the level/impedance for single or dual camera load (required for 3D rigs).

Selecting either PAL or NTSC will possibly override previous FPS selections , as it automatically applies the only matching frame rates of 50i or 59.94i with the only option to switch between non drop and drop timecode in case of the latter.

Note: activating Video sync will also enable PPF shutter sync on pin 3 of the "TC" Lemo port.

Audio

Only available on Lockit

Activates a 48.000 KHz wordclock signal on the BNC to sync audio recorders.

PPF

Only available on TinyLockit

Pulse **P**er **F**rame is a shutter sync at the selected framerate and used to clock some industrial cameras. Available on pin 3 of the "TC" Lemo connector.

Off

If not required, it is recommended to disable sync output to reduce current draw and allow for automatic setting of the frame rate on jam. Also, this must be selected to allow tuning via the now obsolete controller ACC101 or 501.

Slate Menu

↑	Display	LEDs	Sensor

Only available on LockitSlate

Display

Userbits: 0*...20s →	Clapped TC: 0...**10s**...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: **Clap**/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

Tilt

Enabling will revert the 7 digit display when the slate is operated upside down for special markers like end slate e.g.

Brightness

 "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 useful 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	Ch

"Slave", *"Jam"*, and *"Master"* options are only available in C-Jam mode and with Ch not set to "Off"

"Slave": is the default operation and on power cycling in C-Jam 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 the unit will fall back to the "Slave" mode after this this is rather an action than a setting.

"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, switching to TRX or Reader will immediately stop C-Jam broadcasts.*

Ch

Select ACN channel: Off/11…**18**…26

Select the RF channels 11 through 26 according to IEEE 802.15.4 (see Appendix for details). Although ACN is not generating any RF signal when not triggered by a C-Jam Master or TX, radio can be completely defeated for autonomous generator mode by selecting "Off". This will hide all other ACN parameters until an active channel has been reassigned.

> *Note: in general it should not be necessary to make adjustments. Exceeding the preselected channel 18 is not used by wireless focus remotes using the same protocol, the ACN strictly follows the IEEE 802.15.4 standard which allows for friendly coexistence of multiple systems even on the same carrier. The ACN cannot cause interference with a wireless remote control or other radio.*

SYS Menu

↑	Menu	Config	Reset	Info

Menu

Lock/**Standard**/Extended
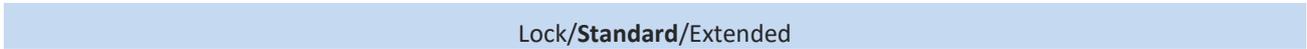
Defines the level depth and sophistication of available options.

"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: We highly recommend leaving it sitting here unless you run in apparent limitations to your required configuration.

"Extended" unlocks additional configuration options. This mode will unlock sync output for **3D** rigs, more uncommon video and sync formats such as **PAL**, **NTSC,** or apply an **Offset** to the TC output for compensation of frame processing delay.

Config

Display	RF	USB (L, LS) / LemoACN (TL)	Bat (L, TL, LS)	IR (E)

Display

Brightness: 1...**3**...10 →	AutoOff:5sec...**30sec**... never
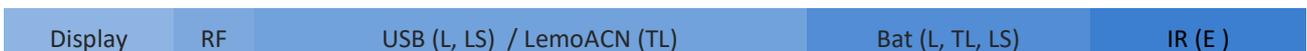
Consecutively adjusts the OLED in brightness and timeout.

RF

LNA: **Auto**/On →	Ant: **Int**/Ext (L (E), TL(E))→	Power (E , PIN protected): 8 dBm

The adaptive RF menu offers additional tweaks to the ACN radio.

"LNA: Auto/On" LNA is a Low Noise Amplifier. While it may improve receiving range it comes with some impact on the current consumption. Default setting "Auto" enables the LNA when the unit is powered from external and switch off when running off batteries. If the last bit of range is essential, you may permanently enable this feature by selecting "On".

"Select ACN Antenna: Int/Ext" only available to earlier revisions of Lockit and TinyLockits did not include the SMA antenna. Retrofitting an external SMA antenna is highly recommended as it will give you the most noticeable range boost of all available tweaks at no cost of battery life. This choice will be permanently stored and be maintained through a factory default restore.

 "Select ACN tx power: 8dBm" restricted to Extended mode and additionally PIN protected. As per default the ACN is set below the globally maximum allowed ERP level for LR-WPAN of +10dBm. Consult your supplier only if your application legitimizes higher settings. Increasing output power will strongly affect battery life time, so even if applicable use with good consideration.

USB / LemoACN

MTC	**COM**

Not available on MasterLockit (Plus)

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" for easy firmware update, you can enable "MTC" in this mode to make the device a MIDI TC generator. If you just want to convert LTC to MTC and vice versa, simply select "TRX" as Mode without alterations here.

Bat

Li	**Alk**	NiMH

Not available on MasterLockit (Plus)

Matches the battery telemetry 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

Legacy feature, pre ACN, only useful in combination with ACC501 controller. Enables the infrared port above the OLED. Leaving the IR port open can compromise reliability of the unit in normal operation, so only to be enabled through *"Extended"* mode.

Reset

Here you can restore the factory settings.

On ACN-ML(P) you have a wider selection of options:

↑	WiFi	Metadata	All

"WiFi": resets the devices SSID and password to ml(p/0)sssss, where "sssss" reflects the last 5 digits of the serial number.

"Metadata": will keep all settings but purges the database. This may take up to 5 minutes.

"All": resets WiFi, database and local settings 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.

10. 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

Orange / Red & green simultaneously: standing ext/ACN TC detected

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Mode/Seconds	1	2
IntTC/C-Jam		
Gen Not Set Mute		● (red)
Gen Not Set Mute, lo Bat		●● (red)
Generator Not Set	● (red)	● (red)
Generator Not Set, loBat		●● (red)
Generator Set	● (green)	● (green)
Generator Set, loBat		●● (green)
Additionally active C-Jam shows the following codes every 6 sec:		
C-Jam Master	● ● (green)	
C-Jam Slave, Master present	●--● (green)	
C-Jam Slave, Master lost	●--● (yellow)	
C-Jam Slave, incompatible FPS to Master	●--● (red)	

TRX	1	2
no TC	●-● (red)	●-● (red)
no TC, loBat	●-● (red)	●● (red)
TX (ext. LTC/MTC detected)		
TC running	● ● (green)	● (green)
TC running, lo Bat	● ● (green)	●● (green)
TC standing	● ● (yellow)	● (yellow)
TC standing, loBat	● ● (yellow)	●● (yellow)
RX (TC over ACN detected)		
TC running	●-● (green)	● (green)
TC running, loBat	●-● (green)	●● (green)
TC standing	●-● (yellow)	● (yellow)
TC standing, loBat	●-● (yellow)	●● (yellow)

Reader (Ext TC)	1	2
no TC	●-● (red)	●-● (red)
no TC, loBat	●-● (red)	●● (red)
TC running	●--------- (green)	---------● (green)
TC running, loBat	●--------- (green)	--●●●●-- (green)
TC standing (Ext TC)	●--------- (green) ●-● (red)	---------● (green) ●-● (red)
TC standing Lo Bat (Ext TC)	●--------- (green) ●--------- (red)	--●●●●-- (green) --●●●●-- (red)

11. ACN

Aside time code and sync, ACN is the key feature of the current Ambient Lockit range. It 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. This standard is designed to allow for friendly coexistence of different systems on the same channel. Still, equivalent ARRI remote focus equivalents listed to further 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	

The ACN features 2 operation modes, the standard "C-Jam" and "TRX".

C-Jam

Building up on the tunable oscillator C-Jam dynamically adjusts 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.

C-Jam can additionally 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 at least one MasterLockit(Plus) acting as server and 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.

TRX

This special mode will allow the units to operate as an enhanced TC radio link. Again, this is not your ordinary timecode over wireless, neither is it suited for standard synchronization purposes. Instead the transmitting unit will jam its free running generator 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(s) will then duplicate the TC source's status as it would directly be connected without danger of drop outs compromising the desired functionality. 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.

However, as the transmitter is only jammed but not synchronized by the source and also the receiving units may stop their timecode and sync outputs this is not suited to reliably sync a system and only recommended for 2 applications. One being playback where you need to display pre-recorded timecode on a slate and the second being documentaries to remote roll an audio recorder via rec run timecode of a camera.

Note: Always 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. Application Notes

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

Please also watch our video tutorials online: www.ambient.de/en/university

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

Timecode, Sync, and the importance of Genlock

One of the most common misconceptions is that timecode *is* sync but in fact they are both 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 affect the speed the camera is generating frames. To achieve this a blank signal commonly referenced to as genlock is required. This is essentially a blank video signal and regardless of the recording resolution all cameras accept either 1080P or 1080i/PsF. Still, the importance of genlock must not be overrated. As cameras have evolved so has their accuracy. While external timecode helps to keep the time during power down sequences and avoids the necessity to frequently check and rejam, in typical scene based productions using genlock is no longer an obligation with file based cameras. They will hold frame sync long enough typically up to 30 minutes and only when shooting longer takes such as live events that need to be edited the use of genlock and thus the Lockit ACL204 becomes obligatory.

What also continuously leads to confusion is the fact, that there are no TC framerates that match 47.94, 48, 50, 59.94 or 60 video rates. This lies in the historic and physical nature of the SMPTE TC signal which doesn't allow for higher frame rates than 30 FPS. To simplify configuration, Lockits since firmware 6.00 allow selecting double rates. This doesn't change the fact, though, that on those settings the timecode frame rate always will be the corresponding single rate.

Choosing the correct TC frame rate and video sync format

Timecode and Sync always have been a cause of confusion and irritation. However there are just a few rules that, when understood and considered greatly help to get things right and with the intelligent algorithms of the Lockit system and ACN it's even easier.

First and upmost:

Lockit Stays on Camera!

This may sound trivial, but it is the most common cause of issues when post gets back with TC consistency errors. Just jamming a camera and then remove the Lockit may appeal AC but it just doesn't cut it. Also, camera department likes to think timecode being a concern of the sound guy only. It is not. It is a concern of keeping everything in sync – sure, this one sound recorder, but these 2, 3, or more cameras none the less - even more. Cameras drift, lose timecode unnoticed on power cycling and so forth. There is a reason Lockits have been around for the quarter of a century and are still going strong. If size is a crucial issue, ditch the genlock, opt for a NanoLockit, but external timecode stays on cam.

There is no double rate

What continuously leads to confusion is the fact, that there are no TC framerates that match 47.94, 48, 50, 59.94 or 60 video rates. This lies in the historic and physical nature of the SMPTE TC signal which doesn't allow for higher frame rates than 30 FPS. To simplify configuration, Lockits since firmware 6.00 allow selecting double rates. This doesn't change the fact, though, that on those settings the timecode frame rate always will be the corresponding single rate.

2 worlds with 2 frame rates each

Basically the video world is split in 2: PAL and NTSC.

PAL uses 24 FPS TC for film and 25 for video/TV, NTSC productions take place in 23.976 for scene based work and also TV and 29.97 for broadcast/sports.

23.976 mostly is also referred to as 23.98 and sometimes even reduced to 23 in writing. No matter how, it's all the same, there is no other "23" format than this one and as of today it is THE format for scripted productions you will find yourself working with most of the time when you live in the NTSC part of the world.

29.97 again may use 29.97 "Drop" (also "D" or "DF") in some cases. Without going down to the nasty bits of this pesky format it is enough to know that 29.97 Drop is the ONLY drop format that exists and it is only consistent within itself. So, if asked to use Drop, make sure EVERYTHING is set to that, which can be a challenge, as RED DSMCs do not even support this.

The last frame rate, 30 FPS have become more or less obsolete in the meantime except some industrial cameras.

One Frame Base across the Set

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.

There are negligible few cases that you really would need to cross sync a camera to an audio recorder using a different TC frame rate. If you have to handle such situations, you will know your stuff, if not just set everything to run on the same frame base.

In any case, do NEVER mix and match DROP with NON DROP or NTSC area with PAL area rates!

The Camera is Always Right

Whatever the frame base is going to be, you will never succeed in trying to sync to a camera to a signal that does not match its requirements. So, in general, the Lockit just needs to be set at the cameras system/project rate. This may become tricky as e.g. some Sony cameras will effectively operate on 23.976 when set to 24, some Panasonics on 29.97 when set to 23.976. So, it is important to know your camera system rate and sync format.

experience quality.

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To ease the setup process we have condensed a little guideline for the most common camera types. However, 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 (see Panasonic), so it is nearly impossible to give a comprehensive and bullet prove advice which setting is 100% correct for a specific production. So, we cannot not claim or grant any liability this to be complete or correct and if in doubt, always refer to the specific camera's manual and should you find inconsistencies or can provide additional information, we would welcome your input to further improve this list.

ARRI: TC only. Being the one and only camera brand currently on the market that can actually sync to external TC, it doesn't have or require genlock input. In TC/Options select "Free Run" as Run Mode and "Regenerate" as Mode. On Amira and Alexa Mini additionally navigate to System/Sensor/Genlock Sync select "TC In".

Blackmagic Ursa: As these cameras only support either TC or genlock, TC is the only option.

Canon C Series: 1080P. XF legacy cameras or mode will require 59.97i/60i when shooting at 23.98/24.

Panasonic: 1080i/PsF. Newer models/firmware have been reported to support 1080P.

Panavision DXL: Lockit inbuilt, no external TC/Sync required. Set to the same ACN channel and run a C-Jam Master to ensure TC is rejammed after power breaks.

RED DSMC 1&2: 1080P. Set HDSDI out to "Auto"

Sony: 1080i/PsF

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

DSLRs and non-timecode cameras: These require timecodde to be recorded on one of the audio tracks. As most of these cameras only provide mic level inputs, the line or TTL level TC signal needs to be padded down before going into the camera. TinyLockit and NanoLockit have built-in padding circuitries, other units will require padding via cable. The correct level varies from the application. While -10dB FS (below maximum) is ideal, this may still lead to the TC signal bleeding into the adjacent channel with nasty noise if a (guide) audio track should be recorded on the second track of a DSLR. In this case go as low as necessary but keep as high as possible. AVID and BMD daVinci Resolve natively support handling TC on audio track while others like FinalCut or Premiere require external tools to prepare the material for proper ingest.

13. Power Supply, Timecode, and Metadata Cables

power cables	DC out on camera or power plate
AK-L0B2-HS4	Lemo 0B 2 pin
AK-HS4	Hirose 4 pin
AK-XLR4M	XLR F 4 pin
MLC-L1B10P	ARRI ALEXA Ethernet

Power supply preferably through battery plate as power outlets on camerabody may be switched off with camera.

timecode cables	TC Interface on camera
TC-IO	Lemo 0B 5 pin
TC-IO-RA	Lemo 0B 5 pin
LTC-OUT/EPIC	Lemo 00 4 pin
LTC-Out	BNC
TC-IO-RA*	1/8" minijack*
TC-OUT*	XLR*

* for recording TC to audio track on cameras with no native TC support, requires additional steps in NLE

metadata cables	metadata source
MLC-L1B10P	ARRI ALEXA includes power
MLC-L1B10	ARRI ALEXA requires additional power cable
ACN-RCP	RED DSMC 1 & 2
MLC-CL	SoundDevices 788T
MLC-HID	SoundDevices 633,664,688
MLC-CP	ZEISS CP.3 XD lenses (only for MasterLockitPlus)

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Exemplary configurations

Camera	w. Zeiss CP.3 XD*	timecode cable	metadata cable	power cable (on cam)
ARRI ALEXA Classic Line (incl. camera metadata)	MLC-CP	TC-IO	MLC-L1B10P	included with metadata cable
ARRI ALEXA (cam metadata optional)	MLC-CP	TC-IO	MLC-L1B10	AK-L0B2-HS4
ARRI ALEXA Mini	MLC-CP	TC-IO or TC-IO-RA	(MLC-L1B10P*)	MLC-L1B10P
ARRI SXT	MLC-CP	TC-IO	(MLC-L1B10P*)	AK-L0B2-HS4 or MLC-L1B10P
ARRI Amira	MLC-CP	LTC-OUT	(RJ 45*)	AK-HS4
BMD Ursa/Mini/Mini Pro	MLC-CP	LTC-Out	NA	AK-XLR4M
Canon C700	MLC-CP	LTC-Out	NA	AK-L0B2-HS4
Canon C500	MLC-CP	LTC-Out	NA	NA*
CanonC300 II	MLC-CP	LTC-Out	NA	NA*
Canon C 100 II	MLC-CP	NA (TC-OUT*)	NA	NA*
Canon 1DC (Typical DSLR)	MLC-CP	NA (TC-IO-RA*)	NA	NA*
Panasonic Varicam LT	MLC-CP	LTC-Out	NA	AK-HS4
Panasonic Varicam 35/HS	MLC-CP	LTC-Out	NA	AK-L0B2-HS4
Panasonic Varicam Pure	MLC-CP	LTC-Out	NA	?*
Panavision Milenium DXL	MLC-CP	over ACN	over ACN	AK-L0B2-HS4
RED DSMC1	MLC-CP	LTC-OUT/EPIC	ACN-RCP	NA*
RED DSMC2 w. Base Expander	MLC-CP	LTC-OUT/EPIC	ACN-RCP	NA*
RED DSMC2 w. V-LOCK I/O Expander	MLC-CP	LTC-OUT/EPIC	ACN-RCP	NA*
RED DSMC2 w. JETPACK Expander	MLC-CP	LTC-OUT/EPIC	ACN-RCP	NA*
RED DSMC2 w. JETPACK-SDI Expander	MLC-CP	LTC-OUT/EPIC	ACN-RCP	AK-L0B2-HS4
RED DSMC2 w. REDVOLT Expander	MLC-CP	TC-IO	ACN-RCP	AK-L0B2-HS4
RED DSMC2 w. OMOD	MLC-CP	over ACN	*over ACN	AK-L0B2-HS4
Sony F65	MLC-CP	LTC-Out	NA	NA*
Sony F5/F55	MLC-CP	LTC-Out	NA	AK-HS4
Sony FS7II	MLC-CP	NA (LTC-Out*)	NA	AK-HS4
Sony FS7II w. XDCA-FS7	MLC-CP	LTC-Out	NA	AK-HS4
	*requires MasterLockitPlus	(*) cameras without native TC support, record timecode onto audio track	(*) pending with camera firmware	NA*: no DC out on camera body, Suited cables depend on connectors available on power plate

14. Safety Instructions

For your own safety and trouble-free use, please carefully read through the instructions below. Always keep a copy of these instructions and hand them out with the unit to other users.

This unit is exclusively intended for indoor use. Keep it safe and away from water, rain and humidity and dry under all conditions, even when powered off. Clean gently with a slightly moistened cloth and never let water, detergents or liquids of any kind get into the unit as this will imply the risk of short circuits and electrical hazard.

Keep distant from sources of heat and never expose to direct sunlight. Admissible ambience temperature for operation and storage is from +5° to +50° Celsius. Power down before storing or shipping, detach external power sources, and, if applicable remove batteries.

Do not throw or expose to mechanical impact and keep it safe from hard vibrations.

Only use genuine accessories such as cables antennae etc. which have been included with the unit or supplied by an authorized dealer. Always observe integrity and the pertinent compatibility with all units connected to.

Powering from external sources is exclusively limited to the use of LPS sources in compliance to part 2.5 of EN 60950-1 with correct polarity, voltage range, and current rating. Disregarding recommended power requirements may damage the product or even risk explosion of the internal backup cell.

Do not perform software updates in situations in which the integrity of mains supply cannot be granted such as thunderstorms and remove connections from and to all devices directly or in directly connected to mains.

When using the wireless connection, place it centrally and keep it distant from sources of possible interference such as microwaves or electrical devices with large metal surfaces.

Only use the original external antenna directly and firmly attached to the socket. Extension or use of 3rd party accessories is not permissible.

Only use the included WiFi dongle that was carefully evaluated for best performance, and leave it connected all the time. (Re-) attaching the WiFi dongle during operation will require a system restart.

Never open the unit. Inappropriate and unauthorized access will void the warranty and imply possible risk of harm to the user.

When disposing the unit, follow the legal requirements for recycling electronic equipment.

15. Warranty

Ambient Recording GmbH warrants this product against defects in materials and workmanship for a period of ONE (1) year from date of original retail purchase. This is a non-transferable limited warranty that extends only to the original purchaser. Ambient Recording GmbH will repair or replace the product at its discretion after evaluation at no charge. Warranty claims due to severe service conditions will be

addressed on an individual basis. THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. AMBIENT RECORDING GMBH DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING

WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AMBIENT RECORDING GMBH IS NOT

RESPONSIBLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING FROM ANY BREACH OF WARRANTY OR UNDER ANY OTHER LEGAL THEORY. Because some jurisdictions do not permit the exclusion or limitations set forth above, they may not apply in all cases.

For all service, including warranty repair, please send the prodcut, along with proof of purchase date to your retailer, or, if not applicable, to:

Ambient Recording GmbH

Schleissheimer Str. 181 C

DE – 80797 Muenchen, Germany

Please obtain a return authorization through the contact form on our website before sending in a unit.

16. Approvals

CE **CE Conformity Statement:**

Declaration of Conformity
According to ISO/IEC Guide 22

Manufacturer's Name: Ambient Recording GmbH

Manufacturer's Address: Schleissheimer Str. 181 C, DE – 80797
                             Muenchen, Germany

declares that this product is in conformity with:
- EN 60950-1:2006 + A11:2009+A1:2010+A12:2011+AC:2011
- EN 301 489-1 V1.9.2 - EN 301 489-3 V1.4.10 which is indicated and affirmed by the applied CE marking.

  Products released and tested before 05 2016 comply to
- EN 300 440-1 V1.6.1
- EN 300 440-2 V1.4.10

  Products released and tested after 05 2017 respectively comply to
- EN 300 328 V2.1.1

FCC Statement

The FCC requires that the following statements be included in this manual:

FCC § 15.19

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada CNR-Gen Section 7.1.3

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

FCC § 15.21

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC § 15.105

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

ICES-003

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.