AMBIENT

Lockit Timecode Controller

ACC 501

Rev. 1.10.0031

experience quality.
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1. Introduction

Superseding the ACC101 the Clockit Controller ACC501 retains all its functions and serves as a general purpose TC master unit which can read, generate and compare and tune to all kind of TC rates. It offers a variety of additional features such as word clock output, dual TC display, enhanced GPS modes and multiple I/O ports including USB ports for PC/Mac connectivity and TC-conversion modes. Although roughly half of the size of its predecessor the user interface has been vastly improved using a graphical display and an enhanced keypad with dual navigational cursor pads for easy two-handed operation.

Power can be provided over internal batteries, USB or an external source. One load of 4 good quality alkaline AA cells should achieve over 24 hrs. of continuous use (depending on activity and brightness of display backlight), and many days in a typical scenario of intermittent use. For increased battery lifetime a special standby mode has been implemented. While the main MCU controls the main timecode generator, keypad, display and memory functions, a special low-power MCU monitors the power converters and an auxiliary generator is maintaining frame accurate timecode when put in standby for the full battery life of the Controller (one week or more).

To allow for even more flexible implementation of future enhancements, the hardware has been purposely designed to cater for new features without major hardware updates. User-manageable software updates will become available from the product page on https://dl.dropboxusercontent.com/u/105377880/Firmware/Firmware1.10.zip so please check back for software updates and change logs.

Updating the software is done via a Windows PC over USB running a dedicated programming tool also available from the aforementioned source.
2. **Package Content**

- ACC501 Clockit Controller
- Pouch for the Controller, ACC-T
- Timecode cable, TC-IN/OUT

3. **Firmware Update**

New in Firmware Version 1.10:

- Works on Windows 7
- Supports the hardware revision of the GPS module (2013)

How to update:

For upgrading, start ACC501 setup.

- Scan port for ACC.
- Load ACC 501 1.09.0030.bin
- Check box “force upgrade all”
- Wait until process is finished and restart the unit.
4. Description

4.1 Lemo 5 pin, common industry TC standard

Pin  
1 Ground  
2 TC in, nominal level 100 mV min., DC decoupled  
3 Aaton ASCII protocol in/out  
4 Tune signal @ 1.92 MHz, (DC in 5 to 12 Volts for Rev. A boards)  
5 TC out, TTL level

4.2 IR - Infrared Port

For setting compatible Lockit devices and data transfer using Aaton ASCII protocol without the need of linking the units via 5 pin Lemo, typical range 4 ft

4.3 BNC, EXT. SYNC

This input will accept sync signals such as composite video PAL, NTSC or trilevel sync and analyze/identify them providing vertical sync and field number signals in future software revisions.

In the current software revision, a PAL video signal can be used to tune the reference oscillator. Thus, Lockit boxes can be recalibrated to match the speed of an OB van or house sync providing frame accurate sync of hardwired and portable equipment. The total timecode drift and diversion of a working system is minimized for most ease in edit.

4.4 BNC, WCLK

The word clock output is in sync to the internal timecode reference generator, which makes it most useful when synchronizing equipment like stand alone audio recorders or DAWs.

44.1 kHz to 192 kHz with pull up and pull down are available.

4.5 USB 1

Used for programming new software or as serial interface for SMPTE/P2 conversion.

EXT power in, 5 Volts

4.6 USB 2

Serves as MIDI TC I/O interface for sending MTC (Midi timecode) to a DAW. EXT power in, 5 Volts

The Mini B USB ports follow the USB specification. It is recommended to have the Controller powered on with the appropriate operation mode selected when establishing the connection to a computer.

_Do not connect to two computers simultaneously!_
4.7 3.5mm Mini jack, TC in/out

Offers a separate LTC input/output carrying the same TC signal as the Lemo TC socket with a reduced level of 1 Volt peak to peak.
Tip = LTC-OUT
Ring = LTC-IN
Sleeve = Ground

4.8 Sub D 15 pin socket, accessory I/O interface

This socket is for general access to the Controller and contains all connections needed to interface to an external device including power. This socket can be used to connect the ACCSI (Ambient Serial Interface) with attached GPS module. Various options like radio link transceivers etc. to follow.

Only connect approved accessories to avoid damage.

4.9 Keypad

The keypad is organized with the menu and command cursors on the right and general editing cursors on the left. These keys can double as hold/log when logging on the fly.

There is a red escape key on the left which doubles as an on/off switch and a green enter key on the right. Underneath there are 0-9 number keys in black with secondary functions in red and a shift key on the left. The 4 domed Allen screws protect the keypad surface.

4.10 Display

The display is a 128 X 64 pixel graphic display with selectable contrast. The white LED backlight can be adjusted in intensity and turned off completely for reducing the power consumption. The display is organized with a menu bar at the top and a command bar at the bottom. Movement within these bars is done by 4 cursor keys at the right of the display, two keys for left/right scroll for the menu bar at the top and 2 keys, left/ right scroll for the command bar at the bottom. The relevant status of the controller is shown in the remaining space between these bars.

A command is executed by selecting the respective command and then pressing ENTER or pressing the relating numeric hot-key shown in the command bar.

ESC returns to the command line.

Battery symbol

This shows only the level of the internal 4xAA batteries, not the external source, for this see Power Supply in the “Config” menu.

We welcome any comments or software ideas for this new controller. Please get in touch with us for your suggestions.
5. Getting Started

Take the Controller out of its pouch and open the sliding door on the left side. Insert 4 AA cells carefully observing the polarity as indicated on the side panel, the 2 cells in the outer slot facing both positive polarity outwards, the 2 cells in the inner tube positive polarity inwards. Then close the contact hinge and slide the door shut.

The controller is designed to interface properly with other products of Ambient Recording's Lockit range. When connecting to 3rd party's equipment carefully consult the referring user manuals for requirements to evaluate the possibility of proper interfacing. Follow the manufacturer’s instruction to the letter and only use the designed inputs with certified cables. Ambient cannot be held liable for any damage or malfunctions caused by improper set up and/or cabling.

SWITCHING THE UNIT ON AND OFF

A delay has been implemented to avoid inadvertent On/ Off switching.

POWERING ON

Press the ESC (On/ Off) key (red flash symbol) until the unit initializes displaying serial No. and software version. After a few seconds the display changes to default with the timecode generator screen (GEN).

POWERING OFF

When switching off either standby or a complete power-down can be selected. In standby mode the timecode is held in the auxiliary TC generator (AUXGEN) that runs off the accurate internal reference while power-off helps to save battery life and is intended for long time no-operation.

Press the ESC key. After a short delay the switch-off select menu will appear.

- Enter standby mode, holding timecode (aux)?
  - Press ESC again to switch off, or press ENTER for standby!

Press ESC again:
Unit is powered off for maximum save of battery capacity, timecode is lost.

Press Enter:
Unit enters standby mode, AUXGEN holds TC until batteries are drained completely.
6. Menus

6.1 CONF menu

This is a general menu for the controller status and control and monitoring of peripherals. Select option by pressing corresponding number.

1: Display:
Change display contrast and default backlight brightness and switch off time.

2: Infrared:
Displays transceived ASCII characters, allows for a test and reset.

3: Power supply:
Shows voltages at power inputs

4: System Info:
Shows the serial number of the unit and the software versions of the various modules currently loaded. Upon start up, the ACC501 checks if a ACCSI (Ambient Serial Interface) is connected and displays the firmware version:

Please note: From board revision “A” on the revision is displayed next to the serial number.
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5: USB Port Settings:

USB Port 1 can be set to:

- **Standard mode (Ambient XDOP):**
  Used for programming and computer connection

- **Sony P2:**
  On the virtual COM Port that appears in your hardware settings when the ACC501 is connected, a Sony P2 protocol is being emulated. Thus the ACC501 can be recognized by editing programs (AVID express, Media Log) as a virtual machine and the timecode be used for logging, etc.

  *Please note: The Com-Port drivers (PC) / extensions (Mac) matching your system need to be installed to use option 2.*

Download from:


**GPS NMEA – Serial Interface**

A GPS module connected via the Ambient Serial Interface can be controlled from a computer through **USB 1.**

*Please note: Prior to use any GPS function always verify that the GPS receiver emits valid data in menu CONF > 6: GPS.*

*Also, do not activate loop through by USB mode when planning manual GPS offset control as per 6. or when using GPS to tune or set the generator.*

6: GPS Extension:

When no ACCSI (Ambient Serial Interface)s connected to the ACC501, the message “No GPS Module attached” is displayed in the fields for longitude and latitude:

```
<<< WCLK TUNE RTC CONF 
  UTC: 00:00 2000-01-01 00:00:00
  Latitude: No GPS Module
  Longitude: attached!
  SOG: 0.0km/h COG: 0.0°
  Sat's: 0  PPS:0 Alt: 0.0m
  1 On/Off 8 Edit UTC Offset
```

If a ACCSI with GPS receiver is connected to the ACC501, it is powered off by default. “GPS module is switched off” will be displayed in the fields for longitude and latitude:
Please note: To save power the GPS module should only be switched on when needed.

After switching the GPS module on by pressing key 1, at first the message “Waiting for GPS NMEA data…” will be displayed.

Once the GPS antenna has established link with enough satellites to emit valid data, the fields for longitude and latitude will be filled with values and refreshed permanently.

Using the command “8 – Edit UTC Offset”, the GPS time should be adjusted to the local time zone. The offset can be adjusted in steps of 5 minutes, as some countries have an offset that is not full hours. The offset is displayed on the top left (in the graphic above: UTC – 14:45)
6.2 GEN menu

In this menu the timecode generator parameters can be set. The generator starts from 00:00:00:00 and can be set from the following sources:

<table>
<thead>
<tr>
<th>Select</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, Preset</td>
<td>Set generator from different sources</td>
</tr>
<tr>
<td>2, RTC</td>
<td>sets generator to internal real time clock</td>
</tr>
<tr>
<td>3, AUX</td>
<td>sets timecode from standby timecode generator</td>
</tr>
<tr>
<td>4, GPS</td>
<td>sets generator to GPS time</td>
</tr>
<tr>
<td>8, Edit</td>
<td>Manually edit the time, user bits and frame rate</td>
</tr>
<tr>
<td>0, Lock</td>
<td>Locks out keypad. Release with shift + lock.</td>
</tr>
</tbody>
</table>
6.3 LTC menu

In this menu the internal and the external LTC are shown including frame rate, user bits and timecode offset in 1/100 frames.

The menus allow various actions to be taken using the internal LTC generator and the external LTC. The EXT LTC can be present on the Lemo input, the 3.5mm mini jack or the accessory socket.

Press 1, Send: Connects LTC to all TC out pins

A square wave icon appears next to Int. Press again to disconnect

Press 2, Jam: Jams the internal generator once to the external LTC

Select: 1: Time / 2: User bit / 3: Both

The frame rate is not changed. This allows time transfer from one frame rate to the other. No time error when jamming between integer frame rates or between pull down frame rates.

Incremental errors will occur if say 24 Fps external is used to jam 23.976 or 29.97 internal. When drop frame rates are jammed to non-drop rates timecode offsets will occur.

Use non-drop timecode for location recording.

Press 4, Snapshot: Freezes display

Use when one needs to note TC values. Press again to release. Note: all functions carry on. Only the display is frozen.

Press 5, Run/Stop: Stops and runs the timecode generator

This is a test mode and will stop the generator and restart it. To avoid inadvertent stopping of the generator ENTER must be pressed to activate. This feature can be used to test other timecode equipment. When restarting the generator after stopping, Idle will be shown, to indicate that the generator is not jammed to any source.

Please note: Time will be lost if Run, Stop is pressed. To retrieve timecode reset generator from the aux generator in the GEN menu.

Press 0, Lock: Locks out keypad. Release with shift + lock.
6.4 ASCII menu

In this menu timecode can be sent, received and compared using the Aaton ASCII protocol. This protocol sends and receives ASCII messages about timecode and is not a continuous data transfer. The Ambient IR interface also can be used to communicate this protocol with external timecode equipment cable free.

Press 1, ENQ & Cmp: Sends and receives message to enquire and compare status of the connected device and returns status to the display.

Press 2, Send & Cmp: Sends and receives message from connected device and compares to check if correct time has been set.

Press 3, Load: Sends and receives message from selected device and loads value into generator.

Select: 1: Time / 2: User bit / 3: Both

Press 4, L/IR:
The Aaton-ASCII protocol can be transmitted either via the Lemo connector or the infrared interface. Pressing key 4 “L / IR” toggles between infrared and Lemo connector:

When set to infrared, the token “IR” is displayed next to “Ext:”

The procedure of setting or enquiring of the time is identical for Lemo or IR-interface.

Press 0, Lock: Locks out keypad. Release with shift + lock.
6.5 MIDI menu

Changes the status of the MIDI timecode (MTC) generator.

<table>
<thead>
<tr>
<th>GEN LTC</th>
<th>ASCII</th>
<th>MIDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Int: WWM</td>
<td>00:00:00:00</td>
<td></td>
</tr>
<tr>
<td>idle</td>
<td>00.00.00.00</td>
<td>24 F</td>
</tr>
<tr>
<td>MTC Out:</td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>1 On/Off</td>
<td>0 Lock</td>
<td>0 Lock</td>
</tr>
</tbody>
</table>

**Press 1, On/Off:** Turns the MTC output on or off.

*Please note: When the MTC generator is "on" a M will appear in the Gen TC line of the LTC menu.*

**Press 0, Lock:** Locks out keypad. Release with shift + lock.

6.6 WCLK menu

The word clock menu controls the parameters of the word clock and turns the word clock generator on or off.

44.1 kHz to 192 kHz clock rate with pull up and pull down are provided.

All word clocks are generated by integer division from a resonator oscillator in fundamental mode and have sub-nanosecond jitter.

<table>
<thead>
<tr>
<th>WCLK Freq.</th>
<th>Pull Up/Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.1 kHz</td>
<td>x 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output:</th>
<th>On</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 On/Off</td>
<td>0 Edit</td>
</tr>
</tbody>
</table>

**Press 1, On/Off:** Turns the word clock generator on or off.

*Please note: When the word clock generator is "on" a W will appear in the Gen TC line of the LTC menu.*

**Press 8, Edit:** Changes the word clock settings

**Press 0, Lock:** Locks out keypad. Release with shift + lock.
6.7 TUNE menu

This menu is used to tune (calibrate) other Lockit devices or for the Controller to calibrate its reference oscillator to an external source.

The internal reference can be tuned to + - 10ppm with a resolution of 0.15 ppm per digit. The tuning number DAC is shown on the display as well as recent tuning history. The tuning process may have to be carried out several times if the tuning error is large (over 4ppm). The tune values are estimated and the final value approached and met after up to 5 tune processes.

Please note: Always make sure that the timecode output is turned off when tuning intern or extern to avoid re-jamming a ACL202CT (up to firmware 8.2 it will rejam every 5 seconds and thus cause false readings when the oscillator is not tuned in yet) or crosstalk from the timecode signal. If timecode out is “on”, you will get a warning message to turn it off first.

Press 1, Tune extern: The device connected can be tuned to the Controller.

Please make sure “tune signal out” is off, i.e. no wave symbol displayed next to “INT” (see command # 3).

Press 1, Ref: The tuning reference signal of the external device is scanned and compared to the internal clock. This is the most used mode as the controller is master in most cases.

After scanning, the DAC value of the external device is read out and a new DAC or “tune value” proposed. You will be asked to ”confirm or edit new tune value”. To confirm, press "Enter". To change values, use the "Up" or "Down" Keys.

Repeat tuning until difference is not more than 0.1 ppm.

Press 2, Man: The tune steps can be entered manually. (1 DAC value difference equals 0.15ppm)

Press 2, Tune intern: This function allows calibrating the controller’s internal reference oscillator to an external source.
Please make sure “tune signal out” is off, i.e. no wave symbol displayed next to “INT” (see command # 3).

Press, 1 Ref: Calibrates the controller’s internal oscillator to another Lockit device’s reference signal such as an ACLxx, ACD301, ALL601, a Sound Devices 7series recorder, an Arri Alexa or other 3rd party products which have a Lockit system built in. After scanning, the DAC value flashes you will be asked to "confirm or edit new tune value". To confirm, press "Enter". To change values, use the "Up" or "Down" Keys.

The ACC501 automatically rescans.

Repeat tuning until difference is not more than 0.1 ppm, exit by "ESC"

Press 2, Man: Manually shifts the Controller’s internal reference oscillator in 0.15ppm steps.

Press 3, GPS: Calibrates the Controller’s internal reference oscillator to a GPS source having the 1 second timing pulse.

Repeat tuning until difference is not more than 0.1 ppm, exit by "ESC"

Press 4, LTC: Calibrates the Controller’s internal reference oscillator to an external LTC. The Controller measures the LTC till enough error has accumulated to make a calculation to tune the internal reference. The external timecode is scanned for a minute. If this results in a value with low enough jitter, tuning is continued. If there is too much jitter, the scan is repeated for a 10 minutes period.

Repeat tuning until difference is not more than 0.1 ppm, exit by “ESC”

Press 5, PAL: The incoming video signal present on the “EXT.SYNC” BNC connector is scanned, the difference displayed and a new DAC (tune value) proposed.

Press "enter" to write new tune value into memory. Repeat procedure until difference is not more than 0.1 ppm

Repeat tuning until difference is not more than 0.1 ppm, exit by “ESC”

Press 3, Tune signal on/off: For board revisions “A” or later: it is now possible to tune one Controller from another.

The reference Controller has to send out the “Tune signal”, a 1.92 MHz clock.

When Tune signal out is “on”, a little wave symbol is displayed next to “INT”

Toggle “on – off” by pressing key 3.
Please note: When Tune signal out is “on”, external devices can not be tuned, nor does “Tune intern” function. This function is exclusively for putting the ACC501 in a slave mode to be able to tune another unit using it as reference!

Press 0, Lock: Locks out keypad. Release with shift + lock.

6.8 RTC menu

This menu sets the Real Time Clock. The RTC runs from its own battery and X-tal oscillator and contains all calendar data such as days in the month, leap year etc. It is an independent on board clock with its own battery and crystal.

```
<<<< WCLK TUNE [RTC] CONF [ ]
RTC YYYY-MM-DD hh:mm:ss
current: 2000-00-00 00:00:00
```

Please note: The RTC does not run from the tuned internal reference and is not as accurate. It is used only to retrieve the actual time of day and the date when starting the timecode generator.

Press 8, Edit: The RTC parameters can be changed or corrected manually.

Press 0, Lock: Locks out keypad. Release with shift + lock.
7. **Technical Data:**

**Powering:**
- Batteries: 4x AA-battery (Mignon-battery, each 1.5V)
- Extern power via Lemo-connector: max. 12Volt
  - Pin 1: Ground,
  - Pin 4: DC 5 – 12 Volt
- Via USB-connector

**Connectors:**
- LEMO 5pin, FGG/JGG.0B.305.CLADxx(ZN)
  - Pin 1: Ground
  - Pin 2: TC in, nominal level 100 mV min., DC decoupled
  - Pin 3: Aaton ASCII protocol in/out
  - Pin 4: Tune signal @ 1.92 MHz or ext. power max. 12Volt
  - Pin 5: TC out, TTL level
- 3.5 Mini jack
  - Tip = LTC-OUT 1 Volt pp
  - Ring = LTC-IN
  - Sleeve = Ground
- USB 1 and 2
  - Pin 1: VBUS +5 VDC
  - Pin 2: D- Data -
  - Pin 3: D+ Data +
  - Pin 4: NC
  - Pin 5: GND Ground

**SUB-D 15 pin**

**Communications parameters:**

<table>
<thead>
<tr>
<th></th>
<th>Lemo socket</th>
<th>Infrared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>2400</td>
<td>115200</td>
</tr>
<tr>
<td>Data bits</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Parity</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Dimensions (housing):** 14cm x 7.6cm x 3cm

**Weight:** 300 grams (no batteries)
8. Warranty & Approvals

8.1 Warranty

Ambient Recording GmbH warrants the Clockit Controller ACC501 against defects in materials and workmanship for a period of ONE (1) year from date of original retail purchase. This is a non-transferable warranty that extends only to the original purchaser. Ambient Recording GmbH will repair or replace the product at its discretion 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 ACD301 RF, 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.
8.2 Approvals

CE Conformity Statement:

Declaration of Conformity

Manufacturer's Name: Ambient Recording GmbH
Manufacturer's Address: Schleissheimer Str. 181 C
DE-80797 Muenchen, Germany

declares that the product:

ACC501, Clockit Controller

is in conformity with:

Document No.
+ Corrigendum April 2003 + A2:2002

Test Report No. 50139-060906 (Edition 1)
by SENTON GmbH, EMC-Test Center
DE-94315 Straubing
January 26th 2007

FCC Statement

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.
experience quality.