



# CLOCKIT CONTROLLER ACC501

Operating Manual  
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# **AMBIENT CLOCKIT CONTROLLER ACC501**

## **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.

Additionally it offers a variety of new features such as wordclock 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 time code generator, keypad, display and memory functions, a special low-power MCU monitors the power converters and an auxiliary generator is maintaining frame-accurate time code 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. This implies that neither all accessible ports are functional as this manual is issued, nor that we can foresee when dedicated features will be implemented to make use of them.

User-manageable software updates will become available from the dedicated product page on <http://download.ambient.de/products/clockit/ACC501/> so please frequently check back for software updates and changelogs.

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

## **The ACC501 features the following ports:**

### **Lemo 5 pin, common industry TC standard**

- Pin 1 Gnd
- 2 TC in, nominal level 100 mV min., DC decoupled
- 3 Aaton ASCII protocol in/out
- 4 Tune signal @ 1.92 MHz
- 5 TC out, TTL level

### **Infrared Port**

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

### **BNC, Sync in**

This input will accept sync signals such as composite video PAL, NTSC or trilevel sync and analyse/ identify them providing vertical sync and field number signals in future software revisions. The signal can be used to externally synchronise the Controller's time code generator or to tune the reference oscillator. Then, 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. Thus the total time code drift and diversion of a working system is minimised for most ease in edit.

### **BNC, Wordclock Out**

The wordclock output is in sync to the internal time code reference generator which makes it most useful when synchronizing equipment like stand alone audio recorders or software based solutions like the Metacorder from Gallery Software.

44.1 and 48 KHz with pull up and pull down are available natively. Higher wordclocks up to 192 KHz pull-up can be achieved via selectable multipliers of x1, x2 and x4.

### **USB 1**

Used for programming new software and as serial interface for SMPTE/P2 conversion. EXT power in 5 Volts.

### **USB2**

Serves as MIDI TC I/O interface for SMPTE/MTC conversion, EXT power in 5 Volts.

Pin 1 VBUS +5 VDC  
2 D- Data -  
3 D+ Data +  
4 NC  
5 GND Ground

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.

**NEVER CONNECT 2 DIFFERENT COMPUTERS SIMULTANEOUSLY!**

### **3.5mm Minijack, TC in/out**

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

### **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.**

### Keypad.

The keypad is organised 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.

### 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 organised 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.

An internal mini SD flashcard slot can be equipped by the user to stack up the internal memory for logging larger data quantities (future software).

## 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 Clockit range. When connecting to 3<sup>rd</sup> parties equipment carefully consult the referring user manuals for requirements to evaluate the possibility of proper interfacing. Follow the manufacturers 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.

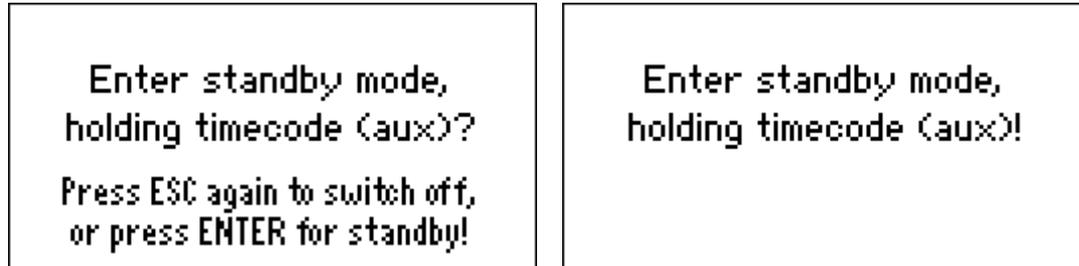
### POWERING ON

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 time code generator screen (**GEN**).

## **POWERING OFF**

When switching off either standby or a complete power-down can be selected. In standby mode the time code 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.



### **press ESC again:**

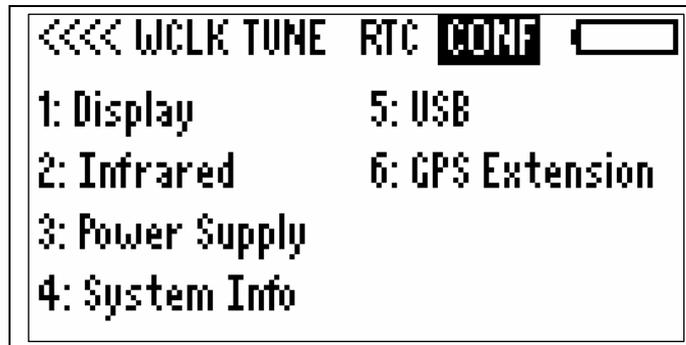
Unit is powered off for maximum save of battery capacity, time code is lost.

### **press Enter:**

Unit enters standby mode, AUXGEN holds TC until batteries are drained completely.

## MENUS

### CONF (menu)



This is a general menu for the controller status and control and monitoring of peripherals.

#### Command

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.

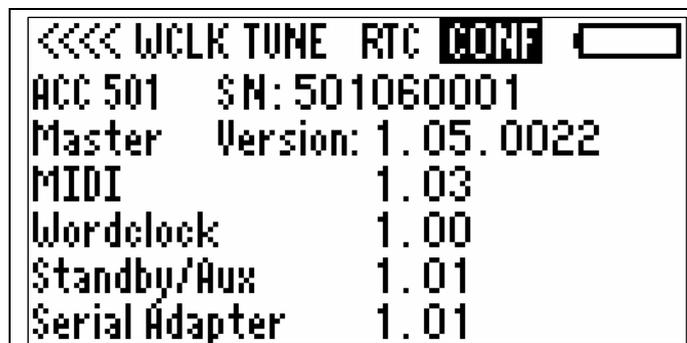
#### **3: Power supply**

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.

## 5: USB Port Settings

**USB Port 1** can be set to:

1. Standard mode (Ambient XDOP):  
used for programming and computer connection
2. 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 time code 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:

[http://www.silabs.com/tqwWebApp/public/web\\_content/products/Microcontrollers/USB/en/mcu\\_vcp.htm](http://www.silabs.com/tqwWebApp/public/web_content/products/Microcontrollers/USB/en/mcu_vcp.htm)

3. GPS NMEA – Serial Interface

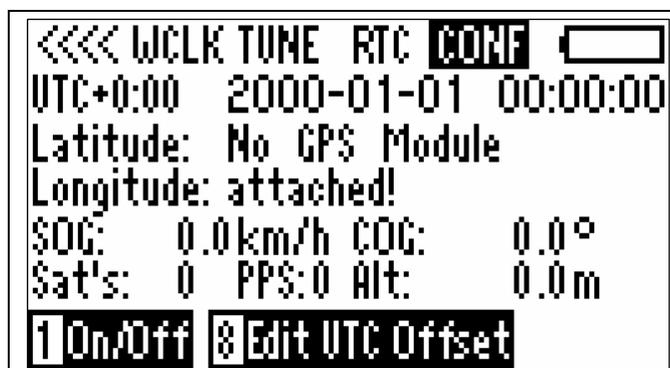
A GPS module connected via the Ambient Serial Interface can be controlled from a computer through **USB 1**.

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) is connected to the ACC501, the message "No GPS Module attached" is displayed in the fields for longitude and latitude:



The screenshot shows a monochrome LCD display with the following text:  
<<<< WCLK TUNE RTC CONF [Progress bar]  
UTC+0:00 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:

```
<<<< WCLK TUNE RTC CONF 
UTC+0:00 2000-01-01 00:00:00
Latitude: GPS module is
Longitude: switched off!
SOG: 0.0km/h COG: 0.0°
Sat's: 0 PPS:0 Alt: 0.0m
1 On/Off 8 Edit UTC Offset
```

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..." is displayed.

```
<<<< WCLK TUNE RTC CONF 
UTC+0:00 2000-01-01 00:00:00
Latitude: Waiting for
Longitude: GPS NMEA data...
SOG: 0.0km/h COG: 0.0°
Sat's: 0 PPS:0 Alt: 0.0m
1 On/Off 8 Edit UTC Offset
```

After 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.

```
<<<< WCLK TUNE RTC CONF 
UTC-14:45 2007-09-07 12:00:00
Latitude: 45° 12.1234' N
Longitude: 12° 12.1234' E
SOG: 5.0km/h COG: 123.9°
Sat's: 10 PPS:0 Alt: 1000.0m
1 On/Off 8 Edit UTC Offset
```

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)

## GEN (menu)



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

### Commands

#### Press 1 Preset, Set generator from different sources

Select 1 RTC sets generator to internal realtimeclock

Set: time, user (date and or userbits), both

Select 2 RESET sets selected bits to zero and generator starts counting

Set: time, user, both.

Select 3 AUX sets time code from standby Time code generator

Set: time, user, both

Select 4 GPS sets generator to GPS time

Set: time, user, both

#### Press 8 Edit, Manually edit the time, userbits and frame rate

Select 1 Time

Select 2 Userbits

Select 3 Frames

#### Press 9, Log, Future logging software

#### Press 0 Lock, locks out keypad nothing can be changed.

Free with shift + lock

## LTC (menu)

In this menu the internal and the external **LTC** are shown including **frame rate**, **userbits** and **time code 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 Minijack or the **Accessory socket**. (Later MIDI TC-in on USB).



### Commands

#### Press 1. Send, Connects LTC to all TC out pins.

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

Note: When the LTC out is on, can be locked "on" using the lock button.

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

Set bits: time, user, both.

Note the frame rate is not changed. This allows time, userbit transfer from one frame rate to the other. Note. No time error when jamming between integer frame rates or between pull down frame rate. 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 time code offsets will occur.

**Use non-drop time code for location recording.**

#### Press 3. C.Jam, Continuous jam, Future software.

Will continuously jam (lock) generator to internal LTC. Frame rate independency will allow "Time code gearbox" and "fly wheeling" if external TC is removed. Reference oscillator will be shifted to fit external TC and improve flywheel accuracy.

**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 time code 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 two times. This feature can be used to test other time code equipment. When restarting the generator after stopping, **Idle** will be show, to indicate that the generator is not jammed to any source.

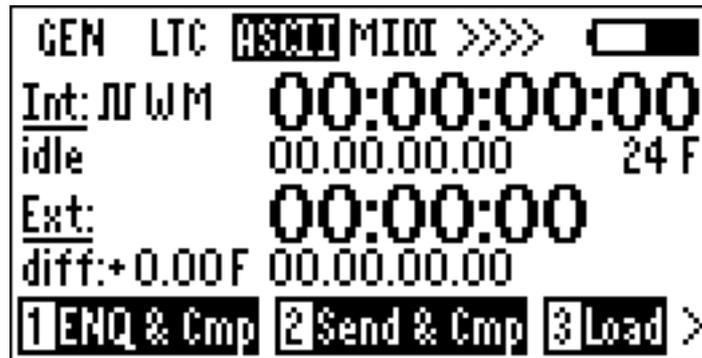
Note: time will be lost if **Run, Stop** is pressed. To retrieve time code reset generator from the aux generator in the **GEN** menu.

**Press 9 Log mode, Future software**

**Press 0 Lock, Locks out keypad.**

Nothing can be changed. Used to prevent settings being changed.  
Free with shift + lock

## ASCII (menu)



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

### **Commands**

#### **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. 3, Both.

**Note:** this process has the same effect as jamming the generator from an external source with LTC, but the load process is different. Only time and/or userbits are transferred. It is a single action. There can be no continuous jam using the Aaton ASCII protocol.

#### **Press 9 Log mode**

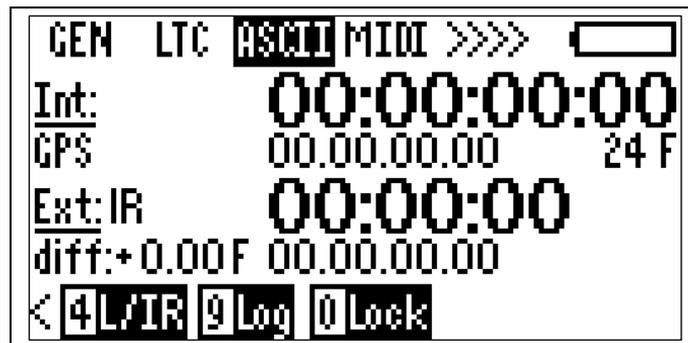
Future software

#### **Press 0 Lock**

Locks out keypad. Nothing can be changed. Used to prevent settings being changed. Free with shift + lock

#### **Aaton-ASCII protocol via Infrared communication**

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.

Communications parameters:

	<b>Lemo socket</b>	<b>Infrared</b>
Baudrate	2400	115200
Databits	8	8
Parity	keine	keine
Stoppbits	1	1

## MIDI (menu)



Changes the status of the midi time code (MTC) generator. In this first software version the MTC generator is locked to the main time code generator at all times. In future software the MTC in will be activated as well as the possibility to run the MTC generator at a different frame rate from the main LTC generator allowing a gearbox function.

### Commands

#### Press 1 On/Off

Turns the MTC output on or off.

**Note:** When the MIDI generator is "on" an M will appear in the Gen TC line of the LTC menu.

#### Press 9 Log mode

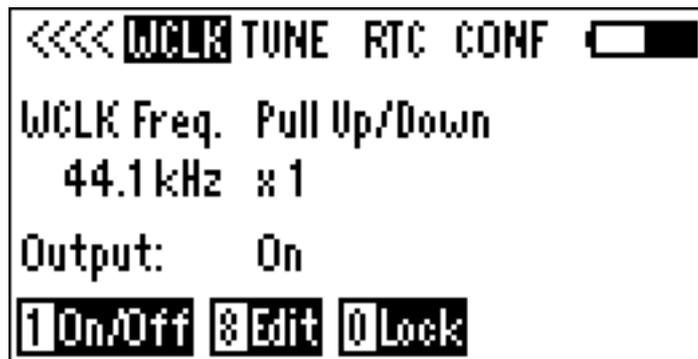
Future software

#### Press 0 Lock

Locks out keypad. Nothing can be changed

Used to prevent settings being changed. Free with shift + lock.

## WCLK (menu)



The wordclock menu controls the parameters of the wordclock and turns the wordclock generator on or off. 48 KHz and 44.1 KHz x1, x2, x4, with pull up and pull down are provided giving a maximum frequency of 192Khz pull up. All wordclocks are generated by integer division from a resonator oscillator in fundamental mode and have subnanosecond jitter.

### Commands

#### Press 1 On/Off

Turns the wordclock generator on and off and shuts down the oscillator and counters saving Power.

**Note:** When the wordclock generator is "on" a W will appear in the Gen TC line of the LTC menu.

#### Press 8 Edit

Changes the wordclock settings

#### Press 0 lock

Locks keypad

## TUNE (menu)

```
<<<< WCLK TUNE RTC CONF   
Int:      src:man  date: 01.01.2006  
diff: +0.0ppm new:107 dac:107  
Ext:  
                                           dac: ---  
[1] Tune extern [2] Tune intern [0] Lock
```

This menu is used to tune (calibrate) other Clockit 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 always make sure that the time code output is turned off when tuning intern or extern to avoid re-jamming a ACL202CT (up to firmware 8.2 it will re-jam every 5 seconds and thus cause false readings when the oscillator is not tuned in yet) or crosstalk from the time code signal. If time code out is "on", you will get a warning message to turn it off first.

## Commands

### 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 is the internal reference of the Controller. This is the most used mode as the controller is master in most cases. Controller selects tune value to reduce tuning error.

After scanning the value 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 digit = 0.15ppm)

### **Press 2 Tune intern**

Using this menu the controller's internal reference oscillator can be calibrated to an external source.

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



### **Press1 Ref**

Calibrates the controller's internal reference oscillator to another Clockit unit such as a ACL202CT, ACD301, ALL601 or a Sound Devices 7'series recorder.

After scanning the value 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 .

After tuning, the scan is repeated automatically and the difference displayed.

Repeat tuning until difference is not more than 0,1 ppm.

### **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  $\mu$ S timing pulse. Note GPS time can also be downloaded.

### **Press 4 LTC**

Calibrates the Controller's internal reference oscillator to and external LTC. The Controller observes the LTC till enough error has accumulated to make a calculation to retune the internal reference.

The external time code is scanned for a minute. If this results in a value with low enough jitter, tune is continued. If there is too much jitter, the scan is repeated for a 10 minutes period.

### **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 keypad

## 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. 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 time code generator and for logging purposes.

### **Press 8 Edit**

The RTC parameters can be changed or corrected manually.

### **Press 0 Lock**

Locks keypad.

## Battery symbol

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.

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08.04.2006

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