

CHAPTER IV TIME CODE ARES-C

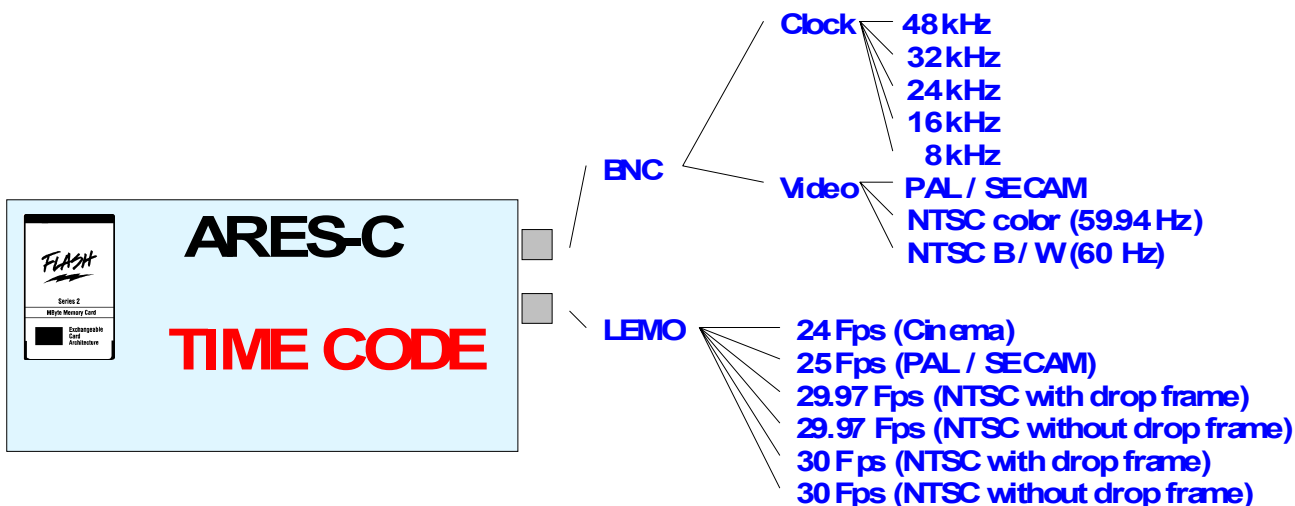
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1.0 GENERAL

Up until now the audio / video domain has always related the word SYNCHRONIZATION with the speed and direction of a tape transport, as is the case with an analogue machine using centre track time code. That is to say that the speed of the transport is directly controlled with respect to an incoming time code signal, and if this time code were to be reversed then the machine itself will reverse. In the case of the ARES-C when we talk about synchronization possibilities, we cover all aspects of time code, the use of an external video reference, using external clock etc.

All the different synchronization methods are selected on the ARES-C by the menu mode. (See MENU's) The diagram below shows the synchronization possibilities of the ARES-C, each of which will be covered in more detail.

The ARES-C can accept the following references:



The actual connectors for these various synchronization inputs and outputs are located on the right side of the ARES-C. The Video signals are via a standard BNC connector (terminated internally 75 Ohms). The External CLOCK SYNC is also on the BNC connector and the time code is via a 5 pin LEMO connector.

1.1 VIDEO REFERENCE

Composite video signals of the PAL, SECAM or NTSC standards can be fed to the BNC socket. A composite video signal has the horizontal sync (line sync) just before the burst, and this horizontal sync is extracted from the signal by the ARES-C and is used as a reference for the machine's VCXO crystal oscillator (Voltage controlled crystal oscillator) or VCLO (Voltage controlled local oscillator). All the other internal frequencies are in turn referenced to this VCXO or VCLO.

1.2 EXTERNAL SYNC

The external sync input is yet another way to synchronize the internal clocks of the ARES-C. The advantage of this 5V logic input is that it can be used to control the VCXO (Voltage Controlled Crystal Oscillator) from an external source. The input can be 48 kHz, 32 kHz, 24 kHz, 16 kHz or 8 kHz with a logic voltage level from min. 0.5 V to 5.0 V. This signal can be fed to the machine through the BNC connector.

2.0 TIME CODE

SMPTE/EBU time code has become a standard for film and video applications as an accurate and reliable means of machine synchronization and sequence location. Location of particular points on a digital tape is often done using ID markers, however these do not allow direct synchronization to film or video during post production.

2.1 TIME CODE FORMATS

The ARES-C can accommodate all presently recognized formats, these being the following:

24	FPS	-Film applications
25	FPS	-PAL/SECAM Video and film to video applications
29.97	FPS	-NTSC black and white television
29.97	DF	-NTSC colour television
30	FF	-Film applications (NTSC)
30	DF	-Film to video (NTSC)

The time code system of the ARES-C also accommodates standard USER bits in either DATE or FREE modes.

The time code system on the ARES-C is equipped with two time code readers (for "external" and "off tape" time codes) as well as an internal time code generator according to the SMPTE / EBU 80 bits longitudinal time code format. The time code is recorded as a burst or stamp at the beginning of each recorded file. The ARES-C can also be fitted with an internal chase synchroniser option, allowing it to synchronize to any external time code.

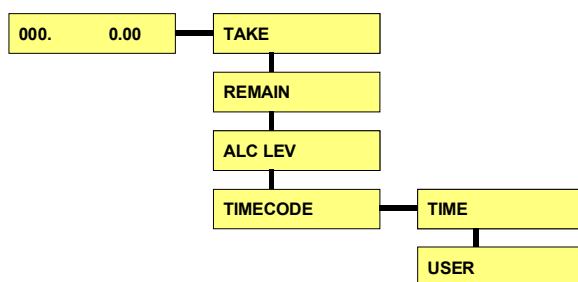
The time code input and output is located on a 5 pole LEMO connector, the pinning of which corresponds to that of the IV-STC, the NAGRA-D and T-Audio-TC. The time code system of the ARES-C is more versatile than that of the IV-STC or NAGRA T-Audio. It offers possibilities that were not previously available and also requires care on the part of the operator to ensure that the correct information is being recorded and displayed at all times.

The QCTCU time code cable delivered with the machine has one connection marked "RS 232". This function is for the AATON interface for the IV-STC and is not implemented in the ARES-C.

The default values are as follows:

25 fps	(Generator format)
INT. GEN.	(Record source)
FREE RUN	(Generator mode)
SYNC	(Chase mode)
REF. TC.	(Chase reference)
VAR. CLK.	(Sync mode)

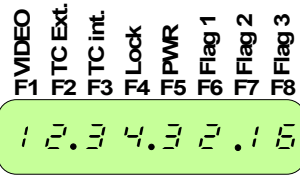
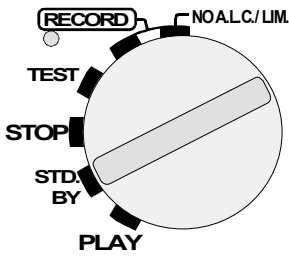
2.2 DISPLAYING A TIME CODE ON FRONT DISPLAY



The small 8 digit 14 segment front display of the ARES-C can be used to display time code.

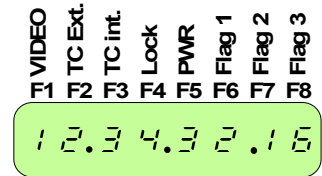
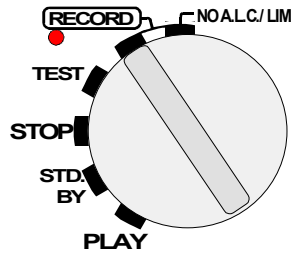
Time code may be selected as one of the display options for the front panel LCD on the ARES-C. To display time code, press and hold the "SHIFT" key, press the right-arrow once followed by the down-arrow key until "TIMECODE" is displayed. While continuing to hold the "SHIFT" key, press the right-arrow key, then the down-arrow key to select either "TIME" or "USER". Press "EXE".

Depending on the position of the main switch, time code record or time code play will appear:



If the main selector is in the “STD. BY” or “PLAY” position, the display will show the time code of the current playback from the card.

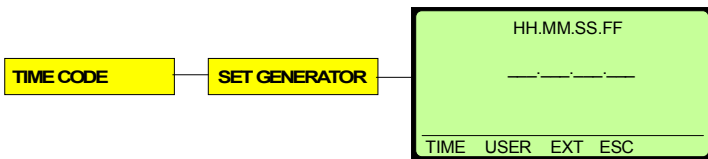
If the main selector is in the “TEST” or “RECORD” position, the display shows the time code that will be recorded.



2.3 SETTING THE TIME CODE (INTERNAL GENERATOR)

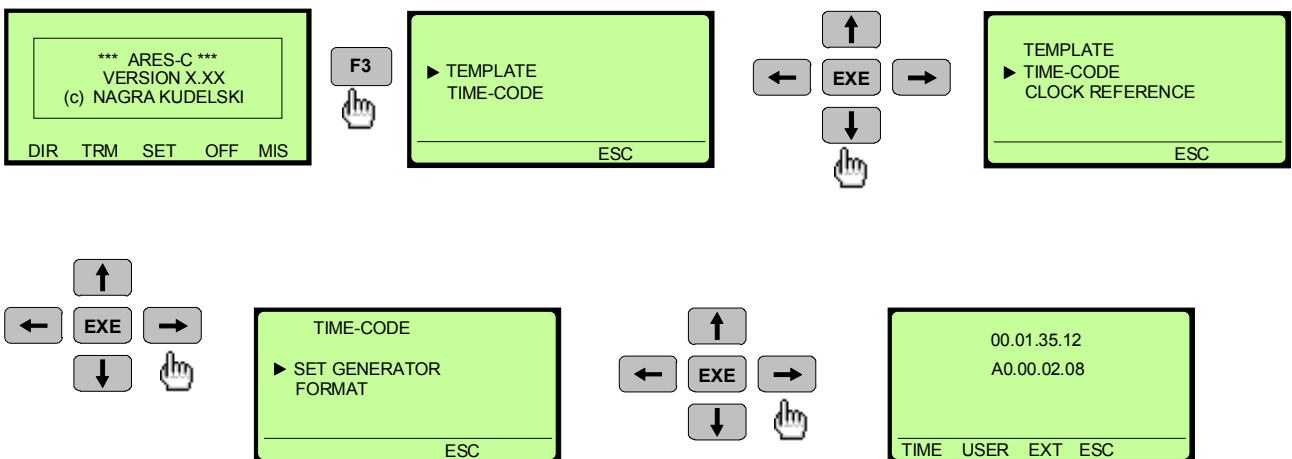
The internal generator of the ARES-C can be set using the numeric keys along with the arrow keys on the deck of the ARES-C, or from an external time code source. Once the internal generator has been set from the EXT source the counting is continued by means of the internal generator, hence there is no need to have a cable link permanently.

2.3.1 KEYBOARD SETTING OF THE INTERNAL GENERATOR

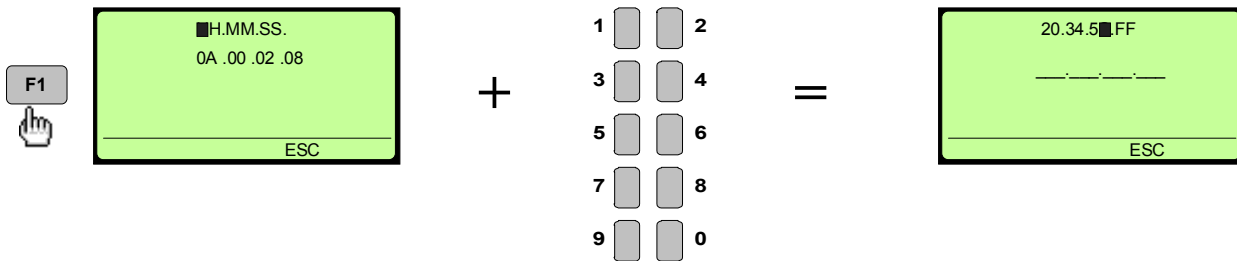


It is important to remember that when setting the time code, the format and frame rate must be correct. See paragraph 2.3.2. Once any settings have been executed in the machine, these will be remembered even when the power is turned off, as long as there is

sufficient power in the battery. **To set the internal generator from the keyboard proceed as follows:**



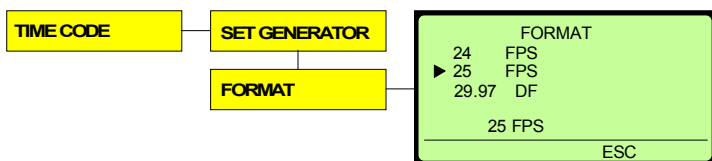
In this menu, 3 different possibilities are available: “TIME” to set the internal time code generator from the numeric keypad; “USER” to set the user bits from the numeric keypad; “EXT” to set the time code and user bits from an external time code source (Lemo connector). **To set the time code from the numeric keypad, proceed as follows:**



At the moment that the seconds are introduced, the internal time code generator starts running with the new value. Frames cannot be entered.

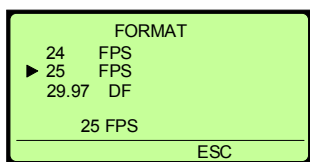
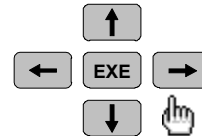
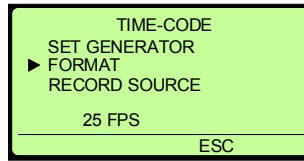
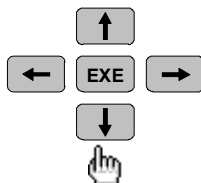
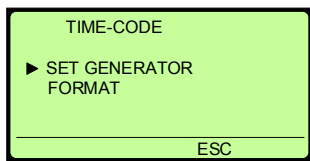
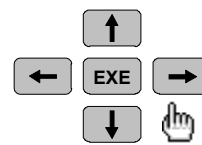
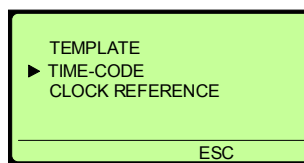
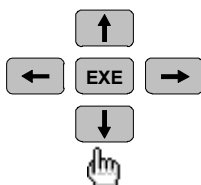
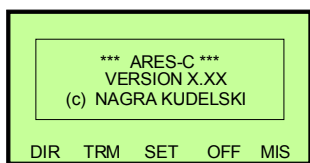
Once the time code has been entered, by pushing F2 “USER”, the user bits can be entered in the same way. At the moment that the last user bit is entered, the internal generator is automatically set.

2.3.2 SELECTING THE TIME CODE FORMAT (Frame rate selection)

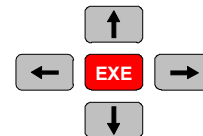


From this point, access is given to select the time code format.

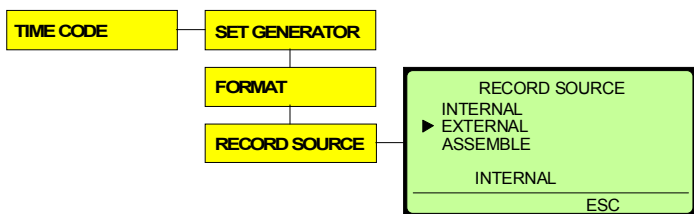
To set the format, proceed as follows:



By scrolling using the up and down arrow keys, select the desired frame rate followed by

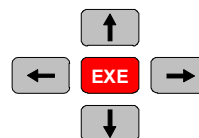


2.3.3 SELECTING THE RECORDING SOURCE (INTERNAL generator or EXTERNAL or ASSEMBLE)



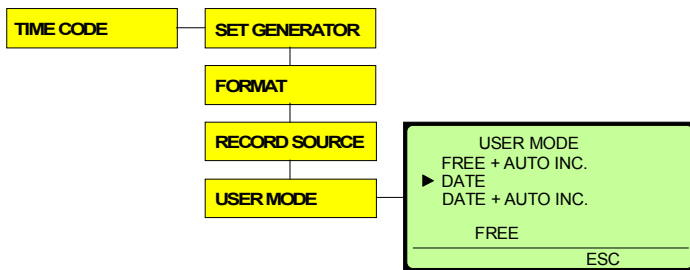
Proceed in the same way as in the previous paragraph to find this menu.

By using the up and down arrow keys, select the desired source and push



When “ASSEMBLE” is selected and the machine is set to record, then a seamless time code assemble will be performed.

2.3.4 SELECTING THE USER MODE OF THE GENERATOR



Proceed in the same way as before to find this menu:

“**FREE**” means that in any case, the user bits will not change.

“**FREE + AUTO INC.**” means that every time a recording is started, the last two user bits are incremented by “01”:

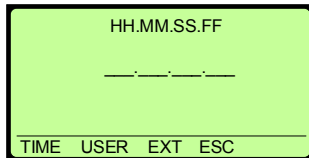
Example; Record no. 1 user bits are “20.13.12.00”, Record no. 2 user bits will be “20.13.12.01”.

“**DATE**” means that the user bits are used to set the date. The date is automatically incremented after 23H 59min. 59sec. Example; February 28, 98 to 01 March, 98: user bits at 23H 59min. 00sec. are “28.02.98.00”, one minute later they become “01.03.98.00”. “**DATE + AUTO INC.**” means that the first 6 digits are still dedicated for the DATE and that the last two digits increment by 01 at every record.

Example; Record no. 1 user bits are

2.4 SETTING THE TIME CODE FROM EXTERNAL

Connect first to the Lemo connector, an external time code source. Verify that the format of the external time code source and the internal time code format are the same. Follow the steps in paragraph 2.3.1 to find the following menu, then continue accordingly:



The Internal generator is immediately set from the external time code source. Verification is possible by observing the time code in the TEST position of the main function selector switch. See paragraph 2.2.

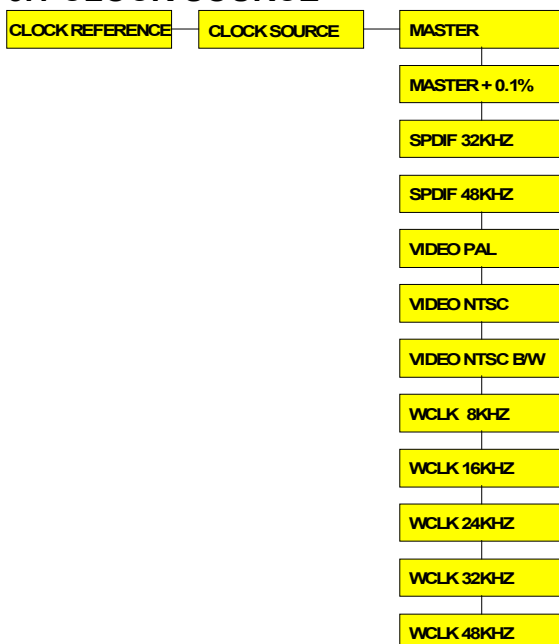
2.5 USING THE ARES-C AS MASTER TIME CODE CLOCK

First set the ARES-C time code generator to “INTERNAL” as described in paragraph 2.3.3

If the main selector is in the TEST or RECORD mode, the internal time code generator is fed to the time code output and can be used to set the external equipment. If the main selector is in the STD. BY or PLAY position, then output time code is from the currently selected take on the PCMCIA card.

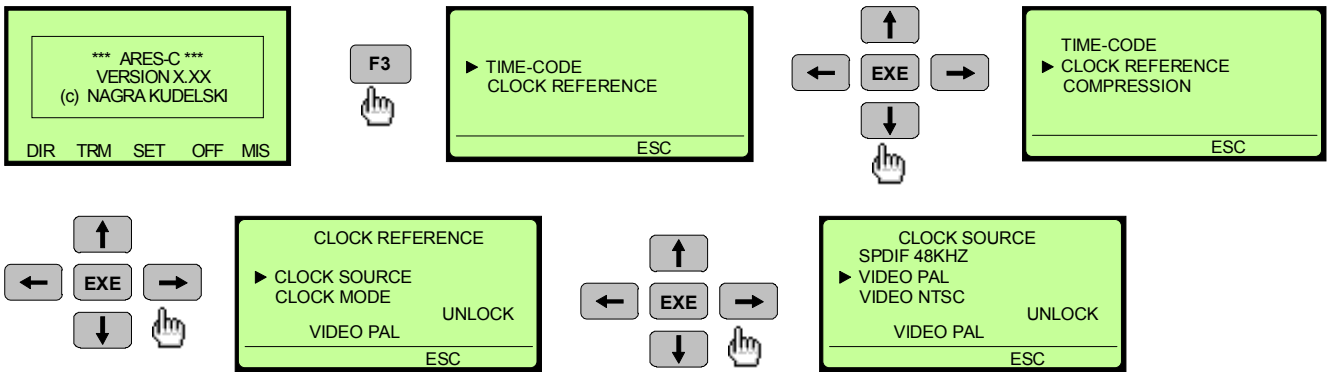
3.0 CLOCK REFERENCE

3.1 CLOCK SOURCE



When operated independently, the ARES-C’s digital audio and time code circuits are running from the machine’s internal master clock which has an accuracy of ± 3 PPM. In addition for special applications, it is possible to increase the frequency of the master clock by + 0.1 %. The ARES-C clock may also be synchronized to a variety of external reference signals, including digital audio SPDIF at 32 kHz or 48 kHz, word clock at 8 kHz, 16 kHz, 24 kHz, 32 kHz or 48 kHz, and video in the standard PAL, NTSC or NTSC B & W formats. These signals are fed to the BNC connector which is internally terminated with 75 Ohms. In the case of SPDIF or word clock, their frequency must correspond to the sampling frequency of the selected compression scheme.

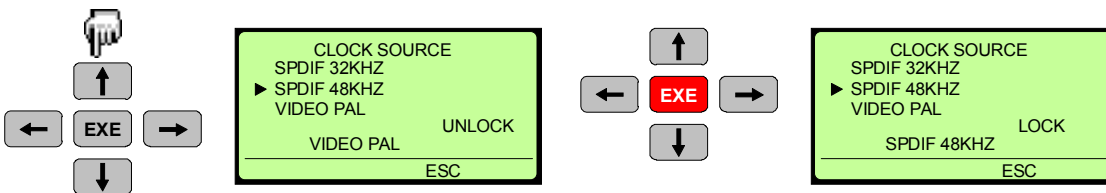
To select an external or internal sync, proceed as follows: as an example, the ARES-C was set to “VIDEO PAL” and needs to be set for SPDIF 48 kHz;



Important: Observe in the right lower corner, the message “UNLOCK”. Once the “CLOCK REFERENCE” menu is selected and the marker sits on “CLOCK SOURCE”, the menu shows which source was selected before. In this case, it shows “VIDEO PAL”, but unlocked because no PAL video signal was fed to the BNC connector.

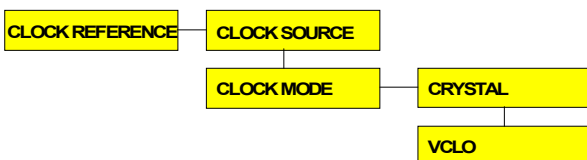
Simultaneously, the 4 led's  on deck will start blinking

The signal fed to the BNC connector in this example is a SPDIF 48 kHz signal.



This time, the message shows “LOCK” which means that the internal generator is locked with the external source.

3.2 CLOCK MODE



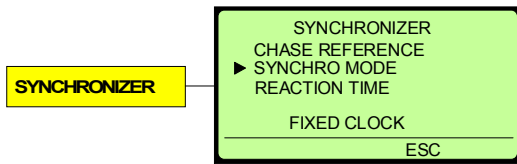
Two possibilities are available, “CRYSTAL” or “VCLO”. In the crystal position, the external reference signal supplied to the BNC connector must be very precise; it may not deviate more than ± 100 PPM from center frequency, otherwise the ARES-C clock will not be locked.

If the ARES-C is running on Crystal and Master clock, the main crystal range becomes ± 3 PPM guaranteed from -30 to $+70$ degrees Celsius. The time code crystal delivers this high quality result.

In situations when external reference frequencies are used to “pull up” or “pull down” the ARES-C clock to non-standard frequencies that are outside the crystal acceptance range, the VCLO mode is available. The VCLO acceptance range is $\pm 4\%$.

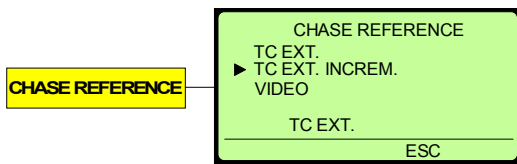
4.0 SYNCHRONIZER **ONLY APPEARS IF THE OPTION IS INSTALLED.**

This submenu only appears in the “SET” menu if the option is installed.



4.1 CHASE REFERENCE

This is the selection of the external reference that is to be used by the internal chase synchroniser. The choices are TC EXT, TC EXT. INCREMENT or VIDEO.



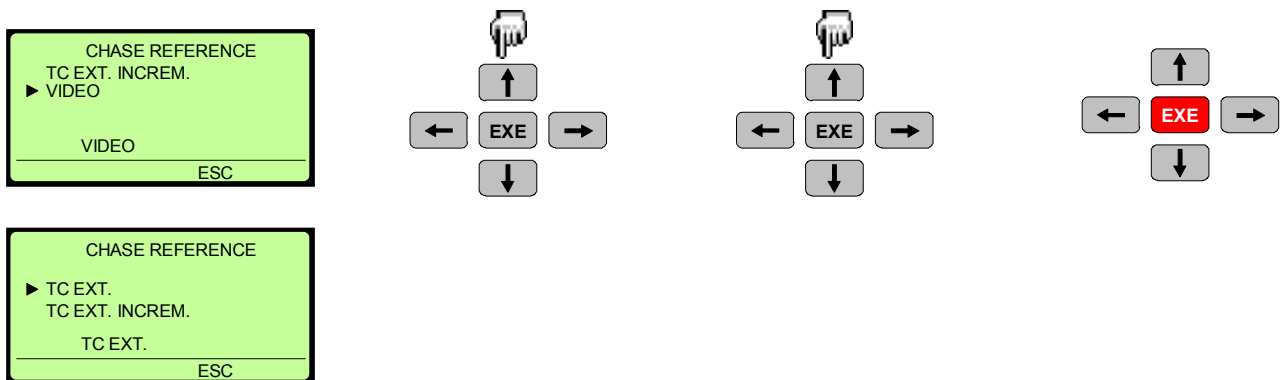
If “**TC EXT**” is selected, the ARES-C, once in the chase mode, will synchronise with the incoming time code signal. If the offset on the ARES-C is equal to zero, both external & internal time codes must be identical. The offset possibilities are described in paragraph 5.3.

Make sure that the external TC, the TC on the card and the settings of the TC format of the ARES-C are the same.

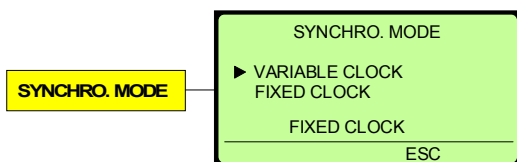
If “**TC EXT. INCREMENT**” is selected, the ARES-C, once in the chase mode, will sync also with the incoming time code. This selection allows NON-MATCHING time codes to be locked together assuming the format is the same. The offset (or difference) is automatically calculated when sync is selected. The incoming time code must be of the same format of the playback file time code as well as the time code format of the ARES-C.

If “**VIDEO**” is selected, the ARES-C, once in the chase mode, will synchronise with the incoming video signal.

The following example shows how to change the chase reference from “VIDEO” to “TC. EXT.”



4.2 SYNCHRONISATION MODE



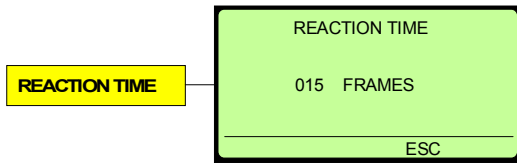
If “**FIXED CLOCK**” is selected, the ARES-C will generate his internal clocks by using the internal VCXO (Voltage Controlled X-tal Oscillator). This internal oscillator has an accuracy of ± 3 PPM.

If “**VARIABLE CLOCK**” is selected, the ARES-C will generate his internal clocks by using the VCLO (Voltage Controlled Local Oscillator). This oscillator permits to derive from the centre frequency with max. $\pm 4\%$. This selection should be used in the case of:

- Speed up or slow down applications.
- If UNLOCK appears with VCXO.

Attention: In the case of “VARIABLE CLOCK”, the sampling frequency of the AES bus will automatically follow the VCXO. This means that if the VCXO is controlled to be 4% higher than his centre frequency, the AES bus running with 48kHz sampling rate will be 4 % higher as well (49.92kHz).

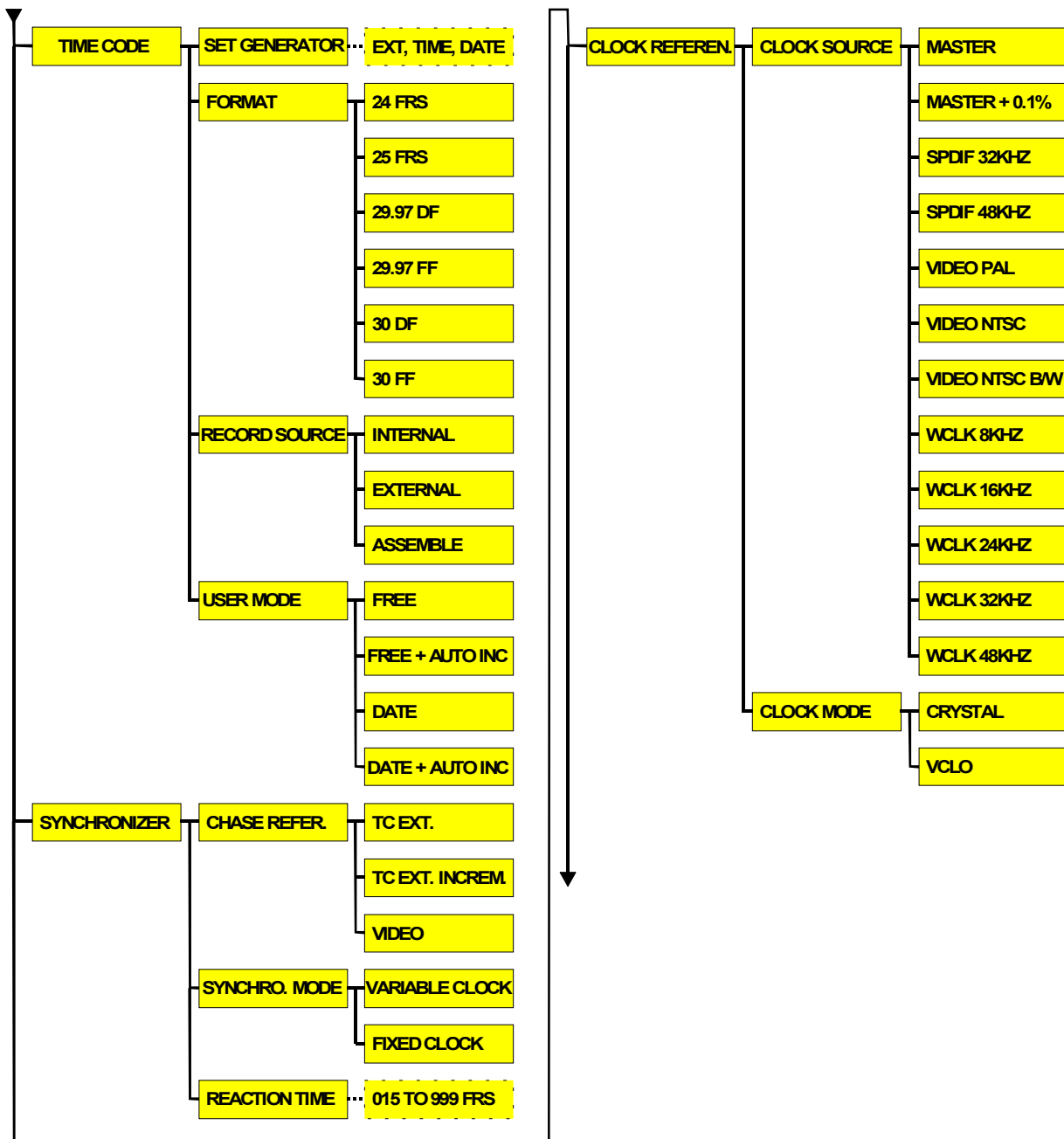
4.3 REACTION TIME



The reaction time is the period of time in frames that can elapse before the synchronizer will react to an anomaly in external time code. As standard, the reaction time is set to 15 frames. This means that if an external time code interrupt appears for less than 15 frames, nothing will happen. After 15 frames has passed, the ARES-C will re-synchronise. The

reaction time can be set from minimum 015 to 999 frames. This is done using the numeric keypad, always introducing 3 digits. Once the last digit is pushed, the reaction time is automatically set.

4.4 TIME CODE TREE



5.0 CHASE MODE

Important: Before running the chase mode, verify that the compression setting of the ARES-C is identical to the compression mode of the audio file that needs to be chased, if not, the file can not be selected.

If the incoming time code or incoming video signal is drifting too much, it can happen that the ARES-C suddenly resynchronises. To prevent this problem, it is preferable to set in the case of "VIDEO", the "CLOCK SOURCE" to the incoming video signal, and in the case of "EXT. TC" to set the "CLOCK MODE" to "VCLO". In this case, the AES output will not be anymore inside specs.

5.1 STARTING CHASE MODE

Time code play position of take 2

The following example shows how to select take No. 3 from card B and start the chase mode:

Card B, take 1 is selected

Card B is selected

Card B, take 3 is selected

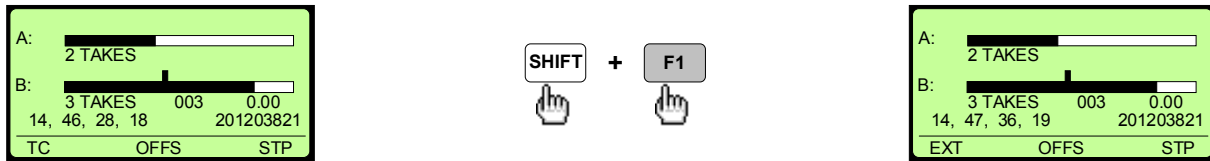
To put the ARES-C in the chase mode, proceed as follows:

The chase mode started. To stop the chase mode, push F5 again.

5.2 DISPLAYING TC PLAY, EXT. TC OR DELTA TC.

It's possible to display the time code from the selected audio file or the external time code or the delta time code between the external and audio file time code.

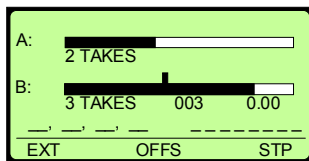
This can be selected in the stop mode or during the chase mode.



If “TC” is displayed above F1, the time code on the display corresponds to the time code of the selected audio file.

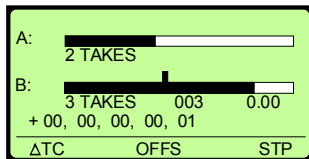
If “EXT” is displayed above F1, the time code on the display corresponds to the external time code.

If the following screen shows up, it means that no external time code is fed to the ARES-C.



If “ΔTC” is displayed above F1, the time code on the display corresponds to the time difference between the external time code and the time code of the selected audio file.

ΔTC (TC delta) is the changing difference between the time code on the card (audio file) and the external time code being fed to the machine.

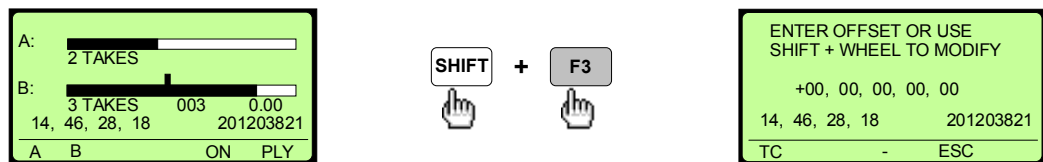


The number “+00 00 00 00 01” means that the delta between the time code from the playing audio file and the external time code is 0 hours, 0 minutes, 0 seconds, 0 frames, 1 bit.

5.3 TIME CODE OFFSET

The time code offset is the fixed difference between 2 time codes and can be introduced before the chase mode is started or during the chase.

Before chasing:



Observe first of all the “+” sign in front of the number. If the offset is “+”, the audio is in advance of the reference and vice versa.

If the offset needs to be negative instead of positive, push



The offset can be introduced by using the numeric keypad. Once the last digit is introduced, the offset is set automatically.
The other way to set the offset is by keeping the SHIFT key pushed and spinning the jogwheel.

To escape from the "OFFSET" menu, press once F4.

During chase:

