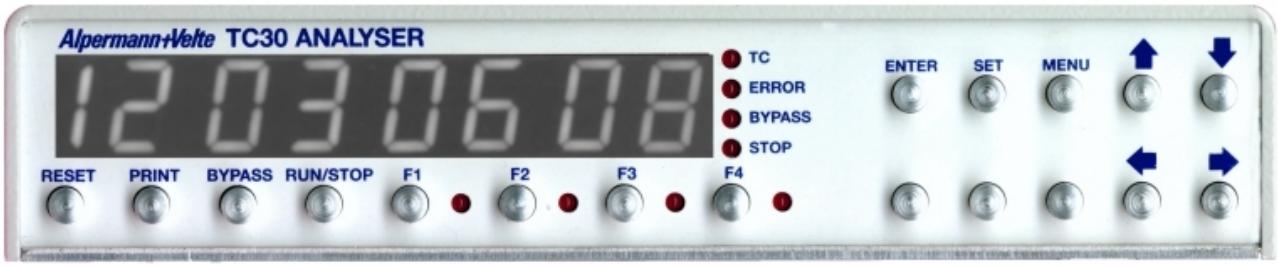
Alpermann+Velte

1.6-04/99

AV - TC30 ANALYSER

VITC, LTC, 3-lines VITC



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1. Functions overview

The AV-TC30 ANALYSER operates as a LTC and VITC reader with visible insertion of status and error messages. The unit is designed to check timecodes with regard to errors. The following error types are detected:

- non-plausible data in the time information.
- drop-outs.
- equal time values with successive frames (with VITC in the first field).
- reverse timecode (LTC).
- time-out (missing timecode).
- wrong field flag (VITC).
- different time values in first and second field (VITC).
- different time values LTC compared with VITC.

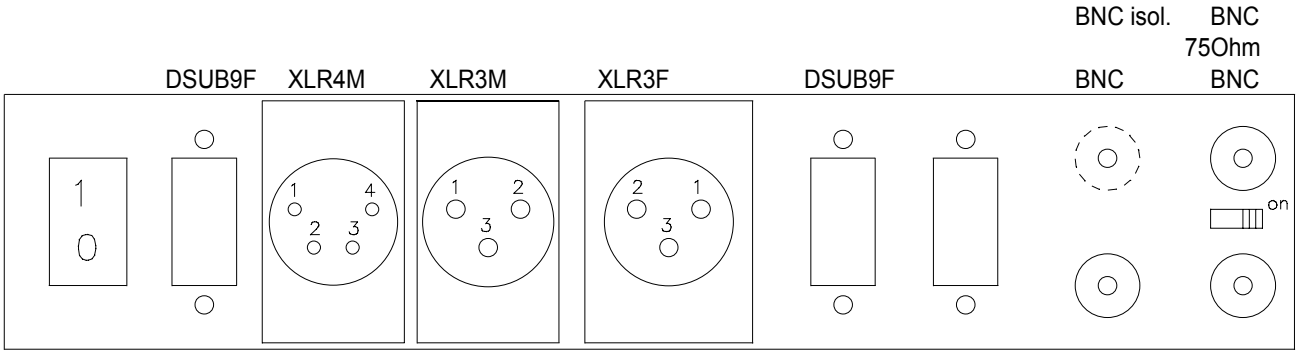
Genuine time jumps (BREAKs) are displayed and counted separately. With the LTC, the video synchronisation (line 1 - 625) is measured and displayed, as well as the LTC period (range of 27.0 - 52.6ms resp. 37 - 19 frames/second).
The timecode framerate may be adjusted: 24, 25 or 30. The television system may be 625/50 (PAL) or 525/60 (NTSC), which will be detected automatically.

AV- TC30 ANALYSER is not designed to measure signal amplitudes, edge steepness or any other analog signals. It rather means an important device to check timecode applications for correctness. With e.g. timecode conversions, dubbing, synchronisation, film-to-video applications ... several units are working together. Thus, the number of possible errors increases, produced either by a faulty device, false wiring, false operation or installation. The AV- TC30 ANALYSER permits parallel monitoring of a timecode application without time requirements; a glance at the error monitor will assure you that the timecode is resp. was without errors. The built-in serial interface RS232 permits to print out a protocol.

The following modules and options are available to enhance the standard unit AV- TC30 ANALYSER:

- converter RS232 - Centronics (externally) to connect a protocol printer.
- relay contacts (GPI) for trigger events.
- external keys RESET, PRINT, BYPASS (with LED), STOP (with LED).
- „presets“ (to be agreed on).
- additional timecode readers (to be agreed on).

2. Rear panel, technical data and connections



RS232:
2: TxD out
3: RxD in
5: GND
6: DTR out
7: CTS in
8: RTS out

Power In:
1: GND
4: +12-18V DC
typ. 600mA

LTC LOOP

LTC In:
1: GND
2/3: Signal
balanced
100mV - 5V
19-37Frames/s

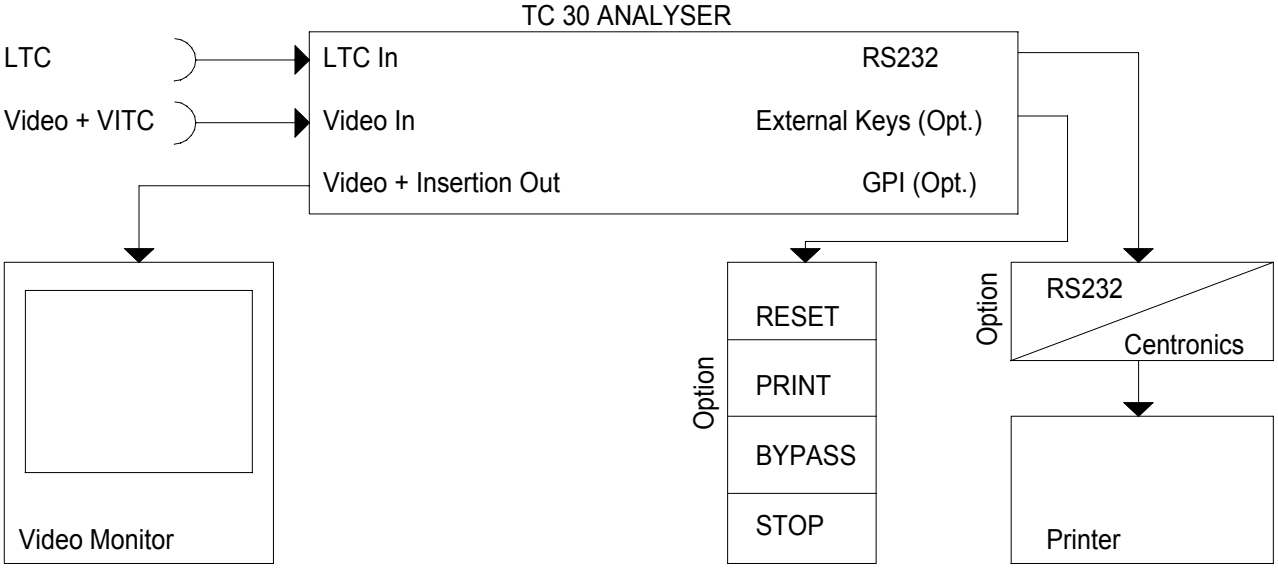
Option:
External Keys:
1: LED RESET
3: RESET
4: PRINT
5: BYPASS
6: STOP
7: LED BYP
8: LED STOP
9: GND

Option:
GPI

Video +
Insertion
Out

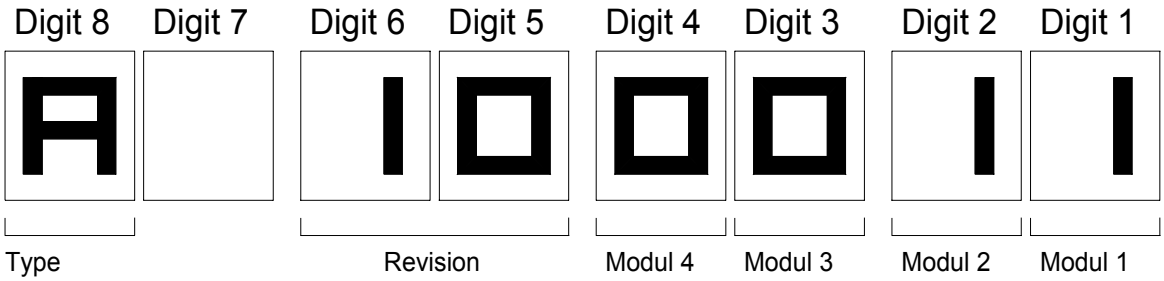
Comp.
Video In
+ Loop:
1 Vpp
75Ohms

Dimensions:	214 (W) x 43 (H) x 262 (D) mm
Weight:	1.5 kg approx.
Admiss. operating temperature:	5°C to 40°C
Admiss. humidity of air:	35% to 85%



3. After power-on, factory settings

After power-on, the data stored from the last current setting are checked. In the event of a storage error, a „RESET“ is made, i.e. the factory values (see below) are set and are written into the non-volatile memory. The display now indicates **reset**.
Then, status messages are displayed, all LEDs are lighting for testing purposes, and the acoustic alarm sounds.



Digit 8 indicates the type of unit = Analyser.
Digit 7 is blank with standard units, with special versions/options **o** is displayed.
Digits 6 and 5 indicate the firmware revision.
Digit 4 indicates whether the module 4 (reserved) has been built-in: 0=no, 1=yes.
Digit 3 indicates whether the module 3 (reserved) has been built-in: 0=no, 1=yes.
Digit 2 indicates whether the module 2 (= serial interface) has been built-in: 0=no, 1=yes.
Digit 1 indicates whether the module 1 (= VITC reader) has been built-in: 0=no, 1=yes.

With built-in options, the display indicates them with further messages .
Then a „PRESET“ is made, i.e. the unit is set to a pre-defined operating mode. Either a preset operating mode is automatically installed after every power-on (option), or a preset selected before power-off is installed. In the event that the preset function is disabled and no option has been preset, no preset will be made. The display indicates **Preset** only if a preset is made.

After power-on, the **STOP** function is enabled.

Factory values
Everything is disabled or set =0 except:

- all frame rates = 25.
- frame rate keycode = 20.
- VITC lines = 17 and 19.
- the recognition drop-out/break is set = 1 for all timecodes.
- serial interface format = 19200/8/n/1.

4. Short description of the keys

Key	Description
RESET	Short key pressing: - acoustic alarm is switched off. - measurements are re-initialised: LTC timing, LTC video synchronisation, time values before an error (TC MEMORY), difference measuring LTC-VITC.
	Long key pressing (until display shows **o.k.**): Reset, all counters (errors, breaks) are reset, error evaluation starts anew.
	Very long key pressing (until display shows **Preset**): A „preset“ is made. If the TC30 ANALYSER has a factory preset for a certain application, this setting will be made; otherwise, the last selected adjustment made in the PRESET menu will be set again.
PRINT	With **RUN** (*STOP* LED is off): printer prints a new headline. With **STOP** (*STOP* LED is lighting): sends ASCII FF (= $0C, Form Feed), i.e. a page printer prints our its character storage. If preset „DIFF. LTC_1/VITC_1“ has been selected, the last printed line (before „Form Feed“) contains the current and maximum difference.
BYPASS	Switches video insertion off (= BYPASS, LED is lighting) or on.
RUN/STOP	Switches error evaluation on/off, the *STOP* LED indicates the current setting. With **RUN** (*STOP* LED goes out): printer prints a new headline.
F1	Selects monitor window(s), depending on the selected preset: • no preset: window 5 = LTC ERROR+DATA • „3-LINES VITC“: window 0 = 3-LINES ERRORS • „DIFF. LTC_1/VITC_1“: window 3 = ERROR LTC+VITC • „CHECK LTC_1/VITC_1“: window 5 = LTC ERROR+DATA alternating window 6 = VITC ERROR+DATA
F2	Selects monitor window, depending on the selected preset: • no preset: window 6 = VITC ERROR+DATA • „3-LINES VITC“: window 1 = 3-LINES TC • „DIFF. LTC_1/VITC_1“: window 4 = LTC-VITC DIFF. • „CHECK LTC_1/VITC_1“: window 4 = LTC-VITC DIFF.
F3	Selects monitor window(s), depending on the selected preset:: • no preset: window 3 = ERROR LTC+VITC • „3-LINES VITC“: window 7 = BREAK EVENTS alternating window 8 = TC MEMORY • „DIFF. LTC_1/VITC_1“: window 7 = BREAK EVENTS alternating window 8 = TC MEMORY • „CHECK LTC_1/VITC_1“: window 3 = ERROR LTC+VITC

Key	Description
F4	Function depends on the selected preset: • no preset: window 7 = BREAK EVENTS alternating window 8 = TC MEMORY • „3-LINES VITC“: switches between 35mm and 16mm, i.e. framerate for keycode = 16 (LED *F4* off) resp. = 20 (LED *F4* on). • „DIFF. LTC_1/VITC_1“: prints out the actual and maximum difference between LTC and VITC, resets maximum value to zero. • „CHECK LTC_1/VITC_1“: window 7 = BREAK EVENTS alternating window 8 = TC MEMORY
ENTER	menu operation, see below.
SET	without function.
MENU	switching on/off the menu lines for the display resp. the monitor menu window.
↑ ↓ ← →	With menu switched off: positions the monitor window. With menu switched on: menu operation, see below.

5. Short description of the LEDs

LED	Description
TC	Lighting if a timecode (LTC, VITC, 3-lines VITC) is read.
ERROR	Lighting if the total error counter unequals zero.
BYPASS	Lighting with „bypass“, i.e. the video insertion is switched off.
STOP	Lighting with „stop“, i.e. errors will not be evaluated and no error protocol will be output via serial interface.
F1	Lighting if the F1-function has been selected, e.g. a special monitor window of the video insertion.
F2	Lighting if the F2-function has been selected, e.g. a special monitor window of the video insertion.
F3	Lighting if the F3-function has been selected, e.g. a special monitor window of the video insertion.
F4	Lighting if the F4-function has been selected, e.g. a special monitor window of the video insertion. With the operating mode „3-LINES VITC“ the framerate of the keycode is indicated: LED off = 16 (35mm), LED on = 20 (16mm).
Dec. Pt.	Units frames (digit 1): Marks the current selection of the menu. If the menu is switched off, serves to indicate a minus sign. Units minutes (digit 5): Separates break counter and error counter displayed (4-digit ea.) when they are displayed at the same time.

6. Menu operation

6.0 Overview

The **MENU** key is used to call up the menu. The menu permits to adjust the settings for operation, to switch further data to on-screen display etc. Keys ↑ and ↓ permit to switch to the next „vertical“ menu level resp. modify the selected value in a setting procedure; keys ← and → cyclically switch within the vertical menu level to the horizontal functions available resp. select the next field in a setting procedure. The **ENTER** key permits to recall functions, to store settings or to start a setting procedure. Pressing the **MENU** key again ends menu operation, or permits to cancel a setting at any time.

When settings are changed, the data are stored with the display showing **store**.

Every input of values may be canceled by pressing the **MENU** key.

Please also refer to the menu overview appended to this manual.

DISPLAY	Selects the data to be shown at the 8-digit front display.
INSERTER	Selects any monitor window which is not directly selectable via the function keys F1 ... F4.
PRESET	Selects the preset for a certain operating mode.
TIMECODE	Selects the frame rates, switches on/off the timecode reader, adjusts the error sensitivity, switches on/off the error types, switches on/off the break evaluation.
GENERAL	Displays the sum of all errors and breaks, resets the counter, adjusts the beeper.
ERROR LTC_1 ...	Displays all errors and breaks for this timecode, resets the counter for this timecode.
SERIAL INTERFACE	Adjusts parameter of the serial interface, switches on/off output of errors and breaks.

6.1 DISPLAY menu

Press **MENU** key to recall the menu and use ↑ or ↓ key to select the DISPLAY line. Use ← or → keys to select the data for being displayed at the 8-digit front display with switched-off menu. A decimal point on the display or a star on the monitor window marks the current selection. Confirm changes with **ENTER**, and the setting will be stored.

The following selections are available:

Insertion	Display	Description
TIME LTC_1	LTC1	Time of the read LTC (reader 1).
TIME VITC_1	VTC1	Time of the read VITC (reader 1).
TIME KEYCODE_1	kc1	Keycode of the 3-lines VITC (reader 1). The 8 least significant digits are displayed, i.e. the last two prefix digits, the 4-digit edge numbers, the 2-digit frames.
TIME FILM-TC_1	FTC1	Time of film or production timecode of the 3-lines VITC (reader 1).
TIME LTC_2	LTC2	As with TIME LTC_1, for a second reader.
TIME VITC_2	VTC2	As with TIME VITC_1, for a second reader.
TIME KEYCODE_2	kc2	As with TIME KEYCODE_1, for a second reader.
TIME FILM-TC_2	FTC2	As with TIME FILM-TC_1, for a second reader.
BRK.ERR ALL	b.E ALL	The four-digit counter for the total breaks in the higher digits + the four-digit counter for the total errors in the lower digits. The two counters are separated on the display by a decimal point (in digit 5).
BRK.ERR LTC_1	b.E LTC1	As with BRK.ERR ALL, but counter only for LTC_1.
BRK.ERR VITC_1	b.E VTC1	As with BRK.ERR ALL, but counter only for VITC_1.
BRK.ERR KEYCODE_1	b.E kc1	As with BRK.ERR ALL, but counter only for KEYCODE_1.
BRK.ERR FILM-TC_1	b.E FTC1	As with BRK.ERR ALL, but counter only for FILM-TC_1.
BRK.ERR LTC_2	b.E LTC2	As with BRK.ERR ALL, but counter only for LTC_2.
BRK.ERR VITC_2	b.E VTC2	As with BRK.ERR ALL, but counter only for VITC_2.
BRK.ERR KEYCODE_2	b.E kc2	As with BRK.ERR ALL, but counter only for KEYCODE_2.
BRK.ERR FILM-TC_2	b.E FTC2	As with BRK.ERR ALL, but counter only for FILM-TC_2.
DIFF. LTC_1/VITC_1	dIFF L-V	Difference (in hrs:min:sec:frames) between the times of LTC_1 and VITC_1. A decimal point displayed in digit 1 indicates a minus sign, i.e. VITC time higher than LTC time.
MAX DIFF_1	dIFF MAX	Maximum value of the difference LTC_1 - VITC_1. Minus sign as with difference.

6.2 INSERTER menu

Permits selection of any monitor window to display current data with switched-off menu. Press **MENU** key to enable the menu and use ↑ or ↓ keys to select INSERTER line. Use ← or → keys to select SELECT, then press **ENTER** key. Now use ↑ and ↓ keys to select the desired window. A decimal point on the display or a star on the monitor window marks the current selection. Confirm changes with **ENTER**, and the setting will be stored.

The following selections are available:

Insertion	Display	Short description
3-LINES ERRORS	SELECT 00	Shows the list of all error counters for the video timecode (VTC), keycode (KC) and film timecode (FTC).
3-LINES TC	SELECT 01	Shows the time data, the flags and the sum of all errors for the video timecode (VTC), keycode (KC) and film timecode (FTC).
(VITC TRIGGER)	SELECT 02	See: VITC timecode
ERROR LTC+VITC	SELECT 03	Shows the list of error counters for LTC and VITC.
LTC-VITC DIFF.	SELECT 04	Shows the time data, the flags, the sum of all errors, the difference and the max. difference for LTC and VITC.
LTC ERROR+DATA	SELECT 05	Shows the time data, the list of error counters, the flags, the video synchronisation and the LTC period.
VITC ERROR+DATA	SELECT 06	Shows the time data, the list of error counters and the flags for VITC.
BREAK EVENTS	SELECT 07	Shows the last frame before and the first frame after a break for eight breaks.
TC MEMORY	SELECT 08	Shows the six time values (frames) before and the two time values (frames) after an error occurred.

The windows are now described in detail:

Index = 00 3-LINES ERRORS

						*	V	T	C		*	K	C			*	F	T	C
A	L	L				0	0	0	0		0	0	0	0		0	0	0	0
P	L	A	U	S		0	0	0	0		0	0	0	0		0	0	0	0
D	R	O	P	S		0	0	0	0		0	0	0	0		0	0	0	0
E	Q	U	A	L		0	0	0	0		0	0	0	0		0	0	0	0
-						-	-	-	-		-	-	-	-		-	-	-	-
T	-	O	U	T		0	0	0	0		0	0	0	0		0	0	0	0
F	L	A	G			0	0	0	0		0	0	0	0		-	-	-	-
1	.	-	2	.		0	0	0	0		0	0	0	0		0	0	0	0

Shows the list of all error counters for the video timecode (VTC), keycode (KC) and film timecode (FTC).
A ***** sign indicates that no valid timecode has been read since last RESET.

ALL = Sum of all errors.
PLAUS = Errors produced by non-plausible time data.
DROPS = Errors produced by frame jumps (< 1..9 seconds, depending on adjustment).
EQUAL = Same time values in successive pictures.
\- = not used.
T-OUT = Missing timecode (time-out after 1.5 frames).
FLAG = Faulty flagbit (field recognition).
1.-2. = Time difference between 1st and 2nd field.

The 4-digits error counter only appears at the error type selected to „on“ at the TIMECODE menu (e.g. TIMECODE - LTC_1 - ERROR ON/OFF ...). For an error type not selected or not defined „----„ appears instead of the digits.

Index = 01 3-LINES TC

	*	V	T	C					*	K	C				*	F	T	C	
	0	2	:	2	4		0	2	9	7	.				1	3	:	5	9
	0	3	:	1	2		3	5	.	9	8	3	9		5	8	:	2	0
							1	2	9	9	.	1	5				p		
E		0	0	0	0				0	0	0	0				0	0	0	0
B		0	0	0	0				0	0	0	0				0	0	0	0
6	5	4	3	2	1		6	5	4	3	2	1		6	5	4	3	2	1
0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0

Shows the time data, the flags and the sum of error for the video timecode (VTC), keycode (KC) and film timecode (FTC). Keycode is indicated numerically only.
A ***** sign indicates that no valid timecode has been read since last RESET.

E = Sum of errors of the timecode type.
B = Sum of breaks of the timecode type.
654321 = Flag bits in the timecode, value 0 or 1.
1 = bit no. 14
2 = bit no. 15
3 = bit no. 35
4 = bit no. 55
5 = bit no. 74
6 = bit no. 75

p = Only with pulldown mode: indicates the difference between keycode and film timecode pulldown sequence as a digit 0...9. Both sequences are identical at 0.

Index = 03 ERROR LTC+VITC

E	R	R	O	R						*	L	T	C	*	V	I	T	C
A	L	L								0	0	0	0		0	0	0	0
P	L	A	U	S	I	B	.			0	0	0	0		0	0	0	0
D	R	O	P	-	O	U	T			0	0	0	0		0	0	0	0
E	Q	U	A	L						0	0	0	0		0	0	0	0
R	E	V	E	R	S	E	/	-		0	0	0	0		-	-	-	-
T	I	M	E	-	O	U	T			0	0	0	0		0	0	0	0
-	/	V	1							-	-	-	-		0	0	0	0
D	I	F	F	/	1	.	-	2	.	0	0	0	0		0	0	0	0

Shows the list of all LTC and VITC error counters.
A ***** sign indicates that no valid timecode has been read since last RESET.

ALL = Sum of all errors.
PLAUS = Errors produced by non-plausible time data.
DROP-OUT = Errors produced by frame jumps (< 1..9 seconds, depending on adjustment).
EQUAL = Equal time values in successive frames.
REVERSE/- = LTC: reverse; VITC: not used.
TIME-OUT = Missing timecode (time-out after 1.5 frames).
-/V1 = LTC: not used; VITC: faulty flagbit (field recognition).
DIFF/1.-2. = LTC: difference to VITC; VITC: different time between 1st and 2nd field.

The 4-digits error counter only appears at the error type selected to „on“ at the TIMECODE menu (e.g. TIMECODE - LTC_1 - ERROR ON/OFF ...). For an error type not selected or not defined „----„ appears instead of the digits.

Index = 04 LTC-VITC DIFF.

		*	L	T	C				*	V	I	T	C		-	D	I	F	F
		0	2	:	2	4			0	2	:	2	4		0	0	:	0	0
		0	3	:	1	2			0	3	:	1	6		0	0	:	0	4
E		0	0	0	0				0	0	0	0			-		M	A	X
B		0	0	0	0				0	0	0	0			0	0	:	0	0
															0	0	:	0	4
	6	5	4	3	2	1		6	5	4	3	2	1						
	0	0	0	0	0	0		0	0	0	0	0	0						

Shows the time data, the flags, the sum of errors, the difference and the max. difference for LTC and VITC.
A ***** sign indicates that no valid timecode has been read since last RESET.

E = Sum of errors of the timecode type.
B = Sum of breaks of the timecode type.
654321 = Flagbits in the timecode, value 0 or 1.

Bit no.	LTC	VITC
1=	10	14
2=	11	15
3=	27	35
4=	43	55
5=	58	74
6=	59	75

DIFF = Difference of time values LTC - VITC, in hrs:min:sec:frames. This evaluation is made only if timecodes are without errors. A minus sign indicates: LTC time values lower than VITC.
MAX = Max. value of the difference.

Index = 05 LTC ERROR+DATA

L	T	C	*	2	3	:	5	9	:	5	9	:	2	4			
A	L	L							0	0	0	0		M	I	N	0	0	2
P	L	A	U	S	I	B	.		0	0	0	0		S	Y	N	0	0	2
D	R	O	P	-	O	U	T		0	0	0	0		M	A	X	0	0	2
E	Q	U	A	L					0	0	0	0		M	I	N	4	0	0
R	E	V	E	R	S	E			0	0	0	0		T	I	M	4	0	0
T	I	M	E	-	O	U	T		0	0	0	0		M	A	X	4	0	0
-									-	-	-	-		6	5	4	3	2	1
D	I	F	F						0	0	0	0		0	0	0	0	0	0

Shows the time data, the list of error counters, the flags, the video synchronisation and the period for LTC.
A ***** sign indicates that no valid timecode has been read since last RESET.

ALL = Sum of all errors.
PLAUSIB. = Errors produced by non-plausible time data.
DROP-OUT = Errors by time jumps (< 1..9 seconds, dep. on adjustment).
EQUAL = Equal time values in successive frames.
REVERSE = LTC reverse.
TIME-OUT = Missing timecode (time-out after 1.5 frames).
\- = not used.
DIFF = Difference to VITC.

The 4-digits error counter only appears at the error type selected to „on“ at the TIMECODE menu (e.g. TIMECODE - LTC_1 - ERROR ON/OFF ...). For an error type not selected or not defined „----„ appears instead of the digits.

MIN SYN MAX =
Indicates the video synchronisation. The three-digit number indicates the line in which the first LTC bit starts and the sync word ends. According to ANSI/SMPTE 12M-1995 the LTC should start with line 2 +/- 1.5 (TV system 625/50 ,PAL) resp. with line 5 +/- 1.5 (TV system 525/60 ,NTSC).
MIN indicates the minimum, SYN the current value, MAX the maximum. A short pressing on the RESET key re-initialises the measurement.

MIN TIM MAX =
Indicates the period. The 3-digit number indicates the duration of a frame, in 100µs.
- 416 (41.6ms) resp. 417 (41.7ms) is the nominal value for a 24- timecode.
- 400 (40.0ms) is the nominal value for a 25-timecode.
- 333 (33.3ms) resp. 334 (33.4ms) is the nominal value for a 30-timecode.

MIN indicates the minimum, TIM the current value, MAX the maximum. A short pressing on the RESET key re-initialises the measurement.

654321 =
Flagbits in the timecode, value 0 or 1.
1: bit no. 10, 2: bit no. 11, 3: bit no. 27, 4: bit no. 43, 5: bit no. 58, 6: bit no. 59

Index = 06 VITC ERROR+DATA

V	I	T	C	*	2	3	:	5	9	:	5	9	:	2	4				
A	L	L							0	0	0	0							
P	L	A	U	S	I	B	.		0	0	0	0							
D	R	O	P	-	O	U	T		0	0	0	0							
E	Q	U	A	L					0	0	0	0							
-									-	-	-	-							
T	I	M	E	-	O	U	T		0	0	0	0							
F	I	E	L	D					0	0	0	0		6	5	4	3	2	1
1	.	-	2	.					0	0	0	0		0	0	0	0	0	0

Shows the time data, the list of error counters and the flags for VITC.
A ***** sign indicates that no valid timecode has been read since last RESET.

ALL = Sum of all errors.
PLAUSIB. = Errors produced by non-plausible time data.
DROP-OUT = Errors produced by frame jumps (< 1..9 seconds, depending on adjustment).
EQUAL = Equal time values in successive frames.
\- = Not used.
T-OUT = Missing timecode (time-out after 1.5 frames).
FLAG = Faulty flagbit (field recognition).
1.-2. = Unequal time between 1st and 2nd field.

The 4-digits error counter only appears at the error type selected to „on“ at the TIMECODE menu (e.g. TIMECODE - VITC_1 - ERROR ON/OFF ...). For an error type not selected or not defined „----„ appears instead of the digits.

654321 = Flagbits in timecode, value 0 or 1.
1 = bit no. 14
2 = bit no. 15
3 = bit no. 35
4 = bit no. 55
5 = bit no. 74
6 = bit no. 75

Index = 07 BREAK EVENTS

		O	L	D							N	E	W					T	C
1	0	1	5	1	6	2	0		1	0	2	6	1	1	0	3		L	1

Shows the last frame before (OLD) and the first frame after (NEW) a break. The list may contain eight breaks.

The column TC indicates the timecode : L1 = LTC_1,
V1 = VITC_1,
K1 = keycode_1,
F1 = film timecode_1.

The first eight breaks are shown; further breaks will not be shown. A complete list can be obtained via protocol printout.
A break is defined as a time jump, with its difference between the time values reaching or exceeding the drop-out limit (1 - 9 seconds). This adjustment is made in the TIMECODE menu.

Index = 08 TC MEMORY

		T	C		M	E	M	O	R	Y								
	1	2	:	3	4	:	5	0	:	0	1							
	1	2	:	3	4	:	5	0	:	0	2							
	1	2	:	3	4	:	5	0	:	0	3							
	1	2	:	3	4	:	5	0	:	0	4							
	1	2	:	3	4	:	5	0	:	0	5							
	1	2	:	3	4	:	5	0	:	0	6							
	1	2	:	3	4	:	5	0	:	0	8	*						
	1	2	:	3	4	:	5	0	:	0	9							

Shows the six frames occurred before an error and the two frames from the error on for the timecode, which are selected to show the time at the front display. If you e.g. want to register an LTC_1 error, select LTC_1 for the display. A „*“ sign following the time value indicates the value producing the error.

6.3 PRESET menu

The preset menu permits to switch TC30 ANALYSER to a certain operating mode without having to make settings at several stages in the menu. If such preset does not comply completely with the desired application, special settings may also be changed after the PRESET. The PRESET also defines the functions of the keys **F1** ... **F4** and - partly - of the **RESET** key.
Press **MENU** key to enable the menu, then use ↑ or ↓ keys to select line PRESET. The ← and → keys permit to select the desired mode. A decimal point on the display resp. a star on the monitor window indicate the current selection. Confirm changes with the **ENTER** key to store the new setting.

The following selections are available:

Insertion	Display	Short description
OFF (NO PRESET)	OFF	No special operating mode, RESET is made.
3-LINES VITC	3-LInES	Preset for 3-lines VITC evaluations
DIFF. LTC_1/VITC_1	dIFF L-V	Preset for difference measurement LTC-VITC
CHECK LTC_1/VITC_1	LTCoVITC	Preset for precise check LTC and/or VITC

6.3.1 PRESET = OFF (NO PRESET)

In detail, the following settings are made by TC30 ANALYSER:
- All readers are switched off.
- The monitor window 3 = ERROR LTC+VITC is selected.
- All error counters for all timecodes are enabled.
- The drop-out/break recognition is set = 1 second for all timecodes.
- The o.k.-counter is set = 0 for all timecodes.
- The break recognition is enabled for all timecodes.
- VITC line selection (LINE MODE) = 2-lines mode.
- Serial interface: error messages and breaks are switched off for all timecodes.

All other settings remain unchanged.
The functions of the **F1**, **F2**, **F3** and **F4** keys are as follows:
F1: selects monitor window 5 = LTC ERROR+DATA.
F2: selects monitor window 6 = VITC ERROR+DATA.
F3: selects monitor window 3 = ERROR LTC+VITC.
F4: alternates between monitor window 7 = BREAK EVENTS and 8 = TC MEMORY.

6.3.2 PRESET = 3-LINES VITC

In detail, the following settings are made by TC30 ANALYSER:

- The monitor window 1 = 3-LINES TC is selected, the *F4* LED indicates the keycode frame rate.
- The 3-lines VITC reader (VITC_1, KC_1, FTC_1) is switched on, all the other readers are switched off.
- All error counters for timecodes VITC_1, KC_1 and FTC_1 are switched on, all error counters for all the other readers are switched off.
- The drop-out/break recognition for VITC_1, KC_1 and FTC_1 is set = 1 second.
- The o.k.-counter for VITC_1, KC_1 and FTC_1 is set = 2.
- VITC line selection (LINE MODE) = 3-lines mode, line numbers remain unchanged.
- Serial interface: error messages and breaks for all timecodes except the 3-lines VITC are switched off.
- If frame rates VITC_1 = 30 and FTC_1 = 24: the pulldown operating mode is selected.

The keys **F1**, **F2**, **F3** and **F4** have the following function:
F1: selects monitor window 0 = 3-LINES ERROR.
F2: selects monitor window 1 = 3-LINES TC.
F3: alternates between monitor window 7 = BREAK EVENTS or 8 = TC MEMORY.
F4: The operating mode 35mm/16mm is switched. LED F4 off/on = 35mm/16mm.

Before you start evaluating please note:

- To switch analysis on/off press **RUN/STOP** key.
- Have the right frames rates for VITC, keycode and film timecode been selected?
- Have the VITC lines been selected correctly? A possibility is to have an automatic setting by menu TIMECODE →→ VITC_1. If you want a rigid check also of the correct line numbers, only select these lines. If it is e.g. generated in lines 18-19-20, set line selection for line 1 and line 2 = 18, the mode (LINE MODE) has to be set = 3 (3-lines mode). If such check is not required or if often tapes with different VITC-lines are checked, select „VITC line selection = block mode, line 1 = 06, line 2 = 22“ which means selection of the whole VITC range.
- For protocol printout: error and break messages have to be switched on/off in the SERIAL INTERFACE menu.

6.3.3 PRESET = DIFF. LTC_1/VITC_1

In detail, the following settings are made by TC30 ANALYSER:

- Monitor window 4 = LTC-VITC DIFF. is selected.
- LTC_1 and VITC_1 reader are switched on, all the other readers are switched off.
- All error counters for the LTC_1 and VITC_1 timecodes are switched on, all error counters for all the other readers are switched off.
- The drop-out/break recognition for LTC_1 and VITC_1 is set = 1 second.
- The o.k.-counter for LTC_1 and VITC_1 is set = 2.
- VITC line selection = block mode, line 1 = 06, line 2 = 22.
- Serial interface: error messages and breaks are switched off for all timecodes except LTC_1 and VITC_1.

  F1: selects monitor window 3 = ERROR LTC+VITC.
  F2: selects monitor window 4 = LTC-VITC DIFF.
  F3: alternates between monitor window 7 = BREAK EVENTS and 8 = TC MEMORY.
  F4: Activates the serial interface. The actual and the maximum difference between LTC and VITC are transferred, then the maximum value is set = 0.

Before you start evaluating please note:

- To switch analysis on/off press **RUN/STOP** key.
- Have the right frame rates for LTC and VITC been selected?
- The preset for the VITC lines selects the whole possible VITC range as a block. If you want a rigid check also of the correct line numbers, only select these lines. If it is e.g. generated in lines 18 and 20, set line selection for line 1 = 18 and line 2 = 20, the mode (LINE MODE) has to be set = 2 (2-lines mode).
- For protocol printout: error and break messages have to be switched on/off in the SERIAL INTERFACE menu.
- The difference will only be measured if LTC and VITC so not show further errors, i.e. after „LTC O.K.“ and „VITC O.K.“ has been announced. After these messages the actual difference is protocolled, if unequal 0 an error is counted. If the difference status changes (from equal 0 to unequal or vice versa), once more the actual difference is protocolled, for unequal 0 an error is counted. Thus for a persisting difference of time values, an error is only once counted. After every LTC or VITC error followed by an o.k. message the difference will be protocolled again. Irrespectively, the current difference is displayed at the monitor or display.
- The **F3** key permits to protocol in between (or at the end of the analysis) the maximum and actual difference, or by pressing the **PRINT** key in the stop mode.

6.3.4 PRESET = CHECK LTC_1/VITC_1

In detail, the following settings are made by TC30 ANALYSER:

- The monitor window 3 = ERROR LTC+VITC is selected.
- LTC_1 and VITC_1 reader are switched on, all the other readers are switched off.
- All error counters except LTC/VITC difference for LTC_1 are switched on, all error counters for VITC_1 are switched on, all error counters for all other readers are switched off.
- The drop-out/break recognition for LTC_1 and VITC_1 is set = 1 second.
- The o.k.-counter for LTC_1 and VITC_1 is set = 0.
- VITC line selection = 2-lines mode.
- Serial interface: error messages and breaks for all timecodes except LTC_1 and VITC_1 are switched off.

  F1: selects alternating monitor window 5 = LTC ERROR+DATA and 6 = VITC ERROR+DATA.
  F2: selects monitor window 4 = LTC-VITC DIFF.
  F3: selects monitor window 3 = ERROR LTC+VITC.
  F4: selects alternating monitor window 7 = BREAK EVENTS or 8 = TC MEMORY.

Before you start evaluating please note:

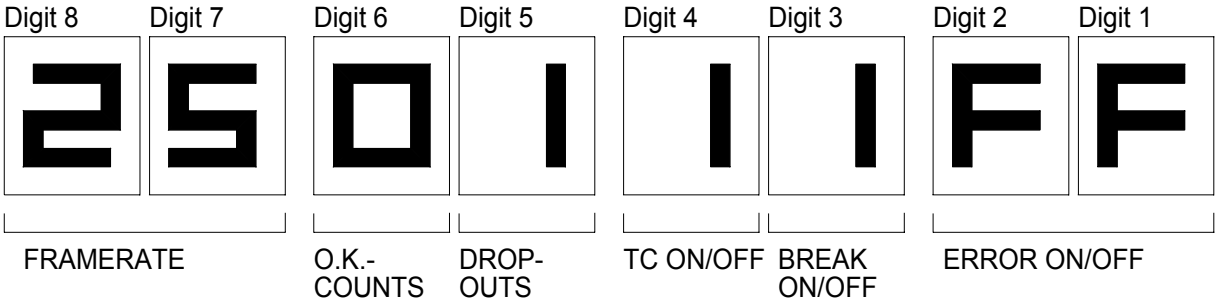
- To switch analysis on/off press **RUN/STOP** key.
- Have the right frame rates for LTC and VITC been selected?
- The preset for the VITC lines only selects the 2-lines mode, the line numbers still have to be selected.
- For protocol printout: error and break messages have to be switched on/off in the SERIAL INTERFACE menu.
- This preset permits an exact check of an LTC or VITC. Every error is counted immediately (o.k.-counter = 0!).

6.4 TIMECODE menu

All settings for the error analysis of a certain timecode are programmed here.
Press **MENU** key to enable the menu, then use ↑ or ↓ keys to select line TIMECODE. The ← and → keys permit to select the desired timecode:

Insertion	Display
LTC_1	LTC1
VITC_1	VTC1
KEYCODE_1	kc1
FILM-TC_1	FTC1
LTC_2	LTC2
VITC_2	VTC2
KEYCODE_2	kc2
FILM-TC_2	FTC2

The **ENTER** key permits to start the programming or to check the current programming. With the standard unit, no timecode readers LTC_2, VITC_2, Keycode_2 and Film-TC_2 are built in, settings are without effect.
The possible settings are the same for all timecodes, with the display or monitor showing e.g.:



The field flashing on the display resp. the line marked * on the monitor marks the setting to be changed, use ↑ or ↓ keys. Press ← or → keys to select the next field.

FRAMERATE Selects the timecode framerate. Select between 24, 25 and 30 - except with keycode, for which 16 or 20 can be selected.

O.K.-COUNTS An error will only be counted, displayed of protocoled if a certain number of frames has been read free of errors. This number can be selected within the range 0 - 9.
If an error occurs constantly, with a setting of 0 every frame will produce an error (long protocol list!), with a setting >0 maybe only once.

DROP-OUTS Select here from which a time jump shall be recognised as a DROP-OUT (as an error) or a BREAK (as genuin time jump, edit list). Adjustment 1 - 9 seconds.
Example: An adjustment of 3 means a time jump < 3 sec. will be recognised as an error = DROP-OUT, >= 3 sec. as a BREAK.

TC ON/OFF Switches timecode reader on (=1) or off (=0). For adjustment 0 no errors or breaks are recognised.
Note: with **VITC** a **2** may be selected here. Now pressing the **ENTER** key permits special adjustments for the VITC, see chapter **6.4.2 VITC...**.

BREAK ON/OFF With a time jump = BREAK (see adjustment DROP-OUT) this will be counted, displayed and protocoled (=1) or not (=0).

ERROR ON/OFF This field first shows only the current setting for the error types to be evaluated. 8 bits as a two-digit hexadecimal number represent an error type each. Bit = 0: error will not be evaluated, Bit = 1: error will be evaluated.
Bit 0: error 1 (PLAUSIBILITY) ... Bit 7: error 8. The information which error is represented by the numbers, what produced this error, and in which priority it is counted, is given in the following chapters with the individual timecode adjustment.
If this field has been marked, the **ENTER** key permits to change the current setting. The display then indicates a 0 in every digit (= error will not be evaluated) or a 1 (error will be evaluated) for every type of error (digit 8 = error type 8). Every type of error is described by a text on the monitor, with a 0 or 1 thereafter. The flashing field on the display resp. the line marked * on the monitor marks the setting to be changed, change by pressing ↑ or ↓ keys. Press ← or → keys to select the next field. Use **ENTER** key to end this programming.

6.4.1 LTC, settings and analysis

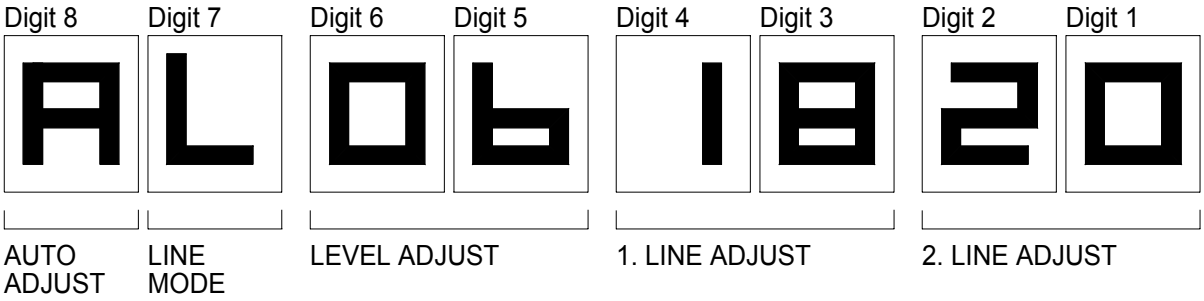
For the LTC, the following errors are evaluated:

- Error no. 1 = PLAUSIBILITY: plausibility control of the time information. Frames 00-29, seconds 00-59, minutes 00-59, hours 00-23.
- Error no. 2 = DROP-OUTS: The time value of the read frame does not equal frames + 1 frame, but a difference lower than BREAK (1-9 seconds, see adjustment DROP-OUT). This error also occurs if wrong frame rate has been selected.
- Error no. 3 = EQUAL VALUES: The time value of the read frame equal the preceding frame..
- Error no. 4 = REVERSE: The LTC direction is „reverse“, deducted from the synchron word.
- Error no. 5 = TIME-OUT: Missing timecode (time-out after 1.5 frames). May also be produced by a broken frame of a timecode lying beyond the reading range.
- Error no. 7 = LTC-VITC DIFF: Difference between the time values of LTC_1 and VITC_1. For description please see chapter 6.3.3 PRESET = DIFF. LTC_1/VITC_1.

It is not possible to recognise several errors at the same time in one frame. The analysis is made according to the priorities given as follows: highest priority for PLAUSIBILITY, then DROP-OUTS and EQUAL VALUES, and then REVERSE.

6.4.2 VITC, settings and analysis

If in field TC ON/OFF of VITC_1 a **2** is selected and then the **ENTER** key is pressed, parameters for the VITC reader are set. The display resp. monitor shows e.g.:



The field flashing on the display resp. the line marked * on the monitor marks the setting to be changed, press ↑ and ↓ keys - except with AUTO ADJUST. Use ← and → keys to select the next field. Use **ENTER** key to end this programming.

AUTO ADJUST The AUTO ADJUST mode permits to start an automatic VITC recognition by pressing the **ENTER** key, i.e. TC30 ANALYSER searches the optimum level and displays all VITC lines on the monitor. A valid video timecode is searched for, not a 3-lines VITC (the first line of a 3-lines VITC is a video timecode). If no VITC is read, the field LEVEL ADJUST is selected after the automatic ends. If a VITC can be read, the field 1. LINE ADJUST is selected after the automatic ends, and the LEVEL ADJUST field shows the found level, 1. LINE ADJUST shows the first detected VITC line, 2. LINE ADJUST shows the last detected VITC line. These automatically detected settings may now be changed, or stored it by pressing the **ENTER** key. The LINE MODE setting will not be adjusted automatically.

LINE MODE Adjustment = **L**: 2-lines mode, i.e. only lines 1. LINE and 2. LINE will be evaluated.
Adjustment = **b**: block mode, i.e. all lines from 1. LINE to 2. LINE inclusive will be evaluated.
Adjustment = **3**: 3-lines mode, i.e. line „1. LINE“ + the following two lines and line „2. LINE“ + the following two lines are evaluated.

LEVEL ADJUST Adjustment of the VITC data threshold, range 03 - 33 hexadecimal.

1. LINE ADJUST Adjustment of the first VITC line, range 06 - 22.

2. LINE ADJUST Adjustment of the second VITC line, range 06 - 22.

With VITC the following errors are evaluated:

- Error no. 1 = PLAUSIBILITY: Plausibility control of the time information. Frames 00-29, seconds 00-59, minutes 00-59, hour 00-23. Analysis is made in every field.
- Error no. 2 = DROP-OUTS: The read frame does not equal the time value of frames + 1 frame, but a difference lower than a BREAK (1-9 seconds, see DROP-OUT adjustment). Analysis is made in the first field. This error also occurs if a false frame rate has been selected.
- Error no. 3 = EQUAL VALUES: The read frame has the same time value as the preceding frame. Analysis is made in the first field.

- Error no. 7 = 1./2. FIELD: The time values in first and second field differ. Analysis is made in the second field.
- Error no. 6 = FIELD FLAG: The VITC field recognition fails to comply with the field recognition deducted from the video sync separation (hardware). Analysis is made for every field.
- Error no. 5 = TIME-OUT: Missing timecode (time-out after 1.5 frames). This may also have been produced by a faulty video signal or a VITC lying beyond the range of the selected lines.

It is not possible to recognise errors at the same time in one frame or one field. Analysis is made according to the priorities as follows: top priority for PLAUSIBILITY,then DROP-OUTS and EQUAL VALUES in the first field, 1./2. FIELD in the second field, and then FIELD FLAG.

6.4.3 3-lines VITC, settings and analysis

Please read chapter 6.4.2 first. There, the selection of the VITC lines for the analysis of the 3-lines VITC is described.
A 1:1 transfer from film to video is analysed, i.e. the time values have to count up for one frame per picture, with values for first and second field identical.
The error evaluation for keycode and film timecode is identical to the evaluation of the video timecodes (VITC of the first of the three lines), except:

- With keycode, generally only the 8 least significat digits are analysed. The plausibility check controls: frames 00-39 (BCD), 4-digit footage count 0000-9999 (BCD), the two least significant prefix digits 00-99 (BCD). Analysis is made in every field.
- With film timecode no FIELD FLAG analysis will be made.

6.5 GENERAL menu

This menu permits to adjust some general settings and to display general data. Enable the menu by pressing the **MENU** key and use ↑ and ↓ keys to select line GENERAL. Use ← or → keys to select the desired setting or display.

The following selections are available:

Insertion	Display	Description
ERRORS ALL = 0000	EA 0000	Displays the total error counter for the time of GENERAL menu recall (values displayed will „freeze“, but counter continues counting).
BREAKS ALL = 0000	bA 0000	Displays the total number of breaks for the time of the GENERAL menu recall (values displayed will „freeze“, but counter continues counting).
RESET ALL	rESET	and then **ENTER** key: same function as a long key pressing of **RESET** = all counters (errors, breaks) are reset, error evaluation restarts.
BEEPER	bEEPEr	Permits to adjust the acoustic signal, see 6.5.1.

6.5.1 BEEPER

Permits to adjust the acoustic signal. Press **MENU** key to enable the menu and use ↑ and ↓ keys to select GENERAL line. Use ← and → keys to select BEEPER, then press **ENTER** key.

The following selections are available:

Insertion	Display	Description
BEEPER= CONT	Cont	The acoustic alarm sounds permanently with every error until it will be switched off by pressing the **RESET** key.
BEEPER= ON 1 (..9) ·20MS	on 1 (..9)	The acoustic alarm sounds for a short moment with every error, selection 1..9 = 20..180ms.
BEEPER= OFF	oFF	Acoustic alarm is switched off and will not react upon errors.

6.6 ERROR LTC_1

Permits to display and reset all errors and breaks for LTC_1. In contrast to the special monitor windows, here the values are „freezed“ at the time of the menu recall, but counter continues counting. Press **MENU** key to enable the menu, then use ↑ or ↓ keys to select line ERROR LTC_1. Use ← or → keys to select the desired display:

Insertion	Display	Description
BRK=0000	br 0000	Displays the break counter.
ERR=0000*	EAn 0000	Displays the sum of the error counters. A „*“or „n“ indicates that no valid LTC_1 has been read.
PLAUSIBILITY	E1 0000	Total of no. 1 errors
DROP-OUTS	E2 0000	Total of no. 2 errors
EQUAL VALUES	E3 0000	Total of no. 3 errors
REVERSE	E4 0000	Total of no. 4 errors
TIME-OUT	E5 0000	Total of no. 5 errors
-	E6 0000	Total of no. 6 errors
LTC-VITC DIFF	E7 0000	Total of no. 7 errors
RESET	rESET	then press **ENTER** key: all counters for LTC_1 are reset to zero.

The error types are described in chapter „6.4.1 LTC ...“ in detail.

6.7 ERROR VITC_1

Permits to display and reset all errors and breaks for VITC_1. In contrast to the special monitor windows, here the values are „freezed“ at the time of the menu recall, but counter continues counting. Press **MENU** key to enable the menu, then use ↑ and ↓ keys to select line ERROR VITC_1. Use ← or → keys to select the desired display:

Insertion	Display	Description
BRK=0000	br 0000	Displays the break counter.
ERR=0000*	EAn 0000	Displays the sum of error counter. A „*“or „n“ indicates that no valid VITC_1 has been read.
PLAUSIBILITY	E1 0000	Total of no. 1 errors
DROP-OUTS	E2 0000	Total of no. 2 errors
EQUAL VALUES	E3 0000	Total of no. 3 errors
-	E4 0000	Total of no. 4 errors
TIME-OUT	E5 0000	Total of no. 5 errors
FIELD FLAG	E6 0000	Total of no. 6 errors
1./2. FIELD	E7 0000	Total of no. 7 errors
RESET	rESET	then press **ENTER**: key: all counters for VITC_1 are reset to zero.

The error types are described in chapter „6.4.2 VITC ...“ in detail.

6.8 ERROR KEYCODE_1

Errors and breaks for the second line of the 3-lines VITC = keycode. For description see chapter „6.7 ERROR VITC_1“.

6.9 ERROR FILM-TC_1

Errors and breaks for the third line of the 3-lines VITC = film or production timecode. For description see chapter „6.7 ERROR VITC_1“.

6.10 ERROR LTC_2

As with LTC_1, but for a second reader (not included in the standard unit).

6.11 ERROR VITC_2

As with VITC_1, but for a second reader (not included in the standard unit).

6.12 ERROR KEYCODE_2

As with KEYCODE_1, but for a second reader (not included in the standard unit).

6.13 ERROR FILM-TC_2

As with FILM-TC_1, but for a second reader (not included in the standard unit).

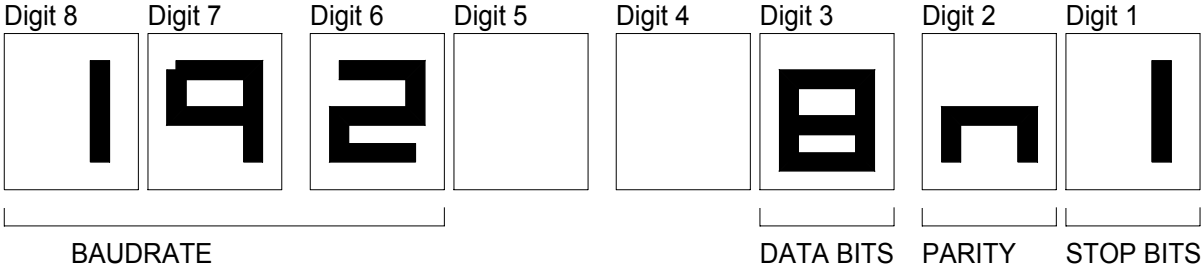
6.14 SERIAL INTERFACE

Permits to adjust the serial interface; with the standard unit to output an error protocol for a printer. Enable the menu by pressing the **MENU** key, then use ↑ and ↓ keys to select the SERIAL INTERFACE line. Use ← and → keys to select one of the following adjustments by pressing the **ENTER** key:

Insertion	Display	Description
PARAMETER	PArA	Adjusts the transfer format, → 6.14.1
ENABLE ERRORS	En ErrOr	Sets output of error messages on/off, → 6.14.2
ENABLE BREAKS	En brEAk	Sets ouput of breaks on/off, → 6.14.3

6.14.1 PARAMETER

Via the menu line SERIAL INTERFACE → PARAMETER, then press **ENTER** key to enable the adjustment of the transfer format:



The field flashing on the display or the line marked * on the monitor marks the adjustment to be changed; use ↑ and ↓keys to realise the changes.Use ← and → keys to select the next field. End programming by pressing the **ENTER** key.

BAUDRATE Selects baudrate: 1200, 2400, 4800, 9600, 19200.

DATA BITS Number of data bits: 7, 8.

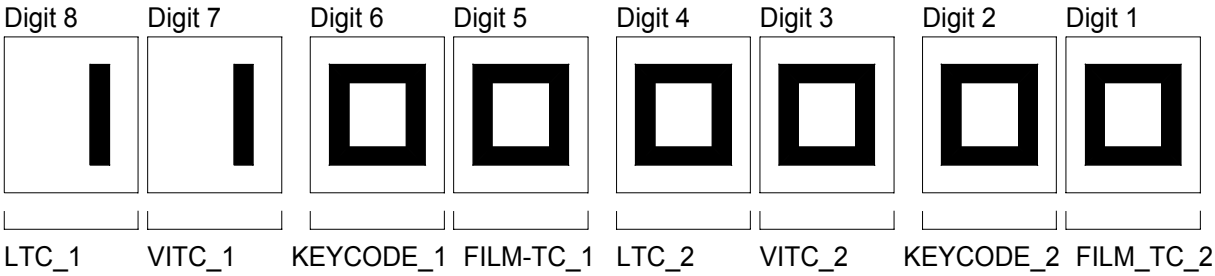
PARITY Adjustment of the parity bit:

Insertion	Display	Parity
NO PARITY	n	no parity bit
ODD PARITY	o	odd
EVEN PARITY	E	even
MARK PARITY	1	parity bit = 1

STOP BITS Number of stop bits: 1, 2.

6.14.2 ENABLE ERRORS

Via the menu line SERIAL INTERFACE → → ENABLE ERRORS, then press **ENTER** key to adjust whether ERROR messages will be sent for the corresponding timecode.

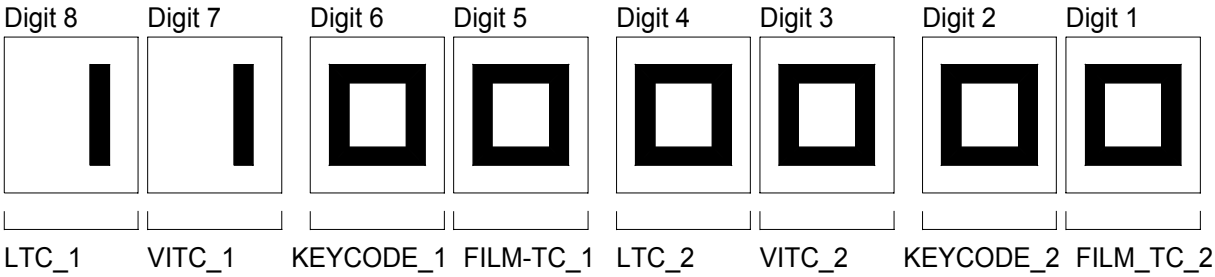


The field flashing on the display or the line marked * appearing on the monitor marks the adjustment to be changed, use ↑ and ↓ to realise any changes. Press ← and → keys to select the next field.

A **1** indicates that ERROR messages are sent for this timecode, a **0** indicates no ERROR messages.

6.14.3 ENABLE BREAKS

Via the menu line SERIAL INTERFACE → → ENABLE ERRORS, then press **ENTER** key to adjust whether BREAK messages will be sent for the corresponding timecode.



The field flashing on the display or the line marked * appearing on the monitor indicates the adjustment to be changed, to realise changes use ↑ and ↓ keys. Use ← and → keys to select the next field.

A **1** indicates that BREAK messages are sent for this timecode, a **0** indicates no BREAK messages.

7. Hints for error analysis

- Please keep in mind that the error analysis may be switched off by pressing the **RUN/STOP** key. The **STOP** LED lightens if no error analysis is executed.
- Please note that for VITC (or 3-lines VITC) the VITC lines have to be adjusted.
- A cyclic error = DROP-OUT can e.g. hint at a false adjustment of the frame rate.
- If a timecode is absolutely faulty, the adjustment of the o.k. counter can have the following effect:
  With adjustment 0 the error list will become very long, keep in mind that there might be a protocol printout!
  With adjustment >0 it might occurr that no errors will be counted, since the adjusted number of frames has never been read without errors occurring! Please check if any o.k. has been given:
  - The protocol printout shows an o.k. message.
  - The monitor window must not show a ***** beside the time.
  - The display must not show a **n** for the error counter in the menu (e.g. menu **Err LTC1** (ERROR LTC_1) → → **EAn 0000**).
- Use monitor window 8 = TC MEMORY if you have difficulties to identify the exact error type. Switch display to time display of the timecode to be analysed. Press RESET key for a short moment and wait until the monitor window shows a list of time values, i.e. an error has been detected. Analysing the time values before and after the error message together with the error counter may supply hints to the error type.

8. General remarks

We reserve the right to modify specifications without notice.

This unit contains maintenance-free parts only. Any intervention must be made by qualified personnel only. Ensure that the equipment is not used in extremely hot, cold or humid locations, nor exposed to heavy vibrations or strong electromagnetic fields.

In case of obvious damage caused during transportation please immediately inform the responsible forwarding agent and your dealer.

9. CE declaration of conformity

We,

Alpermann+Velte
Electronic Engineering GmbH
D-42103 Wuppertal, Morianstr.16

herewith declare under our sole responsibility that the

AV- TC30 ANALYSER

to which this declaration relates is in conformity with the following standards:

1. EN 55022, class B
2. IEC 801-2
3. IEC 801-3/ENV 50140

The following preconditions have to be fulfilled:
- Only shielded audio, video and data cables have been connected.
- Housing has been connected to ground.

Appendix A: Protocol list

The messages output via serial interface are in ASCII format allowing to connect a printer via serial Centronics converter.
The following data strings are transferred (data 01 is sent first):

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

For the header, a string of 48 characters and a string of 47 characters:

CR	LF													A	D	D	R	E	S	S					T	Y	P	E				M	E	S	S	A	G	E	CR	LF		
														=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	LF	CR	LF						

With the evaluation difference LTC-to-VITC pressing of key **F3** permits to print the current and maximum difference:

						M	A	X		=		+	0	0	:	0	0	:	0	0	:	1	2			D	I	F	F		=		+	0	0	:	0	0	:	0	0	:	0	0			

All other messages sent automatically consist of 48 characters + a 4-digit counter + CR ($0D) and LF ($0A). The counter increments with every line.
Example:

Message = 48 characters	0	0	0	1	CR	LF

Breaks. The first time value indicates the last frame before the break, the second time value the first frame after the break:

					L	T	C	_	1			0	1	:	5	8	:	2	7	:	1	4		B	R	E	A	K	=	0	1	:	5	9	:	5	9	:	0	0			
					V	I	T	C	_	1			0	1	:	5	8	:	2	7	:	1	4		B	R	E	A	K	=	0	1	:	5	9	:	5	9	:	0	0			
					K	E	Y	C	_	1			3	9		1	2	9	7	.	1	5		B	R	E	A	K	=		3	9		1	3	0	8	.	0	9			
						T	C	_	1			0	1	:	5	8	:	2	7	:	1	4		B	R	E	A	K	=	0	1	:	5	9	:	5	9	:	0	0			

O.k. messages:

												0	1	:	5	8	:	2	7	:	1	4		L	T	C	_	1	O	.	K	.											
												0	1	:	5	8	:	2	7	:	1	4	V	I	T	C	_	1	O	.	K	.											
					0	2	9	7		3	5		9	8	3	9		1	2	9	7	.	1	5	K	E	Y	C	_	1	O	.	K	.											
												0	1	:	5	8	:	2	7	:	1	4		F	T	C	_	1	O	.	K	.											

Error messages for all timecodes, e.g.:

												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	N	O	T		P	L	A	U	S	I	B	L	E		
												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	D	R	O	P	-	O	U	T							
												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	E	Q	U	A	L										
												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	T	I	M	E	-	O	U	T							

Error messages especially for LTC:

												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	R	E	V	E	R	S	E							
												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	T	I	M	I	N	G								
												2	1	:	3	8	:	2	9	:	1	0		L	T	C	_	1	V	-	S	Y	N	C								
					L	T	C	_	1		=		2	1	:	3	8	:	2	9	:	1	0		D	I	F	F		=		+	0	0	:	0	0	:	0	0	:	1	2		

The last line is sent with the evaluation of the LTC-to-VITC difference.

Error messages especially for VITC/3-line VITC:

												2	1	:	3	8	:	2	9	:	1	0		V	I	T	C	_	1	F	I	E	L	D		F	L	A	G				
												2	1	:	3	8	:	2	9	:	1	0		V	I	T	C	_	1	1	.	/	2	.		F	I	E	L	D				