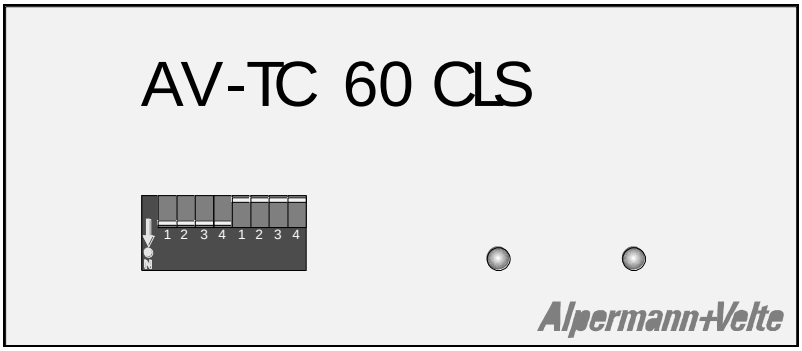
Operating Instructions
Rev. No. 2.9
August 20, 2007

- LTC reader with serial interface
- Converter LTC to “real time” output

AV-TC 60 CLS



plura

Table of contents

A1 General hints for safe operation

In general: Please only use the equipment in dry rooms and according to the directions. Handle the **AV-TC 60 CLS** with the same care as any other studio equipment. Pay attention to the corresponding instructions in the operating manual of our equipment.

Damage due to transportation: In case of obvious damage caused during transportation, please inform the responsible forwarding agency. Please also get directly in touch with your dealer.

Location: Do not expose the equipment to extreme temperatures, dust, humidity, vibrations and strong electromagnetic fields. Excessive heat reduces the life of the equipment and is a safety hazard.

Care: Please use a soft cloth to clean the cabinet case. Do not use any cleaning agents.

Repairs: As electronic state-of-the-art components have been used in your equipment, no maintenance is required. The unit does not contain any parts which might be repaired by yourself. **For this reason, any intervention should only be performed by an authorised service partner.**

EMC: The EMC regulations are observed only under the following condition: use high quality shielded cables at data inputs and outputs.

A2 Copyright

Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

In this operating manual the naming of products of other manufacturers only serves for informational purposes. It is no violation of trade-mark law.

For further information, contact or your local dealer or

PLURA Europe GmbH

Muehlweg 11
D-73433 Aalen
Phone: ++49 - (0)7361 – 589 46 0
Fax: ++49 - (0)7361 – 589 46 55
E-Mail: info@plurabroadcast.com
Internet: http://www.plura.tv

A3 CE Declaration of Conformity

We,

PLURA Europe GmbH

Muehlweg 11
D-73433 Aalen

declare under our sole responsibility that the

AV-TC 60 CLS

meets the intent of the following directives, standards and specifications:

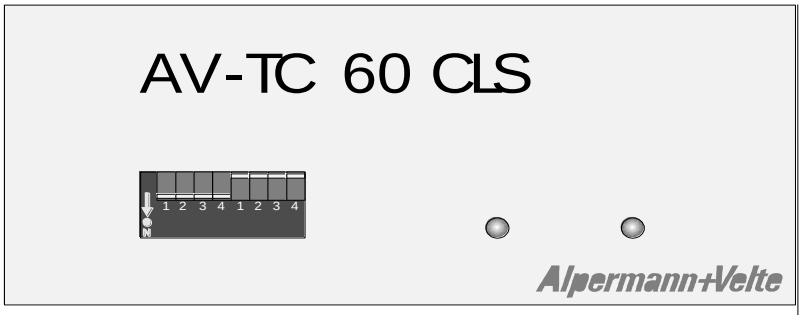
89/336/EEC Electromagnetic Compatibility

EN 50081-1 Emissions
- EN 55103-1
- EN 55022

EN 50082-1 Immunity
- EN 55024
- EN 55103-2

B Functional Description

Front Panel of the AV-TC 60 CLS



1 2 3 4 5 6 7 8 TC Power

dip switches

Functional Overview

The **AV-TC 60 CLS** is a system combining an LTC reader and a serial interface. Two interfaces are available: 1. with RS232 serial interface,
2. with RS422 serial interface.

The **AV-TC 60 CLS** operates like a clock, which counts time and date with the common crystal accuracy. Time and date are output through different data protocols, as selected via dip switches. The date indication for the year is in two-digit format for input, output and internal operation. Day of the week and day of the year is calculated, with calculation valid from the 1.1.1998 - 31.12.2097. After having switched on the unit a valid “real time“ LTC must be read first to set time and date of the internal clock. Then the data output starts. As long as a valid LTC is read, the internal clock will be set as well as synchronised to the LTC. During this time the accuracy of the clock will be determined by the LTC.
The LTC must show certain characteristics to be accepted as “valid“:

- LTC in “forward direction“, with time information continuously up-counting.
- Frame rate = **25** (PAL version) or **30** (NTSC version) and LTC with nominal frequency $\pm$ 2%.
- The date has been identified as valid, and the correct type of LTC has been selected and read (see below).

Two LEDs indicate status information:
LED **POWER** lights as soon as the unit is powered on. This LED will be switched off shortly with every output of a serial data string.

LED **TC** indicates the status of the LTC reader:

LED off:	no LTC is read.
LED flickering:	LTC is read (LED flashes with every frame), but LTC neither sets nor synchronises the internal clock.
LED on:	read LTC synchronises the internal clock.

Dip Switches

The eight dip switches of the **AV-TC 60 CLS** serve to select the following settings. To avoid malfunctions caused through unintended keying, the switches are only requested once after power-on.

SW 1/ SW 2: Type of LTC

SW 1	SW 2	Type of LTC
OFF	OFF	0 = LTC time, no information of a date available, date is set to 01/01/01.
ON	OFF	1 = LTC time, date out of the user bits.
OFF	ON	2 = LTC(MTD): time and date from the user bits multiplex.
ON	ON	3 = LTC(MTD): LTC time, date from the user bits multiplex.

(Further time code formats will be accepted with special firmware, please notice chapter "D Options – Special Firmware".)

SW 3/ SW 4: Baud rate selection

SW 3	SW 4	Baud rate
OFF	OFF	2400
ON	OFF	4800
OFF	ON	9600
ON	ON	19200

SW 5: Parity

ON: transfer with parity bit (even)
OFF: transfer without parity bit

SW 6/ SW 7: Serial data protocol

SW 6	SW 7	Protocol
OFF	OFF	0 = time telegram "VCS"
ON	OFF	1 = "Meinberg" standard protocol
OFF	ON	2 = DCF77 telegram
ON	ON	3 = reserved

(Further protocols will be transmitted with special firmware, please notice chapter "D Options – Special Firmware".)

SW 8: reserved

Type of LTC

The switches SW1 and SW2 serve to select four types of 'valid' LTC:

LTC of type 0, SW1=OFF, SW2=OFF
The real time is identical with the time information of the LTC. There is no date information available, after power-on the date of the internal clock is set to 01/01/01.

LTC of type 1, SW1=ON, SW2=OFF
The real time is identical with the time information of the LTC, a valid date has to be coded in the user bits. The date in the user bits is not expected to come from a data multiplex (the flag bits BGF0, BGF1 and BGF2 of the LTC will not be evaluated) but read out with every frame.
The date has the following format: day = user digits 5+6 ("minutes"),
month = user digits 3+4 ("seconds"),
year = user digits 1+2 ("frames").
The user digits 7 ("units of hours") and 8 ("tens of hours") are evaluated as status information:

Digit	Bit	Status
7	0	=0: time transfer into the LTC is not synchronous to "real time reception" by DCF77/GPS, or the clock of the receiver counts in free running mode. =1: time transfer synchronised.
7	1/2	time zone: 00: UTC 1/0: Central European Time (CET) 0/1: Central European Summer Time (CEST) 1/1: undefined (set to UTC)
7	3	=0: no announcement beginning/end of daylight savings time =1: announcement beginning/end of daylight savings time
8	0	=0: no announcement of leap second =1: announcement of leap second

User bits of this kind will be generated by the time code generator G30TM (with full functionality of the status bits from revision no. 2.4 on) or GM-TTT or RUB GT.

LTC of type 2, SW1=OFF, SW2=ON
The LTC is generated by a central generator unit of the MTD system (e.g. G30TTT or G30TM-TTT or GM-TTT or RUB GT) and is denoted as LTC(MTD). Time and date are read-out data of the user bits (special multiplex of the user data), i.e. the time is the "real time" of the MTD system.
Status bits to be transferred:
- time transfer synchronous yes/no,
- time zone CET or CEST,
- announcement start/end of Daylight Saving Time.

LTC of type 3, SW1=ON, SW2=ON
As with type 2 the LTC expected is of type LTC(MTD). Unlike type 2, the time is read from the time information of the LTC (not out of the user bits).

(Further time code formats will be accepted with special firmware, please notice chapter “D Options – Special Firmware”.)

Serial Data Protocol

Three data protocols may be selected using the switches SW6 and SW7:

Protocol 0, SW6=OFF, SW7=OFF, time telegram "VCS"
Time, date and status information are transferred every 60 seconds always at the 29th second by a serial data string (witch the data of the 30th second). To achieve precise synchronisation, "ETX" will be sent at a valid point of time, i.e. at the start of the 30th second. In detail, "ETX" starts with bit 76 of the last LTC frame (=24) of the 29th second, i.e. 2ms ahead of the "real time" - with a jitter of ±50µs, if the internal clock is synchronised to LTC. No announcement bits will be sent. Baud rate and parity may be set via the switches, 8 data bits and 1 stop bit are fixed.

The data string consists of 21 digits, all of ASCII format except LCR:

<STX>/K/Data/LCR/<ETX> (the separation signs "/" will not be sent).

STX	start of text	$02
K	time zone	K='N' with central European time K='S' with central European summer time K='U' with UTC
Data	YY/MM/DD/W/DOY/hh/mm/ss/D	YY = calendar year, 2 bytes, 00-99 MM = month, 2 bytes, 01-12 DD = day, 2 bytes, 01-31 W = day of the week, 1 byte, 1-7, 1=monday DOY = day of year, 3 bytes, 001-365/366 hh = hours, 2 bytes, 00-23 mm = minutes, 2 bytes,, 00-59 ss = seconds, 2 bytes, (=30 fix) D = status: D = 'S': synchronous, i.e. the internal clock is synchronous to LTC and the LTC supplies the status "synchronous time transfer". D = ' ': internal clock in free-running mode or the LTC supplies the status "non-synchronous time transfer". D = 'X': Invalid time, no time has been set since power-on
LCR	parity check	LCR = XOR over all bytes "K" – "data"
ETX	end of text	$03

Protocol 1, SW6=ON, SW7=OFF, “Meinberg“ standard protocol

Time, date and status information are transferred every second by a serial data string. In detail, the data string starts with bit 66 of the LTC frame 00 of the respective second - i.e. with a delay of 33ms against the “real time“ - with a jitter of ±50µs if the internal clock has been synchronised to LTC. Baud rate and parity may be set with the switches, 7 data bits and 1 stop bit are fixed.

The data string consists of 32 characters in ASCII format:

<STX>D:01.01.98;T:4;U:14.15.41;#*S!<ETX>

STX	start of text	$02
D:	followed by the date	day.month.year
T:	followed by the day of week	1-7, 1 = Monday
U:	followed by the time	hours.minutes.seconds A leap second is transferred as second = 60
#	synchronisation after power-on	# = invalid time, no time has been set since power-on. ‘ ‘ = internal clock has been set by LTC.
*	Current synchronisation	* = internal clock in free-running mode or the LTC supplies the status “non-synchronous time transfer“. ‘ ‘ = synchronous, i.e. the internal clock is synchronous to LTC and the LTC supplies the status “synchronous time transfer“.
S	time zone	S = Central European summer time ‘ ‘ = Central European time U = UTC
!	announcement	! = announcement beginning/end of daylight saving time. A = announcement of a leap second. ‘ ‘ = no announcement.
ETX	end of text	$03

Protocol 2, SW6=OFF, SW7=ON, DCF77 telegram

Time, date and status information are transferred by seconds pulses according to the coding scheme of the time signal transmitter DCF77. The usual parameters of a serial interface (baud rate, parity...) are not relevant here. The seconds pulses are transmitted as data level 0 of data out (TxD resp. T+ and T-). A 0 value is realised through a pulse duration of 95ms, a value of 1 through 200ms. In detail, every pulse starts with bit 66 of the LTC frame 24 of the preceding second - i.e. 7ms ahead of the “real time“ -, with a jitter of ±50µs if the internal clock has been synchronised to LTC.
Time and date of the complete telegram indicate the point of time of the next minute mark. There is no seconds pulse 59; only when a leap second is inserted a 100ms pulse will be sent, and the inserted 60th second will not be represented by a seconds pulse.

Seconds mark	Coding	Description
0	0	= minute mark
1..15	0	= not used with AV-TC 60
16	A1	= announcement beginning/end of daylight saving time
17, 18	Z1, Z2	= time zone: Z1/Z2 = 0/1: Central European time Z1/Z2 = 1/0: Central European summer time Z1/Z2 = 0/0: UTC
19	A2	= announcement of a leap second
20	1	= start bit of the time information
21..27	BCD	= minute
28	P1	= check bit, completes marks 21..27 to an even number of ones
29..34	BCD	= hour
35	P2	= check bit, completes marks 29..34 to an even number of ones
36..41	BCD	= day of calendar
42..44	BCD	= day of week
45..49	BCD	= month
50..57	BCD	= year (units, tens)
58	P3	= check bit, completes marks 36..57 to an even number of ones
59	-	

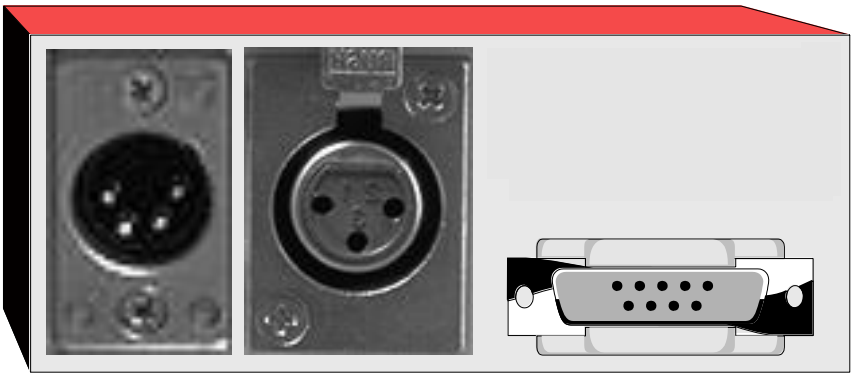
Announcement Bits and Time Jumps

The announcement bits are subject to a chain of plausibility checks in the individual components (DCF77 receiver, LTC generator, TC60), i.e. that the transmission of the first announcement bit will be delayed for a few minutes. The announcement bits will be deleted in TC60 immediately after the time jump.
If TC60 has accepted an announcement bit, the time jump will be executed correctly (i.e. in advance compared to the time of the LTC) by the internal clock. An announcement bit is accepted if it was sent 255 times in succession, i.e. after 255 LTC frames (10 seconds approx.) with a generator of type G30TM/GM-TTT/RUB GT resp. after 3060 LTC frames (122 seconds approx.) with the generator G30TTT. It will only then be dismissed if it has not been set in the LTC 255 times in succession. The announcement bit for beginning/end of daylight saving time will only be accepted if the time zone is CET or CEST.
At the beginning and end of the summer time internally also the time zone bits will automatically be changed to CET or CEST.

Within the transfer chain the LTC generator (G30TTT/G30TM/GM-TTT/RUB GT) assumes a central function. Please take care in selecting the operating mode for the reception of DCF77 or GPS and in setting the date and status transfer in the user data (case G30TM/GM-TTT/RUB GT).

C Connections and Technical Data

Rear Panel of the AV-TC 60 CLS



Technical Data

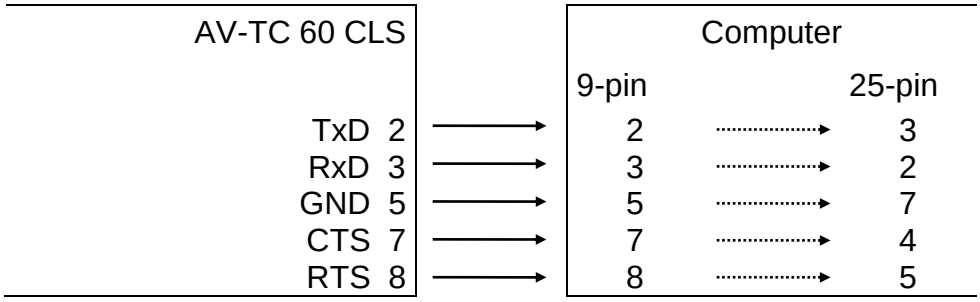
Housing		aluminium
Dimensions		104 x 43.5 x 160 mm (W x H x D)
Weight		0.5 kg approx.
Power supply		9-30 V DC
Power consumption		with RS232: 1 W typically with RS422: 1.5 W typically
Accuracy of internal clock during free run, i.e. with no external LTC signal but after a synchronisation has been achieved.		dependent at amount of temperature changes during free run: basic accuracy: < 0.2ppm (< 0.02 s/day) with changing temperature: < 4ppm/° (< 0.35 s/day)
Ambient temperature		0°- 40° C
Relative humidity of air		35 - 85 %, non-condensing
Inputs:	Connections	Signal description
Power	4-pin XLR male	1 = V- 4 = V+
LTC	3-pin XLR female	1= GND 2/3 = signal, balanced 50 mV_{p-p} - $5V_{p-p}$ impedance 47K approx. reading range (PAL): 24.5 - 25.5 frames/sec reading range (NTSC): 29.4 - 30.6 frames/sec

Technical data cont.:

Interfaces	Connector	Pin assignment	
RS 232	9-pin D-Sub female	1	-
		2	TxD out
		3	RxD in
		4	-
		5	GND
		6	-
		7	CTS in
		8	RTS out
		9	-
RS 422	9-pin D-Sub female	1	-
		2	T- out
		3	R+ in
		4	RxC
		5	GND
		6	TxC
		7	T+ out
		8	R- in
		9	-

Example for Connection

RS 232 interfacing a computer:



C Options

Master Output to Control Analogue Clocks

With this option a distribution amplifier supplies the analogue clocks of the *PLURA* MTD system with power as well as with time data. The time data forms a telegram similar to the German radio time telegram DCF77. The data bits are transmitted every second except at seconds = 59. The time data are synchronous to the seconds pulse of the internal clock.

The signals are connected at a DSUB 9-pins female. Below the pin assignment and a wiring example:

from Master Output	**to Analogue Clocks**
DSUB9F	open ends (to screwing posts)
1: V+ Out	Vdd (1)
2: V- Out	GND (2)
7: Signal Out	Signal (3)
8: Signal GND	GND (4)

The pins not specified should not be used. Use e.g. a two-paired, twisted cable, twist 1 with 2 and 7 with 8.

Every slave clock requires <=11mA at >=6V. To calculate the maximum cable length the output voltage, cross section, specific resistance and number of clocks have to be involved. For radial arrangement of copper cables with a cross section of 0,22mm² and an output voltage of 12V, the following cable lengths are possible:

no. of clocks	**1**	**2**	**5**	**10**	**20**	**30**
length (m)	3500	1750	700	350	175	117

The maximum number of clocks is limited by a 300mA fuse to 30 clocks each driver. A control LED at the front is directly connected to the signal output.

With this option the technical data of the unit change. Use only the AC/DC adapter delivered with the unit!

Item	**Specification**
Input voltage	11-18V DC (instead 9 - 30V DC)
Power consumption	with RS232: max. 6.5 W with RS422: max. 7 W

Special Firmware

Optional the following special firmware is available:

Name	Functional Description
NTSC-30	Time Code with 30 frames (non-drop mode) will be accepted.
NTSC-DROP	Time Code with 29.97 frames (drop mode) will be accepted.
HOPF	Transmits a serial data protocol according to a "HOPF" standard.
WHARTON	Transmits a serial data protocol according to a "WHARTON" standard.
NOMESZ	If the status bits of the time code are indicating a Daylight Saving Time (e.g. CEST) the time will be subtracted by one hour.
SVT	Accepts a special date format of the Time Code: YY MM DD xx. Time zone status will be set to "UTC", no Daylight Saving Time.
YMD	Accepts a special date format of the Time Code: xY YM MD Dx. Time zone status will be set to "UTC", no Daylight Saving Time.
BBC	Accepts a special date format of the Time Code: BBC or LEITCH format. Time zone status will be set to "UTC", no Daylight Saving Time.
BBC-1	Accepts a special date format of the Time Code: BBC or LEITCH format. Time zone status will be set to "UTC", no Daylight Saving Time. The time of the time code will be subtracted by one hour.
MZUTC1	Accepts a special date format of the Time Code: BBC or LEITCH format. The time of the time code shows the CET/CEST time zone, with Daylight Saving Time switching. TC60 calculates the "UTC".
MZUTC2	Date format of the Time Code according to LTC type 1. The time of the time code shows the WET/WEST time zone, with Daylight Saving Time switching. TC60 calculates the "UTC".
MZUTC3	Accepts a special date format of the Time Code: BBC or LEITCH format. The time of the time code shows the WET/WEST time zone, with Daylight Saving Time switching. TC60 calculates the "UTC".