

- LTC and VITC Reader with Serial Interface

# TC 60 RLV



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## A1 General Hints for Safe Operation

- In general:** Please only use the equipment in dry rooms and according to the directions. Handle the **TC 60 RLV** 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

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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

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## A3 CE Declaration of Conformity

We,

### ***PLURA Europe GmbH***

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declare under our sole responsibility that the

### **TC60RLV**

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 Controls



↑ OFF Dip Switches  
↓ ON 1 2 3 4 5 6 7 8

LED LED  
TC POWER

### Overview of Functions

**TC60RLV** works as an LTC and VITC reader and converter. Time code will be converted to a data interface. Three variants are available:

- with RS232 interface = **TC60RLV2**  
or
- with RS422 interface = **TC60RLV4**  
or
- with USB interface = **TC60RLVU**

**TC60RLV** reads the linear SMPTE/EBU time code (LTC) as well as the time code of the vertical blanking interval (VITC) inserted into a PAL or NTSC CVBS video signal. The time code has to comply with the SMPTE 12M-1-2008. LTC and VITC will be read simultaneously if both are enabled by setting the dip switches SW 1 and SW 2 to “on”. Regarding the data transmission via the interface, data of the VITC signal establish priority.

**TC60RLV** detects the frame rate (24, 25, 30 or 30drop) automatically. Time addresses, user data (binary group data) and flag bits can be read simultaneously. LTC can be read in forward and reverse direction; the one-frame advance method will be applied unless a “still” LTC is read. Every read-out of a frame is indicated by flashing of the LED **TC**. According to the frequency of the frames, the LED seems to light continuously: in case the LTC frequency exceeds 33 frames/sec and in case of reading VITC.

The time code data will be transferred by the installed interface (RS422 or RS232 or USB). In case of the USB interface, the device will have an internal USB to serial converter assembled. The USB interface thus works as a serial interface, i.e. the application program at your computer opens a COM port and has to receive a set-up of the serial parameters. One stop bit and eight data bits of the serial

parameters are fixed; parity bit and baud rate can be selected by the dip switches at **TC 60 RLV**.

## Dip Switches

The operating mode of **TC 60 RLV** is selected by eight dip switches. Changing the dip switch settings during operation will have an effect immediately.

**SW1: Enable/disable the LTC reader**

ON: LTC reader on  
OFF: LTC reader off

**SW2: Enable/disable the VITC reader**

ON: VITC reader on  
OFF: VITC reader off

The VITC lines will be found automatically within the vertical interval.

**SW3+SW4: Adjust the baud rate**

SW3	SW4	Baud rate
OFF	OFF	4,800
ON	OFF	9,600
OFF	ON	19,200
ON	ON	38,400

**SW5: Parity**

ON: data transfer with parity bit (odd);  
OFF: data transfer without parity bit.

**SW6+SW7+SW8: Data transfer protocols** (see next chapter for details)

SW6	SW7	SW8	Protocol
OFF	OFF	OFF	Data transfer after a one-word request
ON	OFF	OFF	Automatic data transfer
OFF	ON	OFF	Sony recorder protocol
ON	ON	OFF	ASCII per second: h <sub>10</sub> h <sub>1</sub> :m <sub>10</sub> m <sub>1</sub> :s <sub>10</sub> s <sub>1</sub> <CR>
OFF	OFF	ON	ASCII each frame: h <sub>10</sub> h <sub>1</sub> :m <sub>10</sub> m <sub>1</sub> :s <sub>10</sub> s <sub>1</sub> .f <sub>10</sub> f <sub>1</sub> <CR>
ON	OFF	ON	ASCII per second: <STX><ADDR>h <sub>10</sub> h <sub>1</sub> :m <sub>10</sub> m <sub>1</sub> :s <sub>10</sub> s <sub>1</sub> <ETX>
OFF	ON	ON	ASCII per second: <STX><ADDR><E>h <sub>10</sub> h <sub>1</sub> m <sub>10</sub> m <sub>1</sub> s <sub>10</sub> s <sub>1</sub> <ETX>
ON	ON	ON	Reserved for optional protocols or special operating modes

## Factory or Default Settings

	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
<b>Interface RS422/USB</b>	ON	ON	ON	ON	ON	OFF	ON	OFF
<b>Interface RS232</b>	ON	ON	ON	OFF	ON	OFF	OFF	OFF

## C Data Transfer Protocols

### Data Transfer after Request: SW6/SW7/SW8 = OFF/OFF/OFF

TC 60 RLV transfers data after receiving one of the following words:

Request		TC 60 RLV data return			
ASCII	hexadecimal				
T	\$54	Time, 4 words BCD			
t	\$74	Hours/ Minutes/ Seconds/ Frames			
U	\$55	User data, 4 words			
u	\$75	User 8+7/ User 6+5/ User 4+3/ User 2+1			
V	\$56	Time + user, 8 words			
v	\$76	Hours/ Minutes/ Seconds/ Frames User 8+7/ User 6+5/ User 4+3/ User 2+1			
W	\$57	Time + flag bits, 5 words			
w	\$77	Hours/ Minutes/ Seconds/ Frames/ Flags The 8 flag bits are:			
		<i>VITC</i>		<i>LTC</i>	
		Bit 7	0	Bit 7	Direction 0 = forward
		Bit 6	1 = identifies reading VITC	Bit 6	0 = identifies reading LTC
		Bit 5	Bit 75 of VITC (field flag PAL)	Bit 5	Bit 59 of LTC
		Bit 4	Bit 74 of VITC	Bit 4	Bit 58 of LTC
		Bit 3	Bit 55 of VITC	Bit 3	Bit 43 of LTC
		Bit 2	Bit 35 of VITC (field flag NTSC)	Bit 2	Bit 27 of LTC
		Bit 1	Bit 15 of VITC (color lock flag)	Bit 1	Bit 11 of LTC (color lock flag)
		Bit 0	Bit 14 of VITC (drop flag)	Bit 0	Bit 10 of LTC (drop flag)
F	\$46	Flag bits, one word (see above)			
f	\$66				
R	\$52	Frame rate, 1 word BCD:			
r	\$62	The automatically detected frame rate ( 24, 25 30) will be transferred.			

Difference between commands with a **capital letter** compared to a **small letter**:  
 Receiving a capital letter, the data return will take place immediately. The data are the one which are presently stored in the internal registers. If a small letter is used instead, the data return will wait for the next time code to transfer the up-to-date data. With that, the communication can be synchronised with the time code.



## **Automatic Data Transfer: SW6/SW7/SW8 = ON/OFF/OFF**

**TC 60 RLV** transfers time and user data automatically after having read a valid time code (LTC: each frame, VITC: each field).

Recommendation: Baud rate  $\geq 9,600$ , if only LTC (no VITC) is read;  
 baud rate  $\geq 19,200$ , if VITC is read.

The data string consists of ten words:

No.	high nibble, bits 4-7	low nibble, bits 0-3
1.	0	D (hexadecimal)
2.	8. user digit	Tens of hours
3.	7. user digit	Units of hours
4.	6. user digit	Tens of minutes
5.	5. user digit	Units of minutes
6.	4. user digit	Tens of seconds
7.	3. user digit	Units of seconds
8.	2. user digit	Tens of frames
9.	1. user digit	Units of frames
10.	<b>CHECK WORD</b> = sum of words 1 - 9 without carry	

## Sony Recorder Protocol: SW6/SW7/SW8 = OFF/ON/OFF

**TC 60 RLV** simulates a recorder with a serial interface (mostly a RS422 interface is used).

Recommendation: Baud rate = 38,400.

The following requests give a return:

request	hexadecimal	return
Device type	\$00 \$11 \$11	\$12 \$11 \$11 \$00 \$34 (frame rate = 25) \$12 \$11 \$10 \$00 \$33 (frame rate = 30)
Timer mode	\$60 \$36 \$96	\$71 \$36 \$00 \$A7
Generator time	\$61 \$0A \$01 \$6C	\$74 \$08 *1 *3
Generator user	\$61 \$0A \$10 \$7B	\$74 \$09 *2 *3
Generator time+user	\$61 \$0A \$11 \$7C	\$74 \$08 *6 *3
LTC time	\$61 \$0C \$01 \$6E	\$74 \$04 *1 *3
LTC user	\$61 \$0C \$10 \$7D	\$74 \$05 *2 *3
LTC time+user	\$61 \$0C \$11 \$7E	\$78 \$04 *6 *3
VITC time	\$61 \$0C \$02 \$6F	\$74 \$06 *1 *3
VITC user	\$61 \$0C \$20 \$8D	\$74 \$07 *2 *3
VITC time+user	\$61 \$0C \$22 \$8F	\$78 \$06 *6 *3
LTC or VITC time	\$61 \$0C \$03 \$70	\$74 \$04/\$06 *1 *3
LTC or VITC user	\$61 \$0C \$30 \$9D	\$74 \$05/\$07 *2 *3
LTC or VITC time+user	\$61 \$0C \$33 \$A0	\$78 \$04/\$06 *6 *3
Timer 1	\$61 \$0C \$04 \$71	\$74 \$00 *1 *3
Timer 2	\$61 \$0C \$08 \$75	\$74 \$01 *1 *3
Status	\$61 \$20 *4 *3	*5
Other request/ commands		\$10 \$01 \$11 (=ACK)

Key to signs and symbols:

- \*1: Regardless of the special request (LTC or VITC) the actual time code is sent, i.e. BCD time = frames/ seconds/ minutes/ hours.
- \*2: User data = User 2+1/ User 4+3/ User 6+5/ User 8+7.
- \*3: Check word = sum of the preceding words
- \*4: Status request, for details see Sony protocol
- \*5: Status request. Status bits *SHUTTLE* and *REV* will be set if currently LTC of reverse direction is read, otherwise the status bits *PLAY* and *SERVO LOCK* are set (for details see "SONY PROTOCOL OF REMOTE-1 (9-pin) CONNECTOR").
- \*6: Time data according to \*1 + user data according to \*2.

## **ASCII Protocol Once Per Second: SW6/SW7/SW8 = ON/ON/OFF**

**TC 60 RLV** transmits the time addresses of the time code, no user data.

Data will be sent if a new second in the time code is detected, but also as a refresh once per second if the time in the time code does not change.

The data string consists of nine words:

<b>Nr.</b>	<b>ASCII Word</b>		<b>Description</b>
1.	h <sub>10</sub>	0x30–0x32	Tens of hours
2.	h <sub>1</sub>	0x30–0x39	Units of hours
3.	:	0x3A	Colon
4.	m <sub>10</sub>	0x30–0x35	Tens of minutes
5.	m <sub>1</sub>	0x30–0x39	Units of minutes
6.	:	0x3A	Colon
7.	s <sub>10</sub>	0x30–0x35	Tens of seconds
8.	s <sub>1</sub>	0x30–0x39	Units of seconds
9.	<CR>	0x0D	Control character “carriage return”

## **ASCII Protocol Each Frame: SW6/SW7/SW8 = OFF/OFF/ON**

**TC 60 RLV** transmits the time addresses of the time code, no user data.

Data will be sent with every read time code frame (VITC: each filed), but also as a refresh once per second if no time code can be read.

Recommendation: Baud rate ≥ 9,600, if only LTC (no VITC) is read;  
 baud rate ≥ 19,200, if VITC is read.

The data string consists of twelve words:

<b>Nr.</b>	<b>ASCII Word</b>		<b>Description</b>
1.	h <sub>10</sub>	0x30–0x32	Tens of hours
2.	h <sub>1</sub>	0x30–0x39	Units of hours
3.	:	0x3A	Colon
4.	m <sub>10</sub>	0x30–0x35	Tens of minutes
5.	m <sub>1</sub>	0x30–0x39	Units of minutes
6.	:	0x3A	Colon
7.	s <sub>10</sub>	0x30–0x35	Tens of seconds
8.	s <sub>1</sub>	0x30–0x39	Units of seconds
9.	.	0x2E	Full stop
10.	f <sub>10</sub>	0x30–0x32	Tens of frames
11.	f <sub>1</sub>	0x30–0x39	Units of frames
12.	<CR>	0x0D	Control character “carriage return”

## **“BFE“ Protocol: SW6/SW7/SW8 = ON/OFF/ON**

**TC 60 RLV** transmits the time addresses of the time code, no user data.

Data will be sent if a new second in the time code is detected, but also as a refresh once per second if the time in the time code does not change.

The data string consists of eleven words:

<b>Nr.</b>	<b>ASCII Word</b>		<b>Description</b>
1.	<STX>	0x02	Control character “start of text”
2.	1	0x31	<ADDR> = address, set to 1
3.	h <sub>10</sub>	0x30–0x32	Tens of hours
4.	h <sub>1</sub>	0x30–0x39	Units of hours
5.	:	0x3A	Colon
6.	m <sub>10</sub>	0x30–0x35	Tens of minutes
7.	m <sub>1</sub>	0x30–0x39	Units of minutes
8.	:	0x3A	Colon
9.	s <sub>10</sub>	0x30–0x35	Tens of seconds
10.	s <sub>1</sub>	0x30–0x39	Units of seconds
11.	<ETX>	0x03	Control character “end of text”

## **„Louth“ Protocol: SW6/SW7/SW8 = OFF/ON/ON**

**TC 60 RLV** transmits the time addresses of the time code, no user data.

Data will be sent if a new second in the time code is detected, but also as a refresh once per second if the time in the time code does not change.

The data string consists of ten words:

<b>Nr.</b>	<b>ASCII Word</b>		<b>Description</b>
1.	<STX>	0x02	Control character “start of text”
2.	1	0x31	<ADDR> = = address, set to 1
3.	E	0x45	Command “enter“
4.	h <sub>10</sub>	0x30–0x32	Tens of hours
5.	h <sub>1</sub>	0x30–0x39	Units of hours
6.	m <sub>10</sub>	0x30–0x35	Tens of minutes
7.	m <sub>1</sub>	0x30–0x39	Units of minutes
8.	s <sub>10</sub>	0x30–0x35	Tens of seconds
9.	s <sub>1</sub>	0x30–0x39	Units of seconds
10.	<ETX>	0x03	Control character “end of text”

## **Optional Protocols: SW6/SW7/SW8 = ON/ON/ON**

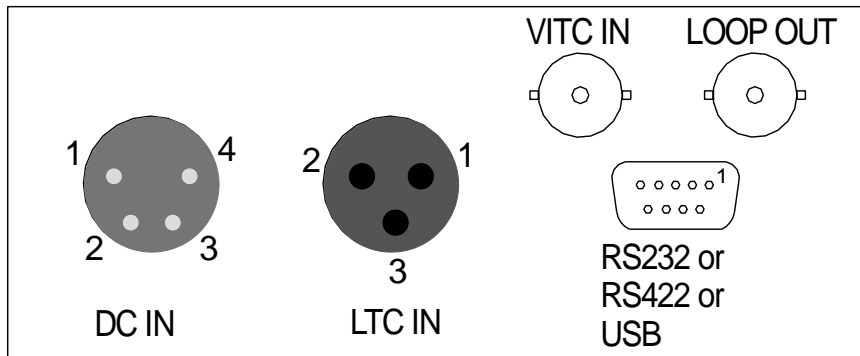
By request other protocols can be implemented, e.g. to obtain an adaptation to existing systems.

Customized operating modes can be implemented as well.

Please feel free to contact us.

## D Connections and Technical Data

### Back Panel Connectors



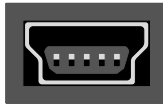
### Technical Data

Housing	Aluminium	
Dimensions	104 x 44 x 164 mm (W x H x D)	
Weight	0.5 kg	
Power supply	9–30 VDC	
Power consumption	TC60RLV2 (RS232): ≈ 1.0 W TC60RLV4 (RS422): ≈ 1.5 W TC60RLVU (USB): ≈ 1.0 W	
Operating temperature	+0 °C to +40 °C	
Relative humidity of air	35 % to 85 %, non-condensing	
<b>Inputs:</b>	Connections	Signal Description
DC IN	4-pin XLR male	1 = V- 4 = V+
LTC IN	3-pin XLR female	1 = GND 2/3 = Signals, balanced Level 50 mV <sub>p-p</sub> to 5 V <sub>p-p</sub> Impedance ≈ 47 kΩ Frequency: 0–56 frames/sec
VITC IN	BNC 75 Ω	Data level 0.3–1.1 V <sub>p-p</sub>

	(IEC 169-8)	VITC noise level $\leq 30\text{mV}$
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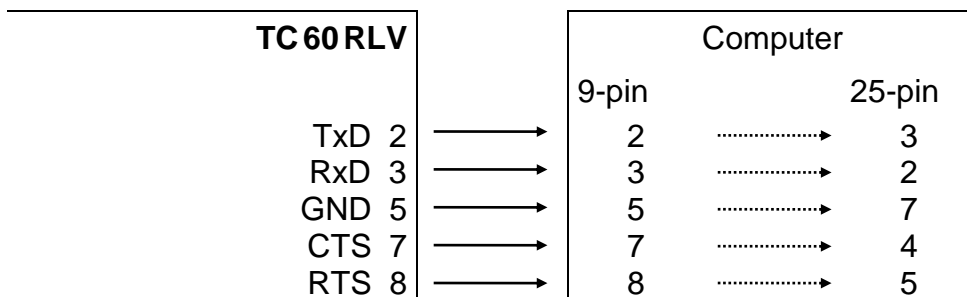
Technical data cont.:

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 -
USB FTDI Module DB9-USB-RS232	USB 5-pin mini B female	Cable USB A to 5-pin mini B as standard accessory



### Examples for Connection

RS 232 interfacing a computer:



Interface RS 422 between recorder and controller:

