



TCA

Timecode Analyzer with LTC Reader and Generator



Operating Manual
Version: 1.0
September 19, 2022





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A1 Revision History

No.	Date	Subject
0.x		Preliminary documents, changes without notice.
1.0	2022-09-19	First release.

The latest document describes the functions of the latest product's software. You can download the latest software version from:

<https://plurainc.com>

A2 Copyright

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For further information please contact your local dealer or:

Plura Europe GmbH
Binger Weg 12
D- 55437 Ockenheim
Phone: +49 6725 918 006-70
Fax: +49 6725 918 006-77
E-Mail: info@plurainc.com
Internet: <http://www.plurainc.com>



A3 Warranty

Plura warrants that their products will be free from defects in materials and workmanship for a period of two years from the date of shipment. If this product proves defective during the warranty period, Plura, at its option, will repair or replace the defective product without charge, provided this product is returned to Plura freight prepaid.

In order to obtain service under this warranty, Customer must notify Plura of the defect before expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to Plura, please notice the Shipping Information given below.

This warranty shall not apply to any defect, failure or damage caused by abuse, misuse, improper use, negligence, accident, modification, alteration, or improper or inadequate maintenance and care.

This warranty is given by Plura with respect to this product in lieu of any other warranties, express or implied. Plura and its vendors disclaim any implied warranties of merchantability or fitness for a particular purpose. Plura's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. Plura and its vendors will not be liable for any indirect, special, incidental, or consequential damages irrespective of whether Plura or the vendor has advance notice of the possibility of such damages.



A4 Unpacking/Shipping/Repackaging Information

This product has been carefully inspected, tested and calibrated before shipment to ensure years of stable and trouble-free service.

The shipping carton and pads provide protection for the product during transit. Retain the shipping cartons in case subsequent shipment becomes necessary.

Carefully unpack the product from its transit material and carefully check the product for signs of damage. In the event that the product has been damaged during transit, contact the carrier and your Plura dealer.

Please confirm that all items listed on the packing list have been received. Check the items against your original order to ensure that you have received the correct parts. If any item is missing, please contact your Plura dealer.

Ensure that all packaging material is removed from the product and its associated components before installing the unit.

Products returned to Plura for servicing or repair should have a tag attached showing:

- Name and complete address of the owner and the name of the person that can be contacted.
- Unit's serial number and a description of the service required, or failure detected.

Products returned should be shipped prepaid in the original packaging material if possible. If the original packaging is not available or is unfit for use, supply an adequate packaging which should meet the following criteria:

- Packaging must be able to withstand the product weight.
- Product must be held rigid within the packaging.
- Allow at least two inches of space between the product and the container.
- The corners of the product must be protected.
- Seal the carton with shipping tape or an industrial stapler.

If the product is still within the warranty period, the product will be returned by prepaid shipment after servicing.



A5 Safety Instructions

The general safety information in this part is for both operating and service personnel. Plura products are only to be used as directed. Specific warnings and cautions will be found throughout the manual where they apply.

Review the following safety instructions to avoid injury and prevent damage to this product or any products connected to it.

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.

Safety Terms and Symbols

Terms and Symbols in this manual:



CAUTION: Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms and Symbols which may be found on the product:



ATTENTION: Refer to the manual.



Observe precautions for handling electrostatic-sensitive devices.



Signal Ground.

Product Damage Precautions

PREVENT OVERHEATING



To prevent product overheating, position the unit only where sufficient air circulation can be maintained. Good air circulation is essential to prevent internal heat build-up, do not block any ventilation openings. Do not expose the unit to direct sun light or any other strong lights. Keep the unit away from heat sources.

PROVIDE PROPER ENVIRONMENT



Dust, humidity, shocks and strong electromagnetic fields must be avoided. Do not expose this apparatus to dripping or splashing water. Ensure that no objects filled with liquid are placed on the apparatus.



OBSERVE EMC REGULATIONS



The EMC regulations are observed only under the following condition:

Use high quality shielded cables at data inputs and outputs.

SUSPECTED FAILURES



Whenever it is likely that safe operation is impaired, the apparatus must be made inoperative and secured against unintended operation. The appropriate service authority must then be informed. Do not operate with suspected failures. Servicing is required when the apparatus has been damaged in any way, such as power-supply is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

PREVENTIVE MAINTENANCE: CLEANING



Qualified Service Personnel Only: The apparatus should be cleaned often enough to prevent dust or dirt from accumulating. Dust accumulating in the apparatus acts as an insulating blanket, preventing proper cooling, and possibly causing overheating and component breakdown. Under high humidity conditions, accumulated dust can also provide an electrical conduction path. Remove accumulated dust with a soft cloth or small paint brush. Remove hardened dirt with a soft cloth, dampened in a mild detergent and water solution. Do not use polish or abrasive cleaners or any other chemical cleaning agents.

PREVENTIVE MAINTENANCE: VISUAL INSPECTION



Qualified Service Personnel Only: Visually inspect the apparatus for signs of damage, scorched components, and loose or disconnected pin connectors. If you discover heat damaged parts, try to determine the cause of the overheating before replacing the damaged parts; otherwise, the damage may repeat.

ATTENTION:



Observe precautions for handling electrostatic-sensitive devices. See "Electrostatic Discharge (ESD) Precautions" below for details.



Electrostatic Discharge (ESD) Precautions



All semiconductor devices are sensitive to ESD. To prevent any damage or degradation on components of the product caused by ESD, observe these precautions when directed to do so (installing, removing sensitive components):

Use a Ground Strap. Wear a grounded anti-static wrist or heel strap to discharge the static voltage from your body.

1. Use a Safe Work Area. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge. Nothing capable of generating or holding a static charge should be allowed in the work area.
2. Handle ESD sensitive components carefully. Do not slide components over any surface. Do not touch exposed connector pins. Pick-up components by the body, never by the leads.
3. Transport and store sensitive components or assemblies in a static-protected bag or container.

A6 Certifications & Compliances

CE-Declaration:

We,

Plura Europe GmbH
Binger Weg 12
D- 55437 Ockenheim

herewith declare under our sole responsibility that the

TCA

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

89/336/EEC Electromagnetic Compatibility

EN 50081-1 Emissions

- EN 55022
- EN 55103-1

EN 50082-1 Immunity

- EN 55024
- EN 55103-2



1. Functional Description

1.1. Introduction

TCA is a timecode analyzer with LTC reader and generator. A 4.3" LCD provides all LTC related information in one place. The TCA is a unique and convenient solution for all LTC related measurements.



TCA – Timecode Analyzer

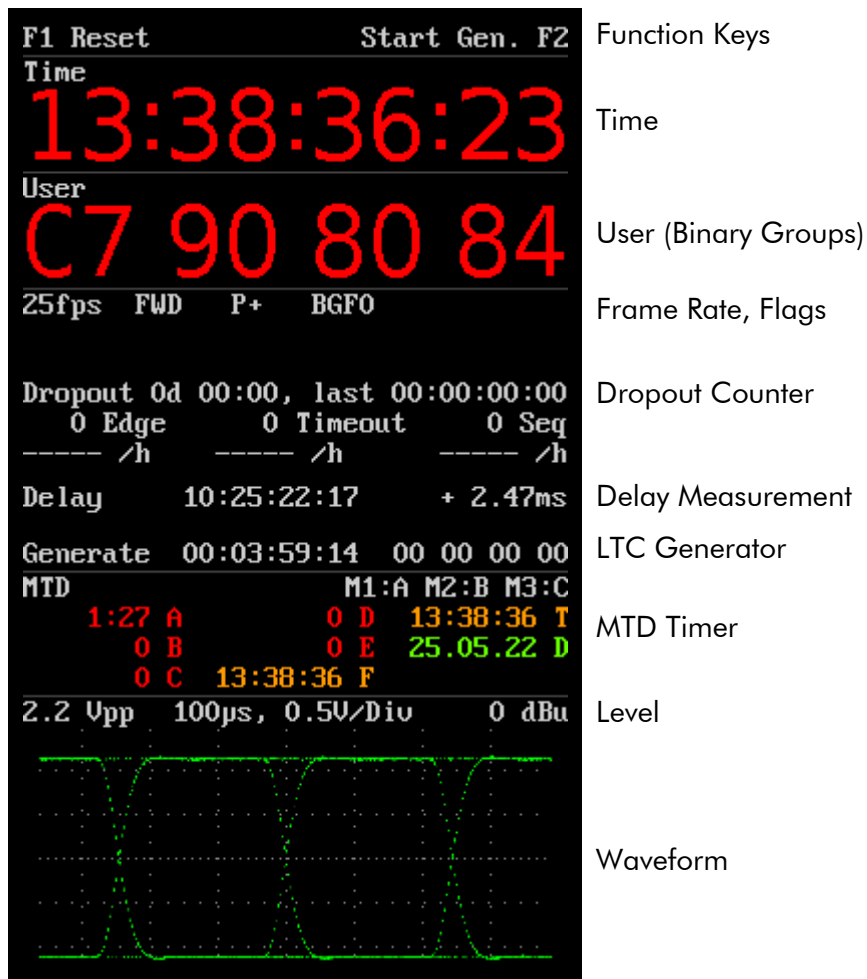
1.2. Features

- Display of complete LTC information: Time, User (Binary groups), Flags
- Auto-detection of frame rate
- Auto-detection of Plura MTD timers
- Measurement of signal level
- Display of LTC waveform
- Detection and counting of drop-outs
- Integrated free-running LTC generator
- Delay measurements between LTC reader and LTC generator
- Power supply and configuration over USB

1.3. Display

The LCD shows all relevant information and measurements at a glance.





Below the different display parts are described in detail.

1.3.1. Function Keys



The programmed function of the two programmable function keys on the back of the TCA.

1.3.2. Time



Time of the LTC reader. Format: HH:MM:SS:FF.

1.3.3. User (Binary Groups)



User (binary groups) of the LTC reader. Format: BG1/BG2 BG3/BG4 BG5/BG6 BG7/BG8.



1.3.4. Framerate, Flags




25fps FWD P+ BGFO

Beside time and user (binary groups) some more information is decoded from LTC.

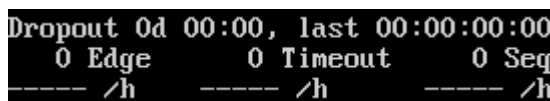
Value	Frame rate, detected from LTC input.
	The frame rate is not coded directly in LTC, it's detected from frame values counting.
24fps	24 frames per second.
25fps	25 frames per second.
30fps	30 frames per second, non-drop.
30df	30 frames per second, drop.
	LTC direction
	Direction is detected separately from sync word coding and time values counting.
FWD	Sync word is coded forward, time is counting forward.
FWD.	Sync word is coded forward, time is not counting (standing still).
FWD-	Sync word is coded forward, but time is counting reverse.
REV	Sync word is coded reverse, time is counting reverse.
REV.	Sync word is coded reverse, time not is counting (standing still).
REV-	Sync word is coded reverse, but time is counting forward.
LOST	No input signal.
	LTC Phase and phase correction bit
PC	Phase correction bit is set.
P+	Phase correction bit gives sync word a steady positive phase.
P-	Phase correction bit gives sync word a steady negative phase.
	Color frame flag
CF	Color frame flag is set.
	Binary group flags
BGF0	Character set not specified and unspecified clock time.
BGF1	Eight-bit character set and unspecified clock time.
BGF2	Character set not specified and clock time specified.
BGF3	Reserved binary group usage and reserved clock time.
BGF4	Date/time zone and unspecified clock time.
BGF5	Page/line multiplex system and unspecified clock time.
BGF6	Date/time zone and clock time.
BGF7	Page/line multiplex system and clock time.
	See below.
	Drop frame flag
DROP	Drop frame flag is set.



With some binary group flag combinations, the LTC binary groups are decoded further:

Value	Description
BGF1	<p>Eight-bit character set and unspecified clock time.</p> <p>Binary group bits are decoded as ASCII characters. Example:</p>  <p>Explanation: 0x56 = 'V', 0x54 = 'T', 0x52 = 'R', 0x31 = '1'</p>
BGF4 BGF6	<p>Date/time zone and unspecified clock time.</p> <p>Date/time zone and clock time.</p> <p>Date and time zone information is decoded from binary groups.</p> <p>Example: SMPTE 309M, YYYYMMDD format:</p>  <p>Example: SMPTE 309M, MJD (6-digit) format:</p> 
BGF0 BGF2 BGF3 BGF5 BGF7	<p>Eight-bit character set and unspecified clock time.</p> <p>Character set not specified and clock time specified.</p> <p>Reserved binary group usage and reserved clock time.</p> <p>Page/line multiplex system and unspecified clock time.</p> <p>Page/line multiplex system and clock time.</p> <p>User (binary groups) are not specified and not decoded.</p>

1.3.5. Dropout Counter



Errors of the LTC signal are counted here. The error counter can be reset by the “Reset Dropout” function key.

Value	Description
0d 00:00	Days, hours and minutes the counter is running.
last 00:00:00:00	Time of the last error.
0 Edge	Counts edge errors, i.e., wrongly coded LTC bits.



0 Timeout	Counts timeouts, i.e., if a new frame isn't read.
0 Seq	Counts sequence errors, i.e., the frame didn't count +1 or -1 compared to the last one.
----- /h	For any of the three error counters an average is calculated based on one hour.

1.3.6. Delay Measurement

```
Delay 10:25:22:17 + 2.47ms
```

The LTC reader is compared to the built-in LTC generator. This allows measurements of the delay of a LTC or audio connection. The result is shown in HH:MM:SS:FF format and in milliseconds.

1.3.7. LTC Generator

```
Generate 00:03:59:14 00 00 00 00
```

The value of the built-in LTC generator is shown in HH:MM:SS:FF format, together with user (binary groups).

1.3.8. MTD Timer

```
MTD M1:A M2:B M3:C
1:27 A 0 D 13:38:36 T
0 B 0 E 25.05.22 D
0 C 13:38:36 F
```

"MTD" are stop timers, generated by Plura timing equipment like RUB GT. If MTD timers are detected in user (binary groups) then it's shown here.

All six MTD timers, A-F, are shown, as well as MTD time and date. Above it the three MTD main timers, 1-3, are shown. In the example main 1 shows timer A, main 2 shows timer B and main 3 shows timer C.

MTD timers are coded time multiplexed, it takes up to 45 seconds to transfer it completely. A "Collect..." message is shown while MTD status data like display format and color are incomplete.

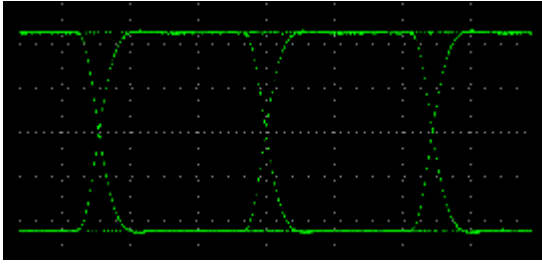
1.3.9. Level

```
2.2 Vpp 100µs, 0.5V/Div 0 dBu
```

The level of the LTC input signal is measured in V_{PP} (Volts peak to peak), referred to a balanced connection. If an unbalanced signal is connected, the value needs to be doubled. The level is also shown in dBu, with 0 dBu is defined as $2.2 V_{PP}$.



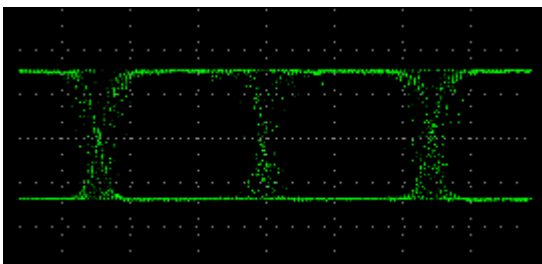
1.3.10. Waveform



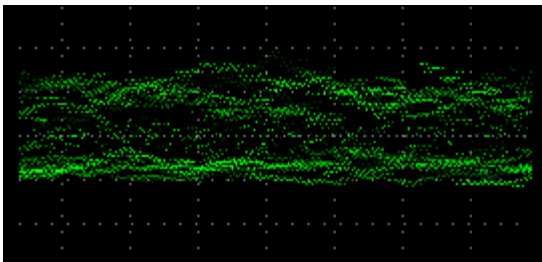
The waveform display allows checking the quality of the input signal. The display is lazy, please allow about 10 seconds to stabilize. The horizontal axis is fixed to $100 \mu\text{s}/\text{Div}$ (division), while the vertical amplification is set automatically between $0.25 \text{ V}/\text{Div}$ and $2 \text{ V}/\text{Div}$.

The example above shows a perfect clean signal directly from a timecode generator.

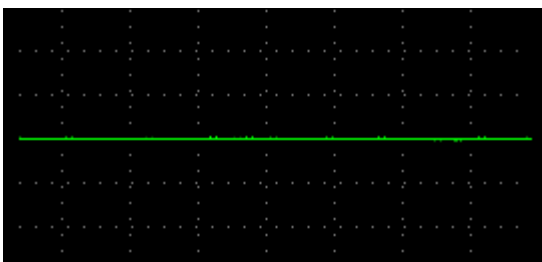
The following example shows a LTC signal from an analog VTR. It has significant jitter but is still valid LTC.



The next example is not a valid LTC signal, it shows noise from an unrecorded analog video tape.



The last example shows silence, i.e., no LTC signal is connected at all.



2. Configuration

2.1. The Configuration Program

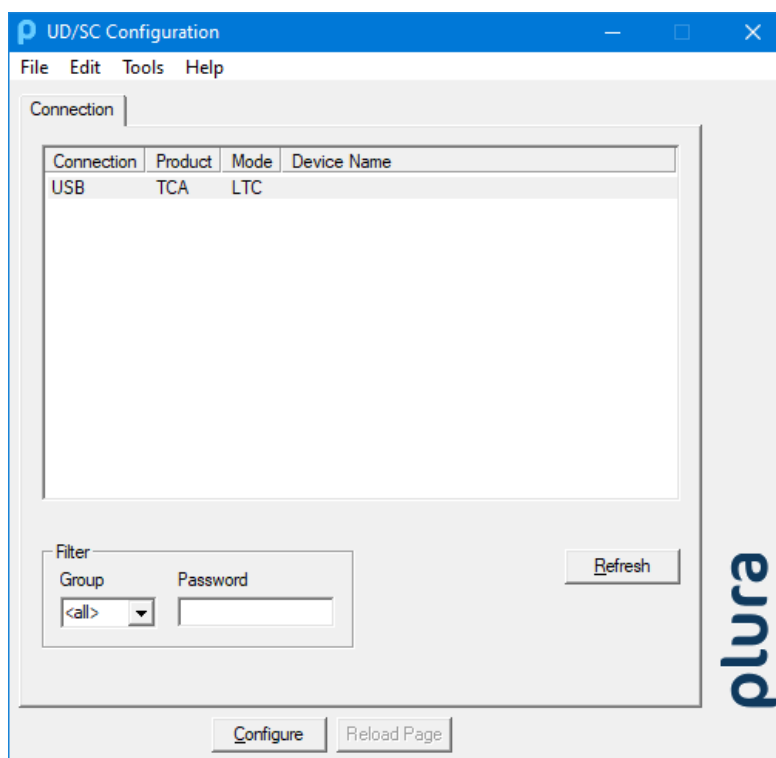
Configuration requires the **UD SC Config.exe** program running on a computer (32- or 64-bit Windows 10 operating system, or later). You can download the latest version of the program from:

<https://www.plurainc.com>

The TCA can be configured via a USB interface. Firmware update is performed by this program as well (chapter “Firmware Update”).

The USB connection requires a standard USB-C cable. The first time the device is plugged to the PC, Windows will install a driver for it. This driver is part of Windows, you don’t need a CD.

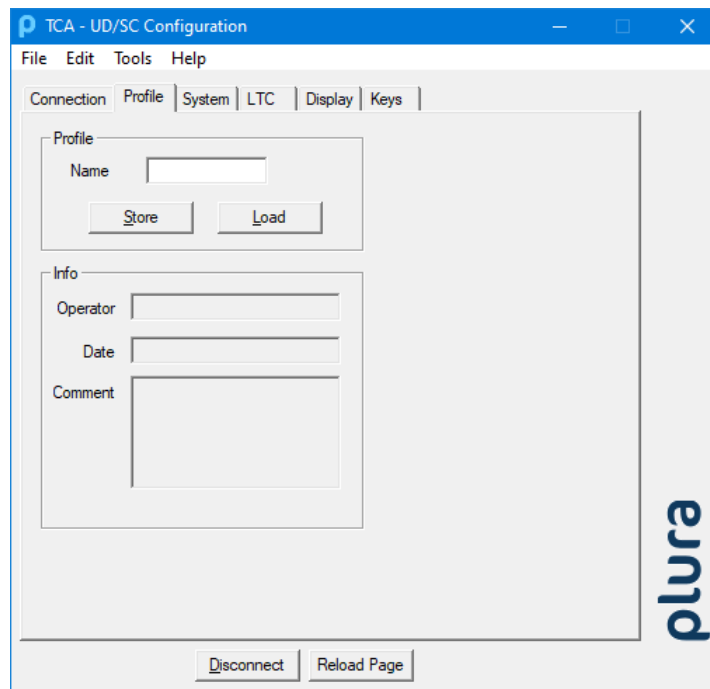
After program start a list is given of all devices found:



Open the configuration by marking the device on the list and pressing button “Configure”, or by a double click on a device in the list. Additional tabs will be shown. On these tabs you can check or change the configuration of the selected device as described in the following chapters.

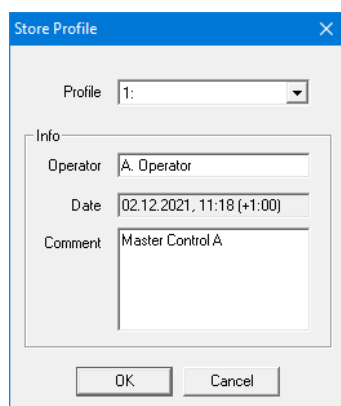


2.2. “Profile” Tab: Store and Load a Complete Set-Up



This feature enables to easily change the complete set-up of the unit during normal operation. During installation, the current set-up can be stored as a “profile”. You can enter a name in the “name” entry before storing. Now choose a different set-up and store this as a different profile. Five profiles are available. Programming any function key or GPI inputs with “Load Profile ...” functions enable you to change over from one set-up to the other during normal operation. Please also refer to chapter “Programming Function Keys and GPI Inputs”.

Five different set-ups can be stored into the non-volatile memory of the unit.
Click **Store**:

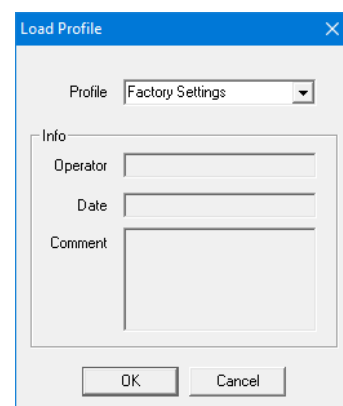


Profile: Select 1 – 5.

Info Operator: You may enter a text.
Comment: You may enter a text.

Click **OK** to store the current set-up.

Any set-up stored as a profile can replace the current set-up.
Click **Load**:

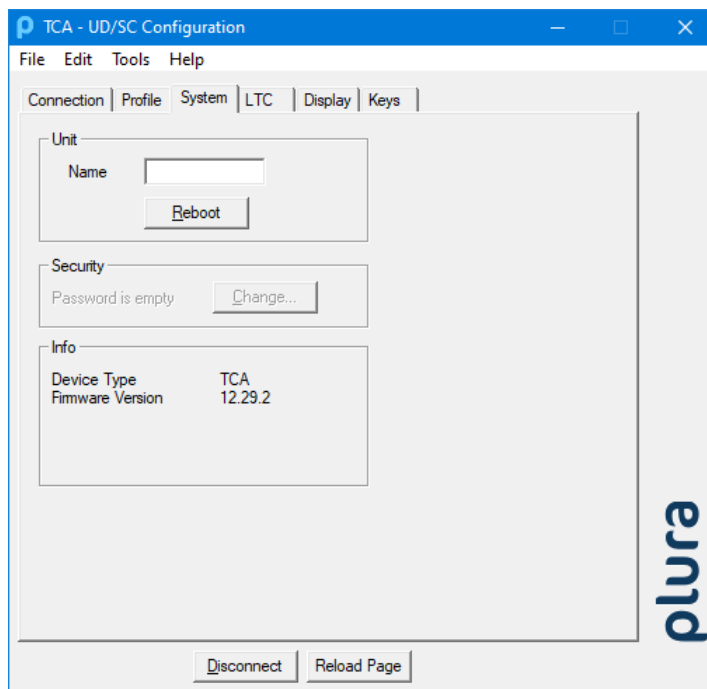


Profile: Select “Factory Settings” or 1 – 5. “Factory Settings” installs the default set-up.

Click **OK** to replace the current set-up by the selected profile. If no valid set-up has been stored, an error message is given.



2.3. “System” Tab: View and Change System Parameters



Unit

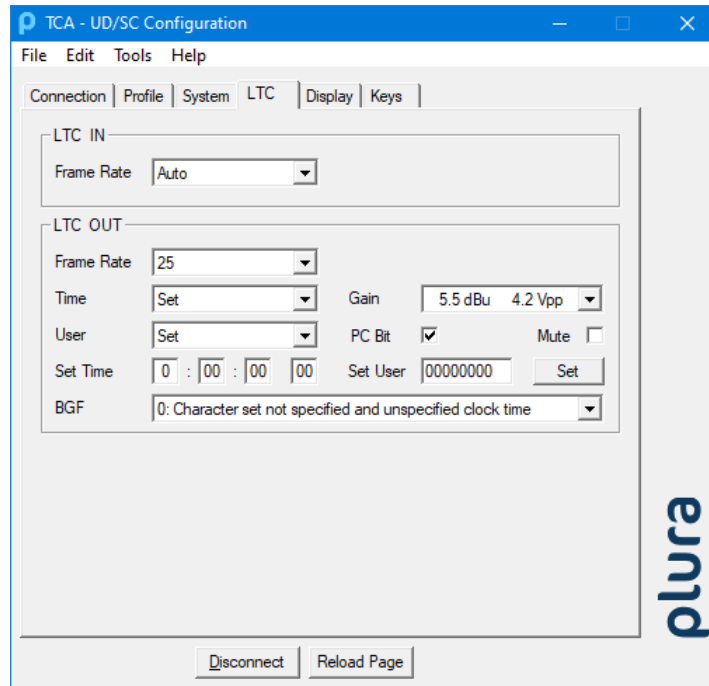
Name	Give the device a significant name. This name appears in the device list of the connection page. Enter a text (10 characters) in the <i>Name</i> field. Complete with <i>Enter</i> or <i>Tab</i> key.
Reboot	Warm boot of the unit.

Info

Indicates some device status, like device type and version of the installed firmware.



2.4. “LTC” Tab: LTC Input and Output



LTC IN

Frame Rate	Frame rate of LTC reader. Auto Automatic frame rate detection. Default (starting point) of detection is the frame rate of the LTC generator (see below). 24, 25, 30, 30 df / 29.97 Fixed frame rate
------------	---

LTC OUT

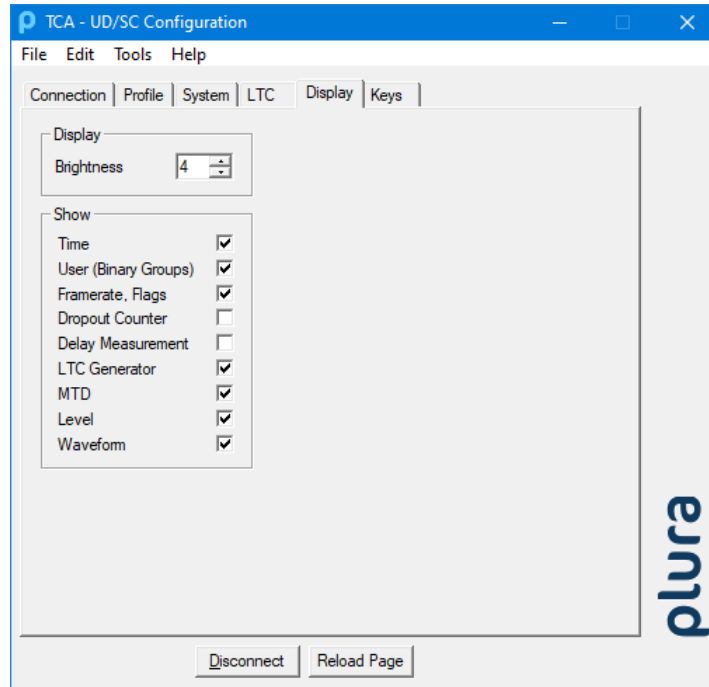
Frame Rate	Frame rate of LTC generator.
Time	Mode of LTC time determines what time is generated when the “Start Generator” function is used: Set Set LTC time from “Set Time” fields, Real-Time Set LTC time from real-time clock.
User	Mode of LTC user (binary groups) determines what user (binary groups) are generated when the “Start Generator” function is used: Set Set LTC user (binary groups) from “Set User” fields, Jam Set LTC user (binary groups) from the last “Jam”.
Gain	Output level of balanced signal of the LTC generator.
PC Bit	Generate phase correction bit.
Mute	Set output level of LTC generator to zero.
Set Time	LTC generator start time.
Set User	LTC generator start user.
Set	“Start Generator” button to re-start LTC generator according to “Time” and “User” settings above.



BGF	Binary group flags (BGF) of LTC generator.
0	Character set not specified and unspecified clock time.
1	Eight-bit character set and unspecified clock time.
2	Character set not specified and clock time specified.
3	Reserved binary group usage and reserved clock time.
4	Date/time zone and unspecified clock time.
5	Page/line multiplex system and unspecified clock time.
6	Date/time zone and clock time.
7	Page/line multiplex system and clock time.



2.5. “Display” Tab: Display



Display

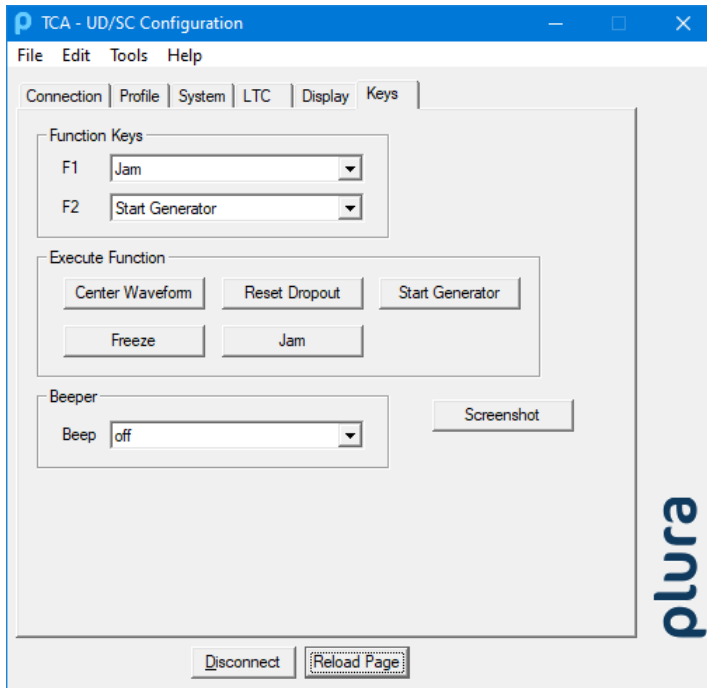
Brightness of LCD background illumination (1 to 7).

Show

Show or hide portions of the display.



2.6. “Keys” Tab: Function Keys



Function Keys

F1	Set function of key F1.																
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>No Operation</td> <td>No Function.</td> </tr> <tr> <td>Center Waveform</td> <td>Calibrate DC offset of LTC input.</td> </tr> <tr> <td>Reset Dropout</td> <td>Reset dropout counters to zero.</td> </tr> <tr> <td>Start Generator</td> <td>Re-Start LTC generator.</td> </tr> <tr> <td>Freeze</td> <td>Freeze or unfreeze display. All functions (like dropout counters) continue working in background while the display is frozen.</td> </tr> <tr> <td>Jam</td> <td>Transfer values of the next value of the LTC reader to the LTC generator (both time and user / binary groups). If no input signal is connected this function is aborted after one second. Additionally set the internal real-time clock from the LTC time at the next seconds change (frames = 0). If no input signal is connected this function is aborted after three seconds.</td> </tr> <tr> <td>Load Profile 1-5</td> <td>Load profile, previously stored with “Profile / Store Profile”.</td> </tr> </tbody> </table>	Function	Description	No Operation	No Function.	Center Waveform	Calibrate DC offset of LTC input.	Reset Dropout	Reset dropout counters to zero.	Start Generator	Re-Start LTC generator.	Freeze	Freeze or unfreeze display. All functions (like dropout counters) continue working in background while the display is frozen.	Jam	Transfer values of the next value of the LTC reader to the LTC generator (both time and user / binary groups). If no input signal is connected this function is aborted after one second. Additionally set the internal real-time clock from the LTC time at the next seconds change (frames = 0). If no input signal is connected this function is aborted after three seconds.	Load Profile 1-5	Load profile, previously stored with “Profile / Store Profile”.
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Load Profile 1-5	Load profile, previously stored with “Profile / Store Profile”.																
F2	Set function of key F2.																
	See description of F1.																

Execute Function

Some functions can be executed immediately, without the need to program it to a function key.

Beeper

Beep Function of the internal beeper:



off	Beeper is muted,
on dropout	Short beep on every dropout detected.



3. Firmware Update

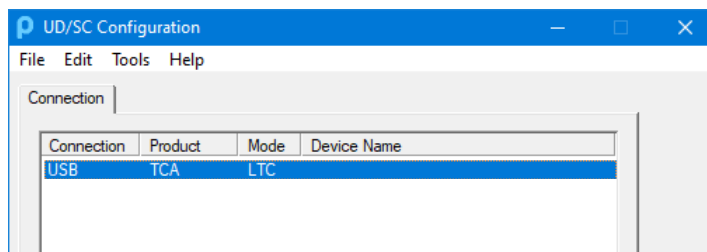
Firmware updates require a (windows operating system) computer with a **USB** interface and the **UD SC Config.exe** program. You can download the latest version of the program from:

<https://www.plurainc.com>

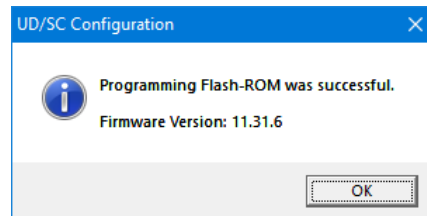
The new firmware should already be stored as a **.tcf** file at your computer.

Please now execute the following steps:

1. Connect the device to the computer with a standard **USB-C** cable. It is recommended not to have more than one device connected to this USB port.
2. Execute **UD SC Config.exe** on your computer. The program gives a list of all devices found. Click (not a double click) on the device in the list which shows the **USB** connection.



3. Select "Flash Update" in the **File** menu.
4. Open the **.tcf** file. The program checks whether the new firmware matches the correct type of the device. In case there is no match an error message appears: "Incompatible Flash Update File". Update starts automatically if everything is ok. Click the OK button at the end.



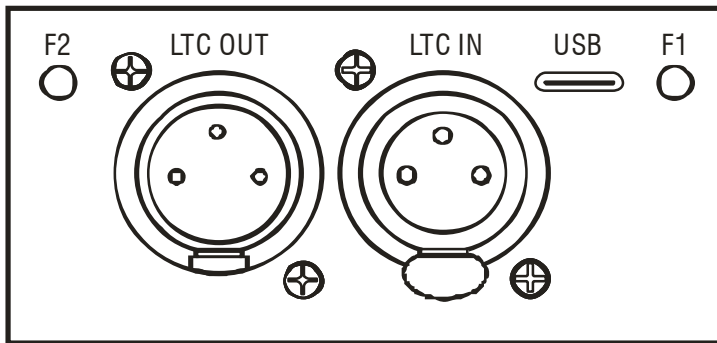
5. Update is finished now. We recommend checking the configuration of the device.

During the flash update the operation of the device stops!



4. Technical Data

4.1. Connections at the Rear



Pin assignments

LTC IN	LTC OUT	USB
XLR3 female	XLR3 male	USB-C receptacle
1: GND	1: GND	USB 2.0
2: LTC_IN_A	2: LTC_OUT_A	
3: LTC_IN_B	3: LTC_OUT_B	

Signal descriptions

GND	Signal ground.
LTC_IN_A, LTC_IN_B	Balanced LTC (Linear Time Code) input.
LTC_OUT_A, LTC_OUT_B	Balanced LTC (Linear Time Code) output.
USB	USB 2.0. Connect a standard USB-C cable to a PC, laptop, USB power supply or USB power bank.

Function Keys

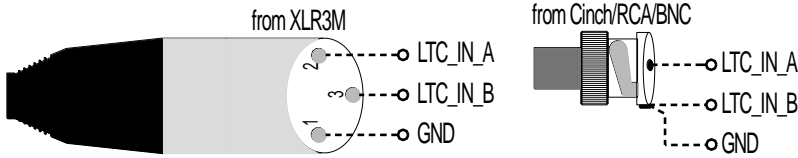
F1, F2	Programmable function keys.
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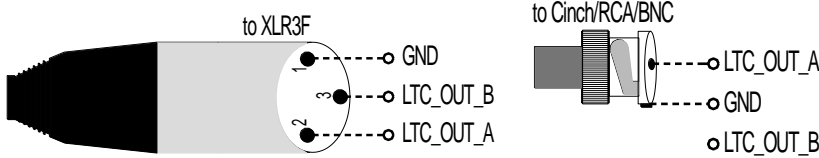
4.2. Specifications

Operating voltage	5 V DC, $\pm 5\%$	provided over USB
Power consumption	2.0 W	typical
Environmental characteristics, operating	Temperature: +5 °C to +40 °C Relative humidity: 30 % to 85 %, non-condensing	
Environmental characteristics, non-operating	Temperature: -10 °C to +60 °C Relative humidity: 5 % to 95 %, non-condensing	

4.2.1. LTC Read

Input	Balanced on XLR3M connector. Unbalanced input with external adapter:	
Level	0.3 V _{PP} to 10 V _{PP} / -13.6 dBu to 13.2 dBu	(0 dBu is 2.2 V _{PP})
Impedance	22 k Ω	
Level measurement	Accuracy: $\pm 5\%$, up to 7.9 V _{pp} / 11 dBu.	
Waveform display	Up to 7.0 V _{pp} / 10 dBu.	
Delay measurement	Accuracy: $\pm 40 \mu\text{s}$.	
Frame rate	24, 25, 30 or 30 drop; 23 to 31 fps.	
Standards	SMPTE ST 12-1:2014 / EBU Tech 3097 SMPTE ST 262:1995	

4.2.2. LTC Generate

Output	Balanced on XLR3F connector. Unbalanced output with external adapter:	
Level	Balanced: 0.5 V _{PP} to 7.9 V _{PP} / -13.6 dBu to 11.1 dBu Unbalanced: 0.25 V _{PP} to 3.85 V _{PP} / -19.6 dBu to 5.1 dBu Accuracy: $\pm 5\%$	(0 dBu is 2.2 V _{PP})
Impedance	< 50 Ω	
Standards	SMPTE ST 12-1:2014 / EBU Tech 3097	

4.2.3. Mechanical

Material	Aluminium, rear plate made of steel
Dimensions	87 (W) x 49 (H) x 161 (D) mm; 3.43 (W) x 1.93 (H) x 6.34 (D) inches
Weight	≈ 0.4 kg





Contact Us



Corporate Offices:
Plura Broadcast, Inc.
Ph: +1-602-944-1044
Sales@plurainc.com



Plura Europe GmbH
Ph: +49-6725-918006-70
Sales@plurainc.com

GERMANY



Plura MEA
Ph: +971-50-715-9625
Sales@plurainc.com



Plura Asia
Ph: +82-10-6688-8826
Sales@plurainc.com

S. KOREA

