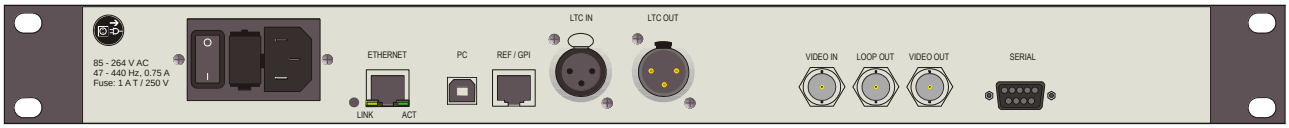
plura
TIMING SOLUTIONS

Standalone Timing Systems

TCC70XS

Integrated Time Code System
Time Code Generator with Real-Time Functionality
Time Code Reader and Inserter



Installation & Operation Manual
Version: 3.2
November 27, 2024

CONTENTS

A1 REVISION HISTORY
A2 COPYRIGHT
A3 WARRANTY
A4 ONLINE RMA
A5 UNPACKING/SHIPPING/REPACKAGING INFORMATION
A6 SAFETY INSTRUCTIONS
A7 EC DECLARATION OF CONFORMITY

1 INTRODUCING TCC70XS 15
1.1 OVERVIEW 15
1.2 FRONT PANEL CONTROLS 16
1.3 BACK PANEL CONNECTORS 17
1.3.1 TCC70XS2 (current) 17
1.3.2 Previous TCC70XS (obsolete) 19
1.4 SPECIFICATIONS 21
1.4.1 Electrical, Mechanical, and Environmental Characteristics, Others 21
1.4.2 Power Supply 21
1.4.3 Video 22
1.4.4 LTC 23
1.4.5 Oscillator and Clock Performance 23
1.4.6 GPIO, GPO, 24 V Output 24
1.5 FUSE REPLACEMENT PROCEDURE 24
1.6 FIRST STEPS 25
1.6.1 Installation 25
1.6.2 Network Set–Up 26
1.6.3 Accessing TCC70XS via Browser 27
1.6.4 Accessing TCC70XS via USB 28
1.6.5 Helpful Tips for Configuration and Troubleshooting 29
1.6.5.1 Configuration: Use of Pre–Installed Profiles 29
1.6.5.2 Verification and Troubleshooting with Status Indicators and Displays 30
1.7 SOFTWARE UPDATE 32

2 SOFTWARE TOOLS FOR TCC70XS 35
2.1 CONFIGURATION 35
2.1.1 Configuration by USB 35
2.1.2 Configuration by Ethernet 36
2.1.2.1 Overview 36
2.1.2.2 Login, Login Status, Logout 37
2.1.2.3 Accessing the TCC70XS Function Modules 37
2.2 THE STATUS MONITOR OF THE 3G–VIDEO MODULE 38
2.2.1 Status Monitor by Ethernet 38
2.2.2 Status Monitor by USB 38

3	**THE ETHERNET MODULE**	**39**
3.1	OVERVIEW OF FUNCTIONS	39
3.2	THE INDIVIDUAL FUNCTIONS	40
3.2.1	Add User: Enter a New User with Password	40
3.2.2	Modify User: Change a Password	40
3.2.3	Delete User: Delete User and Password	40
3.2.4	Version: Information about Status of Hardware and Firmware	41
3.2.5	Buffered Real–Time Clock	41
3.2.6	SNMP Functionality	42
3.2.6.1	Create a MIB File	42
3.2.6.2	Configuration Page “SNMP”	44
3.2.7	NTP Client	45
3.2.8	NTP Server	47
3.2.8.1	General and Configuration	47
3.2.8.2	Handling a Leap Second	49
3.2.8.3	NTP Status and Troubleshooting	50
3.2.9	System: Name, Log File, and Ethernet Status	52
3.2.10	nfiguration Page “Front Panel”: Brightness and Screen Saver	54
4	**THE 3G–VIDEO MODULE: VIDEO AND TIME CODE**	**55**
4.1	OVERVIEW OF STANDARD FEATURES	55
4.1.1	Standard Features of the Time Code Generator	55
4.1.2	The REAL–TIME Mode of the Time Code Generator	57
4.1.2.1	The Principle	57
4.1.2.2	Handling of a Leap Second	58
4.1.2.3	Handling of a DST Switching	59
4.1.2.4	Time Code and Video Locked to a Real–Time Reference	60
4.1.3	The FREE Mode of the Time Code Generator	61
4.1.4	The START Mode of the Time Code Generator	62
4.1.5	Standard Features of the Time Code Reader	63
4.1.6	The JAM SYNC Method of Operation	64
4.1.7	Standard Features of the Video Channel	67
4.1.8	Standard Features of the Character Inserter	68
4.1.9	Other Standard Features	69
4.2	THE STATUS MONITOR	70
4.2.1	Status “System”	70
4.2.2	Status “Time and Date”	73
4.2.3	Troubleshooting Regarding Real–Time Reference	75
4.3	CONFIGURATION	77
4.3.1	General	77
4.3.2	“Save to File”: Store a Complete Set–Up in a File	78
4.3.3	“Profile”: Store and Load Setups	79
4.3.4	“Functions”: Functions of the Module	80
4.3.5	“System”: Name, Boot, Info, SNMP	81

4.3.6 “Keys”: Keys and Lamps, Status and GPIOs 82
4.3.7 “Read”: Configuration of the “General Reader” 84
4.3.8 “LTC Read”: LTC Reader Functions 86
4.3.9 “D-VITC Read”: D-VITC Reader Functions 87
4.3.10 “ANC Read”: Ancillary Data Reader Functions 88
4.3.11 “Jam”: The JAM SYNC Methods 89
4.3.12 “Generate”: Basic Set–Up of the Time Code Generator 91
4.3.13 “Reference”: Real–Time Clock Adjustment 95
4.3.14 “Time Zone”: Time Zone Adjustment 98
4.3.15 “LTC Generate”: LTC Generator Functions 100
4.3.16 “D-VITC Generate”: D-VITC Generator Functions 101
4.3.17 “ANC Generate”: Ancillary Data Generator Functions 102
4.3.18 “Display”: Configuration of the 8–Digit LED Display 106
4.3.19 “Video”: Video System and General Set–Up of the Video Channel 107
4.3.20 “Insert”: Set–Up of all Video Windows 108
4.3.21 “Serial” Serial Interfaces for Remote Control 114

5 APPLICATIONS 115
5.1 VARIOUS TIME CODE CONVERTERS 115
5.1.1 Conversion from LTC to Video Time Code (D-VITC, ATC) 115
5.1.2 Conversion from Video Time Code (D-VITC, ATC) to LTC 118
5.2 TCC70XS AS A REAL–TIME TIME CODE GENERATOR 121
5.3 INSERT REAL–TIME & DATE 124
5.3.1 Real–Time & Date of the Internal Real–Time Clock 124
5.3.2 Real–Time & Date of an External Time Code via READ 125
5.4 INSERT MTD TIMER OR MTD DATE 126

A1 Revision History

No.	Date	Subject
0.n	–	Preliminary versions.
1.0	February 10, 2014	First released document.
2.0	February 21, 2014	• New status at page "Time and Date" of the status monitor of the 3G-Video module: "last used source". • Buffered real–time clock of the Ethernet module sets the real–time clock of the 3G–Video module if no other real–time reference is available.
2.1	April 1, 2014	• New power-up messages at chapter "Front Panel Controls". • New subchapter at "Specifications": "Oscillator and Clock Performance".
2.2	June 5, 2014	Revised with minor changes.
2.3	July 16, 2015	Added TCC70XS2 hardware version.
2.4	December 6, 2016	Added AM/PM formats to inserter and display.
2.5	September 4, 2019	Changed address of Plura Europe GmbH.
2.6	November 4, 2019	Fixed NMEA baud rate to 4800.
2.7	November 6, 2020	Added video propagation delay to specifications.
2.8	December 4, 2020	Re-formatted in new design.
2.9	December 7, 2023	Minor fixes.
3.0	January 11, 2024	Updated download links and update instructions.
3.1	November 14, 2024	Added "Read / MTD / Color" feature.
3.2	November 27, 2024	Added configuration of DNS servers.

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

https://plurainc.com/products/tcc70xs2/

A2 Copyright

Copyright © Plura Europe GmbH 2002-2024. All rights reserved. No part of this publication may be reproduced, translated into another language, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior written consent of Plura Europe GmbH.

Printed in Germany.

Technical changes are reserved.

All brand and product names mentioned herein are used for identification purposes only and are trademarks or registered trademarks of their respective holders.

Information in this publication replaces all previously published information. Plura Europe GmbH assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

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 Online RMA

If the product is in need for repair, Plura offers repair service. Please contact Plura Support.

A5 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.

A6 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 Used in this Manual and Found on the Product

WARNING

Warning statements identify conditions or practices that could result in serious injuries or loss of life.

CAUTION

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

DANGER

Indicates a hazard for high voltage, fire, or personal injury immediately accessible as one reads the marking.

Disconnect the power cord before you open the chassis for maintenance and service.

Protective Ground (Earth) Terminal.

Off (power entry switch ‘off’).

On (power entry switch ‘on’).

CAUTION

ESD: Electrostatic Discharge.

Observe precautions for handling electrostatic–sensitive devices.

Injury Precautions

This product includes a power supply; therefore, potentially lethal voltages are present within this product during normal operation. Observe the following precautions:

WARNING:

To prevent fire or shock hazard, do not expose this product to rain or moisture.

WARNING:

Potentially lethal voltages present. Disconnect the power cord before you open the chassis for maintenance and service.

Potentially lethal voltages are present within this product during normal operation. The power cord must be disconnected before you open the chassis. Power should not be applied to the product during normal operation while any cover is missing.

Only properly trained personnel may carry out maintenance and service.

POWER SOURCE

This product is intended to operate from a power source that will not apply more than 264V_{rms} between the supply conductors or between both supply and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

USE PROPER POWER CORD

To avoid fire hazard, use only power cords rated to your operating voltage.

Standard minimum ratings: voltage ≥ 250 V, current ≥ 3 A.

USE PROPER FUSE

To avoid fire hazard, use only fuses of the correct type:
250 V, 1 A, slow–acting, 5 x 20 mm.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductors of the power entry and power cord. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation. Upon loss of the protective ground connection, all accessible conducting parts can render an electric shock.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Warning: To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Product Damage Precautions

PREVENT OVERHEATING

To prevent product overheating, position this product 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 this product to direct sun light or any other strong lights. Keep this product away from heat sources.

Install this product in accordance with the manufacturer's instructions.

PROVIDE PROPER ENVIRONMENT

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

UNPLUG DURING LIGHTNING STORMS

Unplug this product during lightning storms or when unused for long periods of time. Alternative: Use a UPS or power surge suppressor.

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, this product 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 if this product has been damaged in any way, such as power–supply cord or plug is damaged, liquid has been spilled or objects have fallen into this product, this product has been exposed to rain or moisture, does not operate normally, or has been dropped.

PREVENTIVE MAINTENANCE: CLEANING

Qualified Service Personnel Only:

This product should be cleaned often enough to prevent dust or dirt from accumulating. Dust accumulating in this product 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 this product 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.

Electrostatic Discharge (ESD) Precautions

CAUTION

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

1. Use a Ground Strap. Wear a grounded anti–static wrist or heel strap to discharge the static voltage from your body.
2. Use a Safe Work Area. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge. Also, nothing capable of generating or holding a static charge should be allowed in the work area.
3. 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.
4. Transport and store sensitive components or assemblies in a static–protected bag or container.

A7 EC Declaration of Conformity

EG-Konformitätserklärung

EC Declaration of Conformity

Der Hersteller
The manufacturer

Alpermann+Velte
Electronic Engineering GmbH
Otto-Hahn-Str. 42
D-42369 Wuppertal
Germany

erklärt unter alleiniger Verantwortung, dass das Produkt
declares under its sole responsibility that the product

Produkt Bezeichnung: **Timecode Generator/Leser/Einblender**
product name: *Time Code Generator/Reader/Inserter*

Modell/Typ: **TCC70XS**
product model: *TCC70XS*

Produktoption(en): **alle**
product option(s): *all*

den folgenden Richtlinien, Normen und Spezifikationen entspricht:
meets the intent of the following directives, standards and specifications:

2004/108/EG EMV-Richtlinie
2004/108/EC EMC Directive

unter Anwendung der folgenden Normen:
applying the following standards:

- EN 55022:2010 Störaussendung *Emissions*
- EN 55024:2010 Störfestigkeit *Immunity*

2006/95/EG Niederspannungsrichtlinie
2006/95/EC Low Voltage Directive

unter Anwendung der folgenden Normen:
applying the following standards:

- EN 60950 Elektrische und mechanische Sicherheit
  Electrical and mechanical safety

Wuppertal, den 17.10.2013

(Ort und Datum der Ausstellung)
(Place and date of issue)

Alpermann + Velte
electronic engineering GmbH
Otto-Hahn-Str. 42, D-42369 Wuppertal
Tel.: 02 02 - 2 44 11 10

(Rechtsgültige Unterschrift, Geschäftsführung)
(Legal signature, general manager)

1 Introducing TCC70XS

1.1 Overview

TCC70XS is a 19", 1 RU stand–alone time code system, which combines generator, reader, and inserter functionality.

There are two different hardware configurations, the current TCC70XS2, built from mid-2015, and the previous TCC70XS, built up to mid-2015. They differ in some connectors and in the standard configuration: The RS485/RS422/RS232 serial interface is optional with TCC70XS2.

These are the – all integrated – components of the product:

- 8–digit LED display.
- OLED display for status feedback.
- Four programmable function keys.
- Integrated power supply.
- Ethernet functionality: set–up and status information via browser; SNMP, NTP server and NTP client.
- USB port, used for set–up, status monitor, and firmware updates.
- Time code readers for LTC, D-VITC, ATC_LTC, and ATC_VITC.
- Generator for the LTC, D-VITC, ATC_LTC, and ATC_VITC types of time code.
- Input for serial digital video signals: SD, HD, 3G.
- Video output, format of the video signals same as video input.
- Four GPIOs, individually configurable as input or output.
- An external real–time reference (GPS, DCF77) can be connected. In this case GPIO_1 will be the input for a PPS and GPIO_2 the input for time & date.
- Serial interface RS485/RS422/RS232, depending on configuration.

The following methods of operating are provided for the time code generator:

- REAL–TIME: Using a real–time reference (GPS, DCF77, NTP), the time information of the time code corresponds to a local time zone. You can setup any local time zone including a Daylight-Saving Time.
- FREE: The time code generator counts the time continuously without any time jumps.
- START: The time code starts with a preset value. A start–stop operation is possible.
- JAM SYNC: The time code generator receives data from the time code reader. Time code of type LTC, D-VITC, ATC_LTC, and ATC_VITC can both be read and generated. Additionally, read time code can be transferred via serial interface RS232/RS422, depending on configuration. This method enables the following time code conversions:

from (reader) → to (generator) ↓	LTC	D-VITC	ATC_LTC	ATC_VITC
LTC	yes	yes	yes	yes
D-VITC	yes	yes	yes	yes
ATC_LTC	yes	yes	yes	yes
ATC_VITC	yes	yes	yes	yes
RS232/RS422	yes	yes	yes	yes

1.2 Front Panel Controls

8–digit LED display OLED

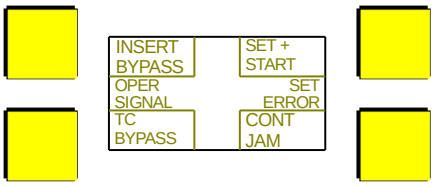
Four programmable function keys

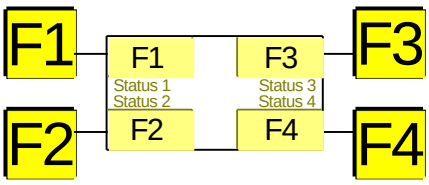
<u>8–digit LED display</u>

Displaying the time addresses or the user data of a time code.

Select with function **Display**, either using the TCC70 Config PC program (USB port) or a **Browser** (Ethernet port).

<u>OLED and four programmable function keys</u>





The OLED display indicates the programming of the function keys and gives a feedback of the operating status:

The text at the four segments F1 – F4 indicates the programming of the four function keys F1 – F4.

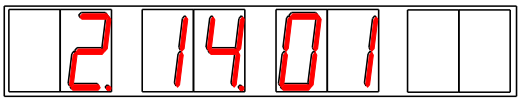
Four status segments give a feedback of the operating status. The segments are programmable and are able to switch a text on or off or to let it flash.

Programming of the function keys and status segments can be done with function **Display**, either using the TCC70 Config PC program (USB port) or a **Browser** (Ethernet port).

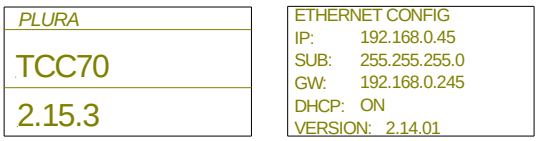
<u>Power–up messages</u>

When TCC70XS is switched on all LEDs of the 8–digit display and all lamps of the function keys will shortly light up.

In the next step current firmware versions will be indicated:



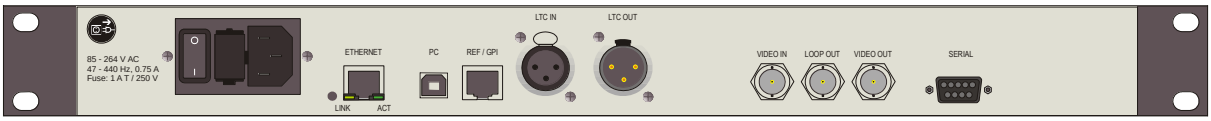
The 8–digit LED display indicates the firmware version of the **3G–Video** module.



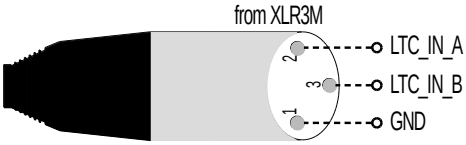
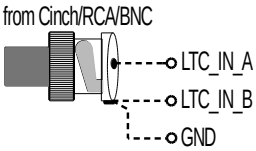
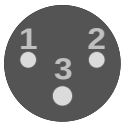
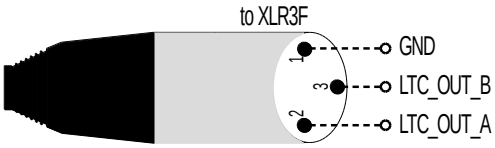
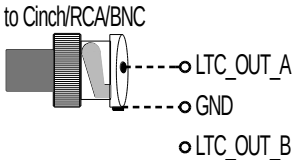
The OLED display indicates the firmware version of the **Front** module (previous TCC70XS models only) and the network set-up and firmware version of the **Ethernet** module in the second step.

1.3 Back Panel Connectors

1.3.1 TCC70XS2 (current)

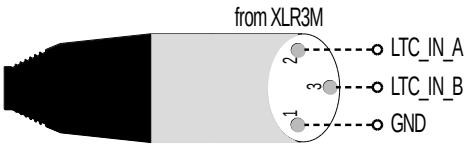
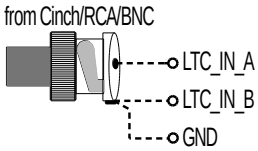
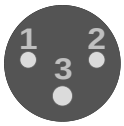
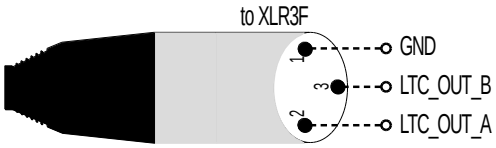
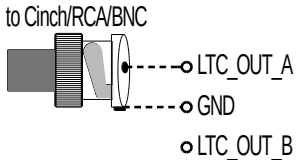


Name	Connector	Pin Assignment/Description
Mains inlet	IEC locking inlet	Mains inlet module, consists of: • Universal IEC locking inlet according to IEC/EN 60320–1/C14, protection class 1. • 2–pole extra safe fuse–holder. • 2–pole ON/OFF switch.
ETHERNET	RJ45 female jack	Ethernet port. You can control the complete functionality of TCC70XS through this port. Also, you can open a status monitor and upload and download profiles. Orange–coloured LED (LINK) lights up if connection to the Ethernet network has been established. Green LED (ACT) flashes during Ethernet activity.
PC	USB Receptacle Type B	USB port, used with the following PC programs: Set–Up and Software Updates: TCC70 Config Status Monitor: TCC70 Status Monitor Minimal requirement for your PC: USB 1.1. Use a common "Type A to Type B" cable.
REF/GPI	RJ45 Female jack	1: GPIO_1 — Configurable: programmable I/O function or input PPS signal of an external reference 2: GPIO_2 — Configurable: programmable I/O function or input time & date of an external reference 3: GPIO_3 — Configurable: programmable I/O function 6: GPIO_4 — Configurable: programmable I/O function 4: GND — Signal ground 5: 24 V — 24 VDC output, 200 mA reversible fused 7: GND — Signal ground 8: n.c. — (do not connect)

Name	Connector	Pin Assignment/Description
LTC IN	XLR3F IEC 268–1 Female 	LTC input, balanced 1: GND 2: LTC_IN_A 3: LTC_IN_B Connections: balanced signals  unbalanced signals 
LTC OUT	XLR3M IEC 268–1 Male 	LTC output, balanced 1: GND 2: LTC_OUT_A 3: LTC_OUT_B Connections: balanced use  unbalanced use 
VIDEO IN	BNC Female	Serial digital video input: SD, HD, 3G. This signal will be used for synchronization purposes. It is strongly recommended to connect an SD/HD/3G video signal as soon as TCC70XS will be used in a video application.
LOOP OUT	BNC Female	Video output, active and reclocked loop-through of the video input.
VIDEO OUT	BNC Female	Video output, format of the video signals same as video input. TCC70XS is able to add data to the input signal as well as to delete data from the video input signal.
SERIAL (depending on configu-ration)	DSUB9F Female	1: T–_TxD serial interface, see below 2: T+_CTS serial interface, see below 6: R–_RTS serial interface, see below 7: R+_RXD serial interface, see below 4, 9: GPO_5 Relay contact (normally open). Programmable function. 5: GND Signal Ground Serial interfaces RS485/RS422/RS232, depending on configuration RS485: Signals T–/T+ = balanced inputs/outputs RS422: Signals T–/T+ = balanced outputs Signals R–/R+ = balanced inputs RS232: TxD = transmit line, unbalanced data output CTS = Clear To Send, handshake input RTS = Request To Send, handshake output RxD = receive line, unbalanced data input

1.3.2 Previous TCC70XS (obsolete)

Name	Connector	Pin Assignment/Description
PC	USB Receptacle Type B	USB port, used with the following PC programs: Set–Up and Software Updates: TCC70 Config Status Monitor: TCC70 Status Monitor Minimal requirement for your PC: USB 1.1. Use a common "Type A to Type B" cable.
REF/GPI	DSUB9F Female 5 4 3 2 1 9 8 7 6	1: GPIO_1 Configurable: programmable I/O function or input PPS signal of an external reference 2: GPIO_2 Configurable: programmable I/O function or input time & date of an external reference 3: GPIO_3 Configurable: programmable I/O function 4: GPIO_4 Configurable: programmable I/O function 5: GND Signal ground 6: 24 V 24 VDC output, 200 mA reversible fused 7: GPO_5 Relay contact (normally open). The relay shortens this pin to GND. Programmable function. 8: LTC_IN_A 9: LTC_IN_B LTC input, balanced, in parallel to signal at LTC IN (XLR3F)
SERIAL	DSUB9F Female 5 4 3 2 1 9 8 7 6	1: T–_TxD serial interface, see below 2: T+_CTS serial interface, see below 3: LTC_OUT_A 4: LTC_OUT_B LTC output, balanced, in parallel to signal at LTC OUT (XLR3M) 5: GND Signal Ground 6: R–_RTS serial interface, see below 7: R+_RXD serial interface, see below 8: GPIO_3 Configurable: programmable I/O function 9: GPIO_4 Configurable: programmable I/O function Serial interfaces RS485/RS422/RS232, depending on configuration RS485: Signals T–/T+ = balanced inputs/outputs RS422: Signals T–/T+ = balanced outputs Signals R–/R+ = balanced inputs RS232: TxD = transmit line, unbalanced data output CTS = Clear To Send, handshake input RTS = Request To Send, handshake output RxD = receive line, unbalanced data input

Name	Connector	Pin Assignment/Description
LTC IN	XLR3F IEC 268–1 Female 	LTC input, balanced 1: GND 2: LTC_IN_A 3: LTC_IN_B Connections: balanced signals  unbalanced signals 
LTC OUT	XLR3M IEC 268–1 Male 	LTC output, balanced 1: GND 2: LTC_OUT_A 3: LTC_OUT_B Connections: balanced use  unbalanced use 
VIDEO IN	BNC Female	Serial digital video input: SD, HD, 3G. This signal will be used for synchronization purposes. It is strongly recommended to connect an SD/HD/3G video signal as soon as TCC70XS will be used in a video application.
LOOP OUT	BNC Female	Video output, active and reclocked loop–through of the video input.
VIDEO OUT	BNC Female	Video output, format of the video signals same as video input. TCC70XS is able to add data to the input signal as well as to delete data from the video input signal.
10/100 BASE–T	RJ45 female jack	 Ethernet port. You can control the complete functionality of TCC70XS through this port. Also, you can open a status monitor and upload and download profiles. Orange–coloured LED (LINK) lights up if connection to the Ethernet network has been established. Green LED (ACT) flashes during Ethernet activity.
Mains inlet	IEC locking inlet	Mains inlet module, consists of: • Universal IEC locking inlet according to IEC/EN 60320–1/C14, protection class 1. • 2–pole extra safe fuse–holder. • 2–pole ON/OFF switch.

1.4 Specifications

1.4.1 Electrical, Mechanical, and Environmental Characteristics, Others

Electrical Characteristics

Power consumption	16 W maximum
Heat dissipation capacity	23 W maximum

Mechanical Characteristics

Weight	Approximately 3.2 kg
Dimensions	Front plate 19″ / 1 RU Electronic case (without connectors): 425 (W) x 44 (H) x 256 (D) mm

Environmental Characteristics

	operating	non–operating
Ambient temperature:	+5 °C to +40 °C	-10 °C to +60 °C
Relative humidity, non–condensing:	30 % to 85 %	5 % to 95 %

1.4.2 Power Supply

Input

Inlet socket	According to IEC/EN 60320–1/C14, protection class 1
Line voltage range	90–264 VAC, auto–ranging
Power line frequency	47–63 Hz
Input current	800 mA maximum @ 90 VAC
Inrush current	50 A max. @ 264 VAC
Efficiency	86 % typical at 75 % load, at +25 °C, at nominal line, after five minutes warm–up
Line regulation	± 0.5 %

Output

Output voltage	23.7 VDC ± 5 %
Output current	0.05 A minimum, 2.5 A maximum
Maximum continuous output power over the whole specified temperature range	45 W
Turn–on delay	4 seconds maximum
Ripple & Noise	1 %
Load regulation	± 1 %
Temperature coefficient	± 0.05 % / °C
Hold–up time at 100 % load	8 ms typical

1.4.3 Video

Video input **VIDEO IN**

Format	Serial digital video: • SD, according to SMPTE 259M • HD, according to SMPTE 292M • 3G, according to SMPTE 242M
Connector	BNC (IEC169–8), 75 Ω
Signal level	800 mV ± 10 %
Digital data	8–bit, 10–bit
Equalization	Automatic cable equalization. Tested with Belden 1505F: 270 Mb/s: 0–190 m 1.485 Gb/s: 0–110 m 3 Gb/s: 0–80 m

Video output **LOOP OUT**

Format	Same as video input
Connector	BNC (IEC169–8), 75 Ω
Signal level	800 mV ± 10 %
DC offset	0.0 V ± 0.5 V
Digital data	10–bit
Propagation delay	SD 50 ns ± 40 ns HD, 3G 25 ns ± 20 ns

Video output **VIDEO OUT**

Format	Same as video input
Connector	BNC (IEC169–8), 75 Ω
Signal level	800 mV ± 10 %
DC offset	0.0 V ± 0.5 V
Digital data	10–bit
Propagation delay	SD 5.88 μs ± 150 ns HD 2.08 μs ± 20 ns 3G-A 1.04 μs ± 20 ns 3G-B, 50 fps 37.02 μs ± 20 ns (~ 2 lines + 1.5 μs) 3G-B, 60 fps 31.34 μs ± 20 ns (~ 2 lines + 1.5 μs)

Video time codes

D-VITC reader/generator	According to SMPTE 266M–1994
ATC reader/generator	According to SMPTE 12–M–2–2008

1.4.4 LTC

LTC Input (**LTC IN**)

Format	According to ANSI/SMPTE 12M–1–2008
Connector	Balanced signals LTC_IN_A and LTC_IN_B: • Via 3–pin XLR female (according to IEC 268–1) • Via 2 pins of the 9–pin DSUB female REF/GPI (depending on configuration)
Input impedance	18 kΩ
Frame rates	24, 25, 30, 30–Drop
Signal level	100 mV_{p-p} to 5 V_{p-p}
Frequency	1.6–2500 frames/s

LTC Output (**LTC OUT**)

Format	According to ANSI/SMPTE 12M–1–2008
Connector	Balanced signals LTC_OUT_A and LTC_OUT_B: • Via 3–pin XLR male (according to IEC 268–1) • Via 2 pins of 9–pin DSUB female SERIAL/LTC OUT (depending on configuration)
Output impedance	< 50 Ω
Frame rates	24, 25, 30, 30–Drop
Signal level	Adjustable 150 mV_{p-p} to 4.9 V_{p-p}

1.4.5 Oscillator and Clock Performance

Internal oscillator of the Ethernet module
(values refer to a free-running mode, neither sync nor lock):

Nominal frequency offset	± 50 ppm
Frequency stability over temperature	± 50 ppm over +5 °C to +40 °C
Aging	± 3 ppm maximum first year ± 12 ppm maximum after 10 years

Internal oscillator of the 3G-Video module
(values refer to a free-running mode, neither sync nor lock):

Nominal frequency offset	± 30 ppm
Frequency stability over temperature	± 50 ppm over +5 °C to +40 °C
Aging	± 3 ppm maximum first year ± 12 ppm maximum after 10 years

Buffered real–time clock of the Ethernet module

Kind of buffering and buffering time	Capacitor; one day (minimum) to three days (typical)
Accuracy of clock	± 2 ppm over +5 °C to +40 °C [173 ms per day] ± 3.5 ppm over -10 °C to +60 °C

1.4.6 GPIO, GPO, 24 V Output

GPIO:

GPIO_1 ... GPIO_4: Input specification	Input "Low": -2.0 to +1.0 V Input "High": +3.0 to +24.0 V Impedance: 4.7 kΩ Frequency: 0–1 MHz
GPIO_1 ... GPIO_4: Output specification	Open Collector output of an NPN transistor at 4k7 pull–up resistor (5 VDC). Max. power dissipation: 200 mW. "High" state: 4.3 V (no load). "Low" state: output switched to GND Max. collector current: 100 mA DC, fused by a100 mA auto–recovery fuse Collector–emitter saturation voltage: @ 100 mA: typ. 200 mV (≤ 600 mV) @ 10 mA: typ. 90 mV (≤ 250 mV) Frequency: 0–150 kHz

GPO:

GPO_5: SPST–NO relay	Contact resistance: 0.2 Ω Max. switching power: 10 W Max. switching voltage: 175 VDC Max. switching current: 0.5 A Max. transportable current: 0.8 A

24 V:

Output of the DC power supply = 23.7 VDC ± 5 %.	Reversible fused. A continuous current of up to 120 mA can be applied over the whole specified operating temperature range. At an ambient temperature of e.g. +22 °C the output switches to a high–resistance state after a few seconds if a current of 300 mA is applied.

1.5 Fuse Replacement Procedure

The power plug module has a 2–pole fuse–holder incorporated, which is located between the inlet and the ON/OFF switch.

To access the fuses please proceed as follows:

1. Turn power switch to off (position **O**).
2. Disconnect the mains plug.
3. With the aid of a tool (e.g. a small screwdriver) the fuse–drawer can be removed.

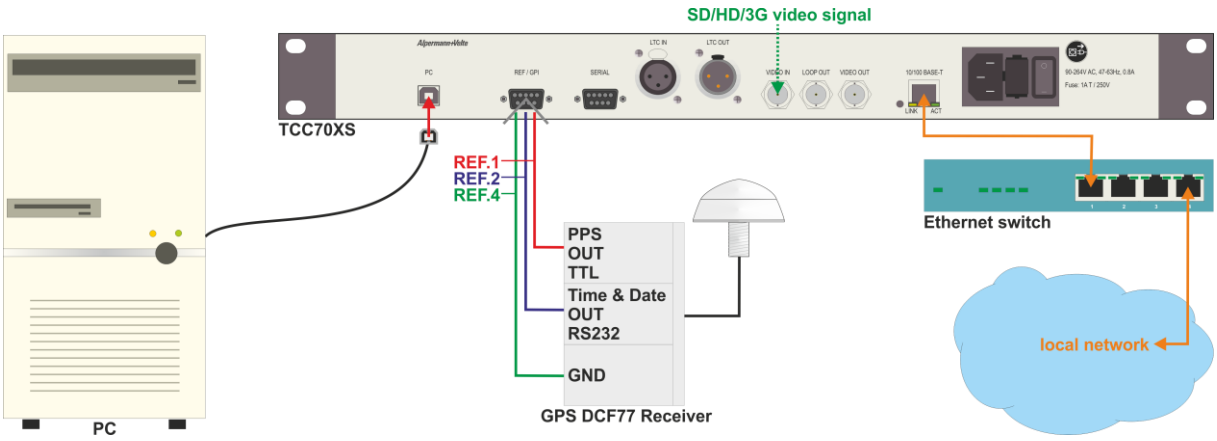
Type of fuse	250 V, 1 A, slow–acting, 5 x 20 mm

To avoid fire hazard, use only fuses of the correct type:

Type of fuse	250 V, 1 A, slow–acting, 5 x 20 mm

1.6 First Steps

1.6.1 Installation



- Connect LTC IN and/or LTC OUT according to your application.
- Connect VIDEO IN and/or VIDEO OUT according to your application. The signal at VIDEO IN will be used for synchronization purposes. It is strongly recommended to connect an SD/HD/3G video signal as soon as TCC70XS will be used in a video application.
- If you want to access TCC70XS via **browser** or if you want to use any other Ethernet function (SNMP, NTP server, NTP client), establish a 10/100Base–T Ethernet connection to your local network as shown above. Use a straight CAT5 cable between TCC70XS and a switch or hub. Use a crossover cable if you connect to the Ethernet card of your computer directly.
- Use a common "Type A to Type B" cable if you want to access TC70XS via **USB** port. If you first plug to the USB port a driver has to be installed. You can download the driver from:

  https://plurainc.com/products/tcc70xs2/

- The REAL–TIME method of operating requires any real–time reference. One approach is to connect a GPS receiver, for example. This type of external real–time reference has to deliver the following signals:
  - PPS: pulse per second, TTL, connect to pin 1 of REF/GPI.
  - TXD: serial data string, time & date, RS232, transmission once per second, connect to pin 2 of REF/GPI.

  In this case, GPIO_1 and GPIO_2 are fixed and cannot be used for other applications.

  Another approach is to use the *NTP client* function of TCC70XS. The real–time reference will be an NTP server which you select via an IP address. GPIO_1 and GPIO_2 now are free to use.

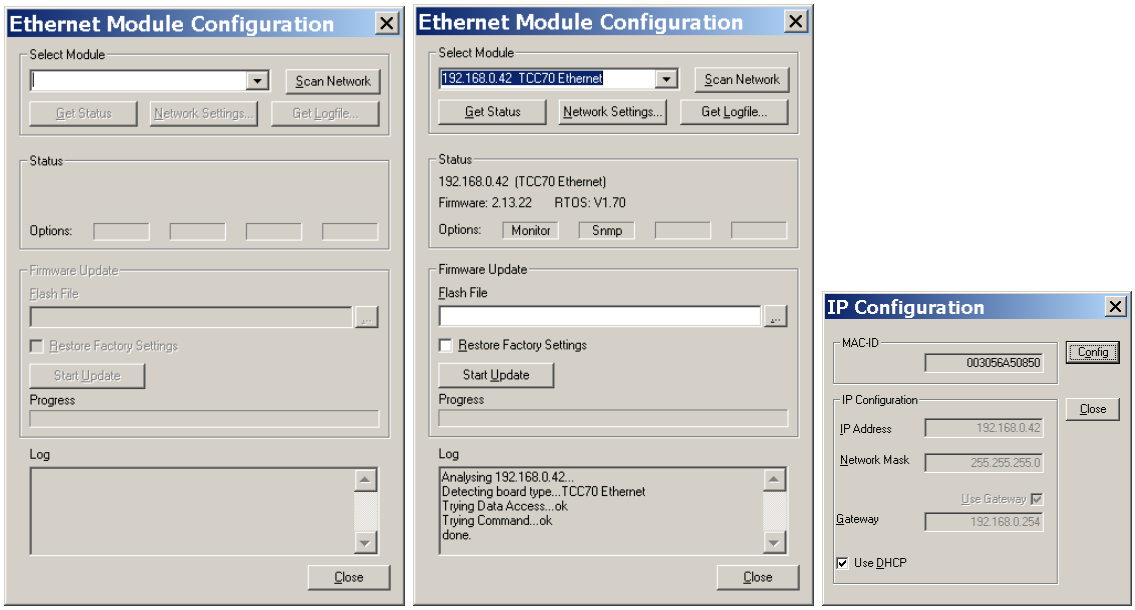
1.6.2 Network Set–Up

If you want to access TCC70XS via **browser**, establish a 10/100Base–T Ethernet connection to your local network as described in chapter "Installation". The computer which you have to use for the network set–up must be connected to the same network as TCC70XS. If you have a firewall running, please disable it or make the UDP port 8001 available for incoming and outgoing traffic.

You need the TCC70 Config program. It is available at:

https://plurainc.com/products/tcc70xs2/

- Please copy this program to your computer.
- Turn on the power of all units.
- Start the TCC70 Config program.
- Now choose "*Ethernet Module Configuration...*" from the "*Tools*" menu. The following screen will appear:

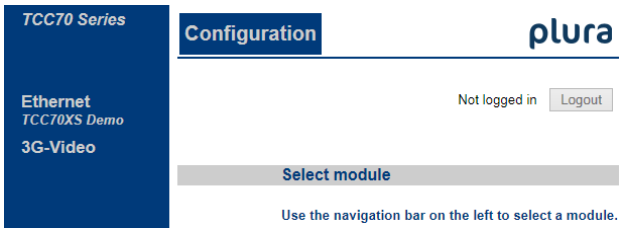


- Press "*Scan Network*" to search for TCC70XS units. All units found in the local network will be listed. Now choose the unit from the list. Clicking "*Get Status*" will fill in the information at the "Status" box.
- Click "*Network Settings...*", and adjust the parameters like IP Address, Network Mask, Gateway, and DHCP. Then click "*Config*" to store this set–up.
- The IP configuration now is complete. Close the "*IP Configuration*" dialog. A new network scan is started automatically, and the configured IP address will be shown in the list.
- Now you can close all dialogs.

1.6.3 Accessing TCC70XS via Browser

Start an Internet Browser and type in the IP address of the TCC70XS Ethernet Module (please refer to chapter "*Network Set–Up*").

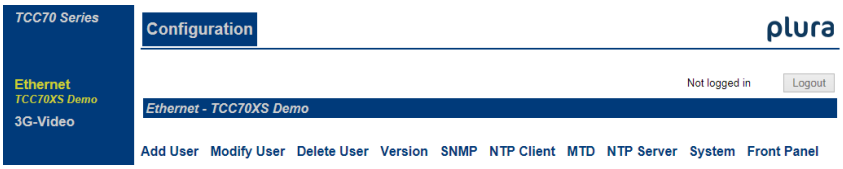
Place a direct link on your PC desktop to have an easy access to TCC70XS next time.



The TCC70XS homepage offers three function modules, which can be configured and controlled:

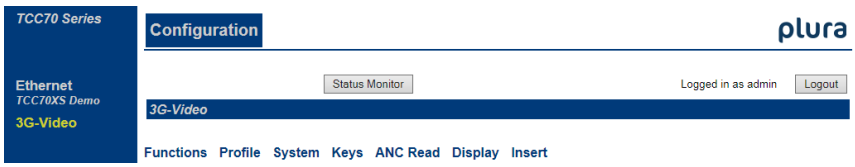
Ethernet:

Configuration and status of the integrated Ethernet module.

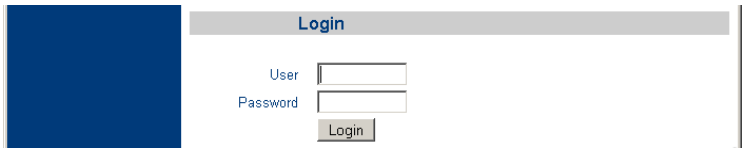


3G–Video:

Configuration and status of the video and time code functions. This includes programming of the 8–digit LED display, of the function keys and GPIOs, and of the status segments at the OLED display.



With a click on one of these items you gain access to the module. A menu appears which shows a list of all configuration pages which are currently available. With a click on one of these entries of the menu a configuration page will be opened where you can see and change parameters. If it is the first time that you try to open a configuration page, you have to pass the **LOGIN**:



At delivery, the username is "**admin**" and the password is "**admin**".

1.6.4 Accessing TCC70XS via USB

Use a common "Type A to Type B" cable if you want to access TC70XS via **USB** port.

If you first plug to the USB port a driver has to be installed. You can download the driver from:

https://plurainc.com/products/tcc70xs2/

The following PC programs are provided for the USB port:

Set–Up and Software Updates: TCC70 Config

Status Monitor: TCC70 Status Monitor

Only one program can access TCC70XS at the same time, because the USB port can be opened only once.

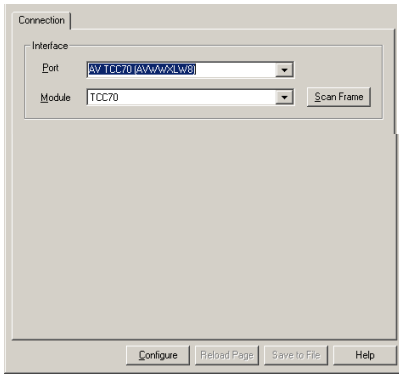
TCC70 Config

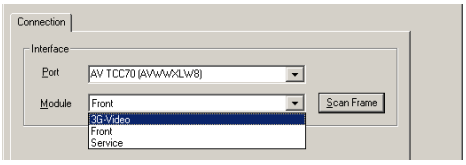
This program enables:

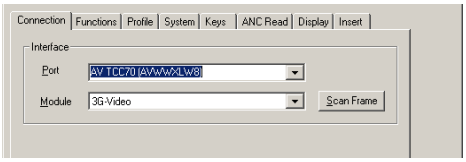
- Software updates.
- Configuration of the **3G–Video** module (video and time code functions). This includes programming of the 8–digit LED display, of the function keys and GPIOs, and of the status segments at the OLED display.
- Configuration of the OLED display (Front Panel): brightness and screen saver (previous TCC70XS models only).

At its start window, the program indicates the **TCC70XS** unit at *Port*, provided that USB has been installed correctly.

Click *Scan Frame* to show the module which can be accessed via USB: **3G–Video**. (Previous TCC70XS models also have a **Front** module.) Choose the module and click *Configure*. The program now offers tabs, which represent the configuration pages. There you can see and change parameters.







TCC70 Status Monitor

This program can be used to monitor the time code generator and readers. At its start window, the program indicates the TCC70XS unit, provided that USB has been installed correctly.

Click *connect* to open the status monitor.

1.6.5 Helpful Tips for Configuration and Troubleshooting

1.6.5.1 Configuration: Use of Pre–Installed Profiles

TCC70XS is a complex device serving different applications. This operating manual describes all the features in detail. This chapter helps you to find very quickly a basic set–up for the most popular applications.

The following description assumes that you successfully managed to do the "First Steps", i.e.

- if you want to access TC70XS via USB: you already have installed the USB driver successfully, and you connected the USB "Type A to Type B" cable;
- if you want to access TC70XS via browser: you successfully could open the TCC70XS start page.

Upon shipping of TCC70XS, some basic setups of the 3G–Video module will be stored as a profile. You can load a profile and proceed to set parameters according to your individual application. Configuration page **Profile** of the 3G–Video module enables to load this basic set–up, for a description of this procedure please refer to chapter:

"The *3G–Video Module: Video and Time Code*"
→ "*Configuration*"
→ "*Profile: Store and Load Set–Ups*".

Additionally, chapter "*Applications*" guides you step–by–step to do these basic setups which have been stored as a profile. If a profile has been lost, you can easily restore your specific setting starting with this basic set–up.

These are the most popular applications:

Time code to time code conversion: LTC → D-VITC or ATC Conversion from LTC to a video time code (D-VITC and/or ATC). Connect LTC to XLR female LTC IN. Connect a video signal to BNC VIDEO IN. BNC VIDEO OUT will output this video signal + time code. Pre–installed profile: **Profile 1: LTC–VTC**.
Time code to time code conversion: D-VITC or ATC → LTC Conversion from a video time code (D-VITC and/or ATC) to LTC. Connect a video signal to BNC VIDEO IN. This video signal should have the video time code embedded. The XLR male connector LTC OUT outputs the generated LTC, which will be phase aligned to the video signal, and which contains the data of the video time code with frame-accurate precision. Pre–installed profile: **Profile 2: VTC–LTC**.
TCC70XS as a real–time time code generator TCC70XS uses an external real–time source for a time & date reference. Any local time zone can be programmed. The generated time code transport time & date of the local time zone. Pre–installed profile: **Profile 3: Real–Time**.

1.6.5.2 Verification and Troubleshooting with Status Indicators and Displays

TCC70XS provides feedback to you via various status indicators and displays. This helps you to verify proper operation as well as to find faults.

The 8-digit LED display: You can program the display to see either what time code currently is generated or read.
Chapter: *"The 3G–Video Module: Video and Time Code"*
→ *"Configuration"*
→ *"Display: Configuration of the 8-Digit LED Display"*

Status segments at the OLED display: Four programmable segments are available. Each segment can give a status feedback by lighting up/flashing/being off. The most important feedbacks refer to the synchronization of the time code generator and to the signals of the real–time reference.

Programmable function keys with lamps: Four programmable keys are available; this includes a function of the integrated lamp as well. The lamps for example indicate whether a function currently is active or not.

Programmable GPIO: Four programmable GPIOs and one GPO are available. They can be used to control external lamps or alarms. Basically, the same functions can be assigned as it is provided for the keys.

Chapter for all these elements:
"The 3G–Video Module: Video and Time Code"
→ *"Configuration"*
→ *"Keys: Keys and Lamps, Status and GPIOs"*

The status monitor of the 3G–Video module:

The 3G–Video module provides a status monitor, which can be accessed via browser as well as via USB. The following chapters describe how to open the status monitor:
"Software Tools for TCC70XS"
→ *"The Status Monitor of the 3G–Video Module"*
→ *"Status Monitor by Ethernet"* and *"Status Monitor by USB"*.

These are the most important features of the status monitor:

- Feedback of the most important parameters of the current set–up.
- State of the frequency and phase synchronization, including error counters.
- Displaying the current time code values of the generator.
- Displaying the current time code values of the reader, including error counters.
- State of the real–time reference: set–up, received values, status.
- State of the internal real–time clock: current time & date of the local time zone and internal UTC, state of synchronization.

You will find a detailed description at chapter:
"The 3G–Video Module: Video and Time Code"
→ *"The Status Monitor"*

NTP Client: Feedback about the NTP client function will be indicated at configuration page **NTP Client** of the Ethernet module.

Chapter: *"The Ethernet Module"*
→ *"The Individual Functions"*
→ *"NTP Client"*

NTP Server: Feedback about the NTP client function will be indicated at configuration page **NTP Server** of the Ethernet module.

Chapter: *"The Ethernet Module"*
→ *"The Individual Functions"*
→ *"NTP Server"*

1.7 Software Update

TCC70XS includes different function modules. The following modules can receive a software update:

- **3G–Video**: Video and time code functions.
- **Front** (previous TCC70XS models only): Module responsible for the 8–digit LED display, for the OLED display, for the function keys, and the communication interface to the 3G–Video and Ethernet module.
- **Ethernet** module.

Each update has to be done separately, with different procedures.

Preparation

Please have ready:

- the program TCC70 Config,
- the update file of type **.tcf**.

Important: Please make sure to always use the latest version of the TCC70 Config tool. You can download it from:

https://plurainc.com/products/tcc70xs2/

Update of modules "3G–Video or "Front"

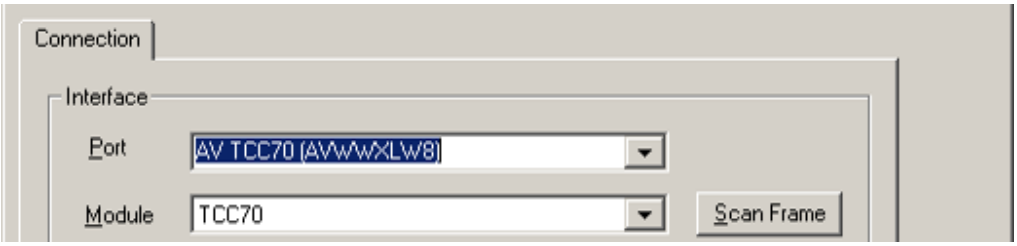
You have to connect the **USB** port of TCC70XS to your computer with a common "Type A to Type B" cable.

If you first plug to the **USB** port a driver has to be installed. You can download the driver from:

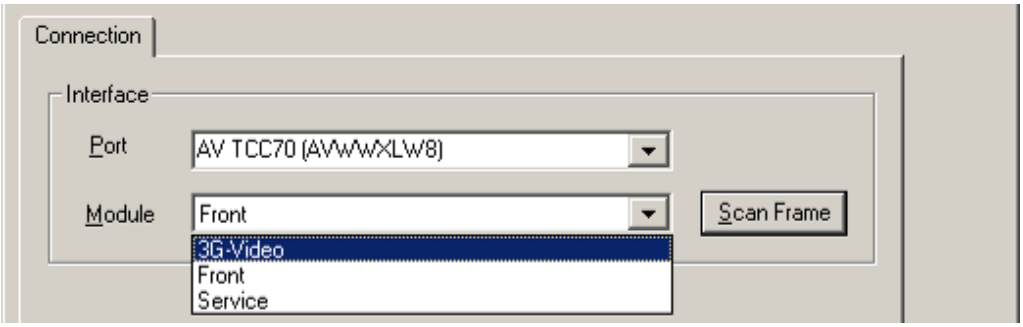
https://plurainc.com/products/tcc70xs2/

Please now execute the following steps:

1. Connect your computer to the **USB** connector of TCC70XS. If the **USB** is used for any other application, please terminate this connection. Switch on TCC70XS.
2. Execute TCC70 Config on your computer. At its start window, the program indicates the TCC70XS unit at *Port*, provided that USB has been installed correctly.



3. Click **Scan Frame** to open the list of the modules. Choose **3G–Video** or **Front**.



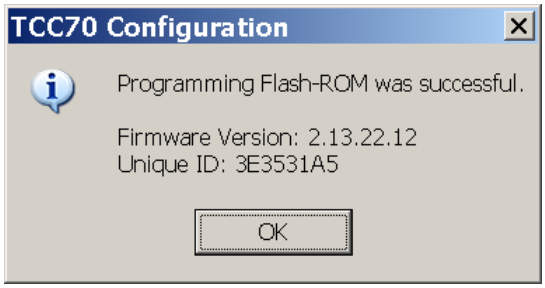
4. Select "*Flash Update*" in the **File** menu.

4. Open the **.tcf** file: 3G-Video module: **TCC70 3G-Video n.nn.nn.tcf**
   Front module: **TCC70 Front n.nn.nn.tcf**

   A window will appear which gives a warning that the module will be out of function from next step on while the flash memory will be overwritten.

   Click "*Yes*", update starts.

5. Click "*OK*" at the end.



6. Update is finished now. We recommend checking module's configuration.

Update of Ethernet Functions

The computer which you have to use for the update must be connected to the same network as TCC70XS. If using a firewall, ensure that the computer can connect to TCC70XS on TCP ports 20, 21, 23 and 954 and on UDP ports 123, 161 and 8001 for both incoming and outgoing traffic.

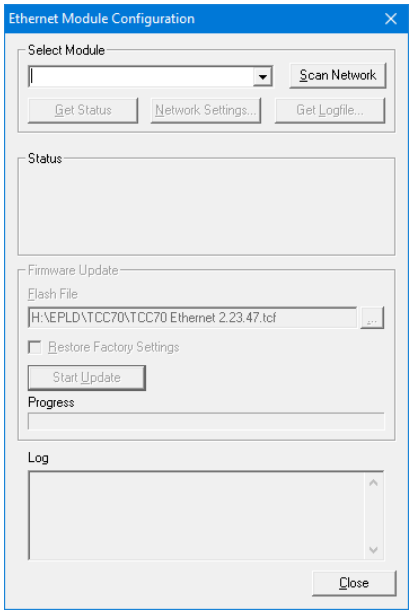
Important: Please make sure to always use the latest version of the TCC70 Config tool. You can download it from:

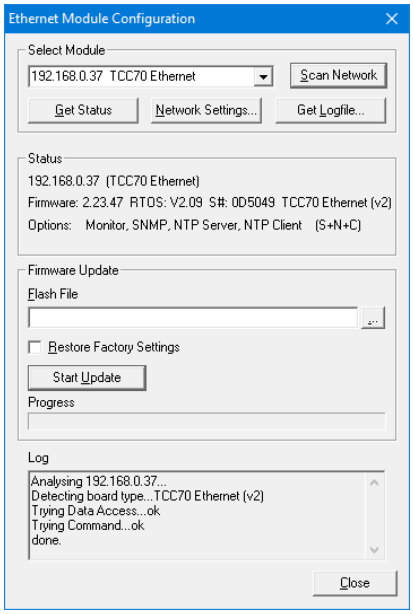
https://plurainc.com/products/tcc70xs2/

1. Be sure that TCC70XS and the computer are connected to the same network, and that they can reach each other at the ports listed above. Switch on TCC70XS.

2. Execute TCC70 Config on your computer.

3. Open the **Tools** menu and choose *"Ethernet Module Configuration..."*. The window *"Ethernet Module Configuration"* appears:





4. Click "*Scan Network*" to search for TCC70XS Ethernet modules in the network. All units found will be shown in a list. Choose your unit from this list.

5. At "*Flash File*" click the "browse" button ("...") to search for the update file:
   TCC70 Ethernet n.nn.nn.tcf.

6. Check the *'Restore Factory Settings'* checkbox only if it is necessary to restore the factory settings. This will reset IP parameters and passwords as well!

   Click "*Start Update*".

7. During flash update, the Ethernet operation of the unit stops! The unit reboots after flash update. A "Reboot complete" message appears. Press the "*OK*" button.

8. An "Update complete" message appears. Press the "*OK*" button. Update is finished now.

2 Software Tools for TCC70XS

2.1 Configuration

2.1.1 Configuration by USB

Please notice subchapter

- "Accessing TCC70XS via USB"

of chapter "First Steps".

The following description assumes that you already have installed the USB driver successfully, and that the USB "Type A to Type B" cable is connected.

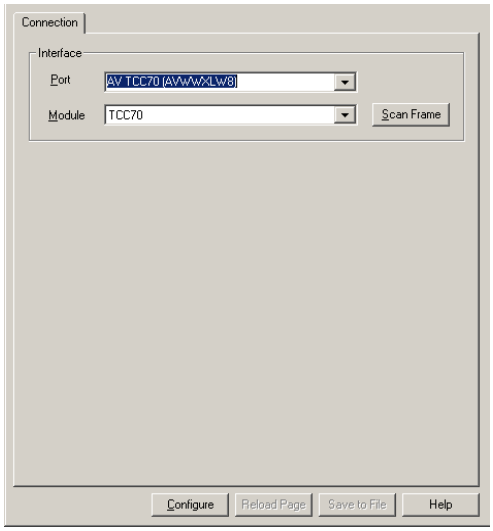
Apart from the power supply TCC70XS includes function modules. The following modules can be configured via USB:

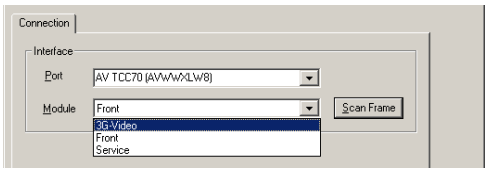
- **3G–Video**: Video and time code functions. This includes programming of the 8–digit LED display, of the function keys and GPIOs, and of the status segments at the OLED display
- **Front** (previous TCC70XS models only): Programming the brightness and the screen saver of the OLED display.

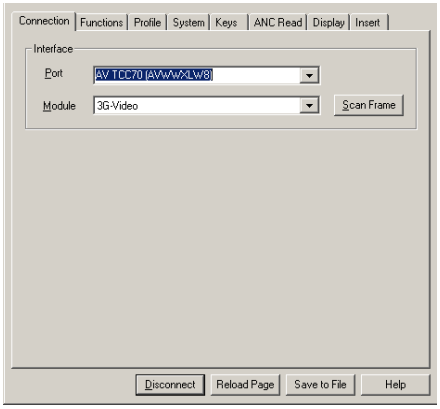
Execute TCC70 Config on your computer. At its start window, the program indicates the TCC70XS unit at *Port*, provided that USB has been installed correctly.

Click **Scan Frame** to open the list of those modules, which can be accessed via USB: **3G–Video** and **Front** (previous TCC70XS models only). Choose a module and click on **Configure**. The program now offers tabs, which represent the configuration pages. There you can verify and change parameters.

Click **Disconnect** to terminate the connection.







2.1.2 Configuration by Ethernet

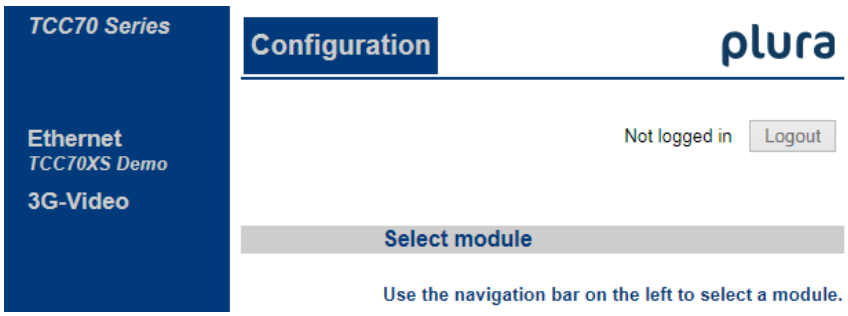
2.1.2.1 Overview

Please notice subchapters

- "Installation",
- "Network Set–Up",
- "Accessing TCC70XS via Browser",

of chapter "First Steps".

The following description assumes that you successfully could open the TCC70XS start page.

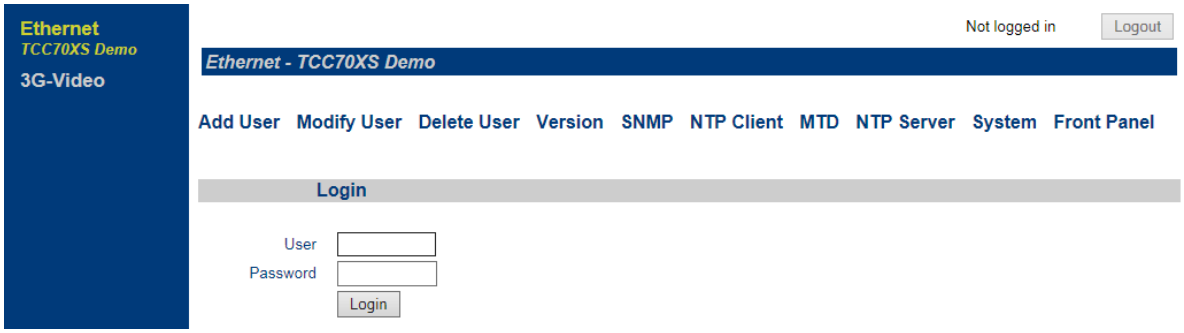


Apart from the power supply TCC70XS includes three function modules. By Ethernet you can reach all modules to perform a set–up as well as to view status information:

- **Ethernet**: Configuration and status information of the integrated Ethernet module. Access is only possible via Browser, not by USB.
- **3G–Video**: Configuration and status of the video and time code functions. This includes programming of the 8–digit LED display, of the function keys and GPIOs, and of the status segments at the OLED display.
- **Front**: Configuration of the OLED display: brightness and screen saver (previous TCC70XS models only).

2.1.2.2 Login, Login Status, Logout

If you try to open a page which enables a set–up, you first have to pass the **LOGIN**. The login status indicates *"Not logged in"*.



Enter username and the corresponding password. At delivery, the username is "**admin**" and the password is "**admin**".

If you have passed the login, the login status indicates the username. Click button **Logout** if you want to logout.

2.1.2.3 Accessing the TCC70XS Function Modules

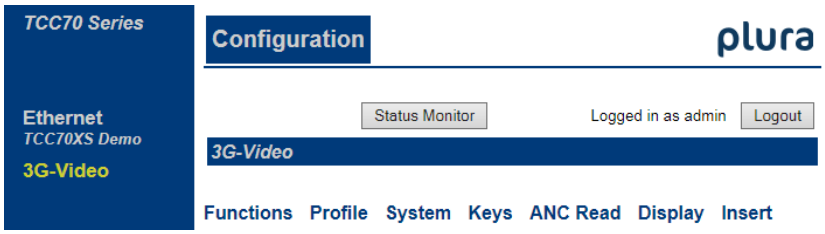
Click on an item in the list at the left side:

- **Ethernet**: Configuration and status information of the Ethernet module.
- **3G–Video**: Configuration and status of the video and time code functions. This includes programming of the 8–digit LED display, of the function keys and GPIOs, and of the status segments at the OLED display.

2.2 The Status Monitor of the 3G–Video Module

2.2.1 Status Monitor by Ethernet

The **3G–Video** module (video and time code functions) offers a status monitor. If you have done the network set–up and if you have access to the 3G video module of TCC70XS (as described in chapter "First Steps"), just click the Status Monitor button to open the status monitor. It is not necessary to perform a **LOGIN**.



Requirements:

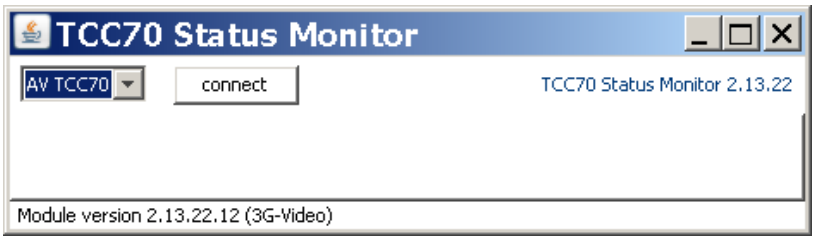
- Please have Java Runtime Environment 1.6.0 or higher installed (for example download at www.java.com).
- Java should be installed as a browser plug–in (a Windows installation will do this automatically if you download Java from the source mentioned above).
- The status monitor works with all operating systems which support Java.

2.2.2 Status Monitor by USB

The **3G–Video** module (video and time code functions) offers a status monitor. If you have connected the USB cable and if you have installed the USB driver (as described in chapter "First Steps – Accessing TCC70XS via USB"), just start the TCC70 Status Monitor program.

TCC70 Status Monitor

At its start window, the program indicates the TCC70XS unit at *Port*.
Click on *connect* to establish the connection to TCC70XS.

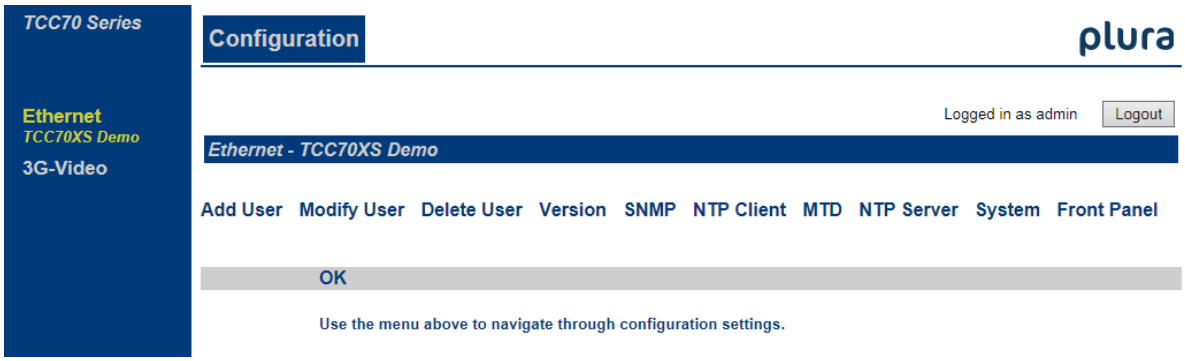


3 The Ethernet Module

3.1 Overview of Functions

You can access the Ethernet module only by Ethernet, not by USB. Please refer to subchapter "Configuration by Ethernet" of main chapter "Software Tools for TCC70XS" for a description of how to access the Ethernet module.

If you have clicked on the Ethernet item in the list at the left side, further links will appear which leads you to set up and status information:

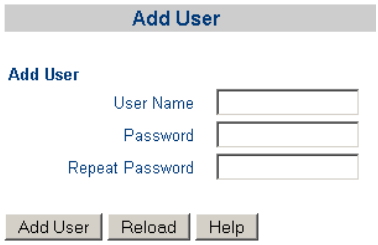


- **Add User** Enter a new user with password
- **Modify User** Change a password
- **Delete User** Delete user and password
- **Version** Information about status of hardware and firmware
- **SNMP** Set–up of SNMP functionality
- **NTP Client** Set–up and status of NTP client functionality
- **NTP Server** Set–up and status of NTP server functionality
- **System** Name, log file, and Ethernet status

Click on an item to open the desired page.

3.2 The Individual Functions

3.2.1 Add User: Enter a New User with Password



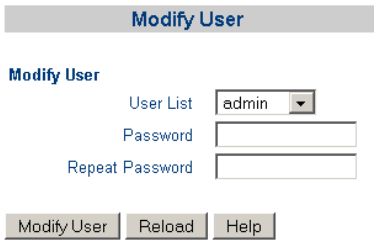
User Name	Enter a new name.
Password	Create a new password.
Repeat Password	Repeat the password.

Click on **Add User** to finish.

The message "*User added*" will appear if the new user has been entered successfully.

The message "*This user already exists*" will appear if the username already exists. The old password will be kept.

3.2.2 Modify User: Change a Password

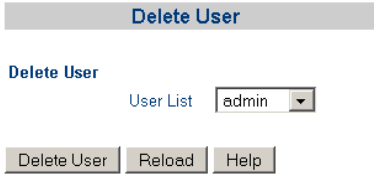


User List	Choose a name from the list.
Password	Create a new password.
Repeat Password	Repeat the password.

Click on **Modify User** to finish.

The message "*User modified*" will appear if the new password has been entered successfully.

3.2.3 Delete User: Delete User and Password



User List	Choose a name from the list.

Click on **Delete User** to delete username and corresponding password.

The message "*User deleted*" will appear if username and password has been deleted successfully.

You cannot delete the user which currently has logged in. The message "*Can't delete current user*" will appear in this case.

Hint: In the event that all passwords are lost, even the "admin" – "admin" access is denied, a firmware update will help. Before starting the update click "**Restore Factory Settings**". Please notice section "Update of Ethernet Functions" of chapter "Software Update" for detailed information.

This update will set **everything** to default, even IP parameters and passwords. Access via "admin" – "admin" will then be possible again.

3.2.4 Version: Information about Status of Hardware and Firmware

Version

Config	2.14.11
Firmware	2.14.11
RTOS	1.80
Hardware	5.8.4.4

Options

Status Monitor	yes
SNMP	yes
NTP Server	yes
NTP Client	yes
Option	no

This page lists information about hardware, about firmware, and about installed options.

3.2.5 Buffered Real–Time Clock

The Ethernet module is equipped with a buffered real–time clock (RTC), which keeps the time & date even at power loss. Buffering is done by means of a capacitor; buffering time will be one up to three days.

Upon power-up, the internal real–time clock of the 3G-Video module starts with the time of this buffered clock if no data of a real–time reference can be received. The status monitor of the 3G-Video module indicates at its **Time and Date** page, that the real–time has started this way: last used source = *rtc*.

The buffered clock can be set in the following ways:

- the first time TCC70XS receives data from a real–time reference;
- the first time TCC70XS receives data from a real–time reference which indicates “lock” state;
- if the internal real–time clock of the 3G-Video module is set manually;
- periodically once a day.

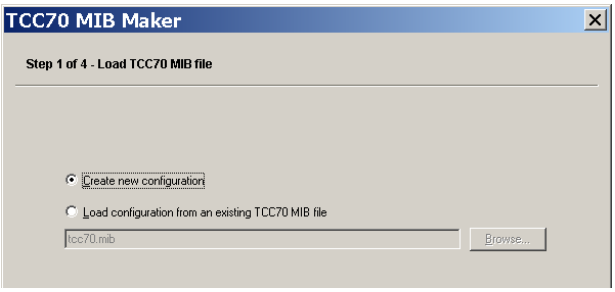
3.2.6 SNMP Functionality

3.2.6.1 Create a MIB File

Execute TCC70 Config on your computer. Open the *Tools* menu and select "Create MIB File ...". Please follow the instructions of the "TCC70 MIB Maker".

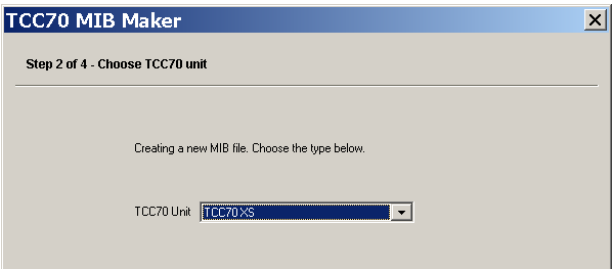
1st step:

Do you want to create a new MIB file or do you want to change an existing one?



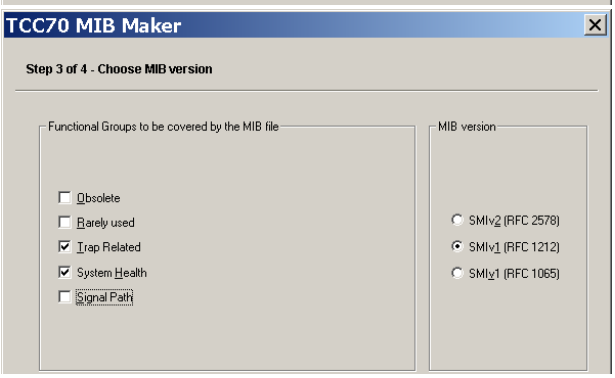
2nd step:

Choose your TCC70 device.



3rd step:

Select the functional groups and the version of the MIB file.



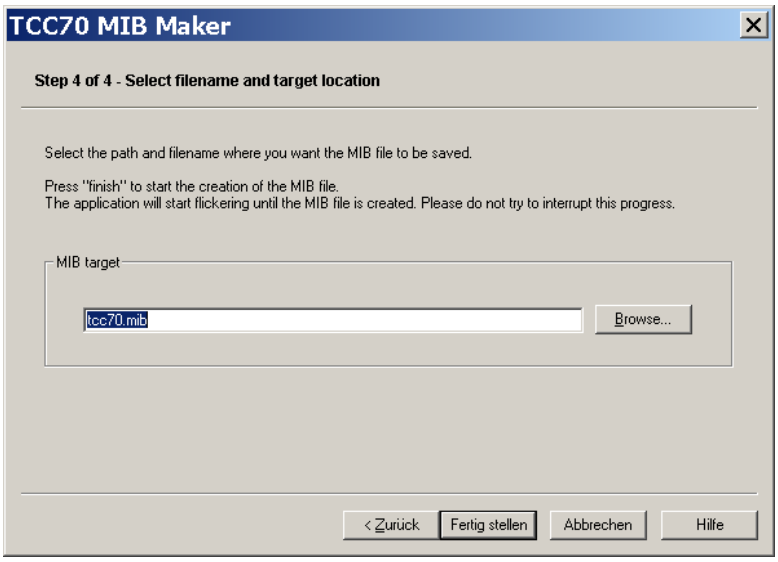
The following **Functional Groups** can be selected:

Signal Path	Contains the most important status information to monitor the signals of the system. Especially, it contains warnings and alarms.
System Health	Contains the most important status information to monitor the device in general. Especially, it contains the status of the temperature and of the power supply.
Trap Related	Contains all the traps the integrated modules are able to generate.
Rarely used	Contains all the rest. It may be used for special applications only.
Obsolete	Not intended to use anymore.

MIB Version Please select a format which is compatible to your SNMP manager.

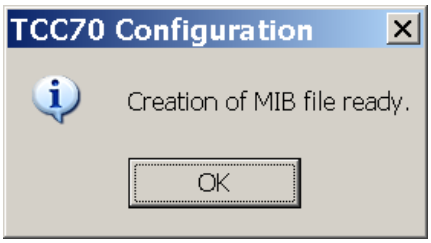
4th step:

Select the path where you want to store the MIB file.

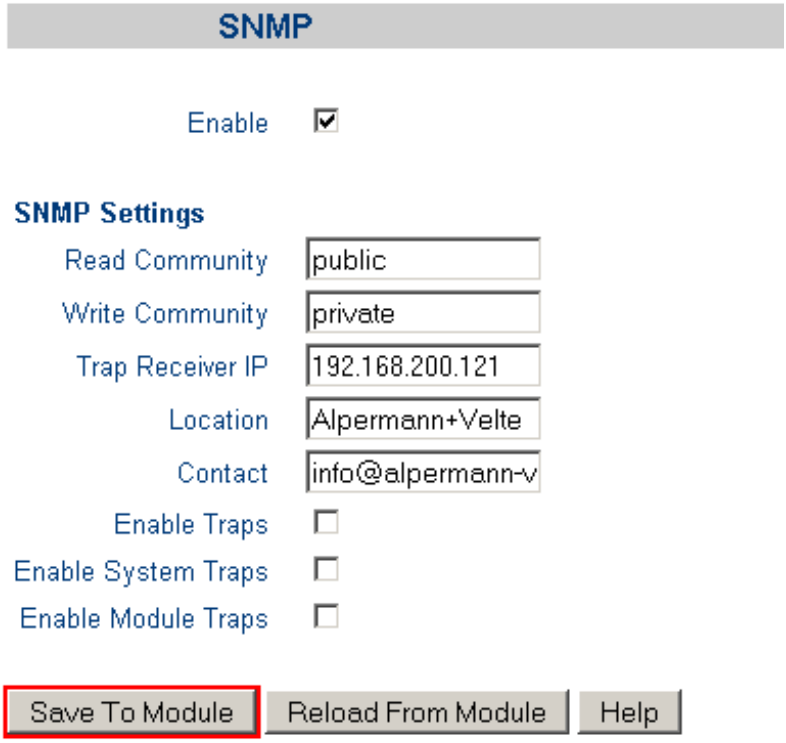


With a click on "Finish" the MIB file will be created. You will see the screen flickering, but don't worry and don't interrupt the process.

Click on the OK button at the end, the MIB file has been created successfully.



3.2.6.2 Configuration Page "SNMP"



Enable You can switch on or off the SNMP functionality completely.

SNMP Settings

Read Community	Password for a read access. Default password is "*public*".
Write Community	Password for a write access. Default password is "*private*".
Trap Receiver IP	Enter the IP address of your trap receiver.
Location	Enter the system location string.
Contact	Enter the system contact string.
Enable Traps	The Ethernet module of TCC70XS is able to send traps to the IP address set at Trap Receiver IP. This feature can be switched on or off completely.
Enable System Traps	If this checkbox and Enable Traps are checked, events within the Ethernet module can generate a trap. Example: a start–up trap after the boot process.
Enable Module Traps	If this checkbox and Enable Traps are checked, events within the 3G–Video module can generate a trap, provided that traps are enabled at the set–up of the module (please notice configuration page **System** of the modules).

Changes on any parameter will not be transferred to the module automatically. Click this button to store the changes to the module.

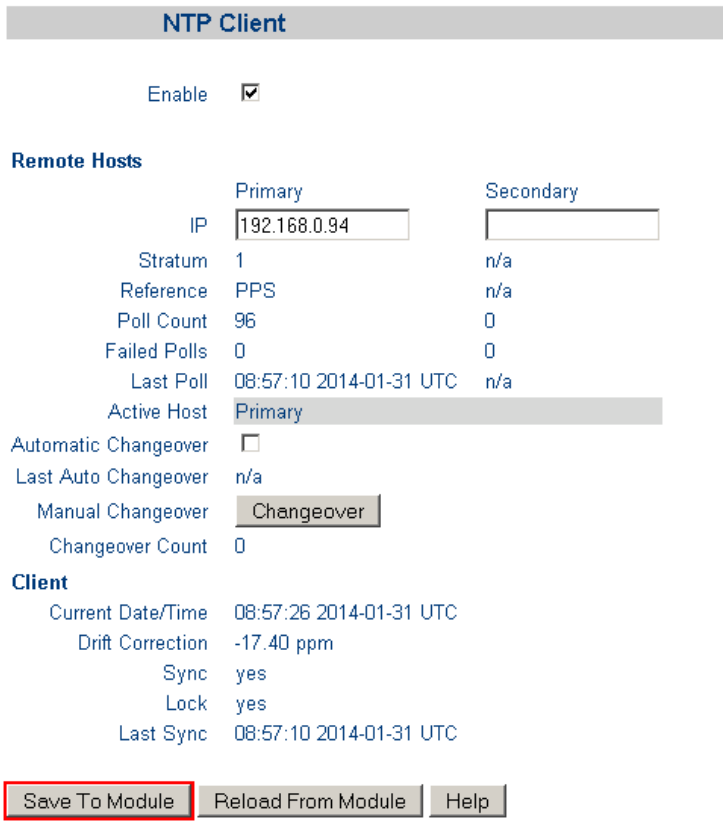
3.2.7 NTP Client

The NTP client functionality is used to synchronize TCC70XS with an NTP server. The NTP client queries time & date from an NTP server and sets the internal real–time clock.

This kind of real–time synchronization can be uses as an alternative to an external real–time reference connected to REF/GPI connector.

If the time code generator should use this kind of real–time reference, "*Source = NTP Client*" has to be selected at the **Reference** configuration page of the 3G–Video module.

This page allows configuring the network parameters and shows important status information.



Notes:

Enable
You can switch on or off the NTP client functionality completely.

Save To Module

Changes on any parameter will not be transferred to the module automatically. Click this button to store the changes to the module.

Reload From Module

You have to refresh this page in order to watch changes at status fields.

Remote Hosts

IP	You can set the IP addresses of up to two NTP servers ("*Primary*" and "*Secondary*") for redundancy. If for example the "*Primary*" NTP server cannot be reached anymore, TCC70XS queries the "*Secondary*" NTP server (please notice checkbox Automatic Changeover). Notes: • Don't use DNS names (e.g. time.nist.gov), since they can't be resolved. • No NTP queries will be sent to IP addresses that end with a "0" (Network addresses) or with a "255" (Broadcast addresses). • To ensure an accurate time base, use only **reliable** time servers! It is recommended to use a local time server. Public servers may not be a good choice, because they may not be available permanently or may differ from real–time within several seconds.

Stratum This field indicates the stratum value received from the selected NTP server.

This value tells the "distance" of the server to a reference clock. A server that is directly connected to a reference device (e.g. an atomic clock or a GPS clock or a radio clock) would have stratum 1. Any server that synchronizes to a stratum 1 server has stratum 2 and so on.

If this field indicates "n/a", no value has been received yet, and this may be a hint to an error. Please consider the possibility that any firewall may block network traffic.

Reference This field identifies that server which forms the reference for the selected NTP server. For example, this field identifies a stratum 2 server if the selected server has a stratum value of 3.

In case of stratum values 1 or 0 a, this field consists of a string of up to four characters, e.g. DCN, NIST, DTS, GPS, PTB, PPS, etc.

In case of stratum values >1, this field shows the IP address of the reference server.

If this field indicates "n/a", no value from the selected server has been received yet (same as field Stratum), and this may be a hint to an error.

Poll Count The number of queries that have already been sent to the server. This value resets to zero if the IP address is changed.

Failed Polls The number of queries that could not be sent or have not been answered. Generally, this is due to an unreachable server.

Last Poll The time and date (UTC, 24h) of the last query that was sent to the server. If there wasn't any query yet, "n/a" is shown. During normal operation, this field should change in a 64 second interval.

Active Host Current NTP server in use: "*Primary*" or "*Secondary*".

Automatic Changeover If checked, a changeover between "*Primary*" and "*Secondary*" can be done automatically. If you select two NTP servers, then it is recommended to use this automatic mode.

Last Auto Changeover The time and date of the last automatically initiated changeover; "n/a" if no changeover took place yet. This value resets if any IP address is changed.

Manual Changeover Click this button **Changeover** to force a changeover manually.

Changeover Count The number of automatic or manual initiated changeover events. This value resets to zero if any IP address is changed.

Client

Current Date/Time Current date and time of the NTP client when the page was loaded.

Drift Correction This status indicates the difference of the internal oscillator's frequency between nominal value and current value. A difference will arise due to synchronization with the NTP server. If this value shows a high degree of fluctuation, the synchronization does not work properly, maybe due to a high jitter of the NTP server. In case of quiet high values (> 500), either the internal oscillator or the NTP server may be out of tune.

Sync "*yes*" is shown if at least once a valid time & date has been received from the NTP server.

Lock "*yes*" is shown if the NTP client is locked to the NTP server.

Last Sync Time & date of the last successful synchronization. This moment should not be older than approx. 64 seconds during normal operation.

3.2.8 NTP Server

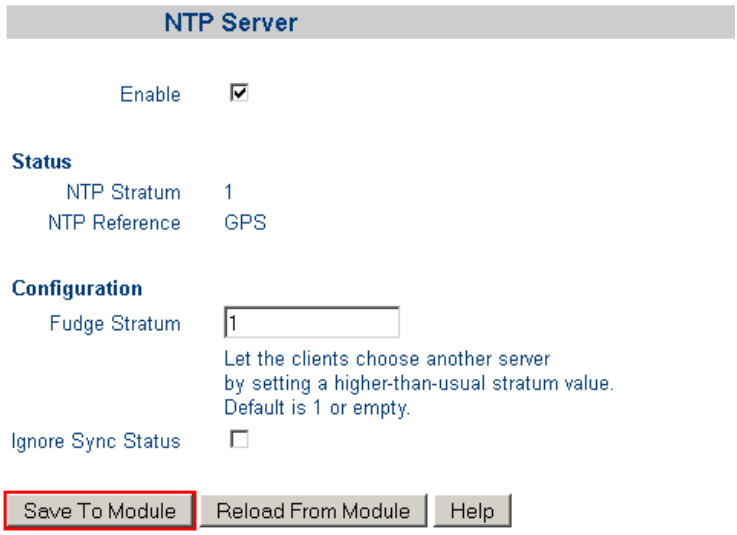
3.2.8.1 General and Configuration

The NTP server functionality enables TCC70XS to be used as a real–time reference by other devices (NTP clients) within the local network.

TCC70XS is able to offer the network a precise real–time if a high precision external real–time reference is connected to the REF/GPI connector. Alternatively, the NTP client function can be used. You can select between these two real–time sources at the "Source" entry of the **Reference** configuration page of the 3G–Video module.

Independent from that setting it is recommended to connect an SD/HD/3G video signal as soon as TCC70XS will be used in a video application. The video sync enables TCC70XS to provide a "video locked real–time".

This page allows configuring the network parameters and shows important status information.



Notes:

Enable
You can switch on or off the NTP client functionality completely.

Save To Module

Changes on any parameter will not be transferred to the module automatically. Click this button to store the changes to the module.

Reload From Module

You have to refresh this page in order to watch changes at status fields.

Status

NTP Stratum	Current stratum value, should be "1" at normal operation.
NTP Reference	Shows the "reference clock identifier" of the NTP message string. This identifier depends on the stratum value. NTP Stratum = 0: NTP Reference = *"INIT"* or = *"LOST"*. NTP Stratum = 1: NTP Reference = *"GPS"*. NTP Stratum > 1: NTP Reference = *"0.0.0.0"*.

Configuration

Fudge Stratum	This value should be "1" for normal applications. If a network includes several NTP server devices, it may be useful to allocate different priorities. The NTP standard does not provide a manual set–up of priorities, but it may facilitate an installation under certain circumstances. That is the reason why this set–up is offered at this place. The "Fudge Stratum" value determines the *NTP Stratum* value during normal operation: "1" = highest priority → *NTP Stratum* = "1"; "2" = next lower priority → *NTP Stratum* = "2". In case of an error (please also refer to chapter "NTP Status and Troubleshooting") the "Fudge Stratum" value will act as an offset to the *NTP Stratum*: Offset = Fudge Stratum – 1.
Ignore Sync Status	This checkbox should not be checked for normal applications. The NTP server indicates its status at the "Stratum" and "Reference" fields. The content of these fields depends on the precision of the real–time clock. This is an internal clock of TCC70XS which is set and tuned by a real–time reference (which is either an external real–time reference at the REF/GPI connector or the NTP client). The internal real–time clock has no high precision if it has not been set at all, or it has been set manually, or the last tuning was a long time ago, or the last tuning occurred while the real–time reference was in an "unlock" state. Chapter "NTP Status and Troubleshooting" gives a detailed description of possible values of the "Stratum" and "Reference" fields. Under certain circumstances and in some applications, a high stratum value may be an essential problem. To overcome this problem and to continuously offer the NTP server for reference within the local network, this set–up is offered at this place. If checked, the stratum value will be kept = "Fudge Stratum" always.

3.2.8.2 Handling a Leap Second

The NTP server basically works with **UTC**, so it is not affected by any DST switching of a local time zone, but it is affected by a time jump according to a leap second.

NTP itself does not provide any special leap second handling. You will find a lot of information on this issue in the Internet.

A real–time reference (which is either an external real–time reference at the REF/GPI connector or the NTP client) will be responsible for the accuracy of the NTP server of TCC70XS.

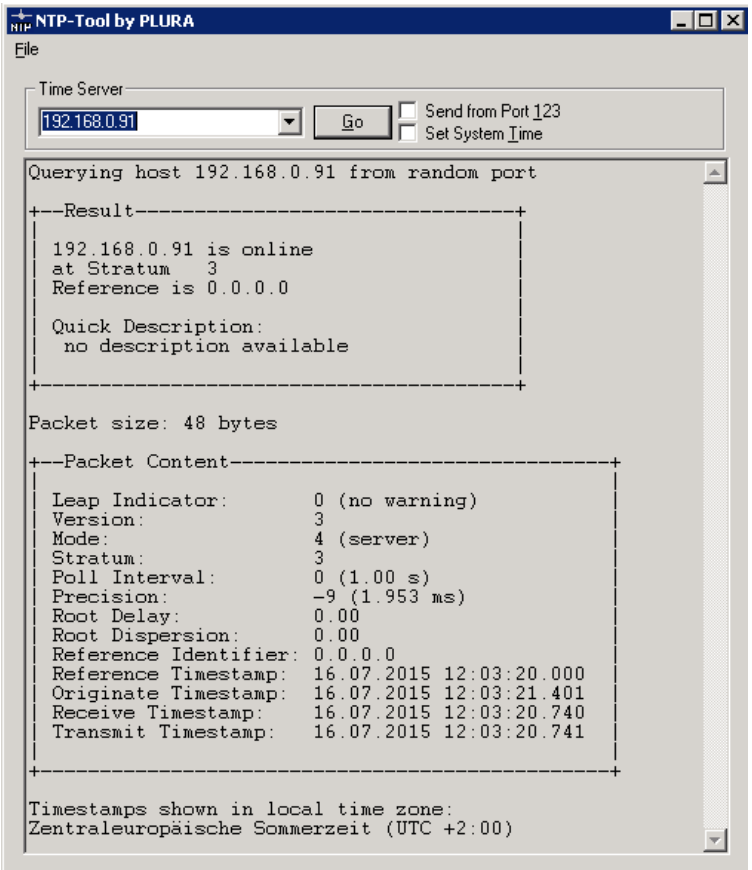
If a leap second announcement from the real–time reference is received, a leap second alarm will be transmitted to the NTP server. Normally, this alarm will be raised 55 minutes before the event.

NTP messages include a leap indicator (**LI**). This way, a leap second alarm can be transported from NTP server via NTP clients to the operating system, which then can use this information for a leap second handling.

You can check your NTP connection and the leap second announcement with **NTP Tool** by Plura, available at:

https://plurainc.com/products/tcc70xs2/

Example: The "**Leap Indicator"** status announces a leap second:



3.2.8.3 NTP Status and Troubleshooting

The NTP server indicates its status at the "Stratum" and "Reference" fields.

Refer to the following table to interpret the given information:

Stratum: 0 **Reference: INIT**

The internal real–time clock has not received any valid time update since power has turned on.
This state sets an alarm condition in the NTP message: **LI** = 3 = clock not synchronized.

Possible causes if "Reference – Source = External PPS + Serial" has been selected at the **Reference** configuration page of the 3G–Video module:

- The external real–time reference is not connected,
- or does not send valid data,
- or the serial protocol does not match the protocol selected at "Reference – Format" at the **Reference** configuration page of the 3G–Video module.

Possible causes if "Reference – Source = NTP Client" has been selected at the **Reference** configuration page of the 3G–Video module:

- The NTP client is disabled (checkbox **enable** at the **NTP Client** configuration page of the Ethernet module must be checked),
- or the NTP client cannot connect to an NTP server (verify the IP addresses).

The status monitor of the 3G–Video module offers further help with its **Time and Date** page: at **external reference** status "connected before" and "accepted before" indicates whether a valid time & date has been received at all.

Stratum: 1 **Reference: GPS**

Normal operating mode. The real–time method of operation works faultless. The internal real–time clock has received an update during last 24 hours by a reference which indicates "Lock" state **and** the frequency and phase synchronization of the time code generator works normal.

[Stratum = 1 requires setting "Fudge Stratum" to 1]

Stratum: > 1 **Reference: 0.0.0.0**

"Reference" will be set to "0.0.0.0" for any stratum values > 1. There are various possible causes for a stratum > 1:

A **Fudge Stratum** set to > 1 (please refer to chapter "NTP Server"). In this case the stratum value receives an offset of "Fudge Stratum – 1" at normal operating.

B The frequency and phase synchronization of the time code generator is lost. Please check the external sync signal (video, PPS, LTC).

Stratum: It gets a single increment by one after a sync loss for 256 seconds.

Options for verifying: Status monitor of the 3G–Video module indicates "pll lock current no" at the **System** page.

Help: Restore synchronization. Verify that the correct sync signal is selected at the **Generate** configuration page of the 3G–Video module.

C The internal real–time clock has been set after power has turned on, either by the real–time reference, or manually utilizing one of the configuration tools. But the time of the clock is not or no longer precise because ...

- it has been set "manually",
- or the last tuning occurred while the real–time reference was in an "unlock" state,
- or it is more than 24 hours ago that the internal clock has received an update by a real–time reference in a "lock" state.

Stratum: = 2 + (possibly) 1 because of case B + (possibly) offset by "Fudge Stratum".

Options for verifying: The **Time and Date** page of the status monitor of the 3G–Video module indicates "locked no" at **local time zone**.

Help: Check real–time reference. If "locked yes" at **external reference** is indicated at the **Time and Date** page of the status monitor of the 3G–Video module, the problem can be solved forcing an update of the real–time clock: click button **Update Now!** at the **Reference** configuration page of the 3G–Video module, or press (proper configured) function keys to switch to FREE mode and then back to REAL–TIME mode.

Check the set–up at the **Reference** configuration page of the 3G–Video module and compare it with the recommended set–up.

D The internal real–time clock has been set after power has turned on, but not yet by a real–time reference in a "lock" state.

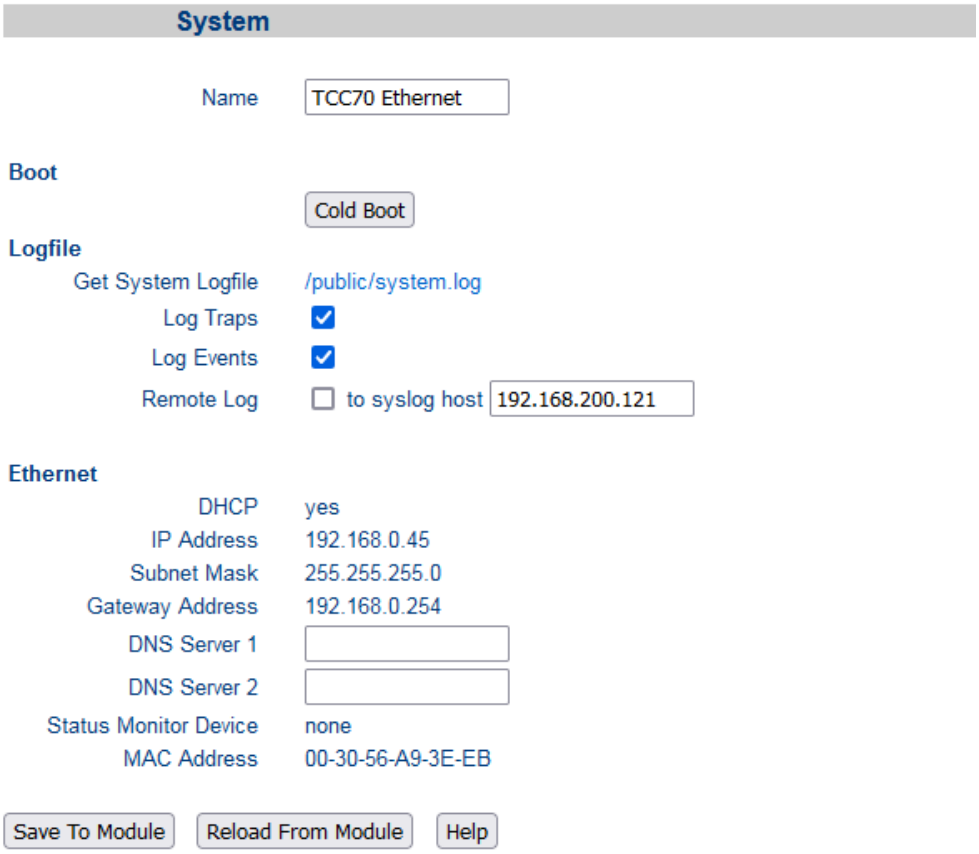
Stratum: = 4 + (possibly) 1 because of case B + (possibly) offset by "Fudge Stratum".

Options for verifying: The **Time and Date** page of the status monitor of the 3G–Video module indicates "sync after reset no" and "locked no" at "local time zone" of the "Time and Date" page.

Help: Check real–time reference. If "locked yes" at **external reference** is indicated at the **Time and Date** page of the status monitor of the 3G–Video module, the problem can be solved forcing an update of the real–time clock: click button **Update Now!** at the **Reference** configuration page of the 3G–Video module, or press (proper configured) function keys to switch to FREE mode and then back to REAL–TIME mode.

Check the set–up at the **Reference** configuration page of the 3G–Video module and compare it with the recommended set–up.

3.2.9 System: Name, Log File, and Ethernet Status



Name The device can get a name. Enter a text with 20 characters at maximum. Click button **Save To Module** to store this entry. This name appears wherever TCC70XS devices can be found within the local network, this helps you to identify this special device.

Logfile

Get System Logfile The Ethernet module creates a log file for service purposes. Click on **/public/system.log** to open this file.

Log Traps If clicked, traps will produce entries in the log file.
Basically, all integrated modules can send a trap. Please remember that you can enable/disable traps for each module via checkboxes at the **System** configuration page.

Log Events If clicked, events will produce entries in the log file.
Events will be sent mainly in case of errors or warnings.

Remote Log You can enter an IP address to which every entry can be sent. The **Syslog** protocol is used. The **Facility** number is used as follows:

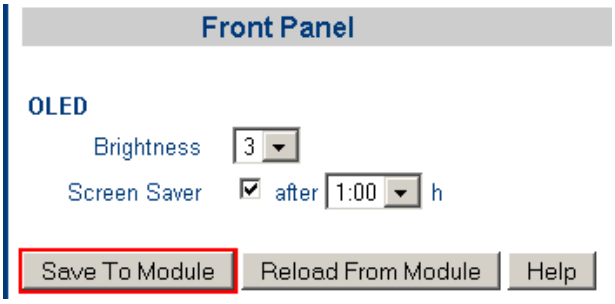
0 message from the Ethernet module
1 traps
2 events

Ethernet Shows the current IP parameters of the RUB Ethernet module.

DNS Server 1
DNS Server 2
The IP addresses of up to two DNS servers can be configured. Then the "Syslog" server as well as the NTP client's hosts can be configured as DNS names rather than IP addresses.

Status Monitor Device The IP address of a running status monitor is shown. If the status monitor doesn't start, complaining that it's running at another place, then you should check the PC with this IP address if there is another instance of the status monitor running.

3.2.10 nfiguration Page “Front Panel”: Brightness and Screen Saver



Brightness Steps 1 to 7 to adjust the brightness of the OLED display. Because the lifespan depends on the brightness, it is recommended to choose the brightness just suitable, not too bright.

Screen Saver A screen saver has been implemented to increase the lifespan of the OLED display. The screen saver moves a text across the whole display.

If this checkbox is checked, the screen saver program starts when no function key has been pressed for the programmed time delay.

Time delay: 0:05 / 0:15 / 0:30 / 1:00 / 2:00 / 4:00 hours.

To turn off the screen saver press any function key. This key press will not execute any other function.

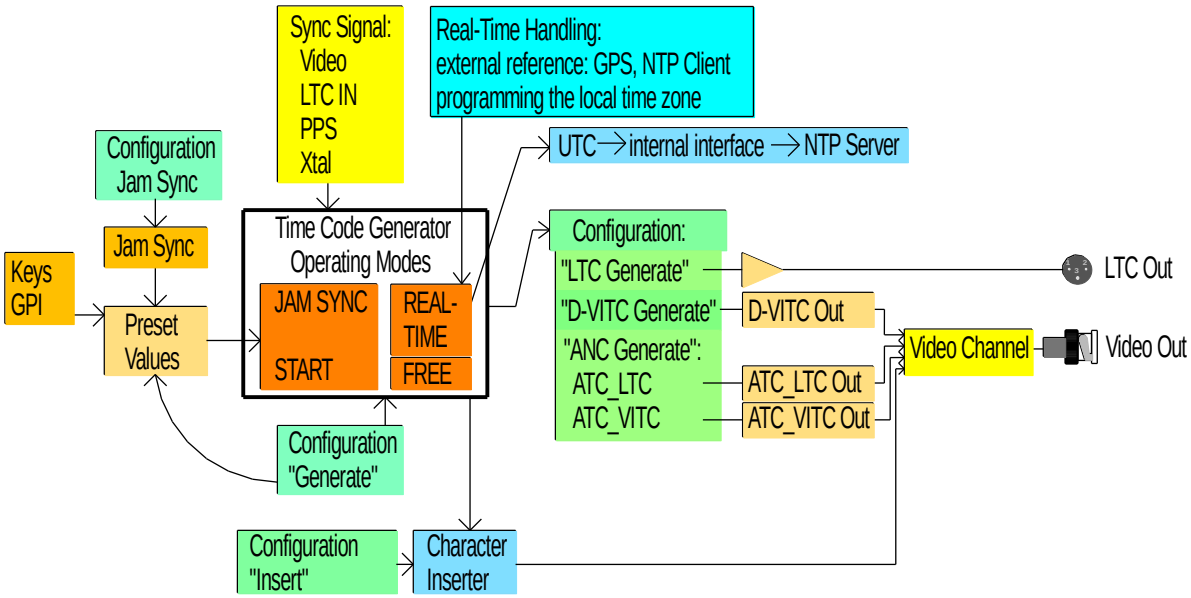
Note:

Previous TCC70XS models have a separate **Front** module to configure brightness and screen saver. To access it click to **Front** in the vertical menu on the left and then to **Front Panel** in the horizontal menu above.

4 The 3G–Video Module: Video and Time Code

4.1 Overview of Standard Features

4.1.1 Standard Features of the Time Code Generator

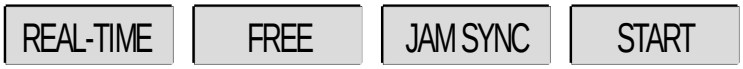


The time code generator outputs the time addresses and the user data in various time code formats: as **LTC**, as **D-VITC**, as ancillary data packets of type **ATC_LTC** and/or **ATC_VITC**. The data of the generator can be visibly inserted in video windows.

The following methods of operating are provided for the time code generator:

- **REAL–TIME**: Using a real–time reference, the time information of the generated time code corresponds to a local time zone. The user data may transport the date.
- **FREE**: The time code generator counts the time continuously without any time jumps. This is an additional service for the real–time feature helping to shift a legal time jump in the time code.
- **JAM SYNC**: The time code generator accepts data from the time code reader.
- **START**: Preset values can be entered from which the time code generator starts to count. A start–stop operation is possible: START/STOP via GPIO or function key.

The operating modes can be switched by a programmed function key, or a programmed GPIO, or clicking a button at the "Generate" page of a configuration tool:

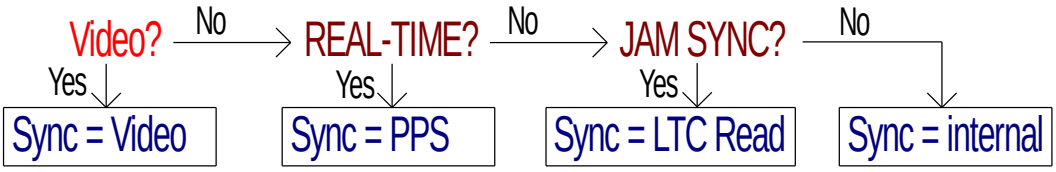


Overview of further basic features of the time code generator:

Frame rate	Selectable: 24, 25, 30, 30 Drop.
Genlock mode	Selectable: Internal, video, LTC read, second pulse (PPS).
Preset value for the time or the user data	Settable: manually via a programmed function or GPIO or via a configuration tool or utilizing the Jam Sync function.
LTC output level	Adjustable.
ATC/D-VITC lines	Selectable.
ATC time code	ATC_LTC, ATC_VITC – can individually be enabled/disabled.
Jam Sync application	Various methods → chapter "The JAM SYNC Method of Operation".
Video window	Time and user data can be visibly displayed. Various formats are selectable, as well as size, position ...

Frequency and phase synchronization

The counting of the time code frames depends on the clock derived from the sync signal. It is strongly recommended to connect an SD/HD/3G video signal if time code will be used in a video application. Without video, the sync signal should be *PPS* in REAL–TIME mode and *LTC Read* in JAM SYNC mode, respectively.



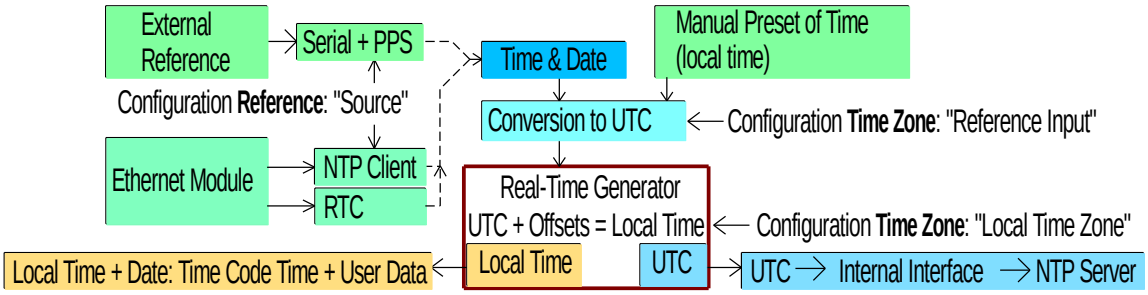
TCC70XS offers status feedback at the OLED screen via four independent programmable status segments. The **Gen Sync Status** function for a status segment indicates the status of the phase and frequency synchronization of the time code generator, depending on the mode of sync selection:

"Sync" selection at "Generate"	Status segment in the "Gen Sync Status" function
Sync = Internal	Segment is permanently off.
Sync = Video	Segment lights up during video lock. Segment flashes slowly during the fine trim procedure. Segment flashes fast if video synchronization is lost.
Sync = LTC Read	Segment lights up during source lock (LTC signal at LTC_IN_A, LTC_IN_B). Segment flashes slowly during the fine trim procedure. Segment flashes fast if LTC synchronization is lost.
Sync = Second Pulse	Segment lights up during lock to the external PPS (signal input at GPIO_1). Segment flashes slowly during the fine trim procedure. Segment flashes fast if PPS synchronization is lost.

4.1.2 The REAL–TIME Mode of the Time Code Generator

4.1.2.1 The Principle

Switching on the REAL–TIME method of operating can be done utilizing a function key or GPIO assigned with the "Operating Mode Real–Time" function or clicking button REAL–TIME at the "Generate" configuration page.



TCC70XS expects time & date from a real–time reference. You can select between two real–time sources at the "Reference" page of a configuration tool:

- External GPS or DCF77 receiver. This type of external real–time reference has to deliver the following signals:
  - PPS: pulse per second, TTL, connect to pin 1 of REF/GPI.
  - TXD: serial data string, time & date, RS232, transmission once per second, connect to pin 2 of REF/GPI.
- The *NTP client* function of TCC70XS. The real–time reference will be an NTP server which you select via an IP address.

The time information of the real–time reference is converted to **UTC**. The **local time** is calculated from UTC ± programmable offsets. The complete set–up is done at the "**Reference**" and "**Time Zone**" pages utilizing one of the configuration tools.

The time of the time code output corresponds to the **local time zone**. The local time may have DST (Daylight Saving Time) and may then switch automatically.

Usage of the user data can be programmed independently, but usually the user data transport the date. There are many formats of the date available – please refer to chapter "Generate: Basic Set–Up of the Generator".

This method of operating sets the "Binary Group Flags" of the time code according to SMPTE 12M–1–2008: BGF2/1/0 = 0/1/0. This combination specifies that the time addresses have been synchronized to a real–time reference. Setting these flags can be disabled (see chapter "Generate: Basic Set–Up the Generator").

Time jumps in the time code can occur:

- periodically by updating with the real–time reference – this can be avoided according to the description at chapter "Time Code and Video Locked to a Real–Time Reference";
- by a DST switching;
- by a leap second event;
- by setting the time manually using the "Set Real–Time" function at the "Generate" page.

4.1.2.2 Handling of a Leap Second

UTC is the worldwide real–time reference. Occasionally, UTC will be corrected introducing a leap second. It is not possible to predict a leap second; the leap second is determined by the IERS (International Earth Rotation and Reference Systems Service) and will be announced at the Bulletin C. Basically, it could be a positive or negative adjustment of the UTC time scale, but – up to now – one second has been added always. UTC forms the time base of all local time zones. If UTC time jumps, the time of a local time zone will jump same way.

How does a leap second affect the time of the output signals?

1. If the time of the real–time reference jumps, the time of the output signals will jump at the very moment when TCC70XS updates its time code generator with time & date of the real–time reference. This update occurs periodically according to set–up, normally once a day at a user selectable hour (please refer to "Mode of Local Time Zone Synchronisation" at chapter "Reference: Real–Time Clock Adjustment").
2. If the data of the real–time reference announces a leap second, TCC70XS will be able to execute the time jump simultaneously with the real–time reference if one of the following conditions applies:

   A: Checkbox "After Leap Second of Reference Input" is checked.

   B: The periodic update has been set to "Every second".

   Please refer to chapter "Reference: Real–Time Clock Adjustment".

   In these cases, TCC70XS is able to calculate the leap second in advance. The minute will then receive an additional 60th second.

   The sequence of the generated real–time signals (time, date [day/month/year]) then will be for example:

Local time zone = UTC	Local time zone = UTC + one hour	Local time zone = UTC – 01:30
23:59:58, 31/12/05	00:59:58, 01/01/06	22:29:58, 31/12/05
23:59:59, 31/12/05	00:59:59, 01/01/06	22:29:59, 31/12/05
23:59:60, 31/12/05	00:59:60, 01/01/06	22:29:60, 31/12/05
00:00:00, 01/01/06	01:00:00, 01/01/06	22:30:00, 31/12/05
…	…	…

Note: The moment of a time jump because of a leap second can be shifted to a user defined moment, if the operating mode is switched to FREE before the time jump event (please notice section "The FREE Mode of the Time Code Generator").

4.1.2.3 Handling of a DST Switching

A Daylight-Saving Time (DST) switching of the output signals occurs automatically under the following conditions:

1. The automatic mode has been selected:
   "Local Time Zone = Auto + Reference Check" at "Time Zone and DST–Mode", please refer to chapter "Reference: Real–Time Clock Adjustment".
   Likewise, start and end of DST must have been adjusted correctly, please refer to chapter "Time Zone: Time Zone Adjustment".

   This DST switching only occurs at a full hour of local time. An announcement is set one hour prior to switching; this status is contained in the time code if "User Mode = Date + Status" has been selected.

   This DST switching affects signal outputs according to the example below.

2. The local time zone follows the time zone of the real–time reference. Adjustment:
   "Local Time Zone = Same as Reference Input" at "Time Zone and DST–Mode", please refer to chapter "Reference: Real–Time Clock Adjustment".
   The real–time reference must transmit a time zone with DST switching.

   If the time of the real–time reference jumps, the time of the output signals will jump at the very moment when the time code generator performs an update with time & date of the real–time reference. This update occurs periodically according to configuration, normally once a day at a user selectable hour (please refer to "Mode of Local Time Zone Synchronisation" at chapter "Reference: Real–Time Clock Adjustment")

   If the data of the real–time reference announces a DST switching,TCC70XS will be able to execute the time jump simultaneously with the real–time reference if one of the following conditions applies:

   A: Checkbox "After DST Switching of Reference Input" is checked.

   B: The periodic update has been set to "Every second".

   Please refer to chapter "Reference: Real–Time Clock Adjustment".

   This DST switching affects signal outputs according to the example below.

If TCC70XS does the DST switching of the local time zone automatically, the sequence of the generated real–time signals (time, date [day/month/year]) then will be for example:

Start of DST	End of DST
01:59:58, 28/03/04 01:59:59, 28/03/04 03:00:00, 28/03/04 03:00:01, 28/03/04 …	02:59:58, 31/10/04 02:59:59, 31/10/04 02:00:00, 31/10/04 02:00:01, 31/10/04 …

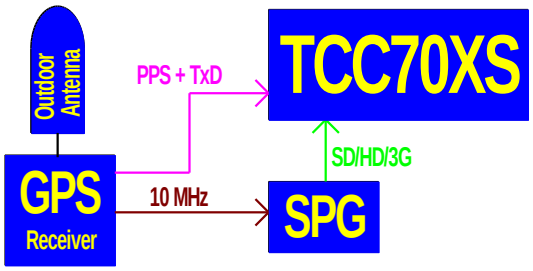
<u>Note:</u> The moment of a time jump because of a DST switching can be shifted to a user defined moment, if the operating mode is switched to FREE before the time jump event (please notice section "The FREE Mode of the Time Code Generator").

4.1.2.4 Time Code and Video Locked to a Real–Time Reference

If you are working with time code and video, the time code has to be locked to the video signal. If the time code should transport the local time precisely, the time code generator receives time & date from a real–time reference.

The video sync generator (SPG) has to be locked to the real–time reference in order to avoid time jumps in the time code. If there is not such a lock mechanism installed, the SPG drifts against the real–time and the time code drifts the same amount – because it is locked to the video. After a certain time, the drift amounts to a whole frame and during the next update with the real–time reference a time jump will occur.

The following installation avoids time jumps in a 625/50 (PAL) television system:



A high–quality GPS receiver outputs a 10 MHz signal which synchronizes the SPG. TCC70XS receives time & date as well as PPS from the GPS receiver, but the internal phase and frequency synchronization locks to the connected video signal. All units are locked, no illegal time jump will occur.

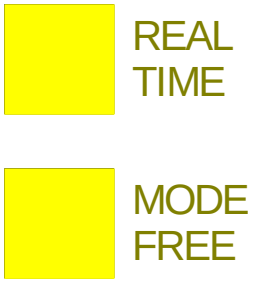
4.1.3 The FREE Mode of the Time Code Generator

Switching on the FREE method of operating can be done utilizing a function key or GPIO assigned with the **Operating Mode Free** function or clicking button **FREE** at the **Generate** page of the configuration tool.

The FREE method of operating has been provided to add a feature to the REAL–TIME mode. With FREE it is possible to shift a legal time jump in the time code according to a DST switching or a leap second to a user defined moment.

During REAL–TIME mode these time jumps occur automatically. There may be other devices in the system depending on a continuous time code. With just one press to a button you can avoid this time jump and allow it later at a suitable moment:

- Switch from REAL–TIME to FREE before the time jump event – the time code counts continuously without any frame discontinuity.
- Switch from FREE to REAL–TIME after the time jump event at a suitable moment. This forces the time code to update with the real–time reference, now the time code transports the precise local time again.



Switching between REAL–TIME and FREE becomes very easy if you program two of the function keys appropriately.

The lamps of the keys give a feedback about the currently selected operating mode.

4.1.4 The START Mode of the Time Code Generator

Switching on the START method of operating can be done utilizing a function key or GPIO assigned with the **Operating Mode Start** function, or clicking button **START** at the **Generate** page of the configuration tool.

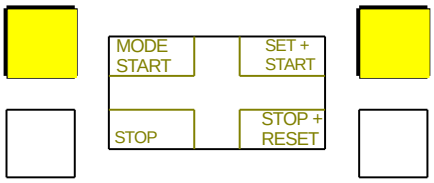
The time addresses of the time code are determined by a free–running counter. If TCC70XS powers up with this operating mode, the generator starts with the value which has last been entered at **Generator Set Time** of the **Generate** page of the configuration tool.

The time information of the time code can be manipulated as follows:

- Each time the START mode will be initiated (by a function key or GPIO or button START), the time will be set to the value which has last been entered at **Generator Set Time**.
- A click to button **Set Time** of the **Generate** page sets the time to the value which has last been entered here.
- The generator can further be manipulated by programming a function key or GPIO:

"Generator Set + Start"	Time updates to the last preset value; generator starts.
"Generator Set"	Time updates to the last preset value.
"Generator Reset + Start"	Time resets to 00:00:00:00; generator starts.
"Generator Reset"	Time resets to 00:00:00:00.
"Generator Start"	Generator starts.
"Generator Stop"	Generator stops.

A suitable programming of the function keys enables a quick operation; additionally, the lamps will give you a feedback. Example:



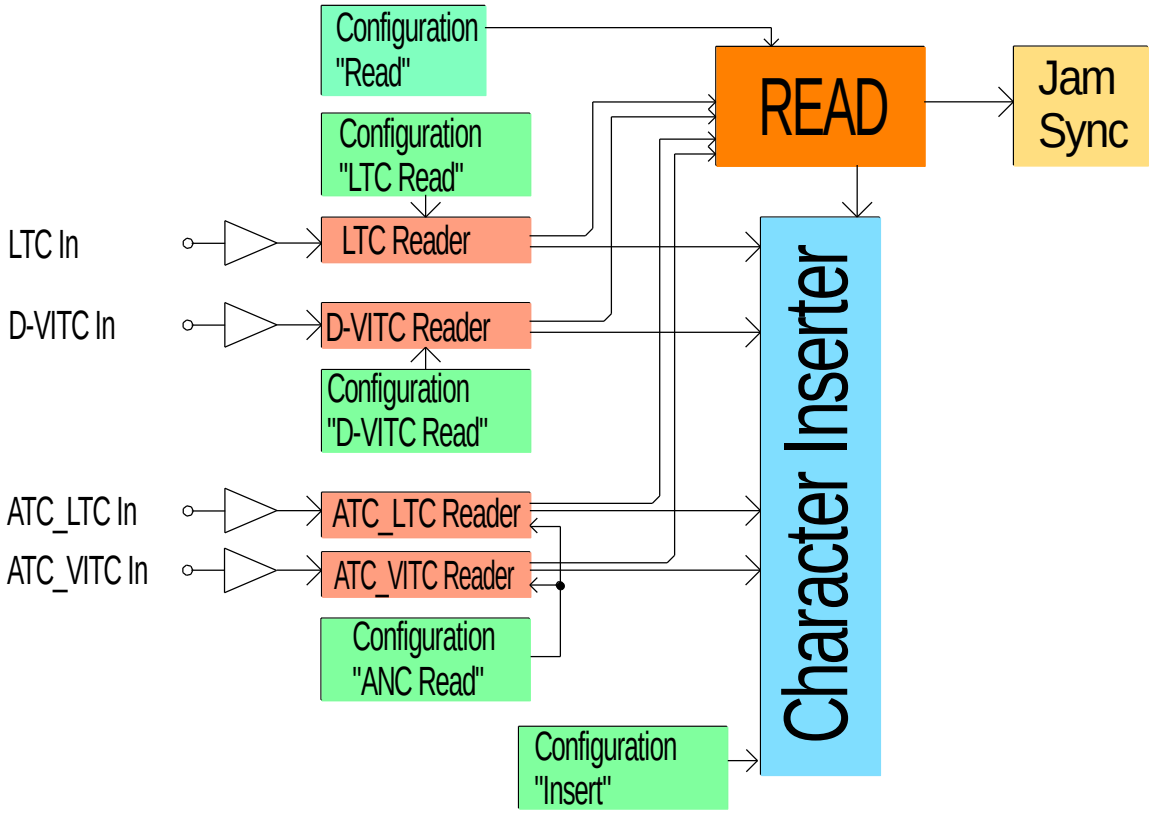
F1 = Operating Mode Start.
Lamp lights up as long as the START method of operating has been selected.
Each press sets the time to the value which has last been entered at **Generator Set Time**.

F2 = STOP.
Lamp lights up if generator stops.
Each press stops the generator.

F3 = SET + START.
Lamp lights up if generator counts upwards.
Each press sets the time to the value which has last been entered at **Generator Set Time** and starts the generator.

F4 = STOP + RESET.
Lamp lights up if generator stops.
Each press stops the generator and resets the time to 00:00:00:00.

4.1.5 Standard Features of the Time Code Reader



Each time code format has its own time code reader. Each reader is able to visibly insert the data in a video window. Each reader can – with selectable priority – transfer the data to the "general reader" (Read). The following functions are only available for the "general reader":

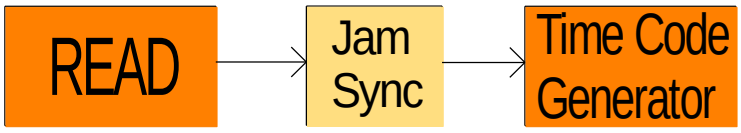
- Jam Sync, i.e. the data transfer of the reader data to the time code generator.
- Decoding the MTD data of the Plura Timer System.
- Decoding a date.

Overview of the basic features:

Frame rate	Selectable: 24, 25, 30, 30 Drop, automatic.
ATC/D-VITC/LTC priority	Selectable.
ATC/D-VITC lines	Selectable.
D-VITC threshold	Settable or automatic.
Decoding MTD data	Selectable for one-time code source.
Decoding a date	Various formats selectable.

4.1.6 The JAM SYNC Method of Operation

The **JAM SYNC** method of operation transfers time code of the "general reader" to the time code generator. Examples of application are all the different time code converter functions, as there are LTC–to–LTC converter, LTC–to–ATC converter, ATC–to–LTC converter etc.



This method of operating can be switched on utilizing a function key or GPIO assigned with the **Operating Mode Jam Sync** function or clicking button **JAM SYNC** at the **Generate** page of the configuration tool.

Overview of the basic features:

Which data should be transferred to the time code generator?	Selectable: – time addresses only, – user data only, – time and user data, – transfer time to user data (cross jam sync), – transfer user data to time addresses.
What should the time code generator do if no time code can be read?	Selectable: – continuous mode (unlimited flying wheel), – generator stops after a programmed number of frames (programmable flying wheel), – "single jam" method: after the time code generator has received data from the reader the JAM SYNC mode will be switched to START mode automatically and the generator keeps on counting.
Is it possible to add or subtract a time offset?	Yes, it is possible to program a "hours:minutes:seconds:frames" offset.

Please refer to chapter **"Jam: The Jam Sync Methods"** for details of configuration.

TCC70XS offers programmable elements which can be used for a status feedback: status segments at the OLED screen, function keys with a lamp, and GPIOs. An element can receive the **Jam** function to give a feedback of the Jam Sync operating mode (for configuration please refer to chapter "Keys: Keys and Lamps, Status and GPIOs").

Feedback: lamp or GPIO or status segment	Status of the "Jam" Function
Lights up	The generator accepts the reader data during a continuous Jam Sync.
Flashes slowly	No time code can be read during a continuous Jam Sync.
Flashes fast	"Single Jam" currently is active.
Off	Jam Sync is switched off.

The **JAM SYNC** method of operation offers several variants. The detailed description of these variants is given here. Except for the "Single Jam" all methods will be selected out of the "Mode" drop–down list.

Single Jam

This method will switch from JAM SYNC to START mode automatically as soon as the time code generator has once received data from the reader. If – according to the set–up at "Values" – a time transfer has been selected, the time addresses of the generator will be set by the time addresses of the read time code only once; after that the time will be counted continuously. If TCC70XS has been switched off, the "Single Jam" method will be cleared.

Single Jam can be activated by a click on a button at the configuration tool, or by a programmed function key or a programmed GPIO.

Continuous

Continuous Jam Sync. This method swaps the generator to a free–running mode if there is no time code input (unlimited flying wheel).

Cont. 1Frame

Jam Sync with one–frame drop–out compensation. This method forces the generator to stop if there is no time code input for more than one frame and if a transfer of time data has been selected.

Cont. Wheel

Jam Sync with programmed drop–out compensation. This method forces the generator to stop if there are no time code input for more than a programmed number of frames and if a transfer of time data has been selected.

Start

This method operates similar to "Single Jam". There will be one transfer only, but unlike "Single Jam" this method keeps the JAM SYNC mode, so every time TCC70XS powers up a single transfer occurs. The transfer in this method waits until the generator reaches the **Genlock**, i.e. after power–on the generator has to lock to the selected source signal, after that the data from the read time code will be transferred to the generator.

Convert

Basically, the Jam Sync method checks the read time code on plausibility and ascending continuous order of the time before a transfer to the generator can take place. But the "converter" method accepts every read value including standing or even non–continuous values. This method transfers directly and exactly each frame from reader to generator. If no time code is read, the generator stops.

A time code, which is badly readable or incomplete, will pass these disturbances to the time code output.

Example for this application: ATC–to–LTC or D-VITC–to–LTC converter. Even the time code of a frozen (still) image or during a single step motion is directly transferred to the generated LTC.

Diff Cont. and **Diff Stop**

Although the read time values will be checked for plausibility and ascending order, it cannot be prevented in all cases that there are frame jumps in the generated time code. For example, now and then a frame jump occurs if read time code and generated time code are not synchronized to each other. Nevertheless, selecting either the **Diff Cont.** or **Diff Stop** method a clean regeneration can be achieved.

This method allows a time transfer only for up–counting read values. A “reverse” or “still” time code will be ignored. However, the generator takes the read time values only if the time difference between reader and generator time exceeds an adjustable threshold. The “Diff Cont.” and the “Diff Stop” methods differ in case no reader values are present: with “Diff Cont.” the generator continues to count the time on its own (continuous Jam Sync without flywheel option), with “Diff Stop” the generator stops counting after a programmed number of frames (programmable flying wheel).

This method sets the generator time equal to the read time at the beginning – for example with the start of a video tape. Later dropouts or phase shifting will not lead to a discontinuous time code output. Each time a difference of ≥ threshold occurs, for example after stopping and restarting the tape, the generator is automatically locked to this new read time code.

This method takes the value of the flywheel (“Wheel”) as threshold for the difference. The allowed range of values is 2–20 frames. If the current value does not lie within this range the threshold will automatically be set to 4 frames.

Please notice the following remarks concerning this method and the setting of the threshold:

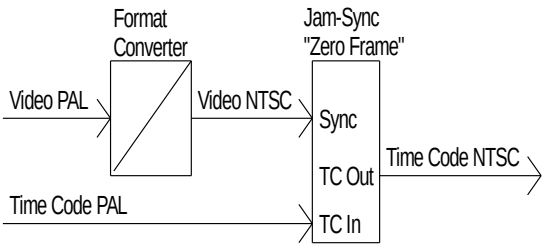
If a time difference greater than the threshold has been detected, the generator accepts the reader values for the next two seconds to get in sync. During this period the incoming time code should stabilize (for example a recorder should reach the normal play speed). If during this period no synchronization has been reached, the generated values compared to the incoming time code now can have any difference up to the threshold value.

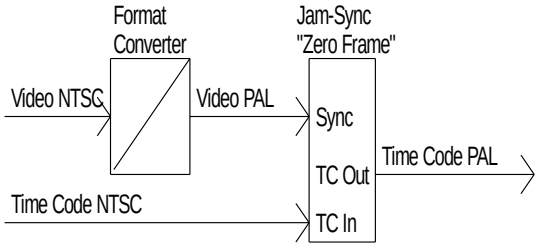
If there is no synchronization between the incoming time code and the generated time code, a continuous drift against each other will take place and a time difference will built up. If the difference exceeds the threshold, a "hard" correction takes place. With the "Continuous" Jam Sync function you would have a one frame jump quiet often in this case, with the "Diff" Jam Sync function you would have a jump of the size of the threshold rarely. However, the more briefly you choose the production time, the more highly the probability for an error free re–generation, because the difference will not reach the threshold.

Zero Frame

With this method, the generator accepts the reader values only if the frame count of the reader values equals to 00. Even if there are different frame rates of reader and generator time code, both time codes will be aligned exactly at the start of each second.

This method should be selected for a frame rate conversion. In case of a video format conversion (e.g. PAL to NTSC or vice versa) the original time code should be connected to the time code input and the converted video should be connected to the video input of TCC70XS. Thus, the converted time code will be synchronised to the converted video.





4.1.7 Standard Features of the Video Channel

Video channel	• 8–bit, 10–bit • Bypass • ATC/D-VITC lines insert enabled/disabled • Character insert enabled/disabled

Supported SD Video Standards

Video Format	Scanning Format	Standard	Frame rate, Hz
525/59.94	2:1 Interlace	SMPTE 125M	30/1.001
625/50	2:1 Interlace	ITU–R BT.601	25

Supported HD Video Standards

Video Format	Scanning Format	Standard	Frame rate, Hz
1280 x 720p/60	1:1 Progressive	SMPTE 296M	60
1280 x 720p/59.94	1:1 Progressive	SMPTE 296M	60/1.001
1280 x 720p/50	1:1 Progressive	SMPTE 296M	50
1280 x 720p/30	1:1 Progressive	SMPTE 296M	30
1280 x 720p/29.97	1:1 Progressive	SMPTE 296M	30/1.001
1280 x 720p/25	1:1 Progressive	SMPTE 296M	25
1280 x 720p/24	1:1 Progressive	SMPTE 296M	24
1280 x 720p/23.98	1:1 Progressive	SMPTE 296M	24/1.001
1920 x 1080i/60	2:1 Interlace	SMPTE 274M	30
1920 x 1080i/59.94	2:1 Interlace	SMPTE 274M	30/1.001
1920 x 1080psf/30	Progressive segmented	SMPTE 274M	30
1920 x 1080psf/29.97	Progressive segmented	SMPTE 274M	30/1.001
1920 x 1080p/60	1:1 Progressive	SMPTE 274M	60
1920 x 1080p/50	1:1 Progressive	SMPTE 274M	50
1920 x 1080p/30	1:1 Progressive	SMPTE 274M	30
1920 x 1080p/29.97	1:1 Progressive	SMPTE 274M	30/1.001
1920 x 1080i/50	2:1 Interlace	SMPTE 274M	25
1920 x 1080psf/25	Progressive segmented	SMPTE 274M	25
1920 x 1080p/25	1:1 Progressive	SMPTE 274M	25
1920 x 1080p/24	1:1 Progressive	SMPTE 274M	24
1920 x 1080p/23.98	1:1 Progressive	SMPTE 274M	24/1.001
1920 x 1080psf/24	Progressive segmented	SMPTE 274M	24
1920 x 1080psf/23.98	Progressive segmented	SMPTE 274M	24/1.001
1920 x 1035i/60	2:1 Interlace	SMPTE 260M	30
1920 x 1035i/59.94	2:1 Interlace	SMPTE 260M	30/1.001

4.1.8 Standard Features of the Character Inserter

Character inserter	• Seven video windows selectable (time code or text) • Colour selectable • Position selectable • Size selectable • Format selectable

Example of character insertion:

4.1.9 Other Standard Features

4 function keys with lamp	Programmable functions
4 status segments at the OLED display	Programmable functions
4 GPIOs	Programmable functions

Please refer to chapter: “Keys: Keys and Lamps, Status and GPIOs”.

8–digit LED display	Programmable display function

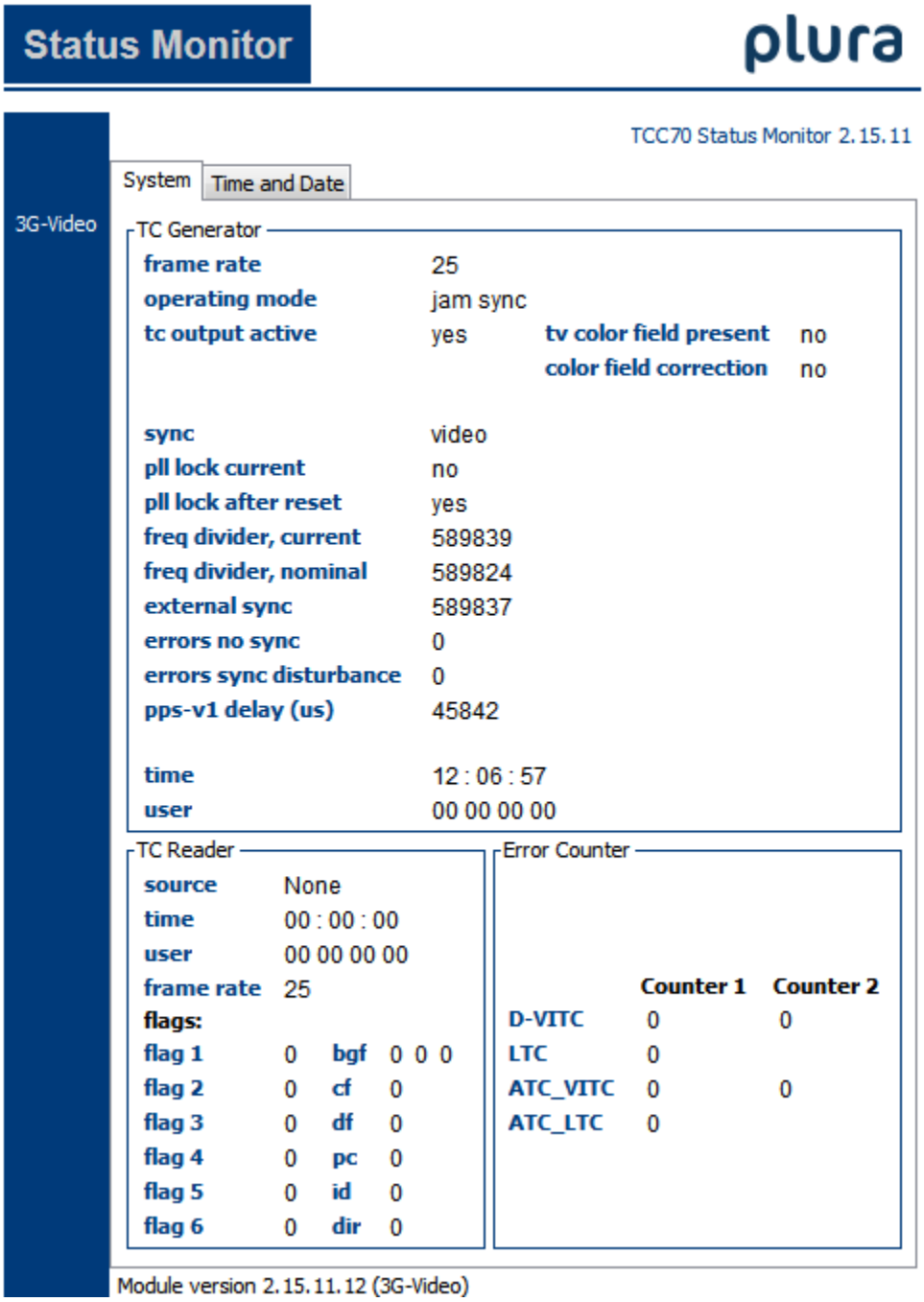
Please refer to chapter: “Display: The 8–Digit LED Display”.

A complete set–up can be stored. Assigning “Load Profile” to a function key or GPIO enables to change the current set–up during normal operation.	Seven profiles

Please refer to chapter: “Profile: Store and Load a Complete Set–Up on the Module”.

4.2 The Status Monitor

4.2.1 Status “System”



TC Generator

Current status of the time code generator and feedback about the current set–up:	
frame rate	Feedback about the current frame rate: *24 / 25 / 30 / 30 df*
operating mode	Feedback about the current operating mode: *real–time* *free* *jam sync* *start*
tc output active	= "*yes*", if the time code generator is ready to output time code of the selected formats (LTC, D-VITC, ATC). After power has turned on, all outputs will be inactive firstly. Outputs become active if the frequency and phase synchronization has been reached, and if during the REAL–TIME method of operation an update with the real–time reference was successful, but not later than 100 seconds.
sync	Feedback about the sync signal setting: *internal* *video* *ltc read* *pps*
pll lock current	= "*yes*", if the phase and frequency synchronisation is currently in a "lock" state; = "*no*" otherwise.
pll lock after reset	= "*yes*", if the phase and frequency synchronisation has reached the "lock" state once before; = "*no*" otherwise.
freq divider, current	Indicates the current tuning of the internal oscillator.
freq divider, nominal	Indicates the nominal tuning value of the internal oscillator.
external sync	Indicates the reference tuning value of the internal oscillator. This value has been gained from the connected sync signal.
errors no sync	Counter of failures of the connected sync signal, 0–9999.
errors sync disturbances	Counter of disturbances of the connected sync signal, 0–9999. Both counters reset to zero changing the operating mode of the time code generator or changing the selection of the sync signal.
pps–v1 delay (us)	The difference between PPS and video signal is measured. This enables to verify that the video sync generator (SPG) is locked to a real–time reference in a 625/50 (PAL) television system. With a constant difference the video signal has no drift against the real–time. With difference equal or near 0 even the video phase is aligned with the PPS signal.
time	The currently generated time, HH:M:SS. This time display should not be used for a precise comparison of time, because this display may be delayed up to two seconds due to internal data transfer.
user	The currently generated user data.

TC Reader

Current status of the "general" reader (**Read**):

source Feedback about that special time code reader which currently transfers data to the "general" reader: *ATC_VITC / ATC_LTC / D-VITC / LTC*

time Current time information of the "general" reader. This time display should not be used for a precise comparison of time, because this display may be delayed up to two seconds due to internal data transfer.

user Current user data of the "general" reader.

frame rate Current frame rate of the "general" reader.

flags: The six flag bits are indicated which are included in each time code word. The meaning of each bit depends on the type of time code (LTC or VITC) as well as on the frame rate. The relationship is as follows:

Bit No			Frame Rate		
VITC	LTC		30, 30 df	25	24
14	10	Flag 1	Drop (**df**)	–	–
15	11	Flag 2	Colour Frame (**cf**)	Colour Frame (**cf**)	–
35	27	Flag 3	VITC: Field (**ff**) LTC: Polarity (**pc**)	BGF 0	VITC: Field (**ff**) LTC: Polarity (**pc**)
55	43	Flag 4	BGF 0	BGF 2	BGF 0
74	58	Flag 5	BGF 1	BGF 1	BGF 1
75	59	Flag 6	BGF 2	VITC: Field (**ff**) LTC: Polarity (**pc**)	BGF 2

The value of each flag is directly shown as read from the time code word (*flags 1 – 6*) as well as evaluated according to its meaning (*bgf 0 – 2, cf, df, ff/pc*).

id and **dir** are flags produced from TCC70XS:

id = *1* if VITC, = *0* otherwise,
dir = *1* if LTC runs in reverse direction, = *0* otherwise.

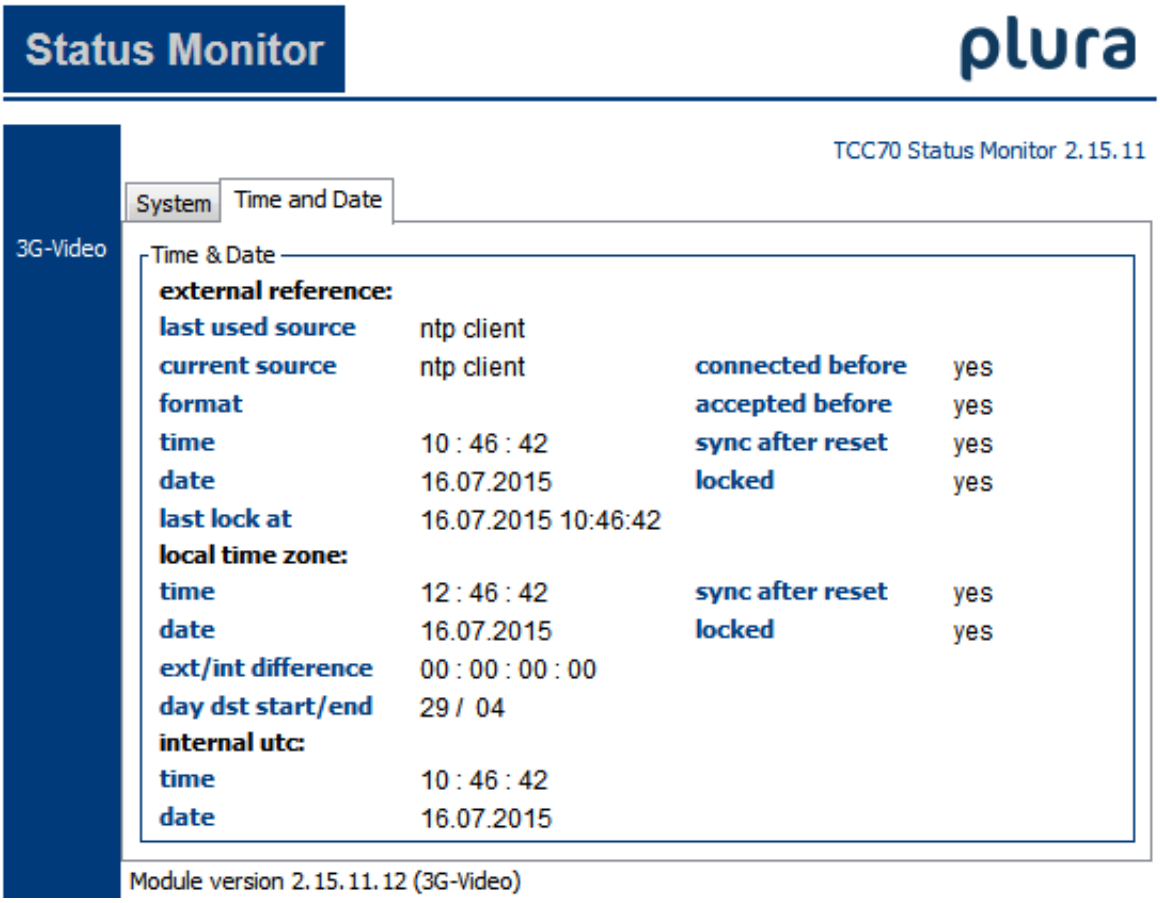
Error Counter

Error counters of the individual time code readers. Each error will increment a counter. Count range: 0 – 255. This information can be used to verify that a time code source is free from errors.

Time Code	Counter 1	Counter 2
D-VITC, ATC_VITC	Discontinuity of the VITC time addresses	Error with respect to VITC of 1st and 2nd field
LTC, ATC_LTC	Discontinuity of the LTC time addresses	

Each counter resets to zero if the corresponding time code reader will be disabled completely at the **Functions** configuration page.

4.2.2 Status "Time and Date"



Time & Date

external reference:	Status information about the selected real–time reference.
last used source	Identifies the source which has last set the internal real–time clock: *none* — internal real–time clock has not set so far *external pps + serial* — real–time reference at REF/GPI connector *ntp client* — NTP client *rtc* — buffered clock of the Ethernet module *manual* — manual setting
current source	Identifies the current used source of real–time reference: *off* — no source selected *external pps + serial* — real–time reference at REF/GPI connector *ntp client* — NTP client
format	Identifies the selected serial protocol, valid if current source shows *"external pps + serial"*.
time	Time currently received from the real–time reference.
date	Date currently received from the real–time reference.
last lock at	The moment when at last the "locked" status has been received.
connected before	= *"yes"*, as soon as data of the real–time reference has been

	received – without a check of plausibility. This status returns to "*no*" every time the REAL–TIME method of operating is switched on or the source of the real–time reference or the serial protocol has changed.
accepted before	= "*yes*", as soon as valid time & date data of the real–time reference has been received once. This status returns to "*no*" every time the REAL–TIME method of operating is switched on or the source of the real–time reference or the serial protocol has changed.
sync after reset	This status is part of the data of the real–time reference: "*yes*", as soon as the real–time reference itself has synchronised.
locked	This status is part of the data of the real–time reference: "*yes*", if the real–time reference currently is synchronised.
local time zone:	Status information about the internal real–time clock.
time	Current time of the internal real–time clock.
date	Current date of the internal real–time clock.
ext/int difference	Time difference between time of the internal real–time clock and the time of the real–time reference converted to the local time. If "*Auto + Reference Check*" or "*UTC + Reference Check*" has been selected at "Time Zone and DST Mode – Local Time Zone" at configuration page **Reference**, the time of the real–time reference will be checked. If there is a difference of one minute or more, the time will be considered as invalid and the ext/int difference calculation stops.
day dst start/end	DST switching is based on a fixed algorithm (please refer to chapter "Time Zone: Time Zone Adjustment"). The month of a switching is set by configuration; the day has to be calculated with respect to the current year. The result is displayed for control purposes. Example for year 2014: Start of DST at last Sunday of March = 30th; end of DST at last Sunday of October = 26th.
sync after reset	Status of the internal real–time clock: "*yes*", as soon as the internal real–time clock has been set after power has turned on either by the real–time reference or manually.
locked	Status of the internal real–time clock: "*yes*", if the internal real–time clock has high precision. This requires an update within the last 24 hours with time & date of the real–time reference. The real–time reference must have indicated "lock" state at that moment.
internal utc:	Status of the internal time base (calculated time zone = UTC).
time	Current time of the calculated UTC.
date	Current date of the calculated UTC.

4.2.3 Troubleshooting Regarding Real–Time Reference

Basically, there are no faults if the status monitor has no red field at its **Time and Date** page.

If the real–time of TCC70XS does not match the expected time, try to find the source of the problem following the steps below:

1. Check the real–time reference, status fields **Time & Date – external reference**

➢ Fault: the time at time has stopped.

If an external real–time reference connected to REF/GPI is used:

- current source = *external pps + serial*? If not → configuration page **Reference** (3G–Video module) → select "Reference – Source = *External PPS + Serial*".
- What is indicated at format? Does this format match the serial protocol of the real–time reference with all its parameters (baud rate, data bits, parity etc.)? Configuration page **Reference** (3G–Video module) → choose the proper format at "Reference – Format".
- connected before = "*no*"? If yes → TCC70XS never received valid data since power has turned on, because either the connection is damaged, or the external reference did not send any data (maybe an antenna is installed incorrect or a receiver is damaged).
- connected before = "*yes*" and accepted before = "*no*"? If yes → it worked before but now there is a fail. Either the connection or the external reference is damaged.

If the NTP Client function of TCC70XS is used:

- current source = *ntp client*? If not → configuration page **Reference** (3G–Video module) → select "Reference – Source = *NTP Client*".
- Verify the set–up of the NTP client functionality at the Ethernet module.

➢ Fault: the time at time counts upwards but does not correspond to UTC.

Please verify the current time of UTC. Generally, the reference delivers UTC (formerly called GMT). Configuration page **Time Zone** (3G–Video module) → all entries at "Reference Input – Offset" should be 00.

➢ Fault: locked indicates "*no*".
Additionally, sync after reset may indicate "*no*" and the time at time may be inaccurate.

Cause: The time of the reference has become inaccurate. Status last lock at indicates the last moment of a "Lock" state.

If an external real–time reference connected to REF/GPI is used: If an antenna is used, please check the installation of the antenna. Maybe the antenna or the receiver is damaged.

If the NTP Client function of TCC70XS is used: Verify set–up and status of the NTP client functionality at the Ethernet module.

2. Check the generated time (local time zone), status fields **Time & Date – local time zone** and **internal utc**

- Fault: The generated time is completely out of tune (deviation ≥ ½ hour).

  Check **internal utc**: A correct internal UTC is a pre-condition for a correct local time. The time at **internal utc** – time should correspond to the UTC; normally this time corresponds to the time of the reference. Configuration page **Time Zone** (3G–Video module) → all entries at "Reference Input – Offset" should be 00.

  Check **local time zone**: If the time at **internal utc** basically is ok, but the time at **local time zone** is wrong, then the time zone set–up may be wrong. Check the entries at "Local Time Zone" at configuration page **Time Zone** of the 3G–Video module. If the selected time zone utilizes DST, you have to select the following entry at configuration page **Reference**: **Time Zone and DST Mode – Local Time Zone** = "*Auto + Reference Check*".

  If the complete set–up is ok, but there is a deviation of ≥ 1 hour, then the reason can be a missed or incorrect DST switching. Please check the set–up of the real–time reference as well.

- Fault: The generated time is inaccurate.

  If the set–up at configuration page **Time Zone** (3G–Video module) seems to be ok, but the generated time is inaccurate and locked indicates "*no*", then last update of the internal real–time clock probably happened a long time ago.

  Configuration page **Time Zone** (3G–Video module) → check the entries at "Mode of Local Time Zone Synchronisation". This set–up determines the rhythm of an automatic update. You can force an update clicking button **Update Now!**

3. Check the method of operation of the time code generator

- Fault: Status monitor does not indicate any error at page **Time & Date**, but the generated time does not correspond to the local time zone.

  The time code generator probably is not working in the REAL–TIME mode. Verify at the **System** page of the status monitor: "TC Generator – operating mode = *real–time*"?
  If not → configuration page **Generate** (3G–Video module) → click button **Real–Time** or press an equivalent function key (lamp of this key should light up).

4.3 Configuration

4.3.1 General

A set–up of the video and time code module requires accessing this module via browser or USB. Please notice the following chapters to learn how to access the module:

Chapter "First Steps" with its subchapters:

- Browser: "Accessing TCC70XS via Browser",
- USB: "Accessing TCC70XS via USB",

and chapter "Software Tools for TCC70XS" with its subchapters:

- Browser: "Configuration by Ethernet",
- USB: "Configuration by USB".

The following description assumes that you successfully managed to access the video and time code module.

There are some differences between the configuration tools:

Configuration via Browser	Configuration via USB
Changes on a parameter will not be stored automatically. At the bottom of each page there are two buttons which should be used to transfer the parameters: Save To Module Reload From Module **Save To Module**: Click this button to store the changes on the module. **Reload From Module**: Click this button to refresh the configuration page.	Any change on a parameter will immediately be stored at the module. If you enter a number or a text press the **tabulator key** at the PC's keyboard afterwards.

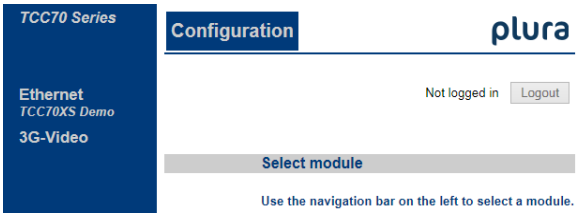
This module offers numerous functions. There belongs one configuration page to each function. Basically, there are three states for a function:

State	Example for the "LTC Generate" function
Function enabled, configuration page available.	TCC70XS generates LTC. Parameters, like LTC level, can be adjusted via the "LTC Generate" configuration page.
Function enabled, configuration page not available. This avoids any unintentional operating.	TCC70XS generates LTC. You have to activate the configuration page before you can change any parameter.
Function disabled, configuration page not available.	TCC70XS does not generate LTC.

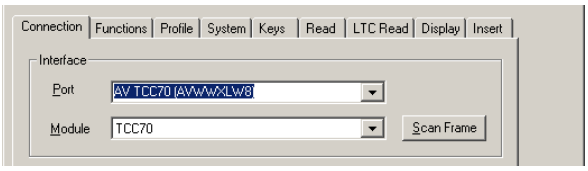
Configuration pages **Functions** and **Profile** are available always. At the **Functions** page you can adjust the states of the functions as described before. The **Profile** page enables to store and load a complete set–up.

The following examples shows that the **Functions**, **Profile**, **System**, **Keys**, **Read**, **LTC Read**, **Display**, and **Insert** pages are available. The **Functions** page allows switching on or off configuration pages.

Configuration via Browser



Configuration via USB



4.3.2 "Save to File": Store a Complete Set–Up in a File

The following reasons – for example – may be given to store the current configuration in a file on your computer:

A The current configuration should be saved.

B The configuration of should be transferred to another unit.

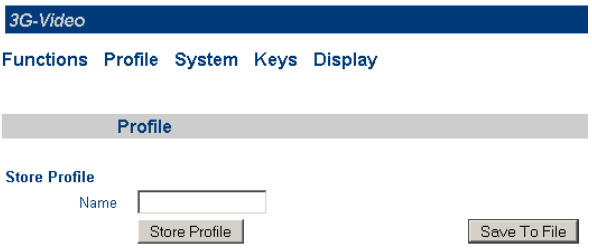
C For service purposes, the current configuration should be sent by email as an attachment.

The current set–up of the module will be stored, not any profiles saved in the flash memory of the module itself. This process will create a "**.tci**" file at the end.

Store via Browser

If you have accessed the module:

- open the **Profile** page,
- click **Save To File**.



If you were requested to confirm the storing of data, please do this. The file browser opens. Select any folder and a name for the file. The type of the file should be "**.tci**", please type this extension manually.

Store via USB

If you have accessed the module (button *Configure*):

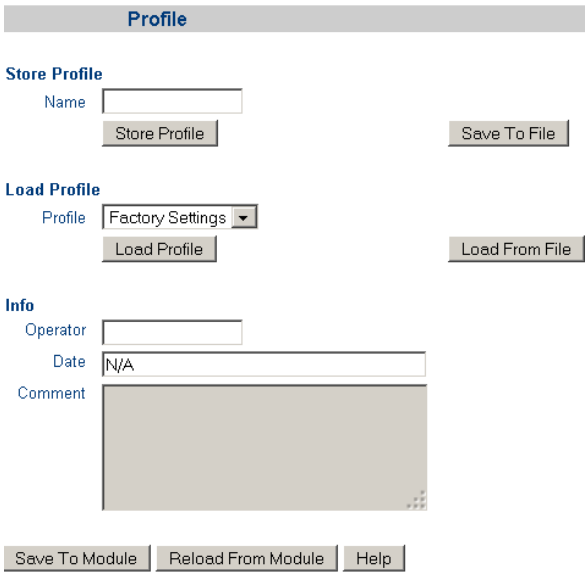
- click **Save To File** on the lower menu bar.

This opens the Windows file browser. Select any folder and a name for the file. The type of the file should be "**.tci**" (as offered as a default).

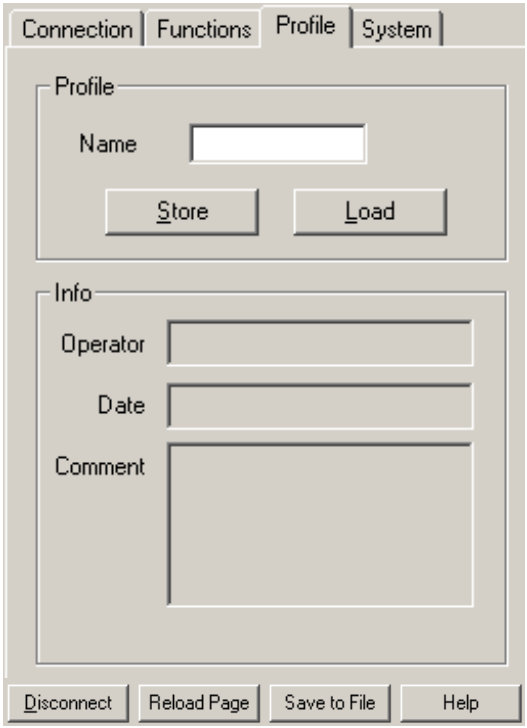
4.3.3 "Profile": Store and Load Setups

This module has a flash memory to store different setups. A complete set–up stored to the module is called a "profile". You can identify different profiles by a number or a name. You can assign the "Load Profile" function to a function key or GPIO, this enables to change the current set–up during normal operation and without using a computer.

Profile via Browser



Profile via USB



Name Optionally, you can enter a name to identify the profile.

Store Profile
Store Click this button to open the "Store Profile" window. Select a number or a name from the "Profile" drop–down list, if you want you can add more information at "Operator", "Date", and "Comment". Click "ok" to store the complete set–up to internal memory of the module.

Load Profile
Load Click this button to open the "Load Profile" window. Select a number or a name from the "Profile" drop–down list. Click "ok" to load the profile, this will replace the current set–up. This process will interrupt the operating mode of the module.

"Factory Settings" will load the default values.

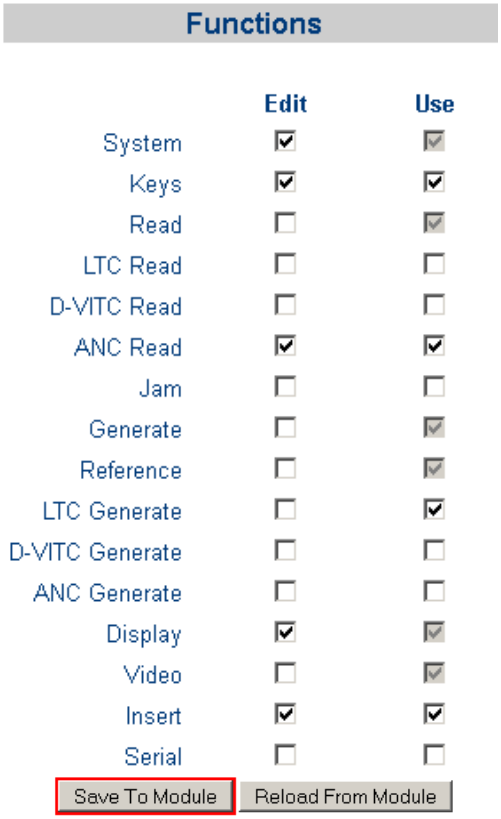
Save To File This button enables to store the current set–up in a file on your computer.

Load From File This button (respectively via USB: Select "**Load Profiles...**" from "**File"** menu) enables to load a set–up from a file.

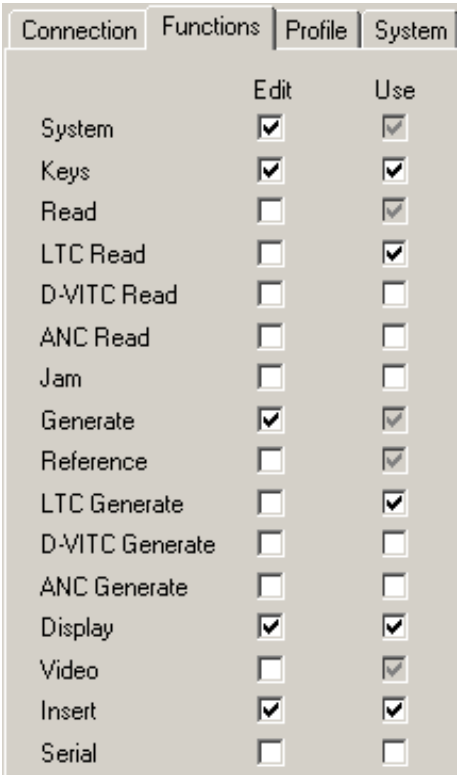
4.3.4 "Functions": Functions of the Module

The configuration page **Functions** indicates the complete range of functions. It is possible to individually switch on or off functions.

Functions via Browser



Functions via USB



The **Edit** and **Use** checkboxes define the state of a function:

Edit	Use	State of a function
		Function disabled; corresponding configuration page not available.
√	√	Function enabled; corresponding configuration page available.
	√	Function enabled; corresponding configuration page not available. This avoids any unintentional operating.

- We suggest that you uncheck **Use** of all functions you are presently not using.
- We suggest that you uncheck **Edit** of all functions you are presently not configuring. That avoids unintentional operating and malfunctions.

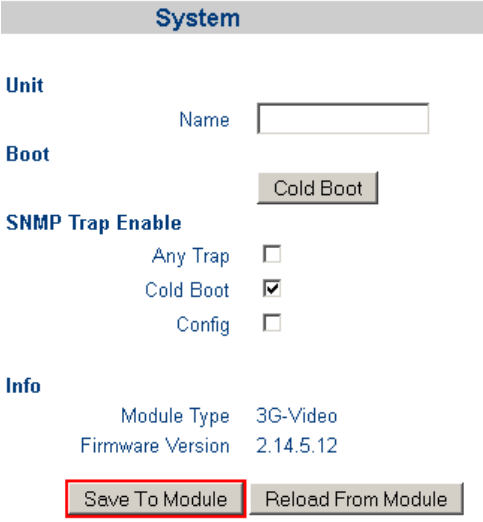
Functions **System**, **Read**, **Generate**, **Reference**, and **Video** cannot be switched off completely, i.e. the corresponding **Use** checkbox is inoperable.

Attention using the Browser:

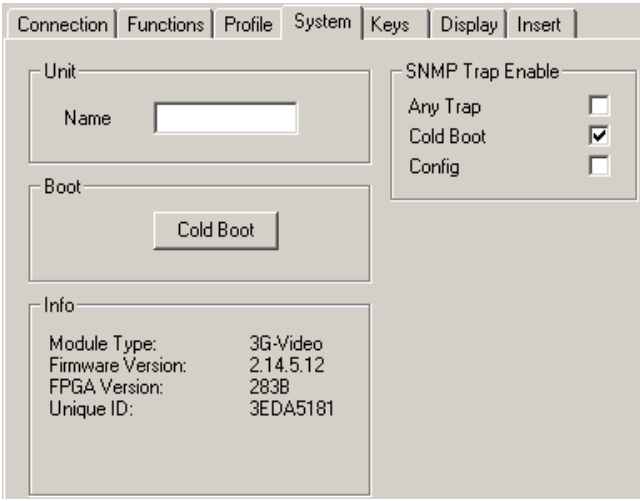
Changes on any parameter will not be transferred to the module automatically. Click "**Save To Module**" to store the changes at this configuration page to the module.

4.3.5 "System": Name, Boot, Info, SNMP

System via Browser



System via USB



Name You can assign a name to this module. Enter a text with 10 characters at maximum. This name appears wherever TCC70XS devices can be found, either via Browser or via USB.

Cold Boot Clicking this button enables a restart of the module. At first a window appears with the message that the operation of the module will stop during restart. Click **ok** to do the restart.

Info Indicates status information:

- module type,
- firmware version,
- FPGA version – via USB only,
- internal unique identification – via USB only.

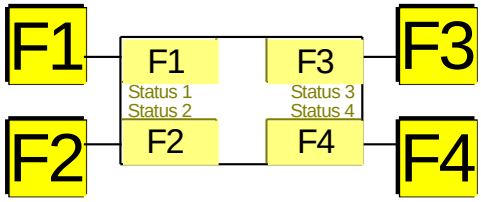
SNMP Any Trap: This checkbox switches on or off the SNMP features of this module generally. If unchecked, no SNMP traps will be generated from this module.

Cold Boot: If this and Any Trap is checked, a restart will generate a trap.

Config: If this and Any Trap is checked, starting and terminating access to this module will generate a trap.

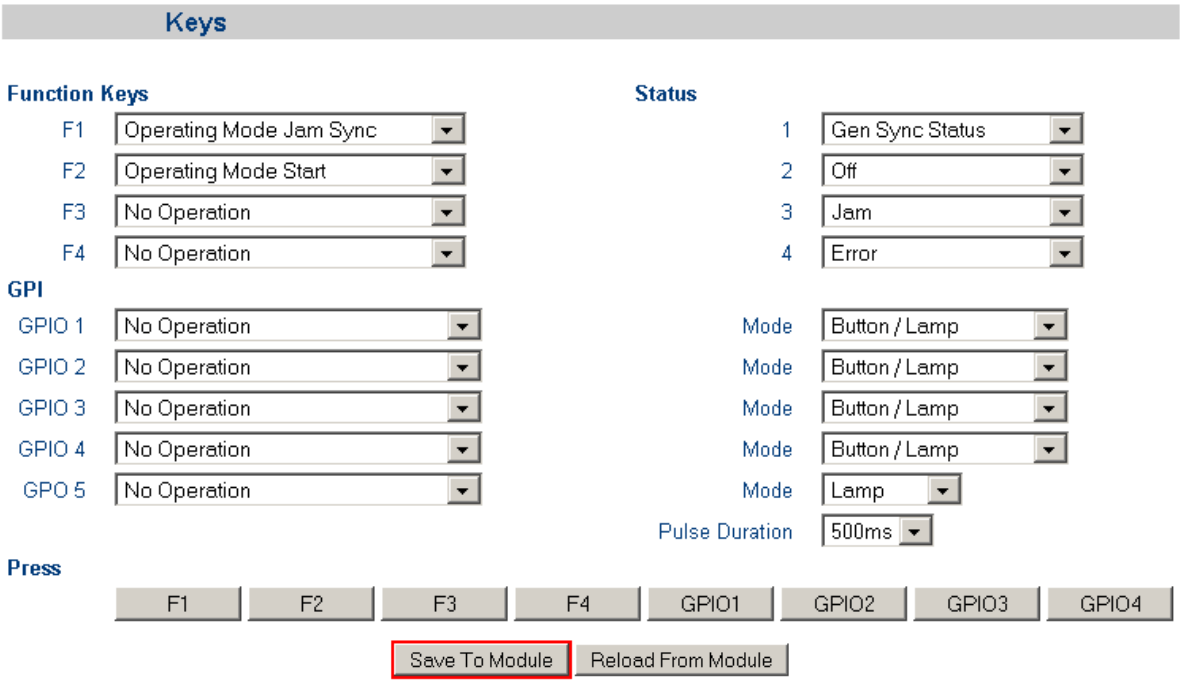
4.3.6 “Keys”: Keys and Lamps, Status and GPIOs

At the front panel, TCC70XS offers an OLED with programmable status segments and four illuminated keys. At the rear panel, there are four programmable GPIOs and one GPO relay contact. Basically, the functions of these in– and outputs are programmable.



Connector REF/GPI	Connector SERIAL (depending on configuration)
GPIO_1 GPIO_2 GPIO_3 GPIO_4	GPO_5

The configuration page **Keys** (example shows the browser view):



Press: A click of any of the buttons F1–F4 or GPIO1–GPIO4 will execute the programmed function as long as this function defines the key or GPIO as an input.

Function Keys (and Lamps)

Four keys F1, F2, F3, and F4 can get a function independently from each other. Select a function from the drop–down list. This selects the function of the lamps as well.

This drop–down list is identical to the drop–down list of GPIO functions.

Please refer to the document “RUB AT/DT/HT/XT + TCC70XS Application: GPIO Functions” for a description of all available functions. You can download it from:

https://plurainc.com/products/tcc70xs2/

GPIO

GPIO_1 to GPIO_4 can get a function independently from each other, as an input or as an output. Additionally, the switching characteristic is selectable. GPO_5 always will be an output.

Input: Edge sensitive as a push button or level sensitive as a toggle switch.

Output: Level sensitive as a lamp or a pulse with selectable pulse duration.

Select from the drop–down lists.

Please refer to the document "RUB AT/DT/HT/XT + TCC70XS Application: GPIO Functions" for a description of all available functions. You can download it from:

https://plurainc.com/products/tcc70xs2/

Restriction: If you selected an external real–time source (selection "**Source** = **Serial + PPS**" at the **Reference** configuration page), GPIO_1 and GPIO_2 will no longer be available.

Status Segments

Four status segments of the OLED can get a function independently from each other:

Off	Segment is off.
Gen Sync Status	Indicates the status of the phase and frequency synchronization of the time code generator (refer to chapter "Standard Features of the Time Code Generator").
Jam	Indicates the status of the Jam Sync operating mode (refer to chapter "The JAM SYNC Method of Operation").
Reference Input	Lights up if the unit receives and accepts signals of a real–time reference.
Reference Lock	Indicates the status of the real–time reference: o On: "Lock". o Slowly flashing: "Lock after Reset". o Off: "Unknown" or "Unlock".
Clock Free Run	Indicates the precision of the internal real–time clock: o Off: High precision. Within the last 24 hours, there was an update with a real–time reference which has been in "Lock" state. o Flashing: No precise time & date update since at least 24 hours. Either the real–time reference was not at "Lock" state during last update, or the periodic update is switched off via configuration, or no valid time & date has been received within this period. o On: Internal real–time clock has not received time & date of real–time reference yet.
Operation	Lights up during normal operating.
Signal	Lights up as long as time code can be read.
Set	Lights up as long as the USB connection (configuration or status monitor program) is active.
Error	Indicates an error.
Storing Profile	Lights up shortly after storing a profile.

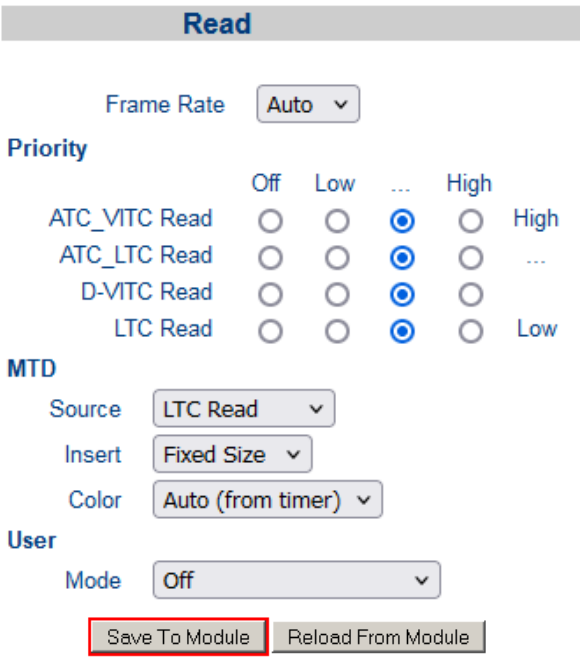
4.3.7 “Read”: Configuration of the “General Reader”

TCC70XS is equipped with time code readers for the following time code formats:

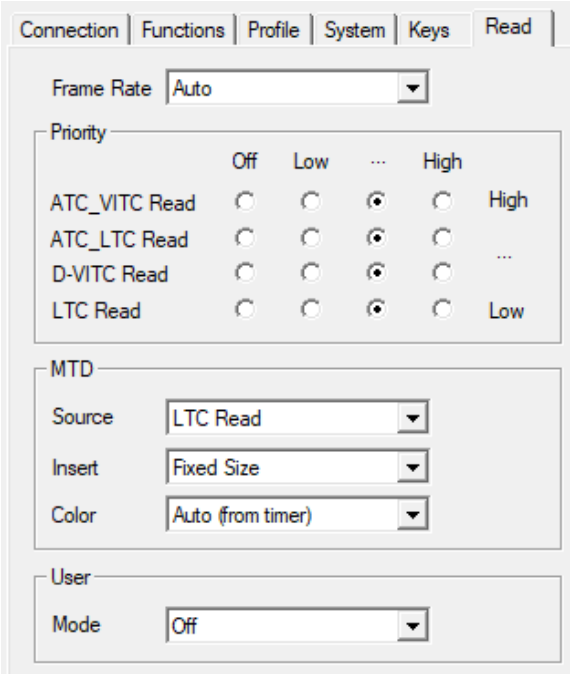
LTC
D-VITC,
ATC_LTC and ATC_VITC.

“Read” is a “general reader” which receives data from the special readers listed above. The current values of this general reader can be visibly inserted in a video window and are available for the Jam Sync function. The special readers can be individually switched off or can be assigned with a priority.

Read via Browser



Read via USB



Frame Rate

The frame rate of the “general reader” can be set automatically or fixed to a specific value. Select the appropriate function from the drop–down list. In case of **Auto,** the frame rate will be received from the special reader.

Auto	automatic
25	fixed to 25 frames (00–24) – conforming to television system 625/50 (PAL)
30	fixed to 30 frames (00–29)
30 df	fixed to 30 frames (00–29; 30/1,001 per second) including drop–frame counting – conforming to television system 525/60 (NTSC)
24	fixed to 24 frames (00–23)

Priority

The "general reader" can receive time code only from those readers which are enabled: the corresponding checkbox **Use** at configuration page **Functions** must be checked: LTC Read, D-VITC Read, ANC Read (+ enable reader at configuration page ANC Read).

Now each time code can individually be switched off or can be assigned with a priority. In case of more than one-time code the priority determines which time code will be preferred. If you assign time codes with equal priority level, a second priority rule will be applied which corresponds to the list above: the time code at the top of the list has the highest priority.

MTD

Source Visibly inserting any MTD timer in a video window requires time code user data of the MTD format. Decoding of MTD data can be done for one source only. Select the time code source from the drop–down list.

This set–up affects all MTD formats ("**Format = MTD ...**") at the **Insert** function.

Off	No decoding of MTD date
Read	Time code of the "general reader"
LTC Read	LTC time code
D-VITC Read	D-VITC time code

Insert MTD timer can have one up to six digits depending on the current count values. The following selection helps you to align the video window on the right or left side of the video screen.

This set–up affects all MTD formats ("**Format = MTD ...**") at the **Insert** function.

Align Left	Left adjusted.
Align Right	Right adjusted.
Fixed Size	Video window fixed to maximal width.

Color Each MTD timer can have one of the colors red, yellow, green or blue. This setting defines if that color is used to show the timer.

This set-up affects all MTD formats ("**Format = MTD ...**") at the **Insert** function.

Manual	Use the color that was manually set.
Auto (from timer)	Automatically set color from MTD timer.

User

Some user data formats require a special decoding e.g. to extract a date or to decode MTD data. This format of the user data has to be selected from the drop–down list.

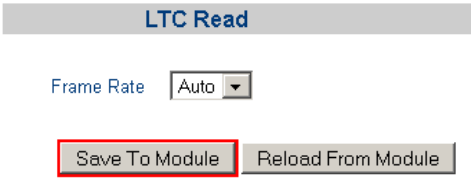
Select "MTD Data" if the incoming time code transports MTD data. This is the only format which enables decoding and inserting MTD stop timer.

All other formats are used to transport a date. Decoding and inserting the correct date require knowing the special format of the user data. Please refer to chapter "Generate: Basic Set–Up of the Time Code Generator" for a detailed description of these formats.

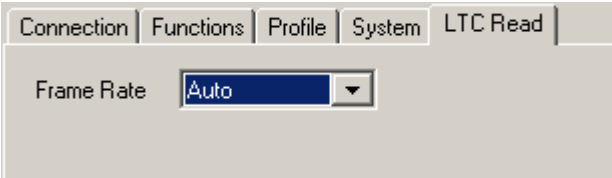
4.3.8 "LTC Read": LTC Reader Functions

TCC70XS is equipped with an LTC reader.

LTC Read via Browser



LTC Read via USB



Frame Rate

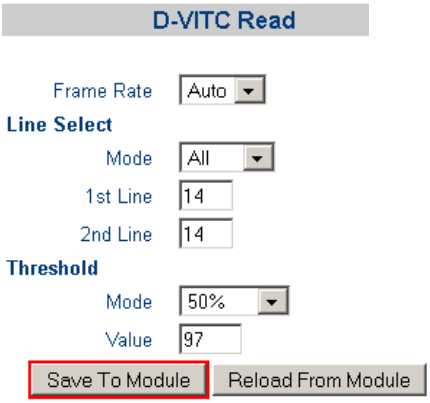
The frame rate of the LTC reader can be set automatically or can be fixed to a value. Select the appropriate function from the drop–down list. In case of **Auto,** the frame rate will be found out within few seconds, and any changes of the frame rate can be detected as well.

Auto	automatic
25	fixed to 25 frames (00–24) – conforming to television system 625/50 (PAL)
30	fixed to 30 frames (00–29)
30 df	fixed to 30 frames (00–29; 30/1,001 per second) including drop–frame counting – conforming to television system 525/60 (NTSC)
24	fixed to 24 frames (00–23)

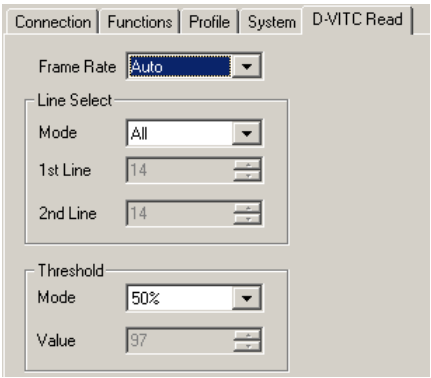
4.3.9 "D-VITC Read": D-VITC Reader Functions

TCC70XS is equipped with a D-VITC reader.

D-VITC Read via Browser



D-VITC Read via USB



Frame Rate

The frame rate of the D-VITC reader can be set automatically or can be fixed to a value. Select the appropriate function from the drop–down list. In case of **Auto,** the frame rate will be found out within few seconds, and any changes of the frame rate can be detected as well.

Auto	automatic
25	fixed to 25 frames (00–24) – conforming to television system 625/50 (PAL)
30	fixed to 30 frames (00–29)
30 df	fixed to 30 frames (00–29; 30/1,001 per second) including drop–frame counting – conforming to television system 525/60 (NTSC)

Line Select

D-VITC reader line selection: The D-VITC of the lowest line within the selected line range (each field) will be read. If this D-VITC carries plausible data, further lines then will be ignored.

Mode	*Off*	No D-VITC will be read.
	Lines	Line range: Only two lines – the "1st Line" and the "2nd Line".
	Block	Line range: All lines from "1st Line" to "2nd Line" (included).
	All	The whole available line range will be processed automatically.
1st Line	1st line (mode = "Lines") or start line (mode = "Block"), valid input = 6–30.	
2nd Line	2nd line (mode = "Lines") or last line (mode = "Block"), valid input = 6–30.	

Threshold

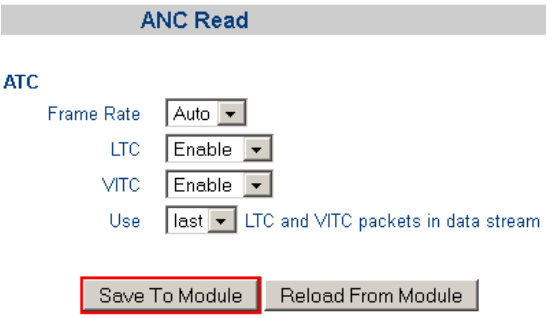
Select the data threshold. **50%** is the default (factory) setting.

Mode	*Auto*	Automatic adaptation to the D-VITC data level.
	50 %	Fixed to a 50% value, based at a nominal video and D-VITC data level.
	Manual	Enter a value manually, for example to find out the limits of the threshold.
Value	If "Mode = Manual" is selected: Enter a value.	

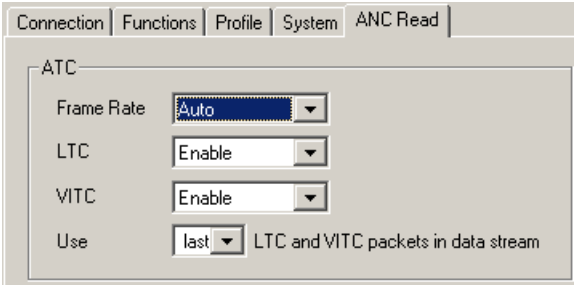
4.3.10 "ANC Read": Ancillary Data Reader Functions

TCC70XS is equipped with an Ancillary Data reader. This functionality is used to read ATC (Ancillary Time Code) according to SMPTE–12M–2. ATC can be of type ATC_LTC and ATC_VITC.

ANC Read via Browser



ANC Read via USB



ATC

"Ancillary Time Code" can be of type ATC_LTC and ATC_VITC.

Reader which are disabled cannot transfer data to the "general reader" ("Read"). It is recommended to enable only those readers which really should be used for the present application.

Frame Rate The frame rate of this reader can be set automatically or can be fixed to a value. Select the appropriate function from the drop–down list. In case of **Auto,** the frame rate will be found out within few seconds, and any changes of the frame rate can be detected as well.

Auto	automatic
25	fixed to 25 frames (00–24)
30	fixed to 30 frames (00–29)
30 df	fixed to 30 frames (00–29; 30/1,001 per second) including drop–frame counting
24	fixed to 24 frames (00–23)

LTC ***Disable*** or ***Enable*** the ATC_LTC reader.

VITC ***Disable*** or ***Enable*** the ATC_VITC reader.

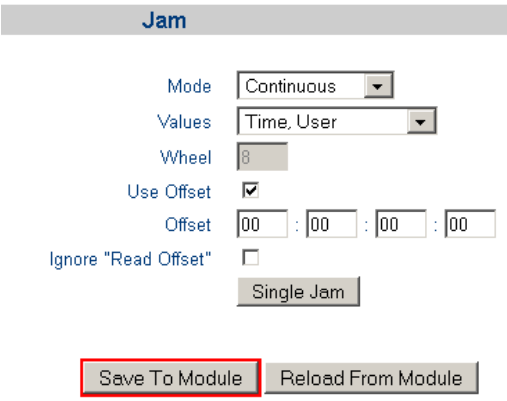
Use ***last / first***: There may be more than one ATC data packet present. You can choose to accept the first or the last of these data packets.

If you just want to check whether there is one data packet or more (with different time code values), you can switch between "last" and "first" and watch the reader insertion for changing values.

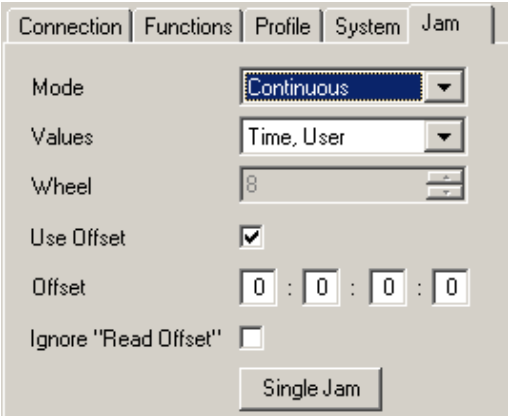
4.3.11 "Jam": The JAM SYNC Methods

The **Jam Sync** method transfers time code of the "general reader" (Read) to the generator.

Jam via Browser



Jam via USB



Mode

Please refer to chapter "The JAM SYNC Method of Operation" for a detailed description.

Off	Jam Sync is switched off.
Continuous	Continuous Jam Sync.
Cont. 1Frame	Jam Sync with one–frame drop–out compensation.
Cont. Wheel	Jam Sync with programmed drop–out compensation.
Start	One–time Jam Sync, active after power–on.
Convert	Time code conversion even at "still" time code input.
Diff Cont.	Continuous Jam Sync if time difference exceeds a threshold value. Generator continues to count if time code input fails.
Diff Stop	Jam Sync if time difference exceeds a threshold value. Generator stops counting if time code input fails.
Zero Frame	Jam Sync at frames = 00 of the time code input. Suitable for format conversions.

Values

The Jam Sync treats the time information and the user data independently:

Time	Time of read time code → time of generator. The content of the user data of the generated time code is determined by the selection "User Mode" at the "Generate" configuration page.
User	User data of read time code → user data of generator. The time of the generator counts independently from the read time.
Time, User	Time of read time code → time of generator, and user data of read time code → user data of generator.
Time to User	Time of read time code → user data of generator. The time of the generator counts independently from the read time.
User to Time	User data of read time code → time of generator. The user data of read time code should transport a time information.

Wheel

Number of frames for the drop–out compensation in the “Cont. Wheel” mode.

Use Offset

If checked a programmed offset will be added to the time of read time code.

A negative offset can be achieved as follows: subtract the time or the number of frames by which the output should be delayed with respect to the input from 24 hours – considering the current frame rate. Example: for a delay of 10 frames in a 30 frames system choose an offset of 23:59:59:20.

Offset

You can program a “hours:minutes:seconds:frames” offset.

Via USB you have to press the **tabulator key** at the PC’s keyboard to store the offset, via Browser press the **Save To Module** button.

Ignore “Read Offset”

This concerns the “Read Offset to 00:00:00:00” and “Read Offset to 10:00:00:00” operation modes switched on by a programmed function key or a programmed GPIO.

If checked: The generator receives and generates the original reader values, regardless of the “Read Offset” function. If any “Read Offset” operating mode is switched on, the generator values will then be different from the processed reader values.

If not checked: If any “Read Offset” operating mode is switched on, the generator will receive and generate these processed reader values.

The offset entered at this configuration page will be added to the values transferred from the reader – independent from clicking this checkbox or not.

Single Jam

This method will switch from JAM SYNC to START operating mode automatically as soon as the time code generator has once received data from the reader. If – according to the set–up at “Values” – a time transfer has been selected, the time addresses of the generator will be set by the time addresses of the read time code only once; after that the time will be counted continuously. If TCC70XS has been switched off, the “Single Jam” method will be cleared.

Single Jam can be activated by a click on this button, or by a programmed function key or a programmed GPIO.

4.3.12 "Generate": Basic Set–Up of the Time Code Generator

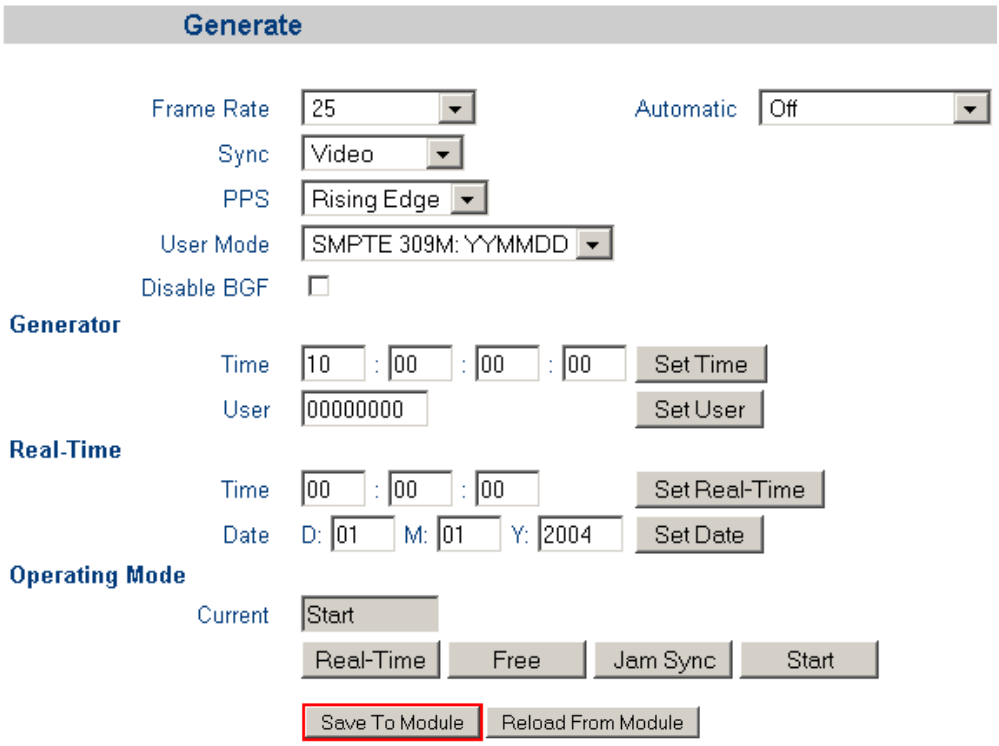
The time code generator outputs the time addresses and the user data in various time code formats: as **LTC**, as **D-VITC**, as ancillary data packets of type **ATC_LTC** and/or **ATC_VITC**. The data content within these time code types are identical always.

The following methods of operating are provided for the time code generator:

- **REAL–TIME**: Using a real–time reference, the time information of the generated time code corresponds to a local time zone. The user data may transport the date.
- **FREE**: The time code generator counts the time continuously without any time jumps. This is an additional service for the real–time feature helping to shift a legal time jump.
- **JAM SYNC**: The time code generator accepts data from the time code reader.
- **START**: Preset values can be entered from which the time code generator starts to count. A start–stop operation is possible: START/STOP via GPIO or function key.

Frame rate and sync signal for the phase and frequency synchronization can be selected. This setting is valid for each method of operating as well as for each time code format.

The configuration page **Generate** (example shows the browser view):



Frame Rate Adjust the frame rate of the time code generator. If TCC70XS is used in a video application, the frame rate has to match the picture rate of the television signal:

Frame rate	at this television signal
24	720p/24; 1080p/24
25	625/50 (PAL); 720p/50; 720p/25; 1080i/50; 1080p/25; 1080p/50
30	720p/60; 720p/30; 1080i/60; 1080p/30; 1080p/60
30 df	525/59.94 (NTSC); 720p/59.94; 720p/29.97; 1080i/59.94; 1080p/29.97; 1080p/59.94

Automatic The generator can adapt its frame rate automatically. This feature is suitable for the START and JAM SYNC methods of operating, but not for REAL–TIME.

Off No automatic mode, recommended for the REAL–TIME mode.

Follow Video Frame rate follows the video input. The frame rate can automatically be set to *24*, *25* or *30 df* – but not to *30*. This feature requires to select **System = Auto** at configuration page **Video**.

Follow Jam Sync Frame rate follows the "Read" time code input during the JAM SYNC method of operating. The frame rate can be set to 24, 25, 30 or 30 df.

Sync Select the sync signal for the frequency and phase synchronization:

Internal Internal reference.
Video Video signal connected to VIDEO IN.
LTC Read External LTC signal connected to LTC IN.
PPS External second pulse connected to GPIO_1.
Not recommend if "frame rate = 30 df".

PPS If "Sync = PPS" has been selected, the reference edge of the PPS input (at GPIO_1) can be chosen:
Rising Edge (default)
Falling Edge

User Mode

The usage of the user data as selected from this list is valid for all main operating modes except during **JAM SYNC**, when user data will be transferred from read time code to generator: configuration "Jam", selection box "Values" = *User*, or *Time, User*, or *Time to User*.

The user data consists of eight four–bit groups which will be denoted as BG1 to BG8, and they are paired in the following way:
BG8/7 = "Hours", BG6/5 = "Minutes", BG4/3 = "Seconds", BG2/1 = "Frames".

Date formats: A "**U**" in a date format receives that value of the user data which has been entered for the "Set User" format at this position. **DD** denotes the day, **MM** the month, **YY** the year – all BCD coded.

Set User

These are fixed values which have been entered by pressing the **Set User** button – please notice description at the **Generator** box below.

Date: UU.DD.MM.YY

BCD coded date: Day.Month.Year [BG6/5 . BG4/3 . BG2/1]; two-digit year format.

Date+Status [S_HS_L.DD.MM.YY]

BCD coded date: Day.Month.Year [BG6/5 . BG4/3 . BG2/1]; two-digit year format. S_HS_L indicate a status:

Bit(s)	S_L = BG7 ("Units of Hours"):		
0	If = 1: Time code transports the local time with high precision.		
1+2	Time zone:	Bit 2	Bit 1
		0	0 = UTC
		0	1 = Standard Time
		1	0 = Daylight Saving Time
3	If = 1: Announcement of DST switching, one hour before switching.		

Bit(s)	S_H = BG8 ("Tens of Hours"):
0	If = 1: Announcement of a leap second, one hour before switching.
1	Century bit, should be equal to 0.
2	Not used, should be equal to 0.
3	Not used, should be equal to 0.

BBC

Date coded according to the "EBU Technical Information I29–1995" (so–called BBC format). The date is BCD coded and assigned to the binary groups as follows:

BG1	Reserved	All bits = 0
BG2	Units of the day	4 bits, LSB = bit 12
BG3	Units of the month	4 bits, LSB = bit 20
BG4	Tens of the day	2 bits, LSB = bit 28
	Tens of the month	1 bit = bit 30, bit 31 = 0
BG5	Reserved	All bits = 0
BG6	Units of the year	4 bits, LSB = bit 44
BG7	Reserved	All bits = 0
BG8	Tens of the year	4 bits, LSB = bit 60

Date: DD.MM.YY.YY

BCD coded date: Day.Month.Year [BG8–7 . BG6–5 . BG4–1]; four-digit year format.

Date: YY.MM.DD.UU
Date: UU.YY.MM.DD
Date: UY.YM.MD.DU
Date: DD.MM.YY.UU
Date: MM.DD.YY.UU
Date: UU.MM.DD.YY

There are several date formats selectable similar to the *„Date: UU.DD.MM.YY"* format. Please refer to this table for a survey:

	BG8/7	BG6/5	BG4/3	BG2/1
UU.DD.MM.YY	U U	DD	M M	YY
Date + Status	S_H S_L	DD	M M	YY
DD.MM.YY.YY	DD	M M	YY	YY
YY.MM.DD.UU	YY	M M	DD	U U
UU.YY.MM.DD	U U	YY	M M	DD
UY.YM.MD.DU	U Y	Y M	M D	D U
DD.MM.YY.UU	DD	M M	YY	U U
MM.DD.YY.UU	M M	DD	YY	U U
UU.MM.DD.YY	U U	M M	DD	YY

AUXOFFS

Coding of date & time offset conforming to LEITCH CSD–5300 format with Auxiliary Offset. The user data are used for the date as described under "BBC". Additionally, an offset is encoded in 30–minute increments. 6 bits in binary form are split into two 3–bit groups and are inserted into the reserved binary groups BG5 and BG7:

BG5	Offset, 3 lower bits	3 bits, LSB = bit 36
BG7	Offset, 3 upper bits	3 bits, LSB = bit 52

This allows an offset in the positive direction of up to 23 hours 30 minutes, or 47 half hour steps (101111 in 6–bits binary form). Devices decoding these bits add this offset to the time information of the time code. The date coded in the user data is not coupled with that offset, i.e. the date changes at 24 o'clock of the time code.

Offset can be entered at **Aux** of the **Time Zone** configuration.

SMPTE 309M: YYMMDD

Date and time zone information, according to SMPTE 309M–1999 "YYMMDD" format.

SMPTE 309M: MJD

Date and time zone information, according to SMPTE 309M–1999 "MJD" format.

Disable BGF Check this checkbox to disable the use of the "Binary Group Flags" of the time code, i.e. these flags will then be set to 0.

Generator

The time and the user data can receive start values:

Time Preset of the time: HH:MM:SS:FF. Press the **Set Time** button to let the generator start with this time – applicable only in the **START** or **FREE** method of operating.

User "User" (user data) denotes the eight binary groups of the time code. These are eight digits with values in the range 0 – 9 and A – F.

Clicking **Set User** will transfer the preset to the time code generator – in whole or in part dependent on the "User Mode" selection:

- in case of 'Set User' all eight digits will be set;
- in case of any date format only those places indicated as "U" will be set.

Real–Time

You can set time and date of the internal real–time clock. This could be useful if there is no real–time reference available or if the time has become inaccurate. This will set the buffered clock of the Ethernet module as well.

Time Enter a time (HH:MM:SS). Click **Set Real–Time** to force an update with this preset.

Date Enter day, month, year (D, M, Y). Click **Set Date** to force an update with this preset.

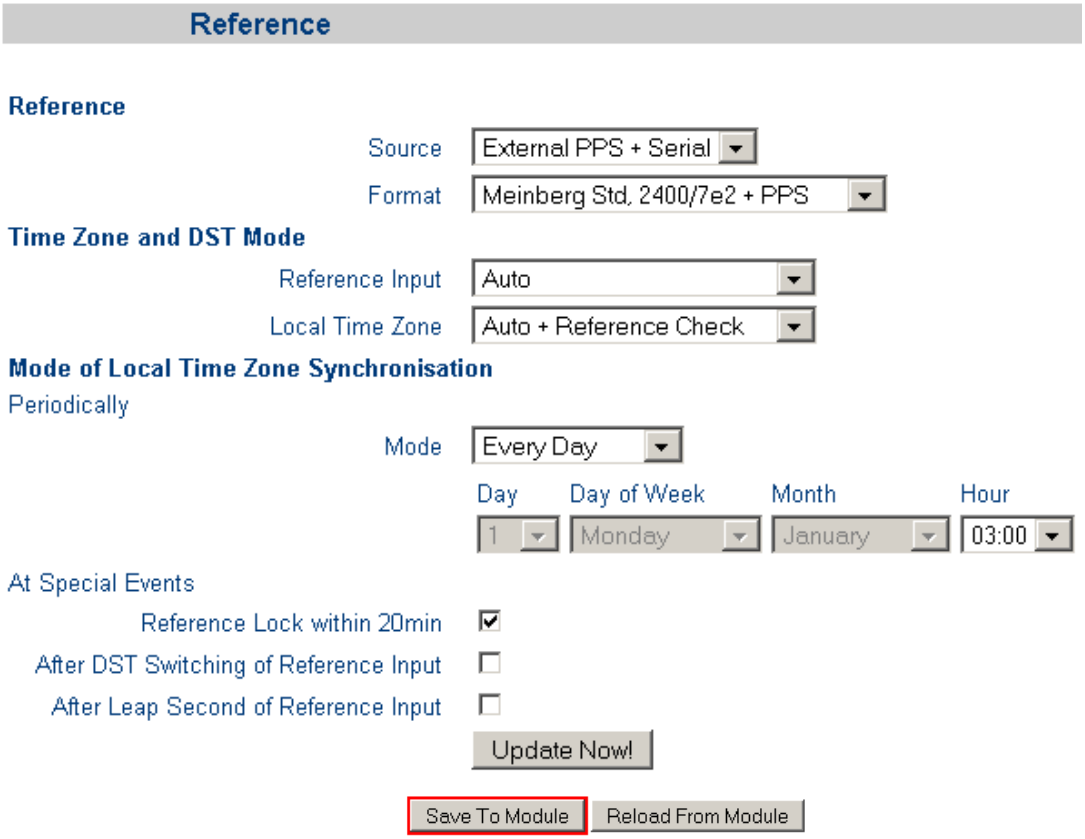
Operating Mode

Clicking buttons **REAL–TIME**, **FREE**, **JAM SYNC**, **START**, will switch the method of operating of the time code generator. Field Current indicates the method which is currently in operation.

4.3.13 "Reference": Real–Time Clock Adjustment

TCC70XS can receive time & date from a real–time reference.

The configuration page **Reference** (example shows the browser view):



Reference

Select the real–time reference and the serial protocols:

Source Select the real–time reference:

External PPS + Serial	Connect an external device, e.g. a GPS or DCF77 receiver which delivers a pulse per second (PPS) and serial data. Various serial data protocols can be selected at the **Format** selection box. Please notice chapter "First Steps" for connection details. GPIO_1 and GPIO_2 now are fixed and cannot be used for other applications.
NTP Client	This uses the *NTP client* feature of the Ethernet module. The real–time reference will be an NTP server which you select via an IP address. Please refer to chapter "NTP Client".
Off	No real–time reference will be used.

Format If "Source = *External PPS + Serial*" is set, you have to select the serial protocol which is used from the real–time reference. TCC70XS accepts:

protocol	from this source
Meinberg Std 2400/7e2	e.g. GPS 10 MHz
NMEA $GPRMC 4800/8n1	e.g. GPS16, GPS17
Wharton Status 2400/7e2	e.g. Wharton clocks

Time Zone and DST Mode **(DST = Daylight Saving Time)**

Reference Input: The module uses UTC as an internal time base. The following settings and the settings **Offset Reference Input** at the **Time Zone** tab are needed to convert the data of the real–time reference input into UTC.

AUTO Time, date and status data of the signal input indicate the time zone of the real–time reference. The real–time reference may utilize DST. "Offset from UTC" and "DST Bias" at **Time Zone** are taken into consideration.

UTC The time zone of the real–time reference does not utilize DST, the 'UTC' status will be set for internal use. "Offset from UTC" at **Time Zone** is taken into consideration!

Standard Time Only The time zone of the real–time reference does not utilize DST, the 'Standard Time' status will be set for internal use. "Offset from UTC" at **Time Zone** is taken into consideration.

Daylight Saving Time Only The time zone of the real–time reference does not switch to DST, the 'DST' status will be set for internal use. "Offset from UTC" and "DST Bias" at **Time Zone** are taken into consideration.

Local Time Zone: These settings determine the status of the local time zone and set conditions for an update of the time code generator with time & date of the real–time reference.

Auto + Reference Check The local time zone utilizes DST; the switching occurs automatically according to the settings at **Time Zone**. Un update (according to the "Periodically" setting at **Mode of Local Time Zone Synchronization**) occurs only if the time of the reference differs less than one minute from the expected time value.

UTC + Reference Check: The local time zone does not utilize DST, the 'UTC' status will be set for internal use. "Offset from UTC" at **Time Zone** is taken into consideration! Un update (according to the "Periodically" setting at **Mode of Local Time Zone Synchronization**) occurs only if the time of the reference differs less than one minute from the expected time value.

UTC The local time zone does not utilize DST, the 'UTC' status will be set for internal use. "Offset from UTC" at **Time Zone** is taken into consideration!

Standard Time Only The local time zone does not utilize DST, the 'Standard Time' status will be set for internal use. "Offset from UTC" at **Time Zone** is taken into consideration.

Daylight Saving Time Only The local time zone does not switch to DST, the 'DST' status will be set for internal use. "Offset from UTC" and "DST Bias" at **Time Zone** is taken into consideration.

Same As Reference Input The local time zone follows the status of the real–time reference input (UTC, Standard Time, DST). A DST switching of the local time zone occurs only if the time zone of the real–time reference switches. "Offset from UTC" and "DST Bias" at **Time Zone** are taken into consideration.

Manual

Clicking **Update Now!** forces a manual update with the real–time reference. All changes at this configuration page will immediately get effective – provided that the real–time reference currently delivers valid data.

Mode of Local Time Zone Synchronization

Periodically

The internal real–time clock updates periodically with the time & date reference according to the following programming:

Mode

Off	No periodically update.
Every Second	Update every second.
Every Day	Update once a day, at the selected **Hour**.
Every Week	Update once a week, at the selected **Day of Week** and **Hour**.
Every Month	Update once a month, at the selected **Day** and **Hour**.
Every Year	Update once a year, at the selected **Month** and **Day** and **Hour**.

Settings **Day**, **Day of Week**, **Month** and **Hour** become active dependent on the "Mode" selection.

At Special Events

Additionally, to the moments selected at **Periodically,** an update with the time & date reference can be programmed at special events:

Reference Lock within 20 min: Due to the nature of some real–time sources it may last some minutes after power has turned on until a "Lock" status will be indicated. The module can be set to monitor this status for a 20 minutes period after power–on, and as soon as "Lock" has been detected an update occurs again. There is a risk of generating a time jump caused by this update. If you don't need this feature, uncheck this checkbox. The "Lock" status has to be part of the status data received from the real–time reference.

After DST Switching of Reference Input: Check this checkbox to force an additional update when the real–time reference switches the time zone (start or end of DST). The DST switching has to be announced in the status data of the reference input.

Please refer to chapter "Handling of a DST Switching" as well.

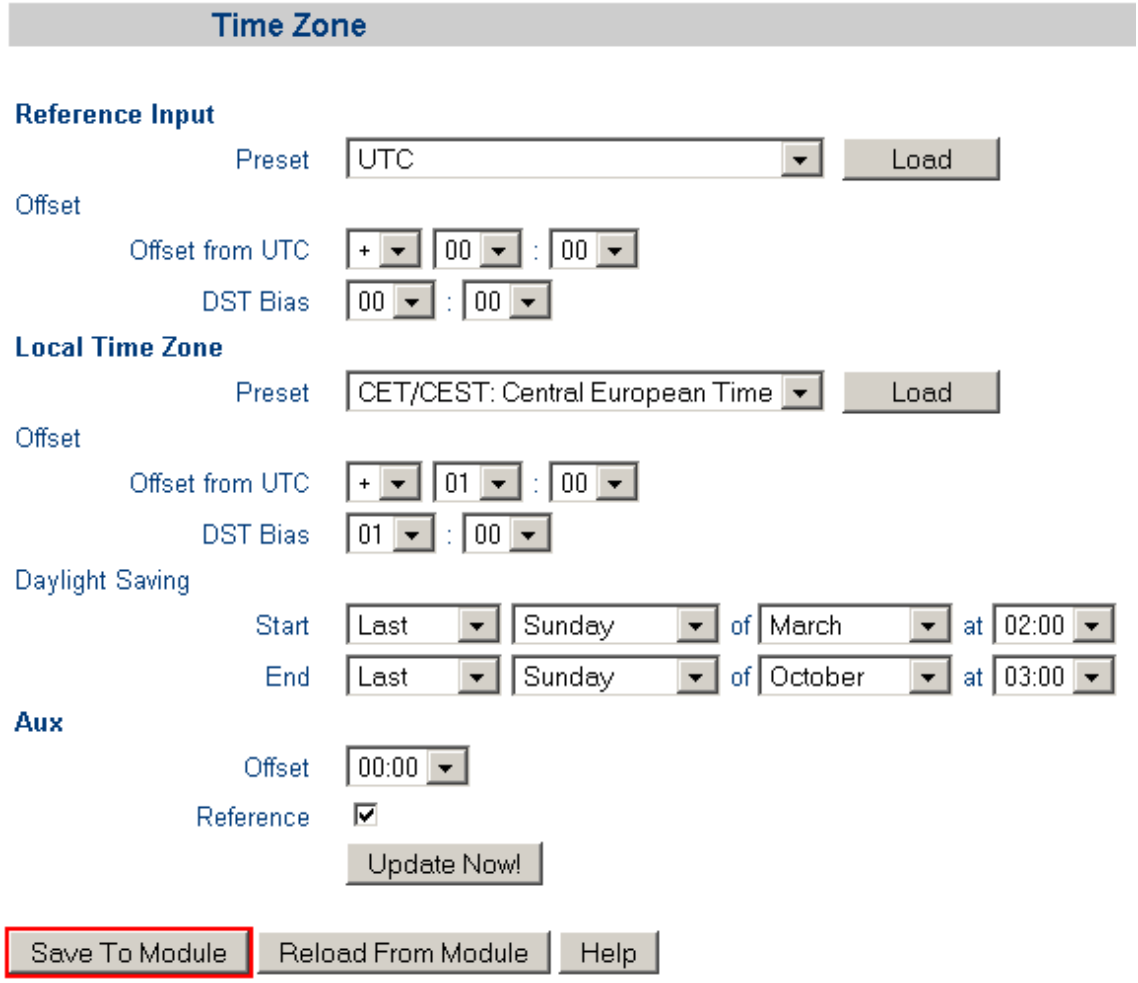
After Leap Second of Reference Input: Check this checkbox to force an additional update when the real–time reference will be corrected through a leap second. The leap second adjustment has to be announced in the status data of the real–time reference input.

Please refer to chapter "Handling of a Leap Second" as well.

4.3.14 “Time Zone”: Time Zone Adjustment

Select the time zone of the real–time reference and the local time zone.

The configuration page **Time Zone** (example shows the browser view):



Reference Input **(DST = Daylight Saving Time)**

This module uses UTC as an internal time base. The following settings together with the settings **Reference Input** at the **Reference** configuration page are needed to convert the data of the real–time reference input into UTC.

Preset

You can select the time zone of the real–time reference from the drop–down list. Click button **Load** to automatically enter the parameter at **Offset from UTC** and **DST Bias**.

Offset

Offset from UTC Enter sign and hours/minutes offsets with respect to UTC.

DST Bias Enter DST correction value in case the real–time reference has a DST period. Most of the cases the correction value will be one hour.

Local Time Zone **(DST = Daylight Saving Time)**

The time code generator operating in the REAL–TIME mode generates the **local time zone**. The following settings are used to calculate the local time zone from the internal UTC time base.

Preset

You can select the local time zone from the drop–down list. Click button **Load** to automatically enter the parameter at **Offset from UTC**, **DST Bias** and **Daylight Saving**.

Offset

Offset from UTC Enter sign and hours/minutes offsets with respect to UTC.

DST Bias Enter the DST correction value in case the local time zone has a DST period. Most of the cases the correction value will be one hour.

Daylight Saving

The local time zone may have a Daylight-Saving Time (DST). These settings determine the moments of switching on and off the DST, referenced to the local time.

Start Using these inputs (e.g. last Sunday of March at 2 o'clock), start of DST for the current year will be calculated.

End Using these inputs (e.g. last Sunday of October at 3 o'clock), end of DST for the current year will be calculated.

Aux

These settings refer to selection "User Mode = AUXOFFS" – please refer to the drop–down list "User Mode" at the "Generate" configuration page.

Offset: Select the auxiliary offset from the drop–down list.

Reference: Check this checkbox if the auxiliary offset should automatically be fixed in a way that offset + local time = reference time. In this case the **Offset** entry above will not be used.

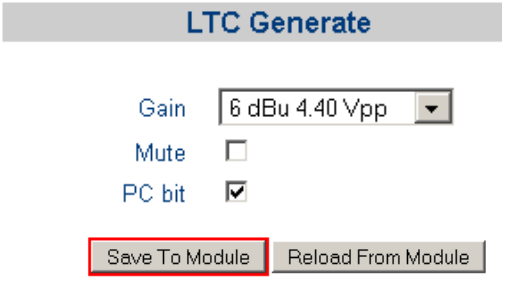
Manual

Clicking **Update Now!** forces a manual update with the real–time reference. All changes at this configuration page will immediately get effective – provided that the real–time reference currently delivers valid data.

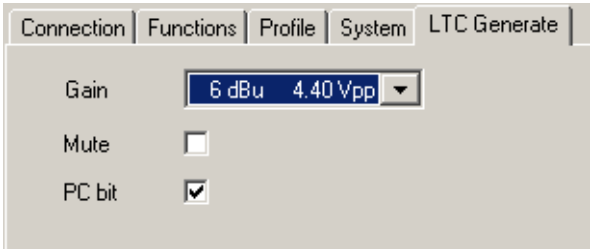
4.3.15 "LTC Generate": LTC Generator Functions

TCC70XS can output the data of the time code generator in an LTC format.

LTC Generate via Browser



LTC Generate via USB



Gain Select the output level from the drop–down list.

The values in this list refer to a use of balanced signals for output and input, i.e. V_{PP} (= peak–to–peak value) will be the difference between LTC_OUT_A and LTC_OUT_B. V_{PP} will be half of the indicated value if unbalanced signals are used, i.e. the peak–to–peak value of the single LTC_OUT_A or LTC_OUT_B signal.

Correspondence between balanced use and unbalanced use:

Use of balanced signals	Use of unbalanced signals
+12 dBu / 8,7 V_{PP}	+6 dBu / 4,4 V_{PP}
+6 dBu / 4,4 V_{PP}	0 dBu / 2,2 V_{PP}
0 dBu / 2,2 V_{PP}	–6 dBu / 1,1 V_{PP}
–6 dBu / 1,1 V_{PP}	–12 dBu / 0,55 V_{PP}

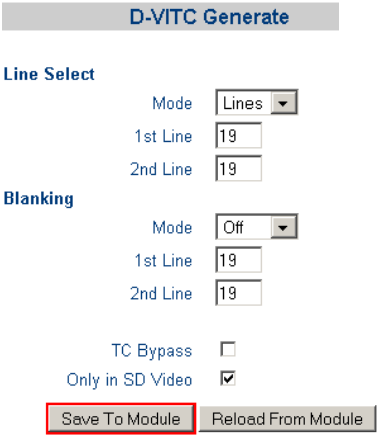
Mute LTC output mute on/off.
This function can be programmed for a function key or a GPIO as well.

PC bit If checked: the polarity of the synchronization word of the LTC output will be stabilised. The polarity correction bit is put in a state, so that every 80–bit word contains an even number of logical zeros. The polarity correction bit is bit no. 27 in the 525/60 system, bit no. 59 in the 625/50 system. Checking this checkbox is helpful if you do some LTC measurements with an oscilloscope.

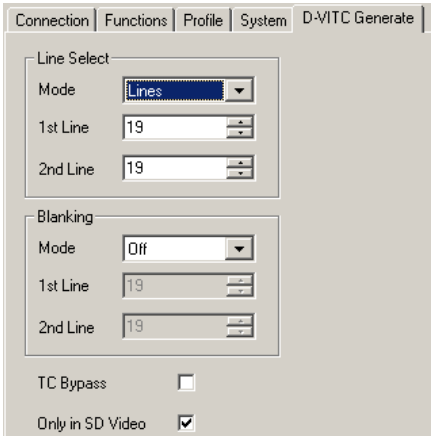
4.3.16 "D-VITC Generate": D-VITC Generator Functions

TCC70XS can output the data of the time code generator in a D-VITC format.

D-VITC Generate via Browser



D-VITC Generate via USB



Line Select

Mode	*Off*	No D-VITC will be generated.
	Lines	D-VITC in only two lines: The "1st Line" and the "2nd Line".
	Block	D-VITC in all lines from "1st Line" to "2nd Line" (included).
1st Line	Select the first line ("Lines") or the start line ("Block"), valid input = 6 to 30.	
2nd Line	Select the second line ("Lines") or the last line "Block"), valid input = 6 to 30.	
Note: If "1st Line" is equal to "2nd Line", only one D-VITC line will be generated.		
SMPTE–12M recommendation:		SD 625/50: line 19 (and 21 optionally) SD 525/50: line 14 (and 16 optionally)

Blanking

Selected lines can be blanked. Typical application is to remove a D-VITC from the video signal. Lines which are selected for blanking and for D-VITC (see "Line Select" above) will be blanked before the D-VITC will be generated.

Mode	*Off*	No blanking.
	Lines	Blanking of two lines: The "1st Line" and the "2nd Line".
	Block	Blanking of the lines from "1st Line" to "2nd Line" (included).
1st Line	First line (mode = "Lines") or start line (mode = "Block"), valid input = 6 to 30.	
2nd Line	Second line (mode = "Lines") or last line (mode = "Block"), valid input = 6 to 30.	
Note: If "1st Line" is equal to "2nd Line", only one line will be blanked.		

TC Bypass

Check it for an automatic D-VITC bypass: New D-VITC will be generated only if no D-VITC is present in the incoming video. If D-VITC is already present, no new D-VITC will be inserted. This feature requires enabling the D-VITC reader as well. Please notice ***3** in the next chapter.

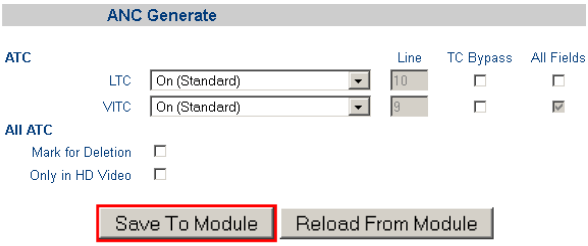
Only in SD Video

There is no specification of D-VITC for HD digital video. It is strongly recommended to check this box if you are working both with SD and HD signals. If checked, the D-VITC generator will be switched off automatically if HD video is detected.

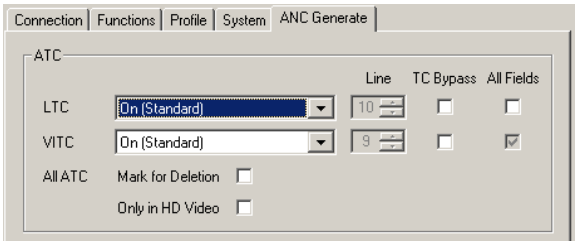
4.3.17 "ANC Generate": Ancillary Data Generator Functions

TCC70XS includes an ancillary data generator. This functionality is used to generate ATC (Ancillary Time Code) according to SMPTE–12M–2. ATC can be of type ATC_LTC and ATC_VITC.

ANC Generate via Browser



ANC Generate via USB



Ancillary data packets may be inserted within the blanking intervals of a digital video signal:

HANC = horizontal ancillary space; VANC = vertical ancillary space.

Please be aware that the available ancillary space depends on the video format.

ATC: LTC/VITC

Off	Use this set–up to disable the corresponding ATC generator.
On (Standard)	Use this set–up to insert the corresponding ATC in recommended lines. ***1**
VANC	Use this set–up to insert the corresponding ATC in a line of VANC space. Select this line at "Line". This set–up includes a line correction for HD interlaced video formats. ***1**
VANC w/o even field correction	Use this set–up to insert the corresponding ATC in a line of VANC space. Select this line at "Line". There will be no line correction for HD interlaced video formats in this case. ***1**
HANC	Use this set–up to insert the corresponding ATC in a line of HANC space. Select this line at "Line". This set–up includes a line correction for HD interlaced video formats. ***1**
HANC w/o even field correction	Use this set–up to insert the corresponding ATC in a line of HANC space. Selected the line at "Line". There will be no line correction for HD interlaced video formats in this case. ***1**
TC Bypass	Check it for an automatic ATC bypass: The corresponding ATC will be generated only if this ATC is not present in the incoming video. If this ATC is already present, no new ATC will be inserted. This feature requires enabling the corresponding ATC reader as well. Please notice ***2** and ***3**.
All Fields	In any case, ATC_LTC will be inserted in the first field of the video. Checking "All Fields", the ATC_LTC data packet will be repeated in the second field. ***1**

ATC: LTC/VITC

Mark for Deletion	Checking this box will mark all ATC data packets for deletion. The data packets are still present and at the same location, but the data content will not be evaluated anymore. The ATC reader of this module receives the data packets independent from this set–up, i.e. this function has an effect on the video output only. The Ancillary Data Generator is able to insert new ATC data packets into this modified data stream.
Only in HD Video	This module can detect SD and HD video formats automatically. If you don't want to generate ATC data packets in SD video, check this box. In this case, the ATC generator will be switched off automatically if SD video is detected.

***1** SMPTE 12M–2 and ITU–R BT.1366–2 standards define the transmission of ancillary time code packets.

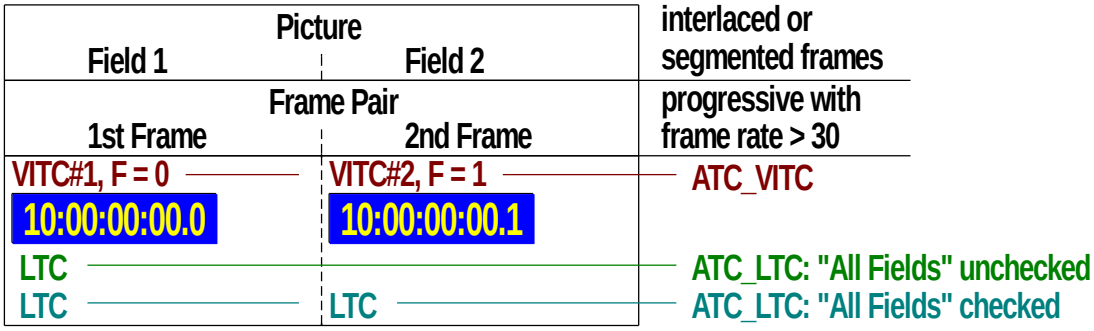
ATC Packet Transmission Rate

VITC (vertical interval time code) is defined as VITC#1 (ATC_VITC1) and VITC#2 (ATC_VITC2). This will be denoted as ATC_VITC for the user. VITC addresses each video field by nature, so it is inserted field–wise and includes a field mark flag ("F").

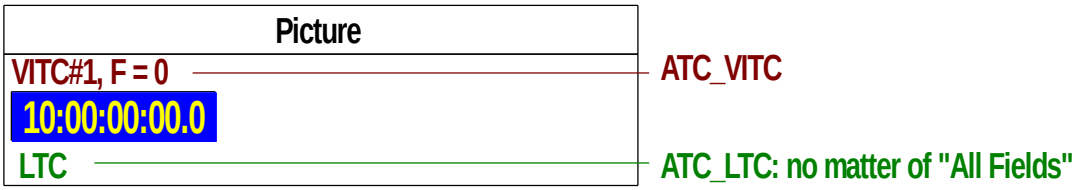
LTC (linear time code) is defined as ATC_LTC. LTC addresses each video picture by nature (frame rate = picture rate), but ATC packets can be treated as a kind of video time code and can be inserted field–wise. Using the "*All Fields*" set–up, the transmission rate of ATC_LTC can be selected: field–wise or frame–wise.

The following transmission rates are provided depending on video formats:

Interlaced and segmented frames formats, as well as progressive formats with frame rates > 30. In the latter case, pairs of frames are regarded.



Progressive formats with frame rates ≤ 30:



Locations of ATC Data Packets

The preferred locations are based on the vertical interval switching point defined in SMPTE RP 168. Regarding HDTV interlaced and segmented frames video formats, the line specified for switching in the second field differs from the line in the first field. This will be considered using setups *"On (Standard)"* as well as *"VANC"* or *"HANC"* for a manual line selection. There will be no line correction using setups *"VANC w/o even field correction"* or *"HANC w/o even field correction"*, in these cases ATC packets will be inserted at the same line of both fields.

Basically, ATC may be inserted in HANC or VANC space located within vertical blanking after the line specified for switching and before the beginning of active video. If set–up *"On (Standard)"* is used, ATC will be inserted in the recommended lines with automatic adaption to the video format.

These are the video format–dependent locations of the ATC data packets:

	SD Video			
	SD 525/59.94/I (NTSC)		SD 625/50/I (PAL)	
	1st Field	2nd Field	1st Field	2nd Field
Switching point	10	273 [10]	6	319 [6]
ATC_VITC *"On (Standard)"*	VANC 13	VANC 276 [13]	VANC 9	VANC 322 [9]
ATC_LTC *"On (Standard)"*	VANC 13	VANC 276 [13] if *"All Fields"*	VANC 9	VANC 322 [9] if *"All Fields"*

Apart from using *"On (Standard)"* to set the locations automatically, it is possible to choose the lines manually. For SD video formats there is no difference between *"VANC"* and *"VANC w/o even field correction"* or *"HANC"* and *"HANC w/o even field correction"*. ATC will be inserted in both fields in that line selected at "Line".

	HD Video				
	1125 lines interlaced or segmented frames		1125 / 750 lines progressive with frame rate > 30		1125 / 750 lines progressive with frame rate ≤ 30
	1st Field	2nd Field	1st Frame	2nd Frame	
Switching point	7	569 [6]	7	7	7
ATC_VITC *"On (Standard)"*	HANC 9	HANC 571 [8]	HANC 9	HANC 9	HANC 9
ATC_LTC *"On (Standard)"*	HANC 10	HANC 572 [9] if *"All Fields"*	HANC 10	HANC 10 if *"All Fields"*	HANC 10

Apart from using *"On (Standard)"* to set the locations automatically, it is possible to choose the lines manually. Please be aware of the differences regarding HD interlaced and segmented frames video formats:

"VANC" or *"HANC"*: 1st field: ATC at line number as selected at "Line".
2nd field: ATC one line earlier than selected at "Line".

"VANC w/o even field correction" or *"HANC w/o even field correction"*:
1st and 2nd field: ATC at line number as selected at "Line".

***2** If "TC Bypass" and "Mark for Deletion" both is checked: the "Mark for Deletion" feature will be disabled automatically as long as ATC is detected in the incoming video.

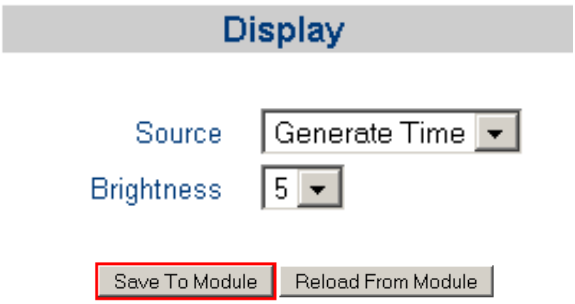
***3** Additionally there is a "TC Bypass" function available programming a function key or GPIO (please refer to configuration page **Keys**). This function differs from the automatic "TC Bypass" function described in this chapter. Enabled via function key or GPIO, no video time code (D-VITC, ATC) will be generated, even if there is no video time code present in the incoming video. Please refer to the document "RUB AT/DT/HT/XT and TCC70XS Application: GPIO Functions" for more information about GPIO functions. You can download it from:

https://plurainc.com/products/tcc70xs2/

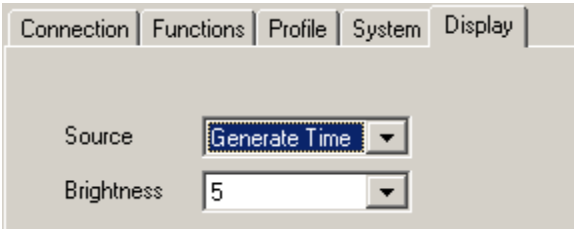
4.3.18 “Display”: Configuration of the 8–Digit LED Display

The 3G–Video module transfers data of the time code reader or time code generator to the 8–digit LED display.

Display via Browser



Display via USB



Source Chose the data which should be displayed:

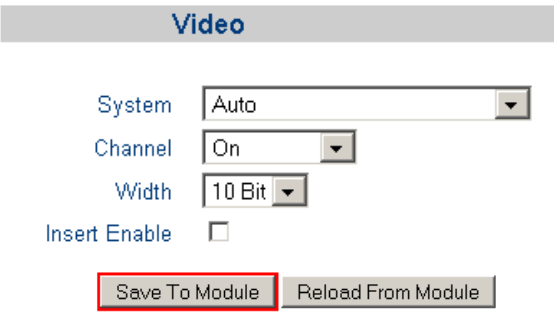
Off	No data will be displayed; display becomes dark except the decimal point of the minutes.
Real-Time	Time of the local time zone (HH:MM:SS).
Real-Time, AM/PM	Time of the local time zone in AM/PM mode (HH:MM:SS).
Date	Date of the local time zone (DD.MM.YYYY).
Generate Time	Time of the time code generator (HH:MM:SS:FF).
Generate Time (6 Digits)	Time of the time code generator (HH:MM:SS).
Generate Time (AM/PM)	Time of the time code generator in AM/PM mode (HH:MM:SS).
Generate User	User data of the time code generator.
Read Time	Time of the “general” reader **Read** (HH:MM:SS:FF).
Read Time (6 Digits)	Time of the “general” reader **Read** (HH:MM:SS).
Read Time (AM/PM)	Time of the “general” reader **Read** in AM/PM mode (HH:MM:SS).
Read User	User data of the “general” reader **Read**.

Brightness Adjust the brightness of the display in seven steps.

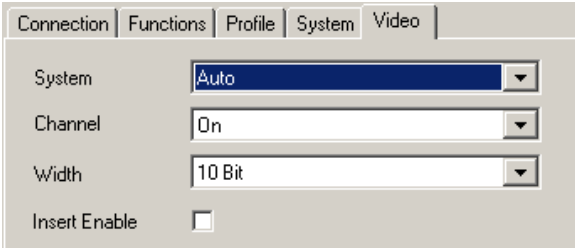
4.3.19 "Video": Video System and General Set–Up of the Video Channel

TCC70XS is equipped with a high-definition serial digital video channel: 3G/HD/SD.

Video via Browser



Video via USB



System Select the video standard:

Auto Auto–detect of the video standard (recommended). The supported standards are listed in the chapter "Standard Features of the Video Channel". Please also refer to configuration page **Generate** for the automatic modes of the frame rate.

Drop–down list Select the video standard from the drop–down list according to the video connected at the video input.

Channel Set–up of the video output:

On Normal operation: The video input signal passes through the video channel, signals will be added as programmed (time code, video windows).

Pass Thru The video input signal passes through the video channel, but the video signal will be left unchanged.

Width: Format of the serial data words: 8 bits or 10 bits.

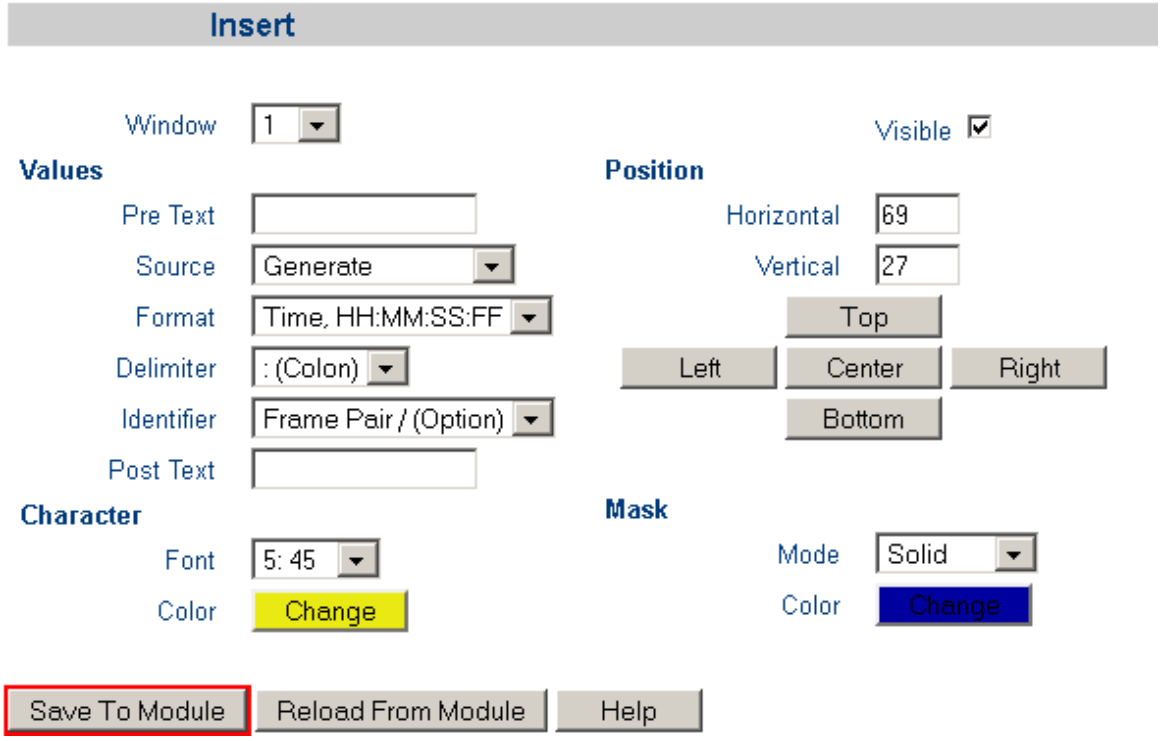
Insert Enable If this checkbox is checked: all video windows with "visible" checkbox checked (see **Insert** configuration page) will be inserted in the video signal.

If this checkbox is unchecked: "insert bypass" of the video signal, i.e. all the video windows will be switched off (this does not affect the D-VITC/ATC generator lines). The input to output delay of the video signal will be left unchanged.

4.3.20 "Insert": Set–Up of all Video Windows

Each video window can get an individual set–up. Up to seven windows can be visibly inserted. It is recommended to connect the video output to a video control monitor so you can verify the changes immediately.

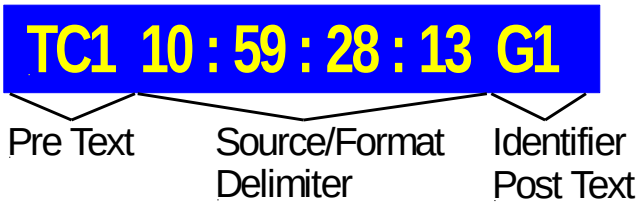
The configuration page **Insert** (example shows the browser view):



Window: Select the video window, all the following setups refer to this window. Seven windows are available.

Visible: Checkbox checked = window visible; checkbox unchecked = window switched off.

Values



Pre Text A text can be placed right before the source characters.

Source Select the data source from the drop–down list:

Read Data of the "general reader" (please refer to configuration **Read**). The data contain time and user data of a time code, perhaps a date (configuration "User – Mode" necessary), perhaps MTD data (configuration "MTD – Source" necessary).

Generate Data of the internal time code generator. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	G	
	String	G1 or G2	(field indication)
	Frame Pair	.0 or .1	(frame pair indication)

Reference Time & date of the internal real–time clock.

Identifier shows:	*Letter*	G

LTC Read Data of the LTC reader. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	L
	String	LR

D-VITC Read Data of the D-VITC reader. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	V	
	String	VR1 or VR2	(field indication)

D–VITC Generate Data of the internal time code generator. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	V	
	String	VG1 or VG2	(field indication)

ATC_LTC Read Data of the ATC_LTC reader. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	L
	String	LR

ATC_VITC Read Data of the ATC_VITC reader. The data contain time and user data; therefore, you are free to select any "time" or "user" format from the **Format** drop–down list.

Identifier shows:	*Letter*	V	
	String	VR1 or VR2	(field indication)
	Frame Pair	.0 or .1	(frame pair indication)

Serial Data received from the serial interface. This is provided for special applications, depending on configuration.

Format Select the representation of the data from the drop–down list. The **Delimiter** can be selected independently to separate pairs or groups of characters.

Text only	This format displays no data of the selected **Source**, but a text which you can enter at "Pre Text" or "Post Text". If "Post Text" is not been used, a source identifier can be displayed choosing "Identifier".

The following formats are provided to display a **time**:

Time, HH:MM:SS:FF	Time of a time code, hours:minutes:seconds:frames.
Time, HH:MM:SS	Time, hours:minutes:seconds.
Time, MM:SS:FF	Time of a time code, minutes:seconds:frames.
Time, HH:MM	Time, hours:minutes.
Time, MMMM:SS	Time, minutes:seconds. Hours will be converted to minutes. Minutes are displayed with four digits, range 0000 – 1439.
Time, MM:SS	Time, minutes:seconds.
Time, SS:FF	Time of a time code, seconds:frames.
HH:MM:SS, AM/PM	Time of a time code in AM/PM mode, hours:minutes:seconds.
HH:MM, AM/PM	Time of a time code in AM/PM mode, hours:minutes.

User data of a time code can be presented in following formats:

User, 8 Digits	All eight digits, in a hexadecimal way: 0 – 9, A – F.
User, 6 Digits	The six most significant digits, hexadecimal 0 – 9, A – F.
User, 4 Digits	The four most significant digits, hexadecimal 0 – 9, A – F.
User, 1st Digit	The most significant digit, hexadecimal 0 – 9, A – F.
User, ASCII	If the user bits contain a character set conforming to ASCII, these (four) characters are displayed.

A **date** can be decoded out of two sources: "Source = Reference" or "Source = Read". If "Read" has been selected, the date has to be decoded out of the user data of a time code before, so choose the correct date format at "User – Mode" at the **Read** function (please refer to chapter "Read: Configuration of the General Reader").

Please notice subchapter "Insert Real–Time & Date" of chapter "Applications".

The following formats are provided:

Date, DD MM YYYY	Day–month–year, four-digit year format.
Date, MM DD YYYY	Month–day–year, four-digit year format.
Date, YYYY MM DD	Year–month–day, four-digit year format.
Date, DD MM YY	Day–month–year, two-digit year format.
Date, MM DD YY	Month–day–year, two-digit year format.
Date, YY MM DD	Year–month–day, two-digit year format.

MTD Data can be decoded out of one source, which has to be selected from MTD – Source" at the **Read** function (please refer to chapter "Read: Configuration of the General Reader"). The selection at "Insert – Source" has no effect anymore, but it is recommended to select "Read" from the drop–down list. **MTD Data** include different timers, real–time & date, and more. Please choose:

MTD Time A – F	Current value of the selected stop timer A – F.
MTD Time	The local real–time decoded out of the MTD data.
MTD Date	The local date decoded out of the MTD data.
MTD Main 1 – 3	Current value of the selected "Main" time 1 – 3.

Please notice the document "RUB und TC70XS Application: Read and Insert MTD Timer". You can download it from:

https://plurainc.com/products/tcc70xs2/

Delimiter Select the delimiter from the drop–down list. The delimiter separates pairs or groups of characters according to the selection at "Format".

Identifier You can add a source identifier following the source characters. Select from the drop–down list:

Off	No source identifier.
Letter	One character, e.g. "G" for generator, "R" for reader etc.
String	Two characters plus possibly a field identifier, e.g. "VR1" stays for VITC reader data of the first field.
Frame Pair	First (.0) or second (.1) frame identifier of a frame pair in progressive video formats with 50/60 frames or field identifier in interlaced video formats.

Post Text Instead of an identifier ("Identifier = Off") you can add a text following the source characters.

Position

Horizontal Adjust the horizontal position of the video window in small steps: Enter a number or click on the increment/decrement buttons at the right side of the box.

Vertical Adjust the vertical position of the video window in small steps: Enter a number or click on the increment/decrement buttons at the right side of the box.

Click on these buttons to set the video window at the upper/lower border of the screen. The horizontal position will be left unchanged.

Click on these buttons to set the video window at the most left/centre/most right position of the screen. The vertical position will be left unchanged.

Character

Font Select the character font from the drop–down list. The standard firmware has the following fonts provided:

Font	Roughly maximum No. of characters side by side			Roughly maximum No. of windows one beneath the other		
	SD	720	1080	SD	720	1080
1: 15	56	105	156	28	35	53
2: 20	40	72	110	18	25	38
3: 25	32	58	88	16	19	29
4: 35	24	44	66	10	13	20
5: 45	18	34	50	8	11	16
6: 60	14	26	38	6	8	12
7: 80	10	19	28	4	6	8
8: 105	8	15	22	3	4	7
9: 139	6	11	16	2	3	5

It is possible to create own character fonts. Please refer to the document "Rubidium Series Font Compiler" for details, available at

https://plurainc.com/products/tcc70xs2/

Color Select the colour of the character insertion. The current colour is indicated. Click on the **Change...** button to change the colour. Refer to the description below for more information.

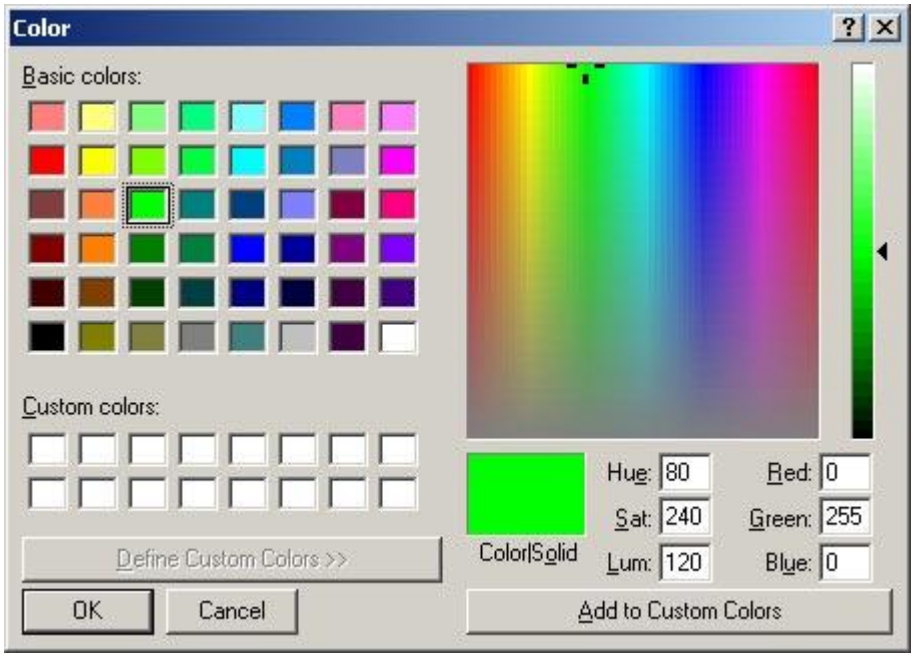
Mask

A background mask can be added to the character insertion. Select from the drop–down list:

Mode
Off No background mask.
Solid With background mask.
Dimmed Reducing the luminance of the video signal in the video window area.

Color Select the colour of the background mask ("Mode" = "Solid" only). The current colour is indicated. Click on the **Change...** button to change the colour. Refer to the description below for more information.

Change...: Select the colour of the character insertion or the background mask:



Click on any of the colour boxes to use an already defined colour: "Basic color" or "Custom color".

If you want to define your own colour you can:

- Enter a value in the **Hue**, **Sat**, **Lum** boxes.
- Enter a value in the **Ret**, **Green**, **Blue** boxes.
- Select colour and saturation: use the mouse button to draw the pointer at any place within the colour spectrum. Select brightness: use the mouse button to draw the pointer at any place within the brightness bar.

Press the **OK** button at the end.

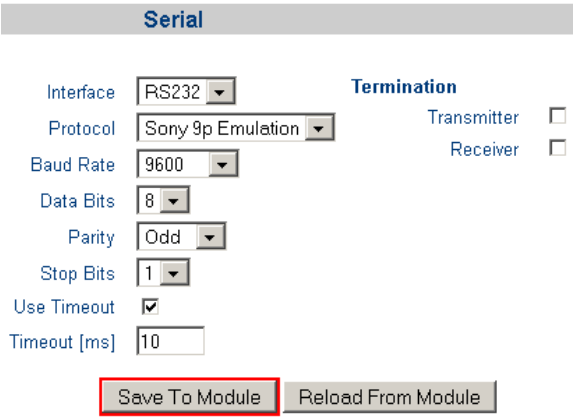
4.3.21 "Serial" Serial Interfaces for Remote Control

Depending on configuration the TCC70XS is equipped with a serial interface (in– and output pins at the SERIAL connector). The electrical format could be selected according to RS232 or RS422 or RS485 standard.

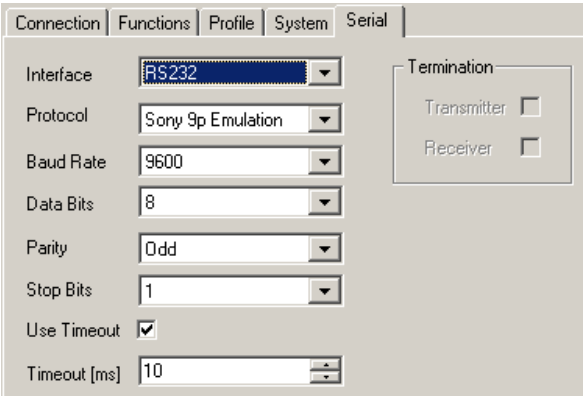
Please refer to the document "RUB +TCC70XS Application: Serial Remote Control" for details. You will find this document at the included CD. Alternatively, you can download it from:

https://plurainc.com/products/tcc70xs2/

Serial via Browser



Serial via USB



Interface Select the electrical interface

Off	Interface switched off
RS232	Interface according to RS232 standard
RS422	Interface according to RS422 standard
RS485	Interface according to RS485 standard

Protocol Select a data protocol from the drop–down list

Baud Rate Choose the baud rate:
2400 / 4800 / 9600 / 19 200 / 38 400 / 57 600 / 115 200

Data Bits *7* or *8* data bits

Parity Select the parity mode

None	Without parity
Even	Even parity bit
Odd	Odd parity bit

Stop Bits *1* or *2* stop bits

Use Timeout A timeout may be used for synchronization.

Timeout [ms] Choose a timer value for the timeout counter. Please choose a value suitable to the selected baud rate.

Termination If RS422 has been selected, the transmitter and the receiver can get a termination. If RS485 has been selected, the transmitter can get a termination.

5 Applications

5.1 Various Time Code Converters

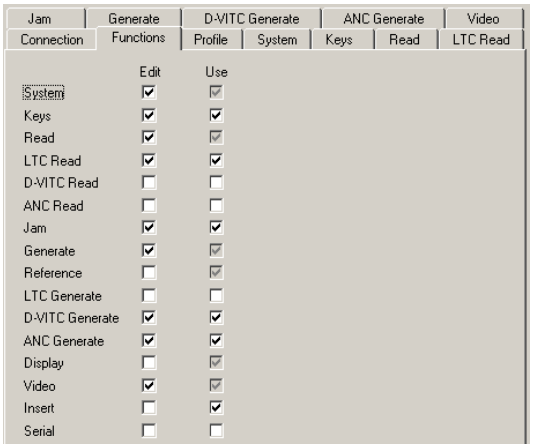
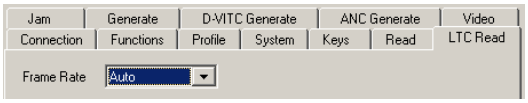
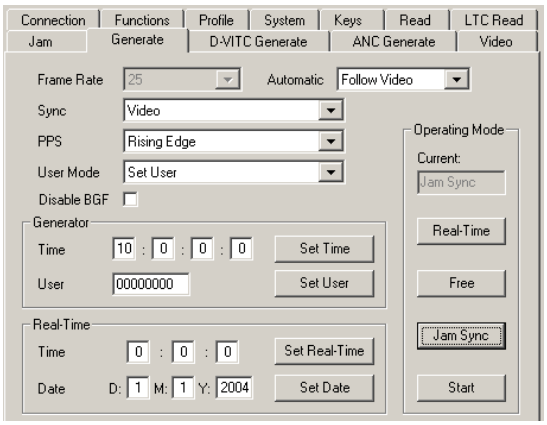
5.1.1 Conversion from LTC to Video Time Code (D-VITC, ATC)

Connect LTC to XLR female LTC IN.

Connect a video signal to BNC VIDEO IN. BNC VIDEO OUT will output this video signal + time code.

As an example, it is shown below how time code conversion can be done in a mixed SD–HD operation. An external LTC will be converted to D-VITC if a SD video signal is connected, and LTC will be converted to ATC_VITC if an HD video signal is connected.

The complete set–up concerns the **3G–Video module** only.

Configuration page **Functions**: • Enable the LTC reader (**LTC Read**). • Switch off all other readers. • Enable the **Generate**, **D-VITC Generate**, and **ANC Generate** functions. • Time code conversion requires the JAM SYNC Function, so **Jam** has to be enabled.	
Configuration page **LTC Read**: **Frame Rate**: If the frame rate of the LTC input does not change, please fix it accordingly (= picture rate of the video signal, = frame rate of the time code generator). Select *"Auto"* if you are working with different video formats (NTSC, PAL), in this case the frame rate of the LTC will be detected automatically.	
Configuration page **Generate**: **Frame Rate**: If the picture rate of the video signal does not change, you can fix the frame rate of the generator – according to the picture rate of the video signal. If you are working with different video formats (NTSC, PAL), select *"Follow Video"*, then the frame rate will follow the picture rate of the video signal. **Sync**: *"Video"*. **Operating Mode**: Click **JAM SYNC**!	

Configuration page **Read**:

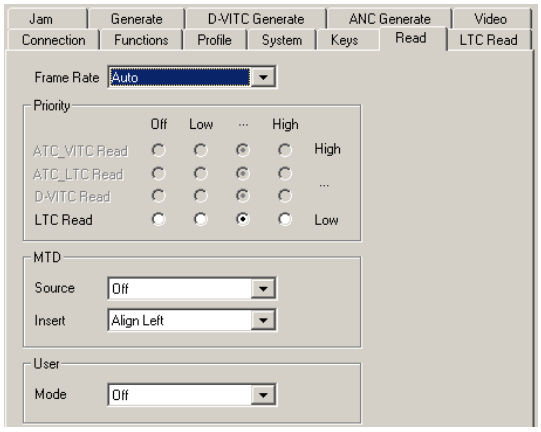
Frame Rate: If the frame rate of the LTC input does not change, please fix it accordingly (= picture rate of the video signal, = frame rate of the time code generator).

Select *"Auto"* if you are working with different video formats (NTSC, PAL), in this case the frame rate of the LTC will be detected automatically.

Priority: All *"Off"* except "LTC Read".

MTD: "Source = *Off*".

User: "Mode = *Off*".



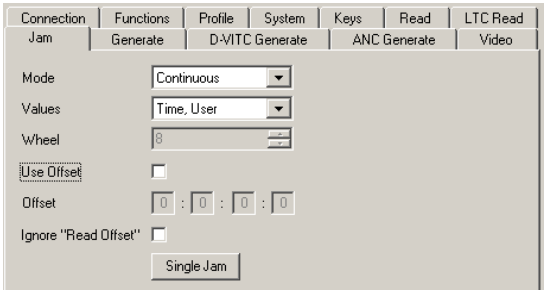
Configuration page **Jam**:

Mode: *"Continuous"* – if the time of the video time code should always (continuously, without breaks) be generated in an up-counting manner.

"Cont. 1 Frame" or *"Cont. Wheel"* – if the time of the video time code should stop in case of an LTC failure or a "still" LTC input.

Values: *"Time, User"*.

Use Offset: Not checked – unless you explicitly have to do an offset correction.



Configuration page **ANC Generate**:

Recommended setting: **On (Standard)**.

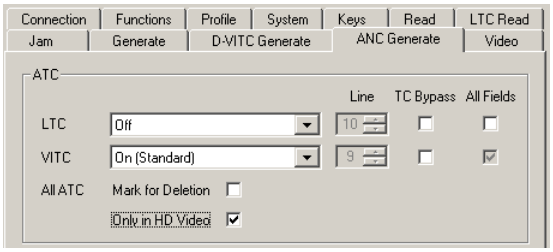
<u>SMPTE 12M recommendations:</u>

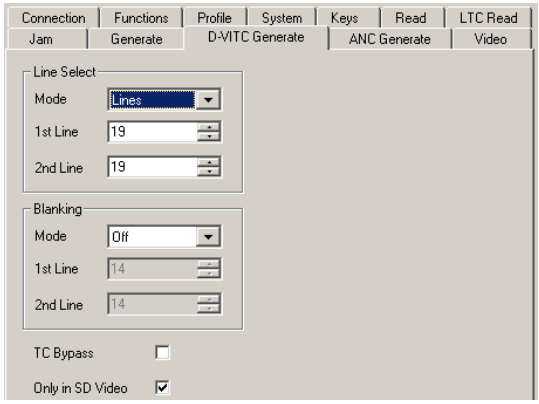
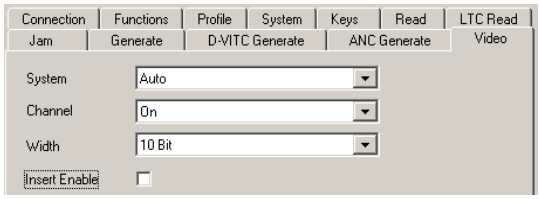
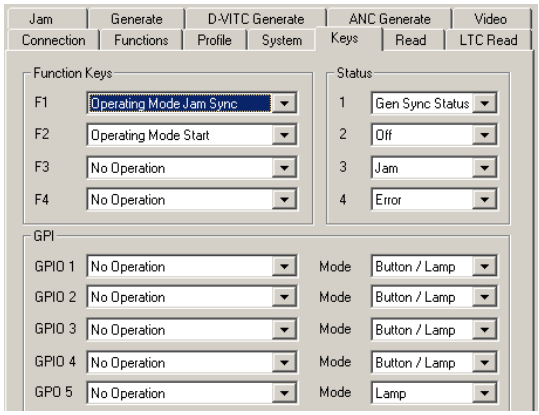
ATC_VITC in SD 625/50: V-ANC, line 9.
ATC_VITC in SD 525/60: V-ANC, line 13.
ATC_VITC in HD: H-ANC, line 9.

TC Bypass: If checked, then ATC_VITC will be generated only if ATC_VITC is <u>not</u> present in the incoming video. If ATC_VITC is already present, no new ATC_VITC will be inserted.

Mark for Deletion: If checked, then all ATC data packets will be marked for deletion. The data packets are still present and at the same location, but the data content will not be evaluated anymore from devices reading this ATC. The Ancillary Data Generator is able to insert new ATC data packets into this modified data stream.

Only in HD Video: If checked, then the ATC generator will be switched off automatically if SD video is detected.



Configuration page **D-VITC Generate**: **Line Select,** SMPTE 12M recommendations: D-VITC in SD 625/50: line 19 (and opt. 21). D-VITC in SD 525/60: line 14 (and opt. 16). 1st Line = 2nd Line: D-VITC in one line only. **Blanking:** Selected lines can be blanked. Typical application is to remove a D-VITC from the video signal. Lines which are selected for blanking and for D-VITC will be blanked before the D-VITC will be generated.	
Configuration page **Video**: **Insert Enable:** Check only if you want to visibly insert any video window into the video signal.	
Configuration page **Keys** (recommended): Status **Gen Sync Status**: feedback of the phase and frequency synchronization. Status segment lights up during video lock. Status segment flashes slowly during the fine trim procedure. Status segment flashes fast if video synchronization is lost. Status **Jam**: feedback of the jam sync method: Status segment lights up = generator receives and accepts the read time code. Status segment flashes = generator does not receive valid time code.	

Note: Upon shipping, the settings described above have been stored as a profile in the module: **Profile 1: LTC–VTC**

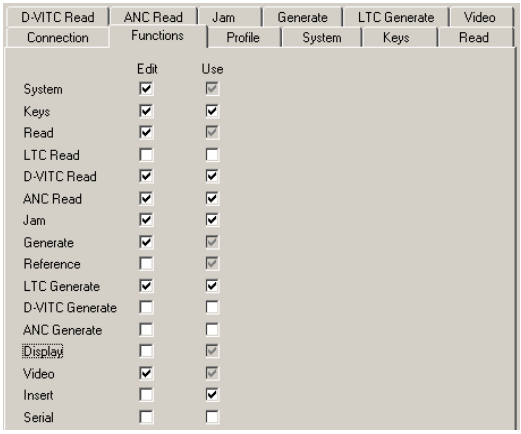
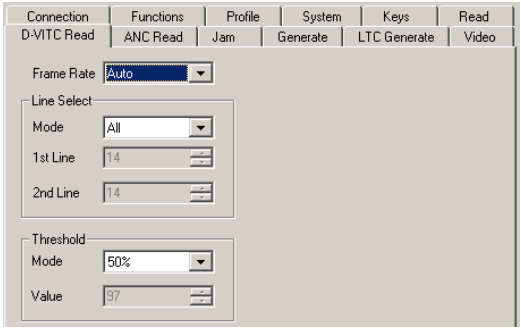
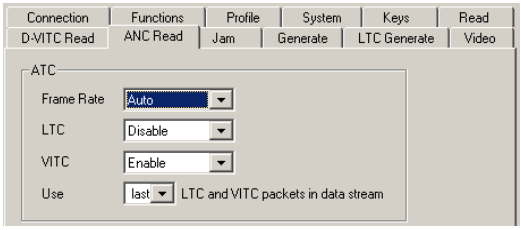
5.1.2 Conversion from Video Time Code (D-VITC, ATC) to LTC

Connect a video signal to BNC VIDEO IN. This video signal should have the video time code embedded.

The XLR male connector LTC OUT outputs the generated LTC, which will be phase aligned to the video signal, and which contains the data of the video time code with frame-accurate precision.

As an example, it is shown below how time code conversion can be done in a mixed SD–HD operation. In case of SD video signals, D-VITC will be converted to LTC; in case of HD video signals, ATC_VITC will be converted to LTC.

The complete set–up concerns the **3G–Video module** only.

Configuration page **Functions**: • Enable the **Read**, **D-VITC Read**, and **ANC Read** functions. • Enable the **Generate** and **LTC Generate** functions. • Time code conversion requires the JAM SYNC Function, so **Jam** has to be enabled.	
Configuration page **D-VITC Read**: **Frame Rate**: If the frame rate of the D-VITC input does not change, please fix it accordingly (= picture rate of the video signal, = frame rate of the time code generator). Select *"Auto"* if you are working with different video formats (NTSC, PAL), in this case the frame rate of the LTC will be detected automatically.	
Configuration page **ANC Read**: **Frame Rate**: If the frame rate of the ATC_VITC input does not change, please fix it accordingly (= picture rate of the video signal, = frame rate of the time code generator). Select *"Auto"* if you are working with different video formats (NTSC, PAL), in this case the frame rate of the ATC_VITC will be detected automatically.	

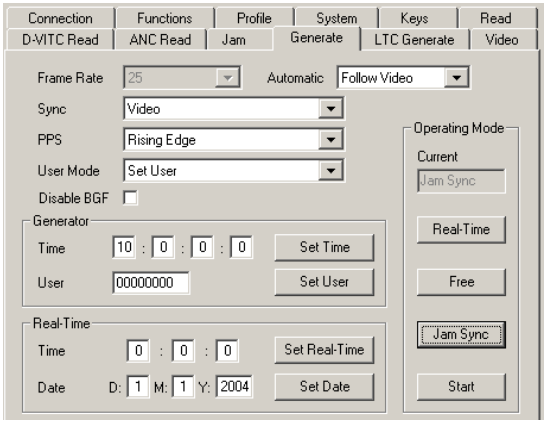
Configuration page **Generate**:

Frame Rate: If the picture rate of the video signal does not change, you can fix the frame rate of the generator – according to the picture rate of the video signal.

If you are working with different video formats (NTSC, PAL), select *"Follow Video"*, then the frame rate will follow the picture rate of the video signal.

Sync: *"Video"*.

Operating Mode: Click **JAM SYNC**!



Configuration page **Read**:

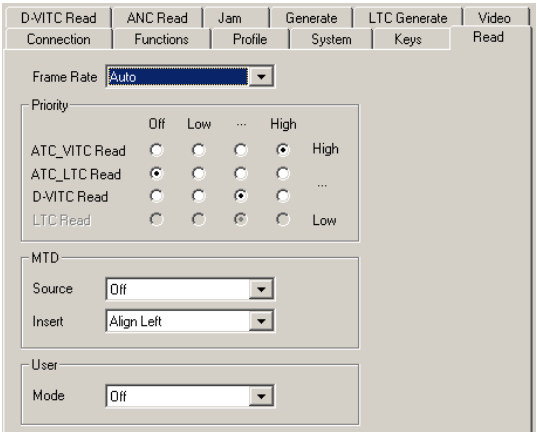
Frame Rate: If the frame rate of the D-VITC and ATC does not change, please fix it accordingly (= picture rate of the video signal, = frame rate of the time code generator).

Select *"Auto"* if you are working with different video formats (NTSC, PAL), in this case the frame rate will be detected automatically.

Priority: You can assign different priorities to the video time codes.

MTD: *"Source = Off"*.

User: *"Mode = Off"*.



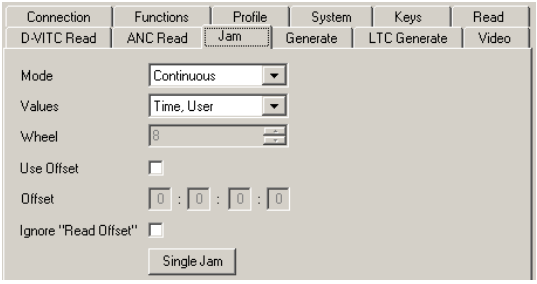
Configuration page **Jam**:

Mode: *"Continuous"* – if the time of the LTC should always (continuously, without breaks) be generated in an up-counting manner.

"Cont. 1 Frame" or *"Cont. Wheel"* – if the time of the LTC should stop in case of a failure or a "still" input of the video time code.

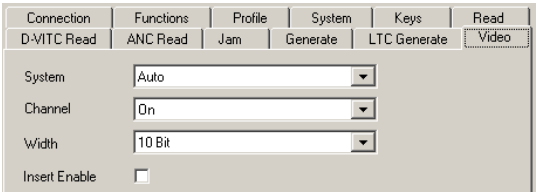
Values: *"Time, User"*.

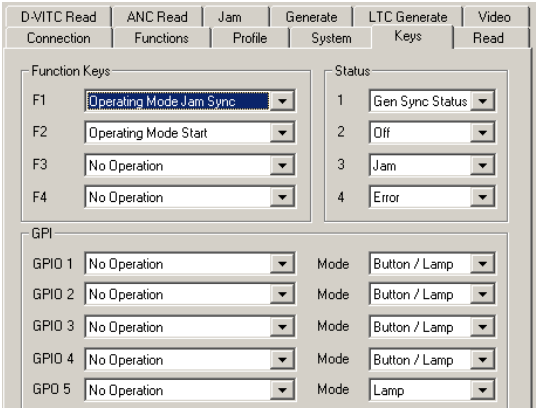
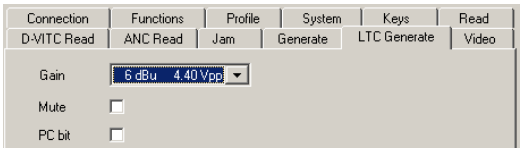
Use Offset: Not checked – unless you explicitly have to do an offset correction.



Configuration page **Video**:

Insert Enable: Check only if you want to visibly insert any video window into the video signal.



Configuration page **Keys** (recommended): Status **Gen Sync Status**: feedback of the phase and frequency synchronization. Status segment lights up during video lock. Status segment flashes slowly during the fine trim procedure. Status segment flashes fast if video synchronization is lost. Status **Jam**: feedback of the jam sync method: Status segment lights up = generator receives and accepts the read time code. Status segment flashes = generator does not receive valid time code.	
Configuration page **LTC Generate**: **Gain:** You can adjust the output level of the LTC if necessary.	

Note: Upon shipping, the settings described above have been stored as a profile in the module: **Profile 2: VTC–LTC**

5.2 TCC70XS as a Real–Time Time Code Generator

The real–time method of operation requires to

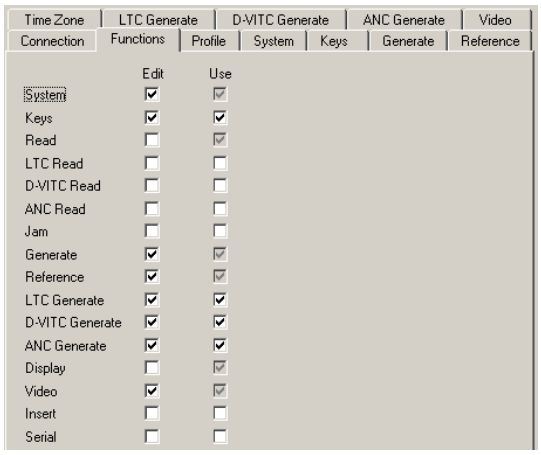
- select and configure any real–time reference,
- switch on the **REAL–TIME** mode of the time code generator.

Mostly, a real–time reference delivers time & date of the UTC time zone. In case a DCF77 receiver is used, time zone of the reference probably will be CET/CEST. You enter the parameters of this time zone, now TCC70XS can calculate the UTC which will be the internal time base. Time & date of any local time zone can be generated programming the offsets from UTC.

As an example, the basic set–up of the **3G–Video module** is shown below. You can connect an external real–time reference; alternatively (even additionally) the NTP client can be used. Please refer to chapter "NTP Client" concerning the set–up of the NTP client functionality.

Configuration page **Functions**:

- Enable the **Generate** function.
- Switch on time code generators – according to your application: **LTC Generate**, **D-VITC Generate**, **ANC Generate**.
- Enable the **Reference** function.



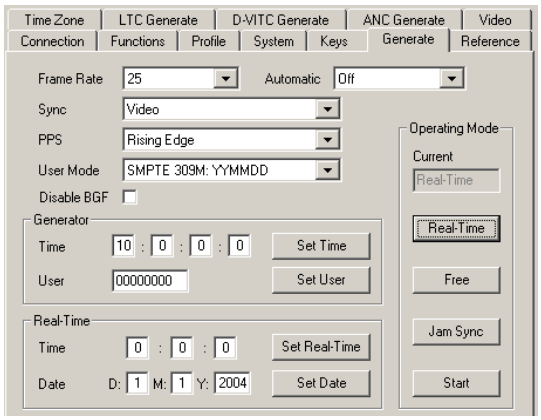
Configuration page **Generate**:

Frame Rate and **Automatic**: We recommend to switch off the automatic mode and to fix the frame rate of the time code generator.

Sync: If you are working with video signals, connect a SD/HD/3G video signal for synchronization purposes and set "Sync = *Video*". Set "Sync = *PPS*" if no video signal is used.

User Mode: The date can be transmitted in the user data of the time code. Select the format of a date from the dropdown list.

Operating Mode: Click **Real–Time**!



Configure the time code outputs:

LTC: → refer to chapter "LTC Generate: LTC Generator Functions".

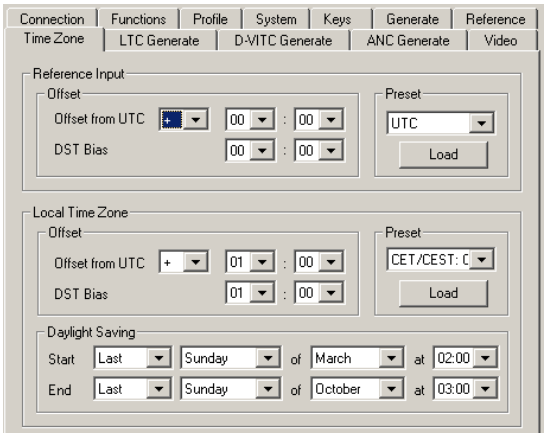
D-VITC: → refer to chapter "D-VITC Generate: D-VITC Generator Functions".

ATC: → refer to chapter "ANC Generate: Ancillary Data Generator Functions".

Configuration page **Time Zone**:

Reference Input: If the real–time reference does not deliver UTC, select the time zone of the reference from the **Preset** list and click **Load**, or enter the offsets manually.

Local Time Zone: Select the local time zone from the **Preset** list and click **Load** or enter the offsets and the parameters of a DST switching manually.



Configuration page **Reference**:

Reference

Source: *"External PPS + Serial"* or *"NTP Client"*.

Format: If *"External PPS + Serial"* is set: you have to select the serial protocol which must conform to the protocol used from the real–time reference.

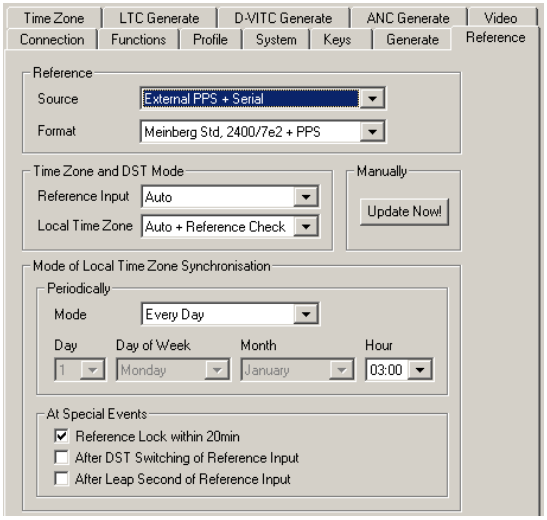
Time Zone and DST Mode

Reference Input: *"Auto"*.

Local Time Zone: *"Auto+ Reference Check"*, if the local time zone utilizes a daylight-saving time (DST).

"UTC+ Reference Check", if no daylight-saving time is in effect.

Please adjust all other parameters as shown.



Configuration page **Keys** (recommended):

Key F1 = **Operating Mode Real–Time**.

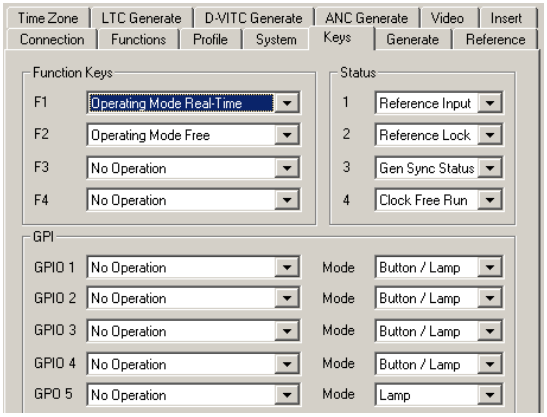
Key F2 = **Operating Mode Free**.

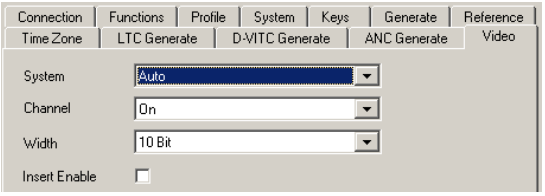
Status **Reference Input**: Lights up if the unit receives and accepts signals of a real–time reference.

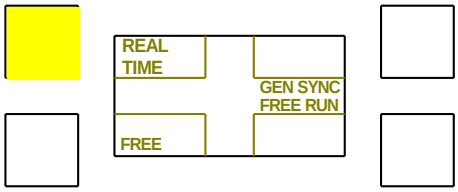
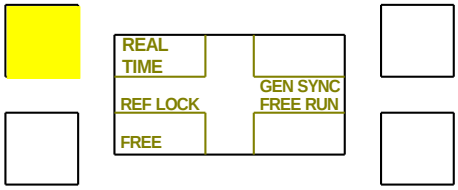
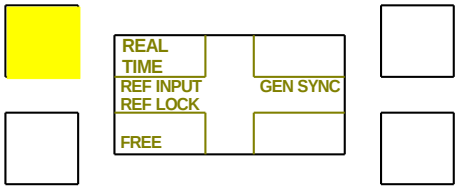
Status **Reference Lock**: Indicates the status of the real–time reference.

Status **Gen Sync Status**: Feedback of the phase and frequency synchronization.

Status **Clock Free Run**: Indicates the precision of the internal real–time clock.



Configuration page **Video**: **Insert Enable**: If the video output of TCC70XS is used e.g. for a video time code, but no video window should be visible, uncheck this checkbox. If you want to visibly insert a time & date for example, check this checkbox.	
Configuration page **Insert**: → please refer to chapter "Insert Real–Time and Date".	

If the recommended set–up at configuration page **Keys** has been performed, the lamps and the OLED display indicate ... during the first minute:	
shortly after having received valid time & date of the reference:	
during normal operation:	

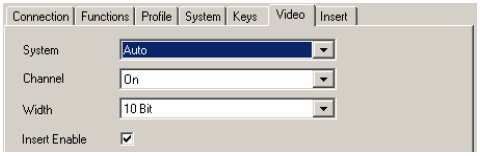
Note:	Upon shipping, the settings described above + setting "insert time & date of the internal real–time clock in video windows" have been stored as a profile in the module: **Profile 3: Real–Time**

5.3 Insert Real–Time & Date

5.3.1 Real–Time & Date of the Internal Real–Time Clock

- Working in a real–time application the time code generator should be switched to the **REAL–TIME** method of operating.
- Real–time & date of the internal real–time clock can be visibly inserted in a video window. If TCC70XS receives valid data from a real–time reference, the internal real–time clock updates its time & date with data of the real–time reference. All necessary settings are taken at configuration pages **Reference** and **Time Zone** of the **3G–Video module**.

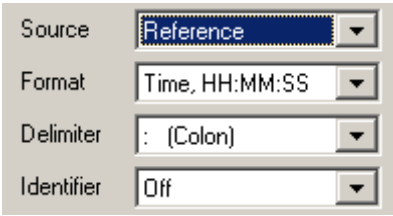
Configuration page **Video** (3G–Video module):
You have to check **Insert Enable** to let all programmed video windows become visible!



Set–up of the video windows is done at configuration page **Insert** of the **3G–Video module**.

Example: Window 1 = real–time.

Check **Visible** and adjust size and position of the video window.



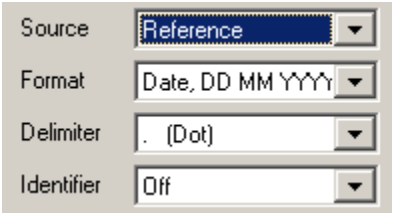
Source = *Reference*

Format = *Time, HH:MM:SS* or
Time, HH:MM:SS:FF

Any other parameter can be selected freely.

Example: Window 2 = date.

Check **Visible** and adjust size and position of the video window.



Source = *Reference*

Format = *Date, DD MM YYYY* or
Date, MM DD YYYY or any other
"*Date*" format.

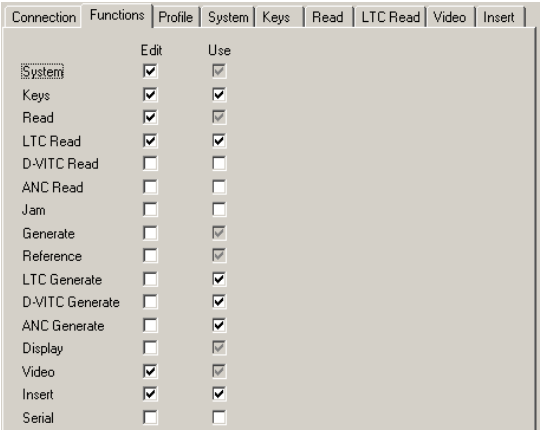
Any other parameter can be selected freely.

5.3.2 Real–Time & Date of an External Time Code via READ

TCC70XS is able to read and decode real–time & date from an external time code. Please notice that an external time code cannot be accepted as a real–time reference for the time code generator. TCC70XS is able to visibly insert real–time & date in a video signal. This feature is independent from the method of operating of the time code generator.

Normally, the real–time time code will be of the LTC format.

Step 1: Choose time code reader and configuration pages (3G–Video module):



At configuration page **Functions** click **Use**

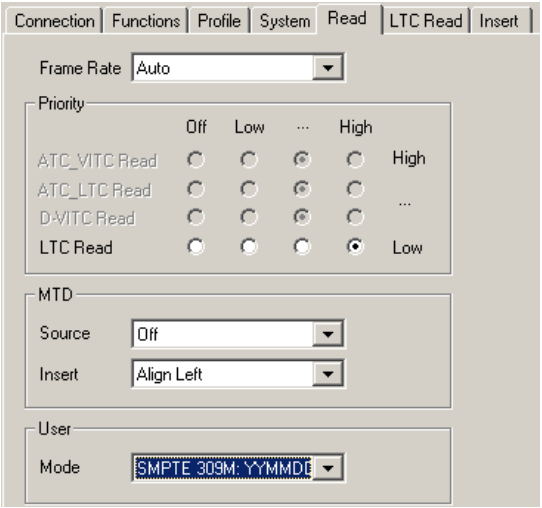
at **Read**,

at **Video**,

at **Insert**,

and at **LTC Read** (or at the reader of that time code format which transports the real–time).

Step 2: Configuration page **Read** (3G–Video module):



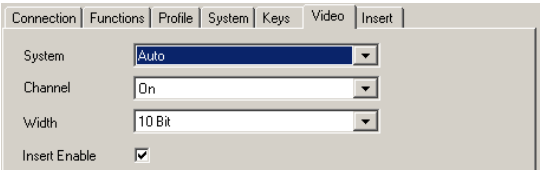
Choose priority "High" for **LTC Read** (or for the reader of that time code format which transports the real–time),

priority "*Off*" for all other time code readers,

"MTD – Source = *Off*".

"**User – Mode**": You have to know in which way the time code source encodes the date in the user data. Select this format from the drop–down list. Only this ensures a proper decoding of the date.

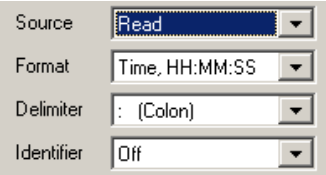
Step 3: Configuration page **Video** (3G–Video module):



You have to check **Insert Enable** to let all programmed video windows become visible!

Step 4: Configuration page **Insert** (3G–Video module):

Insert real–time:



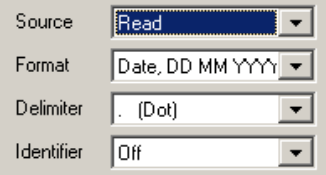
Choose a window and click **Visible**.

Source = *Read*

Format = *Time, HH:MM:SS* or *Time, HH:MM:SS:FF*

Any other parameter can be selected freely.

Insert date:



Choose a window and click **Visible**.

Source = *Read*

Format = *Date, DD MM YYYY* or *Date, DD MM YY* or any other "*Date*" Format.

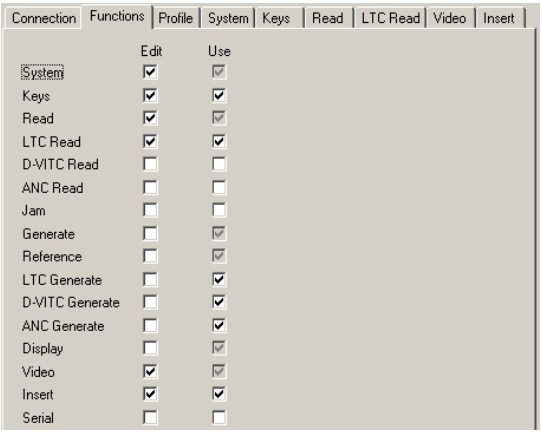
Any other parameter can be selected freely.

5.4 Insert MTD Timer or MTD Date

Time code generators of type RUB GT or RUB GL are able to transmit MTD data in the user data of the time code. MTD data can include stop timers, various time zones, and a date.

TCC70XS can read and decode these data. Normally MTD data will be transmitted in an LTC format of time code. This feature is independent from the method of operating of the time code generator.

Step 1: Choose time code reader and configuration pages (3G–Video module):



At configuration page **Functions** click **Use**

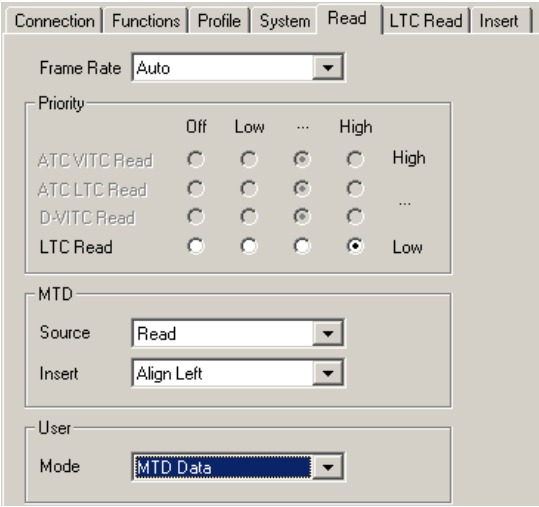
at **Read**,

at **Video**,

at **Insert**,

and at **LTC Read** (or at the reader of that time code format which transports the MTD data).

Step 2: Configuration page **Read** (3G–Video module):



Choose priority "High" for **LTC Read** (or for the reader of that time code format which transports the MTD data),

priority "*Off*" for all other time code readers,

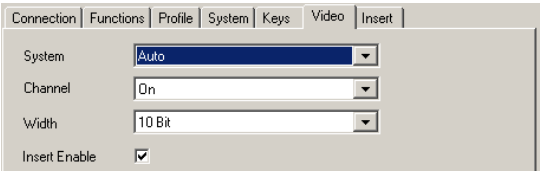
"MTD – Source = *Read*",

"User – Mode = *MTD Data*".

Selection at "MTD – Insert" adjusts the video window of the MTD timer:

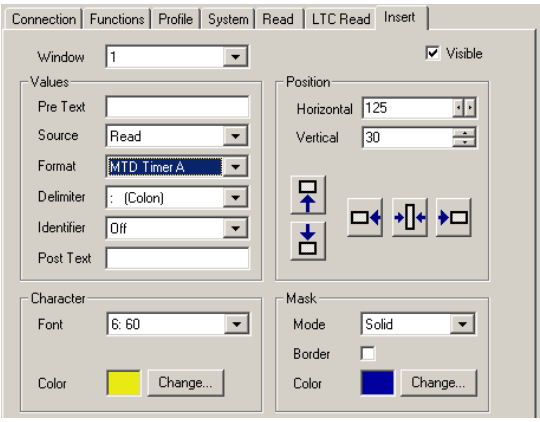
Align Left	Left adjusted
Align Right	Right adjusted
Fixed Size	Window fixed to maximal width

Step 3: Configuration page **Video** (3G–Video module):



You have to check **Insert Enable** to let all programmed video windows become visible!

Step 4: Configuration page **Insert** (3G–Video module):



Choose

a window and click **Visible**,

"Source = *Read*",

"Format = *MTD Time A*" or any other MTD timer as you like. If you want to insert the MTD date, select "Format = *Date, DD MM YYYY*" or any other "*Date*" format.

Any other parameter can be selected freely.

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

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

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