

HORITA TCP-50
SMPTE TIME CODE PROCESSOR
USER MANUAL

For Models TCP-50, RM-50/TCP, SR-50/TCP
And AO-50/TCP

Doc. 073144-00
Rev. B
(C) Copyright 2014



COPYRIGHT

(C) 2014 HORITA Co. Inc., All rights reserved

No part of this document may be copied or reproduced in any form or by any means without prior written consent of HORITA Co. INC., P.O. Box 3993, Mission Viejo, CA 92690.

HORITA Co. INC. makes no warranties with respect to this documentation and disclaims any warranties of merchantability or fitness for a particular purpose.

HORITA, its logo, and TCP-50 are trademarks of HORITA Co., Inc.

Table Of Contents

1 GENERAL	5
1-1 Word and Acronym Definitions	5
2 FEATURES	6
3 CONNECTING	7
3.1 Connecting Power	7
3.2 Operating From Battery Power	8
3.3 Connecting Video IN and OUT	8
Figure 3-1, Basic TCP-50 Hookup	8
3.4 Connecting Time Code IN and OUT	8
4 OPERATING	8
4.1 Front Panel Switches	8
4.2 POWER Switch	8
4.3 MODE Switch	8
4.4 POSITION Switch	9
4.5 CHAR Switch	9
4.6 TCP-50 Mode Flow Diagram Explanation	9
Figure 4-1, TCP-50 Mode Flow Diagram	9
4.7 LED Operation	9
Table 4-1, TCP-50 LED Operation	9
4.8 Entering and Exiting the Setup Menus	10
4.9 Selecting Different Setup Menu Items	10
4.10 Changing the Selected Menu Item	10
4.11 "DISPLAY SETUP" Menu	10
4.12 "TIMECODE SETUP" Menu	11
4.13 "TCR ERR ANALYZER" Menu	13
4.14 "USERBIT SETUP" Menu	14
4.15 Selecting Local Titling Mode and	15
4.16 Character Selection	15
Table 4-2, Character Set	15
4.17 Inserting Spaces and Deleting Characters	16
4.18 Centering a Line of Text	16
4.19 Turning the Display Off and On	16
4.20 Time Code Jam and Genlock Operations	17
4.21 "Jamming"	17
4.22 "Genlock"	17
4.23 AUT SET JAM/LOK Mode Operation	18
Table 4-3, TCP-Auto Jam/Tolerance/Genlock	
Settings	18
4.24 Time Code Frame Rate Translation	18
4.25 Time Code Offset	18
4.26 Time Code Backup or Repair	19
4.27 Time Code User Bit Substitution	19
4-28 Time Code "Start/Stop" Operation	19
4.29 Time Code Error Analyzer	20
4.30 SIGNAL INPUT Error	20
4.31 SYNC PAT Error	20
4.32 FPS Error	20
4.33 DROP/N-DROP Error	20
4.34 VALID TIME Error	20
4.35 VALID SEQUENCE Error	21

5 MAINTENANCE	21
5.1 Cleaning	21
5.2 Service and Troubleshooting	21
5.3 Adjustments	21
Figure 5-1, Adjustment Locations	21
5.4 Horizontal Size Adjustment	21
5.5 Video Level & Equalization Adjustment	21
6-SPECIFICATIONS	22

1 GENERAL

This manual provides instructions for installing and operating the HORITA TCP-50 Time Code Processor.

The TCP-50 is intended for use in field, studio, editing, engineering, and post production situations where it is desired to translate between time code frame rates, add an offset to an existing time code value, repair a time code signal, evaluate time code signal integrity, or provide a seamless switchover to a backup time code signal should a master time code signal fail.

The TCP-50 consists of a SMPTE longitudinal Time Code Reader (TCR) and a SMPTE longitudinal Time Code Generator (TCG) which operate together to perform the various translation functions. The TCP-50 has a time code input for the TCR and a time code output from the TCG. There is also a composite video input to lock the TCG time code to a video reference ("genlock"), and to overlay the video with the TCR and TCG time code numbers or various TCP-50 operational setup menus.

The TCP-50 also allows user entry up to 9 lines of 20 characters each of source ID or other alphanumeric titling information.

All of the TCP-50 setup information, operating mode selection, and titling information is saved in a battery backed up, non-volatile memory, and restored at power up.

1.1 Word and Acronym Definitions

Word and acronym definitions used in this manual are defined below:

DF	Drop Frame time code - A 30FPS time code numbering system consisting of hours, minutes, seconds, and frames (HR:MN:SC:FR) running at the slightly slower frame rate of 29.97FPS rate causes the "real" time indicated by the numbers to also run slightly slower, gradually falling behind real time to accumulate an error of about 3 1/2 seconds an hour. To correct this error in real time, some frame numbers are "skipped" or "dropped" from the expected numbering sequence. The formula is that at the start of each minute, except for a new tens of minute, the frame number sequence progresses from frame number 29 to frame number 02, rather than from frame number 29 to frame number 00. This skipping ahead by 2 frame numbers a minute causes the time code time to match that of real time.
EBU	European Broadcast Union - European standards setting organization.
FPS	Frames-Per-Second of video, film, or time code. 23.976FPS - video "film" camera frame rate proportionally slowed to match 29.97FPS video rate 24FPS - film speed frame rate. 25FPS - European PAL television frame rate. 29.97FPS US NTSC color television frame rate. 29.97DF - "Drop frame" time code that matches US television frame rate as well as real time. 29.97NDF - "Non-drop frame time code that matches US television frame rate but whose time value runs slower than real time. 30FPS - US television BW frame rate.
Freerun	Not locked to a reference.
Genlock	To lock signals together such that one is a timing reference for the other. For example, to lock time code generation to a video reference so that each frame of time code is generated in exact synchronism with each video frame.
Jam, jamming,	To preset a time code generator to the same time as a time jammed code reader to cause the generated time code to be the same as the read time code.
LTC	Longitudinal (or Linear) Time Code - time code that has a frequency range that allows it to be recorded on an audio recorder or the audio track of a video recorder. Generally, longitudinal refers to being

recorded on a continuous path along the length of the tape, rather than on "tracks" via a spinning head as video is recorded.

See "TC"

NDF Non-Drop Frame time code - time code that does not skip frame numbers 00 and 01 at the start of each minute, but then whose time does not match that of real time.

NTSC National Television Systems Committee - US standards setting organization.

SMPTE Society of Motion Picture and Television Engineers - US standards setting organization.

TC Time Code - An electronic timing signal consisting of two audio tones that represent binary ones and zeros which are then in turn used to encode a unique number for a each frame of video or film.

Instead of simply numbering the frames starting from 1 and proceeding on up, the frames are numbered with an hours, minutes, seconds, frame value. This is so that, as long as there are an exact number of frames in a second (no fractional number of frames in a second), the resulting frame number is also a number that matches real time. This is convenient for editing television and film.

See "LTC"

TCR Time Code Reader - reads and decodes SMPTE longitudinal time code.

TCG Time Code Generator - generates SMPTE longitudinal time code.

UB User Bits - Extra "user" information embedded within the hours, minutes, and seconds of the actual time code numbers.

2 FEATURES

- Four separate setup screens containing five menus for DISPLAY, TIMECODE, TCR ERR ANALYZER, USERBIT, and SYSTEM setup provide simple and easy user selection of character attributes such as size, position, black/white, etc., time code and user bit values, translation modes, monitoring of time code reading errors, and selection of video standard.
- Time Code Reader (TCR) portion of the TCP-50 reads SMPTE/EBU Longitudinal Time Code (LTC) at frame rates of 23.976FPS (Frames-Per-Second) 24FPS, 25FPS, drop and non-drop frame 29.97FPS, and 30FPS, at play speed +/- 20%.
- TCR "Auto FPS" detect mode automatically detects 24, 25, 29.97 drop frame and 30FPS frame rates. Other frame rates can be manually set.
- TCR can display a video overlay of the time code and/or user bit numbers.
- TCR "Error Analyzer" displays six 4-digit counter values for time code reading errors due to loss of the TCR input signal, a bad time code "sync" pattern, a bad FPS value, a drop/non-drop frame error, an invalid time code number, or an invalid time code sequence.
- TCR Error Analyzer also features a time code/video phase meter display which shows the timing relationship between the TCR time code signal input and the video signal input. This is useful to determine if and at what point the time code is locked to the incoming video or if the time code is free-running.
- TCG can video overlay display the SMPTE/EBU Longitudinal Time Code (LTC) output.
- TCG can generate time code at 23.976FPS, 24FPS, 25FPS, 29.97FPS DF (Drop Frame), 29.97FPS Non-Drop Frame, and 30FPS (non-drop frame), with a freerun accuracy of +/- 1 frame-per-hour.
- TCG can manually or automatically "Jam" (preset) to the TCR time code input value.

- A TCG automatic Jam can be set to take place if the time difference between the TCR and TCG time code values exceeds a user settable value of from zero seconds and frames to over 59 seconds and 29 frames.
- TCG can be set to "freerun" or to "genlock" (phase lock) the generated time code to incoming video or to the TCR time code input.
- When transcoding between any combination of frame rates of 24FPS, 25FPS, and 30FPS, or between 23.976 and 29.97 non-drop frame, the TCG can be set to genlock to the TCR time code so that although the frame rates are different, each second of the time codes occur at the same time.
- TCG can be set to run continuously after once being started, or to start and stop in response to the input time code being read.
- A special TCG Auto Jam/Genlock setup mode automatically sets up the TCP-50 for an optimum Jam type, Jam error tolerance, and genlock mode according to the TCR and TCG frame rate selections.
- TCG time code output can be offset from the TCR input time code by positive or negative values from 1-frame up to a 23:59:59:29 time value.
- The TCG "user bit" portion of the generated time code can be set to match that of the TCR input or can be set to substitute manually entered values for each of the eight (8) "nibbles" of the generated user bits.
- TCR and TCG Video overlay displays can be set as black or white characters, with or without a background, with size selectable between four horizontal and four vertical values.
- The nine lines of the video overlay display can be automatically numbered (and unnumbered) from 1-9 for easier placing of time code or source ID information on the screen.
- Front panel LED blinks to indicate time code is being read and video is present.
- Operates from a small AC power adapter, which is included, or can be operated in the field from 9-to-14 volts DC battery power.
- Available in desktop (TCP-50), Rackmount (RM-50/TCP), Rackmount Add On (AO-50/TCP) or Shortrack (SR-50/TCP) models.

3 CONNECTING

3.1 Connecting Power

Included with your TCP-50 is an AC power adapter that provides a 9 volt, 500 milliamperes DC output. This adapter is equipped with a miniature phone plug with the "+" (positive) voltage output connected to the front tip of the plug.

Insert the power plug into the TCP-50 "+9V POWER" connector and plug the adapter into 110-120 volt, 60-Hz AC power.

WARNING:

ELECTRICALLY OPERATED PRODUCT

As with all electrical products, precautions should be observed during handling and use to prevent electrical shock.

NOTE:

Make sure the plug is inserted all the way into the power connector or else damage to the power adapter may result. The TCP-50 has internal protection circuitry to prevent it from being damaged should the wrong polarity of power be applied. However, do not use an adapter of more than 9 volts at 500 milliamperes or damage to the TCP-50 may result.

3.2 Operating From Battery Power

You can operate your TCP-50 from battery power in order to use it in the field to process time code or add source Id or other titling information.

The TCP-50 can be operated from 9-to-14 volts DC, obtained either from a conventional 12 volt video camera battery or other DC source.

3.3 Connecting Video IN and OUT

Figure 3-1 shows a basic hookup for the TCP-50 when used with a typical video source and a video recorder or monitor.

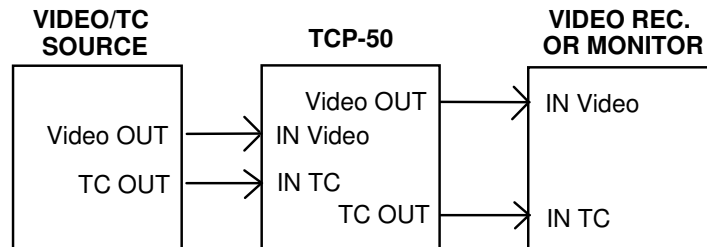


Figure 3-1, Basic TCP-50 Hookup

Connect video from the video source to the BNC connector labeled VIDEO IN on the TCP-50. Connect VIDEO OUT from the TCP-50 to downstream video equipment such as video monitors or video recorders, as desired.

When the TCP-50 is powered up, the VIDEO IN input is terminated at 75 Ohms. When powered off, video is looped directly from VIDEO IN to VIDEO OUT, bypassing the TCP-50.

3.4 Connecting Time Code IN and OUT

Connect time code from the time code source to the RCA connector labeled TC IN on the TCP-50. Connect TC OUT from the TCP-50 to the downstream equipment as desired.

4 OPERATING

To operate the TCP-50, connect video and time code in and out, apply power, and set the POWER switch to ON. A red LED above the power switch lights steady on or begins flashing when the TCP-50 is powered up.

When the TCP-50 is first powered up, its operation returns to that which was selected when the TCP-50 was last powered down. The POSITION and CHAR switches operate to provide quick and convenient control of the horizontal and vertical position of the display, without going through any "menu" operations.

4.1 Front Panel Switches

There are four toggle type switches on the front panel, labeled POWER, MODE, POSITION, and CHAR. Operation of each of these switches is described in the following paragraphs.

4.2 POWER Switch

The power switch turns TCP-50 power on and off. A red LED located above the power switch lights to indicate power is on and also blinks at different rates to indicate presence of the time code and video inputs as described in more detail in later paragraphs.

4.3 MODE Switch

The MODE switch is a three position momentary action switch used to select and control the basic operate/setup modes of the TCP. The center position of the switch is off and the switch can be actuated to either DISPLAY or SETUP positions.

When the MODE switch is first actuated to SETUP, the TCP-50 switches into SETUP mode and the previously selected setup menu and menu item are displayed. Thereafter, each time SETUP is selected the TCP-50 selects a different setup menu.

There are four setup screens and five setup menus titled: DISPLAY SETUP, TIMECODE SETUP, TCR ERR ANALYZER, USERBIT SETUP, and SYSTEM SETUP.
When actuated to DISPLAY from SETUP, the TCP-50 displays a video overlay of the TCR and TCG time code times and/or user bit values, if enabled via an associated menu selection, as well as any source ID information entered for display.

4.4 POSITION Switch

The POSITION switch is a three position momentary action switch labeled with left/right and up/down arrows. This switch is used to select various menu items when the TCP-50 is in SETUP mode, or to select the screen position for a character when entering data in DISPLAY mode.

4.5 CHAR Switch

The CHAR (character) switch is a three position momentary action switch labeled PREV/NEXT and is used to change a selected menu item's value when in SETUP mode, for example Y/N, ON/OFF, etc., or to select a specific character when entering data in DISPLAY mode.

4.6 TCP-50 Mode Flow Diagram Explanation

Figure 4-1 shows how operation of the TCP-50 changes as the MODE switch is actuated between DISPLAY and SETUP. The down arrow means that the MODE switch is actuated down to SETUP, the up arrow means that the switch is actuated up to DISPLAY.

The diagram shows that, for example, if the TCP-50 was displaying source ID information, actuating the MODE switch to SETUP would cause the TCP-50 to display a SETUP menu, while actuating the switch to DISPLAY would cause the display to turn off.

↑ UP arrow = DISPLAY
↓ DOWN arrow = SETUP

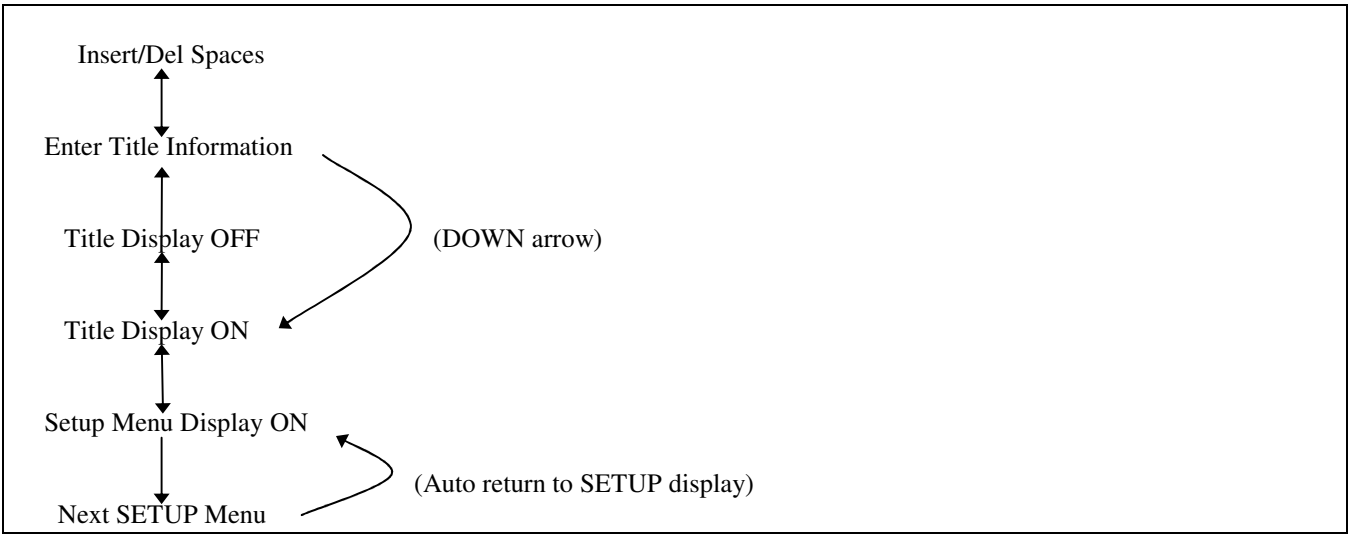


Figure 4-1, TCP-50 Mode Flow Diagram

4.7 LED Operation

The front panel LED blinks at different rates to provide indication of TCP-50 operation. This is shown in Table 4-1.

LED Condition	Meaning
OFF	Power off
Steady ON	Video present, no time code
Slow blink, 1-sec. ON/OFF	No video present
Fast blink ON/OFF	Reading time code
Combination Slow/Fast blink	Reading time code, no video

Table 4-1, TCP-50 LED Operation

4.8 Entering and Exiting the Setup Menus

The setup menus allow selection of various display and character attributes, operating modes and functions, entering user bit data, and error monitoring.

To display the setup menus, toggle the MODE switch to SETUP and release. Depending on the actual mode that the TCP-50 is operating in, you may have to toggle the switch a few times to enter a setup menu.

The selected item on the setup menu is indicated by it "flashing" on and off, and the POSITION and CHAR switches now serve to select and change the flashing menu item.

To exit the setup mode, actuate the MODE switch to DISPLAY and release.

4.9 Selecting Different Setup Menu Items

Menu items are selected via the POSITION switch. Flashing of the menu selection moves on to the next item each time the POSITION switch is actuated and released. Actuating the switch down causes the selection to move to the right and down, actuating the switch up causes the reverse action. Holding the POSITION switch actuated causes quick scanning through the menu items.

Generally, user selectable and changeable items are preceded by a colon ":" character. Menu items or values that result from internal TCP-50 calculations or automatically selected items are preceded by an equal "=" character.

4.10 Changing the Selected Menu Item

This section contains a detailed description of each setup menu, each setup menu item, and the specific operation of the TCP-50 for each item selection option.

After a menu item is selected, the choices available for that item are accessed via the CHAR switch. Actuating the CHAR switch down or up scans forward or backward through the choices available. Holding the switch actuated causes automatic scanning through the choices.

4.11 "DISPLAY SETUP" Menu

A typical DISPLAY SETUP menu appears on the TCP-50 screen as follows:

```
*DISPLAY SETUP*
CHAR:WHT    BACK: ON
SIZE        H:1X V:2X
POSITION    H:17 V:30
CLR SCR:N   SYS RST:N
NUMBER LINES 1-9:  N
TCR/TCG SELECT:  TCR
  TC  DSP: ON   POS:L8
  UB  DSP:OFF   POS:L6
```

The following paragraphs provide a detailed explanation of each of the DISPLAY SETUP menu items.

ITEM	FUNCTION	SELECTIONS
CHAR	Selects character "color" .	WHT = white characters BLK = black characters
BACK	Selects character background.	ON = background is on OFF = background is off
SIZE	Character Horizontal and Vertical size.	
	H (Horizontal)	1X = 1 time (1.0 H pixels) 2X = 2 times (2.0 H pixels) 3X = 3 times (3.0 H pixels) 4X = 4 times (4.0 H pixels)
	V (Vertical)	1X = 1 time (7 H lines)

ITEM	FUNCTION	SELECTIONS
		2X = 2 times (14 H lines)
		3X = 3 times (28 H lines)
		4X = 4 times (42 H lines)

Horizontal sizes 3 and 4 are not practical for displaying time code or user bit data, but can be used for display of large source ID characters if desired.

POSITION	H (Horizontal)	06-64 Numerical reference.
	V (Vertical)	05-64 Numerical reference.

The H and V position value controls the horizontal and vertical position of entire matrix of 9 lines of 20 characters each.

CLR SCR	Clear screen	Y = Clear title screen of all text.
SYS RST	System reset	Y = Reset TCP-50 system.

System reset initializes all variable data in the TCP-50 to default values. A hardware selected SYSTEM RESET function is accessible by powering up the TCP-50 while holding the MODE switch in the "SETUP" position, then releasing it.

NUMBER	Numbers lines on screen.	Y = Add line numbers
LINES 1-9		N = Remove line numbers

Numbering of the lines helps adjust H and V position and size and locate where on the screen to place text or the time code or user bit displays. The lines are automatically numbered with 1-9 at the left side of the display when "Y" is selected. The numbers are removed when "N" is selected.

TCR/TCG SELECT	Selects the TCR or TCG for display setup.	TCR = Time code reader TCG = Time code generator
TC	Time code display	ON = TC display is on OFF = TC display is off
POS	TC display line number position.	L1-L9 = TC is displayed on selected Line-1 to line-9
UB	User bit display	ON = UB display is on OFF = UB display is off
POS	User bit display line number position.	L1-L9 = UBs are displayed on selected Line-1 to Line-9.

4.12 "TIMECODE SETUP" Menu

A typical TIMECODE SETUP menu appears on the TCP-50 screen as follows:

```
*TIMEOCDE SETUP*
TCR      00:00:00:00
FRM RATE: DF AUT29
TCG FREE  00:00:00:00
FRM RATE: DF 29.97
OFFSET:   +00:00:00:00
AUT SET JAM/LOK: ON
JAM AUT=Y  TOL:00:01
LOK:TCR=Y  ERR 00:00
```

ITEM	FUNCTION	SELECTIONS
TCR	TCR time code value being read.	00:00:00:00 - to - 23:59:59:29 Format is HR:MN:SC:FR FR (frame) value shown is for

ITEM	FUNCTION	SELECTIONS
		30 FPS time code.
FRM RATE	TCR frame rate being read or selected for reading.	23.97, 24, 25, DF 29.97, ND 29.97, 30, AUT??, AUT24, AUT25, AUT29, AUT30, frames-per-second (FPS).
AUT?? is displayed when the TCR automatic frame rate mode is first selected. It is replaced with one of the "AUT" frame rates after the frame rate of the incoming time code is detected, which may require a second or two.		
TCG	TCG time code value.	00:00:00:00 - to - 23:59:59:29 FR (frame) value shown is for 30 FPS time code.
	FREE STSP	TCG runs continuously one started Incrementing of the TCG time code stops if the TCR input time code stops or is invalid
FRM RATE	TCG frame rate being generated.	23.97, 24, 25, DF 29.97 ND 29.97, 30, frames-per-second (FPS).
OFFSET	User settable time offset between time code being read and time code being generated. Offset can be set for + or -.	+/-00:00:00:00 - to - +/- 23:59:59:29 + 00:00:00:01 means that the TCG time code is ahead of the TCR time code by +1-frame number. FR (frame) value shown is for 30 FPS time code.
AUT SET JAM/LOK	Automatically sets up optimum TCP-50 jam and genlock modes according to the TCR and TCG frame rates selected.	Y = Enable auto setup N = Disable auto setup
JAM	Selects the type of "jam" the TCP-50 is to perform. "Jam" is when the TCG is preset to the same time as the TCR time code being read.	OFF = Jam mode is off. AUT = Jam TCG if time difference between TCR and TCG is ever greater than "TOL" time. 1X = Jam one (1) time only.
TOL	Amount of time difference permitted to exist between TCR and TCG before the TCG is jammed to TCR time (JAM = AUT). Actual TCR/TCG time difference is displayed as the "ERR" value	00:00 = 00 seconds and frames 59:29 = 59 seconds, 29 frames. FR (frames) value shown is for 30 FPS time code.
LOK	Selects the type of genlock the TCP-50 is to perform. "Genlock" is when the TCG time code output is phase locked to input video or TCR	OFF = Genlock is off. TCG "free runs". VID = TCG is to genlock to input video. TCR = TCG is to genlock to TCR time code input time code.

ITEM	FUNCTION	SELECTIONS
Y/N	Indicates status of selected genlock action.	Y = Genlocked N = Not genlocked
ERR	Absolute frame difference between TCR and TCG as determined at the time each frame of time code is generated. An automatic jam is performed if this value exceeds the TOL value, when JAM = AUT.	00:00 = 00 seconds and frames 59:29 = 59 seconds, 29 frames. Error values greater than 59:29 are detected, but not displayed. FR (frame) value shown is for 30 FPS time code.

4.13 "TCR ERR ANALYZER" Menu

A typical TCR ERR ANALYZER menu appears on the TCP-50 screen as follows:

```
*TCR ERR ANALYZER*
RESET ERR COUNTS:  N
SIGNAL INPUT      G 0000
SYNC PAT          G 0000
FPS               G 0000
DROP/N-DROP       G 0000
VALID TIME        G 0000
VALID SEQ         G 0000
TC/V PHA         +++++G-----
```

ITEM	FUNCTION	SELECTIONS
RESET ERR COUNTS	Resets all 4-digit error counters to 0000. All counters count up to 9999.	Y = Reset counters N = Leave counts as is
SIGNAL INPUT	Indicates presence of good TCR input level. Each loss of input signal counts counter up one count	G = Good signal level B = Bad signal level
SYNC PAT	Indicates good "sync" pattern detected in input time code. Each sync pattern error counts counter up one count.	G = Good sync pattern B = Error in sync pattern
FPS	Indicates FPS detected in TCR input time code matches that as selected for the TCR FRM RATE. A frame rate error counts counter up one count.	G = Good frame rate B = Frame rate error
DROP/N DROP	Indicates match between drop/non-drop frame type of time code being read and that of code selected. A drop/non-drop frame error counts the counter up one count.	G = Good match B = Drop/non-drop error

ITEM	FUNCTION	SELECTIONS
VALID TIME	Indicates time read is a valid time code number from 00:00:00:00 to 23:59:59:29. An invalid time counts the counter up one count.	G = Good time code number B = Invalid time code number
VALID SEQ	Indicates time code being read is in correct sequence of each successive frame number being +1 frame greater than that of the previous frame. Each sequence error counts the counter up one count. (Note that the TCP-50 does not read time code in reverse.)	G = Good sequence B = Bad sequence
TC/V PHASE	+++++  - - - - -	

Indicates phase relationship between incoming time code and video. The center of the time code is represented by the white block. The center of the video frame is represented by the gap at the center of the “+” and “-” signs.

The position of the white “block” within the “+” and “-” signs indicates the phase relationship of the two. The time code is leading the video when the block is in the “+” area, lagging when in the “-” area. If time code is not locked to video the block continuously moves through the “+” and “-” signs.

4.14 "USERBIT SETUP" Menu

USERBIT SETUP

NUMBER 87 65 43 21
 TCR(R) 00:00:00:00
 MAN(M) 00:00:00:00
 SELECT: RR:RR:RR:RR
 TCG OUT 00:00:00:00

SYSTEM SETUP

STD:NTSC TCP-50 V110

ITEM	FUNCTION	SELECTIONS
NUMBER	Identifies the eight "nibbles" of extra data within the time code. This data is referred to as "user bits". A nibble is 4-bits of data.	87 65 43 21
TCR(R)	Displays the "hex" value of each nibble of user bit data being read by the TCR.	00:00:00:00 up to FF:FF:FF:FF
MAN(M)	Displays the "hex" value of each nibble of manually entered user bit data.	00:00:00:00 up to FF:FF:FF:FF

ITEM	FUNCTION	SELECTIONS
SELECT	Displays the users selection of either TCR (R) or MAN (M) data for each user bit nibble being output from the TCG.	Any combination of R or M selection for each nibble of data.
TCG OUT	Displays the "hex" value of the actual user bit data being output from the TCG.	00:00:00:00 up to FF:FF:FF:FF
STD	Composite video standard for lines and fields.	NTSC = 525/60 PAL = 625/50

4.15 Selecting Local Titling Mode and Entering and Editing Data.

To select the text entry TITLE mode for the TCP-50, actuate and release the MODE switch to DISPLAY until the screen displays a flashing cursor. The flashing cursor shows the position of where the next character will be entered.

4.16 Character Selection

Use the POSITION and CHAR switches to move the cursor and select the desired characters for entry as shown in Table 4.2. A blank (transparent) character is available between each grouping, and the numeric characters can be quickly accessed by scanning in the reverse (PREV) direction.

These switches operate in much the same manner as those found on the simple titlers on many camcorders. The POSITION "arrow" switches select a character's position, and the CHAR NEXT/PREV switches select a particular character from various numeric, alpha, punctuation, and math symbols. You can actuate a switch for a single selection at a time, or hold it down for 2-seconds and cause automatic and rapid selection.

When starting in the NEXT direction, the character set goes from A-Z, 0-9, punctuation, math symbols, back to A-Z, etc. Starting PREV goes in exact reverse, proceeding from 9-0, then Z-A, math symbols, punctuation, etc. This is so you don't have to go through the alphabet to get to the numbers, or go through the numbers to get to the alpha characters. A blank space character is placed between each group of characters for added convenience

Alphabet

A-Z	upper case only
blank	transparent

Punctuation

.	period
,	comma
'	apostrophe
&	ampersand
:	colon
?	question mark

Punctuation (cont.)

!	exclamation point
blank	transparent

Table 4-2, Character Set

Graphics

black box	black cursor size box
white box	white cursor size box
up arrow	
down arrow	
left arrow	
right arrow	
center dot	
underscore	(not actually under a character)
blank	transparent

Math Symbols

~	approximately
)	right parentheses
(	left parentheses
/	slash (divide)
*	asterisk (multiply)
-	hyphen (minus)
+	plus (add)
=	equal
blank	transparent

Numbers

0-9	
blank	transparent

ABCDEFGHIJKLMNOPQRSTUVWXYZ . , []
NOPQRSTUVWXYZ : ; ' " ()
0123456789 ? ! , . []
↑ ↓ ← → + - * / = & , ~

(cont.) Table 4-2, Character Set

4.17 Inserting Spaces and Deleting Characters

Actuating the MODE switch to DISPLAY when in the Title mode places the TCP-50 into the Insert/Delete mode. In this mode the cursor flashes more rapidly.

The POSITION switch is used to move the cursor to a desired line or character. Actuating the CHAR switch to PREV deletes the character under the cursor and pulls the remainder of the line to the left. Actuating the CHAR switch to NEXT inserts a space under the cursor and moves the line to the right.

4.18 Centering a Line of Text

The Insert/Delete mode is convenient for centering a line of text once entered. First, enter the text desired on each line, starting at the left of the screen. After the desired text is entered, switch to the Insert/Delete mode, position the cursor at the start of the line, and insert (or delete) spaces using the NEXT/PREV switch until the line of text is centered or placed where desired.

4.19 Turning the Display Off and On

When the MODE switch is first actuated to DISPLAY after the TCP-50 is displaying the titles, the display is turned off. If actuated to SETUP, the TCP-50 display is turned back on. In this manner the TCP-50 display can be quickly switched on and off using the front panel MODE switch.

4.20 Time Code Jam and Genlock Operations

Although related, jamming and genlocking of time code are two different functions. Jamming is the action of "instantly" presetting all of the TCP's time code generator HR:MN:SC:FR values to some other time value, while genlocking is the action of having the time code generator's timing be maintained in synchronism with another reference timing signal.

4.21 "Jamming"

Many of the TCP-50 time code operations involve setting the time code generator to the same time value as the time code being read by the time code reader. This operation is referred to as "jamming" the TCG. When the jam operation is completed, the TCG is jammed and is running, at least for that moment, in step with the incoming time code to the TCP-50.

In the TCP-50, jamming can be turned off, be set to occur just one time, or be set to occur automatically if the time value between the TCR and TCG ever exceeds a user preset amount. Generally, the TCG is jammed just one time if the TCR and TCG frame rates are not lockable to each other.

The TCG is jammed after the TCR acquires valid time code the first time after power up. In addition, the TCP-50 performs a jam operation whenever any of the following setup menu items are changed

- TCR frame rate.
- TCG frame rate.
- Offset sign and offset amount not zero.
- Offset value.
- Jam "type" (AUTO, 1X).

4.22 "Genlock"

After the TCG has been jammed to the TCR, it can be kept "locked" to the TCR's time code input or to the composite video input signal. This is referred to as "genlocked" (GENerator LOCKed). Genlocked means phase locked and this in turn means that, for example, if the frame rates of the TCP-50 time code in and time code out were the same, and if the TCG was genlocked to the TCR, that both time codes would match exactly, bit-for-bit as they were being read and generated. When the TCR was reading the input bits for the units of frames, the TCG would be outputting the exact bits for the units of frames.

When the time code is genlocked to video, this means that the TCG starts generating the frames value of the time code exactly at the start of the video frame, and ends with the time code hours value and sync pattern exactly at the end of the video frame. This process is continuously repeated as each frame of time code and video is generated, and helps insure that when a time code number is later read, that it is for that particular video frame that it overlaid in time.

When genlocking to video, if the frame rates of the video and the (TCG) time code do not match, then the TCG time code can not be genlocked to the video.

If the time code input to the TCR is not locked to video this can be accomplished by selecting VID as the genlock mode, which then locks the TCG time code output to the composite video input. If the natural time drift between the TCR input time code and the TCG time code causes the error to ever exceed the TOL value, the TCR will re-jam the generator.

When genlocking to time code, if the frame rates of the TCR and TCG time codes do not match, the TCG can still be genlocked to the TCR time code as long as the frame rates resolve at each second. This means that in the TCP, the 24FPS, 25FPS, and 30FPS frame rates can be genlocked to each other, as well as can the 23.976FPS and 29.97FPS frame rates to each other.

When genlocking to time code and integer frame rates are selected (24FPS, 25FPS, 30FPS) genlock is checked on each "00" second and the TCG is phase locked to the incoming TCR time code accordingly.

When one of the time codes is drop-frame and the other is not, then an accumulating error of 2 frames a minute occurs due to the drop-frame time code jumping from frame number 29 to 02 at each minute (all right, except on the tens-of-minutes).

Although the 29.97ND and 23.976 frame rates can be genlocked to each other they can not be genlocked to any other integer time code used as the genlock source because they simply run slower than real time.

4.23 AUT SET JAM/LOK Mode Operation

The AUT SET JAM/LOK feature automatically sets optimum TCP-50 Jam and Genlock operation according to the frame rates selected for the TCR and TCG. This auto setup mode should provide optimum operation of the TCP-50 for all typical frame rate translation needs. Table 4.3 shows the automatic settings for each combination of TCR and TCG frame rate selections.

TCR FPS	TCG FPS	JAM	TOL	GENLOCK
23.976	23.976	Auto	1-Frm	TCR
	24, 25, 29.97DF, 30	1X	-- --	Off
	29.97NDF	Auto	8-Frm	TCR
24	23.976, 29.97DF			
	29.97NDF	1X	-- --	Off
	24	Auto	1-Frm	TCR
	25	Auto	2-Frm	TCR
	30	Auto	8-Frm	TCR
25	23.976, 29.97DF			
	29.97NDF	1X	-- --	Off
	24	Auto	2-Frm	TCR
	25	Auto	1-Frm	TCR
	30	Auto	7-Frm	TCR
29.97DF	23.976, 24, 25			
	29.97ND, 30	1X	-- --	Off
	29.97DF	Auto	1-Frm	TCR
29.97ND	24, 25, 29.97DF, 30	1X	-- --	Off
	23.976	Auto	8-Frm	TCR
	29.97ND	Auto	1-Frm	TCR
30	23.976, 29.97DF			
	29.97NDF	1X	-- --	Off
	24	Auto	8-Frm	TCR
	25	Auto	7-Frm	TCR
	30	Auto	1-Frm	TCR

1X = 1-time, -- -- = N/U. The 1-Frm, 2-Frm, 7-Frm, and 8-Frm tolerance settings are values chosen to include normal frame count errors expected to occur within each second, especially with two different frame rates selected, plus one additional frame for error in the measuring process.

Table 4-3, TCP-Auto Jam/Tolerance/Genlock Settings

4.24 Time Code Frame Rate Translation

One of the uses of the HORITA TCP-50 is to translate time codes from one frame rate to another frame rate, for example when converting from NTSC video and time code numbers to PAL video and time code numbers. To perform this operation simply select the frame rate of the input time code and the frame rate of the desired output time code. The TCP-50 will then read the input time code, jam the generator to the TCR, then output the time code at the TCG frame rate.

Certain jam and genlock restrictions apply when translating time codes and these should be reviewed in the section on jam and genlock operations.

4.25 Time Code Offset

The TCP-50 allows the output time code value to offset from the input time code value by permitting the user to introduce either a positive or negative amount of offset. This is useful if the time code and video frame relationship has been changed because the video has been delayed by TBC's or frame-store devices. Offsetting the time code an opposite amount can restore the time code number/video image relationship.

The offset value is entered as a typical hours, minutes, seconds, frames time code number, along with a + or - sign value. When the TCG is jammed to the TCR, this plus or minus offset amount is applied to the TCR time that the TCR is jammed too. If the offset is set to a value of "+00:00:00:01", then the TCG time code output is ahead of the TCR time code input by exactly 1-frame.

It should be noted that this offset amount is subtracted from the TCG time when checking to verify that the TCG is genlocked to the TCR, so that is why it does not appear as an "ERR" value and cause an automatic jam when the TCP-50 auto jam function is turned on.

4.26 Time Code Backup or Repair

The TCP-50 can be used as a backup time code generator by setting its TCR and TCG frame rates to the same FPS value. With this setting, the TCG output time code matches that of the TCR input time code and if the input is ever lost, the TCG will seamlessly continue to output correct time code.

This same action can be used to "repair" poor time code because once the TCG is jammed, it will continue to output new time code to replace the poor input time code as it comes and goes.

4.27 Time Code User Bit Substitution

The time code "user bits" are actually four bytes of data that are carried along with each frame of the time code. The four bytes are further divided into eight "nibbles" of data, each nibble having four binary bits and a "hexadecimal" (hex) value. What all this means is that the numbers from 0-9 and characters A, B, C, D, E, and-F can be encoded into each of the eight nibbles of the user bits and used for whatever purpose needed.

Although sometimes the user bits are setup to contain the date, scene and take, production number, or other information, the user bits are generally not used much, simply because of the user's limited access to them. However, even if originally not used, the TCP-50 can substitute new user bit data in the output time code from the TCG if desired. This is useful if you wish to add a date into the time code or other information, such as a production number, scene/take number, or whatever, when making a video copy with time code.

To use just this feature, set up the TCP-50 to operate in a time code backup or repair mode and then go to the "USERBIT SETUP" menu and enter the desired data into the MAN(M) user bit fields. For example, the date can be entered as 07 08 05 in user bit fields 87 65 43.

After this, go to the SELECT menu item and change the selection to "M" for user bit nibbles 87 65 and 43. This manually entered date information will now be output in the user bits of the time code.

4.28 Time Code "Start/Stop" Mode Operation

In Start/Stop mode, if the TCR is reading good time code, the TCG outputs incrementing time code at the selected frame rate. If the input time code is removed or stops incrementing, the TCG time code output stops incrementing. This condition is sometimes described as the time code being held or "frozen" at the last valid number.

There are several ways that the input time code can become invalid and the TCG responds a little differently for these different ways. The time code signal itself can just stop, dropout, or it can have an invalid framing pattern or an incorrect number of total bits. It can have an invalid time value, or "drop frame" value, or frame rate value.

In the Start/Stop mode, any of these errors, singly or in combination, will eventually cause the input time code to become invalid and, in turn, cause the TCG time code output to "freeze". This may occur within a single frame of the input time code, or it may take several frames of erroneous input time code, depending on the type of error(s). Therefore, the time code value that the TCG freezes at may be several frames later in time from the last good input time code read.

When the input time code again starts up, that is starts incrementing or becomes readable, the TCG is "re-jammed" and normal incrementing output time code generation resumes, starting from the jam time code value.

It should be noted that if the TCP-50 jam mode is set to "MAN" and "OFF", then the TCP-50 TCG does not re-jam when the input time code resumes, but instead continues from its last valid number.

4.29 Time Code Error Analyzer

The time code error analyzer detects and displays six common time code error conditions to help a time code user evaluate the overall condition of the time code.

The error analyzer displays a "G" for good and a "B" for bad for each error detect function. When a "B" is displayed it flashes fast to get attention. Each time the measured condition changes from G to B, the associated counter is counted up by +1 count. Thus, to count a particular counter, the associated condition has to first be detected as good, and then switch to bad.

All of the error counts can be reset to zero, 0000, by selecting "Y" on the TCR ERR ANALYZER menu item "RESET ERR COUNTS". The six error conditions measured are described in detail in the following paragraphs.

4.30 SIGNAL INPUT Error

The signal input error counter is counted up if the level of the time code input signal to the TCR falls below a value that can be read by the TCR. This level is checked once each frame of time code and each time a signal input failure is detected, the error count is counted up.

Note that a "good" signal level does not mean that it is a time code signal, just that the level of the signal at the input to the TCP-50 is good.

4.31 SYNC PAT Error

In addition to the time code and user bit data, the time code has what is referred to as a "sync" pattern embedded within it. It is this sync pattern that allows determining where the start of the time code and user bit data begins and ends, and the direction and speed of the time code.

The TCP-50 reads time code only at "play" speed and in "forward" direction. If there is a failure of some kind within the sync pattern, then the time code cannot be read. Each time a sync pattern failure is detected, the SYNC PAT error counter is counted up.

4.32 FPS Error

The FPS error detect counts up the associated error counter each time there is a difference noticed between the actual FPS rate of the time code input to the TCR and the FPS rate selected for TCR operation. For example, if 25 FPS time code is input to the TCR and the TCR is set to and has been operating at 24FPS, an FPS error will occur, be detected, and count up the FPS error counter.

4.33 DROP/N-DROP Error

When reading drop frame time code a special bit within the time code identifies it as drop-frame format time code. If this bit is detected when reading any other code format except 29.97DF time code, a DROP/N-DROP error is detected and the associated error counter is counted up.

4.34 VALID TIME Error

Time code has a format of hours (HR), minutes (MN), seconds (SC), and frames (FR), usually displayed in the format of: HR:MN:SC:FM.

Over a 24 hour period, the smallest time code number is 00:00:00:00 (midnight), the largest is 23:59:59:29, with 29 being the largest frame number for the 29.97 and 30 FPS rates. The maximum frame number for 23.976 and 24 FPS is 23, and for 25FPS it's 24.

After the time code is read, the TCR checks each HR, MN, SC, and FR number to be sure that it does not exceed the maximum value allowed for time code. If this happens then the associated counter is counted up.

4.35 VALID SEQUENCE Error

When time code is generated it follows a format of each successive frame number being greater in value by one frame. This sequence is checked by the TCR and if the time code numbers read do not stay in sequence, the associated TCP-50 error counter is counted up.

5 MAINTENANCE

5.1 Cleaning

1. Do not attempt to disassemble your TCP-50 to clean it.
2. Clean your TCP-50 using only a damp cloth.
3. NEVER use water or solvents such as alcohol, window cleaner, etc., to clean your TCP-50.

5.2 Service and Troubleshooting

If you suspect your TCP-50 is not operating properly, check the following:

1. Check all video and time code coaxial cables and connections for opens or shorts.
2. If using an AC power adapter different from the one supplied with the TCP-50, make sure it supplies the TCP-50 with at least 9 volts (maximum of 14 volts) when the TCP-50 is switched on.

You may return your TCP-50 to HORITA for service. Please contact HORITA first, either by phone or mail, before returning your unit.

5.3 Adjustments

Adjustments are provided for video level and equalization and horizontal size.

To access the adjustments, remove the bottom cover from the TCP-50 by removing the two screws from the front panel and then sliding the bottom cover out towards the front.

If you have a Rackmount or Shortrack packaged TCP-50, remove the four screws from the top cover and remove the cover.

All adjustments are located on the circuit board as shown in Figure 5-1.

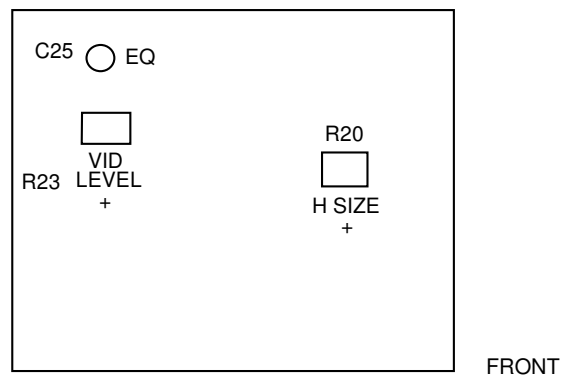


Figure 5-1, Adjustment Locations

5.4 Horizontal Size Adjustment

1. Adjust H-SIZE control R20 for the desired horizontal size. Note that this adjustment also affects the size of the setup screen displays.

5.5 Video Level & Equalization Adjustment

1. Connect a 1-volt P-P video sweep signal to VIDEO IN and a waveform monitor or oscilloscope to VIDEO OUT. Make sure the video output is terminated.

2. Adjust VID LEVEL control R23 for a 1-volt P-P output level (unity gain).
3. Adjust C25 for flattest frequency response out to 5 MHz.
4. Re-assemble the TCP-50.

6 SPECIFICATIONS

Power

Operation	9-to-14V DC, 160 milliamperes
Connector	3.5 MM mini phone jack
AC Adapter	9 volt, 500 milliamperes

Video

IN/OUT	
Level	Standard RS-170 1V P-P composite video terminated at 75 Ohm
Connector	BNC

Time Code

IN	200 mV - to - 10V P-P
OUT	1.6V P-P square wave. Rise time is approximately 35uS.
Connector	RCA

Switches And Controls

POWER ON/OFF	Toggle switch with red LED above
MODE	Momentary toggle switch
POSITION	Momentary toggle switch
CHAR	Momentary toggle switch

Environment

Operating	5C to 40C (41F to 104F)
Storage	-10C to 60C (14F to 140F)

Dimensions

1.75"H, 3.5"W, 4.5"D

Weight

Approximately 13 Oz. (shipping weight approximately. 29 Oz. including power adapter)

Specifications subject to change without notice

