HORITA TCD-100

SMPTE VITC/LTC CODE READER
LED DISPLAY

USER MANUAL

Doc. 072350-00
Rev. B

HORITA®

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1 GENERAL

The TCD-100 is a versatile SMPTE time code LED display, combining high speed SMPTE Longitudinal Time Code (LTC) and SMPTE Vertical Interval Time Code (VITC) readers.

The LED display characters are 0.8" high and are suitable for viewing across a room. A brightness control allows adjustment of display intensity for use in a darkened environment.

The TCD-100 can display time code or user bits and is optionally available as the TCD-100PC with RS-232 serial interface and HORITA TC-TOOLKIT Tape Logging and Control software. The TCD-100 can be factory upgraded to the TCD-100PC.

The TCD-100 comes standard as a desktop unit and can be installed in a standard 19" rack using an optional rackmount ear kit, or can be attached to a wall or other piece of equipment using an optional wall mounted swivel bracket kit.

2 FEATURES

* Reads LTC from 1/30th to 100 times play speed, forward and reverse.
* Reads VITC from pause to over 30 times play speed forward and reverse (depending upon tape format).
* 0.8" high LED display characters with brightness control.
* Outputs 2V P-P reshaped LTC for passing on to other units.
* Rear panel SELECT switch allows choice of LTC/AUTO/VITC modes. AUTO mode automatically selects between VITC and LTC. Selection of VITC backup of LTC only for tape speeds less than 1/5th play is also available.
* Rear panel DATA switch selects time code or user bits for display.
* Rear panel DISPLAY switch allows freezing of time code or user bit display.
* Discrete LEDs indicate LTC or VITC code present, VITC video field 1 or field 2, and drop frame or non-drop frame time code.
* Operates from +9V to +14V DC for portable use in the field. Includes a 9 Volt AC adapter.
* Desktop sized TCD-100 measures 8.75"W x 1.5"H x 4.5"D.
* Optionally available as the TCD-100PC with RS-232 serial interface and HORITA TC-TOOLKIT Tape Logging and Control Software for a PC.
* The HORITA S100EK 19" rackmount ear kit and the S100SK wall mounted swivel bracket kit are optionally available for use with the TCD-100.

3 SMPTE TIME CODE

SMPTE (pronounced "simtee") is an acronym for the "Society of Motion Picture and Television Engineers". SMPTE adopts and sets standards for the motion picture and television industry. SMPTE has adopted standards for both Longitudinal Time Code (LTC) and Vertical Interval Time Code (VITC). For historical reasons, LTC is more commonly referred to as SMPTE time code and VITC simply as VITC.

3.1 LTC

Longitudinal time code is an audible timing signal, sounding much like a FAX machine signal, that identifies each frame of a television picture with a number expressed in an hours, minutes, seconds and frames format.

Being an audio signal, LTC is not recorded in the picture but instead on either an audio channel or on a special time code channel of a video recorder or other audio recorder. The LTC signal can be recorded simultaneous with recording of the video signal or can be recorded later during post-production (post-recorded).

The LTC signal itself is an 80-bit serial binary code that repeats once each video frame. Of these 80 bits, 32 are reserved for the

time information. An additional 32-bits, known as user bits, are available for including miscellaneous information along with the time information. These user bits are organized as eight, 4-bit hexadecimal digits. (A hexadecimal digit can contain the values from 0 to 9 and from A to F.) The remaining 16 bits of time code form a special "sync" pattern which is used to locate and decode the time code and user bit information.

When a tape with time code is played back, the time code signal can be read by appropriate equipment to provide a precise frame number identification for video editing and other purposes.

Depending upon the playback capabilities of the video recorder, the TCD-100 can read and decode LTC signals at speeds as slow as 1/30th times play speed up to speeds as high as 100 times play speed.

3.2 VITC

Vertical interval time code is a visual timing signal that is recorded as a series of varying width white dots located in the vertical interval of a standard television picture. VITC is typically recorded on two non-adjacent lines of the vertical interval of each composite video field. In addition to containing the same time code and user bits information as does LTC, VITC also indicates which video field is currently displayed.

The major advantages of VITC over LTC are:

1. VITC does not use an audio channel or a special time code channel on the video recorder.
2. VITC can be read from search speeds down to still frame and pause. Thus, it provides a very accurate and precise means of identifying each video frame (and possibly field, depending upon the video recorder).

However, there are a few disadvantages to VITC. Because VITC is actually part of the video signal, it must either be recorded when the original video signal is recorded, or when a copy of the original tape is made. Thus, it cannot be "post recorded" without going down one generation. Recording in the field can be difficult using composite video camcorders unless a VITC generator is an integral part of the camcorder. Sometimes the VITC signal gets stripped from the vertical interval by various types of video equipment, such as time-base correctors, field and frame stores, etc.

3.3 Drop Frame Time Code

Drop frame time code is a form of SMPTE time code which is used when it is important that the timing information stored in the time code be an accurate representation of real time.

US color television standards for composite video were developed to be compatible with earlier black and white television. This required a slight slowing of the video frame rate from 30 frames-per-second to 29.97 frames-per-second. Because it is this frame rate that increments the SMPTE time code numbers, these time code numbers fall behind real clock time by about 108 frames per hour, or 3.6 seconds. Drop frame time code was developed to adjust for this error and make SMPTE time code more closely match real time.

The technique for producing drop frame time code involves advancing the frame number ahead by two frames at the start of each minute, except on minutes 00, 10, 20 , 30, 40, and 50. Thus, excluding these tens-of-minutes exceptions, instead of the frame numbers progressing from ..28, 29, 00, 01, 02, etc., drop frame time code advances from frame 29 to frame 02, skipping frame numbers 00 and 01, progressing from …28, 29, 02, 03, etc. at the start of each minute.

Although drop frame time code is widely used in the broadcast industry, if real time is not an issue it is often avoided elsewhere due to the nature of it's unconventional numbering system.

If it is a requirement that the time code numbers you read from your time-coded tapes represent real time within 3.6 seconds an hour (or 0.6 seconds every 10 minutes) then you may want to consider using drop frame time code. Otherwise, non-drop frame time code will work just fine, and may avoid problems later on. Whichever time code format you decide to use, you should adopt it as your standard and use it for everything.

4 CONNECTING THE TCD-100

4.1 Connecting Power

Included with your TCD-100 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 "+9V DC" rear panel 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. Do not use an adapter of more than 9 volts at 500 milliamperes or damage to the TCD-100 may result.

4.2 Connecting LTC In and Out

Figure 4-1 shows a basic hookup for the TCD-100.

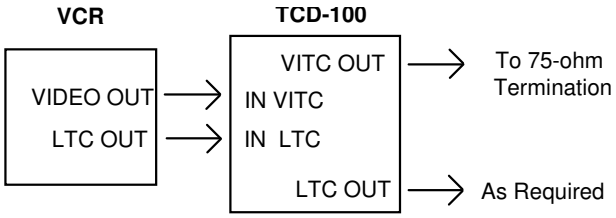

Figure 4-1, Basic TCD-100 Hookup

Connect SMPTE LTC from its source to the RCA connector labeled LTC IN. Reshaped, 2V P-P LTC is available at the RCA connector labeled LTC OUT.

4.3 Connecting VITC In and Out

Connect the video source supplying VITC to the BNC connector labeled VITC(VIDEO) IN. The VITC(VIDEO) IN signal is directly looped through to the BNC connector labeled VITC(VIDEO) OUT. To ensure correct VITC reader operation, this video loop through must be properly terminated at 75-ohms by using a BNC terminator, connecting the VITC(VIDEO) OUT to a terminating video monitor, VCR, etc.

4.4 Connecting Serial COMM (TCD-100PC Only)

The Horita-supplied serial interface cable connects the TCD-100PC COMM connector (3.5mm phone jack) to a DB-9 Male connector compatible with PC RS-232C serial port interfaces. A 9-pin/25-pin adapter is included for computers with serial ports that have a 25-pin connector.

5 OPERATING THE TCD-100

5.1 Selecting the Time Code Source

The rear panel SELECT switch allows choice of reading and displaying either LTC or VITC, or an AUTO mode of operation. In AUTO mode, the TCD-100 reads VITC if LTC becomes unavailable, and vice versa. Through the use of an internal jumper selection (see Chapter 6), the meaning of the AUTO mode can be changed to that of automatic backup of LTC by VITC only at tapes speeds less than 1/5th times play speed. It is at these slow tape speeds that the audio LTC signal often deteriorates and is unreadable, whereas the VITC signal, being part of the video, is readable down to still frame and pause.

NOTE:

When first attempting to read VITC, the TCD-100 performs an "acquisition" procedure which takes a fraction of a second to complete. This procedure is repeated whenever any of the following conditions arise:

* Loss of incoming video is detected.
* Loss of incoming VITC for more than five seconds.
* Change in position of the SELECT switch from the LTC to AUTO position or from the AUTO to VITC position.

5.2 Controlling the Display

The DATA switch allows the display of either time code or user bits.

The momentary DISPLAY switch toggles the display between RUN and HOLD modes. An initial press of this switch "holds" the display from changing. The DATA switch can be used to alternate between displaying the held time code number and its associated user bits. A subsequent press of the DATA switch causes a change back to RUN mode and the most current time code or user bits are displayed. Note that although the display may be in HOLD mode, the internal reader remains active.

The BRIGHT knob controls the display brightness.

5.3 Display Description

The following paragraphs refer to Figure 5-1 when describing various aspects of the TCD-100 display.

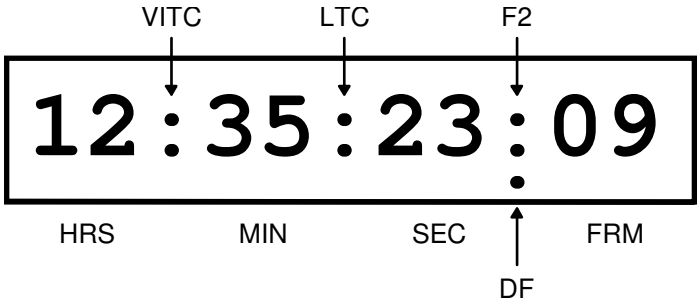

Figure 5-1, TCD-100 LED Display

When displaying time code data, the TCD-100 automatically blanks the two frame digits whenever the tape speed is above two times play. (The frames digits can be permanently blanked via the setting of an internal jumper, see Chapter 6.) Also, during time code display, four discrete LEDs indicate the operating status of the TCD-100 as follows:

LED	MEANING
VITC	This LED indicates VITC present by flashing each time VITC is successfully read. LED is off when no VITC signal is present or when the VITC reader is not selected.
LTC	LED is on when LTC is available and the LTC reader is selected. It is off when no LTC is available or the LTC reader is not selected.
F2	LED is on when reading field 2 and off when reading field 1whenever the VITC reader is successfully reading VITC and the tape speed is less than 1/5th play speed. It is continuously on if reading VITC above 1/5th play speed or if reading LTC.
DF	LED is on whenever drop frame time code is read. It is off for non-drop frame time code.

When user bits are displayed, the three bottom colon LEDs and the DF LED are off.

Regardless of whether time code or user bits are displayed, whenever the display is held, the active LEDs blink at a ¼-sec on/off rate.

6 MAINTENANCE

6.1 Cleaning

1. Do not attempt to disassemble your TCD-100 to clean it.
2. Clean your TCD-100 using only a damp cloth.
3. NEVER use water or solvents such as alcohol, window cleaner, etc., to clean your TCD-100.

6.2 Service and Troubleshooting

If you suspect your TCD-100 is not operating properly, check the following:

1. Check all cables for opens or shorts.
2. If using an AC power adapter different from the one supplied with the TCD-100, make sure it supplies the TCD-100 with at least 9 volts (maximum of 14 volts) when the TCD-100 is switched on.

You may return your TCD-100 to HORITA for service. Please contact HORITA Co. first, either by phone or mail, before returning your unit.

6.3 Adjustments

Internal jumper selections are provided for LTC OUT rise time control, VITC backup limits, VITC-to-LTC translation options, and time code frame digit blanking.

To access these jumpers, remove the top cover from the TCD-100 by removing the six hex screws. The locations of these jumpers are shown in Figure 6-1.

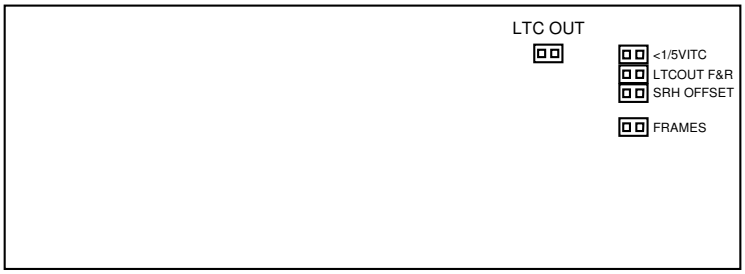

Figure 6-1, Jumper Locations

LTC Output Rise Time Jumper

The LTC OUT jumper allows adjustment of the LTC output waveform rise time both when regenerating the reader LTC IN signal and for the output of the LTC generator. With a shunt installed, the rise time of the LTC output is limited to 25uS, ±5uS. With no shunt installed, wide band LTC is regenerated.

Factory setting is wide band (shunt removed).

<1/5 VITC Jumper

When automatic reader mode is selected (i.e., MODE in RDR position and SELECT in AUTO position), the "<1/5 VITC" internal jumper further defines the switching behavior between LTC and VITC. With a shunt installed, the automatic backup of the LTC reader by the VITC reader is restricted to tape speeds below 1/5th times play speed. When no shunt is installed, VITC can backup LTC at all tape speeds. Note that this jumper has no effect on VITC-to-LTC translation.

Factory setting is VITC backup at all tape speeds (shunt removed).

FRAMES Jumper

With a shunt installed on the "FRAMES" jumper the frames digits are displayed at tape speeds below two times play during either LTC or VITC reader operation. With no shunt installed the frames digits are always blanked in all reader and all generator modes.

Factory setting allows framed digits display (shunt installed).

7 SPECIFICATIONS

Power

Operation	9-to-14V DC, 650 mA max
AC Adapter	9 volt, 500 mA

Connectors

VIDEO IN VIDEO OUT	BNC
LTC IN LTC OUT	RCA
COMM	3.5MM mini phone jack (TCD-100PC only)
POWER	3.5MM mini phone jack

Switches And Controls

SELECT	Three-position toggle switch
DATA	Toggle switch
MODE	Three-position toggle switch
DISPLAY	Momentary toggle switch
POWER ON/OFF	Toggle switch
BRIGHT	Brightness adjustment

Environment

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

Dimensions

8.75"W x 1.5"H x 4.5"D

Weight

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

Specifications subject to change without notice