The TC-3

SMPTE Time Code Generator/Reader

Manual Version 1.4
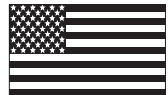
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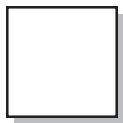(505) 898-0159 FAX

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Made in USA

OPERATION MANUAL

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Introduction

The TC-3 is a SMPTE longitudinal time code generator/reader/re-generator that uses the audio track (or special TC track if so equipped), of a VCR, to record/read the time code. The TC-3 uses the industry standard SMPTE time code format. Time code, read or generated, is displayed in a "window" keyed over incoming video. The TC-3 will read time code at play speed.

SMPTE Time Code

SMPTE time code is a standardized format for recording a unique set of numbers on video tape for each video frame. For the TC-3 these numbers are recorded on the audio track of a VCR and increment for each frame of video. The time code format is standardized in the United States by the Society of Motion Picture and Television Engineers (SMPTE).

SMPTE time code is composed of two parts: the time code itself and "user bits".

The time code consists of hours, minutes, seconds, and frames. NTSC video has approximately 30 frames of video per second. The TC-3 accepts a video signal, and when in the generator mode, counts frames. When 30 frames have been counted the TC-3 increments the "seconds" count. When the "seconds" count passes 59, the minutes count is incremented and so on.

In the reader mode, the TC-3 reads the time code off from tape, and displays it in a "window" keyed over incoming video.

The user bit portion of the time code is for storing any miscellaneous information you may want to encode on tape. This information could be most anything, such as the date when the tape was shot, the camera number the tape came from, or even special information other equipment might use (if this equipment has the ability read user bits).

How to Set Up the TC-3

The TC-3 has five connectors on its rear panel:

9 VDC IN	This is the power input for the unit. Voltage may be 9 to 12 volts DC, either polarity.
VIDEO IN	Time code generated will be synchronized to the video fed to this connecter.
VIDEO OUT	This is a loop-through from Video in. Also a time code window (keyed over incoming video) appears on this output.
TIME CODE IN	Audio level (1 volt p p) digital time code signal input to the TC-3.
TIME CODE OUT	Audio level (1 volt p p) digital time code output from the TC-3.

Connecting the TC-3

Connect power to the TC-3. Power may be from the AC adapter module included with the TC-3, or from a user supplied battery pack. If power is to be supplied from a battery pack, the voltage should be between 9 and 12 volts DC (polarity is unimportant).

Feed a video signal to the VIDEO IN connecter on the TC-3. This is the signal from which time code generated will be synchronized. Note that a video signal must be present at this input for proper operation of the TC-3. The VIDEO OUT should be connected to the record deck or a monitor. TIME CODE IN comes from the audio output (Audio out or special time code track output) of a VCR. TIME CODE OUT goes to the audio in (audio in or special time code track input) of a VCR.

The above is a basic configuration with which you can record time code on a tape either by recording "off air", from another VCR, or by doing an "audio dub". Other configurations possible are: time

code regeneration, time code "window" sent to a second VCR, etc. These configurations will be covered later in the manual.

Operation of the TC-3

The TC-3 has 7 push buttons and 4 LED's for easy operation.

The push buttons are labeled as follow:

WINDOW SIZE   Sets the window (time code display keyed over video) to one of the two sizes, or makes the window transparent.

WINDOW POS   Sets the window to one of the three vertical positions, or turns the window off.

TIME/UBITS   Changes display to either time code or user bits for reading or setting purposes. LED ON=user bits.

RDR/GEN   Switches between generator and reader modes. LED ON=generator mode.

RUN/STOP   Starts and stops the TC-3. LED ON=stop.

SEL/SET/CLR   Used to initially set time code or user bits. If both SEL and SET buttons are pressed at the same time the display is reset to zero.

The functions of the LEDs are:

TIME/UBITS   Indicates time code or user bits mode ON=user bits, OFF=time code.

RDR/GEN   Indicates which mode the unit is operating in. ON=generator, OFF=reader.

RUN/STOP   Indicates whether the generator is running or stopped. ON=stopped, OFF=running.

ON   Power to the TC-3.

Powering Up the TC-3

After setting the unit up as outlined in "Connecting the TC-3", turn the unit on. (The power switch is located on the rear panel of the unit.) Be sure a video signal is applied to VIDEO IN.

After power is applied you should see the time code window display keyed over video on your composite monitor, and the "ON" LED should be lit. Also the RDR/GEN and RUN/STOP LED's should be on.

Generating Time Code

To start the generator, be sure the unit is in generator mode (RDR/GEN LED on). Press the RUN/STOP button. The RUN/STOP LED turns off and the time code window display starts counting. A time code signal is now being output on TIME CODE OUT that can be recorded on a VCR.

To stop the generator, press RUN/STOP, the RUN/STOP LED turns on, and the time code window display stops counting.

Recording & Play Back of Time Code

Put a tape in the VCR, and start recording. Be sure the unit is in generator mode (RDR/GEN LED on), and press RUN/STOP (RUN/STOP LED off) to start generating time code. Let the unit run for a few minutes, stop the generator, and rewind the tape to the point were you started recording. Press RDR/GEN so that the RDR/GEN LED is off (reader mode). Play the tape. The TC-3 will now read the time code just recorded and output it as a window on the Video Out of the TC-3.

Presetting Time Code

To preset the generator for a certain time, first be sure the generator is stopped (Press RUN/STOP so that the RUN/STOP LED is on). Then press the SEL button, the first two digits of the window display will flicker. (The flicker indicates which set of digits is about to be set.) Next press the SET button until the number you want for hours is displayed. Press SEL again and repeat the process for minutes, seconds, and frames, until the time code you want to preset is displayed.

After setting frames, pressing SEL once more will make the colon between seconds and frames flicker. Pressing SET will now cause the colon to change from a colon to a semicolon and back. This is the setting for drop frame and non-drop frame operation.

A semicolon (;) indicates drop frame operation, a colon (:) indicates non-drop frame operation. Because NTSC doesn't have quite 30 frames of video per second (the exact number is 29.97) a cumulative error in the SMPTE time code is present. To correct for this error the TC-3 operates in a "drop frame" mode, dropping (not counting) 1 frame of video at regular intervals.

Setting the User Bits

To set user bits, press TIME/UBITS so that the TIME/UBITS LED is on. Now each digit of the user bits may be set using the SEL and SET buttons in a similar manner as in setting the time code.

NOTE: Pressing the SEL and SET buttons at the same time will reset the display (either time code or user bits) to all zeros.

Setting Window Display Size and Position

Vertical window size may be set by pressing the WINDOW SIZE button. This button will also set the window to a transparent mode.

Vertical position of the window may be set by pressing the WIN-DOW POS button. There are three settings for vertical position, pressing this button a fourth time removes the window display.

Horizontal size and position may be adjusted by two trimmer pots located on the right panel of the unit.

Auto Back Time

Sometimes you may want time code "pass through zero" at the starting of a tape. The time "before" zero can be set from 30 seconds to 2 minutes in 30 second increments. This is useful to get past tape leader, or to have a clean start on a tape.

To access the auto back time feature, hold down the SET button while powering the unit up. Continue to hold the SET button. The TC-3 will cycle through 00:30, 01:00, 01:30, 02:00. Release the button when the back time that you want appears.

NOTE: Auto back time will be activated only after the TC-3 has been preset for a certain time. The selected auto back time stays in effect until the unit is powered off.

Making a Window Dub

To do a window dub (recording the time code window to a tape) you will need a prerecorded tape with time code. (This is your source tape.)

Also needed are two VCR's. We'll call the VCR's Source deck and Record deck. Connect the VCR's and the TC-3 as follows:

VIDEO OUT from the Source deck to VIDEO IN on the TC-3.

AUDIO OUT (time code) from the Source deck to TIME CODE IN on the TC-3.

VIDEO OUT on the TC-3 to VIDEO IN on the Record deck.

VIDEO OUT on the Record deck to a monitor.

Optionally, TIME CODE OUT on the TC-3 may be connected to AUDIO IN (time code) of the Record deck to record time code in addition to the time code display window video.

Put the Source deck in play and the Record deck in record. Set the TC-3 for reader mode.

Once time code is detected, the TC-3 will automatically start reading and the time code window will be recorded onto the Record deck .

If time code is not present on the tape in the Source deck, a time code window may still be recorded on the tape in the Record deck by placing the TC-3 in generator mode and starting the generator after starting the two VCR's. Note: This will produce a time code window display, but the source tape won't have time code so it won't have any direct reference to the tape just produced.

Adding Time Code

If you have a tape that doesn't have time code and would like to record time code on it, you don't need two VCR's if you have a VCR equipped with audio dub. To record time code to a tape using audio dub connect the VCR and the TC-3 as follows:

VIDEO OUT on the VCR to VIDEO IN on the TC-3, VIDEO OUT on the TC-3 to a monitor.

TIME CODE OUT of the TC-3 to AUDIO IN (time code) on the VCR.

Put the TC-3 in generator mode. Put the VCR in play and audio dub mode. Start the generator. Time code will now be recorded on the audio track of the VCR.

Jam Sync (Time Code Regeneration)

Jam sync (time code regeneration) is useful if you have a tape with questionable time code. The TC-3 has the ability to regenerate time code.

To regenerate time code, do the following:

Set up cabling for two VCR's and the TC-3 as for "Window dub". In audition connect TIME CODE OUT on the TC-3 to AUDIO IN (time code) on the Record deck.

Set the TC-3 for reader mode, RDR/GEN LED Off. Put the Source deck in play and the Record deck in record.

As soon as the TC-3 detects time code from the Source deck, switch the TC-3 to generator mode. The TC-3 will now regenerate time code based on the last code read while in reader mode.

Time Code Display Indicators

Error detection:

The TC-3 has automatic error detection. If incoming time code is invalid, such as 12:99:99:99, the entire window display will flicker, much the same way individual digits flicker when presetting the generator.

Field one, Field two indication:

Fields one and two are indicated by the colon or semicolon between the seconds and frames digits. You will notice that the top portion flickers. What is happening is that for each field this character is alternating between a period (.) and a colon(:). A period indicates field one and a colon indicate field two.

Specifications:

Video In: Standard 1 Volt, 75 Ohm BNC

Video Out: Standard 1 Volt, 75 Ohm BNC

Time Code In (Audio): -13 to +7 dBm (500 mV to 5 V p-p) Zin=100K, RCA Connector

Time Code Out (Audio): 0 dBm (0.7 V), Zout=2K, RCA Connector

Time Code: SMPTE 80 Bit Longitudinal Drop Frame/Non-drop Frame

User Bits: 8 digits setable, format is Hexadecimal (0 - F)

Size: 5.6W x 1.5H x 7.3D inches Aluminum and Steel Enclosure

Power: 120 Vac 60 Hz 3 W AC Adapter or 9 to 12 Vdc 200 mA

| The TC-3 | SMPTE Time Code Generator
Time Code Out Adjustment |

An improvement has been made to the TC-3. The Output level of the Time Code Out signal can now be adjusted. It is preset to 0 dBm, 0.775 Vac (2 volts peak to peak). Some VTRs (such as the Sony 9800) might require a higher audio signal.

The adjustment control is located on the rear panel between the two RCA jacks. Adjust as required, minimum is 0 V, max is 1.5 Vac (4.2 Vpp).

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