# HORITA VG-50

VITC Time Code Generator/LTC-VITC Translator,
with On-Screen Window Display

# USER MANUAL

For Models VG-50, RM-50/VG, SR-50/VG

Doc. 071350
Rev. D


HORITA®

P.O. Box 3993, Mission Viejo, CA 92690 (949) 489-0240 www.horita.com

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# 1 GENERAL

This manual provides installation, operation, and troubleshooting instructions for all models of the HORITA VG-50 SMPTE VITC generator and LTC-to-VITC translator with on-screen time code window display.

VITC, usually pronounced "VIT-C", is an acronym for "Vertical Interval Time Code". VITC time code, like standard "SMPTE" longitudinal time code, is another SMPTE industry standard time and control code.

Although VITC and SMPTE time codes are both SMPTE standards, common usage is that the phrase "SMPTE time code", "time code", "LTC", or just "SMPTE", is generally used when referring to the audible SMPTE time code signal recorded on the audio channel or special LTC time code track of an audio or video recorder, and "VITC time code" or "VITC" is used when referring to SMPTE VITC time code which is recorded in the vertical interval of a standard analog composite video signal.

In this manual, "LTC time code" is used to refer to the audible SMPTE LTC time code signal, and "VITC time code" refers to SMPTE VITC time code. These two different SMPTE time code formats are described in more detail in later paragraphs.

In the VITC generator mode the VG-50 generates standard VITC time code. The VITC time code is "locked" to the input video signal so that the VITC time code field and frame number changes are precisely timed to and in step with the start of each video field or frame.

The VG-50 also produces a digital-clock type video time code display, called a time code "window", which shows the corresponding SMPTE VITC number for each individual video frame. The display is in a fixed vertical and horizontal position and used for setting up the VG-50 or for recording on a video recorder.

In the LTC-VITC translate mode, play speed LTC time code and its associated video, usually from a VCR, are input into the VG-50. The VG-50 translates the LTC time code into VITC time code. The LTC time code can be continuously translated on a frame-by-frame basis, or can be used to momentarily preset, or "jam" the VG-50 VITC time code generator.

Because the VG-50 also produces a time code window display, it can also be used in a limited fashion as a play speed LTC window inserter. Play speed refers to the tape speed of a VCR when it's in play mode.

The VG-50 provides various front panel switches to permit selection of VITC generator or LTC-VITC translator mode, time code or user bit display, and VITC line number.

The VG-50 can be used with the VLT-50 VITC-LTC translator to form a complete VITC and LTC generator/reader system.

# 2 FEATURES

## VITC Time Code Generator

* Generates drop frame or non-drop frame VITC time code.
* Jamsyncs (presets) VITC generator to incoming LTC time code.
* Can jamsync both time code and user bits, or time code only.
* Front panel switches allow easy selection and identification of one of six different line pairs for insertion of VITC time code
* Manual preset of both time code and user bits
* Provides optional automatic 30, 60, 90, or 120 second automatic generator backtime mode.
* Allows run/stop operation using momentary action front panel
* Front panel LED indicates power on, stop, run, genlock, freerun.
* Operates from 9-to-13.5 volts DC. Can be used in the field.

## LTC-VITC Translator/Play Speed LTC Reader

* Reads LTC time code at play speed +/-10%.
* Displays all errors resulting from reading a poor quality LTC time code recording.
* Has an input level sensitivity compatible with most VCR address and audio tracks.

* Outputs a 1.5-volt peak-to-peak, 25-uS rise-time, restored/reshaped LTC time code signal for use when copying or amplifying LTC time code or when simultaneously recording both LTC and VITC time code.

### Time Code Window Inserter
* Displays pleasing, sharp, white characters, keyed into video signal.
* Displays time code, user bits, or can be switched off.
* Displays "T" or "U" to indicate time code or user bits displayed.
* Indicates drop frame or non-drop frame VITC or LTC time code.
* Indicates video field-1 or field-2.
* Is always frame accurate (on-time).

# 3 SMPTE VITC AND LTC TIME CODES

Because the VG-50 works with both VITC and LTC time code formats, a brief description of both is included here for reference.

SMPTE (pronounced "simtee") is an acronym for the "Society of Motion Picture and Television Engineers". The SMPTE adopts and sets standards for the motion picture and television industry. SMPTE VITC and LTC time codes are industry standard timing signals that identify each frame of a television picture with a number expressed in an hours, minutes, seconds, and frames format.

## Advantages of VITC
The great advantage of VITC time code over LTC time code is that it does not use an audio channel or special time code track for recording on a video recorder, and it can be read at speeds ranging from search speeds down to still frame and pause. VITC provides a very accurate and precise means of identifying each video frame and it finds particular application in animation and frame grabbing systems.

## Disadvantages of VITC
There are a few disadvantages of VITC, however. 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 making a copy of the tape and thereby going down one generation if recorded as an analog video signal..

Also, because VITC is inserted in the video path, recording in the field is difficult, if not impossible, using popular camcorders unless the VITC generator is an integral part of the camcorder.

Another disadvantage of VITC is that it sometimes gets removed by various types of video equipment, such as time-base correctors, field and frame stores, effect generators, and other video devices which "clean up" the vertical interval.

One last problem with VITC is that it is sometimes difficult to read at still frame VCR playback because the VCR may position the guard bar noise out of the active picture area and into the vertical interval, where it masks the VITC information.

## VITC Time Code Format
VITC is recorded onto two non-adjacent horizontal lines of the vertical interval of each video field. Lines assigned for recording VITC are from line 10 to line 20, inclusive. A "blank" line is left between the active VITC lines. For example, lines 13 and 15 are two lines on which VITC could be recorded. Also lines 12 and 14, 15 and 17, etc.

A VITC time code recording appears as a series of varying width white dots located in the vertical interval of a standard television picture. The vertical interval appears as a dark horizontal bar when viewed on a pulse-cross video monitor, or as the familiar rolling horizontal bar when the vertical hold (if present) on a standard monitor is misadjusted.

The VITC time code signal itself is a 90-bit serial binary code of 1's and 0's that repeat once each picture field, about 60 times a second. Of these 90 bits, 40 are reserved for the time information which consists of eight 4-bit decimal characters, two each for the hours, minutes, seconds, and frames. Information is also included which identifies each video field as field-1 or field-2,

Another 40-bits, called user bits, are reserved for adding extra information along with the time information. User bits are made up of eight hexadecimal characters of 4-bits each. Hexadecimal characters go from 0-to-9 and A through F.

The last 10-bits form a special mathematical check character, called a "CRC" or "cyclic redundancy check" character which assists in verifying accurate decoding of the "white dots".

When a tape with VITC time code is played back, a VITC time code reader can change the VITC back into the actual visible numbers that identify each frame. These numbers can then be used to locate and select specific video frames to permit precise frame identification for video editing and other purposes.

### LTC Time Code
SMPTE LTC time code is an industry standard audible timing signal, sounding much like a FAX machine transmission, that identifies each frame of a television picture with a number expressed in an hours, minutes, seconds, and frames format.

Since the LTC time code signal is an audio signal, it is not recorded in the picture but is instead recorded on either an audio channel or on a special LTC time code channel of a VCR. The LTC time code signal can be recorded when the picture is being recorded, or recorded later during post production (post-recorded).

The LTC time code signal itself is an 80-bit serial binary code that repeats once each picture frame, about 30 times a second. Of these 80 bits, 32 are reserved for the time information which consists of eight 4-bit decimal characters, two each for the hours, minutes, seconds, and frames.

Another 32-bits, called user bits, are reserved for adding extra information along with the time information. User bits are made up of eight hexadecimal characters of 4-bits each. Hexadecimal characters go from 0-to-9 and A through F.

The last 16-bits form a special "sync" pattern used to locate and decode the LTC time code and user bit information.

When a tape with LTC time code is played back, a LTC time code reader can change the audio LTC time code signal back into the actual visible numbers that identify each frame. These numbers can then be used to locate and select specific video pictures to permit precise frame identification for video editing and other purposes.

### Drop Frame Time Code
If you have used time code before, you have probably heard the term "drop frame". If not, eventually you will come across it. Drop frame time code is a special format time code which makes it a more accurate indicator of "real time" and you may want to use it in your system. The following provides a brief description of drop frame time code and may help you determine whether or not to use it.

U.S. analog color television standards were developed so color television would be compatible with earlier black and white television. This required a slight slowing of the video frame rate, from 30 frames-per-second (FPS) to 29.97FPS

Because it's the frame rate that counts the time code clock, the time code clock falls behind a real clock by about 108 frames an hour, approximately 3.6 seconds. 3.6 seconds is very important to television broadcasters who sell air time. Drop frame time code was developed to adjust for this error and makes time code time more closely match that of real time.

The technique chosen advances the time code clock ahead two frames a minute except on minutes 00, 10, 20, 30, 40, and 50. The exceptions are because two frames a minute is 120 frames an hour, 12 frames too much. Not advancing on the tens of minutes produces the needed advance of 108 frames an hour.

Thus, at the start of every minute, (except on the tens of minutes), drop frame time code advances the time code clock from frame 29 to frame 02, instead of 29 to 00. Frame numbers 00 and 01 are skipped or "dropped".

# 4 CONNECTING AND BASIC CHECKOUT

### Connecting Power
Included with your VG-50 is an AC power adapter that provides a 9-volt, 500 milliamps DC output. This adapter has a 3.5MM miniature phone plug with the "+" (positive) voltage output connected to the front tip of the plug.

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

***Note:***

The VG-50 has internal protection circuitry to prevent it from being damaged should the wrong polarity of power ever be applied. However, do not use an adapter of more than 9-volts at 500 milliamps or damage to the VG-50 may result.

## Connecting Video In

Connect the video output from your camera or source VCR to the VG-50 VIDEO IN connector. The VG-50 operates with standard 1-volt video levels and always terminates the input.

When the VG-50 power switch is in the OFF position, the VIDEO IN and VIDEO OUT connectors are disconnected from the internal circuitry of the VG-50 and connected directly together. This is the video bypass mode. Video termination is provided by the input on your recorder VCR or video monitor.

When power is switched ON, the VG-50 internally terminates the video input signal applied to the VIDEO IN connector.

## Connecting Video Out

Connect the VG-50 VIDEO OUT signal to your recorder VCR video input or other video device.

## Connecting LTC Time Code In

To translate, read, or preset the VG-50 VITC generator to an LTC time code input signal, connect the LTC time code output signal to the VG-50 TC IN connector.

## Connecting LTC Time Code Out

When translating LTC time code the VG-50 amplifies and re-shapes the LTC time code input signal into the proper "square-wave" waveform and outputs it at the TC OUT connector. Use this restored time code signal if you are translating LTC to VITC and are going to record both, or if you are going to copy LTC time code from one recorder onto another

## Connection Diagrams

Although the VG-50 is simple to install and operate, you will probably have to disconnect and reconnect it in various configurations as your system equipment and needs change.

You can also use the VG-50 in combination with the VLT-50 to form a complete VITC/LTC generator/translator/reader system that will both read and generate VITC and LTC.

Figure 4-1 below-shows a typical connection of the VG-50 into a video recording system

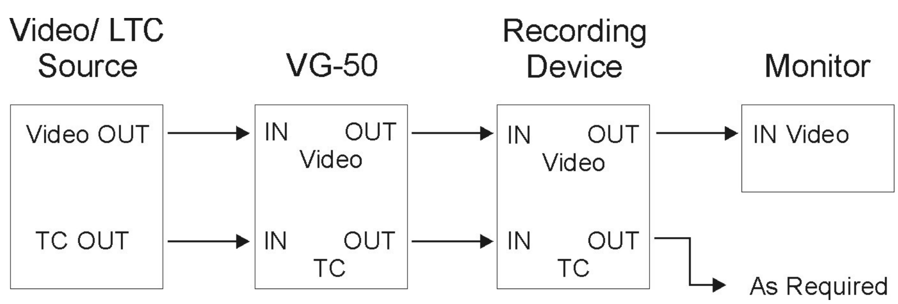


**Figure 4-1, Typical VG-50 System Connections**

## Basic Checkout

After you have connected your VG-50 you should observe a normal video display without a window when the VG-50 power switch is in the OFF position. This is the video bypass mode and allows you to leave the VG-50 connected into your system, turning it on only when you wish to generate VITC.

If you do not have a normal picture with the VG-50 powered OFF, then you need to review and correct your hookup until you do.

After observing a normal video display without a window with your VG-50 powered OFF, set the MODE switch to the GEN position and switch the VG-50 power switch to ON. Momentarily actuate the DISPLAY switch and at the bottom of the screen you should observe a "T" time code window of all zeros and with all the colons "flashing". The front panel LED also flashes along with the colons.

Momentarily actuate the MODE switch to SET then GEN and note that the time code numbers start counting up and the LED flashes rapidly. Operate the GEN/SET switch several times and note the generator starts and stops.

Actuate the momentary action DISPLAY SEL switch several times and note that the window display changes between time code, user bits, then off.

If the VG-50 is connected to read LTC time code and you have a tape with LTC time code recorded on it, play it on the source VCR and place the VG-50 into TRN LTC mode. The LED remains on continuously and you should observe the time code numbers counting up when the time code window is displayed.

This completes basic checkout of the VG-50.

## Time Code and User Bit Display Format

The VG-50 can display either time code or user bits. The time code display consists of a "T" character followed by hours, minutes, seconds, and frames digits, proceeding from left to right and separated by colon characters (:). The display format is HRS:MIN:SEC:FRM and a time of 23-hours, 59-minutes, 59-seconds, and 29-frames is displayed as T 23:59:59:29.

The user bit display consists of a "U" character followed by four pairs of hexadecimal characters separated by colon characters. The hexadecimal character set consists of the characters 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, F. One use for the user bits is to record the date and a typical user bit display of the date could be either U 07:23:92:00 or U 00:07:23:92, depending on how the user set it up.

## Time Code/User Bit Display Selection

The VG-50 powers up with the window display off. Each time the DISPLAY SEL is actuated, the window display switches between time code, user bits, and display off.

## Drop Frame Indication

Drop frame time code is indicated by displaying a semicolon (;) instead of a colon (:) between the frames and seconds of the time code display. For example, 00:15:44:09 is non-drop frame, 00:15:44;09 is drop frame.

## Field-One/Field-Two Indication

Video field-1 is indicated by displaying a period (.) between the seconds and frames instead of a colon (:) or semicolon (;). A period indicates field-1, a colon or semicolon indicates field-2. For example, 00:15:44.09 is field-1 of frame nine, while 00:15:44:09 is field-2.

When generating VITC time code or when reading LTC time code at play speed, the field indicator alternates between field-1 and field-2 once each video frame and appears as a dimming or flickering of the top portion of the colon or semicolon on the window display. However, after recording the window on a VCR, the video fields can be separately identified if the VCR is capable of producing a still picture playback of each field. Many 1/2" format VCRs play back only field-1 or field-2.

## Turning the Window Display Off

The window display can be turned off by actuating the DISPLAY SEL switch until the display switches off.

## VITC Time Code Generator Operation

When the MODE switch is in the GEN position the VG-50 is in the time code generator mode and generates and inserts VITC time code into the input video signal. When the generator mode is selected, the front panel LED flashes to indicate generator operation as described below.

## LED Indicator

| LED Indication | Generator Operation |
|---|---|
| Medium Flashing | Stopped (not counting) |
| Rapid Flashing | Running (counting) |
| Slow Flashing | Stopped, no input video |
| Rapid/Slow Flashing | Running, no input video |

## Generator Run/Stop

Each time the MODE switch is momentarily positioned to SET, then back to GEN, the VG-50 alternately starts and stops counting (incrementing) the time code number. When the generator is stopped, all of the colons in the time code flash along with the LED. When the generator is running, the LED flashes rapidly. Use of the run/stop feature is discussed further in the section titled "Using the VG-50 in the Field".

***Note***

Run/stop operation generally works best if the VCR is not in PAUSE (still frame) or SEARCH modes as these modes usually do not output a stable video signal and this can cause intermittent run/stop operation.

## VITC Line Number Selection

The horizontal lines assigned for VITC time code use are lines 10 to 20, inclusive. This results in nine pairs of non-adjacent lines on which VITC can be placed: 10/12, 11/13, 12/14, 13/15, 14/16, 15/17, 16/18, 17/19, and 18/20.

Although there are no "standard" line pairs for VITC, commonly used ones are lines 11/13, 13/15, or 15/17. With using video tape recorders, selection can vary depending on the tape format used and can be affected by where "head" switching occurs, how much of the vertical interval is "eaten up" or replaced by a pseudo vertical sync pulse used when most VCRs are placed into search, jog, or pause modes, action of time-base correctors, and presence of other information in the vertical interval.

*Note*

The VG-50 will not remove any video information from the vertical interval in the process of inserting VITC time code. You need to be sure that the line pairs selected for VITC time code insertion are not already used, and the selected line pairs can be read by VITC time code reading equipment you are planning on using later.

The VG-50 provides selection from one of six line pairs using the two front panel "LINE SELECT" switches. The "ODD EVEN" line select switch chooses a pair of odd numbered or even numbered lines as indicated by the setting of the "11/13, 12/14, 13/15, 14/16, 15/17, and 16/18" line select switch.

## Presetting the Time Code

The VG-50 VITC time code generator starting value can be preset in a manner similar to presetting a digital wrist watch.

***Note:***

Either time code or user bits must be displayed in order for preset to operate. Also preset operations generally work best if the VCR is not in PAUSE (still frame) or SEARCH modes as these modes usually do not output a stable video signal and this can cause intermittent preset operation.

If the MODE switch is held in the SET position for two seconds, the VITC time code generator presets to 00:00:00:00 and the hours digits flash between 00 and 88. Thereafter, quickly switching between GEN and SET or holding the switch in the SET position counts up the hours value. The hours count from 00 to 23 then start over.

When the MODE switch is released from SET to GEN after the hours start flashing, the previous hour value is recalled and displayed (instead of just setting it to zero). Note that the hours do not flash at this time. Subsequent actuation of GEN/SET counts up the hours from this value. Recalling the last hour value permits faster presetting when using the hours for the tape reel number, and it's not necessary to remember the number of your last reel.

If the switch is left in the GEN position for two seconds, the preset operation moves on to the minutes digits, with the same presetting action as described for the hours, except that the minutes count from 00 to 59 then start over. The seconds and frames are not preset except during jamsync or auto-backtime modes.

Note that instead of waiting for the preset cycle to run its course if you just want to preset the hours, you can quickly end the preset cycle at any time by switching the DISPLAY SEL switch, as described later.

## Selecting Drop Frame or Non-Drop Frame Time Code

After presetting the minutes, the preset operation changes to selecting drop frame or non-drop frame time code generation. This selection point is indicated by alternate display of a colon (:) then a semicolon (;) between the seconds and frames. The colon means non-drop frame time code; the semicolon means drop frame time code.

The drop frame/non-drop frame selection time lasts for two seconds. It's not necessary to time selection of the desired mode with the flashing of the colon/semicolon character. Simply switching to SET during this time places the VG-50 into the drop frame/non-drop frame setup mode. Further actuation of GEN/SET then selects between the two modes.

Once the drop frame/non-drop frame mode is selected, that mode remains selected until it's changed or the VG-50 is powered off. For example, assume you have selected drop frame mode and you later preset the hours to a different value. After presetting the hours the VG-50 flashes the minutes for two seconds, then the drop frame/non-drop frame indication for two seconds, then automatically selects the previous drop frame mode. After this, all of the colons flash to indicate the VG-50 is ready to run.

## Presetting the User Bits

When the user bits are displayed, they can be preset in much the same manner as used for presetting the time code. If the MODE switch is held in the SET position for two seconds, the left most user bit position will flash between 0 and 8, and can be preset to any value between 0 thru 9 and A, b, C, d, E, and F.

If the switch is left in the GEN position for two seconds the preset operation moves on to the next user bit digit, until all have been given the opportunity to be preset.

If you want to zero all of the user bits but leave the time code at its current value, hold the MODE switch in the SET position for two additional seconds after the left most user bit first flashes, and all of the user bits will be reset to zero.

It should be noted that if the user bits are ever preset, from then on the "jamsync" operation described later affects only the time code number, not the user bits.

## Ending the Time Code or User Bit Preset Cycle

If left on its own, the VG-50 automatically ends the preset cycle after several seconds. However, the preset cycle can be manually terminated at any time by momentarily switching the DISPLAY SEL switch. Any time code or user bit values you have preset so far remain in effect, and operation proceeds directly to starting the generator.

## Automatic Backtime Preset

On a record master tape that is pre-striped with time code and black (or color bars then black), it's desirable to have a "leader" of 30, 60, or more seconds before the time code "rolls through zero" and the first edit is performed. Performing the first edit at time zero allows the time code number to indicate the length of the program, in addition to the location of edits.

To have the time code roll through zero requires presetting the generator to a time code which is in front of zero. To assist in quickly presetting the starting time for this situation, the VG-50 allows you to select an automatic backtime preset of -30, -60, -90, or -120 seconds.

If the MODE switch is held in the SET position while the VG-50 is powered up, the window sequentially displays 00:00:30:00, 00:01:00:00, 00:01:30:00, 00:02:00:00, continuously changing each second. The time last displayed when the switch is released to the GEN position is the amount of time automatically subtracted from the generator's start time.
For example, the hours are always preset to 00 when the VG-50 is powered up. If the automatic backtime is set to 00:00:30:00 (30 seconds), the generator presets to 23:59:30:00. The auto backtime mode remains selected until the VG-50 is powered off.

*Note:*

Because the automatic backtime always sets the minutes to either 58 or 59, the minutes preset operation is skipped when presetting time code and using the automatic backtime feature. Preset operation proceeds directly from hours preset to drop frame or non-drop frame selection.

## Jamsync Operation

Jamsync presets the VITC time code generator to the last good LTC time code read by the LTC time code reader. Jamsync is automatic on the VG-50 and occurs when the VG-50 is switched from translate mode to generator mode via the MODE switch. When switched to generator, the VG-50 immediately starts generating and outputting VITC time code that remains in step and continuous with the LTC time code that it was reading.

To help prevent jamming to a wrong LTC time code number should the LTC time code input to the VG-50 be of poor quality, the VG-50 time code reader must read several good frames of in-sequence LTC time code before the generator is allowed to jamsync.

This means that when reading very poor quality LTC time code it may be necessary to switch between TRN LTC and GEN several times in order to get a good jamsync. If the jamsync is not successful, the VITC time code does not increment and all of the colons in the time code display flash.

Perform the following steps to jamsync the VG-50 to the LTC time code input.

1. Make sure LTC is input to the VG-50 TC IN connector and that the MODE switch is in the TRN LTC position.

2. As soon as running LTC time code is observed on the window display, switch the MODE switch to GEN. The VG-50 will continue generating VITC.

## Jamming Time Code Only

Normally the VG-50 jamsyncs both the VITC time code and user bits. However, if you preset any of the user bits, from then on (till power is switched off) only the LTC time code value is used to preset the VITC time code generator.

This feature allows you to preset the VITC user bits to indicate reel number, production number or other information, but still have the VITC preset to the LTC time code value. This applies to both momentarily jamming the generator and for continuous translating of LTC-to-VITC

## LTC Time Code Translator Operation

When the MODE switch is in the TRN LTC position, the VG-50 is in the LTC to VITC translator mode and it continuously translates LTC into VITC on a frame-by-frame basis. The front panel LED remains on.

## LTC Time Code Reading Speeds

The VG-50 reads and translates LTC time code at play speed in the forward direction only. This means that it does not read in reverse direction or in any search or fast wind mode, even if your VCR outputs audio channel or address track LTC time code at these speeds.

## Handling of LTC Reading Errors

Although designed to accurately read LTC time code from a LTC time code generator or a first generation tape, in practice the VG-50 can read and translate second and usually third generation time coded tapes without error, depending upon the type of VCR and how much "jitter" it introduces into the LTC time code signal.

Jitter is normal and is timing variations within the LTC time code produced by the mechanical nature of the recording/reproducing process. Excessive jitter can cause LTC time code reading errors which give editing systems trouble in editing accuracy and in VCR cueing and synchronization. This is because LTC time code readers in most editing systems fill-in LTC time code reading errors with calculated or predicted LTC time code values, which may not actually be correct.
Because of this, the VG-50 displays all decoding errors so that you can get an idea of how good your LTC time code is. Decoding errors appear as out-of-sequence time jumps or as erroneous time code values, such as 54 or AF hours.

## "On-Time" Time Code Updating

The VG-50 adds "plus" one frame number to the LTC time code frame number after it is read so that the VITC time code and video window display will be "on-time" with respect to the recorded LTC time code. This is done because it takes one frame to read the LTC time code number, and by the time it is read, its associated frame and VITC time code value of video have already been displayed and/or recorded.

By adding one frame to the LTC time code number the next frame of video will display the LTC time code number that the VG-50 is currently reading. If this operation were not performed, the VITC time code and time code window display would always lag the actual LTC time coded input by one frame.

## Using the VG-50 as an LTC Time Code Reader

To use the VG-50 as a play speed LTC time code reader to locate material on your VCR, place the VCR in PLAY mode and note the time code location. If you are close enough to the desired time code number, simply wait till the tape is almost there and then PAUSE your VCR. With a little practice you can reliably stop within a few frames of the desired location.

If you are far away from the time code number you desire, PAUSE your VCR, note approximately how far away you are, 1-minute, 3-minutes, 20-minutes, etc. Reset the VCR tape time to zero and fast search or wind till the tape-timer shows slightly less than the desired value. Then place the VCR into play and proceed as previously described.

## Time Code Phase Analyzer

The Time Code Phase (TCP) analyzer provides an on-screen indication of the timing, or "phase", relationship between the longitudinal time code (LTC) signal and the video signal when translating from longitudinal time code (LTC) to VITC.

When SMPTE LTC time code is generated, it is usually "genlocked" to a video reference such that the start of each frame of time code begins one video frame to generate all 80 digital bits of the LTC. The end of the last bit of the LTC signal coincides with the end of the video frame.

Because the LTC and video can be recorded by physically separate audio and video recording heads, it is possible for the timing relationship established at the time of recording to be altered, due to normal mechanical tolerances, when a tape, recorded on one VCR, is played back on another that has a slightly different distance separating the video and audio heads.

The TCP analyzer is a very useful piece of time code test equipment because it lets you see the actual phase relationship between the LTC and video. You can immediately tell where the LTC falls within the video frame and whether it was locked to the video or was free running when it was recorded. You can use the TCP analyzer to compare any LTC input with any video reference input. For example, you can check the LTC coming from a professional multitrack audio deck with the video from a separate video playback deck to see if they are drifting or are locked together.

## Effects of Incorrect LTC/Video Phase

Although desirable, it is usually not necessary for the LTC/video phase relationship to be exactly correct in order for a time code system to operate properly. Incorrect LTC/video phase is a matter of degree and the kinds of symptoms and problems that result from incorrect phase can vary as the LTC "moves" out of one video frame and into another earlier or later frame.

For example, in a time code based video editing system, smaller phase errors, perhaps up to about of a video frame, may not show up at all, or may produce inconsistent or intermittent frame accurate edits. Larger errors can produce these same results or produce edits that are consistently off by one or more frames.

When translating LTC to VITC, larger phase errors can cause the frame number, both on the screen and in the translated VITC signal, to change in the middle of a frame (i.e., at the start of field 2) rather than at the beginning of each new frame.

## TCP Analyzer Display

The TCP analyzer display consists of a thin white dash which resides just below the time code or user bit characters. It is enabled whenever the VG-50's MODE switch is in its TRN LTC position and forward, play speed LTC is being read. This white dash represents the center bit of the LTC frame. The horizontal width of the time code window represents the frame time of the video.
when correctly phased to video, the center of the LTC occurs at the center of the video frame time and the TCP analyzer white dash is displayed directly under the center colon separating the minutes and seconds. The more the dash is positioned left of center, the more the LTC has "moved" into the preceding frame of video. Conversely, the more to the right, the more into the next frame of video.

If the TCP analyzer dash continuously moves or drifts through the video frame, this indicates that the LTC and video were not locked together when the recording was made or, if the LTC and video are being played back from separate decks, then these decks are not presently locked to the same reference.

### Adjusting the LTC/Video Phase

If the LTC was recorded on a "linear" audio channel or on a special time code or address track, adjustment of the tracking control on a VCR will change the LTC/Video phase relationship.

When translating LTC to VITC, the tracking control can be adjusted to center the TCP dash under the center colon. If this produces too much noise in the picture, simply adjust for a dash position as close to the center colon as practical.

Note that during tape playback the TCP dash may jump from side to side the width of a single dash. This is normal and can sometimes be eliminated by a very slight adjustment of the tracking control.

### Recording Levels for LTC Time Code

Typical levels for recording the restored LTC time code output from the VG-50 range from -10dB to +3dB on the audio recording level meter. The lower recording levels introduce less time code bleed (crosstalk) onto the adjacent audio channel.

Recording levels are usually fixed when recording on an address track or if the VCR dedicates an audio channel for LTC time code by way of an AUDIO/TIME CODE switch

# 5 MAINTENANCE AND TROUBLESHOOTING

### Cleaning

1. Do not attempt to disassemble your VG-50 to clean it.

2. Clean your VG-50 using only a damp cloth.

3. NEVER use water or solvents such as alcohol, window cleaner, etc. to clean your VG-50.

### Service

Do not attempt to disassemble your VG-50 to service it. There are no user serviceable parts or adjustments inside. You can return your VG-50 to HORITA for service or repair. Please contact HORITA first before returning your unit.

### Troubleshooting

The following provides a list of the most common items to check if you are having trouble with your VG-50.

### General

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

1. Make sure the video input to the VG-50 is not "double terminated", that is, there are no other video terminations on the video input line from other recorders, monitors, etc.

2. Check all coaxial cables in signal path for opens or shorts.

3. If using an AC power adapter different from the one supplied with the VG-50, make sure it supplies the VG-50 with at least 9-volts (maximum of 12-volts) when the VG-50 is switched on.

### No Video When Power ON, Video When Power OFF

1. Check that the VIDEO IN and OUT cables have not been switched. If the cables are reversed there is still a picture when power is off and this can give a misleading indication that the cables are correctly connected.

2. Check that you are using the correct power adapter and that is has power applied. The output of the 9-volt power adapter furnished with your VG-50 generally measures 13 to 14 volts DC at the connector, without a load.

### Doesn't Read LTC Time Code

1. Check that the MODE switch is in TRN LTC and that time code ("T") is selected for display.

2. Check that the VCR level indicators indicate LTC time code is present and at the correct level during both record and playback.

3. Unplug the time code input to VG-50 and connect it to an audio monitor. The time code signal sounds something like FAX transmission. Because LTC time code is an audio signal, you can use an audio monitor to follow it around your system until the fault is located.

4. It's normal to have momentary disturbances in LTC time code reading at camera edit points.

5. A continuous LTC time code display of 00:00:00:01 means the input time code is frozen at zero. (the VG-50 adds one frame to it which makes the frame read 01).

Either the generator was not running when the time code was recorded or the time code is not from "off-tape" but instead from a time code generator in the VCR or camcorder. This is the case with some Betacam equipment. Check and make sure your VCR will actually play back off-tape time code to the time code output connector and that if there is a reader/generator type of select switch on the VCR, that it is set to reader.

# 6 SPECIFICATIONS

| | |
|---|---|
| Power | |
| Operation | 9-to-13.5 volts DC, 250 milliampers |
| Connector | 3.5MM Mini phone jack |
| AC Adapter | 9-volt, 500 milliampers |
| | |
| Video | |
| Standard | NTSC 525 line, 60 field, RS-170A |
| Input | |
| Level | 1-Volt p-p |
| Impedance | 75-Ohm |
| Output | |
| Power On | 1-volt p-p (terminated at 75-Ohm) |
| Power Off | Same as input (direct loop thru) |
| Connectors | BNC |
| | |
| VITC Time Code | |
| Format | SMPTE 90-bit drop frame/non-drop frame |
| Output Level | 0 IRE to +90 +/-10 IRE |
| | |
| LTC Time Code | |
| Format | SMPTE 80-bit longitudinal drop frame/non-drop frame |
| Input | |
| Level | 100 millivolts to 10-volts p-p |
| Impedance | 10K Ohm, single ended |
| Speed | Play speed, +/-10% |
| Output | |
| Level | .5 volts p-p |
| Impedance | 2K Ohms |
| Risetime | 25 microseconds, +/-5uS |
| Connectors | RCA |
| | |
| Preset | |
| Time Code | Hours 00 to 23, Minutes 00 to 59 |
| | Drop/non-drop frame |
| User Bits | Hexadecimal 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F |

| | |
|---|---|
| Display | |
| Format | Hours, minutes, seconds, frames HR:MN:SC:FR (23:59:59:29 max) |
| Drop frame Indicator | Semicolon separating seconds and frames |
| Field-1 Indicator | Period separating seconds and frames |
| Switches | |
| Power | ON/OFF |
| Mode | TRN LTC/GEN/SET |
| Display | SEL Time Code, User Bits, Off |
| Line Select | ODD/EVEN and 11/13, 12/14,13/15,14/16, 15/17, 16/18 |
| LED Indicator | |
| Power ON(RDR) | Steady on |
| Generator | |
| Running | |
| Video | Fast flashing |
| No video | Alternating fast/slow flashing |
| Stopped | |
| Video | Medium flashing |
| No video | Slow flashing |
| Environment | |
| Operating | 5øC to 40øC (41øF to 104øF) |
| Storage | -10øC to 60øC (14øF to 140øF) |
| Dimensions | |
| Desktop | 2" H, 3" W, 4" D |
| Rackmount | 1-3/4" H, 19" W, 5-3/4" D |
| Shortrack | 1-3/4" H, 7" W, 5-3/4" D |
| Weight | |
| Desktop | 8 Oz. |
| Rackmount | 1-1/2 Lbs. |
| Shortrack | 1-3/8 Lbs. |