HORITA VLR-100

SMPTE VITC/LTC CODE READER
LTC GENERATOR
LED DISPLAY

USER MANUAL

For Models VLR-100 and VLR-100PC

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Rev. F

HORITA®

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1 GENERAL

The VLR-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 with both an LTC generator and VITC-to-LTC translator.

The LED display characters are 0.56" high and are suitable for viewing across a room. A brightness control allows adjustment of display intensity for use in a darkened environment.

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

The VLR-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).
* Manual preset of LTC generator or jam-sync from LTC or VITC reader. Supports both drop and non-drop frame time code.
* Translates VITC to LTC.
* 0.56" high LED display characters with brightness control.
* Outputs 2V P-P reshaped LTC for passing on to other units.
* Front 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.
* Front panel DATA switch selects time code or user bits for display.
* Front 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 VLR-100 measures 8.75"W x 1.5"H x 4.5"D.
* Optionally available as the VLR-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 VLR-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 VLR-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 VLR-100

4.1 Connecting Power

Included with your VLR-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 VLR-100 may result.

4.2 Connecting LTC In and Out

Connect SMPTE LTC from its source to the RCA connector LTC IN. In Reader operation, the VLR-100 supplies reshaped LTC at the LTC OUT connector. This output connector is also the source of LTC during LTC generation/translation. In either case, the LTC output is single-ended at a level of 2-volts peak-to-peak (approximately 0dB). It is compatible with most VCR audio channel or address track levels for recording LTC.

An internal jumper allows adjustment of the LTC OUT signal risetime. See Section 6 for further details.

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 or connecting the VITC(VIDEO) OUT to a terminating video monitor, VCR, etc. If you are using a Time Base Corrector (TBC) it is usually best that the VLR-100 VITC(VIDEO) IN be connected inline with the video input to the TBC.

4.4 Connection Diagrams

Figures 4-1 through 4-4 describe various connection configurations in which the VLR-100 can be used.

Figure 4-1 shows the basic setup for reading LTC and/or VITC.

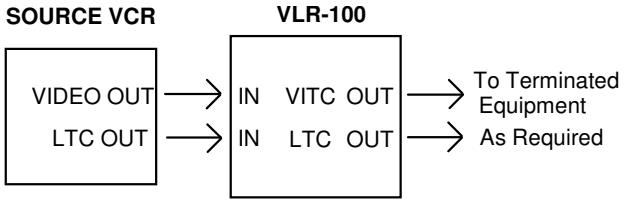

Figure 4-1, Basic VLR-100 LTC/VITC Reader Connections

Adding LTC to a pre-recorded source tape is shown in Figure 4-2. In this application the Source VCR must be able to insert record (dub) the LTC so that the pre-recorded audio and video signals are not disturbed. Note that the LTC to be added can be manually preset or can be translated from any VITC that currently resides on the source tape.

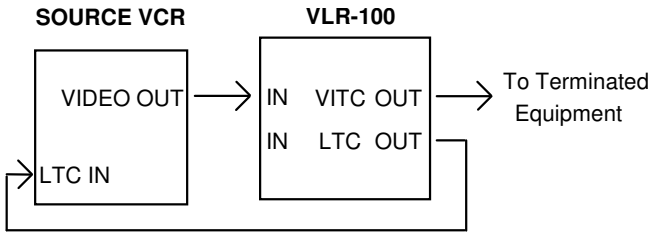

Figure 4-2, Adding LTC to Source Tape

LTC can also be added to a pre-recorded source tape and be jamsync'd to existing LTC or VITC (Figure 4-3). This procedure again requires a dubbing VCR.

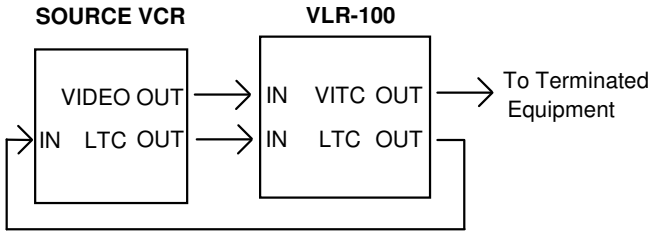

Figure 4-3, Adding LTC to Source Tape Using Jamsync

Figure 4-4 shows pre-striping of tape with black-burst and LTC.

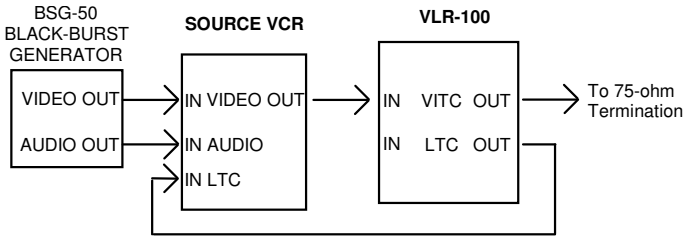

Figure 4-4, Pre-striping Tape with Black-Burst and LTC

4.5 Connecting Serial COMM (VLR-100PC Only)

The HORITA-supplied serial interface cable connects the VLR-100PC COMM connector (3.5mm phone jack) to a DB-9 male connector compatible with most PC RS-232 serial port interfaces. For a USB connection an RS-232-to-USB adapter cable can be used. These are available online or usually at a computer store. They have a DB9 female connector at one end and a USB connector at the other.

It should be noted that there are many suppliers of these devices and each device has its own internal software to translate and time the RS-232-to-USB conversion process. Because of this and also because of all of the Windows operating systems available and in use, not all of the adapters operate correctly with the VLR-PC and may need to be exchanged until one is found that operates correctly.

5 OPERATING THE VLR-100

5.1 Time Code Reader Operation

Selecting the Time Code Source

The front panel SELECT switch allows choice of reading and displaying either LTC or VITC, or an AUTO mode of operation. In AUTO mode, the VLR-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 a VCR audio LTC signal often deteriorates and is unreadable, whereas the VITC signal, being part of the video, is readable down to still frame.

LTC Reader Operation

When recorded on a VCR, the VLR-100 reads LTC in both forward and reverse directions at various search speeds. The full search speed reading range can be realized only with professional VCRs that have a separate address track (time code track) for recording and reproducing time code. This is because the address track has a much higher bandwidth compared to a normal audio track, and thus allows a more faithful reproduction of the time code waveform at the various search speeds.

When LTC is recorded on the linear audio track of a VCR both ends of the speed range are reduced, typically the low end to about 1/10th-to-1/5th times play speed and the high end up to around 2-to-5 times play speed. This also applies to VCRs that dedicate an audio channel for time code via a "time code/audio" select switch.

Note that some VCRs mute the audio channel at some of the slower search speeds while some mute it at all speeds other than play speed, thus making the time code unreadable at these speeds.

Because it takes an entire frame time to read the LTC number, the VLR-100 updates its display value by one frame so that it is always showing the frame number it is reading. This process is known as "on-time updating" and is generally used by all of HORITA's Longitudinal Time Code Reader products to ensure the greatest accuracy.

VITC Reader Operation

The VLR-100 reads VITC in both forward and reverse directions from pause on up to fast search. There is no VITC line number selection for the VLR-100. The VLR-100 reads the first line of VITC that it detects in the vertical interval.

Note:

To ensure proper VITC reader operation, the looped-through OUT VITC(VIDEO) connector MUST be properly terminated at 75-ohms.

When most composite video VCRs are placed into search or pause mode, the "off-tape" vertical interval is corrupted by "noise bar(s)". To correct for this effect and to create a more stable picture, the VCR replaces the off-tape vertical interval with a more stable "pseudo" vertical interval sync pulse derived from magnetic pickups on the rotating scanning head. Unfortunately, this pseudo vertical interval can on occasion "replace" the VITC signal as well, depending upon the direction and speed of searching, the tracking control adjustment setting, and the lines on which the VITC signal was originally recorded. Similarly, when in pause mode, the VCR may move the noise bar into the vertical interval so that a clear picture is produced; however, this action may render the VITC unreadable. In all such cases, the VCR tracking control can usually be adjusted to improve readability of the VITC signal if required.

When first attempting to read VITC, the VLR-100 performs an "acquisition" procedure which takes a fraction of a second to complete. This VITC acquisition procedure is intended to account for variations in video level due to changes of tapes, tapes speeds, etc. and 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 LTC Generator Operation

The VLR-100 enters the LTC Generator mode of operation when the MODE switch is set to GEN LTC. If reading VITC, the VLR-100 operates as a VITC-to-LTC translator when the MODE switch is changed from RDR to GEN LTC. This translation operation is described in more detail later on.

When play speed video is supplied to the VLR-100 (at its VITC(VIDEO) input connector) the LTC generator genlocks its LTC

output signal to this video; otherwise the LTC generator free runs at an approximate 29.97 frames-per-second rate.

Generator Run/Stop

Each time the mode switch is momentarily positioned to SET and then released back to GEN LTC, the VLR-100 alternately starts and stops incrementing the LTC numbers. When the generator is incrementing, the LTC colon LED blinks rapidly. When stopped, the LTC colon LED blinks at a ¼-second on/off rate.

Presetting the Time Code

The VLR-100 LTC Generator starting value is preset using the MODE switch. When the MODE switch is held in the SET position for two seconds, the minute, second and frame digits are preset to 00 while the hour digits flash the current hours value on and off. Alternate activation/release of the MODE switch to/from the SET position causes the hour digits to count up to 23 and then start over at 00. The MODE switch can also be held in the SET position to force automatic counting of the hour digits.

Once the MODE switch has remained released from its SET position for two seconds, the preset operation moves to the minute digits. Starting from 00 the minute digits can be counted up to 59 in a similar manner as the hours. Once the MODE switch remains released from its SET position for two seconds, the minutes preset operation finishes. If no counting of the minute digits is performed (i.e., MODE was never pressed to SET), the minute digits simply flash on and off for two seconds and then the operation completes, leaving the minutes value at 00.

Except for jamsync and auto-backtime operations (both described further on), the seconds and frames are always preset to 00. After presetting the minutes, the preset operation moves on to selection of drop frame or non-drop frame time code generation indicated by the DF LED blinking on and off. Alternating the MODE switch to/from the SET position toggles between drop and non-drop frame generation, forcing the DF LED on or off, respectively. Once the MODE switch has remained inactive for one second, the drop frame preset operation completes.

At this point, the LTC colon LED begins to blink, indicating that the LTC generator is ready to run.

Presetting the User Bits

When the DATA switch is in the UB position, the user bits can be preset in much the same manner as used for presetting the time code. Presetting the user bits does not affect the time code value. When the MODE switch is held in the SET position for one second, the left most user bit digit blinks on and off, and can be preset to any value between 0 through 9 and A, B, C, D, E and F, starting from its current value. Once the MODE switch remains inactive for one second, the preset operation moves on to the next user bit digit until all eight have been given the opportunity to be preset.

If you wish to "auto-clear" all of the user bit digits before setting them (without affecting the time code value), continue to hold the MODE switch in the SET position for one additional second after the left most digit first begins blinking.

Ending the Preset Cycle

If left on its own, the VLR-100 automatically ends the preset operation after several seconds. However, the preset operation can be manually terminated at any time by switching the DATA switch between its TC and UB positions. 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 burst (or color bars and then black burst), it is often desirable to have a "leader" of 30, 60, or more seconds before the time code number "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.

Automatic backtime preset allows the generator to be preset to a starting time "in front of" zero. The backtime preset value can be selected from -30, -60, -90, or -120 seconds.

If the MODE switch is held in its SET position while the VLR-100 is powered up, the automatic backtime preset selection mode is immediately entered. As long as MODE remains in the SET position, the display will sequentially change between 00:00:30:00, 00:01:00:00, 00:01:30:00, and 00:02:00:00, once per second. The time last displayed when the MODE switch is released from the SET position becomes the amount of time automatically subtracted from the generator's start time whenever it is preset.

For example, the VLR-100 LTC generator normally starts at 00:00:00:00 at power up. If automatic backtime mode is set to 00:00:30:00 (30 seconds), then the generator presets to 23:59:30:00. The automatic backtime mode remains in effect until the

VLR-100 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 the time code and using the automatic backtime feature. Preset operation proceeds directly from the hours preset to the drop/non-drop frame selection.

Time Code Jamsync

Jamsync operation presets the LTC generator to the last good time code number read when the MODE switch is changed from RDR to GEN LTC. In addition to the time code value, the drop/non-drop frame mode of the jamsync time code is also transferred to the LTC generator. This permits re-recording good LTC over a poor LTC recording, starting from a point where the original LTC was good, and also allows adding additional LTC to a tape on which LTC is already recorded but ends at some arbitrary point.

If the SELECT switch is in its LTC position at the time that the MODE switch is changed to GEN LTC then the generator will preset to the last good LTC number read. If the LTC reader is currently reading good time code, then the LTC generator starts running from the jamsync value, producing LTC output that remains in step and continuous with the time code that was being read. On the other hand, if the LTC reader is not currently reading good time code when the switch to LTC generator takes place, then the LTC generator presets to the last good time code read, but remains in its STOP mode.

If the SELECT switch is in its VITC position when the MODE switch is changed to GEN LTC then the VLR-100 enters the VITC-to-LTC translation, which is described in more detail further on in this manual. At this point, a momentary actuation of the MODE switch to its SET position causes a VITC jamsync operation, leaving the LTC generator running from the last good VITC time code number.

User Bit Jamsync

The user bits are normally jammed along with the time code when a jamsync operation is performed. However, if they were previously manually preset, they remain at their preset value. This allows you to preset the LTC generator user bits to a desired value, for example, to indicate a tape reel number when making a copy of the tape, but still jamsync the time code to the correct value. If all eight user bit digits are "auto-cleared" as previously described under the section "Presetting the User Bits", then they now jamsync to incoming VITC or LTC once again.

LTC Recording Levels

Typical levels for recording LTC range from -10dB to +3dB on the recording meter. The lower recording levels introduce less time code "bleed" (crosstalk) onto an adjacent audio channel when they are used to record time code.

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

When recording LTC on VHS and SVHS VCRs using audio channel-2 for dedicated LTC, it is normal for the program audio channel-1 recording level meter to peg to the right while channel-2 shows 0-VU. This results from audio channel crosstalk at the recording head (which started out as a monophonic head and was later split into two heads for stereo) and, although quite severe because the recording heads are very close to each other, the crosstalk does no permanent harm because it does not get recorded. However, it does prevent post-recording LTC while making a copy of the tape with program audio in a single operation.

5.3 VITC-to-LTC Translation

When the SELECT switch is in its VITC position and the MODE switch is changed from RDR to GEN LTC, the VLR-100 enters its VITC-to-LTC translation mode of operation. The translated LTC is genlocked to the incoming video (if at play speed) and tracks the drop/non-drop frame format of the VITC.

This translation mode allows VITC striped tape to be used to operate LTC-based editing systems, synchronize audio transports or MIDI equipment, operate other LTC equipment such as GPI devices, LTC reader and generators, and time code tape logging programs, as well as various other pieces of video and audio equipment requiring standard SMPTE LTC to operate.

The LTC output of the VLR-100 in translation mode is always at play speed, thus it can be read by inexpensive play speed readers and window inserters, such as the HORITA WG-50.

NOTE:

The information concerning proper video termination and VITC acquisition procedures mentioned in the section on the VITC reader also applies to the VITC-to-LTC translator mode of operation.

Controlling Direction of LTC Output

An internal jumper selection allows the choice of generating both forward and reverse direction LTC output, or forward direction LTC only. Direction in this context refers to the direction information inherent in the VLR-100 LTC output waveform as it would occur if this waveform was read directly off tape. For example, when normally reading LTC from a VCR's audio channel or time code track with the tape moving in the forward direction, the time information contained in the LTC waveform is received in the sequence of frames, seconds, minutes, and hours. In reverse tape direction, this sequence changes to hours, minutes, seconds, and frames.

This direction information contained in the LTC waveform may be required by LTC-based audio synchronizers and edit controllers for correct operation. If your downstream LTC-based equipment reads and processes bi-directional time code, then the VLR-100 VITC-to-LTC translator should be setup to produce both forward and reverse LTC.

For downstream equipment which can only process forward LTC, then the VLR-100 should be setup to only produce forward LTC output. In this mode of operation, the LTC waveform is always in the forward direction format even though the time code numbers themselves may be counting down in reverse.

The VLR-100 is factory set to produce bi-directional LTC. See Chapter 6 for information on changing this setting.

Search Offset

When reading LTC at play speed, it takes the time of an entire video frame to read the LTC number for that frame of video, and, as soon as this frame number has been read, that frame of video is history. Because of this situation, most (but not all) SMPTE LTC equipment add one frame count to the LTC number so that the next frame of video will be known beforehand. This process is generally referred to as "on time updating" or "+1 frame."

However, when the VCR is in search mode and is still framed, adding an extra count to the translated time code number causes the frame number to be ahead by one. To compensate for this behavior, an internal jumper selection enables the VLR-100 VITC-to-LTC translator to apply a "-1 frame" search offset to the time code number contained in the output LTC waveform. With search offset enabled, the VLR-100 subtracts one frame count from the translated value so that when downstream equipment adds one frame, the correct frame number is produced.

The VLR-100 is factory set to enable search offset. See Chapter 6 for information on changing this setting.

Ending VITC-to-LTC Translation

The VITC-to-LTC translation mode is exited when any of the following operations take place:

* The MODE switch is changed back to its RDR position. The VLR-100 re-enters the VITC reader mode.

* The MODE switch is momentarily activated to SET. This action causes the VLR-100 to change from translation to simply generating LTC. It immediately begins incrementing the LTC generator number starting from the most recently translated VITC value.

* The SELECT switch is moved out of its VITC position. Again, the VLR-100 enters its LTC generator mode, but whether it automatically starts incrementing depends upon the state of the input VITC. If play speed VITC was being successfully read immediately before the SELECT switch was changed, then the VLR-100 jamsyncs to this input VITC and the LTC generator enters its "run" mode and begins incrementing. On the other hand, if either the translated VITC input was not at play speed or was not available at all, then the VLR-100 does not begin incrementing its time code number and enters its "stop" mode.

5.4 Controlling the Display

The rear panel BRIGHT knob controls the display brightness. The DATA switch allows display of either time code or user bits.

The momentary DISPLAY switch toggles between display RUN and display HOLD modes. An initial press of this switch "holds" the current display and prevents it from changing. The display HOLD mode is indicated by blinking the active colon LEDs at a ¼-sec on/off rate. 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 DISPLAY switch releases the display HOLD mode and the most current time code or user bits are again displayed. Note that although the display may be in HOLD mode, the internal reader/generator remains active.

Display Description

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

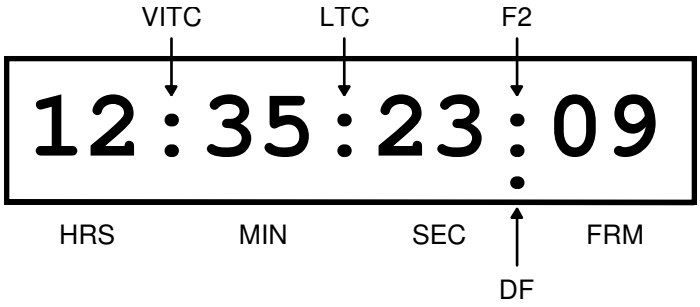

Figure 5-1, VLR-100 LED Display

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

Table 5-1, Discrete LED Descriptions

LED	MEANING
VITC	The VITC LED blinks rapidly when VITC is being actively read, both in VITC reader and VITC-to-LTC translation modes. If the VLR-100 can no longer read VITC, the VITC LED remains steady on if the currently displayed time code or user bits originated from VITC (as opposed to LTC). The VITC LED slowly blinks on and off at a 1-second rate to indicate loss of input video.
LTC	If the VLR-100 is operating as an LTC reader, the LTC LED blinks rapidly whenever incoming LTC is being actively read. As with the VITC LED, the LTC LED remains steady on if the LTC reader stops reading LTC to show that the current display reflects a previous LTC input.When in either the LTC generator or VITC-to-LTC translation modes of operation, the LTC LED blinks rapidly to indicate that the LTC generator is running (i.e., incrementing the output LTC numbers), or that successful translation is occurring. When the LTC generator is stopped, the LTC colon LED blinks at a ¼-sec on/off rate. Upon loss of input video, blinking of the LTC LED is stopped every other second to indicate that the LTC generator is not locked to video.
F2	This LED is on when reading field 2 and off when reading field 1 whenever 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 the VITC reader is not active.
DF	This LED is on whenever drop frame time code is being read or generated. 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 VLR-100 to clean it.
2. Clean your VLR-100 using only a damp cloth.
3. NEVER use water or solvents such as alcohol, window cleaner, etc., to clean your VLR-100.

6.2 Service and Troubleshooting

If you suspect your VLR-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 VLR-100, make sure it supplies the VLR-100 with at least 9 volts (maximum of 14 volts) when the VLR-100 is switched on.

You may return your VLR-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 VLR-100 by removing the six hex screws. The locations of these jumpers are shown in Figure 6-1.

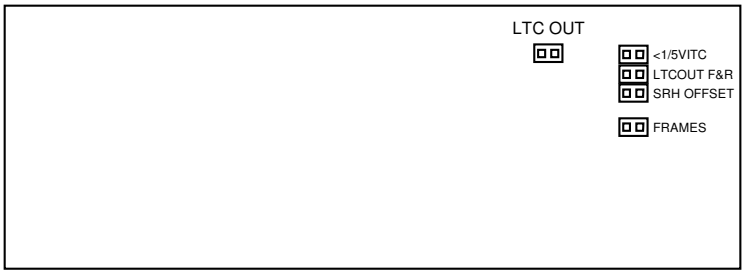

Figure 6-1, Jumper Locations

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).

LTCOUT F&R Jumper

The "LTCOUT F&R" jumper controls the allowable direction of the generated LTC OUT during VITC-to-LTC translation. With

the shunt installed, both forward and reverse LTC is generated. With the shunt removed, the LTC OUT waveform is always in the forward direction regardless of the apparent tape direction from which the VITC is read.

Factory setting allows both forward and reverse LTC generation (shunt installed).

SRH OFFSET Jumper

The "SRH OFFSET" jumper enables application of a "-1 frame" offset to the generated LTC number during VITC-to-LTC translation when the VITC source VCR is at search speeds (especially slow and still-framed). Search offset is enabled when the shunt is installed and disabled otherwise.

Factory setting is to enable search offset (shunt installed).

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 (VLR-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