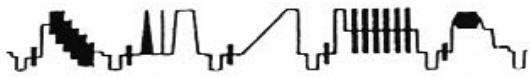


LEADER

TELEPRODUCTION TEST



VOLUME 3 NUMBER 3



TIMING (GENLOCK) ADJUSTMENTS IN HDTV

Timing or genlock adjustments in the 1080i/59.94 environment poses some new problems in comparison with familiar NTSC techniques. There is no burst reference and signal delays can be in lines rather than microseconds due to processing delays. What's needed is a timing reference that spots an address on a particular line, is there all the time and is not influenced by picture content. The procedure described in this issue makes use of a pulse that appears on line 9 of field 1 if embedded audio is in use in the sources to be timed. The pulse is formed by the 000,3FF,3FF preamble to the audio control packets that are in the Y channel. (See SMPTE 299M, page 15.)

The Setup

Two sources, generators such as the LT 440D, are needed as well as the waveform monitor LV 5152DA. Connect the serial output of the generator designated as the master to the A serial input of the LV 5152DA, and connect the serial output of the generator to be genlocked to the B serial input. Connect the tri-level sync output of the master generator to the GENLOCK input of the slave and loop through to the EXT REF inputs of the LV 5152DA and terminate. When the setup is powered, the INT LED will light in the GENLOCK group on the master but the 1125 LED will light on the slave showing that it is locked to external 1125 sync. Set both generators for 100% color bars.

At the LV 5152DA select SERIAL A for observation and set controls for a normal parade display to confirm proper operation for the waveform monitor. Next, reset the WFM monitor as follows:

- Select EXT REF. The LED shows when external reference is selected.
- Touch CH2 and CH3 to turn off the LEDs and confirm that CH1 is active. We will be looking at the audio control pulse in the Y (CH1) channel.
- In the DISPLAY group select OVERLAY.
- Activate the SYSTEM menu, go to the DIGITAL menu and select EAV/SAV PASS. (We will be looking at a signal in blanking.)
- Touch LINESEL and select Field 1. Set the WINDOW to 2 and set the line number to 8. (The reason for selecting line 8 will be shown shortly.)
- Select the SWEEP menu and select 2H.

The display should appear as shown in Fig. 1. Turn INTEN fully CW as we are looking at 2 lines out of 1125.

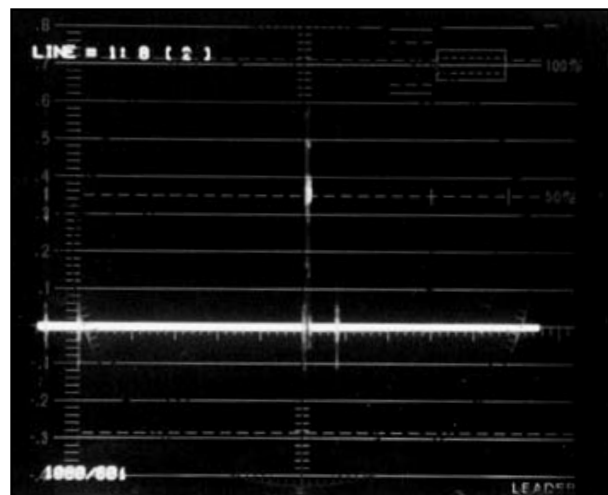


Fig. 1 Lines 8 and 9 of Field 1 shows the audio control pulse at mid screen.

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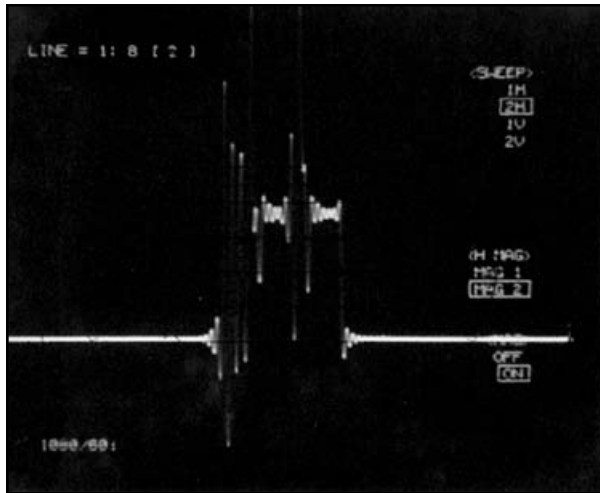


Fig. 2 The audio control pulse magnified with MAG 2.

What the display shows is lines 8 and 9 from left to right. Starting at far left is EAV followed by SAV for line 8 with EAV for line 9 followed by the audio control pulse at mid screen. This is followed by SAV for line 9. Now to set up adjustment, set H POS to place the control pulse on the center major time tick of the graticule.

Figure 2 shows the pulse expanded in the MAG2 mode. This is actually very dim at this magnification. The photo was taken using a time exposure.

The control pulse can also be found in the data dump for line 9. Touch DIGITAL, dial up line 9 and the data appears as shown in Fig. 3. The preamble appears at addresses 1928-1930.

To set genlock on the slave generator, switch the LV 5152DA to observe SER B. Fig. 4 shows an example of a delay in this generator's signal as its control pulse shows up to the right of the center graticule mark that had been set up earlier as the timing reference. (Almost a full line late.)

Timing correction is made by holding SET on the

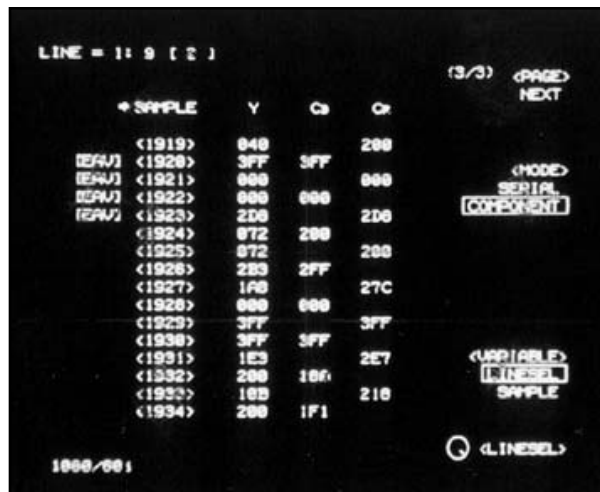


Fig. 3 The audio control pulse at addresses 1928-1930 on line 9.

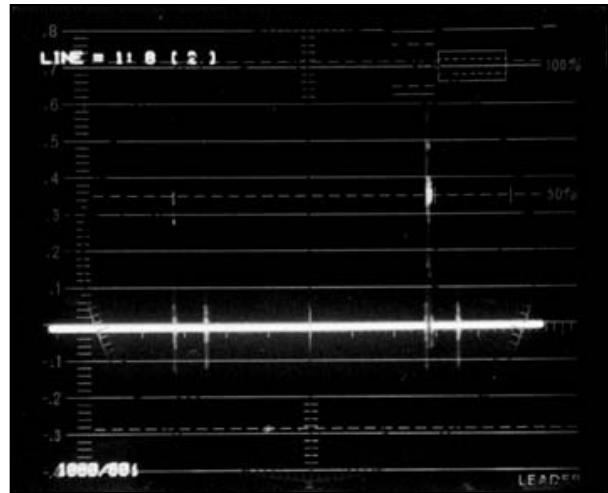


Fig. 4 Late pulse from the slaved generator.

slave LT 440D and touching the outer ← key until the leading edge of the control pulse comes to rest on the center reference graticule mark. See Fig. 11 on the back page for locations of timing controls.

Fine Adjustment

The adjustments outlined above should be adequate for most cases as digital equipment should lock with an error of less than 0.5H. But to make more precise adjustments, repeat the procedure with MAG 1 selected from the SWEEP mode. Fig. 5 shows the reference setting after MAG 1 has been selected. Here again the master generator is selected and H POS is set to put the leading edge of the control pulse on the center graticule mark. Then SER B is called up to view the pulse from the slaved generator. This is shown in Fig. 6 after the coarse adjustment had been completed. Note that the pulse is still late, but by a very small time. The cursors had been activated to show a 277 nanosecond delay. But this delay can be corrected with the fine adjustment of the inner arrow keys on the LT 440D.

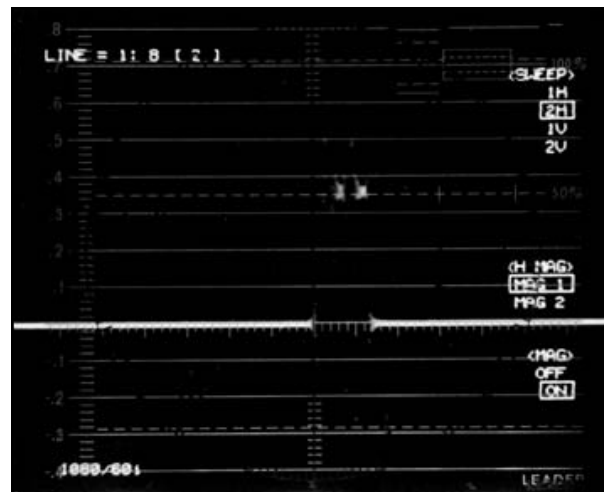


Fig. 5 Control pulse from the master generator set to the reference mark in MAG 1.



Fig. 6 Small timing error easily corrected with the fine keys. Cursors activated to show the initial error.

Error Greater Than 1H

The procedure thus far works for errors of less than 1H. For larger errors, the LV 5152DA is set to the 2V sweep mode with MAG ON. See Fig. 7. Here the master generator's signal is observed with a 2V sweep but we are still in line select. Here the display is changed in that the lines selected (8 and 9) are highlighted. That accounts for the bright dash seen on the base of the V blanking pulse and that audio control pulse is sitting on that two line dash.

Fig. 8 shows the signal from the slaved LT 440D after a five line delay had been inserted at that generator. This delay or advance of up to 100 lines is available from the LT 440D menus. Note that the V blanking interval for the slave generator has moved to the right as compared to the leading edge of blanking for the reference setting of Fig. 7. The audio control pulse also no longer sits on the highlighted dash for lines 8 and 9. In this case, removal of the delay introduced by the SER B generator (advance/delay set to zero lines) would return the

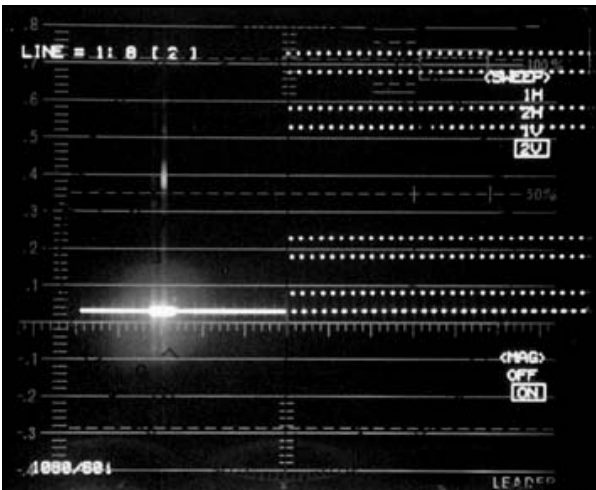


Fig. 7 Master generator pulse in line select (8) and sweep set to 2V.



Fig. 8 Slave generator (SERB) with a delay of five lines.

SER B display of Fig. 8 to that of Fig. 7.

Timing errors of more than several lines would require that the V blanking signals be viewed without the MAG function. Fig. 9 shows a delay of 75 lines at the slaved generator. Sweep has been set to 2V and sweep mag has been switched off.

Very large timing errors can also be observed with the LV 5152DA set to the PICTURE mode. Fig. 10 shows an example. Here the slave generator has the same 75-line delay shown in the waveform of Fig. 9. The picture is still synced from external reference, and the V blanking bar is shown to have dropped from the top.

Line-Select Window

Some comment about the LINE-SELECT window notation on the LV 5152DA is in order. Look back at Fig. 1 for a moment. The notice at the top-left of the screen is: LINE = 1 : 8 [2]. This reads that we are looking at field 1, line 8 and the window (in parenthesis) is two lines. Under normal conditions, where the

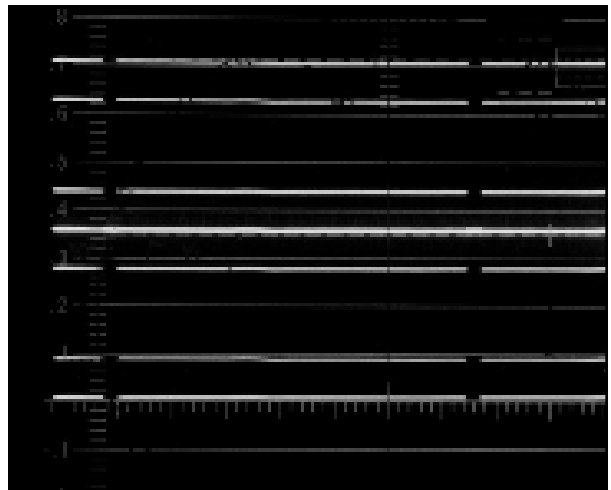


Fig. 9 Large delay in the slaved signal viewed at 2V without MAG.

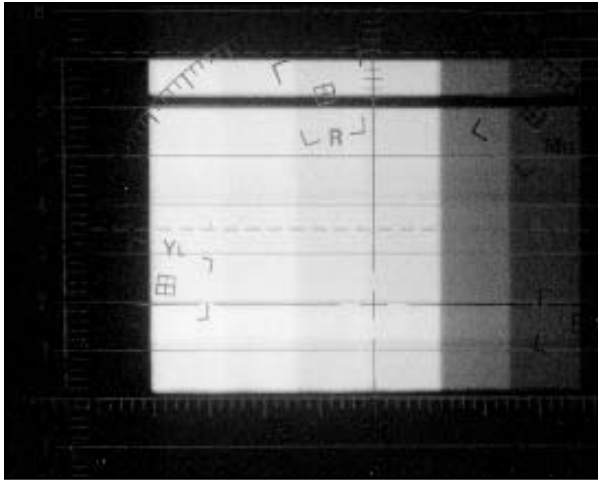


Fig. 10 An example of a 75-line delay for the slave generator viewed in the PICTURE mode.

window is selected from the Line-Select menu, the lines within the window are overlaid and the sweep is 1H. But, because the sweep had been set for 2H at the outset the window is shown to be two lines, and the traces for lines 8 and 9 appear side by side in time sequence from left to right. This points up another example of control flexibility in the LV 5152DA.

Don't Overlook the Presets

Control setup to view the audio control pulse and to make timing adjustments involves a number of con-

trol settings given on page 1, and omission of any one of them will hide the pulse to be used as the reference. To avoid repeating this somewhat involved number of settings the solution is to assign the setup, once completed, to one or two of the ten available presets available in the LV 5152DA. (One could be used for errors of less than 1H, another for larger error. The procedure to assign presets is as follows. Touch PRESET. This will bring you the list of available presets, labelled P1 to P10 on the unit as it comes from the factory. Pick one of these with the rotary F·D control. The presets will recall all settings including centering and the selection of external sync. One thing that is not recalled in the preset mode is the setting of the INTEN (brightness) control. You can leave it as is, P3 for example, or call up the <PRESET> mode (F-2) and then the <RENAME> mode. Now you can rename the setup with either today's date hit the <RENAME-DATE>) or compose your own label for the preset, such as "GENLOCK." Here the LOCATION keys move the cursors to the position of each character location and the rotary <SELECT> knob (F·D) allows you to select the characters. When ready, touch the STORE key from the PRESET menu.



Fig. 11 LT 440D generator. Timing controls are in the GENLOCK group.