

TV Triggers

Video triggers and Pedestal Camping

Video Overview

There are three major TV standards presently in use, they are: a) National Television Systems Committee (NTSC), b) Phase Alternation Line (PAL), and c) Sequential Couleur avec Memoire (SECAM). The differences between PAL, SECAM and NTSC video systems are clearly defined in their respective standards. Each system has a set of associated recommended test practices and procedures, which exploit the advantages offered by an analog scope equipped with TV trigger...such as the LeCroy analog scopes.

PAL, SECAM, and NTSC

All three systems use the same definition for luminance. However, the three systems do not use the same definitions for primary R, G and B colors. The major difference between the three systems is the number and frequency of horizontal lines.

NTSC Summary

- Total lines: 525
- Active lines: 484
- Aspect Ratio: 4:3
- Horizontal Frame Rate: 29.94Hz

PAL & SECAM Summaries

- Total lines: 625
- Active lines: 575
- Aspect Ratio: 4:3
- Horizontal Frame Rate: 25Hz

NTSC is typically used in the US and Japan. NTSC 525/60 refers to 525 lines at 60Hz rate (30 frames in a second).

PAL typically used in Europe. PAL 625/50 refers to 625 lines at 50Hz rate (25 frames in a second).

SECAM is typically used in France and many parts of the former Soviet Union. SECAM 625/50 refers to 625 lines at 50Hz rate (25 frames in a second).

The above is a generalized classification of the predominant TV standards. Details of various

TV system similarities and differences beyond the scope of this paper.

Measurements

Composite video is typically monitored while triggering in Line Rate or Horizontal Synch rate. The Line rate allows selection of Field 1 (ODD) Field 2 (EVEN) or, Fields 1 and 2 sequentially (BOTH).

NTSC Example Measurements

The TV line trigger (TV-BOTH, ODD, EVEN) can be selected to

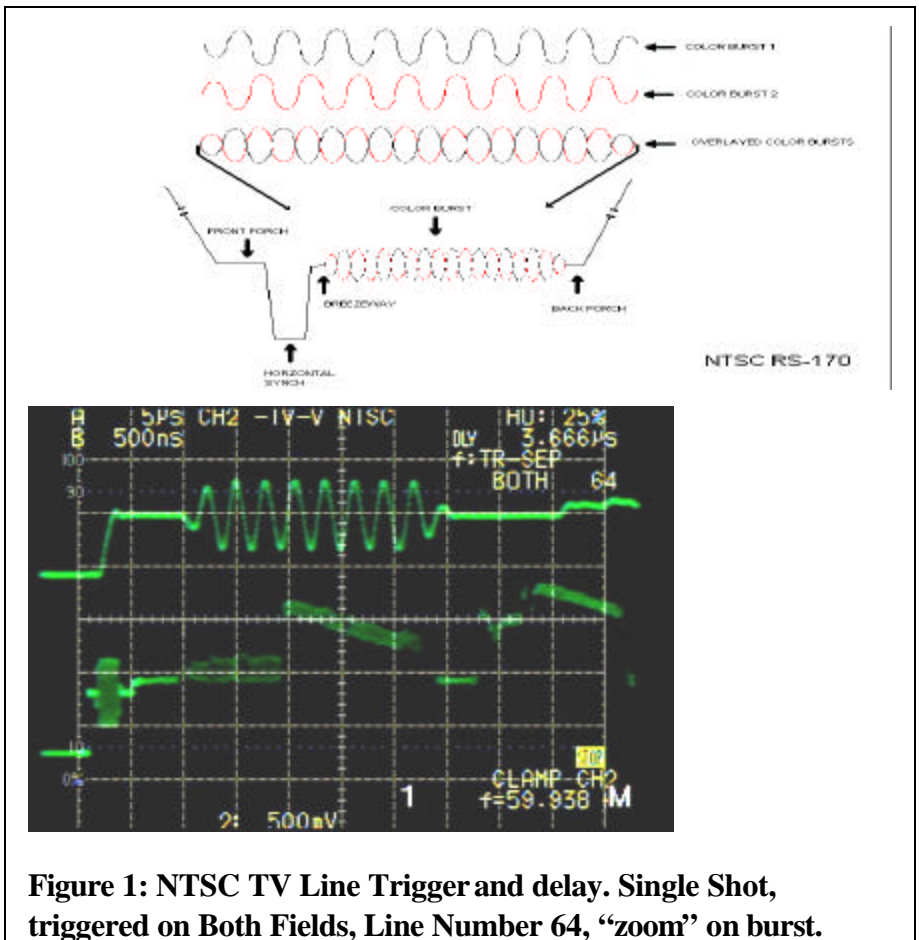


Figure 1: NTSC TV Line Trigger and delay. Single Shot, triggered on Both Fields, Line Number 64, “zoom” on burst.



view signal with respect to Line rate. Setting the Time Base to 3.24mSec/Div the scope will display one full frame (two fields) of video on the display (see figure 2). The delay function allows examination of one line while displaying the entire frame. This useful feature allows a user to view one "Pixel" while monitoring the full frame of video.

The Horizontal synch trigger (TV-H) can be used to display two adjacent horizontal (2H Display) lines (see figure 6).

The channel output from the scope allows the user to measure Video on the scope while outputting the same signal to a specialized device such as a vector scope, video monitor or lower impedance device which would load the device under test.

When using the scope to measure video, the variable time base allows performing specific video measurements requiring time base settings not achievable with scopes having fixed 1-2-5 step time increments. The variable time base is calibrated allowing, valid time/div and frequency measurements to be made while in variable. Amplitude can be adjusted in the same way, percent display compression is displayed on the screen when variable amplitude is invoked or changed. The LA354 has the added feature of having an IRE

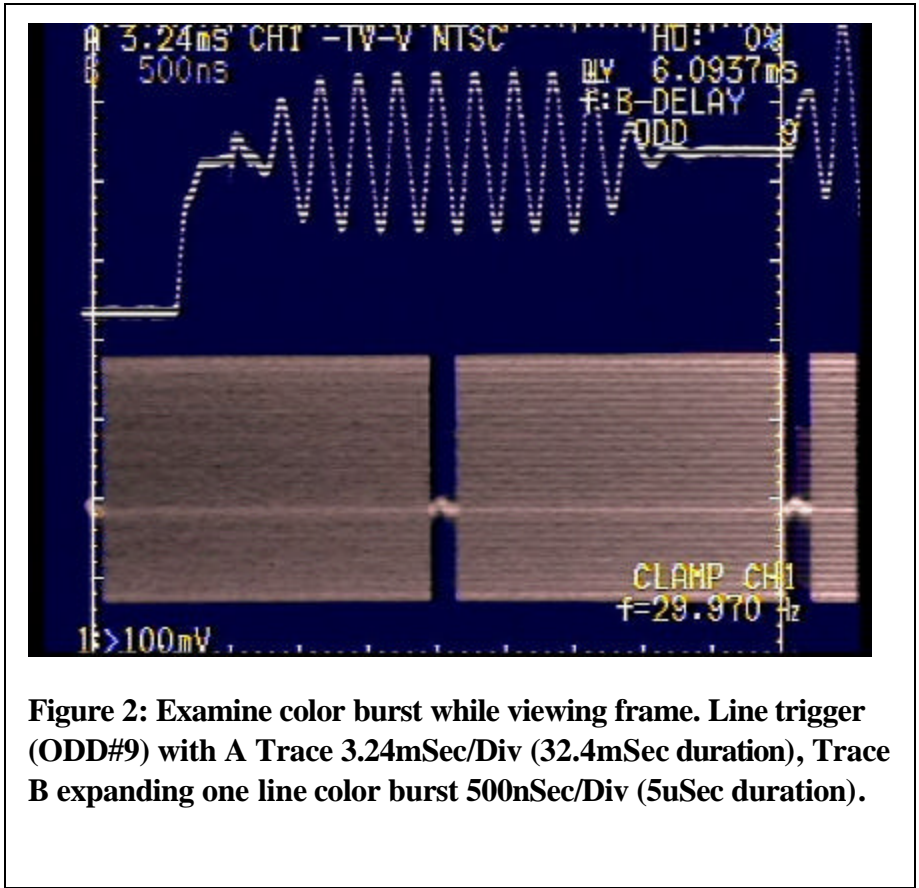


Figure 2: Examine color burst while viewing frame. Line trigger (ODD#9) with A Trace 3.24mSec/Div (32.4mSec duration), Trace B expanding one line color burst 500nSec/Div (5uSec duration).

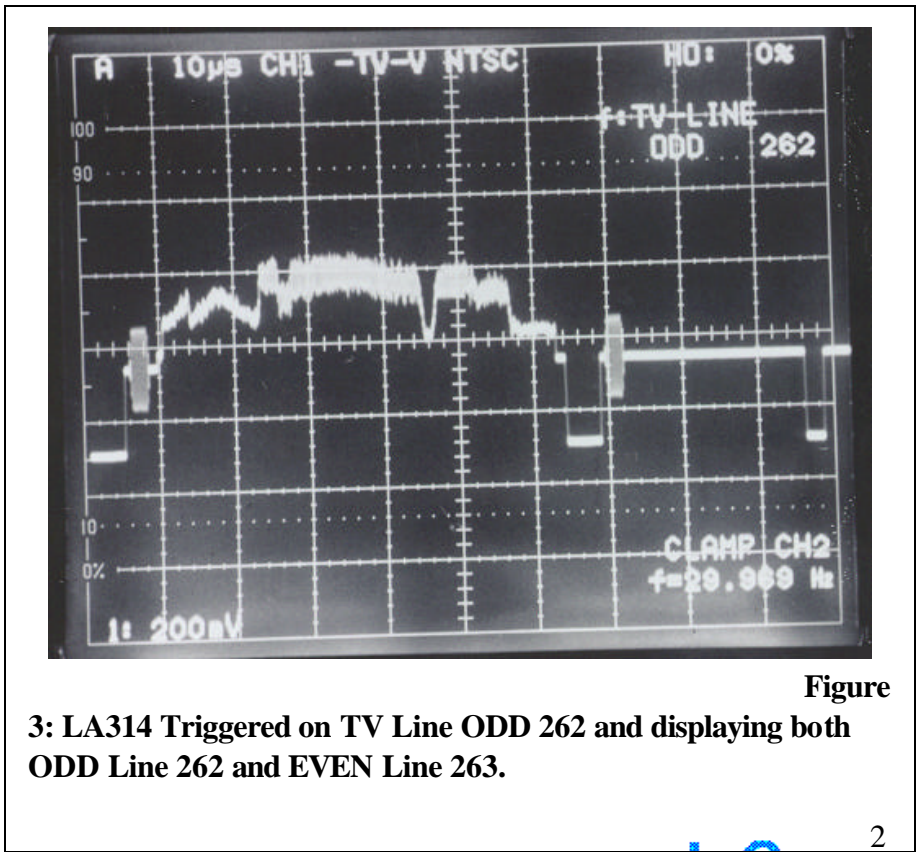


Figure 3: LA314 Triggered on TV Line ODD 262 and displaying both ODD Line 262 and EVEN Line 263.

Units scale when in CCIR or EIA scales.

Using TV Trigger

1. Input composite video signal of any format to scope Channel 1 or 2.
2. Depress the TV Trigger Key to select TV Trigger.
3. Depress AUTO SET. And observe the scope smart trigger select the appropriate TV Trigger type triggering at the TV Horizontal (TV-H) rate.

Selecting TV Trigger Type

Depressing the TV key selects the TV type. Each time the TV key is depressed the TV selection will toggle between:

- a) TV-H (Horizontal Synch): The sweep is triggered by horizontal synchronization pulse.
 - b) BOTH (Odd or Even Lines): Sweep is triggered by the selected line number of horizontal synchronization signal in the odd-numbered or even-numbered field.
 - c) ODD (Odd Field Lines): Sweep is triggered by the selected horizontal synchronization signal in the odd-numbered field.
 - d) EVEN (Even Field Lines): Sweep is triggered by the selected horizontal synchronization signal in the even-numbered field.
 - e) OFF (Non-TV Trigger)
- Rotating the FUNCTION knob selects TV Trigger Format (TV-H)

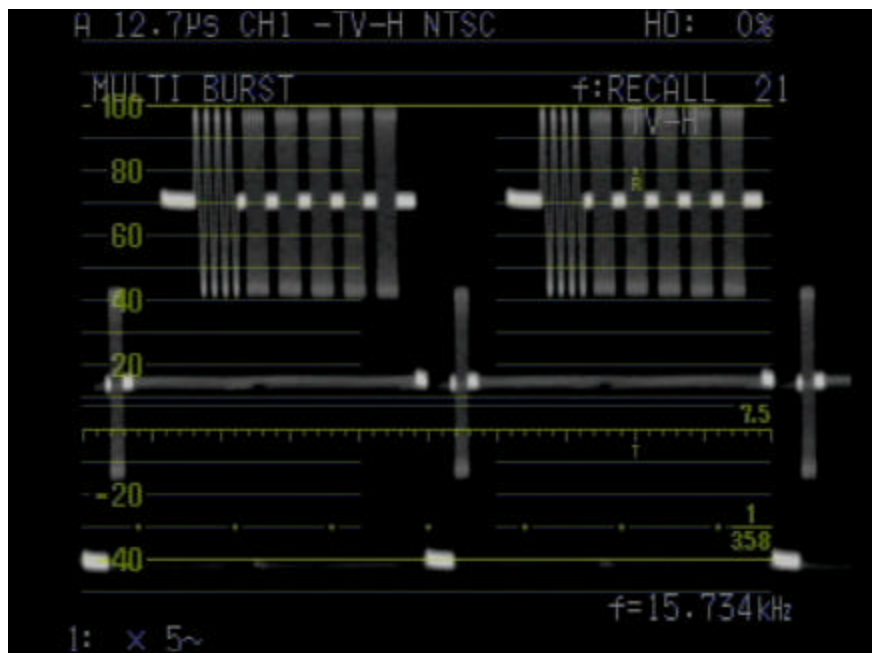


Figure 4: TV-H Trigger with EIA scales. 2H display of Multi-Burst Test Pattern. Note frequency counter displays trigger rate is Horizontal Synch frequency.

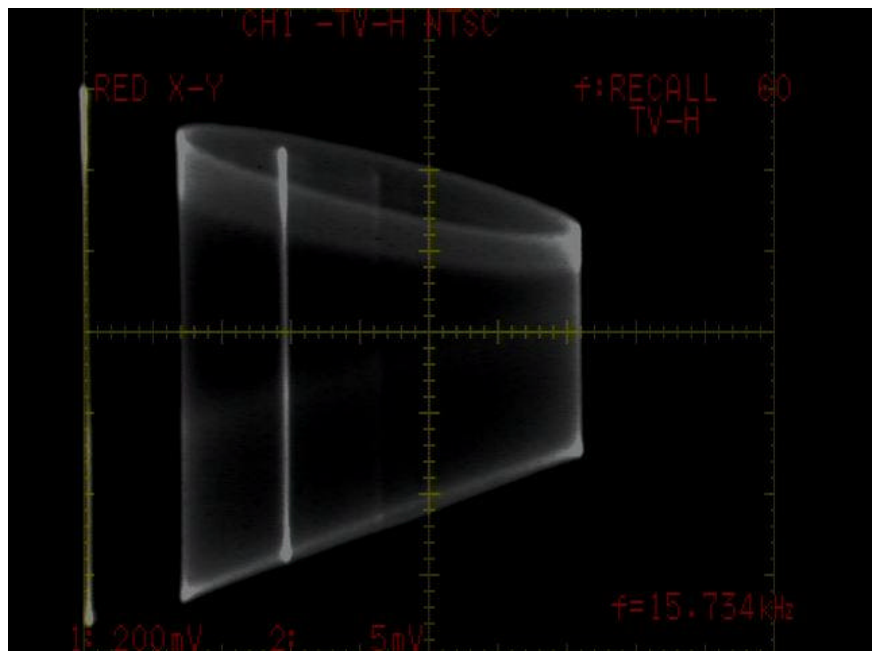


Figure 5: X-Y Mode, CH1 (X-Axis) Red Modulated Carrier Vs CH2 (Y-Axis) Red Modulation Signal.



or LINE Number (TV BOTH, ODD, EVEN)

Notes:

- 1) In NTSC the line number count is NTSC-M mode.
- 2) In PAL/SECAM the line count is PAL-B, G, H, I mode.
- 3) M mode: Sequential numbers are assigned to scanning lines after the start of the vertical blanking period.
- 4) Non-M Modes: The TV line number 1 is set to the start point of the vertical synchronizing signal of the first field.

TV CCIR and EIA Scales

When the EIA scale selected, input 1V = 140 IRE full scale.

When the CCIR scale selected, input 1V = 100 IRE full scale.

When VARIABLE is selected, the voltage cursor (ΔV) measurements, are ratio $\Delta V1/\Delta V2 = \text{IRE}$ is displayed.

TV Clamp

Depressing the EVENT/TV CLAMP key, while in TV Mode enables clamp. Either CH1 or CH2 may be clamped. Clamping locks the back porch of composite signals to the reference level (ground level) enabling stable observation of DC coupled TV signals without the fluctuation of average DC voltage resulting from changes of average picture level changes.

Each time the EVENT/TV CLAMP key is depressed, in TV trigger mode, the operation toggles:

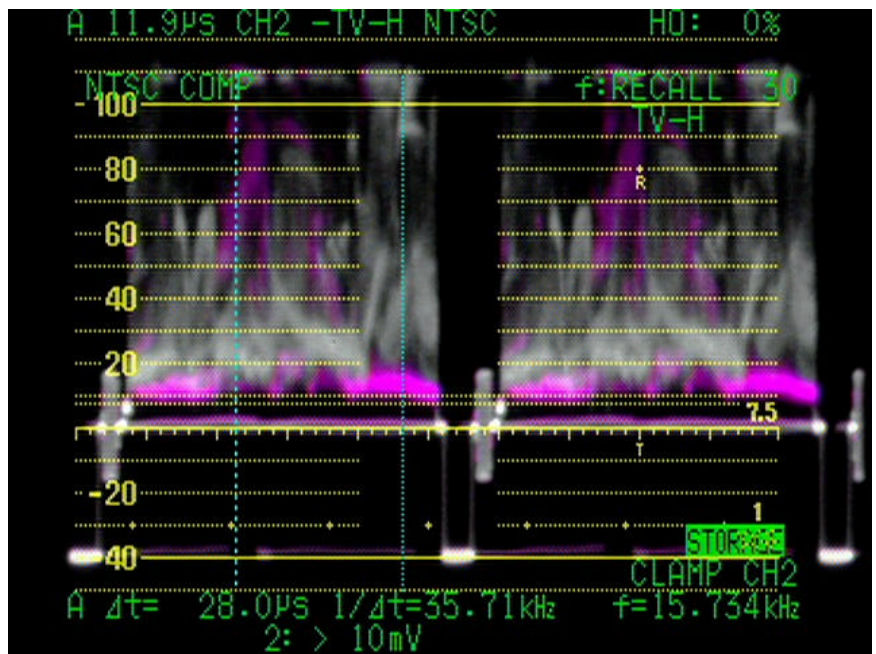


Figure 6: TV-H Trigger, 2H Display with EIA scales. White trace is “Live” feed, Magenta trace is stored trace.

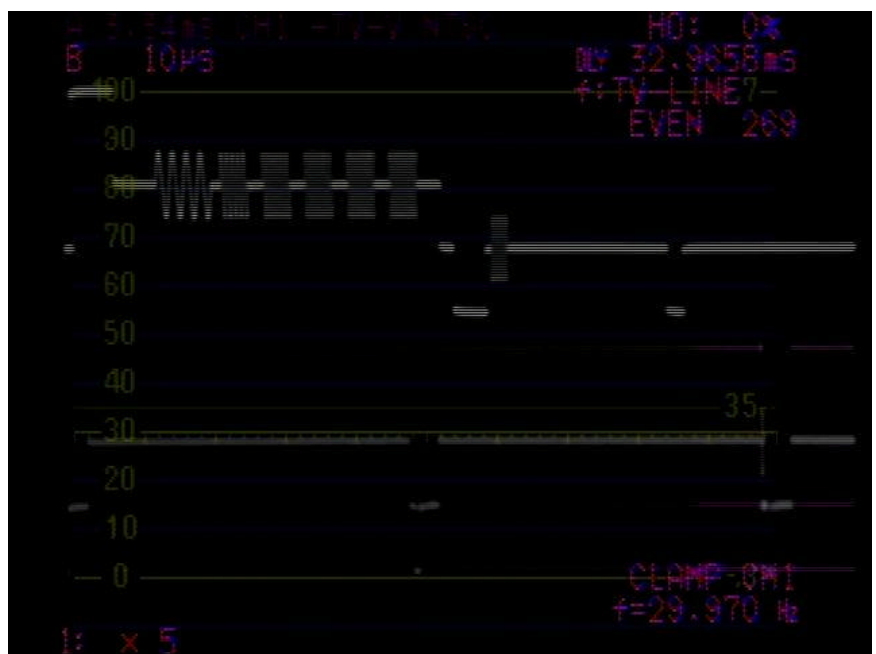


Figure 7: TV Line trigger EVEN 269; Trace A 3.34mSec/Div (32.4mSec duration), Trace B 10uSec/Div (100uSec duration) displaying the only line in the field with Multi-Burst pattern. All other lines are 100 IRE for 1/4 duration then drop to 7.5IRE.

CLAMP CH1 or, CLAMP CH2 or, OFF. The selected clamp is displayed at the bottom right corner of the screen. Figure 1 shows an example of the position of the back porch and channel clamp display. To perform TV hum measurements, disable the TV Clamp.

Notes:

- a) During the V synchronizing period of HDTV, waveform may be distorted if clamp is not used.
- b) The reference level may become unstable if the TV signals are not synchronized.
- c) The clamped level is 1div or less from GND.

All LA3xx series analog scopes include delayed traces as a standard feature. This allows examining a large section of a waveform in one time base, while zooming in on details at a faster time base. The LA354 has additional capability of dual delay allowing examination of two sections of a larger waveform. These features are particularly useful when measuring VTR head switch points on RF envelope, Sub Carrier to Horizontal Synch Phase for Gen-Lock.

The inherent analog fast update rate, responsive controls, crisp "alias free" display, fast re-trigger rate, TV triggers and ease of use combine to make LeCroy analog scopes an indispensable tool, especially to the video engineer.

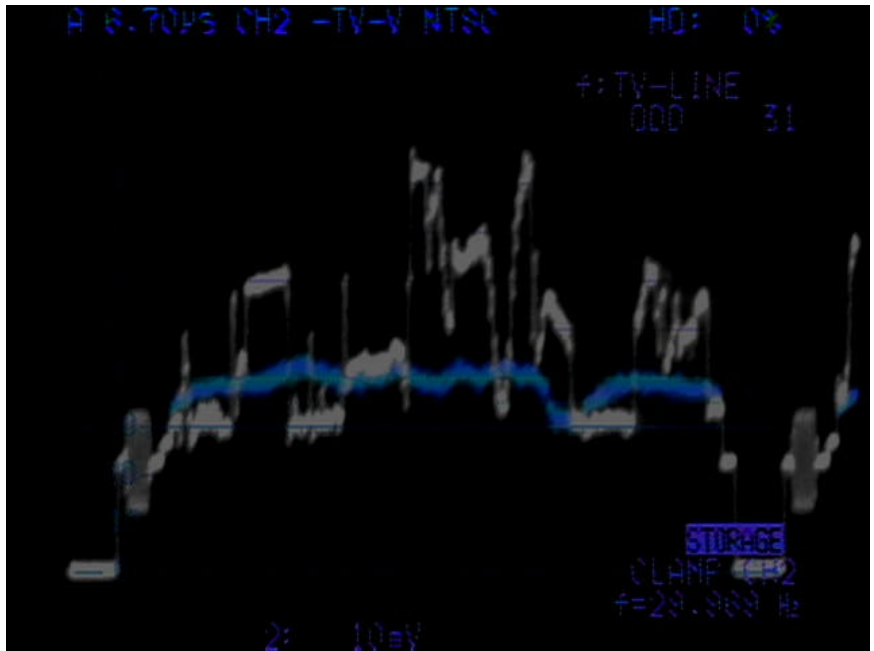


Figure 8: TV Line Trigger (ODD 31); White trace is "Live" feed, Blue trace is stored.

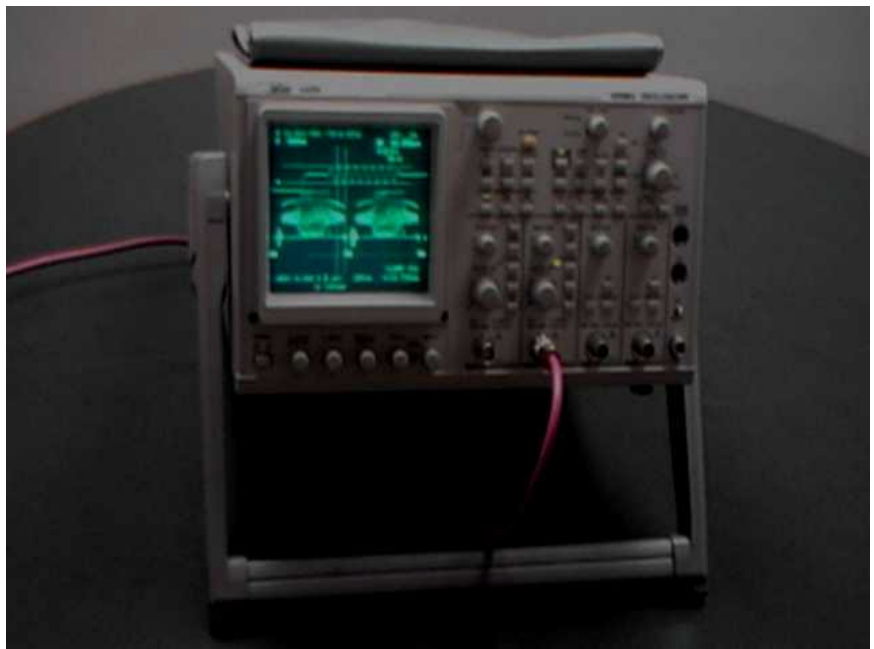


Figure 9: LeCroy Analog...See what you've been missing!

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