Keysight Technologies
Using Oscilloscopes to Test and Debug Analog HDTV Signals

Application Brief

Keysight Technologies, Inc. InfiniiVision 4000 X-Series oscilloscopes with DSOX4VID option provide trigger and display features ideal for debugging and characterizing analog HDTV signals.

KEYSIGHT TECHNOLOGIES

Today's consumer electronic designers must be proficient mixed signal designers. Many devices have a combination of analog (audio, video) and digital (HDMI, DisplayPort) interfaces. A composite video input and/or output is still the lingua franca (working language) of consumer electronics video devices. If a device has one, and most do, it is an excellent way to quickly verify its correct operation, but you must have the right oscilloscope.

Figure 1 shows the display of a standard NTSC color bar signal triggered on all lines. The 4000 X-Series oscilloscope's 1 million waveforms per second update rate is able to plot all lines, creating an intensity graded image with details from the many different lines that are readily apparent. Color bursts, sync pulses, color bars and flat field are all visible. Lesser oscilloscopes may not keep up with the information available.

Figure 2 shows the 4000 X-Series with DSOX4VID option triggering on a 1080p/60 signal in the yellow channel. The green trace is a standard-definition composite NTSC signal that is being converted to the component HDTV signal in the yellow. Good triggering is essential for debugging and characterizing such complicated tasks.

Figure 1: High-quality rendering of NTSC "Color Bars."

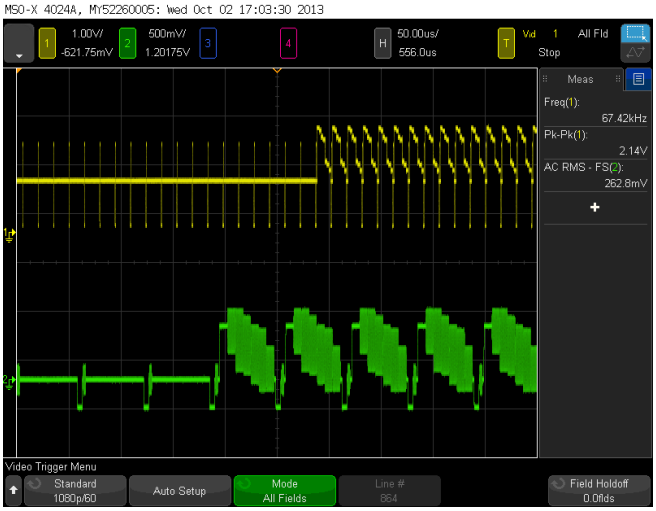

Figure 2: Triggering on 1080p/60 signals.

Figure 3 shows the use of "Zone Trigger" on the 4000 X-Series oscilloscope to isolate a particular video line. The video trigger is set to trigger on all lines. This line is not isolated by its line number, but by its waveform shape. With touch-drawn boxes that the waveform "must intersect" or "must not intersect," it is easy to trigger on only the desired lines. Note the use of an IRE graticule and IRE cursor readout to measure the isolated line. InfiniiScan Zone trigger is useful when you don't know the line number for a certain waveform shape. It is even more useful for capturing intermittent errors when triggering on specific lines.

Another important aspect of high definition analog video is minimizing noise. The hardware-accelerated averaging available in Keysight's InfiniiVision X-Series oscilloscopes can help track down troublesome noise sources. Averaging removes all noise not correlated to the trigger. Triggering on a noisy video signal and averaging will show a clean signal when noise is coming from an external source such as switching power supplies. Figure 4 shows a flat field with thousands of averages applied. The clean signal tells us any noise is not correlated to the video line and, hence, not due to the video portion of the design.

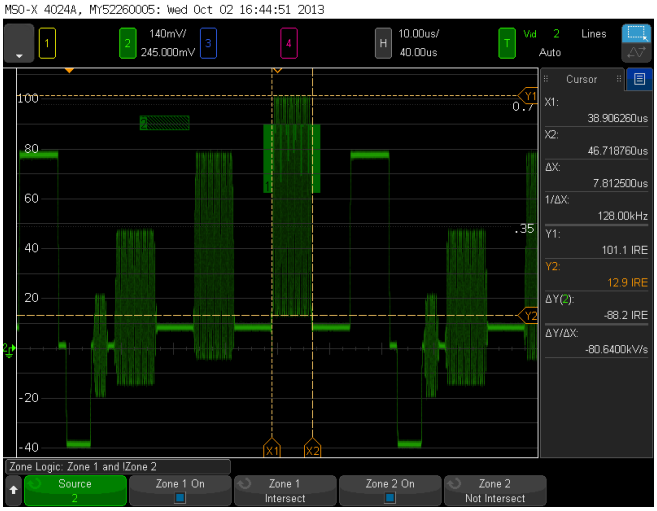

Figure 3: Using InfiniiScan Zone trigger to isolate lines by content. Note IRE graticule and cursor measurements.

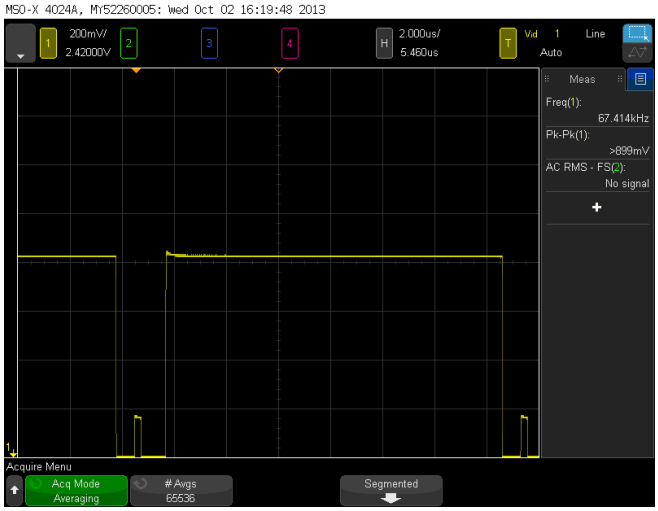

Figure 4: Averaging this noisy 'flat field' shows a clean signal. Therefore, we know the noise is uncorrelated to the video and must look elsewhere for its source.

This document has shown just a few examples of typical video system measurements that may be required. More advanced measurements may include mixed analog and digital measurements with the digital inputs of an InfiniiVision MSO model or I²C trigger and decode using an DSOX3EMB or DSOX4EMB embedded serial (I²C, SPI) trigger and analysis package.

Keysight's InfiniiVision X-Series oscilloscopes

If you are in the market today to purchase your next oscilloscope to test your latest high-definition video design, Keysight Technologies' InfiniiVision X-Series oscilloscopes come in various bandwidth models ranging from 70 MHz up to 1.5 GHz. Available in the InfiniiVision 3000 and 4000 X-Series are various measurement options including the video trigger and analysis option (DSOX3VID and DSOX4VID). These oscilloscopes also come with a standard 3-year warranty as well as an industry-first 2-year recommended calibration cycle.

To learn more about Keysight's InfiniiVision X-Series oscilloscopes for power supply measurement applications, visit **www.keysight.com/find/InfiniiVision**.

myKeysight

www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353 Opt. 1 (DE) Opt. 2 (FR) Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-09-23-14)

KEYSIGHT TECHNOLOGIES

Published in USA, August 3, 2014
5991-3370EN
www.keysight.com