SENCORE®
Means Success In Electronic Servicing

tech tips

Troubleshooting TV Sync Circuits With Your VA62A Universal Video Analyzer™

Successful troubleshooting of TV sync circuits requires both an understanding of the different types of circuits used and the use of an efficient troubleshooting process. This Tech Tip outlines the types of sync circuits used and explains how to successfully troubleshoot these circuits using the VA62A Universal Video Analyzer.

TV Sync Circuits

Two basic types of TV sync circuits are encountered by video servicers. The first type has been used for many years and is still used in a few current models. It consists of a discrete sync separator to remove the vertical and horizontal sync signals from the composite video signal. The sync separator is followed by a low pass filter (vertical integrator) and a high pass filter (differentiator) to feed the sync signals to the vertical and horizontal sweep circuits (Figure 1). The sync signals are used to lock the vertical and horizontal oscillators at the proper frequency and phase.

A newer type TV sync circuit is used in most current model televisions. It consists of a combination sync separator/sweep oscillator IC often known as the "countdown chip." This IC separates the horizontal sync pulses and uses them to lock an internal oscillator running at twice the horizontal frequency (2H). The circuits then divide (countdown) the 2H signal by either 524 or 525 to obtain the proper vertical sync signal. Internal vertical and horizontal oscillators are then locked to the sync signals. By deriving the vertical sync directly from the horizontal sync, a more precise phase relationship is maintained between the two signals for proper scan interlace.

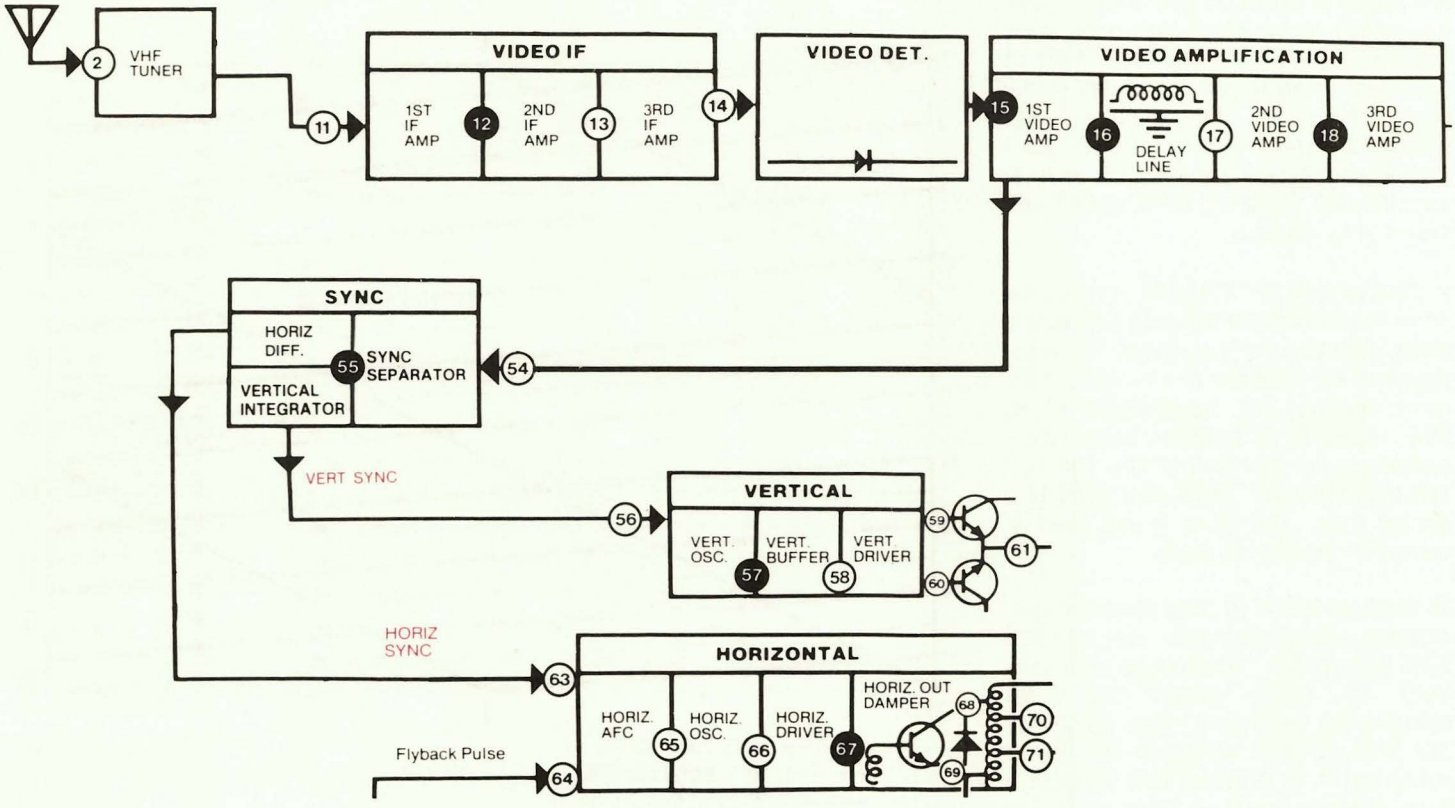

Fig. 1: Conventional sync separator circuits feed the separated sync to separate horizontal and vertical oscillators.

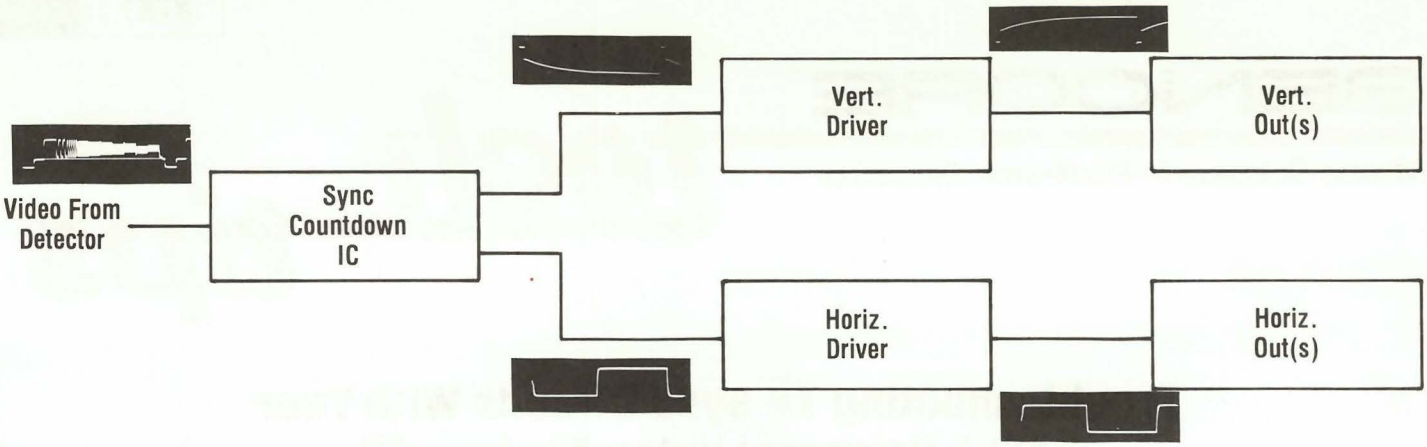

Fig. 2: Sync countdown circuits include the sweep oscillators in the same IC with the sync separator.

The two oscillator outputs of this IC feed the vertical and horizontal driver circuits (Figure 2). In some cases, the sync chip includes the vertical drive circuits, in which case the chip feeds the vertical output transistor(s) directly.

Types of Sync Signals

There are two types of sync signals that both these types of sync circuits have to handle properly. The first is the standard interlaced type of signal from broadcast stations, VCRs, and other NTSC standard video sources. This signal has 262.5 lines per field resulting in a vertical scan rate of 59.94 Hz. The extra half line in each field is included to cause the two fields of video information to be offset from each other (Figure 3), rather than the scan lines of each field being traced out on top of the scan lines from the previous field. Interlaced sync also includes extra ''equalizing pulses'' during the vertical sync interval. These are included to insure proper scan interlace.

A disadvantage of interlaced sync is that when you view an unchanging picture at a close distance (as you might do when adjusting convergence or viewing a video game display), you see a slight 30 Hz jitter, especially on horizontal lines. This is caused by the scanning of first one field and then the next, offset field 1/30 of a second later. This jitter is not seen at normal TV viewing distances.

To eliminate the 30 Hz jitter otherwise seen at close viewing distances, non-interlaced sync (also called ''progressive scan'') is used by video games and most convergence generators. This signal has 262 lines per field, with each field traced out on top of the previous field rather than being offset by a half line. The vertical scan rate for this non-standard scan system is 60.05 Hz.

Sync Circuit Switching

TV sync circuits must be able to handle both types of sync signals (interlaced and non-interlaced) in order to work with all types of signal sources. The original sync separator circuit switches automatically from one sync system to the other because it simply passes the original vertical and horizontal sync pulses to the output.

Sync circuits using a countdown chip, however, construct vertical sync by dividing down from the horizontal sync. These chips must have an extra switch circuit to monitor for interlaced sync and switch from a 524 to a 525 divide number when interlaced sync is detected. If this switch circuit is not working properly, the TV will not lock properly on either interlaced or non-interlaced sync.

Troubleshooting Sync Circuits

To troubleshoot sync circuit problems with the VA62A Video Analyzer you substitute known-good signals into the individual circuits and watch for a good picture to prove which circuits work and which don't. You need to troubleshoot TVs with countdown sync chips using both interlaced and non-interlaced signals to be sure the set works with both types of signals.

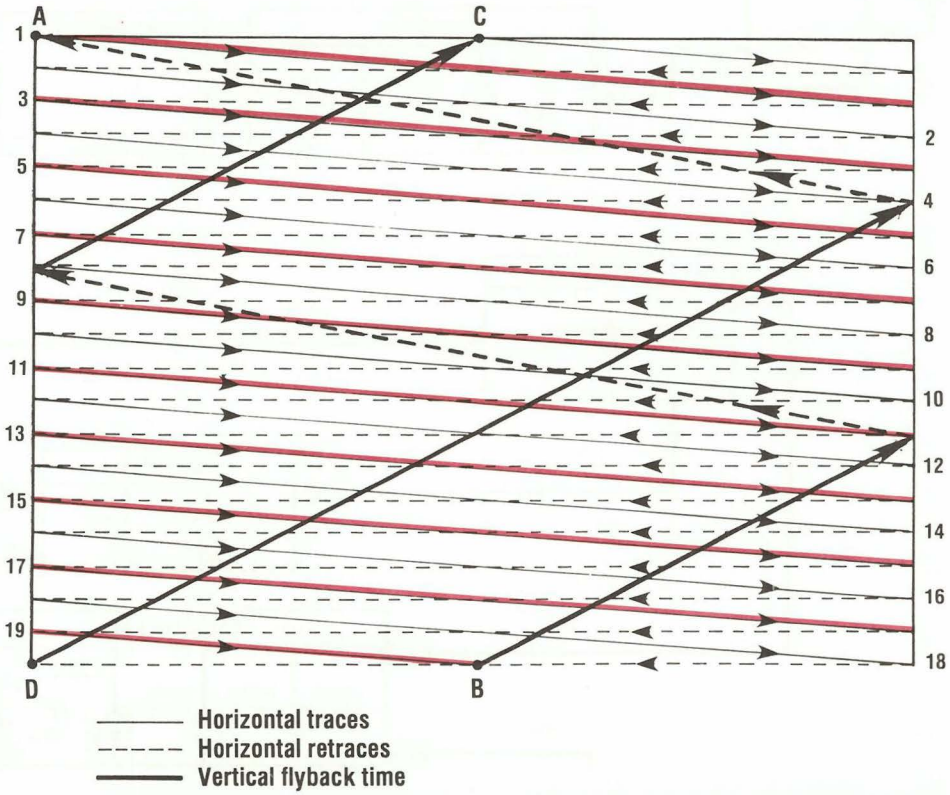

Fig. 3: With interlaced scan, first one field is scanned on the CRT, and then the second field is scanned in the spaces between the first set of scan lines.

To Troubleshoot Sync Problems With Discrete Sync Separators:

Connect the RF output of the VA62A to the TV's antenna input. Set the RF-IF LEVEL to HI and the VERNIER to NORM. Select the Chroma Bar Sweep pattern to give the easiest recognition of an out of sync picture. Follow the ''Poor Sync'' section of the TV TROUBLESHOOTING GUIDE as outlined below.

To Troubleshoot Sync Problems With A Sync Countdown Chip:

As a final step when troubleshooting sync countdown circuits, be sure to switch the INTERLACE ADDER switch on your VA62A to both positions to check operation with both interlaced and non-interlaced sync.

Follow the same setup procedure as for conventional sync separators, but because of the circuit differences, use the modified troubleshooting tree that follows.

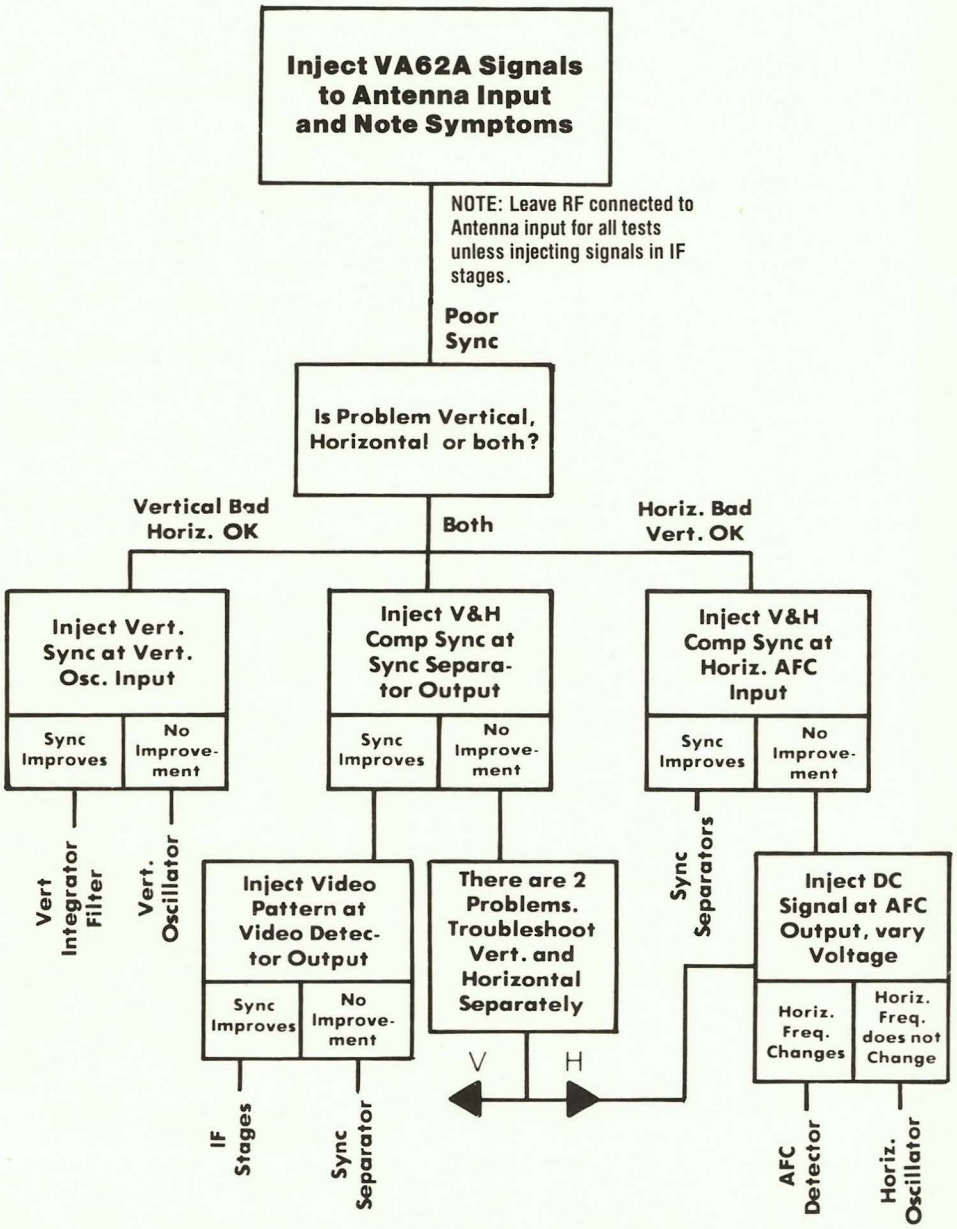

Fig. 4: Use this troubleshooting tree and your VA62A to quickly troubleshoot sync problems in TVs with conventional sync separators.

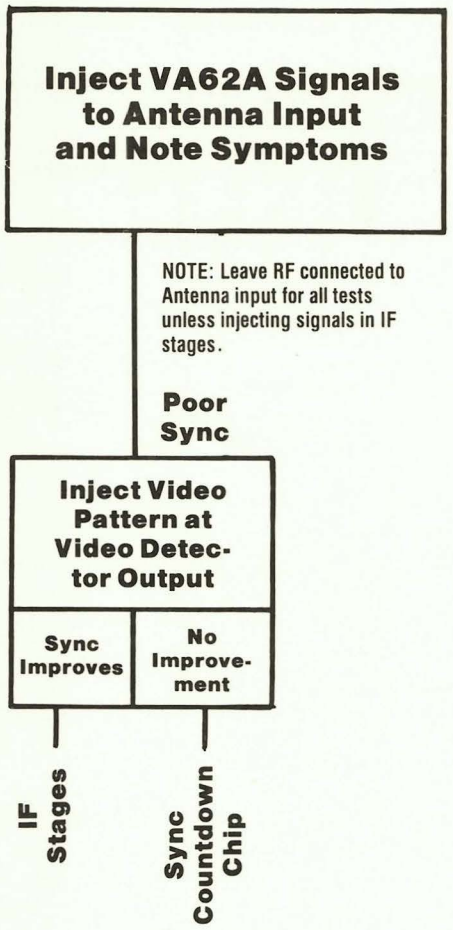

Fig. 5: Use this simple troubleshooting tree and your VA62A to quickly troubleshoot sync problems in TVs with sync countdown chips.

#151 #151

Form 4153 Printed in U.S.A.