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tech tips

How To Isolate Vertical Problems With Your VA62A Universal Video Analyzer

Vertical problems fall into two general categories; sweep and sync. Each category involves different vertical circuits, so we must discuss them separately. We will start with problems affecting vertical sweep.

Isolating Vertical Sweep Problems May Be Tough

Many technicians find vertical problems more difficult to troubleshoot than any other defects. Two factors contribute to this difficulty: 1) Direct-coupled (DC) stages and 2) Interaction with the video circuits.

The vertical stages are direct-coupled with no DC blocking capacitors between stages. Because of direct-coupling, a problem in one stage affects the DC bias in many other stages, both before and after the defective stage. This makes DC voltage measurements difficult to use for troubleshooting.

Some vertical problems cause a blank raster because the vertical and the video circuits interact. This means some vertical problems may cause the same symptom as a video or high voltage problem.

Troubleshooting DC Bias-Related Problems

A problem that affects the DC bias of one stage often affects later stages, too, forcing them into saturation or cutoff. Stages before the defect may also become improperly biased. Because of this, you may need to use signal substitution from the VA62A in two layers - correcting DC problems first and AC problems second. Correcting the DC bias first ensures that substituting the AC signal produces predictable results.

Before you inject a vertical drive signal from the VA62A, make sure the DC bias is correct. Measure the voltage drop across the emitter-base junction of each transistor using the VA62A's digital meter. If all transistors show a normal voltage drop (about 0.6 volts), you know the DC path is good and that you can proceed directly to AC signal substitution.

Always connect your meter directly across the emitter-base junction, rather than measuring the voltage to ground of the base and the emitter and then subtracting the two voltages. Measuring directly across the emitter-base junction eliminates any possible errors caused by the DC meter responding to the low frequency signals found in the vertical circuits.

If you find a bias problem, use the VA62A DC power supply to correct it. Inject the voltage through a current-limiting resistor while monitoring the bias on the transistor. Match the polarity of the applied DC signal to the type of transistor used, as shown in Fig. 1. In each case, you forward-bids the emitter base

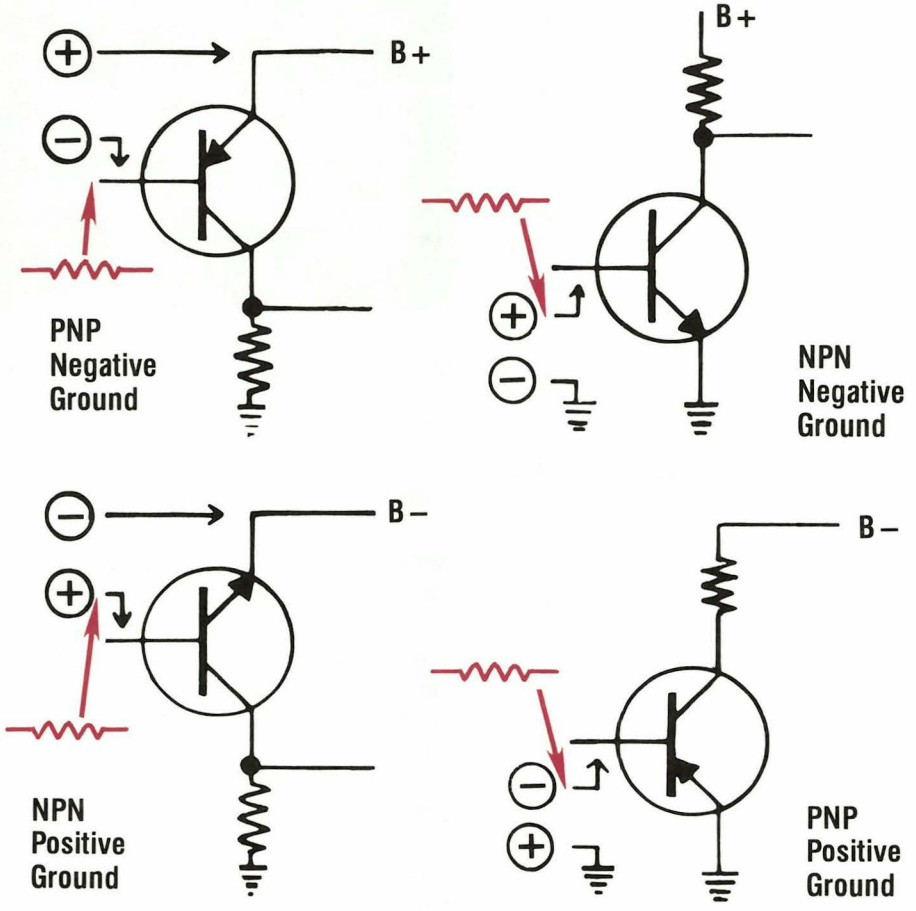

Fig. 1 Connect the VA62A power supply leads to forward the emitter-base junction if a stage shows low bias. Use a 1k ohm resistor for small signal transistors and a 100 ohm resistor for medium power driver transistors.

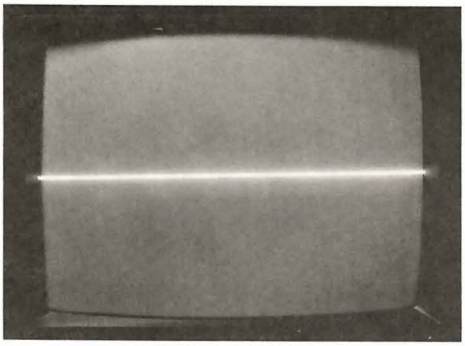

Fig. 2: The original vertical symptom collapses sweep to single line.

junction, meaning the "+" lead of the VA62A supply connects to the base for an NPN transistor or to the emitter for a PNP transistor.

Always use the correct series limiting resistor to prevent possible damage to the transistor. Use a 1 kilohm resistor for small "signal" transistors or a 100 ohm resistor for medium-power "driver" transistors. You don't need a resistor when biasing the output transistors.

Monitor the voltage drop across the emitter-base junction of the transistor with the VA62A DC voltmeter to determine when you have enough bias, 0.6V. Remember to measure across the junction; not from the base to ground.

If the VA62A does not return proper bias, something is wrong in the DC path. Check for open or shorted transistors, or resistors that changed value. Capacitors may also affect the DC bias if they short, become leaky, or develop excessive dielectric absorption. They won't affect the bias if they open or change in value.

Substituting the AC Component For Loss Of Vertical Sweep

After you have corrected the DC bias, use the VA62A to inject an AC drive signal. Most vertical circuits require the "Vert Drive" signal. This signal consists of the vertical ramp signal needed by the vertical circuits. Inject the Vertical Drive signal and watch for an improvement in the symptom.

Injecting into vertical circuits won't always produce perfect vertical deflection. This is because most of the signals found in vertical stages are uniquely shaped through feedback loops and other waveshaping methods. The VA62A Vert Drive signal can't exactly match all of these different waveshapes. But don't worry, the VA62A signal gives you reliable results when you know what to expect.

Figs. 2 through 4 show typical examples of what to expect. In each case, the original symptom shown in figure 2 is a single horizontal line running across the center of the CRT. When injecting at some test points, you will see the thin line expand to about 25% of the screen, as shown in Fig. 3. In other circuits, the substitute signal returns full-screen deflection, but lack of correct feedback causes the scan lines to be come 1/4 to 1/2 inch apart, as shown in Fig. 4. In each case, the expanded sweep tells you that the circuits work correctly from the injection test point forward to the vertical output.

If driving the output stage doesn't return sweep – in part or in full, one of the output components is bad. Begin by using the VA62A Ringer test to check the yoke, as explained in Tech Tip 116. If the yoke checks good, check the output transistors.

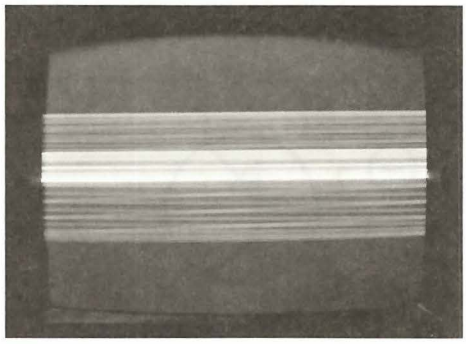

Fig. 3: Injecting at some test points increases the sweep to half screen (either center-to-top or center-to-bottom), indicating an improvement over the original symptom.

Troubleshooting A Blank Raster

Some television chassis use a " Sandcastle" signal to feed several signals into a single pin of a luminance/chroma IC. An open sync separator, a missing flyback pulse, or a missing signal from the vertical stages cause the Sandcastle to blank the raster.

How can you separate all of the Sandcastle problems that cause a blank screen? By injecting a VA62A drive signal into the Sandcastle test point, the VA62A's signal will override a possible problem with the Sandcastle signal and show the true symptom (Figure 5).

To substitute for the Sandcastle signal:

1. Inject a Video Pattern reference signal from the VA62A into the RF or IF of the television receiver.
2. Set the DRIVE SIGNAL switch to "HORIZ KEY PULSE."
3. Set the DRIVE RANGE switch to "30 VPP. "
4. Adjust the DRIVE LEVEL control towards "+" until the VA62A digital meter shows a 5 volt peak-to-peak signal.
5. Connect the ground lead of the DRIVE OUTPUT to chassis ground.
6. Connect the "+" lead to the Sandcastle test point.

If you see a single, horizontal line when you inject the Sandcastle signal, the blank raster is the result of a vertical problem. If you see an out-of-sync picture, the problem is probably in the sync separator. Of course, if you see a fully deflected, locked-in picture, the blank raster is not caused by the vertical circuits.

Isolating Vertical Sync Troubles

The second category of vertical problems involves sync problems. When you see the picture rolling vertically, adjust the oscillator's frequency with the vertical hold control to see if you can get it to drift slowly or nearly locked on the screen. If you can't, the vertical oscillator has a problem in its timing components so concentrate your troubleshooting efforts on it.

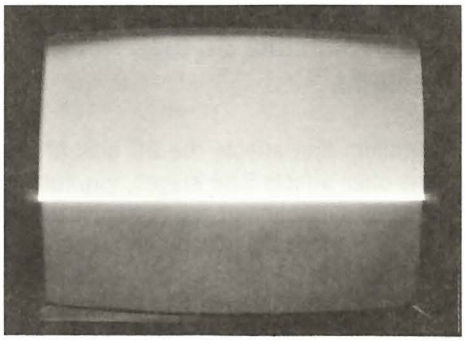

Fig. 4: Injecting in some circuits returns full height deflection with poor linearity – also indicating the expected symptom improvement.

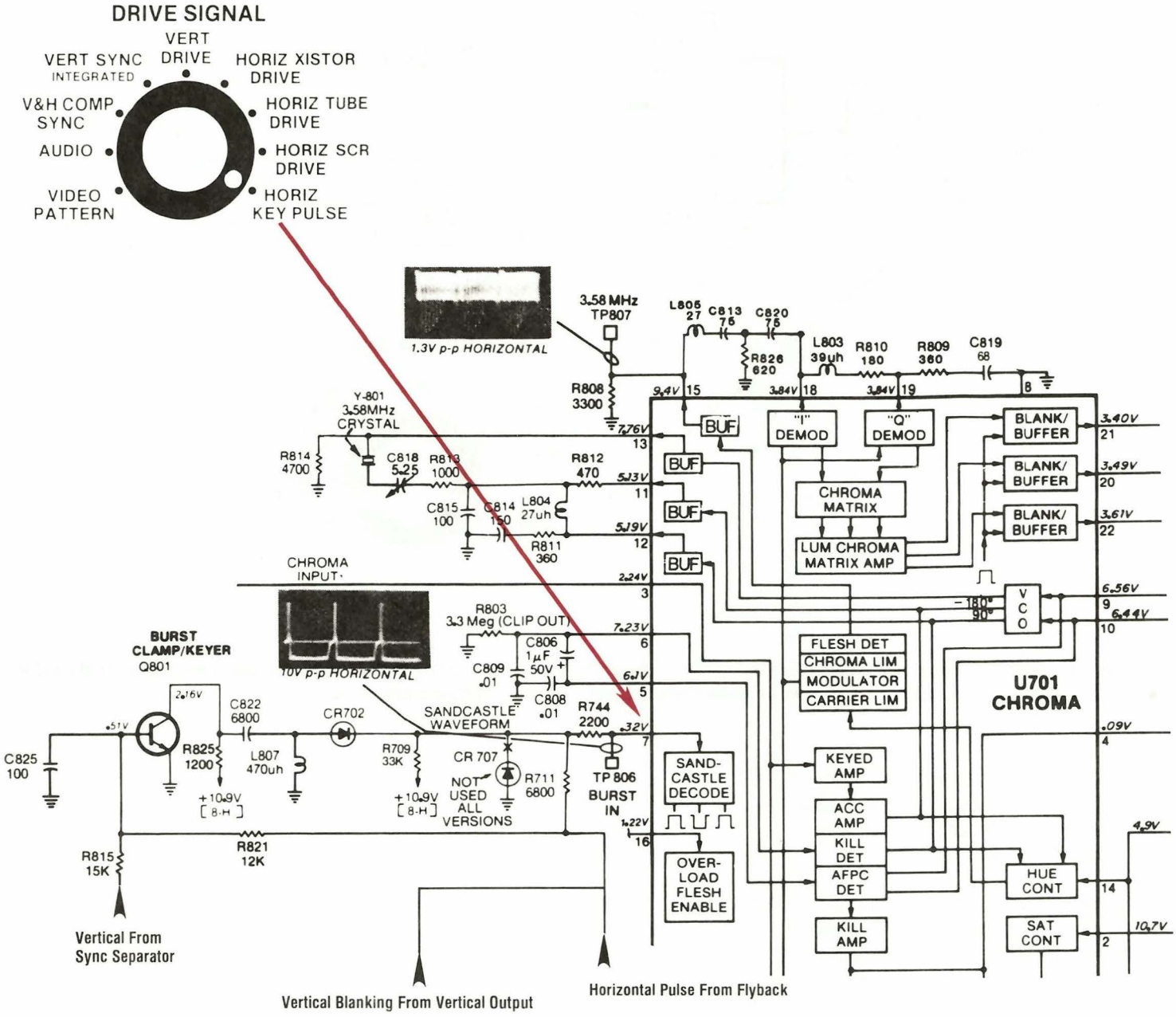

Fig. 5: Defects in the Sync Separator, a missing flyback pulse, or a missing signal from the vertical circuits may cause the Sandcastle circuit to blank the raster. Inject a Horiz Key Pulse into the Sandcastle input to unblank the raster and uncover the true symptom.

If you can adjust the oscillator close to the correct frequency, the oscillator is probably OK, but it is not being synced properly. The VA62A produces the three drive signals which will isolate any vertical sync-related problem. They are:

(1) Integrated vertical sync to apply at the oscillator input.

(2) Composite vertical and horizontal sync to apply at the input of the vertical sync.

(3) Composite video to apply at the input of the sync separator (see Figure 6).

Begin by injecting the VA62A's "Integrated Vertical Sync" drive signal at the output of the vertical sync integrating filter while watching the CRT for correct lock-in.

NOTE: The matching components on the output of the VA62A drive circuits may cause the vertical oscillator to shift its free-running frequency. Re-adjust the vertical hold control to see if the vertical oscillator can be made to lock.

If you see lock-in, you know the vertical oscillator responds correctly to vertical sync. If it does not, troubleshoot the oscillator circuits.

If sync returns when injecting at the oscillator input, move the VA62A drive signal back to the vertical integrator input. This time, use the composite vertical and horizontal sync

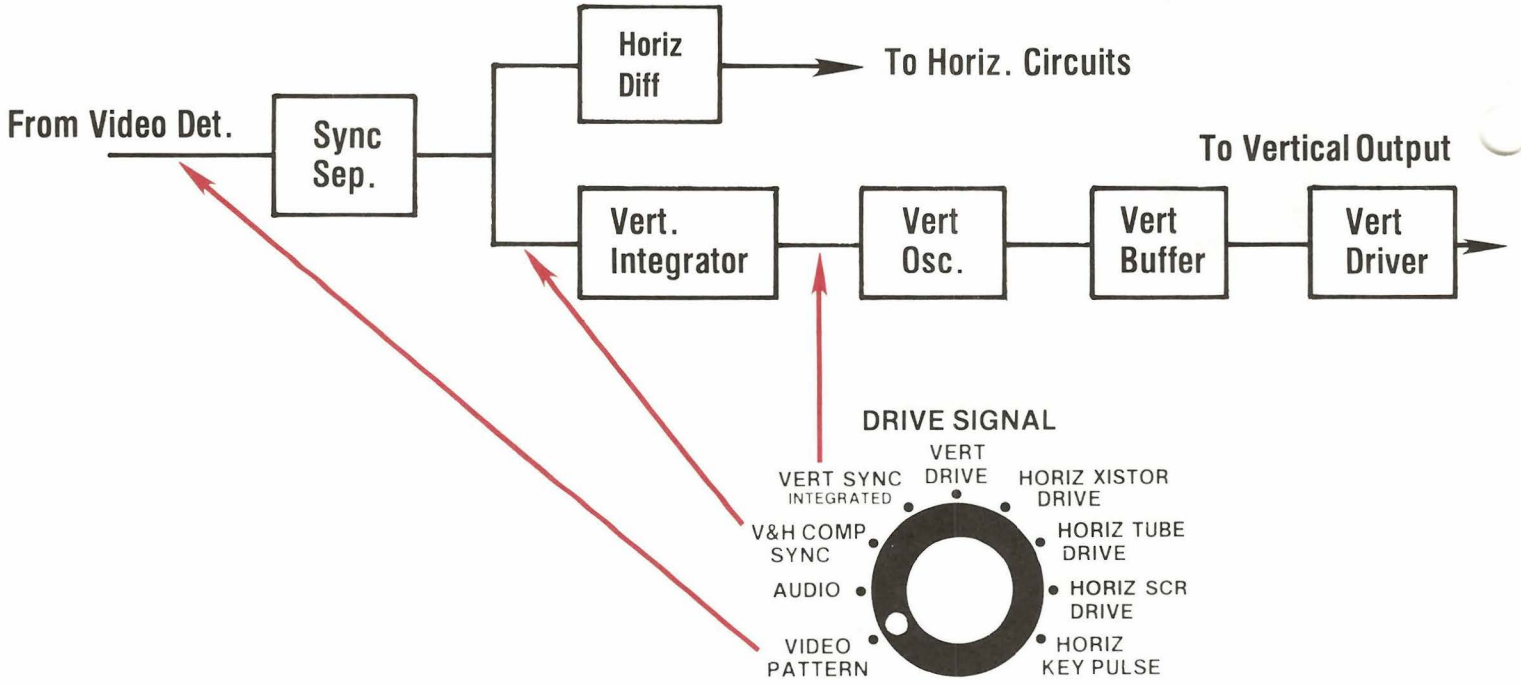

Fig. 6: The VA62A provides several drive signals for use in isolating vertical problems. Use the VIDEO PATTERN at the Sync Separator input, the V & H composite sync at the vertical integrator input, and the vertical sync integrator at the vertical oscillator input.

drive signal. (Readjust the vertical hold control, if necessary.) If you still get sync, you know the integrator works and the problem is in the circuits leading up to it.

Sync problems ahead of the integrator will affect both horizontal and vertical sync. Inject the "V & H COMP SYNC" to isolate a problem between the sync separator and the vertical oscillator.

Problems in, or ahead of the sync separator often blank the raster because the signal feeds the Sandcastle. Substituting for the Sandcastle signal (as explained earlier) will return the raster with an out-of-sync symptom .

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