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tech tips

Learning To Use The VA62A Universal Video Analyzer

The VA62A Universal Video Analyzer provides tests needed to isolate problems in any NTSC TV receiver or video monitor. This Tech Tip helps you become familiar with the VA62A by working with each feature.

You will need the following:

1. Your VA62A with its instruction manual and supplied cables.
2. An isolation transformer or the Sencore PR57 "AC Powerite" ® AC safety supply.
3. A TV receiver in good operating order. When possible, use one with a digital tuner and cable channels.
4. The schematic and service literature for the TV receiver.

RF Signals Are Used Every Time

You need to understand the RF generators first. You use these generators in three ways: 1) They confirm that the tuners work correctly, 2) They test the internal circuits without taking the back off the set, and 3) They provide the reference signal needed for signal substitution.

The VA62A has three RF generators: 1) Standard TV, 2) Standard Cable, and 3) Programmable Cable. The signals from all three generators are controlled by the RF-IF LEVEL switch and the RF-IF LEVEL VERNIER control. *For most testing, the RF-IF LEVEL switch should be in the "HI" position.*

Fig. 1: Gather these items before going through the information in this Tech Tip.

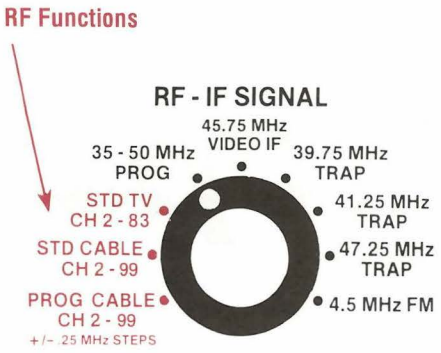

Fig. 2: The VA62A has three RF functions to dynamically test any standard or cable-ready tuner.

Refer To Your VA62A Instruction Manual For The Following Steps:

Standard TV RF

The Standard TV RF generator lets you test any VHF or UHF tuner. For the first test, you will connect the VA62A to the TV, and then move through several channels to see how to choose any standard channel.

1. Connect the VA62A RF cable to the TV's "VHF" antenna input.

2. Move the VIDEO PATTERN switch to "Color Bars".

3. Move the AUDIO switch to "OFF".

4. Move the RF-IF SIGNAL switch to the "STD TV" position.

5. Set the RF-IF LEVEL switch to "HI" and the RF-IF LEVEL VERNIER control to "NORM".
   Key Point: *"HI" is the normal setting when feeding the antenna.*

6. Set the TV to channel 2, and enter "0" and "2" into the VA62A keyboard.

You should see color bars on the CRT. If you have a TV station operating on channel 2 within close range, you may see the transmitter's signal mixing with the color bars. If so, change both the TV and the VA62A to channel 3.
Key Point: *A TV should give a clear picture with the VA62A producing 1000 microvolts, which it does with an attenuator setting of "HI" and "NORM".*

7. Move the RF-IF LEVEL switch to the "MED" position. The VA62A is now producing 100 microvolts, so the picture becomes snowy.
   Key Point: *The attenuator lets you drop the signal level to confirm the TV works correctly on weak signals.*

8. Press the CHANNEL STEP button with the arrow pointing up (the channel display will move up one channel). Move the TV selector channel to the same channel.
   Key Point: *Use the VA62A to check every channel by moving through the tuner, one channel at a time.*

9. Select channel 14 (enter "1" and then "4"). Move the RF cable to the TV's UHF antenna input. Tune UHF channel 14 on the tuner. (If the tuner has cable channels, be sure the selector is *out of* the "cable" position.)
   Key Point: *The VA62A produces UHF channels when any channel between 14 and 83 is entered. All channels are available, to make complete tests on UHF tuners.*

Standard Cable RF

Channels 2 through 13 of the "STD CABLE" generator are identical to the "STD TV" generator. The channels from 14 to 99, produce cable channels, instead of UHF channels. See Fig. 100 (page 86) of your VA62A manual, for details on these channels.

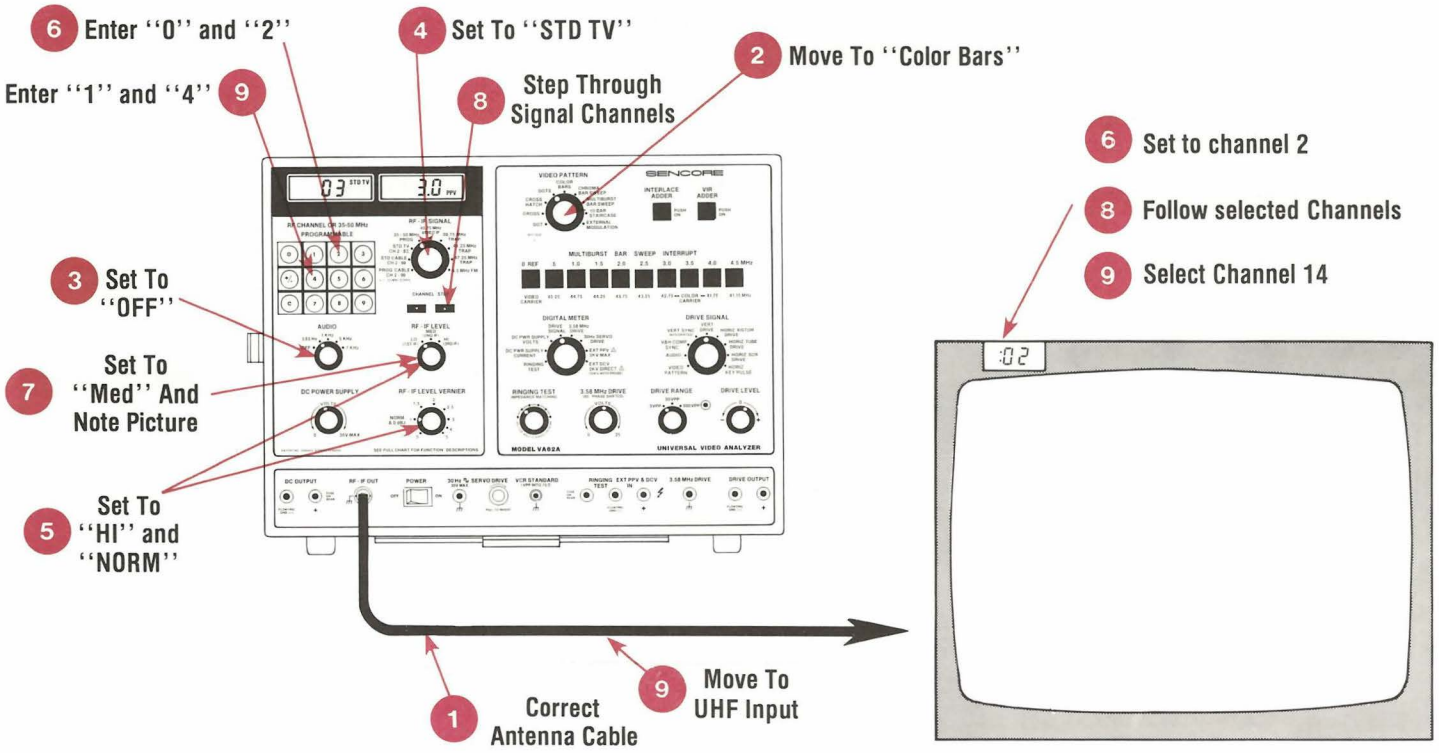

Fig. 3: Follow these steps to use the RF generator to test all the channels of a standard tuner.

If your TV has cable channels, switch it to the "cable" mode. Confirm that the RF cable is connected to the VHF input.

1. Move the RF-IF SIGNAL switch to the "STD CABLE" position.

2. Select channel 12 by entering the number "1" and "2". Set the TV to channel 12. (If you have a local channel 12, use channel 13.)

Key Point: *There is no difference between this channel 12 and the one produced by the "STD TV" function.*

3. Change the channel to 14, by pressing a "1" and a "4". Move the TV to channel 14 as well.

Key Point: *Fig. 100 (page 86) shows that this is one of the cable channels between VHF channels 6 and 7. Use the cable generator to test tuners with cable capabilities.*

Programmable Cable RF

The "STD CABLE" generator produces every cable channel at the frequency shown in Fig. 100. Many cable systems do not use these frequencies. They shift their channels to a higher or a lower frequency. Fig. 99 (page 84) shows the two most common shifting schemes.

The "PROG CABLE" generator duplicates any cable shift to find tuning or AFT problems. In the next steps, you will learn how to program a cable shift.

1. Move the RF-IF SIGNAL switch to the "PROG CABLE" position. (Notice that the left-hand display shows a channel number.)

2. Press the "+/-" key of the keyboard. (Notice that the left-hand display now shows a frequency.)

NOTE: *The "+/-" button only functions in the programmable mode.*

Key Point: *If the display shows 0.00 MHz, the channel is not shifted. If it shows any other number, the channel has been programmed with a shift.*

You will next program the common cable shift of -1.25 MHz. The first step is setting the correct shift direction.

3. Notice whether there is a minus sign at the left of the frequency reading. Press the "+/-" key a second time. Notice how the minus sign either appears or disappears. Leave the minus sign showing, for the next step.

Key Point: *The minus sign shows whether the shift will move the frequency up or down from the standard frequency.*

4. After getting the minus sign, enter three numbers: "1", "2", and "5".

NOTE: *The display will blank out for a moment to show you that the microprocessor has received your program instructions.*

Key Point: *When the channel number returns, the RF generator has moved from the original assigned frequency (-1.25 MHz, here).*

5. Press the "+/-" key again. Notice that the display now shows a -1.25 MHz shift.

Key Point: *The generator remembers your last programming instruction, until you program it again. This is even true if you remove the power.*

You can erase the shift by entering three zeros.

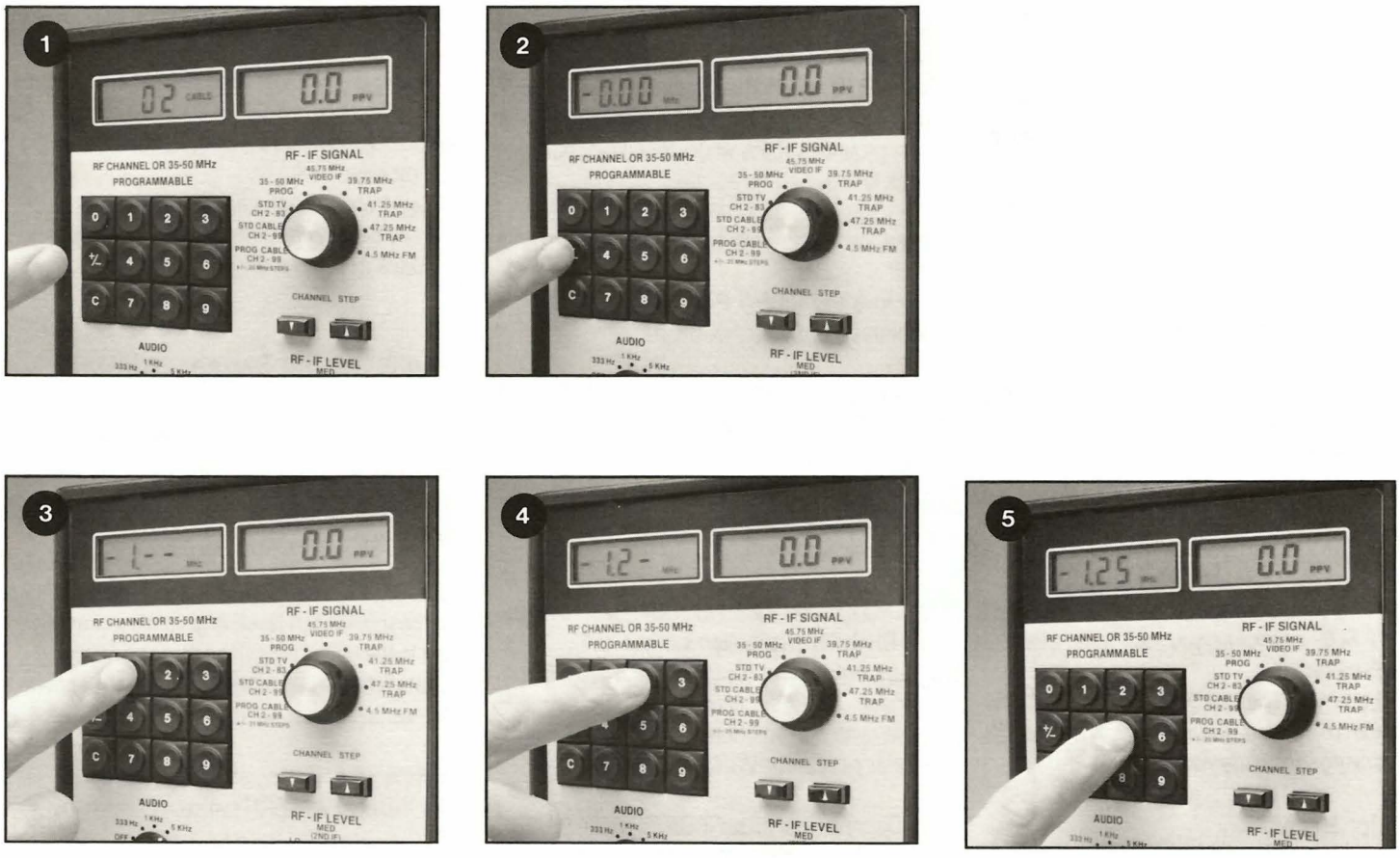

Fig. 4: The Programmable Cable function lets you program each cable channel with an offset. 1. The channel number shows before entering the program mode, 2. The display shows the current frequency program (zero indicates no program), 3-5. Entering the desired numbers program in a new frequency offset.

6. Press "0", "0", and "0" (the minus sign doesn't matter).

NOTE: Just as before, the display blanks out for a moment, and then comes back to the channel number when the shift is erased.

Key Point: *You can program each cable channel for the same shift, or each to a different shift, depending on the tests you want to do. Once programmed, the microprocessor will remember the shift, unless you decide to change them later.*

Video Patterns Let You Isolate Troubles

The RF signals are used on every TV receiver or VCR. The VA62A modulates the RF signals with convergence patterns or analyzing patterns. The convergence patterns let you use conventional test procedures. The analyzing patterns identify circuit problems.

In the following sections, you will examine each of the video patterns on a good receiver. You will learn how the video patterns *should look* on a *good* receiver. Receivers with problems distort these ideal patterns.

To view the pattern, feed the RF-IF signal to a VHF channel, which does not show interference from a local station. Set the AUDIO switch to the "OFF" position, to prevent beats from the audio carrier.

Convergence Patterns

The first four patterns give you the test patterns needed to adjust the static and dynamic convergence controls.

1. Watch the CRT as you choose each pattern: DOT, CROSS, CROSSHATCH, and DOTS.

2. Use a small screwdriver to adjust the VA62A DOT SIZE control as you look at its affect on each pattern.

Key Point: *The Dot Size control affects the width of the dots and the vertical lines of the convergence patterns.*

Color Bars

This is an improved version of the RCA-type, gated-rainbow test pattern. The most noticeable improvement is increased color saturation, which provides better results when servicing VCRs.

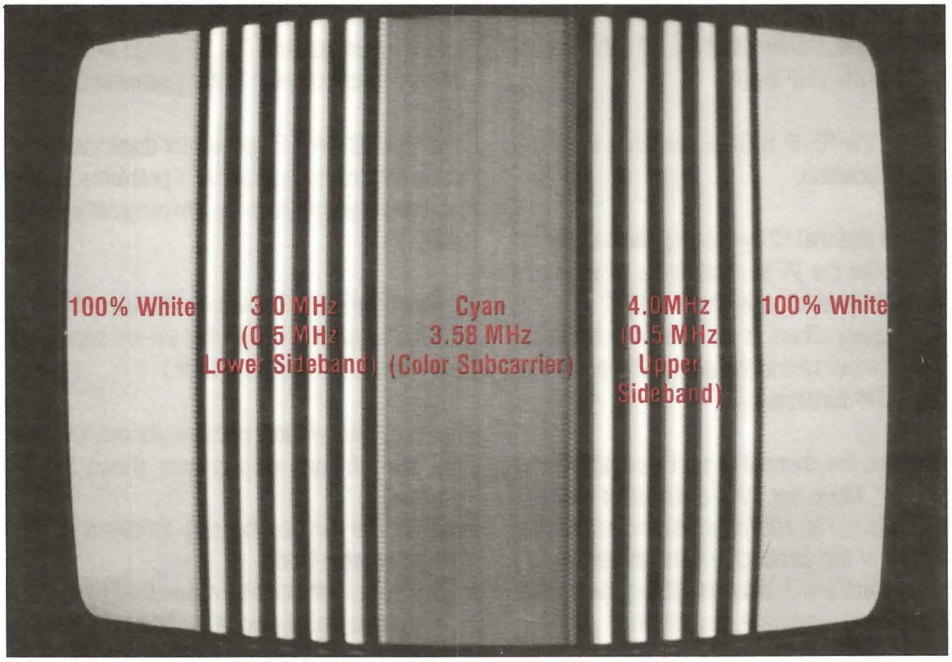

Fig. 5: The three bars of the Chroma Bar Sweep should have the same color intensity. If they don't, the colors may be distorted, even though a color bar generator produces good color.

Chroma Bar Sweep

This analyzing pattern dynamically tests all the color circuits. Three features provide added information, compared to color bars: 1) Its center bar is fully saturated cyan for use in VCR servicing, 2) Its outside bars represent the 500 kHz upper and lower color sideband limits, and 3) Its background is 100% white, for correct peak-to-peak levels.

Feed the VA62A into an unused VHF channel and:

1. Move the VIDEO PATTERN switch to the "Chroma Bar Sweep" position.

2. Release the MULTIBURST BAR SWEEP INTERRUPT pushbuttons marked "3.0", "3.5", and "4.0" MHz.

Key Point: *The Chroma Bar Sweep produces a 100% white screen with these three buttons out.*

3. Depress the MULTIBURST BAR SWEEP INTERRUPT pushbutton marked "3.5".

Key Point: *The center bar is a continuous phase, 3.58 MHz color bar. This duplicates the cyan bar from the "NTSC" (EIA-RS189) color pattern for VCR adjustments.*

4. Depress the MULTIBURST BAR SWEEP INTERRUPT pushbutton marked "3.0".

Key Point: *This bar is a color signal 500 kHz (0.5 MHz)* ***lower*** *than the color subcarrier. The bar will have several vertical color strips if the color circuits are processing this signal correctly.*

5. Depress the MULTIBURST BAR SWEEP INTERRUPT pushbutton marked "4.0".

Key Point: *This bar is a color signal 500 kHz (0.5 MHz)* ***higher*** *than the color subcarrier. If the color circuits have at least 1 MHz bandwidth, this bar should have the same color intensity as the other two bars.*

6. Gradually reduce the color level control on the TV receiver.

Key Point: *Compare the color levels of the three bars by observing when each turns grey (loses all trace of color).*

Multiburst Bar Sweep

This analyzing pattern dynamically tests all the video stages, from the antenna to the picture tube. It confirms that each stage has proper bandwidth.

The VA62A produces each of the 10 bars at the same modulation level. Any variation from one bar to the next is caused by the receiver circuits. Examining the bars on the CRT, lets you confirm the variations are normal.

1. Select the "Multiburst Bar Sweep" position of the VIDEO PATTERN switch.

2. Release all 10 of the MULTIBURST BAR SWEEP INTERRUPT pushbuttons to their "out" position.

Key Point: *The Multiburst Bar Sweep produces a solid black picture when all the buttons are released.*

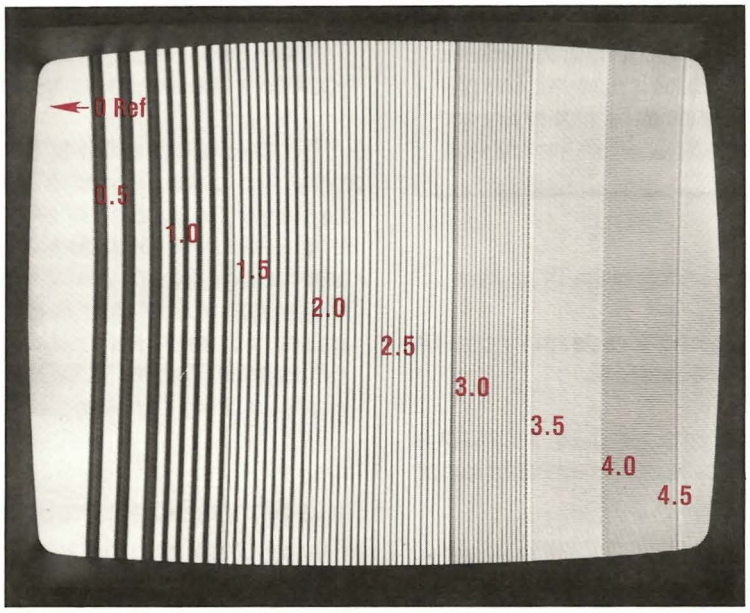

Fig. 6: The ten bars of the Multiburst Bar Sweep check the response of all the video circuits, including the IF and video amplifiers.

3. Press in the "0 REF" button.
Key Point: *This bar (which may just show on the left side of the CRT) is a reference to which the other bars are compared.*

4. Press in the ".5" and "1.0" buttons.
Key Point: *These bars should show solid white and solid black vertical stripes. These two bars test the video stages for overshoot or ringing.*

5. Press the "1.5", "2.0", "2.5", and "3.0" buttons.
Key Point: *Each bar should have vertical white stripes of various sizes. A bar without stripes means that a video stage has excessive frequency loss.*

6. Adjust the "sharpness" or "video peaking" control on the receiver to see its affects on the various bars.

7. Press in the "3.5" button.
Key Point: *This is the color bar and* ***should be*** *a uniform shade of grey (no vertical stripes). This confirms that the color has been properly trapped out by the video stages.*

NOTE: *If the bar shows in color, the receiver's color killer is not working correctly.*

6. Press in the "4.0" and the "4.5" buttons.
Key Point: *Sets with comb filters may show detail (vertical stripes) in the "4.0" bar (conventional sets do not). When feeding the antenna, all sets should show the "4.5" bar as a grey bar without striped, to confirm that the sound carrier does not cause picture interference.*

10-Bar Staircase

The 10-Bar Staircase pattern tests the circuits for proper brightness and contrast range. If the video stages work correctly, there should be 10 different picture levels, ranging from pure black to pure white.

1. Move the VIDEO PATTERN switch to the "10-Bar Staircase" position.

2. Adjust the TV receiver's "brightness" and "contrast" (or "picture") controls until each of the 10 bars has a different brightness level.
Key Point: *If all the video stages work correctly, you should see 10 different brightness levels.*

3. Leave the "brightness" control set, and watch the pattern as you gradually reduce the "contrast" or the "picture" control.
Key Point: *Notice how the bars blend together. When 3 bars have the same intensity, you have lost 20% of the picture range. If this is caused by a bad stage, the "contrast" control cannot return normal contrast.*

4. Return the "contrast" control to normal. Adjust the "brightness" control in either direction from its normal setting.
Key Point: *Notice how a problem which affects the DC bias on a stage affects the bars near the black area. If a bad stage causes the losses, the "brightness" control cannot correct for the problem.*

Signal Adders for Special Tests

The INTERLACE ADDER and the VIR ADDER buttons let you modify any of the video patterns for testing special circuits. The two interlace modes confirm the vertical circuits lock with standard interlaced signals from a TV station or VCR or non-interlaced from video games or computers. VIR confirms that automatic color circuits work correctly on "station controlled" receivers.

1. Move the VIDEO PATTERN switch to the "Color Bars" position.

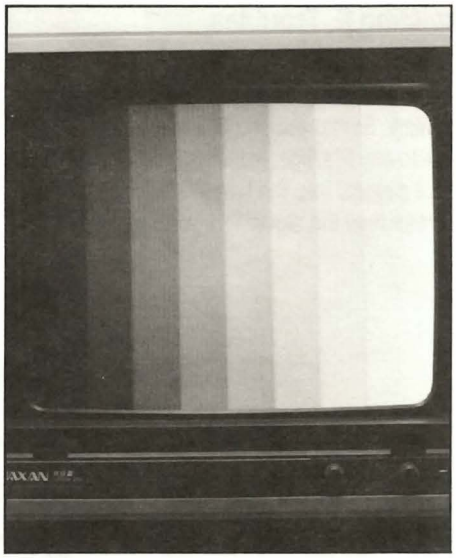

Fig. 7: The 10-Bar Staircase pattern tests the video stages for correct dynamic operating range, from pure black to pure white.

2. Release the INTERLACE ADDER button to its "out" position. Notice the edges of the color bars.
Key Point: *In the non-interlaced mode, the phase-locked color signals stand still because the color has the same phase every time the electron beam returns to the same place on the CRT.*

3. Press the INTERLACE ADDER button to its "in" position.
Key Point: *Notice that the edges now seem to run because NTSC video reverses the color phase on alternating video fields to make the color subcarrier less noticeable.*

4. Leave the INTERLACE ADDER button pressed, and move the VIDEO PATTERN switch to the "Crosshatch" position. Notice how the horizontal lines seem to jitter.

Key Point: *Interlaced sync causes flicker, because the horizontal lines alternate between two screen locations at a 30 Hz rate.*

5. Release the INTERLACE ADDER button to its "out" position.

Key Point: *Notice how this stabilizes the horizontal lines because the lines trace over the same spot every time the CRT is scanned.*

6. If you have a TV with VIR: Switch back to color bars and notice the affect of adding or removing VIR with the VIR ADDER button.

Isolating IF Troubles

The VA62A identifies troubles with signal substitution. Signal substitution can isolate problems to any IF stage. In the next section, you will inject a signal into the first IF stage, so that you can see how the signal lets you find a problem.

WARNING

Plug the TV into an isolation transformer, whenever the back is removed. This prevents possible shock hazards to you, and protects the receiver circuits from damage.

1. Remove the back from the TV receiver.

2. Unplug the "tuner link" cable running from the tuner to the first IF amplifier.

3. Use the adapter supplied with the VA62A to plug the RF-IF cable into the connector leading to the first IF stage.

4. Set the RF-IF SIGNAL switch to the "45.75 MHz VIDEO IF" position.

5. Set the RF-IF LEVEL switch to "LO" and the RF-IF LEVEL control to "NORM".

Key Point: *"LO" is the normal signal level for the first IF stage.*

6. Plug the TV receiver into an isolation transformer.

7. Turn on the TV.

Key Point: *The VA62A is substituting for the TV tuner. Since the picture comes through, you know all the later stages are working.*

8. Turn the AUDIO switch to the "1 KHz" position. Turn up the TV "volume" control.

Key Point: *The audio signal adds a modulated carrier to isolate audio troubles, or to align the audio detector. The small amount of interference in the picture is normal, and caused by the method of supplying all-channel operation. Turn the AUDIO switch "off" unless you're working on an audio problem.*

Drive Signals Isolate Problems Without Unsoldering Parts

The VA62A also provides a signal to substitute into every stage after the video detector. These are called the "drive signals".

You don't have to disable the signal that's already in the circuit to use a drive signal. The VA62A has special "swamping" circuits, which take the original signal out of the way before replacing it with the fresh VA62A signal. This

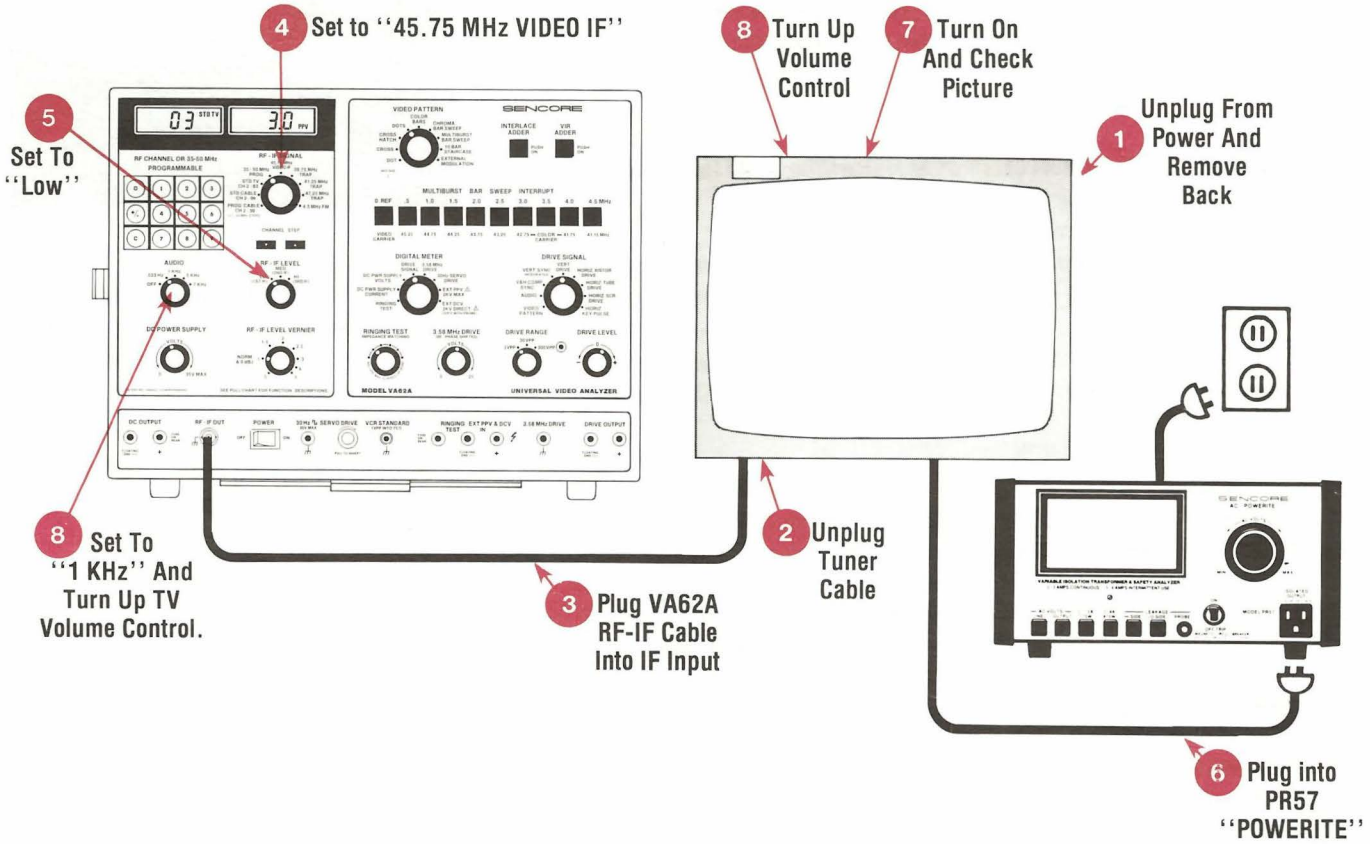

Fig. 8: Plug the TV into an isolation transformer, and then inject an IF signal in place of the tuner to see how the modulated carrier feeds through to the picture tube.

does not damage the circuit, because the output has DC blocking capacitors to prevent loading the bias voltage.

In the next steps, you will inject a drive signal to see how swamping works. Use the input of the first or second video amplifier. Find this test point on your service literature before following these steps.

Fig. 9: You don't need to disconnect components when using the Drive Signals, because the VA62A swamps out the signal in the circuit.

1. Reconnect the tuner, and connect the VA62A to the antenna input.

2. Set the VA62A and the TV receiver to the same channel, which does not have a local station.
   Key Point: *To use signal substitution, the VA62A must also feed the antenna terminal. This holds all the circuits in sync with your drive signal.*

3. Set the DRIVE SIGNAL switch to the "Video Pattern" position.
   Key Point: *The "Video Pattern" drive signal is used in any of the video amplifier circuits.*

4. Determine the peak-to-peak signal level at the injection point by looking at the schematic. *Use the peak-to-peak level from a scope waveform, not the DC bias voltage.*

5. Set the DIGITAL METER switch to the "Drive Signal" position to monitor the peak-to-peak level of the DRIVE SIGNAL output.

6. Adjust the DRIVE LEVEL control and the DRIVE RANGE switch until the meter shows the peak-to-peak level determined in step 4. To determine the correct polarity (+ or -), compare the schematic waveform to the waveforms in Fig. 31 (page 33) of your VA62A manual.

7. Connect a black test lead from the black DRIVE OUTPUT jack to the chassis ground.

8. Connect a red test lead from the red DRIVE OUTPUT jack to the test point.
   Key Point: *The signal that you see on the CRT is now the VA62A signal being injected into the test point, not the antenna signal. You can prove this by lowering the signal level while connected to the test point. If you lower the level to zero, the screen will go blank.*

You can inject signals into any of the other circuits using the same technique. When troubleshooting, the symptom *improves* when injecting *after* the trouble, or *stays bad* when injecting *before* the bad circuit.

Digital Meter Rounds Out the Tests

The digital meter lets you monitor any of the VA62A drive signals, or lets you do special tests. When it's monitoring the internal signals, it is measuring the true peak-to-peak level of the output. The reading drops when you connect to a shorted component, which provides clues of a bad stage.

1. Unhook the test leads from the test points used in the previous example.

2. Note the peak-to-peak voltage of the drive signal with the test leads open.

3. Short the red test lead to the black one.
   Key Point: *Notice how the voltage drops when feeding a shorted test point. Protection prevents damage when feeding a shorted stage.*

The meter also lets you test yokes, flyback transformers, and triplers. Details on testing these components are found on page 52 of the VA62A manual.

External DC and peak-to-peak voltage tests are autoranged. These tests let you monitor circuit test points, to combine signal tracing with signal substitution.

Adjustable Power Supply For Feedback Circuits

Think of the DC power supply as another drive signal. Its main use is for blocking the correction voltage in feedback loops (see page 66 for details). The supply is fully monitored with the digital meter, and protected against damage with a short circuit.

1. Set the DIGITAL METER switch to the "DC PWR SUPPLY VOLTS" position.

2. Adjust the DC POWER SUPPLY control fully clockwise.
   Key Point: *The digital meter lets you set the exact voltage.*

3. Connect the output leads together.
   Key Point: *The voltage drops because the meter shows the voltage at the output jacks.*

4. Move the DIGITAL METER switch to the "DC PWR SUPPLY CURRENT" position.
   Key Point: *The meter shows about 1 ampere of current. The output protection lets you feed a dead short all day long without causing damage.*

Notes

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