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tech tips

Learning to Use The VG91 Universal Video Generator

Todays TV-video systems can be divided into 3 sections: 1) Tuner/IF, 2) Video and 3) Audio. The VG91 provides signals to fully test and isolate defects in any NTSC TV-video system. This Tech Tip will familiarize you with the VG91 signals, how to select them and where to use them when testing TV-video systems.

You will need the following:

1. VG91 Operation & Application Manual and supplied test cables.
2. A good TV receiver/monitor preferably equipped with MTS Stereo/SAP receiving capabilities. (A schematic of the receiver/monitor may be helpful)
3. Isolation Transformer

Selecting RF TV Channels

The VG91's RF-TV channel generator gives you access to every TV channel modulated with video and audio test signals. You'll use the RF generator to test the tuner portion of a TV-video system, to performance test video and audio stages, and to provide a reference signal when substituting signals using companion analyzers such as the Sencore TVA92 TV Video Analyzer. All the VG91's RF-TV channels are supplied through the RF-IF OUTPUT jack. The VG91 has 4 RF-TV channel generator functions: STD TV, STD CABLE, HRC CABLE, and ICC CABLE. Here is what each function provides.

STD TV - The STD TV position of the RF-IF Signal switch provides any assigned VHF or UHF channel to duplicate any over-the-air signal. The channels are generated at FCC assigned frequencies.

STD CABLE - The STD CABLE position produces any of the standard cable

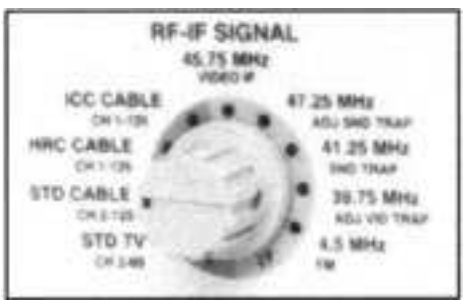


Fig. 1 Use the TV-RF generator to duplicate broadcast or cable channels for complete tuner analyzing.

channels from 2 through 125. This covers all standard VHF, mid-band, super-band, and hyper-band cable channels from 50 to 800 MHz. Channels are generated on FCC assigned frequencies with EIA/NCTA channel number designations.

HRC CABLE - The HRC (Harmonically Related Carriers) CABLE position produces any HRC cable channel 1 through 125. HRC cable channel carriers are shifted - 1.25 MHz from the FCC assigned (STD cable) frequencies, except channels 5 and 6. Channels 5 and 6 are each shifted t 0.75 MHz. An additional channel, designated channel 1, is created between channels 4 and 5. Other designations for this added channel are 4+, 5A, or A-8.

ICC CABLE - The ICC (Incremental Coherent Carriers) CABLE position produces any ICC cable channels 1 through 125. In this position, channels 5 and 6 are each shifted t 2.00 MHz from the FCC assigned (STD cable) frequency. An additional channel, designated channel 1, is created between channels 4 and 5.

To use the RF-TV channel generator to test a tuner:

1. Connect the RF-IF Test Cable to the receiver/monitor's antenna input.
2. Set the VIDEO PATTERN switch to "EIA COLOR".
3. Set MTS STEREO MODE to "MONO", Set AUDIO FREQUENCY to "300 Hz".
4. Set RF-IF SIGNAL switch to "STD TV"
5. Set the RF-IF Level switch to "HI", Set the RF-IF Level to "1" (NORM)

NOTE: HI is the normal range setting when feeding the antenna input.

6. Apply power to the receiver/monitor. To test for normal TV off-air reception set the TV receiver/monitor to "Normal TV" and select channel 2, Enter "2" into the VG91 keyboard.

You should see a clear color bars pattern on the CRT with the setting of the VG91's attenuator as in step 5 (1000µV).

7. Move the RF-IF RANGE switch to "MED".

The VG91 attenuator lets you decrease the output level to confirm the TV-video system works correctly on weak signals. Return to the "HI" RF-IF Range and "NORM" level.

8. Press the key of the VG91 keypad with the arrow pointing up (the channel display should move up one channel). Select the TV receiver to the same channel. You may continue to increment channels or directly select channels with the keyboard to check channels 2-13 VHF and 14-69 UHF. When directly selecting VG91 channels enter valid 1, 2 or 3 digit numbers. You are not required to enter O's preceding a valid channel number.

NOTE: If the receiver uses a separate UHF

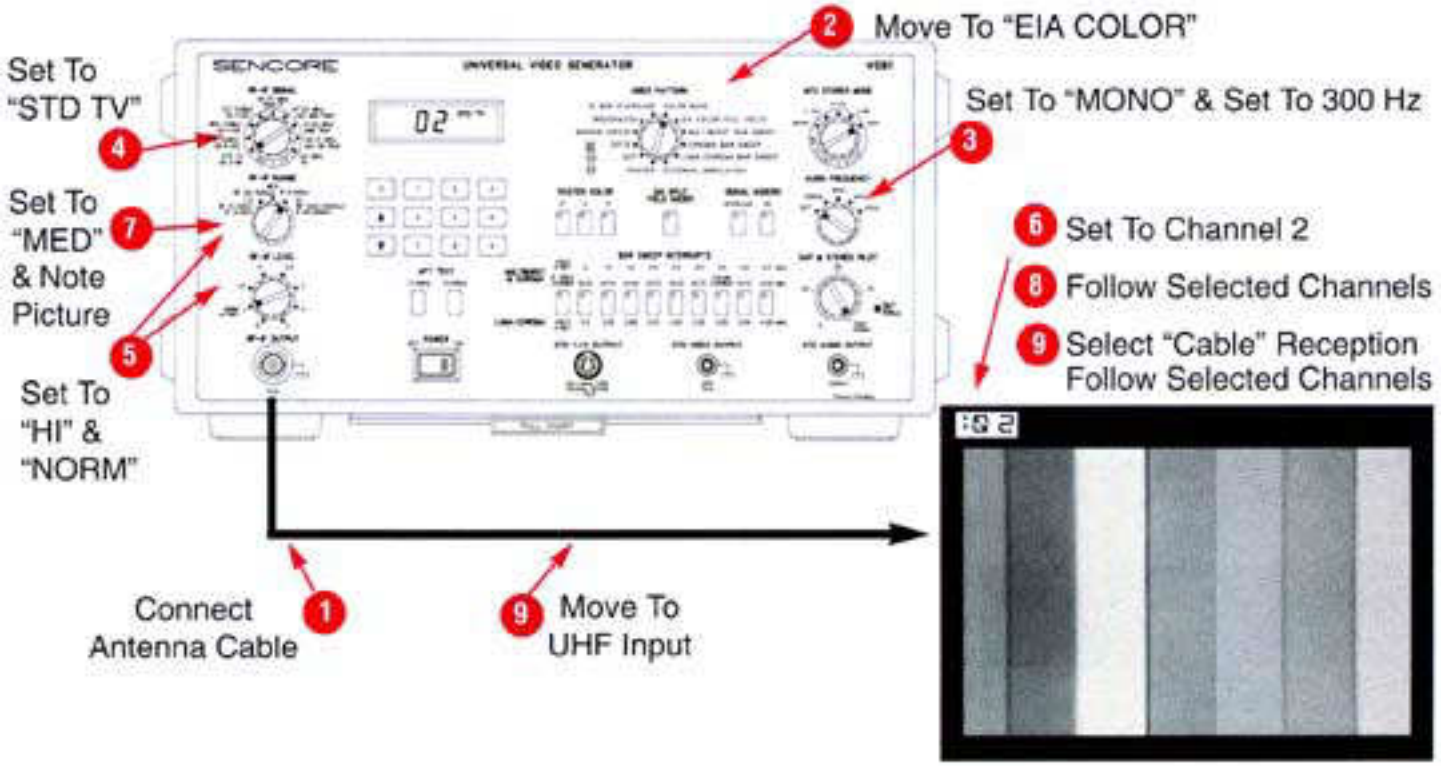


Fig. 2: Follow these steps to use the VG91's RF-TV channel generator.

antenna jack, move the RF cable to the UHF antenna input to test channels 14-69.

9. To test cable reception: Move the VG91's RF-IF SIGNAL switch to STD CABLE, enter "2" into the VG91 keyboard. Select the TV receiver/monitor to "Cable" reception and select channel 2. Increment or directly select channels to check any cable channel 2-125. If the TV receiver/monitor must tune to HRC or ICC cable shifts, select the "HRC CABLE" or "ICC CABLE" position.

See Appendix A of the VG91 Operation & Application manual for a complete listing of cable channel video carrier frequencies.

NOTE: When testing receivers in the "cable" mode of reception, select the channel on the VG91 first then select the channel on the receiver. This permits the tuning search performed by digital tuners to properly find and lock to the STD TV, STD HRC or STD ICC cable frequencies.

AFT Test

The VG91's AFT TEST is used to check the TV receiver/monitor's automatic fine tuning (AFT) performance. The AFT TEST works by shifting the RF channel frequency + or - 0.5 Mhz when an AFT TEST button is pushed and held in. This permits you to view the receivers AFT action.

To check the AFT performance of a receiver/monitor:

1. Select the desired STD TV or STD CABLE channel as you did earlier in steps l-6 when learning to use the TV-RF channel generator.

2. Select the EIA COLOR BARS pattern. (Do not use the Bar Sweep patterns as high frequency video will affect AFT circuit operations)

3. Push and hold the "- 0.5 MHz" AFT TEST button while observing the video display.

When the AFT TEST button is first depressed the video should degrade and then as AFT action restores proper tuning the video should improve. The same action should be observed when the AFT TEST button is released.

4. Push and hold the "+0.5 Mhz" AFT TEST button and again observe the AFT action.

Failure to recover a good video picture when either AFT TEST button is pushed indicates poor performance or a defective in the AFT circuits. Good performance in one direction and not the other indicates the need for AFT centering alignment.

Isolating IF Troubles

The VG91 provides substitute and alignment signals to isolate problems in video-IF stages or sound IF stages. The VG91's IF generator provides 3 functions: 1) 45.75 MHz Video IF signal, 2) Video IF Trap Setting signals and 3) 4.5 MHz Sound IF signal. The signals are output from the RF-IF OUTPUT jack. Here is what each function provides.

45.75 MHz VIDEO-IF - The 45.75 MHz Video IF position provides an accurate 45.75 MHz video carrier. Use ths signal to sub for the tuner and inject into IF stages to isolate defects or to align the video IF stages. When applied at the correct level to a properly working IF stages, video and audio information appears at the corresponding detector outputs or on the CRT monitor or speaker(s).

Trap Setting Signals - The VG91 produces three special IF trap signals to align video-IF stages. The trap signals consist of a modulated 45.75 MHz video IF and an interference carrier the IF stages are supposed to filter out; (41.25 = on channel

sound; 47.25 = lower adjacent channel sound; 39.75 MHz = upper adjacent channel video). The RF-IF RANGE and RF-IF LEVEL controls vary the level of the interference carrier.

4.5 MHz FM - The "4.5 MHz FM" position provides an FM modulated carrier used for troubleshooting the sound IF stages of a TV-video system. The signal is modulated with mono or stereo audio to produce an audio output when injected into a properly working IF sound IF stage.

In this section you will inject the 45.75 MHz Video IF signal into the 1st IF stage to see how it lets you find IF problems.

1. Remove the back from the TV receiver/monitor. Plug the receiver/monitor into an isolation transformer.

WARNING

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

2. Connect the RF-IF cable to the 1st IF stage.

The VG91 provides 3 options for making connections to IF circuits: 1) Troubleshooting Matching Balun, 2) F-connector to RCA Female Adapter cable and 3) F-connector to RCA male adapter cable. Unplug the "tuner link" at the IF stage input. Use one of the adapter cables to connect the VG91's RF-IF cable to the input to the 1st Video-IF stage. If the tuner module is directly soldered to the IF circuits, use the Troubleshooting Matching Balun.

3. Set the RF-IF SIGNAL switch to "45.75 Mhz Video IF". Set the RF-IF RANGE switch to "LO" and RF-IF LEVEL to "NORM".

NOTE: The "LO" range is the normal level required by the 1st IF stage. Remember the "HI" range was the normal antenna input level.

4. Turn the TV "ON".

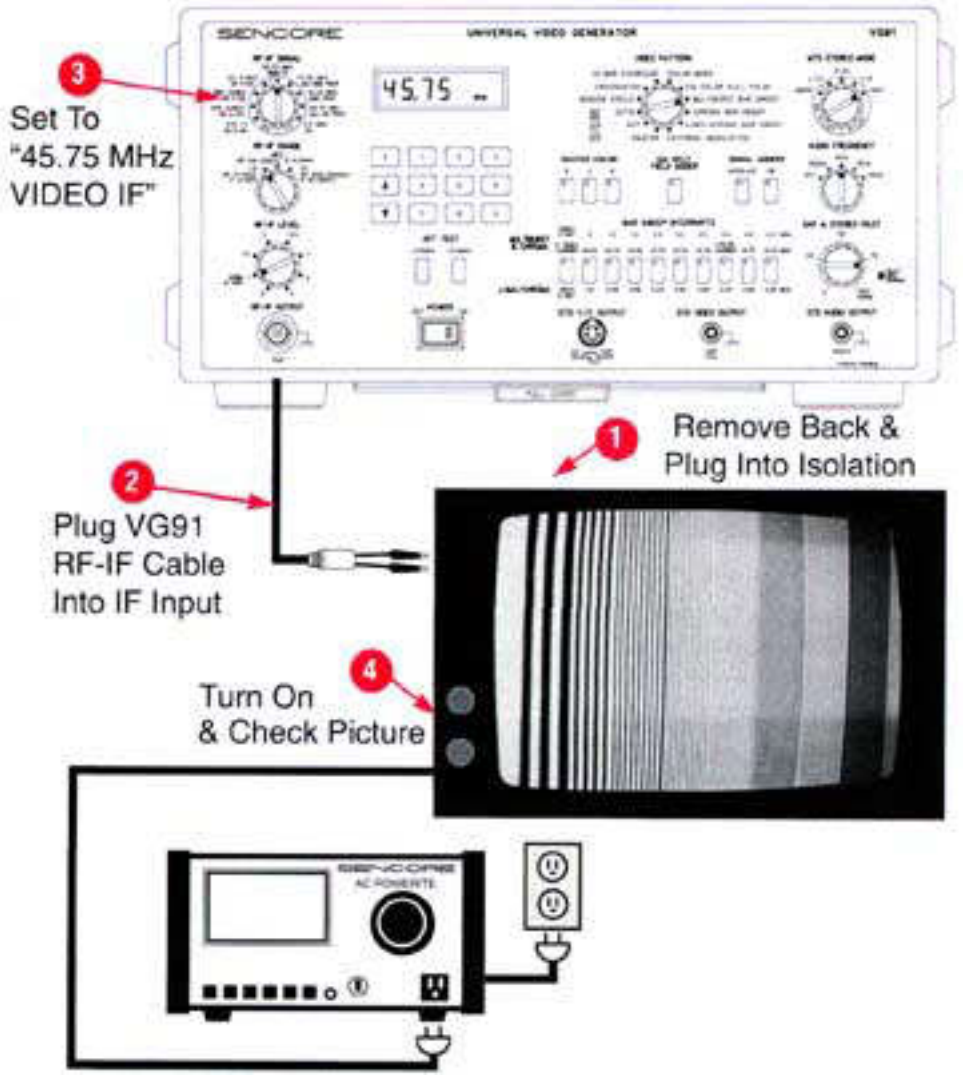


Fig. 3: Plug the receiver/monitor into an isolation supply, and then inject the 45.75 MHz Video IF in p/ace of the tuner to test the stages through to the CRT.

The VG91 is substituting for the signal coming from the tuner. Since the picture comes through you know that all stages from this injection point to the CRT are good.

NOTE: Some tuners contain the 1st IF stage inside the tuner module. When injecting directly into the 2nd IF or SAW filter use the "MED" RF-IF RANGE position.

Video Patterns Isolate Troubles

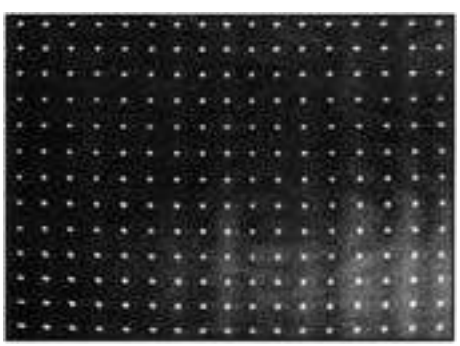
The VG91 provides industry standard and exclusive video test patterns. A pattern is provided to test luminance stages, while others test chroma stages, synchronous detectors, comb filters, or deflection circuits. TV-Video. systems with problems distort the ideal video test pattern. In many cases, you can pinpoint defects by viewing the video pattern. Here is a brief description of each video pattern and what you should see.

1. Select each pattern with the VIDEO PATTERN switch and examine each on your working receiver/monitor.

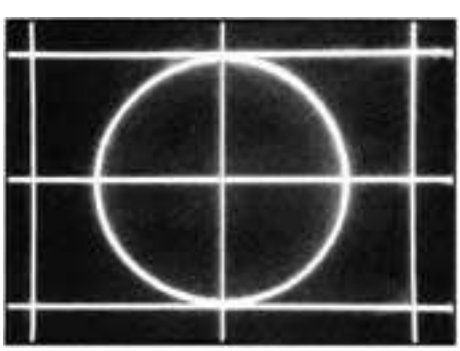
RASTER - The RASTER pattern provides a blank color raster of any primary or secondary color. The color is selected with the RASTER COLOR switches. The

RASTER COLOR switches also add or delete colors to the Raster, Dot, Dots, Window Circle, Crosshatch and EIA Color pattern. Use the Raster pattern to evaluate the operation of each color gun, and to test and align color purity.

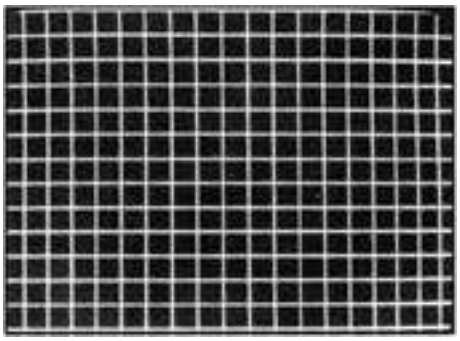
DOT - The DOT pattern provides a single dot centered within the raster. It is used to set the static convergence of a color receiver or monitor to produce a white dot without color shading in the center of the display.



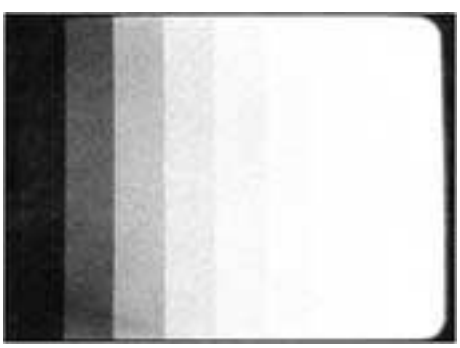
DOTS - The DOTS pattern provides the standard dynamic convergence pattern recommended by most manufactures. It is used to set the dynamic convergence of a color receiver or monitor to produce white dots without color shading throughout the display.



WINDOW CIRCLE - The WINDOW CIRCLE pattern consists of several patterns combined into one useful pattern; a cross, a box and a circle all centered within the raster. This pattern is used for evaluating or adjusting centering, width, height, linearity, pincushion and other deflection circuits.

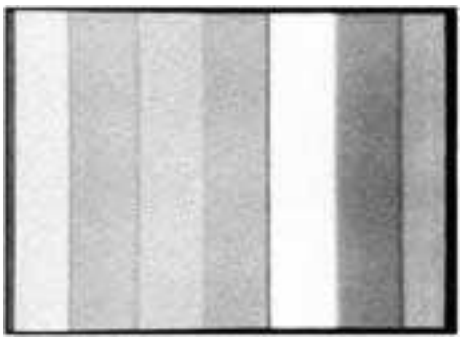


CROSSHATCH - The CROSSHATCH pattern produces 21 vertical and 15 horizontal lines that form squares on the screen. This pattern is used for the entire convergence procedure on one gun CRTS or in-line gun CRTS.

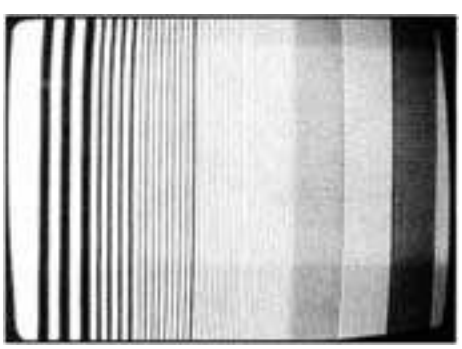


10 BAR STAIRCASE - The 10 BAR STAIRCASE pattern consists of 10 evenly-spaced bars, with video levels ranging from black to 100% white. Use it to test the video circuits for proper dynamic range and for alignment of the synchronous video detector and color tracking controls. When properly aligned each bar should show a distinct change in brightness level with no hint of color.

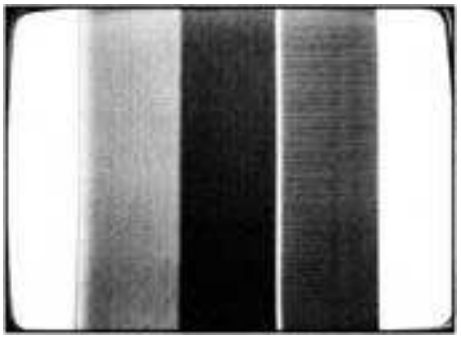
COLOR BARS - The Color Bars pattern is similar to the industry accepted 10 Bar Gated Rainbow pattern used by video servicers for years and still referenced on schematics. Each color bar represents a phase shift of approximately 30 degrees, resulting in 10 visible bars of different color hues.



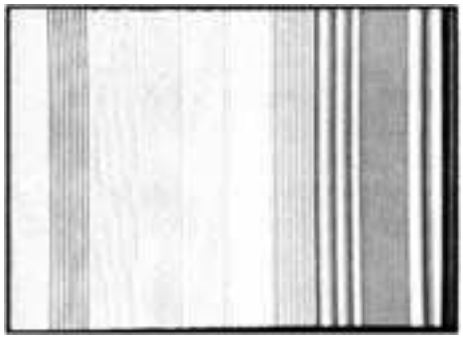
EIA COLOR (Full Field) - The EIA COLOR bars pattern meets the industry-standard color pattern specified by manufacturers for video equipment testing. It consist of two distinct amplitude portions - luminance (brightness) and color level (saturation). The luminance portion of the signal forms an uneven, seven-level stairstep. The color saturation is 75%, which brings the top of the yellow and cyan bars to the 100% white level. The EIA COLOR pattern can be used with a conventional vectorscope and waveform monitor to analyze the relative amplitudes and phase of the color signals. The EIA SPLIT FIELD ADDER switch adds a -I, white, Q and black reference test signals to the bottom quarter of the EIA COLOR pattern.



MULTIBURST BAR SWEEP - The Multiburst Bar Sweep pattern consists of ten, reference frequency bars beginning with a solid white "0 MHz" reference bar, and increasing in .5 MHz steps to 4.5 MHz. This pattern isolates frequency response problems in video IFs, comb filters and luminance processing circuits. A stage that is restricting the video signals will reduce the amplitude of distort the shape of the one or more frequency bars. Releasing the BAR SWEEP INTERRUPT switches removes or identifies test frequency bars.



CHROMA BAR SWEEP - The Chroma Bar Sweep pattern consists of three frequency bars at 3.0 MHz, 3.5 MHz and 4.0 MHz. This pattern is used to isolates chroma response problems in IF, comb filters and chroma processing circuits. Defects which may be restricting the 1 MHz band of color signals required for good color reproduction will reduce amplitude of one or more of the frequency bars. Releasing the BAR SWEEP INTERRUPT switches removes test freqency bars to provide a 100% white raster.



LUMA/CHROMA BAR SWEEP - The Luma/Chroma Bar Sweep pattern combines luminance and chroma test frequencies. The pattern consists of six luminance frequency bars (0 MHz reference white, 2.0 MHz, 3.28 MHz, 3.88 MHz, 4.2 MHz and 4.5 MHz) and 4 chroma frequency bars (2.28 MHz, 3.08 MHz, 3.58 MHz and 4.08 MHz). This pattern simplifies testing and alignment of comb filters and may be used to analyze today's wideband I color decoding circuits and Y/C (S-Video) inputs. Proper comb filter separation should produce luminance without color interference. When testing wideband color circuits or Y/C Inputs use the 2.28 Mhz bar to test the color response. Releasing the BAR SWEEP INTERRUPT switches removes or identifies test freqency bars.

Signal Adders for Special Tests

The INTERLACE and VIR buttons modify any of the VG91's video patterns to more accurately duplicate TV-video signals for testing special circuits. Switching between interlace and non-interlaced video modes confirms vertical circuits lock to interlaced TV broadcast signals or to non-interlaced video games or computers. VIR confirms that automatic color circuits work properly on VIR controlled receivers.

Test Mono or MTS Stereo/SAP Audio Performance

In addition to video, most TV-video systems receive and process the mono or MTS audio portion of the TV signal. Use the Mono/MTS Stereo/SAP audio generator of the VG91 to test tuner, IF and audio circuits of the TV-video system. The makeup of the audio portion of the VG91's RF or IF TV signals is determined by the MTS STEREO MODE, AUDIO FREQUENCY and SAP & STEREO PILOT switches.

To test the audio circuits of a mono or MTS Stereo/SAP receiver monitor:

1 Select the desired STD TV or STD CABLE channel as you did earlier in steps 1-6 when learning to use the TV-RF channel generator. You should see a clear Color Bars pattern.

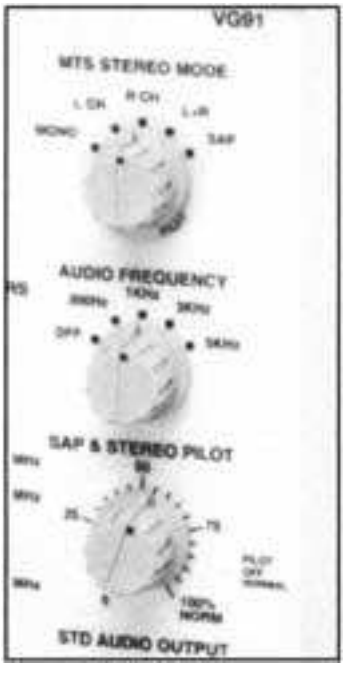


Fig. 4: Use the Mono/MTS Stereo/SAP generator of the VG91 to tesf tuner, IF and audio circuits of a TV-video system.

2. Set the MTS STEREO MODE switch to "MONO". Set the AUDIO FREQUENCY switch to "300 Hz".

3. Set the receiver/monitor for non-stereo or "Mono" operation and adjust the volume to mid-range.
4. Monitor both the left and right AUDIO OUT Jacks or the speaker terminals with dual channel oscilloscope or audio voltmeter.

A mono receiver only should have a good audio output. A stereo receiver should be producing equal audio output in the left and right channels. Unequal outputs indicates improper balance or need to adjust the gain of the individual channels.

5. Set the MTS STEREO MODE switch first to "L+R". Set SAP & STEREO PILOT switch to "100% NORM". Set VIDEO PATTERN switch to "RASTER".

6. Set the receiver/monitor to MTS stereo operation.

The "L+R" position produces a stereo output. You should see proper audio in both the left and right audio channels and the receiver's MTS Stereo light should be "ON".

7. Switch the MTS STEREO MODE switch to "R CH" and then to "L CH" as you observe the left and right channel audio outputs.

The "L CH" and "R CH" positions produce an output in only the left or right channel of a properly working MTS Stereo receiver. This shows you if the MTS stereo circuits are truly working and decoding separate left and right audio. Equal output from each channel indicates a MTS decoder defect or misalignment. The output that is not 20 dB or more lower in the non-selected channel indicates the need for alignment.

8. Set MTS STEREO MODE switch to "L+R". Decrease the setting of the SAP & STEREO PILOT control until the MTS Stereo indicator light turns off. Increase the SAP & STEREO PILOT control until the MTS Stereo indicator light turns back on.

Varying the pilot signal level tests the stereo detect circuits. The pilot detect circuits should turn-off MTS stereo operation at about the 50% level. Stereo operation should resume when the pilot level is increased above 50%.

9. Set the MTS STEREO MODE switch to "SAP". Set SAP & STEREO PILOT switch to "100% NORM".

10. Set the receiver/monitor to SAP operation:

The "SAP" position produces an audio signal only in the SAP portion of the audio composite signal. You should see the SAP indicator light illuminate and get proper audio output in both the left and right audio channels.

Performance Testing With The STD Outputs

TV-Video systems often have line inputs to apply video, audio or luma/chroma (S-Video) signals directly to the video or audio stages. These inputs bypass the tuner, IFs and detector/decoder circuits and produce higher resolution video or stereo sound.

1. Connect the video cable from the VG91's STD VIDEO OUTPUT to the receiver/monitor's rear "Video In" jack.

2. Select the receiver/monitor to display video from this input. Commonly referred to as: Video In or Aux Video

3. Select the Luma/Chroma Bar Sweep Pattern

You should see a good video pattern on the display. Inputting a standard video test signal checks the performance of all the video, luminance and color stages between the input and the CRT.

4. Connect the Y/C Cable from the VG91's STD Y/C OUTPUT to the receiver/monitors rear "Y/C In" or "S-VIDEO In" jack. Select the receiver/monitor to display luma/chroma from this input.

The standard Y/C signal tests the receiver/monitor's performance when displaying super or S-Video signals such as from S-VHS VCRs. This input bypasses the comb filter or conventional passive luminance and color filter circuits. With this input, separated luma and chroma signals are feed directly to the luminance and color circuits permitting improved picture resolution or clarity. You should see an improvement in the clarity of the 4.0 and 4.2 MHz luma bars and 2.28 MHz chroma bars of the Luma/Chroma Bar Sweep pattern.

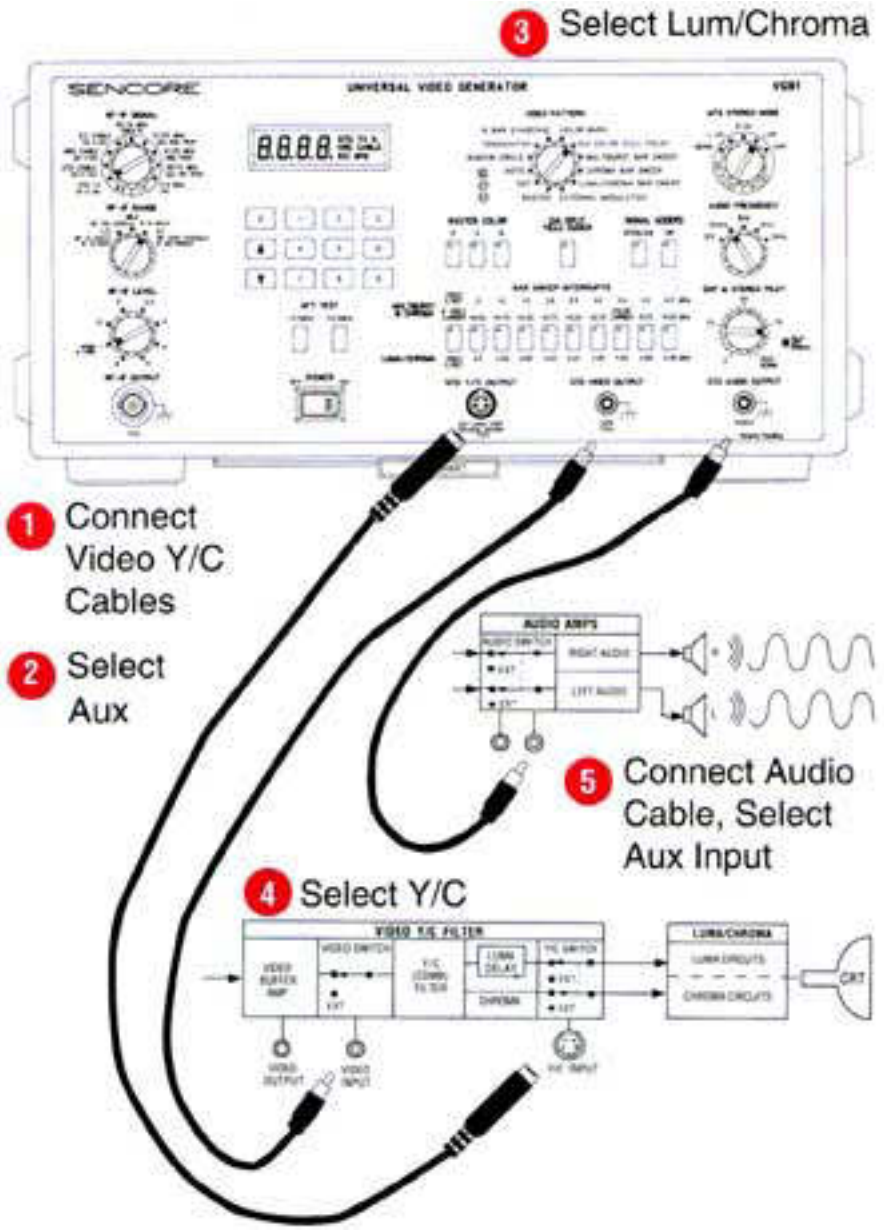


Fig. 5: Use the VG91's standard outputs to apply video, audio or luma/chroma (S-Video) signals directly to fhe video or audio stages.

5. Connect the Audio cable from the VG91's STD AUDIO OUTPUT to the receiver/monitors rear "AUDIO In" jack. Select the receiver/monitor to accept audio from this input.

The standard audio test signal tests the receiver/monitor's audio circuits. This input bypasses the audio IF, detector, and stereo decoder circuits. You should get a good audio output.

For More Information,
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