

Troubleshooting VCR Luminance Circuits With The VC93 All Format VCR Analyzer

A VCR contains five major sections: luminance, chroma, audio, servo, and system control. The luminance section of a VCR receives the FM signal from the tape and processes it into a form that can be used by a television or monitor. The blockdiagram in Figure 1 shows the luminance section of a VCR. Defects in any of these luminance stages produce the same symptom – a snowy or muted playback picture. This often makes isolating the symptom to a specific circuit difficult. This TechTip explains how to troubleshoot the luminance section of a VCR using the signals supplied by the VC93.

Before explaining how to use the VC93, let's briefly review how the luminance stages function and what signals are found at each block during playback.

How The Luminance Signal Is Processed

The FM luminance signal begins at the video heads. After the spinning heads pick up the signal, it is coupled through the rotary transformer windings and fed to the head preamplifiers. The output from the head preamps is selected by the A/B head switcher. Only the signal from the head which is in contact with

the tape is fed to the remaining circuits. This keeps unwanted noise from the head not in contact with the tape from getting into the picture.

After the A/B headswitcher, the FM luminance signal is separated from the down-converted chroma signal. The color and luminance signals are processed separately until they are combined in the Y/C mixer. The signal at the Y/C mixer output is composite video which is fed to the VIDEO OUT jack and RF modulator. The VC93 provides the special luminance signals needed to troubleshoot the circuits from the video heads to the RF modulator.

The make up of the FM luminance signal is different for each VCR format (VHS, Beta, U-Matic, & 8MM). The VC93 generates the necessary luminance signals needed for each VCR format. For specific information on the VCR formats refer to Tech Tip #189, "Comparison Of VCR Formats."

Troubleshooting The Luminance Signal Path

The VCR luminance signal path can be di-

vided into three major sections for troubleshooting:

1. The video head channel
2. The FM luminance stages
3. The video stages

Since the video heads pick up the tape signal, the head channel is a good place to begin signal injection.

Injecting the VC93 "Lum" PLAYBACK SIGNAL at the input of both preamps simultaneously will prove whether or not the FM luminance circuits and the video circuits that follow are able to process a good signal. Use the "Playback Head Sub" position of the PLAYBACK RANGE switch when injecting into the head channel. If the circuits properly process the VC93 signal (as indicated by the "Color Bars" pattern on the playback monitor), you have narrowed the problem to the video heads or to the rotary transformer. For additional information on testing the head circuits refer to Tech Tip #194, "Troubleshooting 'Bad Head' Symptoms With The VC93 All Format VCR Analyzer."

If your injection into the head channel fails to return a picture on the playback monitor, a

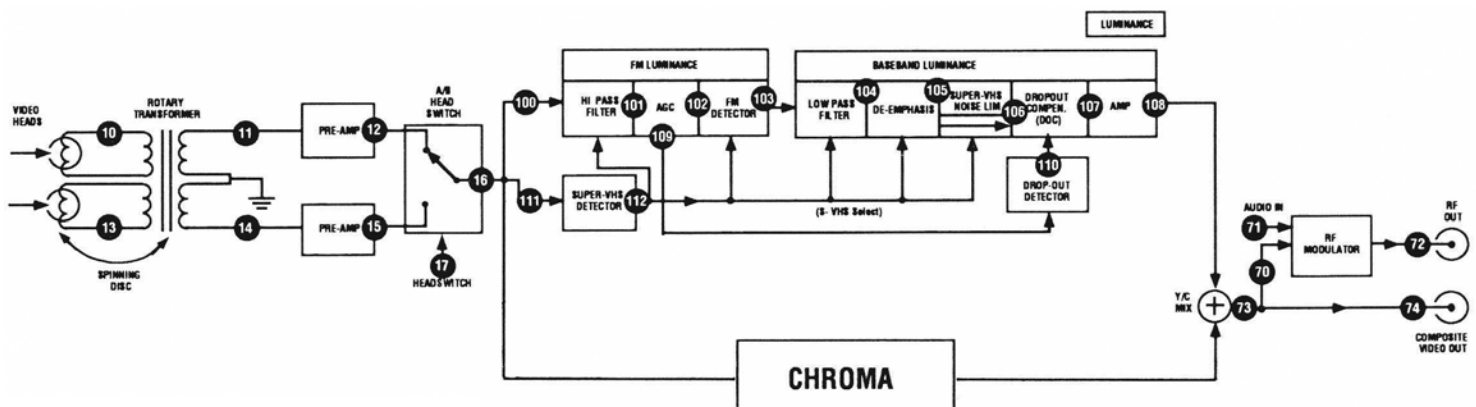


Fig. 1: The luminance signal path in a VCR.

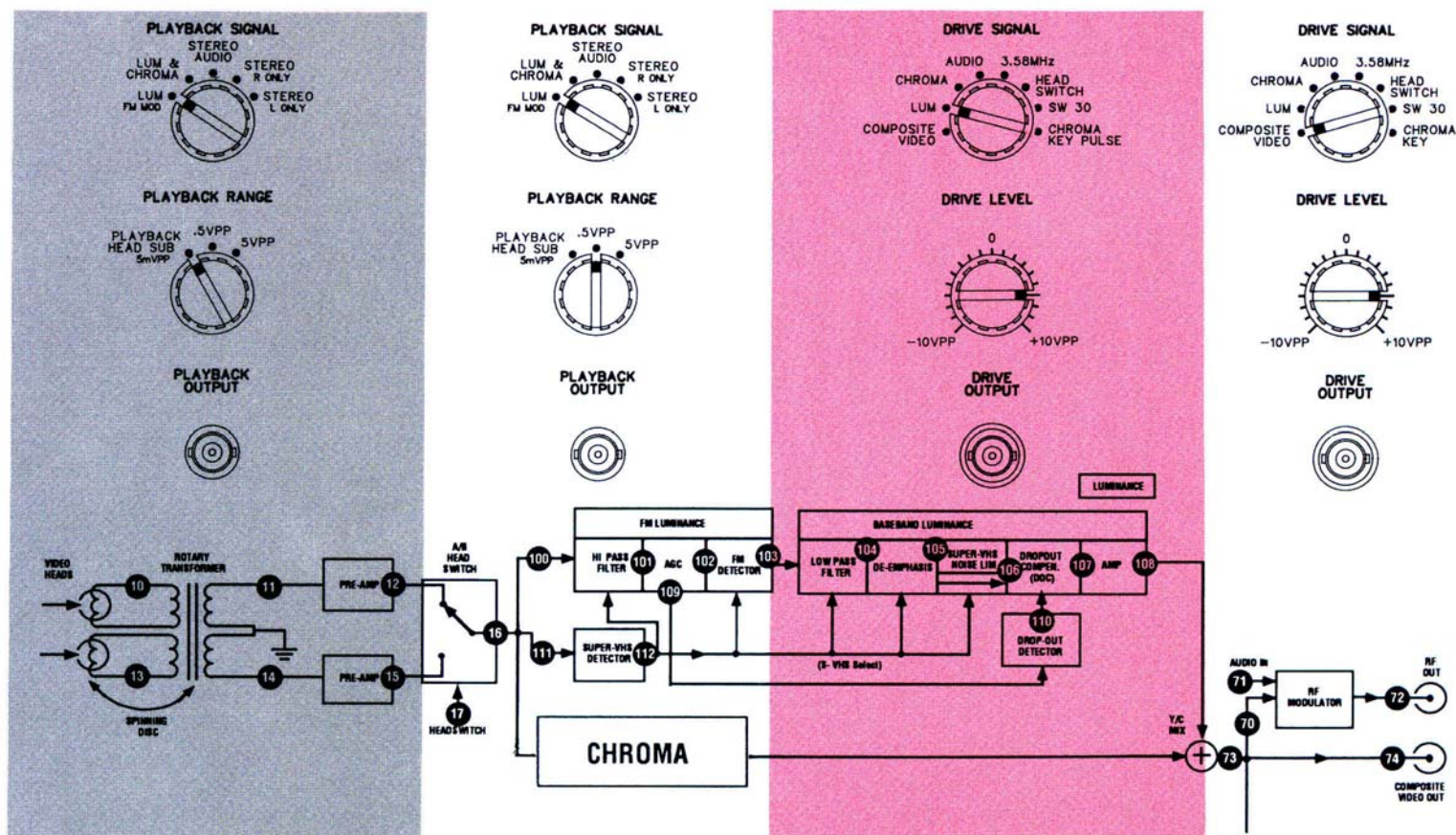


Fig. 2: The VC93 provides the signals to inject into each of the luminance stages.

problem exists in either the FM luminance or video stages. The next step is to inject a signal into the FM luminance stages after the head switcher to determine if the video circuits are functioning. Again use the "Lum" PLAYBACK SIGNAL to inject into these stages. But because the signal has been amplified by the preamps, use either the ".5VPP" or "5VPP" range of the PLAYBACK RANGE switch.

The FM luminance signal is converted to video (baseband luminance) by the FM detector. Use the "Lum" DRIVE SIGNAL to inject into all the stages between the FM detector output and the Y/C mixer. The Y/C mixer combines the chroma signal with the luminance signal. Use the "Composite Video" DRIVE SIGNAL to inject after the Y/C mixer.

How To Inject The luminance Signals From The VC93

As explained in the previous section, the VC93 provides several signals to inject into the VCR luminance stages (Figure 2). The remainder of this Tech Tip shows you how to inject the PLAYBACK and DRIVE SIGNALS, and what you should expect when injecting these signals.

When injecting into any of the luminance stages, always have a test tape playing to make the VCR circuits operational. All the procedures explained in this Tech Tip use the internal "Color Bars" MODULATION, so injecting the VC93 signal into a working luminance stage will produce a black and white splitfield video pattern on the playback monitor connected to the VCR. If you desire, you can use the VA62A Universal Video Analyzer to provide another video modulation pattern.

Injecting the PLAYBACK SIGNALS

Use the PLAYBACK SIGNALS to inject between the video heads and the FM detector. The VC93 provides the properly modulated FM luminance signal for each VCR format.

To inject the "PLAYBACK SIGNALS" signal:

1. Insert a prerecorded work tape into the VCR and press play.
2. Set the VC93 as follows:
 - a. VCR FORMAT to match format being serviced.
 - b. MODULATION to "Color Bars" or "External".

- c. PLAYBACK SIGNAL to "Lum".
- d. PLAYBACK RANGE to match the PPV of the circuit under test.

3. Connect the HEAD SUBSTITUTION TEST LEAD to the VC93 PLAYBACK OUTPUT jack.
4. Connect the HEAD SUBSTITUTION TEST LEAD to the circuit (Figure 3):
 - a. Red lead to injection point.
 - b. Black lead to circuit ground.
5. Observe the playback monitor for an improved picture.
6. Adjust the PLAYBACK RANGE and PLAYBACK LEVEL for the best picture.
 - a. Only use the "Playback Head Sub" PLAYBACK RANGE when injecting into the head channels.
 - b. Use the ".5VPP" and "5VPP" PLAYBACK in the FM stages after the head preamps.

This injection checks the ability of the luminance circuits to pass the signal onto the video circuits. If the picture on the TV monitor is good, the stages after the injection

point are working properly. If the picture on the TV is bad, you are injecting before the problem. Continue isolating the defective stages by moving your injection closer to the output until the injection produces a good picture.

The "Lum & Chroma" PLAYBACK SIGNAL is used to troubleshoot defects in the chroma stages. It provides both the luminance and down-converted chroma signals for each VCR format. The VC93 must be phase locked to the VCR while injecting into the chroma circuits. Further details on this signal and on troubleshooting color problems may be found in Tech Tip #195, "Troubleshooting VCR Chroma Circuits With The VC93 All Format VCR Analyzer."

Injecting the DRIVE SIGNALS

Use the DRIVE SIGNALS to inject into the luminance stages after the FM detector. The "Lum" Drive Signal is used between the FM detector output the luminance input of the Y/C mixer. Use the "Composite Video" Drive Signal after Y/C mixer output.

To inject the DRIVE SIGNALS:

1. Insert a work tape into the VCR and press play.
2. Set the VC93 as follows:
 - a. MODULATION to "Color Bars" or "External".

- b. DRIVE SIGNAL to "Lum" or "Composite Video".
 - c. DRIVE LEVEL to "0".
 - d. Set OUTPUT SIGNAL MONITOR/DVM to "Drive Signal".
3. Connect the DIRECT TEST LEAD to the VC93 DRIVE OUTPUT jack.
 4. Connect the DIRECT TEST LEAD to the VCR:
 - a. Red lead to circuit test point.
 - b. Black lead to circuit ground.
 5. Observe the picture on the playback monitor.
 6. Adjust the DRIVE LEVEL control for the best picture.

This injection checks the ability of the video circuits to process the signal and pass it on to the video output jack or the RF modulator. If the picture on the TV monitor is good, all the circuits between the injection point and the video output are good. If the picture on the TV is bad, you are injecting before the problem. Continue to isolate the defective stages by moving your injection closer to the output until the injection produces a good picture. You are now injecting before the defective stage.

**For more information,
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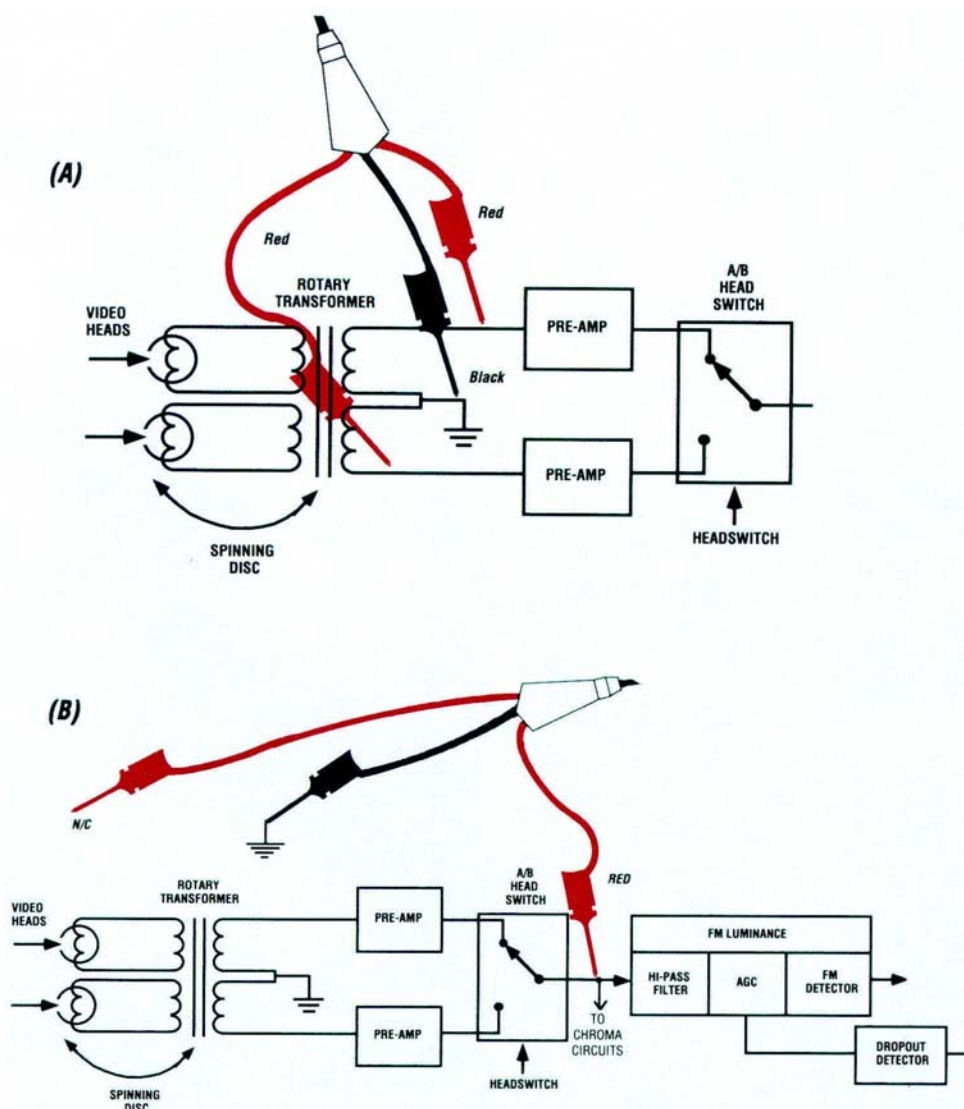


Fig. 3: Use both red clip leads on the HEAD SUBSTITUTION TEST LEAD to inject in to the head channels simultaneously (A). You only need to connect one of the red clip leads when injecting after the A/B headswitcher (B).

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