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tech tips

How To Test Video Heads With Your VC63 VCR Test Accessory

An important use of the VC63 VCR Test Accessory is to determine whether a VCR playback problem is caused by defective video heads or by one of the other circuits. The VC63 supplies signals to confirm that these circuits are working. The VC63 generates an FM carrier, modulated by the video pattern selected on the VA62A Universal Video Analyzer, at the correct signal level to inject directly into the VCR head amplifiers.

The biggest problem in working with possible video head problems is that defects in as many as 16 different circuits produce symptoms that look like a bad head. These are all the circuits from the video heads to the output of the head switcher (test points number 37 through 45 on the Sencore Universal VCR Block Diagram). The VC63 lets you quickly confirm whether these other circuits are working. If they are, the trouble is in the heads. If you find one of the other circuits defective, you prevent replacing good heads.

Check The Symptom Carefully

Before you make any VC63 connections, you should confirm that the symptoms point to problems directly related to the heads and input circuits. There are only two symptoms that can be head-related. Only use head-testing methods when you see one of these symptoms.

The first symptom is a complete loss of video. This could be caused by both video heads failing simultaneously or a defect in any later stage. Do the head testing process explained later to confirm the heads are bad.

The second symptom appears when only one of the two heads fails. The VCR produces a picture on a TV connected to its output, but the picture will contain noise. Here's the essential part of interpreting

this symptom: *The noise must cover every part of the picture.* If any section of the picture is clear, even if it's only a few inches somewhere on the screen, you *do not* have a defective head. Before we continue, let's be sure you understand why this is the case.

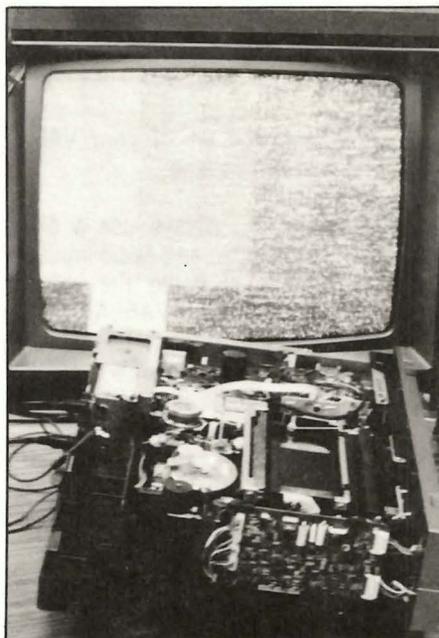


Fig. 1: When one video head (or related stage) fails, the VCR produces a picture, but noise covers the entire screen. If any part of the screen is clear, you don't have a bad head.

The video heads are always used in pairs. A VCR with two or three video heads uses the same pair for all tape speeds, while a VCR with four or five video heads uses one pair for the fastest tape speed (VHS-SP or Beta I) and the other pair for the other two speeds. If the deck has an odd number of heads (three or five) the extra head will provide a clear picture during special effects, such as stop-action or scanning. The "special effects" or "trick" head is not used when playing a tape at normal speed.

As the tape plays, each video head picks up half of the horizontal lines in the picture. The first head produces the 262.5 horizontal lines that form the first *field* and the second head picks up the remaining 262.5 lines. (There are 2 *fields* in each complete *frame* of 525 lines.) If one head is good and the other is bad, the TV shows a noisy picture because it gets the lines needed to fill one trace from top to bottom, mixed with 262.5 lines of noise.

Both heads must produce an output if any part of the picture is clear. For example, a common symptom in some 4-head or 5-head VCRs is a picture which is noisy for 3/4 of the screen, and clear for the remaining quarter. Here, the heads and the head amplifiers are working correctly. The problem is in the relay that selects the correct pair of heads for each tape speed. Injecting the VC63 signal at the input and output of the head selecting relay, quickly isolates the problem.

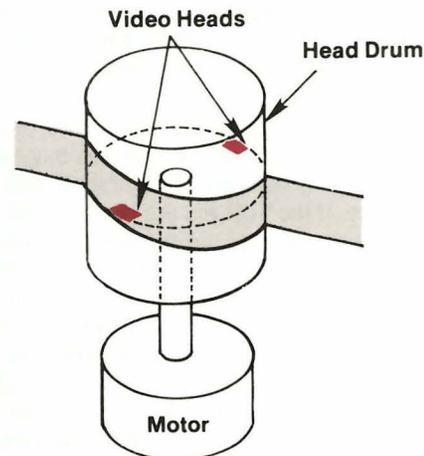


Fig. 2: The video heads are always used in pairs: one in contact with the tape, while the other is out of contact on the back side of the drum. Each head picks up alternating lines of the interlaced picture.

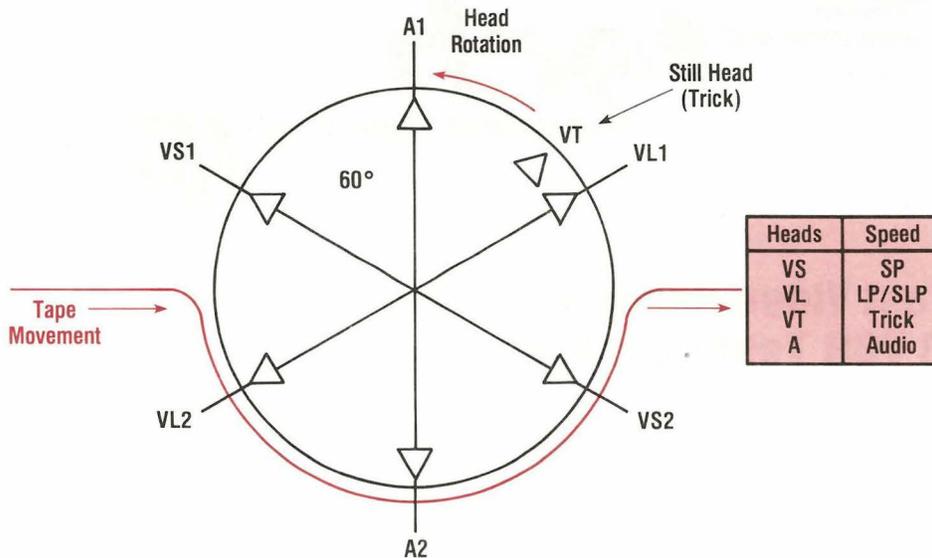


Fig. 3: A multi-head machine still uses the video heads two at a time, based on the tape speed being used.

You can use any pre-recorded tape to confirm these symptoms. When isolating problems, however, you should use tapes which contain test patterns that give extra troubleshooting details. Sencore suggests that you record your own "working" tapes, as explained next.

Build A Set Of "Working" Tapes

You will need a set of test tapes to use with the VC63. We say a "set" because it's best to use a separate tape for each tape speed. If you only work on one VCR format, three tapes should do the job. If you service both VHS and Beta, you will need a set of three tapes for each format.

These "working" tapes offer two major advantages over the test tape you buy from the VCR manufacturer. The first advantage is price. If the VCR you are servicing eats a tape, you are only out the cost of a blank tape and the time needed to record a new one. Your purchased tape is protected from damage, so that it's factory fresh when you want to use it to test a repaired deck. Tapes recorded with VA62A patterns also give better troubleshooting information than the patterns on most purchased tapes.

Always record your working tape using the highest quality tape and VCR you can. A 4-head or 5-head deck is better than a 2-head machine, since it uses the correct head-width for each tape speed. Follow the

procedures on page 91 of your VA62A manual to make each tape.

For highest quality, always use a direct connection to the video and audio inputs of the VCR, instead of using the antenna input. Connect the VA62A "VCR STANDARD" output directly to the video input. Connect the VA62A "DRIVE OUTPUT" to the audio input through the

simple voltage divider shown in Fig. 5. The half-watt resistors make it easier to produce the 200 mV (RMS) signal needed by the VCR audio input. Set the DRIVE SIGNAL switch to the "AUDIO" position, the DRIVE RANGE switch to the "3 VPP" position, and the DRIVE LEVEL control fully clockwise to produce a 3 volt peak-to-peak signal. Control the audio frequency with the AUDIO switch on the left side of the VA62A panel.

What To Expect When You Substitute

In most cases, substituting a signal from the VA62A or the VC63 produces a nearly

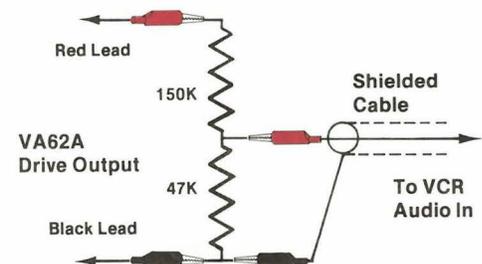


Fig. 5: Use two resistors to form an attenuator between the VA62A output and the VCR's direct audio input. The cables supplied with the VA62A can be used to make the connections, as shown.

TYPICAL TEST TAPE

LENGTH	VIDEO PATTERN	AUDIO
10 sec.	Multiburst Bar Sweep (Fast Speed)	1 kHz
10 sec.	Multiburst Bar Sweep (Medium Speed)	1 kHz
10 sec.	Multiburst Bar Sweep (Slowest Speed)	1 kHz
20 sec.	Color Bars	333 Hz
"	Chroma Bar Sweep	1 kHz
"	Multiburst Bar Sweep	5 kHz
"	10-bar Staircase	7 kHz
2 min.	Color Bars	333 Hz
"	Chroma Bar Sweep	1 kHz
"	Multiburst Bar Sweep	5 kHz
"	10-bar Staircase	7 kHz

Fig. 4: Use this chart like a recipe to produce your working tapes. Make a separate tape for each tape speed, using a multi-head machine and high quality tape.

normal picture on the CRT, if you are injecting after the bad stage. Substitution works a little differently in head circuits, because there are two identical paths, parallel to each other. An electronic switch alternates between the two paths at a 30 Hz rate. As you inject into one of the paths, the other continues to work on its own.

There are two main differences in the TV picture: 1) The video output is a mixture of two signals, and 2) They are not synchronized to each other. The VA62A's crosshatch pattern lets you ignore these conditions, because of its high contrast. You can easily see the crosshatch in comparison with the video coming from your test tape.

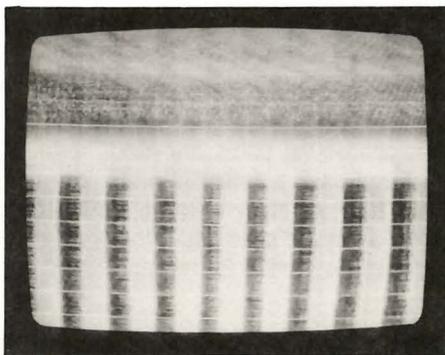


Fig. 6: Use the crosshatch pattern when substituting in the head circuits for maximum contrast. As shown, you will often see a mixture of the VC63 signal and the signal coming from the video tape.

You usually need to know the normal signal level at the test point you are feeding to use signal substitution. The schematic does not give the normal signal level at the head amplifiers. The VC63's "PLAYBACK HEAD SUB" function gets around this lack of information by supplying the normal range of signal levels for all VCRs. You adjust the output through its full range and watch for a pattern on the TV screen. If you see a crosshatch at any setting, you know the circuits have normal sensitivity. You use the VC63 calibrated output to confirm that the second head circuit has the same gain.

Isolating VCR Input Problems With The VC63

You now have the background needed to understand how the VC63 helps you positively identify the source of troubles around the video heads. Now, we'll use this information to see how to isolate troubles. In these first steps, you will use signal injection to confirm that all the circuits from the head amplifier to the output work correctly. These steps

eliminate about 12 of the circuits that can cause the same symptoms as a bad head.

1. Connect the VCR to a TV, insert your working tape and press the "play" button.
2. Set the VC63 SPECIAL SIGNALS switch to the "Lum" position for the format you are testing and the OUTPUT LEVEL switch to the "PLAYBACK HEAD SUB" position.

NOTE: Never use the "X.1" or the "X1" positions when injecting at the head input connectors. These higher signal levels can "blow through" a bad stage and give questionable results or can feed back through the heads and ruin a segment of your test tape.

3. Set The VA62A VIDEO PATTERN switch to the "CROSSHATCH" position.
4. Locate the connector on the main PC board which comes from the heads, and inject the VC63 signal into either head pre-amp. (You *do not* need to remove the connector for this test.)

- a. If the VC63 crosshatch signal is *not seen*, the problem is *after* the injection point. Check the pre-amp IC, record/playback switching, wiring, or head-switching pulse.
- b. If the VC63 crosshatch signal *mixes with the tape signal*, the head

amplifier and later circuits are *good*. The head, wiring, or rotary transformer for the *channel being fed* is bad.

c. If the VC63 signal *replaces the tape signal*, the path being fed is *good*. The VC63 signal is replacing (swamping) the good signal from the head so *the head for this channel also is good*.

If the crosshatch signal is visible at *any setting* of the VOLTS PP control, you have confirmed that the head amplifier circuits have normal sensitivity. Use the signal level from the first head for comparison as you repeat the test at the second head. Both paths should have about the same sensitivity, as confirmed by the calibrated VC63 output.

Isolating Rotary Transformer Problems

If all the preamps show normal sensitivity, you have confirmed that the video problem is in an earlier circuit. This leaves the rotary transformer, connectors, and the video heads. Each head has its own rotary transformer to couple signals from the rotating video heads to the stationary circuits. The next procedure tests the rotary transformer. To understand this test, you need to know that a rotary

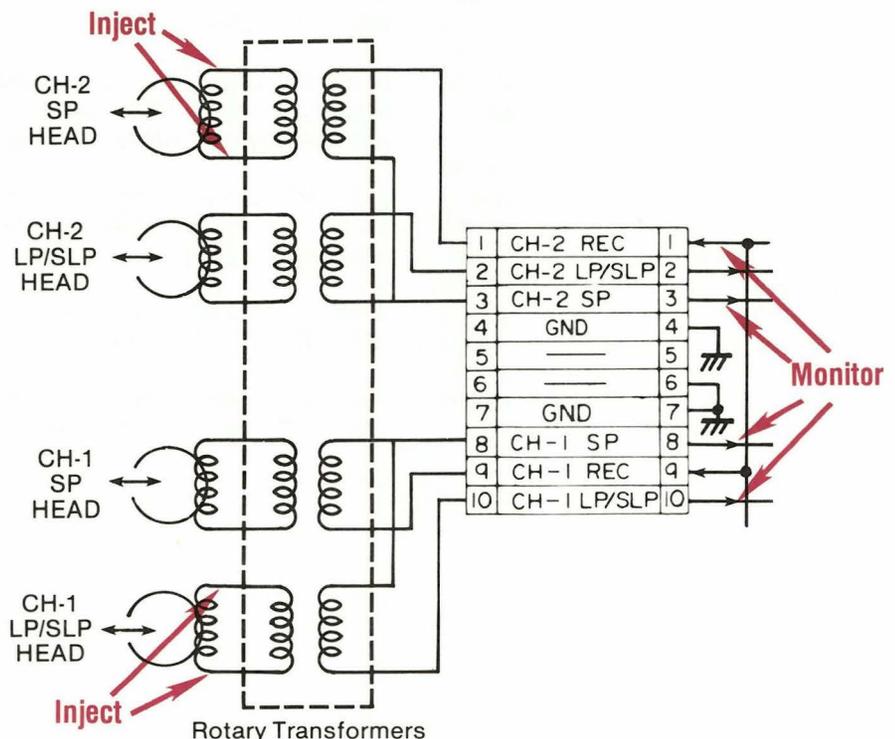


Fig. 7: To check the rotary transformer, confirm that each head path has the same peak-to-peak output while injecting the VC63 signal at a video head and monitoring the connector on the main printed circuit board.

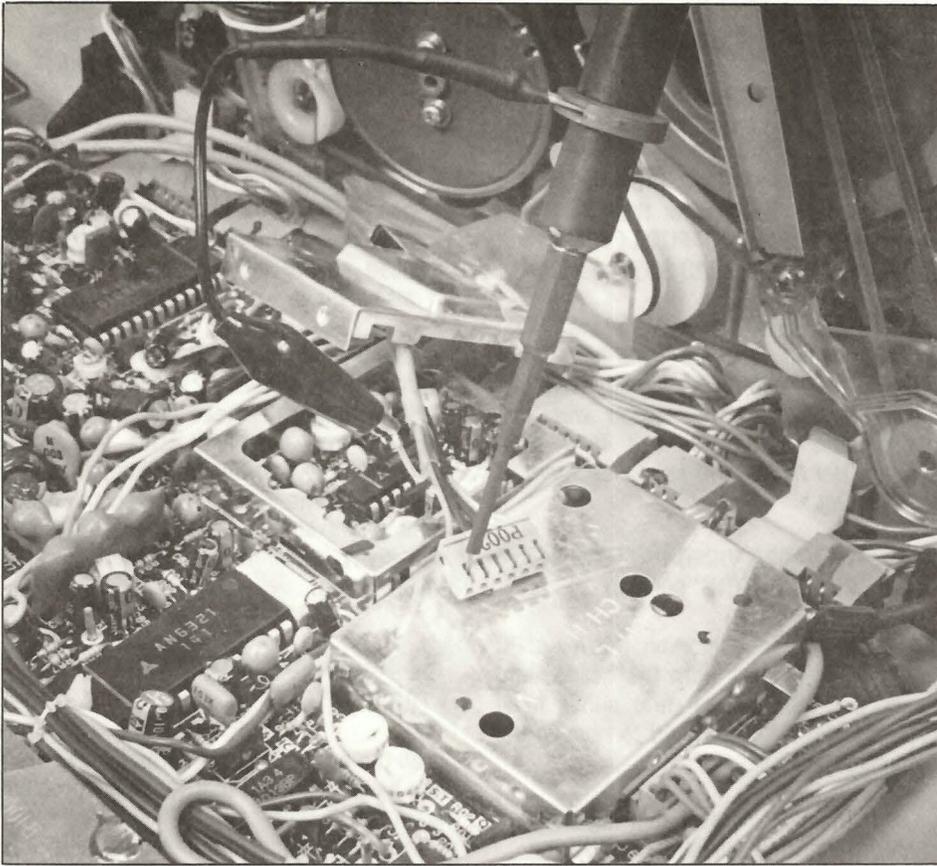


Fig. 8: When making the rotary transformer tests, disconnect the connector and connect your scope across the wires coming from the heads.

transformer couples signals just as well when the heads are standing still as when they are rotating. You will feed a fixed signal into each rotary transformer and confirm it produces an adequate output.

These procedures replace the steps on the lower part of page 22 of the VC63 manual, which suggests forcing the VCR into the playback mode with the heads stopped. The process in the manual calls for more time—especially in VCRs which use a microprocessor to control the safety shutdown circuits. You *do not* have to disable any of the safety circuits when you use this new procedure.

1. Turn off the VCR and unplug the head connector on the main P.C. board.
2. Connect your SC61 (or oscilloscope) across one of the head contacts in the connector running to the video heads.
3. Connect the VC63 to inject into the wires at the top of the head disk for the corresponding head.
4. Set the VC63 output for 2 VPP (X1 and 2 on the OUTPUT LEVEL controls).

The scope should show a reading of *at least* 2 VPP, because of the step-up action

of the rotary transformer. Monitor the peak-to-peak level as you slowly rotate the heads one complete turn. The level should remain the same. If there is a change, one of the rotary transformer coils is shorting, and must be replaced.

If the peak-to-peak output is low, you either have a shorted head (which is loading the test signal) or a bad rotary transformer. To confirm which, isolate the head by unsoldering the wire running to the rotary transformer connection in the center of the head disk. Monitor the output voltage as you inject the VC63 signal directly at the rotary transformer connector. If the output has increased to *over 2 VPP*, the problem is a *shorted video head*. If the output remains low with the head disconnected, the *rotary transformer* is defective.

Repeat the test for each suspected head. If all head paths show a normal output, the interconnecting paths are good, meaning that you have a defective head. You may wish to try carefully cleaning the heads to see if a clogged head-gap is the problem. If cleaning does not help, replace the heads.

Testing Multiple Head Systems

The VCR senses the tape speed to choose the correct pair of video heads in a multi-head system. Using the correct working tape forces the VCR to choose the pair of heads you want to test. You can test the special effects head (in a 3 or 5-head machine) by placing the VCR into the pause mode, while injecting the VC63 signal into the head circuits.

For more information
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