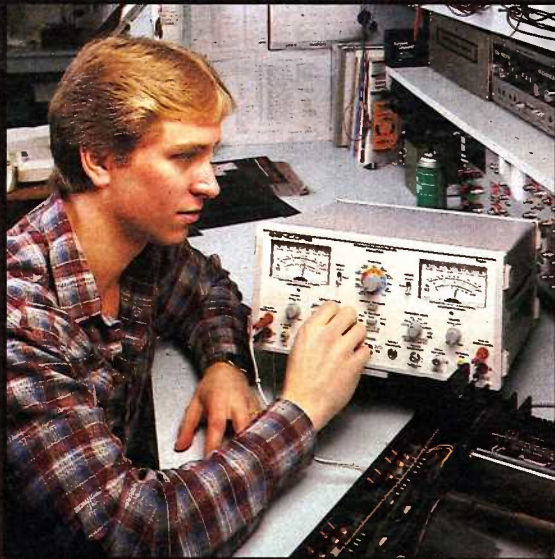


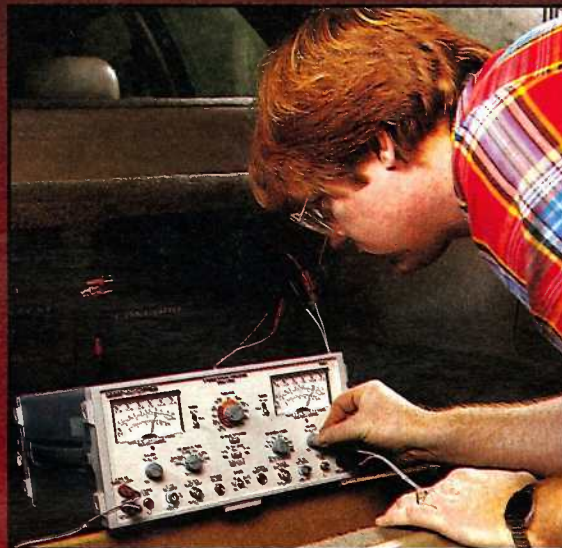
# SENCORE NEWS

Innovatively Designed With Your Time In Mind

Issue #144 May/June 1989



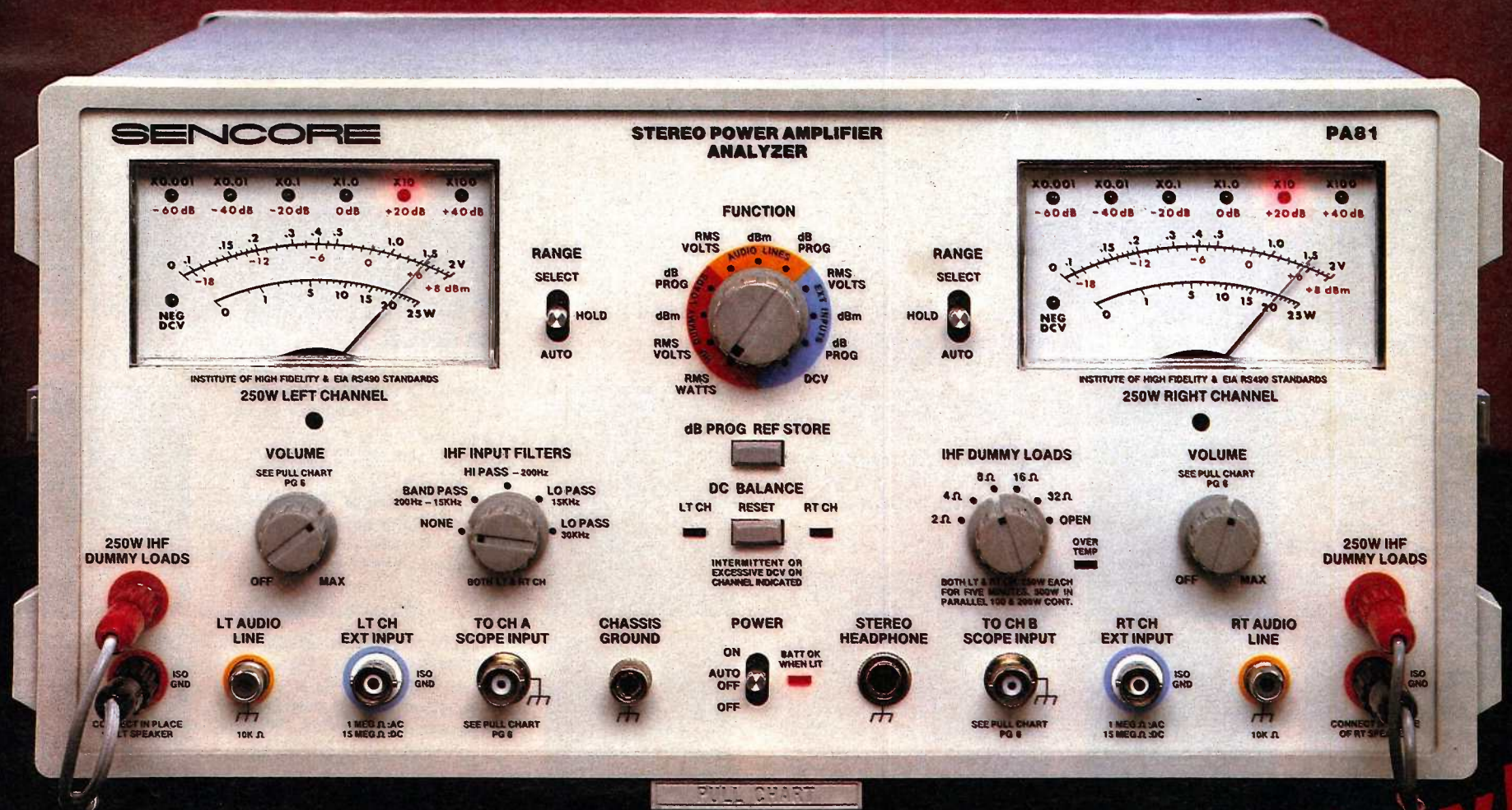
*... On The Bench,*



*Or At The Job Site ...*

**Now, You Can  
Dynamically Analyze  
Stereo Audio Power  
Amplifier Troubles  
Anywhere, To A Full 500  
Watts ... With The PA81  
Stereo Power Amplifier  
Analyzer™!**

*Details On Page 3.*



**New!**

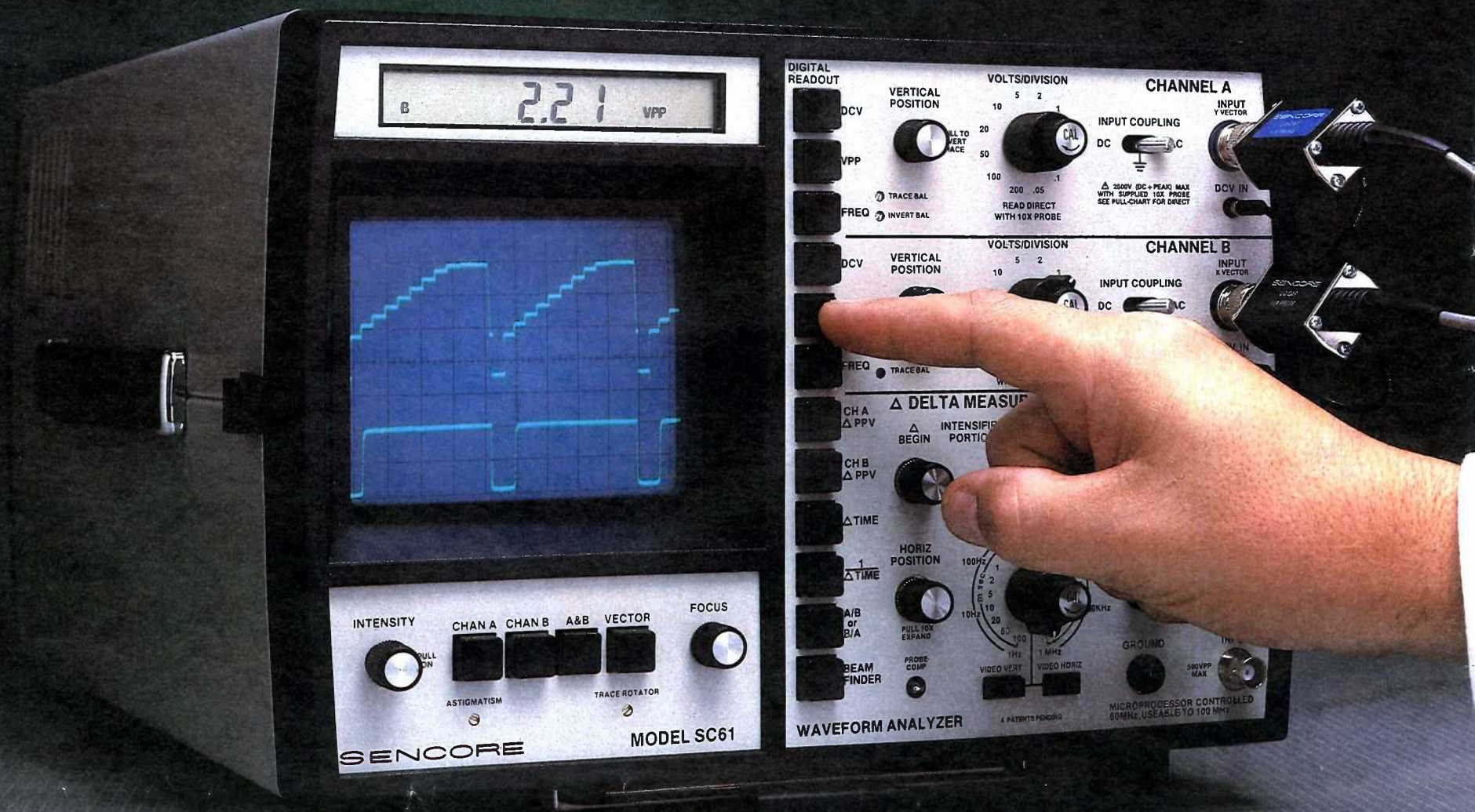
**Call 1-800-SENCORE Today!**  
(736-2673)

**In Canada Call 1-800-851-8866!**

**FAX 605/335-6379**



**With Just One Probe Hookup You Can Confidently Analyze Any Waveform To 100 MHz, 10 Times Faster, 10 Times More Accurately, Absolutely Error Free, Guaranteed Or Your Money Back . . .**



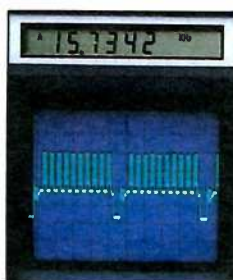
**With The SC61 Waveform Analyzer Patented**

**Analyze Waveforms Easily - VPP, DCV, Freq, Through One Probe!**

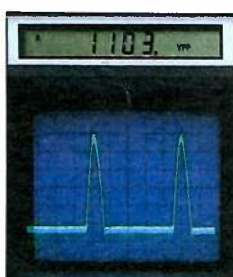
**Accurate Waveform Display - 60 MHz Bandwidth (Usable To 100 MHz) To Test The Latest Digital Circuits.** Analyze signals up to 100 MHz and update your present troubleshooting needs and future requirements. The SC61 provides high performance features such as: addition, subtraction, 10X expand, and vector capability.



**Rock-Solid Sync - ECL Logic Circuits And Differential Amplifiers Give Fiddle-Free Operation.** Lock onto tough video waveforms and other evasive signals easily. The SC61 gives you complete control over even the hardest to trigger signals.

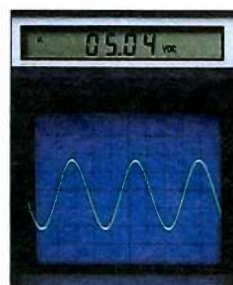


**Four Times The Measuring Range - Measure from 5 mV To 2000 Volts (3000 Volts Protection) For Expanded Signal Handling.** Now you can confidently measure the pulse on the collector of a horizontal output transistor without the fear of damaging your instrument. Only the SC61 gives you this peace of mind.



**AUTOTRACKING™ Digital Readings Analyze The Whole Signal.**

**Autoranging DC Volts Through Single Probe.** Now you can quickly determine DC Volts, at the push of a button, while still viewing the waveform. The SC61 gives you .001 Volts resolution for superior accuracy.



**Automatic Peak-To-Peak Volts - Even If Variable Control Is "Out Of Cal."** Now, eliminate the errors that are common to conventional scopes. The SC61's Automatic Digital Readout will tell the EXACT level, even if the attenuator is left "Out Of Cal."



**Automatic Frequency Measurements Without Sensitivity Adjustment Or Range Switching.** The SC61 will display the frequency of any waveform without the hassles of other "digital" scopes. Simply lock in the waveform and push a button. It's that easy.



**Delta Digital Tests Analyze Any Part Of The Signal.**

**Delta Peak-To-Peak Volts - Peak-To-Peak Volts Of Any Part Of The Signal.** Analyze part of a waveform by setting the starting and stopping point with the "Delta" controls. The (Delta) PPV function of the SC61 lets you measure any part of the waveform you want, like the color burst on a composite video signal.



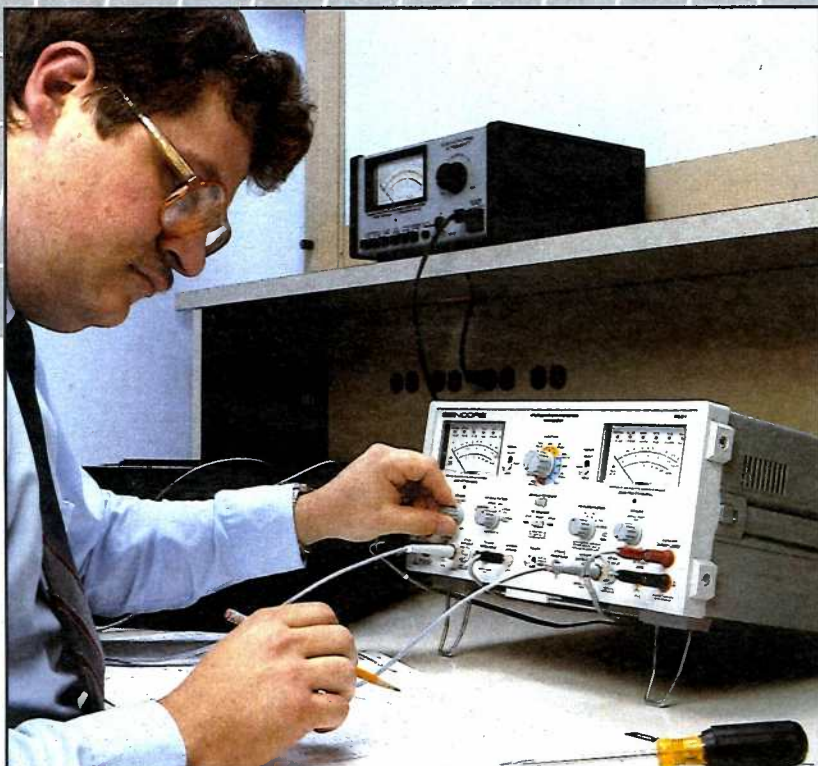
**Delta Time For Any Time Reading - Including Delay Between Traces.** An easy way to determine the time of any waveform segment or between two waveforms.



**1/Delta Time - Or Frequency Of Part Of The Signal - Finds Sources Of Interference Or Ringing.** Track down the source of interfering ripple on a power supply line, or on top of a digital waveform, with the 1/DELTA TIME function. Simply intensify one cycle of the interfering signal and read the signal's approximate frequency.







## Saving Time In Audio Service With Your PA81 Stereo Power Amplifier Analyzer™

by Paul Nies, Applications Engineer

“The successful audio servicer has to be able to measure levels from milliwatts to hundreds of watts where signals change form as they move from input to power outputs . . .”

One confusing thing about audio service is that schematics show levels in RMS, dB, or watts and you usually don't have the right meter! Stereo doubles the trouble since both channels in power amplifiers have to balance and track, AC and DC wise. For stereo, you really need two of everything—from zero reactance loads that match the impedance of every amplifier you service, to IHF/EIA filters and high sensitivity audio meters ... or, you need a fully equipped, dual channel, dynamic tester especially made for audio servicing.

### Power Amplifiers Offer The Greatest Challenge For Servicers

Servicers have the most trouble repairing audio power amplifiers, because they are direct coupled. And there's plenty of power amplifiers to repair. As shown in Figure 1, audio has grown into a billion dollar a year industry with fast growing service needs. Even simple troubles can affect every stage in a power amplifier from inputs to outputs, making troubleshooting especially difficult.

You have to measure signals from a milliwatt to over 1000 watts in many cases, and relating these measurements to schematics is difficult,

because readings may be listed in RMS, dB or watts—and they *always* don't match your meter.

To make matters worse, power amplifiers must balance from inputs to outputs. Each stage in the left channel must balance with the same stage in the right channel, AC and DC wise. When direct coupled stages become unbalanced, high current and heat cause multiple failures—that's when components explode like popcorn.

### The PA81 Stereo Power Amplifier Analyzer "Fills The Missing Link In Audio Analyzing."

- Twin autoranged wattmeters make each job a snap.
- Built-in IHF/EIA testing components at your fingertips make your job easier and your work more accurate.
- You can monitor sound quality at all times to prevent troubleshooting backtracking.
- RMS and dB audio signal tracing lets you tie down troubles in any stage.
- Built-in DC balance monitor speeds intermittent troubleshooting.
- Exclusive protection circuit removes the loads when DC unbalance is sensed, saving on blown components and repair time.

*For the first time in electronics servicing history, you can check stereo separation to an unprecedented 126 dB, plus test audio power to an unbelievable 5000 watts\**

In addition, customers often complain of poor separation, and servicers routinely test for it. Unfortunately, errors made in measuring separation cause many servicers to troubleshoot good stages needlessly. When you suspect poor separation, you need two highly sensitive meters to fight troubleshooting and alignment problems. (Continued on page 5)

### Contents

Learn How To Save Time In Audio Service—page 3

Find Out How To Earn \$7,800 More Per Year—page 7

Repairing A Blank Raster Problem—Step by Step—page 8

Avoiding Unnecessary VCR Head Replacement—page 11

EIA Offers Free VCR Service Workshops—page 14

Testing VCR RF Modulators—page 14

Learn How To Set New Troubleshooting Records—page 15

Finding Those Challenging MATV Problems—page 18

New Phone Number, 1-800-SENCORE—page 22

Added Benefits Of Buying From Sencore—page 22

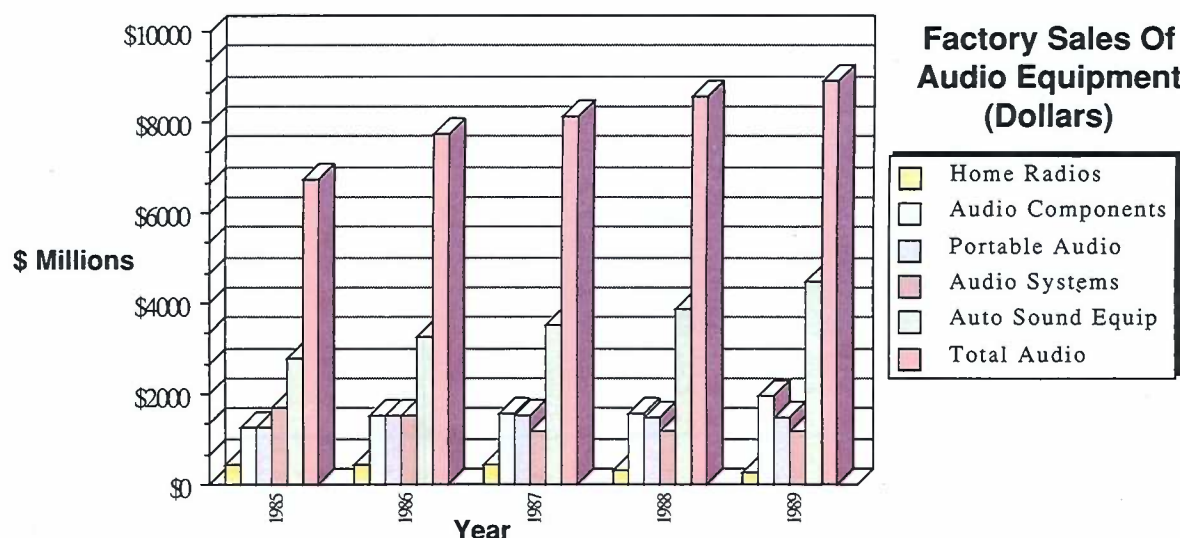
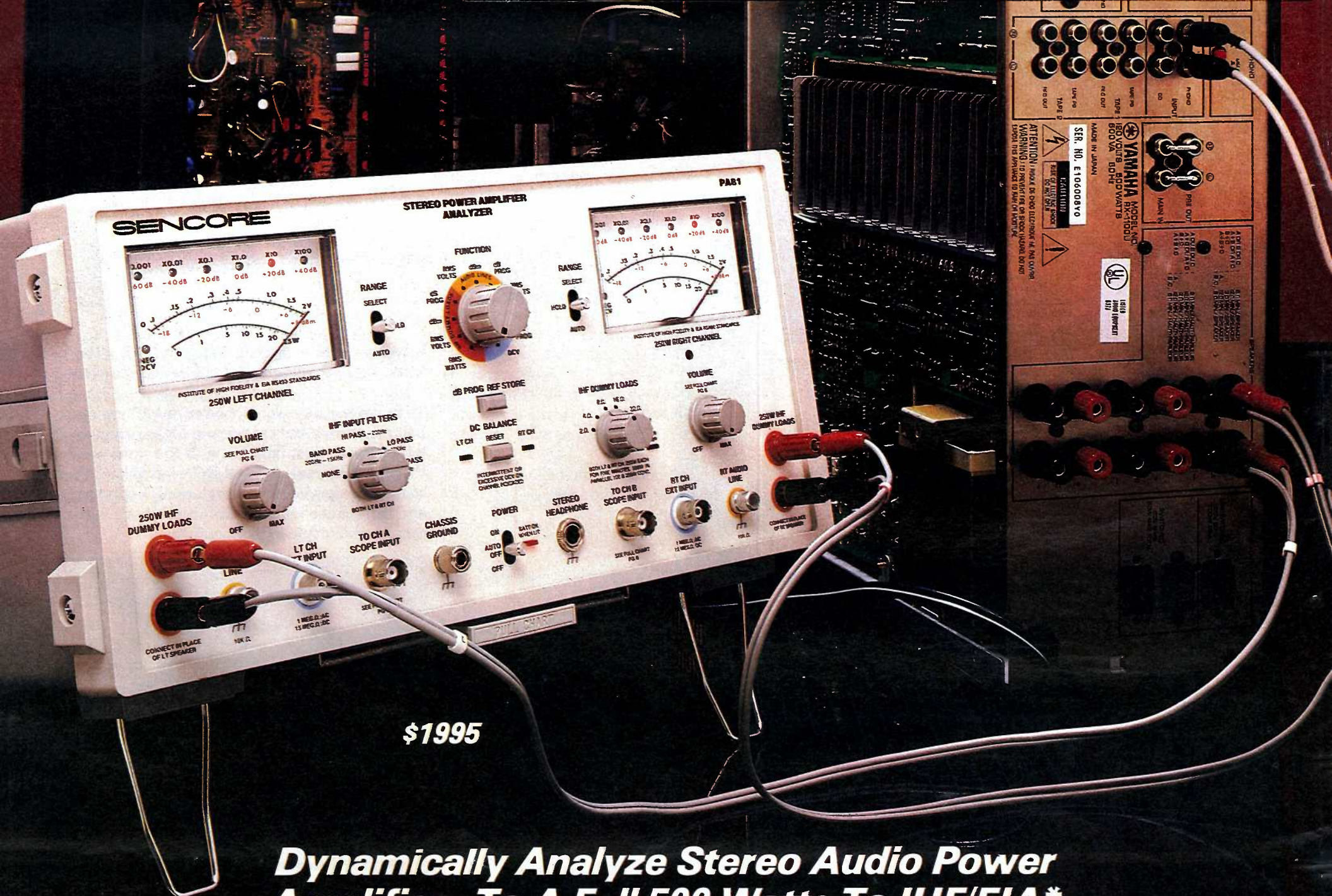


Fig. 1: Growth in the audio industry offers high profits and tough challenges—even simple troubles can make audio troubleshooting especially difficult.

\* From 500 watts (250 watts/channel) to 5000 watts (2500 watts/channel) with optional accessory.





**\$1995**

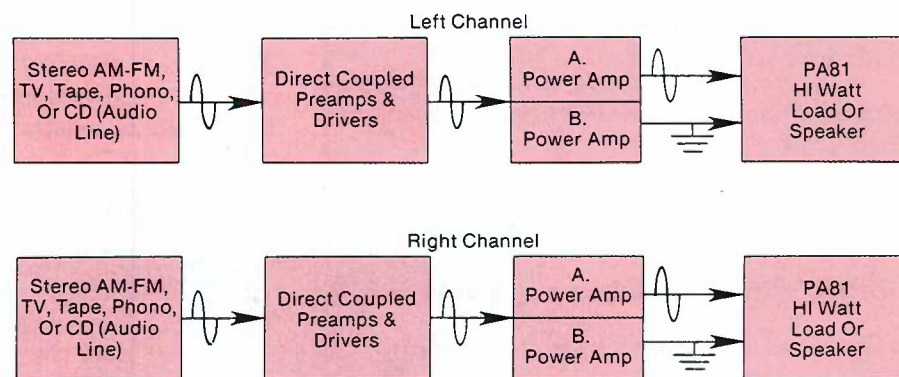
***Dynamically Analyze Stereo Audio Power Amplifiers To A Full 500 Watts To IHF/EIA\* Specifications In Less Than 1/2 The Time It Now Takes***

***The PA81 Is Truly The  
"Missing Link In Audio Servicing"***

Introducing the "Missing Link In Audio Servicing," with the NEW PA81 Stereo Power Amplifier Analyzer™ from Sencore Electronics. The PA81 provides everything you need for power amplifier analyzing integrated into one complete package, with:

- **Twin Frequency Compensated Autoranged Wattmeters:** 250 watts per channel (500 watts if paralleled), and listen to audio clarity with built-in volume control.
- **Built-in IHF/EIA Testing Components At Your Fingertips:** 2, 4, 8, 16, and 32 ohm-zero reactance loads, and all specified bandpass audio filters.
- **Measure RMS Volts And dB As You Trace Through Circuits:** Plus, programmable dB to measure stage gain.
- **Test Intermittents To Prevent Amplifier Damage:** Built-in DC balance test, automatically opens loads.
- **Test Audio Line Levels To Make Sure The Driver Input Signal Is Correct:** Check turntables, AM tuners, FM tuners, TV stereo demodulator outputs, CD players, etc. for standard line levels.
- **Monitor Stereo Separation To 126 dB:** Monitor, troubleshoot, or align AM-FM or TV Stereo separation circuits.

Pricing Note/ All prices shown are U.S. dollars. Canada must add applicable Duty, Freight, and F.S.T. Prices and specifications subject to change without notice.



***Walk troubles out of any power amplifier stage, step by step, with the PA81.***

**SENCORE**  
3200 Sencore Drive, Sioux Falls, South Dakota 57107

**Call 1-800-SENCORE**  
(736-2673)  
**In Canada Call 1-800-851-8866**

**Ask About  
A 10 Day  
Video Preview**



\* IHF—Institute Of High Fidelity  
EIA—Electronics Industries Association



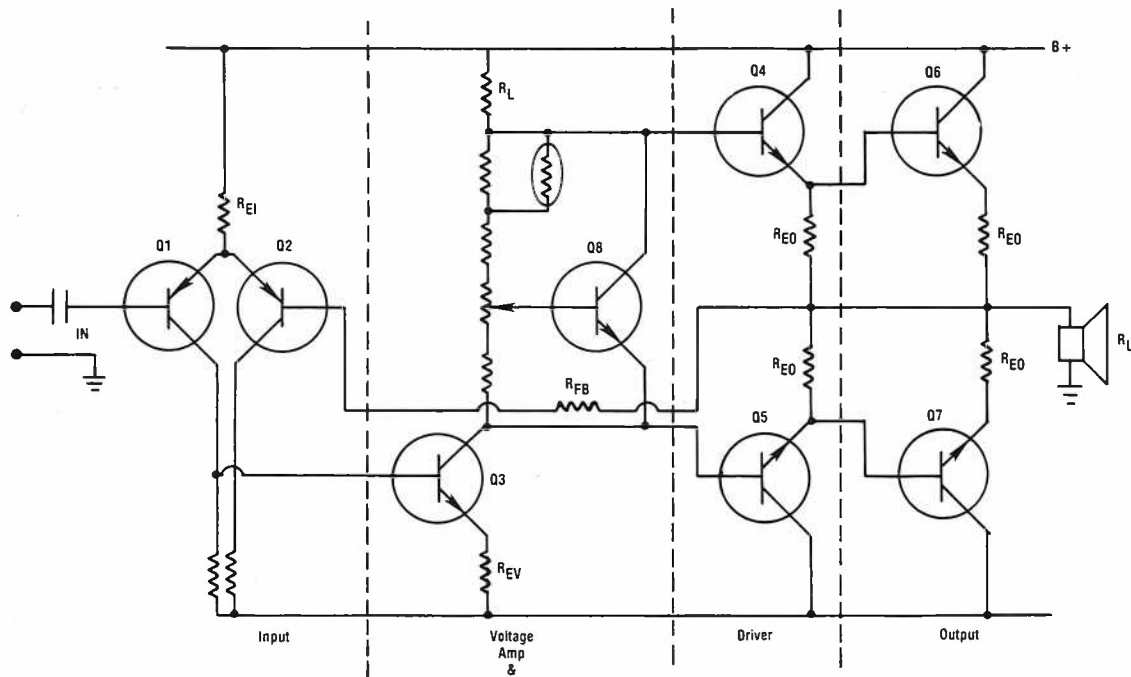


Fig. 2: From input to output stages, power amplifiers have to balance AC and DC wise.

(Continued from page 3)

Audio servicers have struggled with power amplifier analyzing for years. It's like trying to tow a car using a chain that has a missing link.

What it comes down to is this: The PA81 Stereo Power Amplifier Analyzer saves troubleshooting time, increasing your success in audio service. To become more familiar with the PA81 Stereo Power Amplifier Analyzer, let's look at a couple of troubleshooting examples.

The examples come from real experiences. You see, we listen to what servicers say at seminars and in phone calls. One servicer told us about barely breaking even on installing a set of speakers for a car stereo ... another told of a "Tough Dog" stereo that sat in the shop for over a month. Let's see how each repair went and how it could have been completed confidently and quickly, with the PA81 Stereo Power Amplifier Analyzer. Let's suppose that we are the servicer.

## Balance Circuit Turns A Simple Repair Into A "Tough Dog"

One of our best customers had brought a stereo combination unit in for service. The trouble sounded pretty simple, "I haven't used this much since you fixed it last time," she said, "But now, one speaker works and the other doesn't."

This was a "fast repair" the first time, as we recall. But, two weeks later this "fast repair" is back in our shop! We slapped it on the bench, hooked up a couple of speakers, and promptly proved the customer right. The left channel was okay, but the right channel was weak. We scoped it out — the cassette player, FM tuner, and record changer signals were about the same level and the right channel signals dropped off right away. It had to be the power amplifier, we thought. So, we replaced the output chip (waiting a few days for the part, before proving that decision wrong).

Then, after checking every resistor, capacitor, transistor, and circuit path from inputs to the speaker outputs, we sat the unit aside. Getting back to it was becoming harder and harder as new business took higher priority. This stereo was becoming a problem. Trying the PA81 Stereo Power Amplifier Analyzer was an easy decision

power (even in the bad channel) moved up smoothly. Plus, we could listen with headphones or built-in speakers and monitor the waveform with our scope. It didn't take long to performance test the entire stereo, while at the same time becoming more familiar with the new PA81 Stereo Power Amplifier Analyzer.

We decided to check the gain of the output amps, and flipped the PA81'S FUNCTION switch to EXT INPUTS and set it up to read dB PROG. With two autoranged meters and two external inputs, it seemed reasonable to compare both channels. After connecting the EXT INPUT leads to the left and right channel IC outputs and pressing the dB PROG REF STORE button, both meters promptly zeroed.

We moved the leads to the IC input pins, and the meters matched up again, but this time they were a few dB lower... "This must be the gain of the amps," we thought. "But, just a minute, the gains are the same!" We *know* the outputs are at different levels; it shows on our scope and we

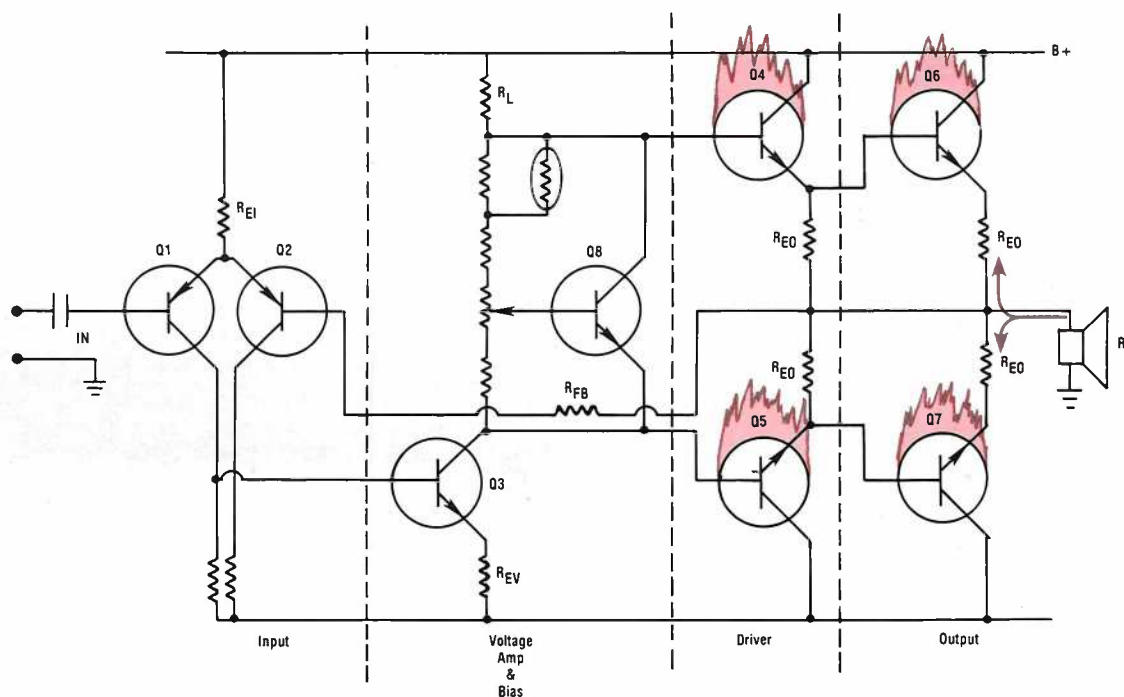


Fig. 3: When direct coupled stages become unbalanced, high current and heat can cause multiple failures.

for us, especially with this "Dog" in the shop to try it on ...

With the "Tough Dog" on the bench, we began to check out the PA81 Stereo Power Amplifier Analyzer. Connecting the amplifier outputs to the analyzer quickly proved what we already knew; the right output was weak. But, now with the analyzer's built-in dummy loads we were able to crank up the volume and confirm that the

could hear it on the speakers. Suddenly we realized what the PA81 Stereo Power Amplifier Analyzer was doing.

In dB PROG, the PA81 Stereo Power Amplifier Analyzer didn't care that the levels were different, it simply stored a different reference for each channel. This way, when we stepped back to the inputs of the amps, we got the same dB readings because both amps had the same gain! (This step

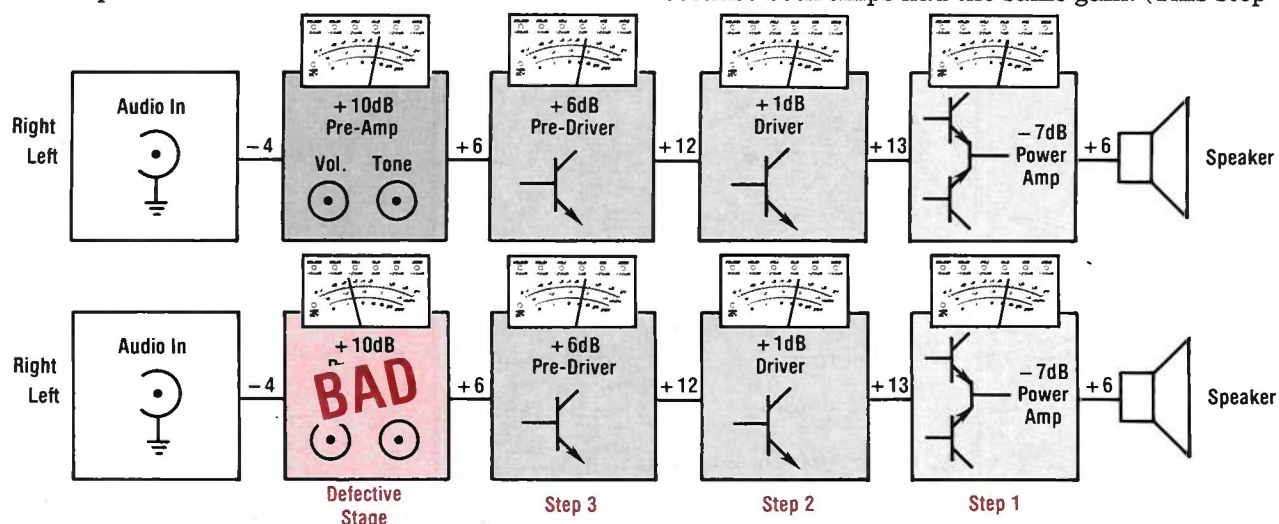
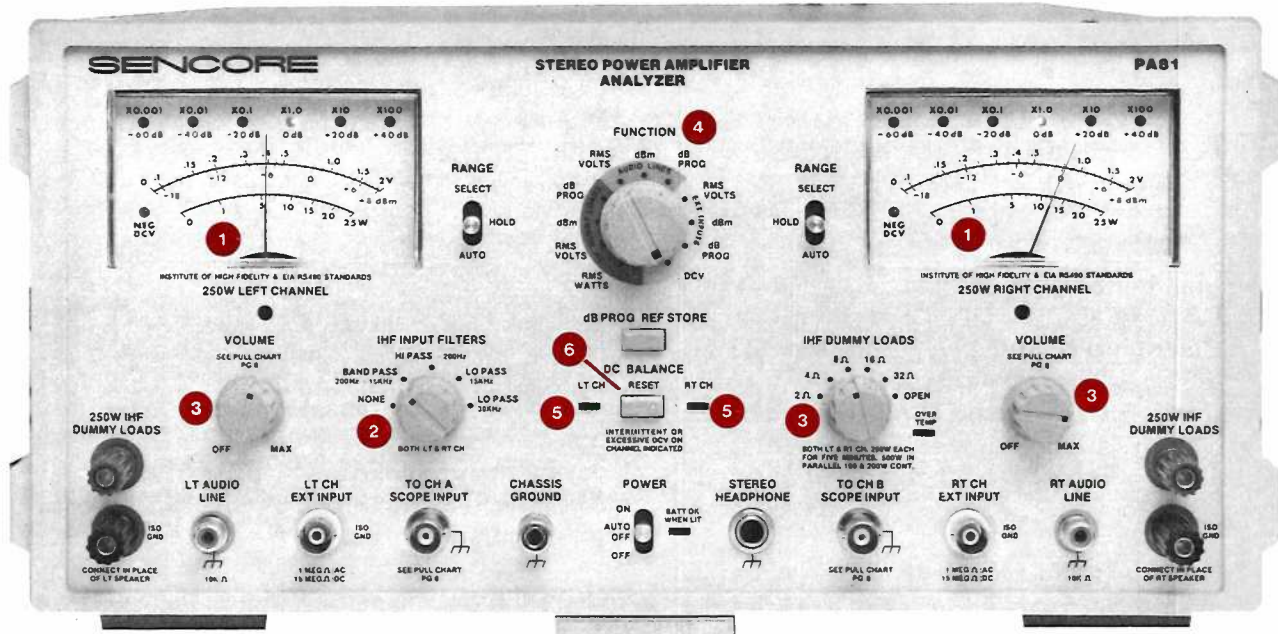


Fig. 4: Use the PA81 Stereo Power Amplifier Analyzer's dB PROG feature and step thru the amp to quickly locate the defective stage.





- 1 Twin autoranged wattmeters make each job a snap.
- 2 Built-in IHF/EIA testing components at your fingertips make your job easier and your work more accurate.
- 3 You can monitor sound quality at all times to prevent troubleshooting backtracking.
- 4 RMS and dB audio signal tracing lets you tie down troubles in any stage.
- 5 Built-in DC balance monitor speeds intermittent troubleshooting.
- 6 Exclusive protection circuit removes the loads when DC unbalance is sensed, saving on blown components and repair time.

Fig. 5: The PA81 Stereo Power Amplifier Analyzer fills the missing link in audio analyzing.

alone would have saved replacing the good IC.) What a benefit; the PA81 Stereo Power Amplifier Analyzer made all the calculations, totally eliminating any error. Now we could quickly step back through the amps comparing one channel's gain to the other automatically, until we found the point of major difference. That's when we'd be at the bad stage; it was as simple as one, two, three.

One! The gain of the preamps checked good. Two! The outputs of the balance control checked good. Three! The inputs to the balance control checked ... oops! Now we've found the problem stage. Could the control be simply misadjusted? Nope, it was centered in its detent and a quick ohmmeter check showed about the same resistance for both channels. Better disconnect the control and check it out. Closer examination with the ohmmeter pinpointed the problem.

Although the resistance values checked good terminal-to-terminal, the balance pot for the right channel also showed resistance to the chassis. Our "tough dog" stereo had a bad balance

control—isolated in just a few steps with the new PA81 Stereo Power Amplifier Analyzer.

From the above, It's easy to see how the PA81 Stereo Power Amplifier Analyzer saves troubleshooting time on home stereos. Now, let's see how it works with auto sound systems.

### Auto Stereo Power Amplifier Problem Becomes A Simple Task

Unlike the successful servicer portrayed in our next example, the real servicer yanked the entire stereo system out of the car and bench tested it before finding the problem. There was certainly no profit made on that job. Let's take a look.

Audio amplifiers and speakers are installed in some pretty tough places to service, especially in automobiles. Here, you'll want and appreciate the PA81 Stereo Power Amplifier Analyzer's portability. Especially, if you've ever curled up with an extension cord while working on an amplifier in the trunk of a Camaro.

This particular repair job reminded us of just such an experience. Customer complaint? "Music distorts when the volume is cranked up." Why did this job seem tough? Because the power amplifier was hidden in the trunk with a long bundle of wires connecting it to a graphic equalizer panel mounted in the console just below the dash. Behind the dash, there were a dozen wires neatly tied down. We knew this was true, because we could remember installing this high powered system about three years ago. We also knew how tough and time consuming it would be to tear this system out for repair.

"The trouble has to be in the amp, the speakers, or the stereo radio—or could it be in the graphics equalizer?" How can we prove it without tearing the system out? Cranking the volume all the way up (like the customer probably runs it), could make any part of the system distort; right? And, cranking the volume up on *this* amp could blow our 50 watt test speaker; right? That's right. Did

this amplifier ever sound good, even when first installed? Well, the customer probably won't have it fixed, considering the cost of removal, repair, and installation ... There we were, trying to talk ourselves out of working on this stereo! Once burned, twice shy. Fortunately, we had just received our new PA81 Stereo Power Amplifier Analyzer. It solved the problem in minutes and helped us turn a nice profit, here's how:

The PA81 Stereo Power Amplifier Analyzer's portable operation made it simple to hook up to and monitor the amplifier's performance at full power (even in the trunk!) All we had to do was open the trunk, pull the clip leads off the speakers and connect to the analyzer's high power dummy loads. Setting the fader to the rear speakers and cranking the stereo up, pushed the dual autoranged meters to 215 watts per channel. Plus, we could monitor the sound quality dynamically, every step of the way with a scope, headphones, or built-in speakers. Everything looked good—even at full power the amplifier produced clear, clean music. In just a couple of minutes we had proven that the amplifier (and the entire system), was good. No need to remove the stereo system for bench testing or repair, no jerry-rigged test speakers or loads, and best of all, no error. We were able to demonstrate this system's performance at full power to our customer. As a result, he bought a new set of speakers which we gladly installed.

Saving time in audio servicing, that's what it's all about. Call us today, at **1-800-SENCORE**, and ask your Area Sales Engineer how you can put the new PA81 Stereo Power Amplifier Analyzer to the test. When you call, ask about Sencore's new Video "The Missing Link In Audio Service."

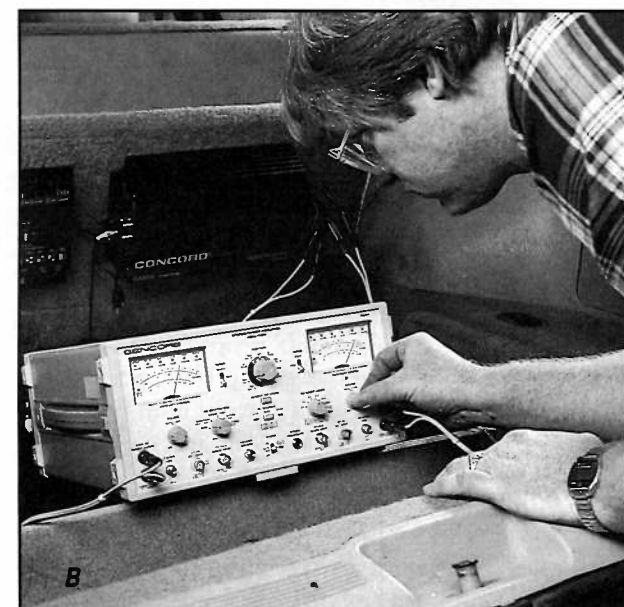


Fig. 7: (A) No need to remove the stereo system for bench testing. (B) The PA81 Stereo Power Amplifier Analyzer tests to full power—anywhere, anytime, without guesswork or error.

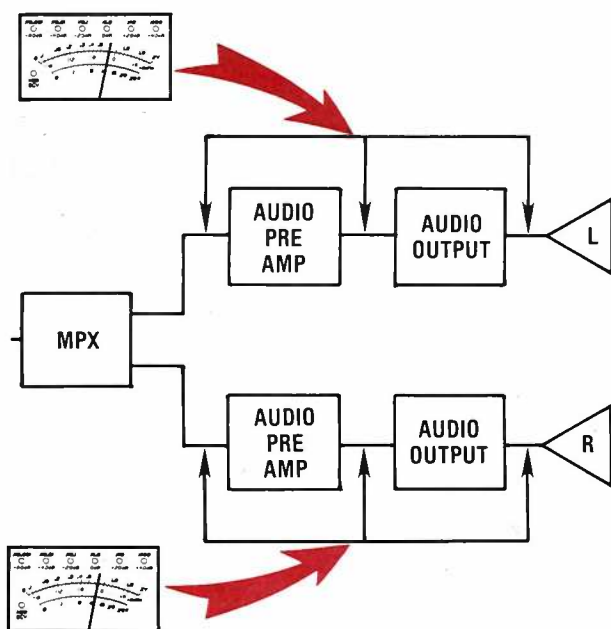


Fig. 6: Use the PA81 Stereo Power Amplifier's dual meters to check for DC, audio signal, and audio power balance.

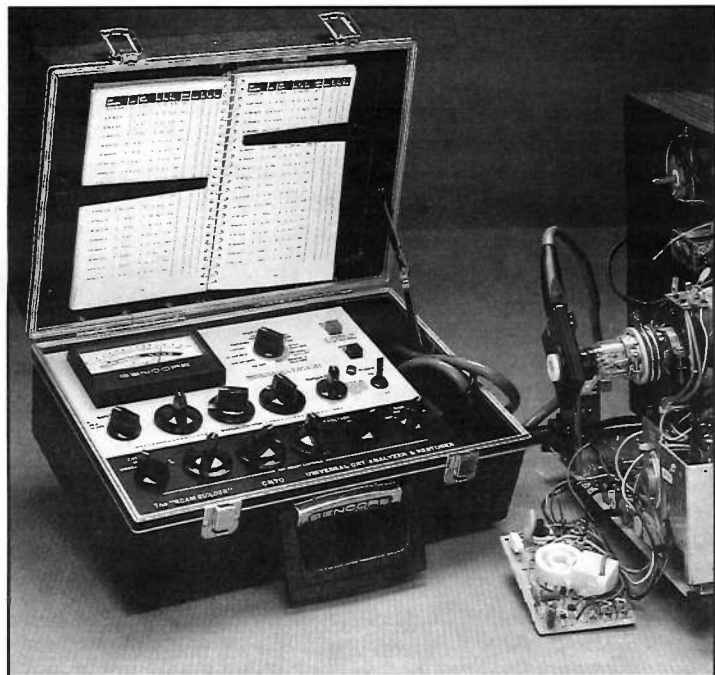


# Earn An Additional \$7,800 Per Year With Your CR70 "BEAMBUILDER"™ And PR57 "Powerite"™

by Rob Barden, Merchandising Manager

**K**nowing how to provide a service, at the right price, is the key to a profitable service center. The amount you charge for your service is determined by what your customer perceives the service to be worth. He pays you to repair his TV or VCR, because he feels that fixing it is less costly than investing in a new one.

Providing extra services, other than "parts and labor" is one way successful service centers make a profit. These extra services can provide a high perceived value with a low actual cost to the service center. That's where the Sencore CR70 "BEAMBUILDER" and PR57 "Powerite" can boost your servicing profits.



Use the CR70 to boost your service profits and provide a service for your customer.

## Give Your Customer An Option By Restoring 9 Out Of 10 Weak Or Shorted CRT's With The CR70 "BEAMBUILDER"

The CR70 "BEAMBUILDER" can increase your profits with service that has a high perceived value to your customers. Here's a typical situation where the CR70 can build your profits, and give your customer an option:

"Dan Johnson has brought you a set with an apparent "Shutdown" problem. After investing \$30 in parts, and a few hours, you have the problem fixed. You power up the set, only to find the CRT is weak. You don't have a way to restore it, and now you are faced with a problem—getting Dan to put out an extra \$150 to replace his picture tube. You call him, and, like you figured, he tells you that he doesn't want to replace the CRT, and you have to scrap the set.

Sound familiar? Now, with your CR70, you can provide Dan with the option of restoring the CRT for only \$35, versus having to replace a \$150 picture tube. Dan sees a much higher perceived value in restoring the CRT, than having to spend four or five times the amount for a new tube, or having to pay for a whole new TV. You profit, too, because you not only make an additional \$35, but you can now collect the parts and labor you originally put into the set to begin with.

## Guarantee Your Restoration To Keep Your Customer Happy, And For Repeat Business

The CR70's restoration techniques give you the best results possible, with longer life than any other tester on the market. However, no one can guarantee the CRT will last forever. But you can still guarantee the restored CRT for 6 months, 1 year or even longer. If it fails, simply refund the restoration costs towards the installation of a new picture tube. You're guaranteed the profit of a new tube installation—less the cost of the original restoration that you already received.

## Use The PR57 "Powerite" To Boost Profits—And To Protect Your Customers

Nothing is worth more to your customer than the safety of his family. Use your PR57 "Powerite" to give your customer this guarantee, plus boost your shops credibility and profits. The PR57 gives you a variable isolation transformer to help troubleshoot today's start up and shut down problems. It also has a special AC

leakage test that detects excessive AC current on exposed parts of the TV or other consumer electronic products.

Most manufacturers and some states require that this test be done before you release the set back to the customer. Since you perform a service, you can charge a small amount for this test. Most service centers are charging around \$3 per test.

The customer perceives an expense of \$3 to be very minimal compared to the peace of mind it gives him. Again, he sees the test is worth the expense.

## Use Your PR57 And CR70 Profits To Update Your Service Center

Not only do the PR57 and CR70 pay for themselves, you can use them to update your entire bench. Here's how:

Let's say that you run into a bad or weak CRT one out of every 10 service jobs that come into your shop. If you're an average service center and you service 5 TVs per day\*, you would see a CRT problem 10 times each month. A \$35 charge to restore the CRT would generate an additional \$350 per month on jobs otherwise lost. That comes out to an extra \$4200 every year!

Plus, if you charge just \$3 for every safety leakage test you perform, you would earn an additional \$15 per day, on top of your regular service repairs. That's an extra \$300 per month, or \$3,600 per year!"

Together that's an additional \$650 per month, or \$7,800 per year! You can own a new Sencore Bench for as little as \$200 per month with our "Pay As You Grow" Investments plans. The PR57 alone would pay for all your test equipment needs.

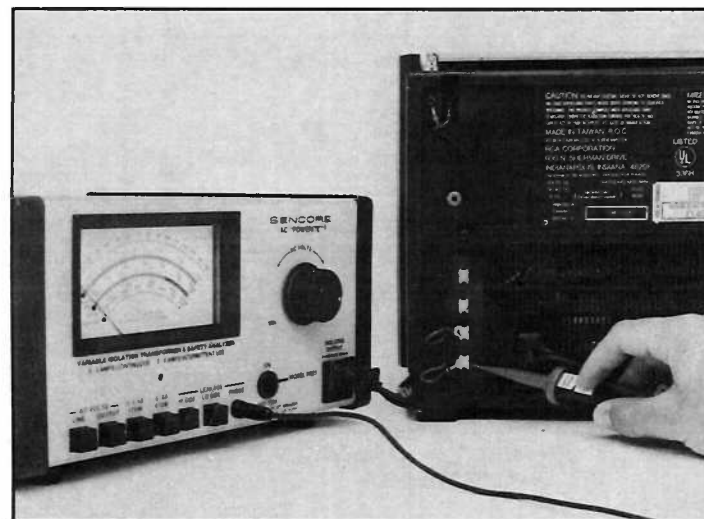
## Try The PR57 And CR70 On Your Bench For 10 Days!

We are so convinced the CR70 and PR57 can make you money, that we have a special offer that lets you try them on your bench for 10 days. Here's our offer:

*"Try the CR70 and PR57, or either one, for a full 10 days on your bench. If you don't feel the CR70 and PR57 will make you that extra profit, return it us, no questions asked, we'll even take care of the freight both ways."*

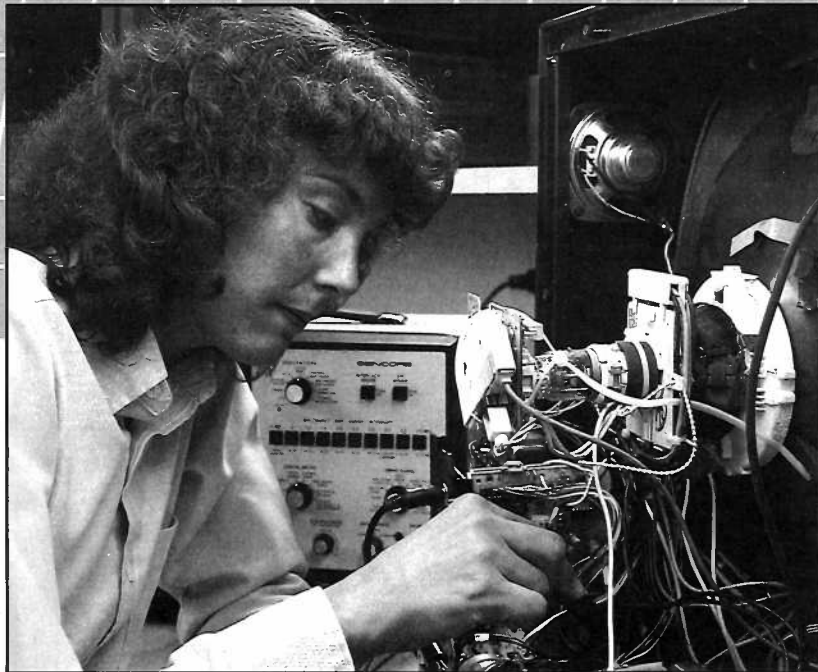
If you decide to keep the CR70 and PR57 we'll arrange for you to keep them for as little as \$85 per month with our "Pay as You Grow" investment plans. Call 1-800 SENCORE for more details, or return the Sencore "Fast Action Card."

\* Based on a NESDA survey.



The PR57's AC leakage test provides a valuable service to your customer, and can earn you an additional \$3,600 per year!





## “How I Used Functional Analyzing To Walk A ‘Blank Raster’ Problem Out Of An RCA TV”

by Sunshine Snyder, Technical Writer

Signal tracing requires you to connect your scope to the various input and output stages and visually compare the displayed waveforms to those on the schematic. But there are over 50 waveforms shown on a common TV schematic. There must be a better way!

Yes—there is! It’s a troubleshooting team that gives you what it takes to safely service any TV set, identify the trouble stage and isolate the defective component in less than half the time it would take to trace the signal and compare 50 or more waveforms to those shown on a schematic.

The VA62 Universal Video Analyzer™, the SC61 Waveform Analyzer™ and the PR57 “Powerite”® Variable Isolation Transformer and Safety Analyzer let you locate the trouble stage, and isolate the defective part without waveform interpretation or parts removal. My objective here is to show you how I walked a “No Picture” Problem out of a 25 inch RCA CTC121 chassis using Sen-core’s PR57, VA62 and SC61 and four easy steps.

### The Initial VA62 Setup

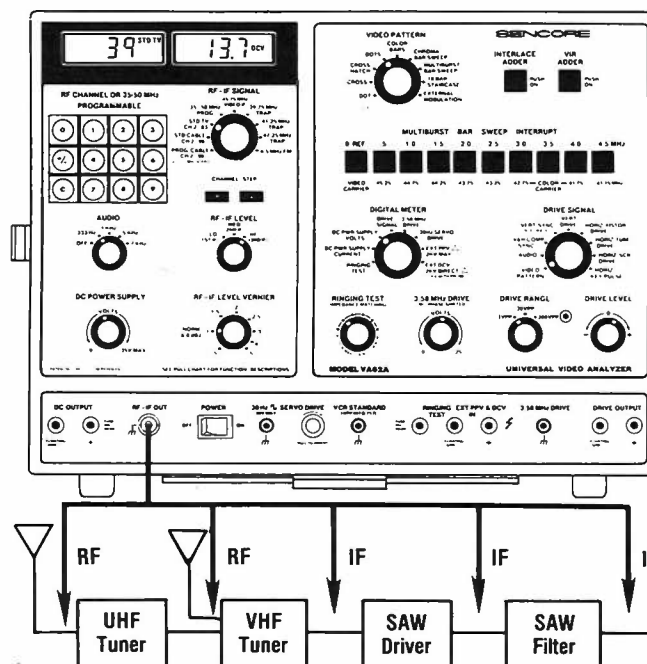
1. In order to provide the TV circuits with their normal input signal, I connected the VA62’s RF-IF Output to the TV antenna and selected the STD CABLE position with the RF-IF Signal knob. With the RF-IF Level in the HI position, and the RF-IF Vernier in the NORM position, I

“You can identify the troublesome stage and isolate the defective part in half the time it would take to trace the signals . . .”

While researching new topics for a technical article, I reviewed the most often-asked questions about video analyzing. Over the last few months, inquiries about troubleshooting “no picture” problems (when high voltage shutdown is not the case), have been common.

As you know, when the symptom is “no picture” (raster OK), the probable cause is no signal or a weak signal at the CRT inputs. The common “cure” is to signal trace all stages from the RF input to the CRT output. This is easier said than done.

A typical TV contains some 50 to 100 transistors, about half that number of diodes, and up to a dozen or so integrated circuits (ICs). It’s possible that any one of these components (or a combination of them), if defective, can cause the signal at the CRT inputs to weaken or disappear.



### 1. Select Channels

Enter two digits on keypad  
0-5 = Channel 5  
3-9 = Channel 39  
OR Press “up” or “down” CHANNEL STEP button.

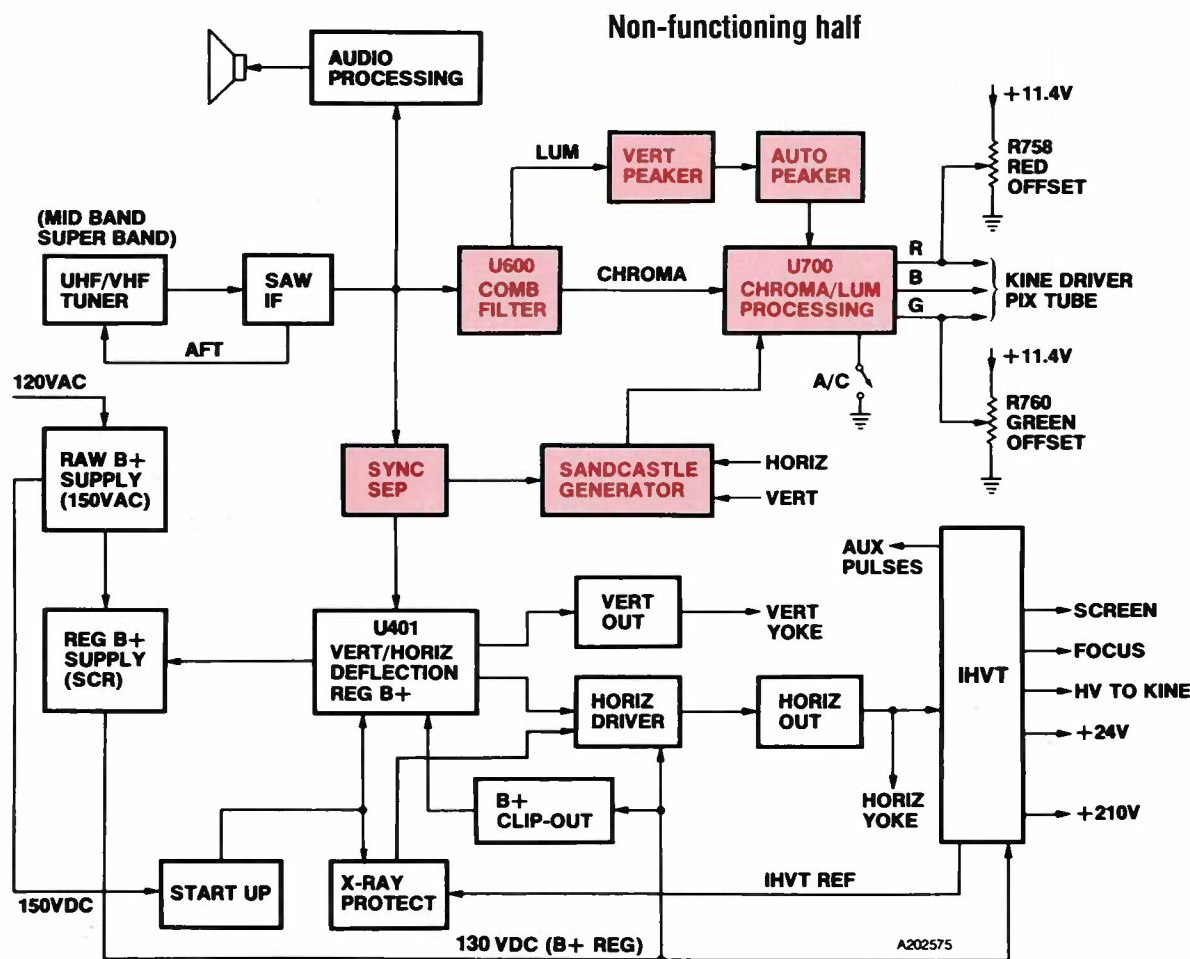
### 2. RF & IF Output Levels:

Multiply levels by 2 if used with 75/300 ohm balun.

Vernier Setting	Lo	RF Med	Hi	Lo	IF Med	Hi
.5	5uV	50uV	500uV	500uV	5000uV	50mV
1	10uV	100uV	1000uV	1000uV	10mV	100mV
2	20uV	200uV	2000uV	2000uV	20mV	200mV
5	50uV	500uV	5000uV	5000uV	50mV	500mV

Fig. 1: Connecting your VA62’s RF-IF output is the first step. Set the RF-IF output as shown above to keep the good circuits in sync while you troubleshoot the TV.





**Fig. 2:** Since I could hear the sound and sense the presence of high voltage, I reasoned that the power supply, high voltage, and sound circuits were operating normally.

entered channel 02 on the VA62 keypad, and I selected Channel 2 on the RCA TV. (Figure 1)

2. Next, I rotated the VA62 VIDEO PATTERN knob to the MULTIBURST BAR SWEEP position.

3. Finally, I rotated the VA62 DIGITAL METER knob to the DRIVE SIGNAL position.

The VA62 remained set-up in this manner throughout the following testing and troubleshooting procedures.

**NOTE:** To protect the TV and test instruments (plus myself from shock hazard) I plugged the TV into the PR57 "Powerite" Variable Isolation Transformer and Safety Analyzer.

### Simplified Block Diagram

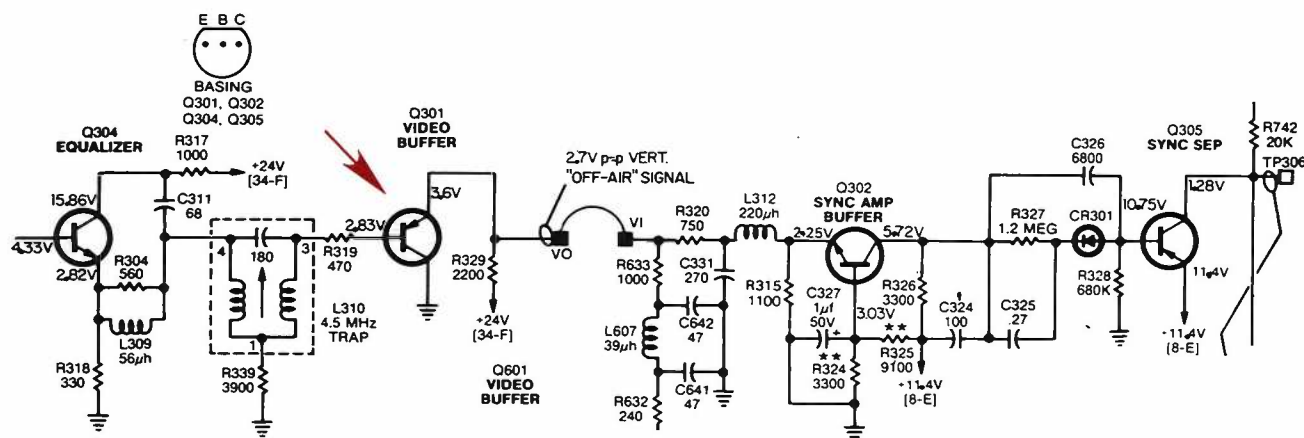
Before I started troubleshooting, I wanted to identify as many symptoms as possible. I could hear the hum of high voltage on the CRT and a tone at the speaker output—so I reasoned that the power supply, high voltage and sound circuits were operating normally. The major symptom here was "No Picture".

I started identifying my list of suspect circuits. This "No Picture" symptom could be caused by a break in the signal path anywhere after the 4.5 MHz sound take-off. That meant my list of suspects included every circuit from that point forward, (except the power supply and high voltage). With a list like that, I began wishing I had chosen a different assignment!

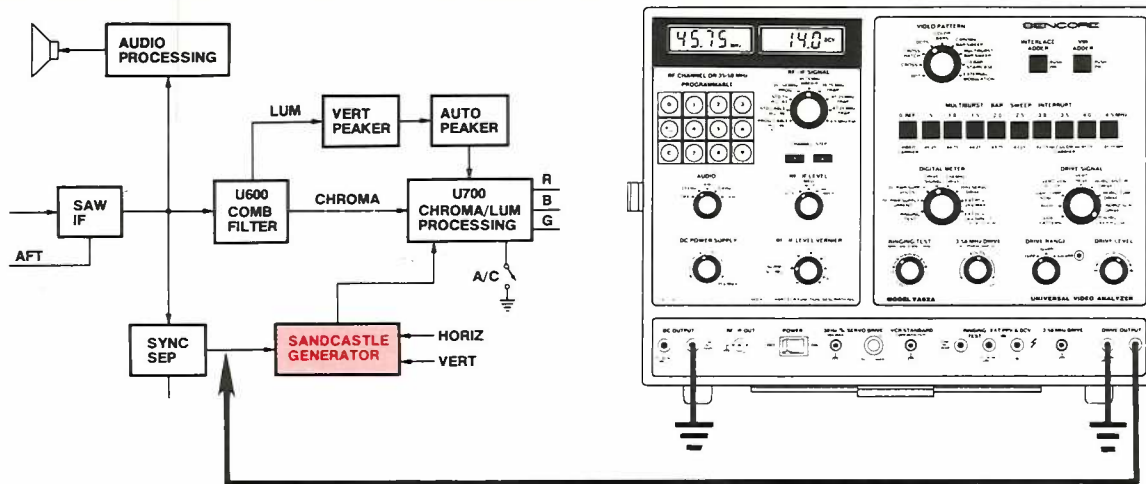
The main functional division point in the luminance circuits (see Figure 2), is the video detector, (right after the 4.5 MHz sound take-off).

That's where the signal changes from modulated to unmodulated, and that's where I'd begin using signal substitution with the exclusive VA62 drive signals. This "divide and conquer" method of analyzing would allow me to be sure my list of suspects was accurate.

**NOTE:** In this particular chassis, the Video Detector is contained in the U300 I-F/AGC Processor chip, so I injected at the nearest test point, the emitter of Q301, the Video Buffer. (Figure 3)







**Fig. 4:** Injecting the horizontal keying pulse at the sandcastle input restored the picture, proving that the video processing stages were good all the way to the CRT.

the best place to begin troubleshooting. I decided to substitute for the Sandcastle signal with the VA62's Horizontal Keying Pulse, and see what happened. (Figure 4)

a) I rotated the VA62 DRIVE SIGNAL knob to the HORIZ KEY PULSE position, connected the DRIVE OUTPUT floating ground to ground, and the positive lead to Test Point 306 (Sandcastle input to Pin 7).

b) Then I switched the VA62's DRIVE RANGE

Sandcastle decoder. When the symptom improved, it confirmed that the defect was between my first point of injection and the Sandcastle input.

Now, I could safely assume that the circuits after the injection point were functioning normally. So, I erased the Lum/Chroma I.C. and all stages after the I.C. from my list of "suspects".

The new out-of-sync video information caused me to suspect a problem in the Sync stages. So I

tor output to swamp out the existing Sync signal.

b) I rotated DRIVE RANGE switch to the 30 VPP position, and the DRIVE LEVEL until the same peak-to-peak amplitude shown on the schematic (12 VPP) appeared on the digital meter.

The symptom disappeared—the picture returned totally in sync.

**ANALYSIS:** When I injected the VIDEO PATTERN DRIVE SIGNAL at the emitter of Q301 in Step 1, I effectively drove the Sync Separator input with a known good signal. The symptoms did not improve. But, when I drove the output of the Sync Separator in Step 3, the symptoms disappeared. I had isolated the defective stage—THE SYNC SEPARATOR!

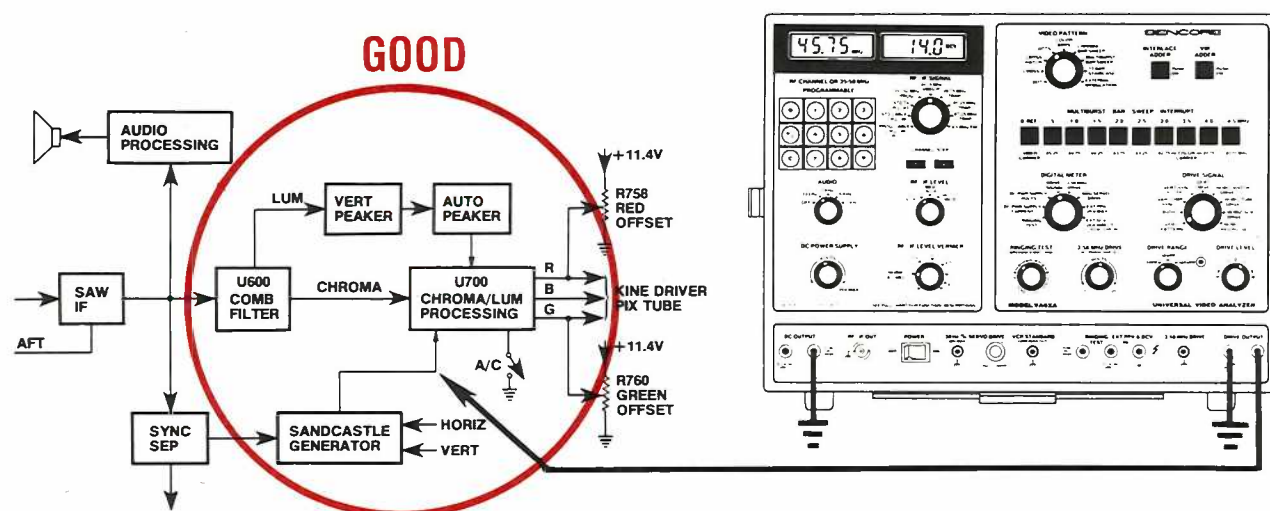
## Step 4

**How I isolated the defective component with the SC61 Waveform Analyzer.**

a) A quick check for proper signals at Q305 in the Sync Separator circuit showed no signal present at the Collector. When I pressed the DCV button on the SC61, the digital readout showed the DC bias voltage was 0.00 volts. The Base and Emitter voltages read 11.88 VDC.

The transistor was shorted. There was no output. There was no sync pulse.

**ANALYSIS:** The sync pulse is one of the three signals that make up the Sandcastle. Without the horizontal sync pulse from the sync separator, the luminance/chroma I.C. couldn't produce an output signal, and that's why the CRT went blank.



**Fig. 5:** When the symptom improved, it proved that the stages past the point of injection were good.

knob to the 30 VPP position, and adjusted the DRIVE LEVEL knob until the same peak-to-peak amplitude shown on the schematic appeared on the digital meter.

As I watched the TV screen, video information returned to the CRT, but now I had a new symptom. The picture was out of sync!

**ANALYSIS:** The VA62's Horizontal Keying Pulse swamped out the existing Sandcastle signal and provided a known good signal to the

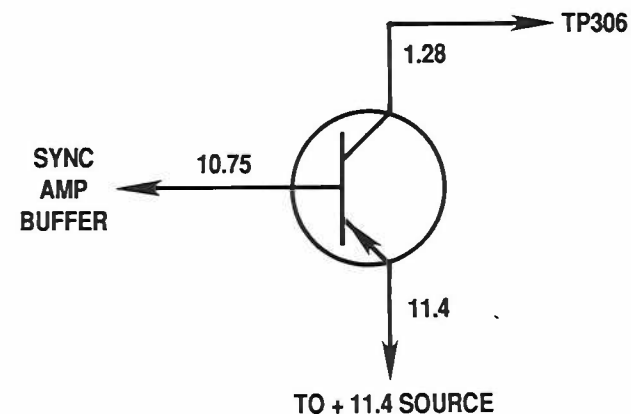
moved my injection point to the output of the Sync Separator (Figure 5).

## Step 3

**I isolated the defective stage with the VA62 Universal Video Analyzer**

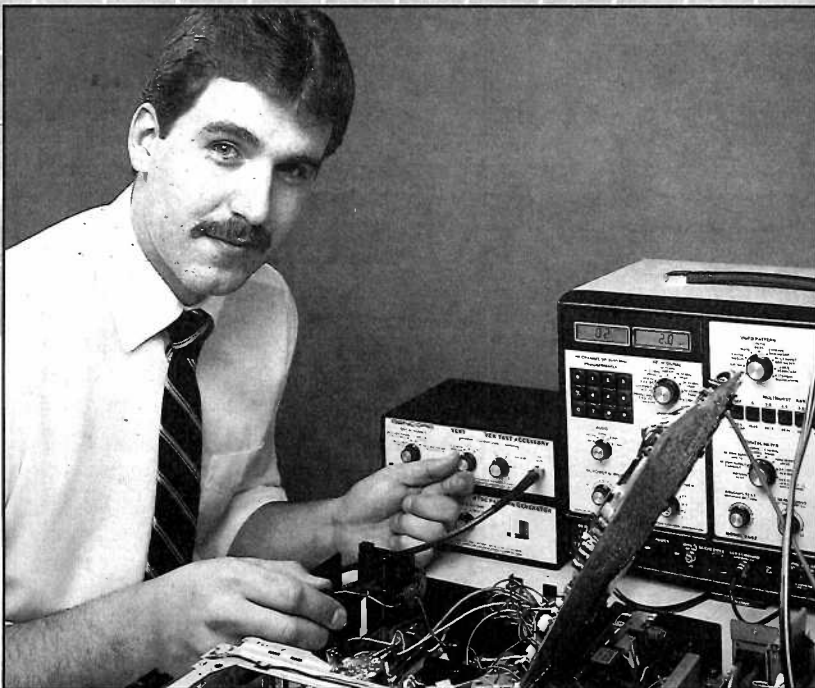
a) I moved the VA62 DRIVE SIGNAL switch to the V & H COMP SYNC position. Then I connected the DRIVE OUTPUT floating ground lead to ground, and the positive lead to Sync Separa-

I learned a lot that day on the bench. I learned, first hand, the importance of functional analyzing. I found out how easy it was to use the VA62's drive signals to identify the good stages. All I had to do was inject a signal and watch the TV screen. I didn't disconnect one component. Do you have questions about this article or Sencore instrument applications? Call 1-800-SENCORE and ask for your Area Sales Engineer. ■



**Fig. 6:** The problem was traced to a shorted base-emitter junction at the sync separator.





## How Your VA62 Universal Video Analyzer™ Saves You From Unnecessary VCR Head Replacement

by Brian Phelps, Technical Writer

sory™ extends the VA62's analyzing capability to include FM luminance and down converted color signals. The VC63 exactly duplicates the VCR head signal. The VA62 and VC63 make up an uncompromised, patented team, unequaled by any other instrument from any other source.

Let's take a look at a typical VCR repair experience as told by customers at a recent seminar.

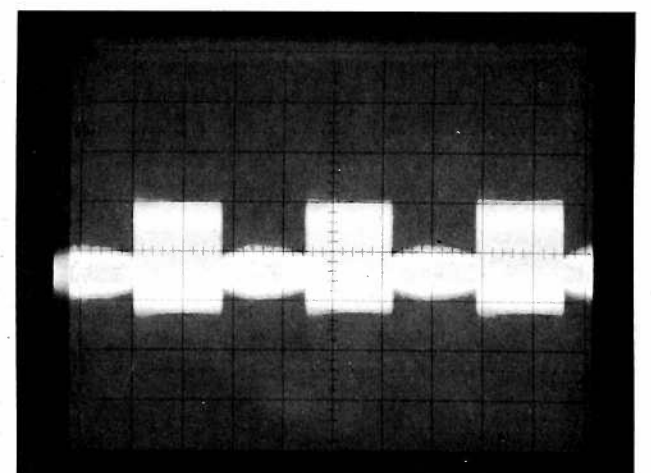


**Fig. 1: The symptom of a snowy picture from a VCR can be caused by several defects.**

### Any Bad Picture Could Make You Suspect The VCR Heads

This repair starts like many others, with a customer complaint of a bad picture. Connecting the VCR to a monitor/TV quickly confirmed the symptom — it looked like a bad or dirty video head (snow and jumpy video over the entire screen).

"This repair will be easy," you think ... little do you know that this VCR is going to cost you hours of troubleshooting and unnecessary parts



**Fig. 2: The output of the video head switching IC indicates that one head path is not working.**

**“**National Service Managers report that 50% of all warranty returned VCR heads are good. Since head replacement is one of the most common services performed, someone out there is losing money! Is it you and your customers?**”**

**T**rying to stay on top of service opportunities and sidestep investment pitfalls is tough for service owners. In fact, staying on top and making the right business decisions is tough for everybody. Even at Sencore, where we talk to hundreds of servicers a day, we have to stop, look, and listen closely to find out what's going on in the industry. Fortunately, your calls and letters help us identify servicing problems — which in turn identifies needed test instruments. Along the way, we gather and publish helpful servicing information.

What information caused me to write this particular article? It was the startling realization of the fact that you can loose your shirt on 30% of the VCRs that come into your shop! Customers tell us that 70% of their VCR service is mechanical, just simple things like cleaning and replacing the heads! That took a while to sink in — were they saying that they are having trouble servicing 30% of the VCRs that come in the door? Yes, and recent industry reports confirm their analysis.

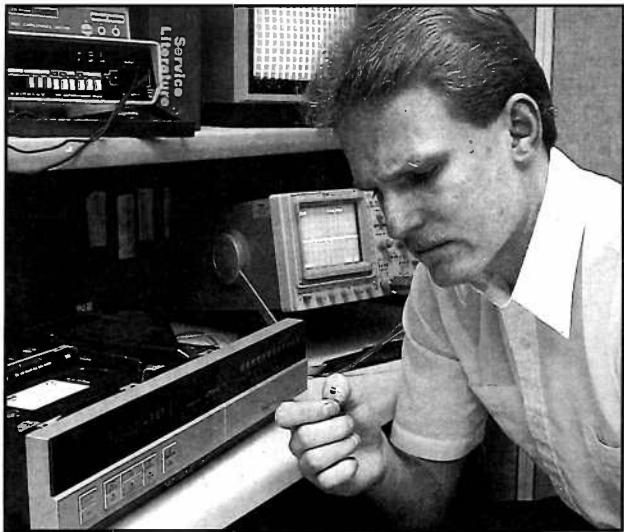
50% of all warranty returned VCR heads are good, according to National Service Managers.

Head cleaning and replacement is the most common service performed on VCRs, according to consumer surveys.

These service industry facts prove that there are a lot of servicers experiencing profit robbing VCR troubles. Sure, you can quickly handle problems like belts, idlers, and sensors, but the profits from those successful jobs fade fast when you purchase and replace good integrated circuits and head assemblies!

In this article, we'll show you how to prove, once and for all, whether the VCR heads or any other circuits in the VCR are good or bad. Frankly, it's quite simple when you have the right signals — the VA62 Universal Video Analyzer gives you standard luminance and color signals to substitute into video and color circuits, plus it includes the special 30 Hz VCR Servo signal (phase reversible) needed to pin down reference and head switching problems. The VC63 VCR Test Acces-





**Fig. 3: A defective play/record switching transistor can cause similar symptoms as a bad video head.**

replacement. Taking out your standard test setup (volt-ohmmeter, scope, various tools, cleaning supplies and a schematic), you slip the top off the VCR and look for obvious defects. Everything looks good, so you begin to troubleshoot the video head circuits. Why the head circuits? The symptom on the monitor pointed you to the "obvious defect" of a dirty or defective video head. You clean the heads thoroughly and try your test tape again. No improvement ...

Your first thought: "I wonder if my tape is still any good?" You play it on another machine and it

order the parts and in less than a week the new heads arrive.

Oooops! You're back in the same boat! What did all this cost you? Troubleshooting time, waiting on parts, replacing the heads, etc., and the VCR still isn't working. What do you really know about this VCR? Were the original heads bad? Is there a multiple failure?

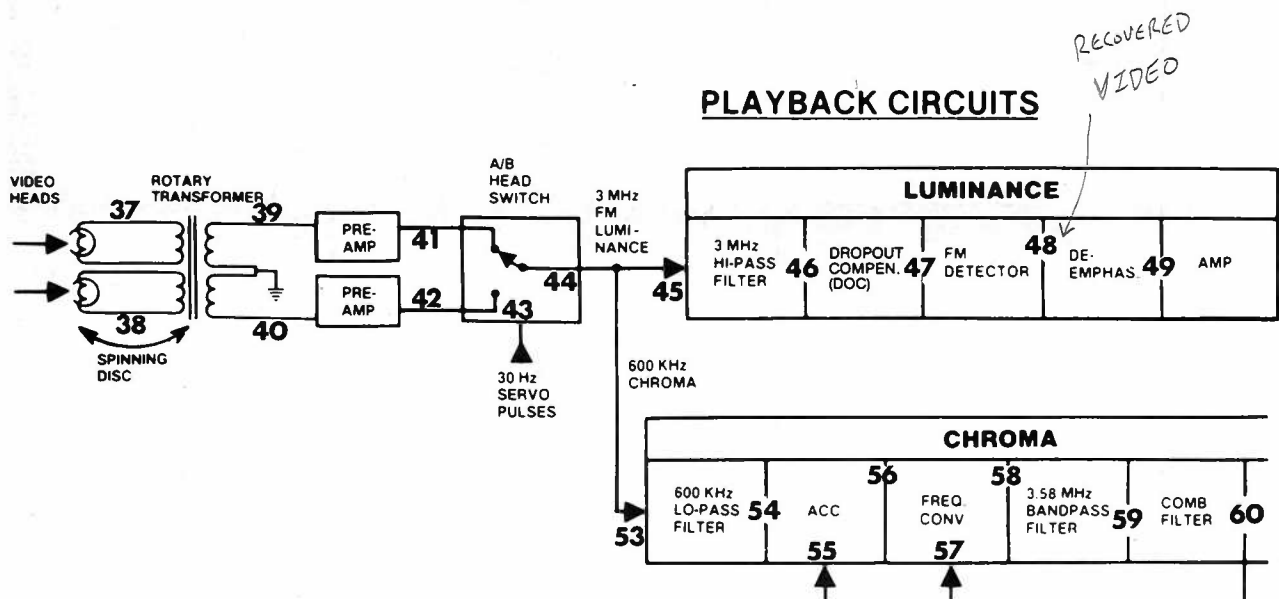
And you thought this was going to be an easy repair ...

You grit your teeth and dig in — you're tackling a VCR that has already beaten you once, and you are determined to win.

You connect your SC61 to the output of the head switching IC again. The waveform still shows that one head isn't working. You check the IC's B+ voltages, they're good. Could the trouble be a defective IC?

That's right, you replaced the IC ... no help! Checking and rechecking proved fruitless. What was wrong with this VCR? First, of course, it was a dog — a profit robber! Second, its "bad head" symptoms led you astray. Third, it had a bad play/record switching transistor. You know that for sure, because that's what it said on the repair ticket when you got the VCR back from your "Tough Dog Specialist".

Let's see how we could have turned this VCR



**Fig. 4: Match the Universal VCR Block Diagram to the schematic of the VCR to help simplify your troubleshooting.**

proves to be good. Maybe the heads aren't really clean? You try cleaning the heads again. This time using a little more force, being careful not to damage the heads. You play the tape again ... no improvement. Maybe you should change your mind about this being an easy repair? Reluctantly, you accept the fact that you are going to spend some time on this VCR.

Placing your SC61 Waveform Analyzer at the output of the head switching IC, you notice what appears to be dropout from one of the video heads (Figure 2). Since the signal is FM, you can't tell if it's video or noise, but there is a definite dropout. What are your choices? One of the video heads must be defective.

A quick check of the parts list and a call to your customer with an estimate and you're home free. The customer says, "That's a little steep, but the VCR is worth it ... go ahead and fix it." So, you

trouble into a profit maker. We'll start with a review of the play/record switching transistors to see how they contributed to the misleading "Bad Head" symptom.

### A Playback/Record Switching Transistor Can Give Misleading Symptoms.

When the VCR is used in the playback mode, the play/record switching transistors should be biased off. This produces a high impedance to ground and allows the signal from the video heads to be passed to the head preamps. Typically, a VCR will use a control voltage from the microprocessor to switch the state of the transistors from on to off.

During record, the microprocessor changes the bias on the play/record transistors to place the preamps at approximately 10 ohms to ground. This is done to complete the record current path and reduce the output of the preamp to eliminate noise.

The switching can be affected by:

1. Defective transistors.
2. Microprocessor switching at the wrong time.
3. Incorrect power supply voltage.

When the transistor shorts or turns on at the wrong time, the playback signal is effectively shorted — one or both heads may appear bad because of the very low output from the preamp. When only one preamp is affected, the symptom is similar to a bad head. On the SC61 Waveform Analyzer, this symptom also looks like one head is not picking up signal.

Your VC63 VCR Test Accessory catches this elusive defect, with 100% accuracy. To see where and how to use the VC63, let's look at the Universal VCR Block Diagram.

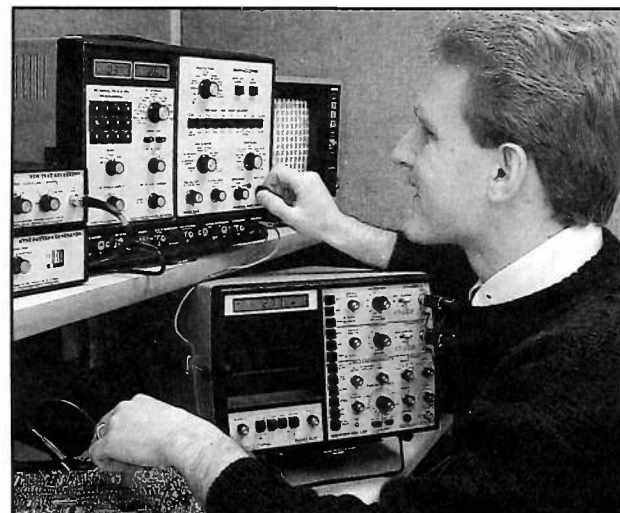
### Use The Universal VCR Block Diagram To Simplify Your Troubleshooting

When troubleshooting VCR problems, many servicers find it beneficial to use a block diagram. The block diagram eliminates the unique circuits and components of individual VCRs, and places them all on one functional (block) level. Every VCR has the same basic signals at the inputs and outputs of the blocks. At the output of the FM detector, for example, they all have video. The Universal VCR Block Diagram helps you step through a defective VCR quickly, because you simply test the inputs and outputs of the blocks.

Figure 4 shows the Sencore Universal VCR Block Diagram. A schematic is also given to show how the block diagram relates to actual VCR circuits. We'll use the block diagram to identify the test points that will help us troubleshoot this VCR.

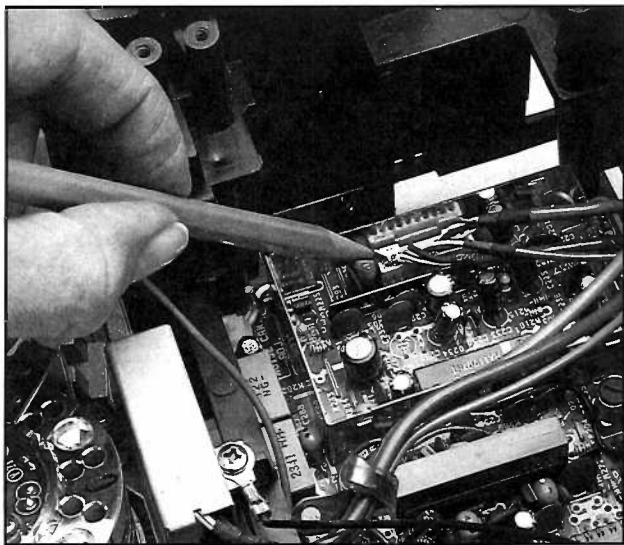
### Use The VA62, VC63, And SC61 To Isolate VCR Playback Luminance Problems.

An excellent starting place, when troubleshooting a VCR FM luminance problem, is at the output of



**Fig. 5: Signal injection points you in the direction of the defective component.**





**Fig. 6:** On many VCRs the input of the video head preamps is easily located.

the FM detector. Inject a VIDEO PATTERN drive signal from your VA62 Universal Video Analyzer at this point to isolate the modulated from unmodulated signal circuits. When the drive signal is injected at the output of the FM detector, you should see a good picture on the monitor if the problem lies in the direction of the video heads. Otherwise, you would see no improvement. The VCR we are troubleshooting gives us a good picture when injecting at the output of the FM detector. This proves that the defect is towards the video heads.

**NOTE:** When troubleshooting the FM luminance and down converted chroma circuits, use the VC63 VCR Test Accessory. The VC63 will help you divide and conquer these special circuits.

We can isolate the defect further, to the video heads or preamps, and split the possible defects in half by injecting the VC63's VHS LUM & CHROMA signal at the output of the video head switching IC. When connecting the VC63 to this test point, you see a normal picture on the monitor. You now know the defect lies further towards the video heads. Plus, you know that if the head switching IC were putting out the correct signal the VCR would work.

Your next signal injection, with the VC63, should be at the input of the video head preamps. On most VCRs, this point is easily found, even without service literature. The preamps are usually placed away from the video heads. To find the preamps, simply follow the shielded cables running from the heads to the PC board. (On VCRs that have the preamps located directly beside the heads, it may be necessary to consult your service literature.)

When you connect the VC63 to the head A preamp, the picture shows normal response, but when injecting at the input of the head B preamp you don't see a normal picture. However, increasing the drive signal level from the PLAYBACK HEAD SUB range to the X.1 position at the head B preamp returns the picture to normal.

Since both preamps have the same sensitivity, you should see similar results with the same drive signal level. If increasing the drive level to return a good picture is required, you know that you have found the problem. The defect is a bad preamp, or a load on the input of the head switching IC.

The play/record switching transistors are tied to the inputs of the preamps. You have located the bad stage, now simply use conventional test equipment to pin down the bad component. Use your SC61 Waveform Analyzer to check the switching levels on the transistors, or simply test them in circuit with your TF46 Portable Super Cricket Transistor/FET Tester (be sure to remove power to the VCR before testing transistors.) Your VA62 Universal Video Analyzer and VC63 VCR Test Accessory work together in one integrated system to help you solve VCR troubles and turn profit robbing "Tough Dogs" into profitable service successes.

Do you have questions about VCR servicing with Sencore instruments? Call your Area Sales Engineer today, at 1-800-SENCORE. ■

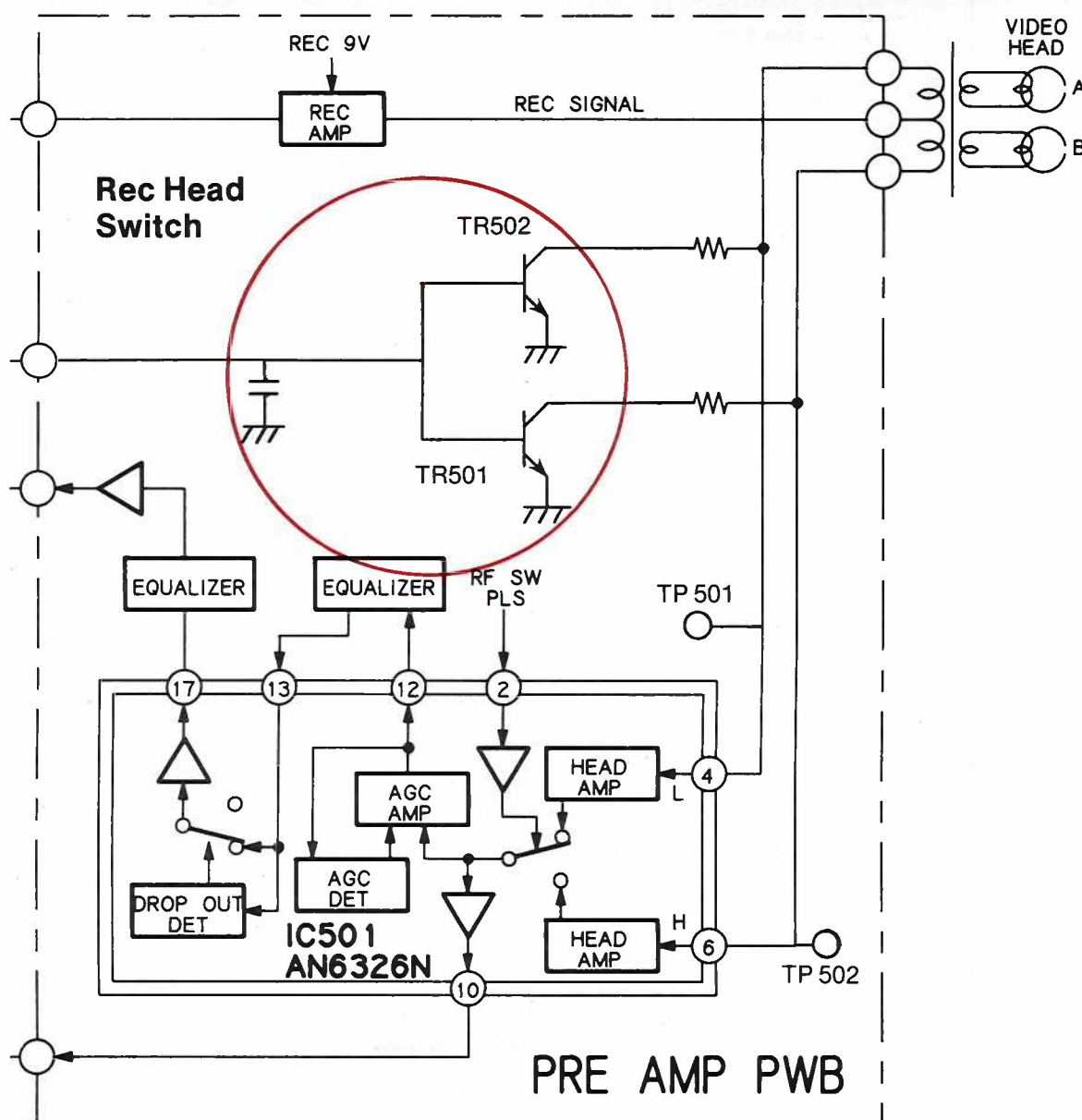
## Tips For Successful VCR Servicing With Your VA62

**1. Test VCR head circuits, rotary transformers, and preamps in circuit:** Many VCR problems can look like the video heads are bad. Use the VC63 to substitute for the FM signal into any stage from the heads to the FM luminance detector. Find problems in minutes rather than hours by watching the TV screen for an improvement when injecting with the VC63 signals. Identifying head circuit problems on VHS, Beta, or U-Matic decks, with confidence, avoids expensive head substitution.

**2. Record your own test tape of VA62 test patterns and audio tones to test VCR circuits and avoid expensive alignment tape damage:** Analyze any VCR's playback operation with just three VA62 patterns recorded on your test tape. The Multiburst Bar Sweep, Chroma Bar Sweep, and Color Bar patterns let you check the playback system's three important parameters in seconds: color saturation, hue, and frequency response. A recorded audio tone lets you check the operation of the audio circuits. Avoid expensive alignment tape damage by using a VA62 test tape on questionable VCRs.

**3. Test the record circuits with the VA62's standard 1 VPP video signal:** Troubleshoot VCR record circuits by using your VA62 to supply a VCR standard 1 VPP signal to the VCR's video input in the record mode. Then use the VA62's digital peak-to-peak meter or an oscilloscope to signal trace through the record circuits. You'll find this method much faster than recording a segment of tape, playing it back, and going back and doing it again.

**4. Use the VA62's test patterns to speed up VCR adjustments:** You can make deviation and record current adjustments faster using Multiburst Bar Sweep and 10 Bar Staircase patterns. These patterns eliminate unnecessary alignment steps.



**Fig. 7:** After changing the video heads and switching IC, the trouble was finally isolated to a record head switch transistor.

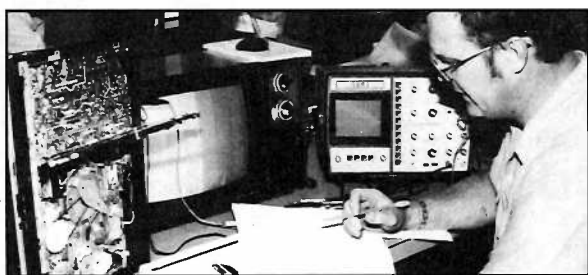


## EIA/CEG Offers Free Resident VCR Service Training Programs\*

### ONE WEEK VCR WORKSHOPS

**E**lectronic Industries Association/Consumer Electronics Group (EIA/CEG) will be conducting classes for consumer electronics technicians in Dallas, Chicago, Tampa, and Long Beach. The workshops are conducted by EIA-trained instructors who will teach a 40-hour, five-day course designed to train and upgrade currently employed consumer electronics technicians.

The training session covers electrical and mechanical functions of playback, recording and servo control. A heavy emphasis is placed on hands-on applications through various lab exercises and actual troubleshooting. Both VHS and Beta formats will be covered.



Classes are free of charge. \*Technicians must be currently employed in private industry by an independent sales and/or service organization who acts as an authorized servicer of one or more manufacturers of consumer electronics products. Familiarization with VCRs is recommended.

Technicians who meet the above criteria can register by sending a letter on company letterhead to the below address (to the attention of the Product Services Department). Please identify an alternative location and/or date in the event the first choice cannot be met. NOTE: One registrant per organization for each class requested.

#### Workshop Locations and Dates

<b>Video Technical Institute</b> 1806 Royal Lane Dallas, Texas 75229	July 31-August 4, 1989 November 6-10, 1989
<b>Tampa Technical Institute</b> 3920 East Hillsborough Ave. Tampa, Florida 33610	June 26-30, 1989 September 25-29, 1989
<b>Video Technical Institute</b> 2828 Junipero Avenue Long Beach, CA 90806	July 31 - August 4, 1989 October 9-13, 1989
<b>Illinois Technical College</b> 506 S. Wabash Avenue Chicago, Illinois 60605	August 28 - Sept. 1, 1989

**Electronic Industries Association**  
1722 Eye Street, NW  
Washington, D.C. 20006  
TWX 710-822-0148  
(202) 457-4919

## VCR RF Modulator Testing

By: Robin "Sparky" Kopetzky, PRO-VIDEO, Grants, N.M.

**O**ne of the most important parts of a VCR is the RF modulator. Without this electronic marvel, we would all be buying expensive monitors to watch our movies on. But this small, square, metal covered box is what allows us to use a standard black and white or color TV set to enjoy our VCR.

What makes an RF modulator special? It is a miniature TV transmitter that will take a composite video signal and an audio signal, and mix them together into an RF signal that is transmitted on either channel 3 or channel 4. The crystal oscillators within the RF modulator are extremely accurate and meet rigid FCC standards—but once and a while, frequencies will drift or modulators will take a static electricity surge from a nearby lightning strike and will not work properly. Symptoms might range from no video or no sound to interference lines in the video and possibly garbled sound.

To make sure an RF modulator is getting good signals, fire up your SC61 Waveform Analyzer™ and check the DC input to the RF modulator. It should read from 9 to 12 volts. If you don't get a reading, check and see if the VCR is in the VCR position of the TV/VCR switch. This switch is on the front panel of most VCR's or under the hidden panel located on the front as well. If this voltage is not present, check the signal from the computer chip first. On most of the newer VCR's the computer chip takes an input from the front panel and in return, sends out a signal to a switching transistor which turns on the voltage to the RF modulator. Next, see if the DC input is free from noise. A noisy switching power supply can produce very bizarre effects on the video or the audio signals. Playback the VA62 test tape you made and scope out the video and audio inputs. The video should be within the 1 volt peak-to-peak NTSC requirements and the audio should be about 1/2 volt peak-to-peak. These signals are the same as the outputs coming from the front/back of the VCR as AUDIO/VIDEO OUT.

To be sure about the video portion of the RF modulator, try this little trick I discovered. Get a shielded cable with a BNC female connector on one end

and an RCA male phono plug on the other. Connect the BNC to the EXTERNAL MODULATION input of your VA62 Universal Video Analyzer™. Plug the other end into the VCR's VIDEO OUTPUT. Connect the RF/IF output coming out of your VA62 to either the A or B input on an A/B video switch box. Connect the RF output from the VCR to the other input on the A/B switch. Tune the TV into the same channel as the VCR RF modulator is transmitting and set the VA62 channel selector to the same channel. Set the VA62's VIDEO PATTERN switch to EXTERNAL MODULATION. Put the VCR into the PLAY mode and compare the two RF signals by switching between the VA62 and the VCR.

If the VA62 signal is better and clears up the noise and other garbage seen on the screen, the VCR's RF modulator is defective. Don't expect to hear audio from the TV when you are looking at the VA62's output since you cannot input the audio from an external source. The video may have some bands rippling through the picture. This is intermodulation. All you are looking for is an improvement in the picture quality. I hope that this little tip will help other VCR servicers get more use from their VA62 s. ■

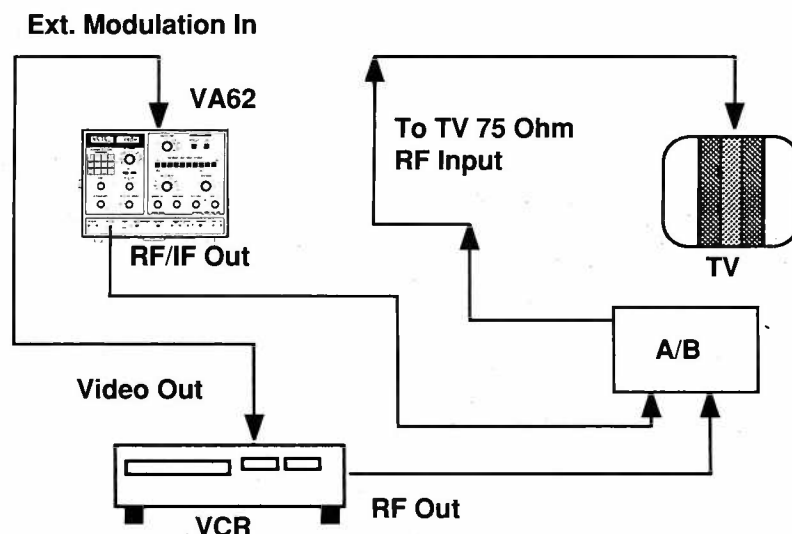


Figure 1: When you suspect the VCR's RF modulator, use your VA62 Universal Video Analyzer and the above setup to quickly prove the modulator good or bad.





## Let your VA62 Universal Video Analyzer™ "Lead The Way" To New Records In Troubleshooting

By Larry Schnabel, Technical Writer

sound like anything out of the ordinary. With the VA62 and your vast experience, you've got the tools and knowledge to fix any problem this set can throw at you.

The first thing you do is hook the VA62's RF signal to the TV's antenna, make sure the VA62 and TV are on the same channel, and turn the set on. Now you run a full performance test using the VA62's various patterns and signal levels. The performance test takes just a few minutes, but you've found those few minutes can be a big time-saver later on.

Symptom confirmed. The TV's screen stays blank with no sign of a pattern or even a raster. When you turn the VA62's AUDIO switch to 1 kHz, you can hear a clean, crisp audio tone coming from the set's speaker. Since the VA62's digital tuner is equipped for VHF, UHF, and cable frequencies, you run a quick check on all of these bands, all yielding the same "blank screen" symptom. With a confident smile on your face, you power the set down and start taking the back off.

### Using Correct Troubleshooting Procedures And Equipment Will Save You Time

As with any set you are troubleshooting, you plug it into the PR57 "Powerite"® Variable Isolation Transformer and Safety Analyzer. The PR57 provides the needed isolation and variable

“**T**he first thing you do is hook up your VA62 Universal Video Analyzer's RF signal to the TV's antenna connector and run a full performance test...”

**J**ust one more set. If you fix one more TV by the end of the day, you'll break your own record for most sets repaired in a month. Since it's the last day of the month, you hope you don't get a tough dog set now. Anytime but now.

Tough dog sets. It's almost a phrase of the past now. Since you've had your VA62 Universal Video Analyzer on your bench, the tough dog sets have just stopped coming in. Or maybe you and your VA62 have just tamed down these challenging sets into routine repairs.

Well, enough bragging. It's time to fix that record-breaking set. You've got a couple hours to fix it, so your confidence is running high. You anxiously walk toward the repair rack for the next set hoping that this set has some type of straight-forward problem that you're familiar with.

Whew! The repair tag says: "No picture. It just died while we were watching it." That doesn't

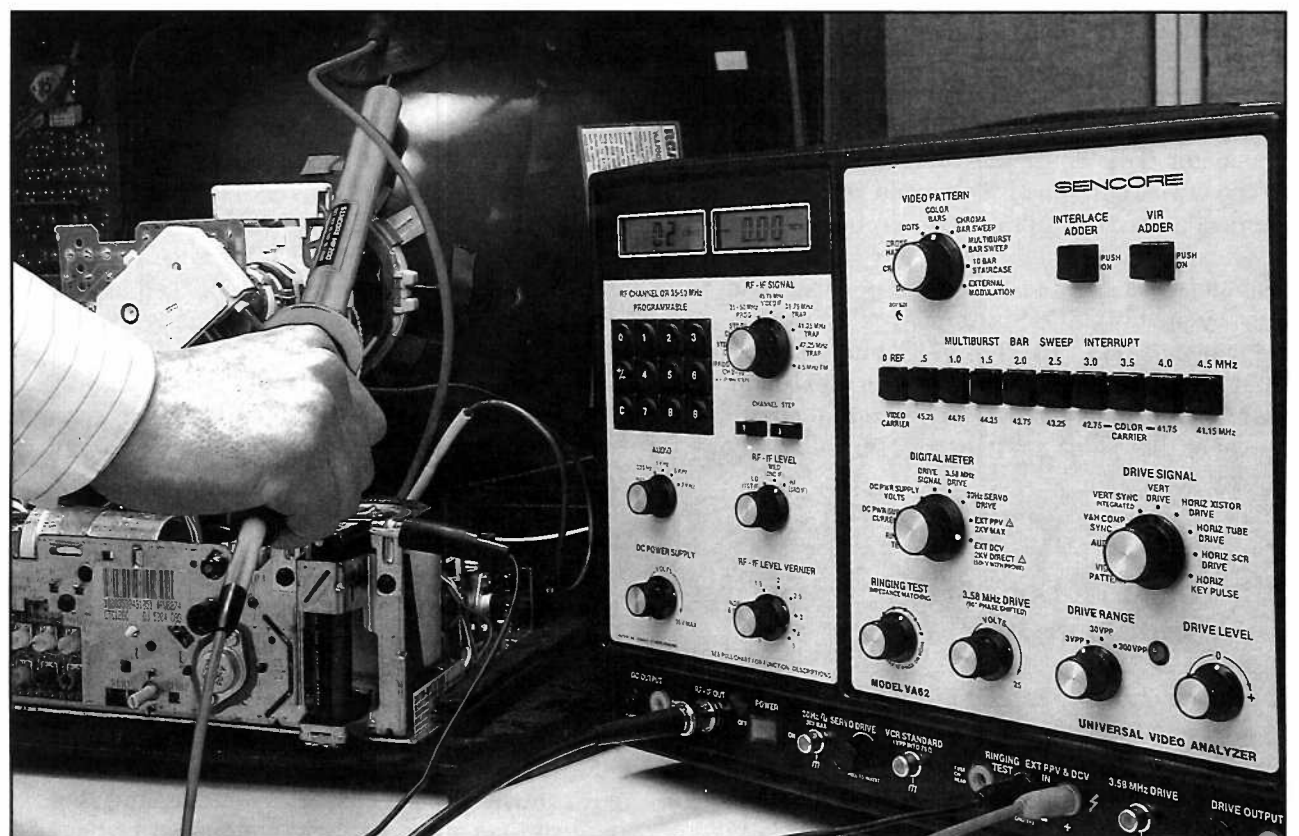


Fig. 1: Use the HP200 probe and the VA62's DC meter to measure high voltage. Multiply the VA62 reading by 100 for the actual voltage.