SENCORE NEWS

Issue #172 Jan/Feb 1996

VCR Servicing

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TV Servicing

How To Give The Most Accurate TV Estimates Possible...
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Monitor Servicing

How To Reduce Computer Monitor Callbacks...
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Camcorder Servicing

Estimating Camcorders For Customer Satisfaction...
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Are You Ready?

Recent Market Trends Show 97.5% Of All Service Centers Aren't Ready For:*

- *New Products*
- *Decreasing Consumer Prices*
- *Emerging Technologies*
- *Building Customer Trust*
- *And More...*

Are You? *see page 3*

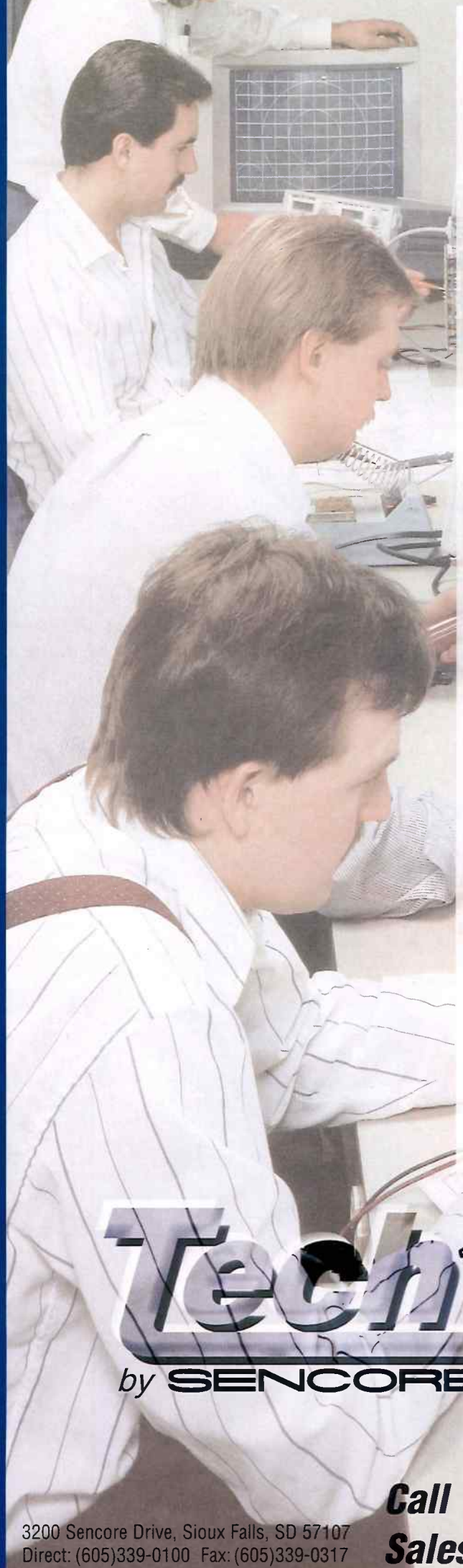
Call Today! 1-800-SENCORE (736-2673)

Sencore Wins Top Business Award!
(see page 4)

** Based On Service Center Tech School Attendance*

"Sharing Your Vision For Success"

Today more than ever, a basic functional understanding, combined with proven effective troubleshooting techniques is essential to your success. But where do you get solid, well-rounded training? To meet the growing demand for fundamental, practical training, Sencore introduces "Tech Training" – by technicians... for technicians.

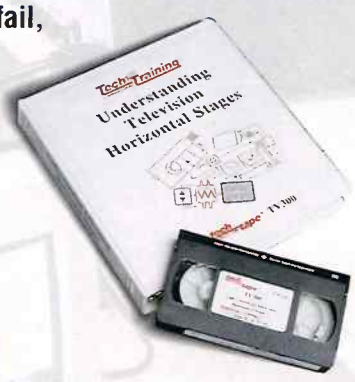


Computer Monitor Servicing Course – TC100

(Approved for CEU credit) This hands-on self study course teaches you how to efficiently test and troubleshoot as you work through the activities and self tests. You'll learn:

- How to quickly determine monitor types
- How to make all monitors look alike
- What video patterns to use to accurately identify failures

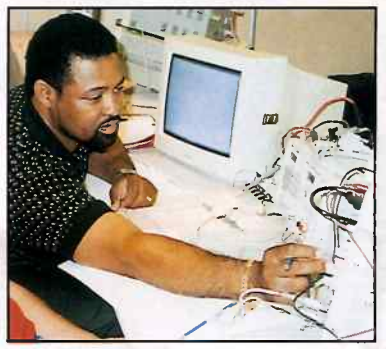
Understanding Television Horizontal Stages – TV300



Knowing how horizontal stages work, how they fail, and how they interact with other circuits will help you conquer these difficult servicing problems. This training package includes a self-study workbook and a 45 minute video.

Computer Monitor Servicing Class – TC100T

(Approved for CEU credit) This 3 1/2 day class provides hands-on experience on actual chassis. You'll learn how computer monitors work, typical circuit operation, how to make adjustments, and gain lots of practical troubleshooting experience.



Tech Choice Technical Troubleshooting Demonstrations

Do you need a quick servicing refresher? No matter how you service, you'll gain valuable tips that you'll put into practice immediately. Choose from these practical demonstrations:

- Computer Monitor Troubleshooting
- Profitable TV Troubleshooting
- Simplified VCR Servicing
- Camera/Camcorder Testing & Troubleshooting

Tech Training™ by SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107
Direct: (605)339-0100 Fax: (605)339-0317

Call 1-800-SENCORE (736-2673) and ask your Area Sales Representative about dates and locations!

On The Cover

Are you ready for the new technology and new opportunities? We're here to help you take that next step into new profit areas while improving your efficiency in the areas you know best. This issue of the Sencore News contains articles showing you how to get where you want to be, starting on page 3 with our feature article on profitability in the service center.

In This Issue

BUSINESS BUILDING

Are You Ready? It's 1996!

Building Profitability Is The Critical Issue For Today's Service Center

1994... 1995... 1996...

Can it be that we are already in the last half of a decade that has seen more change than in the last 50 years combined? As the year 2000 approaches, the challenge to all of us is to capitalize on this explosion of technology while striving to keep bottom line profitability in line with our personal or business objectives.

As you are well aware, new technology is expanding at an exponential rate. We have seen such rapid changes in the consumer electronics market that it's a challenge to stay current with new technology while improving your technical knowledge of the products that have kept you in business over the years. Some of these changes include switching power supplies, microprocessor controlled RF tuning, the computer explosion, etc....

By Rob Barden
Marketing Manager

Sencore Electronics

Add to this the daily demands of just running a business - invoicing, customer retention programs, credit card processing, etc. - and you may occasionally feel overwhelmed. Although the technical and business challenges to the service center of the '90s are great, they are not insurmountable.

Let's face it, you're in business to make a profit. Whether you are a business owner, service manager, or service technician, you need to focus first on those elements of your business that continue to make you money. Along with that, you need to find outlets for profits in new areas of growth. For anyone in the service business, there are two critical areas you should focus on:

1. **Expanding profits on your "core" business.** The 80%+ part of your business that keeps you going daily is your core business. This is your service and parts invoices on the TVs and VCRs you service on a regular basis.

2. **New revenue growth opportunities.** You've heard it said that the best companies in the world spend 10-20% of their time, money, and effort focusing on new business opportunities. For today's electronic service center, new revenue opportunities are emerging in several areas, especially computer monitor and camcorder service.

Expanding Your Core Business Profits

Developing profits in your "core" business can sometimes take so much time that we don't focus on new revenue growth opportunities, and the competition passes us by like a Ferrari in fifth gear. Yet, it remains

Sencore Wins #1 Business Award

Sencore president Al Bowden with Sencore's most recent award, the South Dakota ABEX award, including Business of the Year.

Sencore, Inc. of Sioux Falls, SD was named the South Dakota Business of the Year by the Industry and Commerce Association of South Dakota. Sencore was chosen from all the firms across the state for its commitment to customer service, community involvement, innovation, safety, and quality.

Every two years, the Industry and Commerce Association of South Dakota recognizes firms that have shown business excellence in several key categories. In 1993, Sencore was a finalist in the Manufacturing category and was the winner of the Community Involvement category.

In addition to winning the 1995 Business of the Year award, Sencore was declared the winner of the New Product of the Year for the CM2125 Computer Monitor Analyzer. Sencore was a finalist in the Manufacturing, Quality, and Customer Service categories and was honorable mention for New Venture (AAVS), Plant Safety, and Community Involvement.

We're proud to be recognized as South Dakota's #1 business. Each and every employee on the Sencore Team would like to thank you, our customers, for making this recognition possible. Our continued teamwork gives us the opportunity to work, grow, and dream together.

THANKS FOR YOUR SUPPORT!

our primary source of revenue. Achieving balance between the two, all within the confines of a 24 hour day, is tough. That's where Sencore can help, and sometimes a little help can make the difference between a profit and a loss.

On the technical side, your day to day business profitability is a function of time and parts. Simply put, it's how quickly you can turn out a TV or VCR with only the exact amount of parts needed to repair the unit. This means time is of the essence, from estimating repairs to performing the actual service. In addition, it means you have to be 100% sure of the problem, so you aren't "shotgunning" problems by swapping unneeded parts in the wrong part of the TV. Today's prices of consumer electronic products just don't allow it.

That is where Sencore can and has made a difference in thousands of service centers. Sencore introduced functional analyzing over 20 years ago with the revolutionary concept of "Divide and Conquer." This same, proven concept of time saving functional analyzing holds true today. While technology has changed dramatically, the process in which a TV or VCR processes a video signal remains basically the same.

Sencore doesn't just design, manufacture, and sell test instruments, we offer you a proven way to improve your technical effectiveness. This includes innovative test instruments, backed by Sencore's dedication to support today's service center with technical training programs and sound business building ideas.

Innovative Test Instruments Provide The Foundation You Need For Improved Profitability On Your Everyday Service And Testing Needs

Sencore's VG91 Universal Video Generator and TVA92 TV Video Analyzer provide you with the standard and special signals, plus the tests you need to quickly performance test and isolate potential problem areas in all TVs, both low-end and high-end. This translates to more accurate estimates on your customer's set. See Brad's article on page 9 for more details on how this effective troubleshooting team can improve your TV servicing effectiveness.
VCRs fail more than most consumer electronic products, and with functional analyzing, the VC93 All Format VCR Analyzer offers you the test signals and tests to quickly isolate defective stages in the servos or the chroma/luminance circuits. See Lisa's article starting on page 28 describing how to troubleshoot confusing VCR picture problems.

Fig. 1: Your daily service and testing needs start with innovative test equipment that save time on every repair.

For waveform and circuit analyzing, no one comes close to the SC3100 "AUTO TRACKER" for automatic, accurate, but most importantly - fast tests. The automatic timebase and attenuators make the "AUTO TRACKER" faster than conventional scopes, and was designed for everyday troubleshooting, with input protection of 3,000 volts. We challenge you to try and make a mistake using the SC3100. See the article on page 15 for more details.

The Key To Improved Effectiveness Is Improving Your Technical Abilities

Having the correct instruments to help you troubleshoot is very important with today's technology. Understanding how a TV or VCR operates functionally helps you to further use the capabilities of your equipment and reduces time spent troubleshooting. Improving your technical understanding of circuits and how they process signals is key to improving your testing and troubleshooting skills.

Sencore is a leader in effective technical training with tips and ideas that you can quickly put to use in your service center. Sencore has recently introduced a number of technical courses and hands-on classes designed to improve the effectiveness of the technician in understanding today's circuits and using our instruments more effectively (*see next page*).

There are a variety of other technical seminars offered by manufacturers and electronic associations. As technology changes, attending these seminars can only add to your servicing effectiveness. The service center that keeps up with trends and technology is the service center ready to capitalize on new opportunities when they become available.

Value Added Services Bring In Additional Income

One of the hot trends of the '90s has been value added services. Why do you think this is the case? It's because many companies are finding that their customers are willing to pay an additional amount of money for what they consider to be valuable services. This can range from same day service to safety tests.

The PR570 "POWERITE II" is an excellent instrument for generating added cash with its exclusive safety leakage test you can perform on any unit your customer brings

in for service. Documenting this test with a "safety sticker" is value added, and most customers will pay an additional $3 to $5 dollars without question if they know how the test benefits them. The article starting on page 26 covers more value added ideas.

Improving Your Customer Service And Business Practices Can Save You Hours A Day

No matter how good a technician you may be, sound business practices are key to maximizing business profits. Managing customer relations, and accurate tracking of customers, invoices, and inventory are all part of succeeding in today's business environment.

When dealing with customers, professional appearance, professional estimates, and sending friendly reminders for tune-ups or referrals, can go a long way towards building a quality reputation for your shop.

Fig. 2: Sencore "Tech Choice" seminars improve your technical understanding of circuits and teach you more efficient troubleshooting methods.

Managing invoices, parts ordering, inventory, accounts receivable, and warranty claims are time consuming for the non-automated service center. Today's high performance service centers use some sort of business software to improve their business practices. Sencore offers the SM2001 Service Center Manager software to help you manage all aspects of your business more efficiently, effectively, and profitably. See page 24 for more details on this dynamic business management tool.

Capitalizing On New Frontiers

Again, having the right instrument at the right time is important to troubleshooting and performance testing. With camcorders, performance is critical. While the VC93 All Format VCR Analyzer allows you to signal inject and quickly isolate problems in the luminance/chroma stages and troubleshoot servo problems, the CVA94 "Video Tracker" and VR940 allow you to quickly analyze camera video signals for fast servicing and alignment. Performance testing is a must with camcorders, so just "eyeballing" the settings won't do it, and will often result in a call-back from your customer.

Computer sales are exploding. By the turn of the century, most homes will have at least one computer (I have two), with the largest service opportunity coming from computer monitor failure. Computer monitors operate at varying vertical and horizontal scanning frequencies, and you would need a variety of signal generators to troubleshoot the various monitors from all the different manufacturers.

The CM125 "Pix Pak" signal generator is fully programmable with video bandwidth to 125 MHz to handle high resolution monitors. It gives you 43 preprogrammed monitor setup locations for the most popular monitors, while providing you with fully programmable vertical and horizontal frequencies for new monitors as they are released. The CM2125 Computer Monitor Analyzer gives you patented drive signals to help you functionally analyze and troubleshoot these monitors quickly and accurately. See page 6 for more information on both the CM125 and CM2125.

It All Starts With Commitment. A Little Help Doesn't Hurt Either

Sencore is committed to helping you be successful. Take a look at this issue of the Sencore News for more information on our instruments, software, and training programs. Then pick up the phone and call your professional sales engineer at **1-800-SENCORE.** We're in this business together. If we work as team, we can win! SN

Sencore's Technical Training Resources

Tech School Hands-On Classes

- ***Computer Monitor Servicing Class*** *(TC100T)* A 30 hour, 3 1/2 day hands-on workshop designed to give you the skills necessary to service computer monitors and turn this opportunity into profits.
- ***Computer Monitor Hands-On Tech School*** *(TS100)* This program gives you all you need to get started in computer monitor troubleshooting from testing multisync monitors to basic SMPS troubleshooting.
- ***Camcorder Hands-On Tech School*** *(TS200)* This day-long workshop gives you training in camera diagnostics, and troubleshooting methods. It's a must for full service camcorder technicians who are interested in providing their customers with quality repair.
- ***SMPS Hands-On Tech School*** *(TS400)* Learn the theory behind switched mode power supplies and how to troubleshoot these frustrating circuits.

Tech Choice Demonstration Seminars

- ***Basic Computer Monitor Troubleshooting*** *(TD100)* Learn timesaving monitor troubleshooting techniques in this condensed, three hour version of the TC100T.
- ***Simplified VCR Troubleshooting*** *(TD201)* Learn the basics of VCR theory and troubleshooting in this three hour Tech Choice presentation.
- ***Profitable TV Troubleshooting*** *(TD300)* This three hour Tech Choice presentation features the VG91 and TVA92 giving you intense, to-the-point troubleshooting techniques.
- ***Practical Camera/Camcorder Testing & Troubleshooting*** *(TD200)* A two hour presentation featuring the CVA94 "Video Tracker" and VR940 gives you troubleshooting tips and techniques you need to start you on your way to successful camcorder servicing.

Self-Study Courses

- ***Understanding TV Horizontal Stages Course/Book/Videotape*** *(TV300)* Covers the theory behind TV horizontal stages in a 46 page full color book, and includes a video tape so you can better understand these troublesome stages.
- ***Understanding & Using The TVA92 Horizontal Tests Course/Book*** *(TV301)* A guide to testing TV horizontal circuits with the TVA92, this workbook and videotape guide you through the TVA92's horizontal tests including troubleshooting TV horizontal stages with the TV off.
- ***Computer Monitor Servicing Course*** *(TC100)* This hands-on self study course teaches you how to efficiently test and troubleshoot computer monitors. Thirteen chapters cover everything from SMPS to the CRT so you can gain that servicing edge.

For more information or to register for the seminars, call your Area Sales Representative at 1-800-SENCORE. Most of these classes fill up fast, so call early to reserve your seat. Check out the schedule on the reply card between pages 16 and 17 to see when we're coming to a city near you.

How To Reduce Computer Monitor Callbacks

Strategies To Insure Every Computer Monitor Repair Works Right

By Stan Warner
Application Engineer

Sencore Electronics

Once you've finished a repair on a computer monitor, you're not quite through. After you've repaired the monitor, you'll need to do a final test and alignment on the unit before you "burn in" the unit and send it back to the customer. This quick quality check strategy assures customer satisfaction with your services and it greatly reduces the risk of monitor callbacks.

The new CM125 "Pix Pak" Computer Monitor Signal Generator works perfectly for this customer service quality check. The "Pix Pak" is a high performance (video bandwidth of 125 MHz and 2048 x 2048 pixel output) computer monitor signal generator so your monitors will be tested to their full capabilities. The CM125's programmability, dynamic video patterns, and computer monitor storage locations let you test every circuit in the monitor in seconds to help locate those hidden problems - thereby reducing callbacks.

This article takes you through several of the troubleshooting/quality checks you'll want to complete before you send the repaired monitor back to your customer. Every quality test you can run on a finished monitor repair reduces your chances of callbacks. And that means less rework, greater customer satisfaction, and repeat business. ***Editor's Note:*** *The tests described in this article also apply to the Sencore CM2125 Computer Monitor Analyzer.*

Avoid Callbacks By Testing Sync Lock Phasing And Linearity

After you've completed a repair, you'll want to make certain the computer monitor displays a locked in and centered picture when you feed it the correct video format. Pictures that are shifted to the left or right or that are sized too large or small are one of the most common sources of customer callbacks.

With programmable control of the scan frequencies and pixels, the CM125 "Pix Pak" generates the signals that match the output of your customer's video card and that match the input requirements of the computer monitor under test. The CM125's CIRCLE/CROSS pattern lets you confirm that the picture is sized properly on the display and that it's not shifted left or right.

Example: Testing sync lock phasing and linearity with the CM125 (if the computer monitor format is contained in one of the 43 preprogrammed storage locations).

1. Press [RECALL], enter "storage location #," [ENTER]
2. Connect the CM125 to the computer monitor under test
3. Press [*CIRCLE/ CROSS]

If the computer monitor format is not preprogrammed

1. Press [HORIZ FREQ], enter horizontal frequency, [ENTER]
2. Press [VERT FREQ], enter vertical frequency, [ENTER]
3. Press [HORIZ PIXEL], enter horizontal pixels, [ENTER]
4. Press [VERT PIXEL], enter vertical pixels, [ENTER]
5. Press [FRONT PORCH], enter front porch time, [ENTER]
6. Press [BACK PORCH], enter back porch time, [ENTER]
7. Press [SYNC], enter sync time, [ENTER]

Note: You need to enter front porch, back porch, and sync times for both the horizontal and vertical blanking pulses.

8. Connect the CM125 to the computer monitor under test.
9. Press [*CIRCLE/ CROSS]

What to expect:
The picture should be locked in and centered on the display. Check that each line is straight and that each box is square and uniform throughout the raster (except for the row of squares on the outside of the display). Also check that each circle is round with no visible distortion.

If the circles are egg shaped, check the horizontal and vertical linearity adjust-

ments. If the picture is shifted up or down, left or right, or folded over, check the horizontal and vertical phasing adjustments.

Fig. 1: Use the CM125's CIRCLE/CROSS pattern for testing a computer monitor's display centering and linearity.

If a computer monitor's format is not one of the CM125's preprogrammed storage locations and you do not know the exact timing parameters (scan frequencies, pixels, and blanking times), do not adjust the monitor's internal sync and phasing controls for a locked-in, centered picture. The computer monitor display may look nice leaving your service center, but it will almost certainly result in a customer callback. If you do not know the format, don't perform any phasing adjustments in the monitor. You stand a far better chance of returning a properly aligned computer monitor than if you try to adjust to the wrong monitor parameters. This especially holds true if the repair you've performed was not in one of the critical timing circuits.

If the computer monitor has more than one mode or if it is multiscan, you need to do a sync lock and phasing linearity test on each mode or video format. The next sections tell you how.

Test The Mode Select Circuits To Avoid Embarrassment

Several monitor standards have different graphics modes. The VGA standard, for example, has three modes as Fig. 2 shows. The horizontal sync frequencies are the same for each mode, but the vertical sync and pixels are different. With no adjustments made in the vertical sweep circuits, a picture that looks okay in one mode could be too tall or scrunched in one of the other two.

A mode select circuit, used in some monitors, compensates for the compressed or stretched display that results from these different graphic modes (different vertical sync frequency and vertical pixels). The mode select senses the input and tells the vertical driver to adjust the drive output to produce a full raster for each of the modes. The polarity of the horizontal and vertical sync pulses forms a code that tells the mode select circuit what graphics mode is applied. Figure 2 shows the polarity code. A faulty mode select circuit will cause the display to be too compressed or spread out. The display may look okay in one of the modes but not another.

You should always test each of the modes before you send a computer monitor back to a customer. If you don't, a monitor may look good in the mode you've tested, but may be misaligned in the customer's mode. Testing the mode select circuits with the CM125 "Pix Pak" is an easy task, especially if each of the monitor's modes are already stored in preprogrammed storage locations. Just recall each of the modes from the CM125 and test for proper alignment in each mode.

What to expect:
For each mode, make sure the display is not distorted. If necessary, adjust the monitor's raster size and linearity controls. The computer monitor should produce a full display in each mode. If it does not, troubleshoot the mode select circuit or the vertical or horizontal

Example: Testing the mode select circuit on a VGA monitor

1. Press [RECALL] [5] [ENTER]
   (this is VGA mode 1)
2. Connect the CM125 to the computer monitor under test
3. Press [RECALL] [6] [ENTER]
   (this is VGA mode 2)
4. Press [RECALL] [7] [ENTER]
   (this VGA mode 3)

3 VGA Modes						
VGA Mode	Horizontal Frequency (kHz)	Vertical Frequency (Hz)	Horizontal Resolution (Pixels)	Vertical Resolution (Pixels)	Horizontal Sync Polarity	Vertical Sync Polarity
1	31.5	70.1	640	350	(+)	(-)
2	31.5	70.1	720	400	(-)	(+)
3	31.5	64.0	640	480	(-)	(-)

Fig. 2: VGA monitors only sync to a 31.5 kHz horizontal sync frequency but can display three modes.

driver stage. Note: You can test the modes for standards that are not stored in the CM125's memory by entering the parameters directly.

Testing The Multiscan Circuits Reveals Hidden Problems

Multiscan monitors lock to any applied horizontal and vertical sync frequency within a set range. A common problem in multiscan monitors is they will lock to a small frequency range, either horizontal or vertical, but are unable to lock over the entire range of input sync frequencies. Before you return a multiscan computer monitor to a customer, you must make certain the monitor is able to lock in each of the formats in its frequency range. A hidden problem in the multiscan circuits can make you look bad in the customer's eye.

You can easily do a quality test on multiscan computer monitors using the CM125 "Pix Pak". Simply recall each of the formats the computer monitor can lock to within its frequency range. The monitor should produce a locked-in display with all formats. If the monitor doesn't lock, there may be a problem in the multiscan or sweep circuits. If the monitor shifts or distorts the pattern, the monitor may simply need to be aligned.

Example: Test a computer monitor that can sync to VGA, SVGA, MAC II, 8514, and 1024 x 768.

1. Press [RECALL] [ENTER] [ENTER]
2. Connect the CM125 to the computer monitor under test
3. Press [RECALL] [6] [ENTER]
   (this is VGA mode 2)
4. Press [RECALL] [7] [ENTER]
   (this is VGA mode 3)
5. Press [RECALL] [8] [ENTER]
   (this is SVGA)
6. Press [RECALL] [9] [ENTER]
   (this is 8514)
7. Press [RECALL] [10] [ENTER]
   (this is MAC)
8. Press [RECALL] [11] [ENTER]
   (this is 1024 x 768)

What to expect:
The computer monitor should have a locked in display for each of the computer monitor formats. If the computer monitor doesn't sync to any one of the standards, you need to troubleshoot either the automatic synchronizing circuits or the horizontal or vertical sweep circuits (depending on which circuit has lost sync), or align the computer monitor for that particular format.

Dynamic Patterns Let You Test The Power Supply Regulation Circuits

The high voltage regulator circuit is responsible for maintaining a constant high voltage at the CRT as the HV load varies. A black raster turns the guns off, so there is minimum beam current and minimum load. The heaviest load is produced by a white raster. Without regulation, the high voltage would vary with the displayed image. Poor high voltage regulation creates problems such as blooming, improper brightness variations, poor focus, poor color, and a jumpy display.

A computer monitor you've repaired may perform well under low current conditions but may lose regulation as the monitor is switched between high and low beam currents. Use the CM125's RASTER pattern to dynamically test a monitor's high voltage regulation circuit. Quickly switching the VIDEO polarity button between "+" and "-" causes the display to alternate between white (maximum load) and black (minimum load).

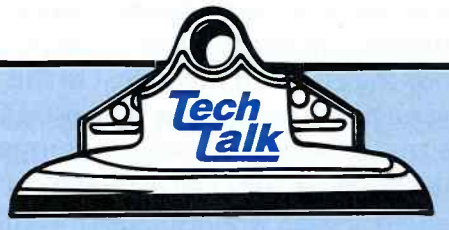
What to expect:
The display should remain stable as the pattern is switched between the white raster and black raster. The white border line should remain stable with no signs of bowing or blooming.

If the display shows a regulation problem, measure the peak-to-peak voltage at the collector of the horizontal output transistor while repeating step 5. If the PPV voltage changes widely with the changing video pattern, troubleshoot the B+ regulator circuit. If the PPV voltage remains stable, check the video or sync circuits for changing levels.

Example: Testing a monitor's high voltage regulation with the CM125.

1. Connect the CM125 to the computer monitor under test.
2. Press [RASTER]
3. Press [R] [G] [B] all to "on"
4. Set the monitor's brightness to maximum.
5. Quickly toggle VIDEO polarity from "+" to "-"

For more ideas and stragies on reducing callbacks, call us today at **1-800-SENCORE**. If you're interested in a no-obligation trial, just give us a call. Then you can see for yourself how the CM125 "Pix Pak" fits your computer monitor and analyzing needs. SN



Tips From Application Engineering

Answers To Your Most Common Questions

Q. How do I connect the CM125/2000/2125 to IBM 9500 monitors?

The IBM 9500 monitors use pin 4 on the video connector for the monitor to sense the horizontal sync frequency. Since this is a non-standard configuration, the Sencore 39B274 adapter (#4) used for standard VGA connectors will not match this setup.

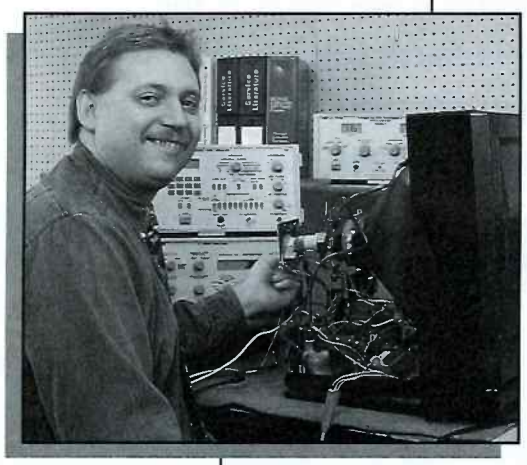
You can use the Sencore Universal Connector (39B273), however, and custom wire it for the 9500 monitor's input configuration. Following is the proper configuration:

Universal Connector Color	IBM Pin Number
Brown	1-red video
Red	2-green video
Orange	3-blue video
Green	13-H. sync
Red/White	14-V. sync
Blue, Purple, Slate, White	6-8, 10-gnd

Call 1-800-SENCORE
with all your Sencore equipment questions!

Your "Bench Advantage" To Giving Accurate Estimates

Use Your VG91 Universal Video Generator & TVA92 TV Video Analyzer For The Most Accurate Estimates Possible



By Brad Johnson
Communications Product Marketing Specialist

Sencore Electronics

How many unrepaired TVs are sitting around that don't belong to you, but nobody has come around to pick them up? Why weren't the estimates OK'd on these sets? Why didn't those potential customers come back to get their set?

The answer is fairly obvious, but it may not be something you want to hear. It's possible that these customers just couldn't afford the repair charges right now. But, is it possible the estimates you gave were more than the customer felt the repair was worth, forcing them to wait? Did the high estimate encourage them to buy new versus repairing their old set? But you had to give a high estimate to make sure you didn't get stuck with an expensive component that wasn't part of your estimate. Did you know there's a way you can protect yourself from this scenario?

We've outlined some methods and strategies in this article that will protect your service center from becoming a storage area for unrepaired sets. By running a few simple performance and diagnostic tests before giving your estimate, you will have the confidence you need to give an estimate that will be accurate even after the repair is finished. You'll increase your approved estimate rate, increase your profits, and your service center won't become a graveyard for deceased TVs.

Accurate Estimating With The TVA92 TV Video Analyzer

If you were to ask 10 technicians where they spend a majority of their television troubleshooting time, 8 of 10 will tell you "shutdown problems." But are they really all shutdown problems? Some are startup, shutdown, or vertical drive, while some are switch mode power supply problems. The reason for some of the confusion is simple. It is difficult to diagnose all these problems accurately without making some assumptions and/or guesses.

The real problem is that all these types of problems can cost you right from the beginning. How can you provide an accurate estimate to the customer when you're staring at a blank television screen? Here's where you use your "bench advantage" - the TVA92 TV Video Analyzer, companion unit to the VG91 Universal Video Generator.

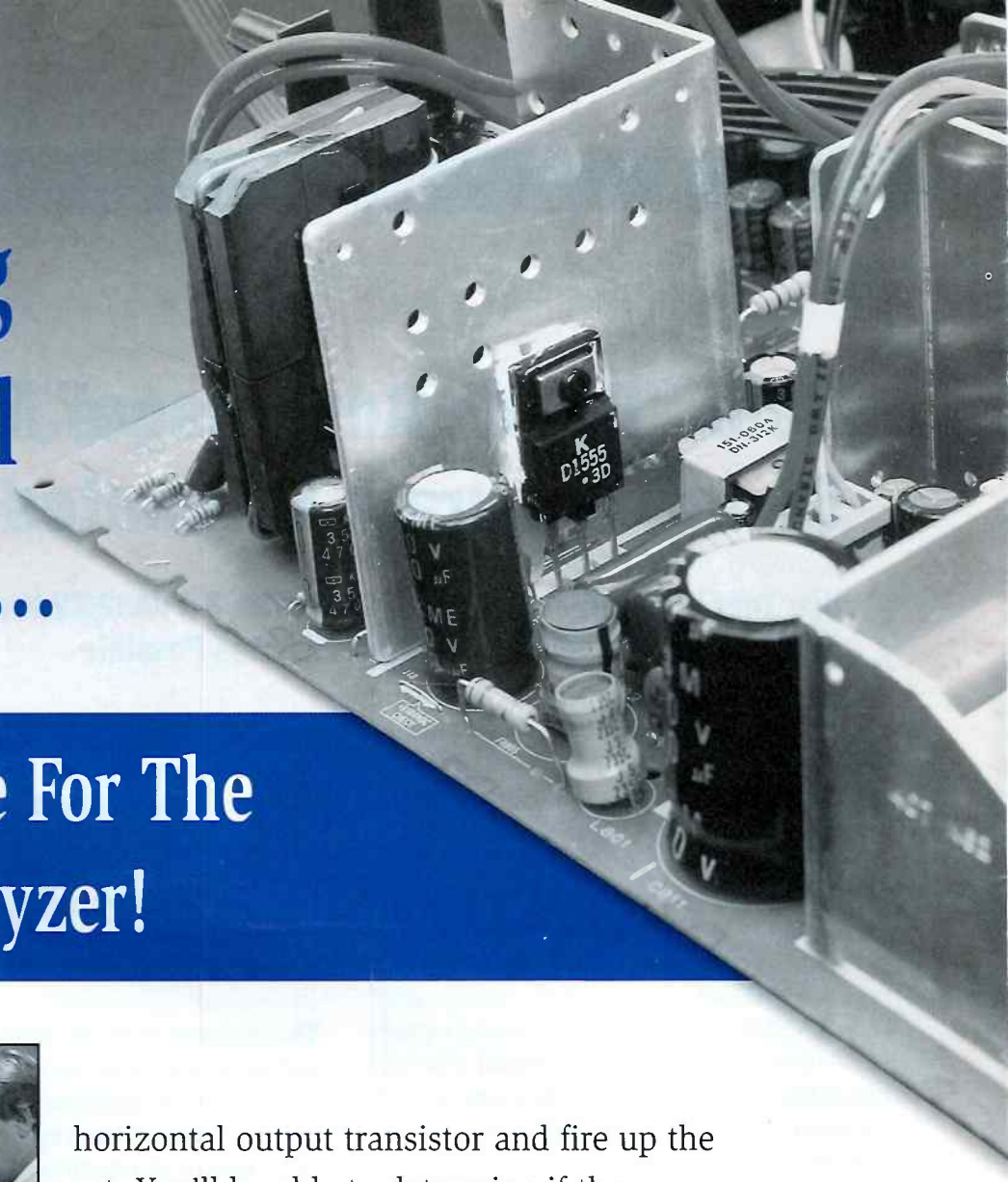
The TVA92 is specially designed to take the guesswork out of estimating all types of TV vertical, horizontal, and power supply problems. As we mentioned earlier, it is very difficult to diagnose something you can't see, and in the case of a shutdown problem, it takes longer to hook up your probe than for the television to go into shutdown. This leaves you no time to make voltage or waveform measurements.

Fig. 1: The TVA92 TV Video Analyzer can help you save money by providing faster and more accurate estimates.

You can make a guess and replace the burnt parts, but you run the risk of burning up these new parts. Will the customer pay for those parts willingly? The other alternative is to over-estimate the cost of repairing the television to protect yourself against the worst case scenario, but then you run the risk of having the customer say, "That's too much for this TV, I'll just buy a new one." That leaves you standing there with no work and bills to pay.

To prevent this situation from happening, consider trying the following methods and procedures, some of which use your VG91 Universal Video Generator and TVA92 TV Video Analyzer. Using these methods guarantees you'll have less headaches and greater success in transforming estimates into profits for your pockets.

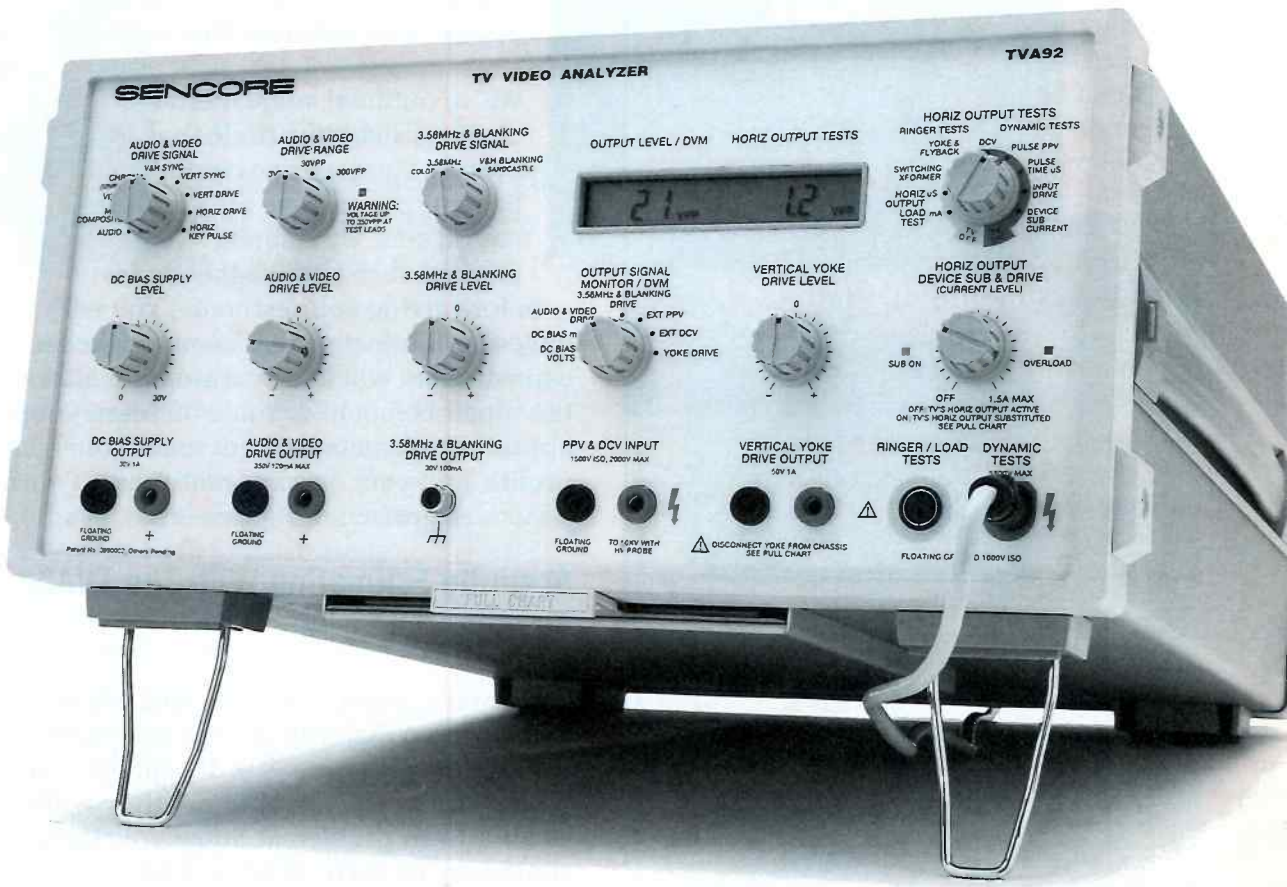
When Substituting For The Horizontal Output Transistor....



There Is No Substitute For The TVA92 TV Video Analyzer!

Now you can actually substitute for a TV's horizontal output transistor. The TVA92 TV Video Analyzer increases your troubleshooting efficiency by giving you the capability to substitute for the horizontal output transistor and fire up the set. You'll be able to determine if the problem goes beyond the output transistor into more expensive parts (such as the flyback). Your estimates will be more accurate and your productivity will rise. And that means profits will increase.

TECH CHOICE SYSTEM *If you'd like to learn more about the TVA92 TV Video Analyzer and how it can help your horizontal troubleshooting, call us today at* ***1-800-SENCORE!*** *It's part of the "Tech Choice System".*



* *The TVA92 is a companion unit to the VG91 Universal Video Generator.*

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Test Major Components First To Prevent Losses Later

Before you give the customer an estimate or begin any troubleshooting, you should confirm the customer's symptoms. A good rule of thumb is to test the major (expensive) components first. Let's face it, if one of these components is bad, the chances of your customer wanting to follow through on the repair are reduced significantly.

Let's begin with the CRT. If it is an older set, it's best to test the CRT before going any further. A set with a bad CRT is going to be very expensive to repair. And when the cost of a new set is comparable to the cost of replacing a CRT, chances are you won't be repairing that set for a customer. In the cases where the CRT tests good, but shows marginal cutoff or a weak gun, you can rejuvenate it with your CR70 "BEAM BUILDER" and move on to the next high dollar area of concern. If the CRT is beyond repair, knowing that fact up front may save you hours of troubleshooting time, only to discover the CRT is bad at the end.

The next sections or areas you'll want to check are the shutdown, vertical, and horizontal stages. Here's where your TVA92 TV Video Analyzer can pay for itself time and time again.

Whether you have a dead set or a set with marginal problems, the horizontal output transistor (HOT) is usually the best place to start testing or troubleshooting. The HOT is possibly the single most important test point in a TV. The horizontal output stage is the key to detecting power supply loading and "power up" problems. It's also responsible for taking current (power from the B+ supply) and transferring it to much of the TV circuitry through the flyback transformer. Plus, the timing action of the horizontal output stage determines the amplitude of the flyback pulse that is used to develop the TV's high voltage.

Can you see a problem here? If the HOT is shorted or open, the set is basically non-operational. And how do you make an accurate estimate on a set like this? Will simply replacing the HOT solve the problem?

This is where your "bench advantage" comes into play. The TVA92 performs a circuit load test that allows you to detect high current loading or shorted conditions in the horizontal output or B+ supply circuits with no AC power applied to the TV (see Fig. 2). This exclusive test works by simulating the operation of the horizontal output stage while measuring the loading and timing of the resultant signals. You simply hook up three clips to the chassis, and test.

If you get a "GOOD" reading from the TVA92's Horizontal Output Load Tests, you can confidently say that the IHVT and yoke are okay and move on to the next stage. If you receive a "BAD" reading from the TVA92, you'll need to isolate whether it is the yoke, IHVT, or surrounding components using the TVA92's Ringing Test and conventional methods before you call the customer with an estimate. The problem may appear as if either the yoke or IHVT is shorted, but could be caused by an inexpensive diode, capacitor, or resistor (see Fig. 3). The rule here is to be sure before you call the customer. It could be the difference between finishing the repair and getting paid, or storing a TV for several months.

The TVA92 also allows you to simulate the normal operation of the TV's horizontal output stage by substituting directly for the horizontal output transistor. Three simple connections and you're ready to completely test the vital horizontal section (and other sections) of any television. You'll also want to test the television's

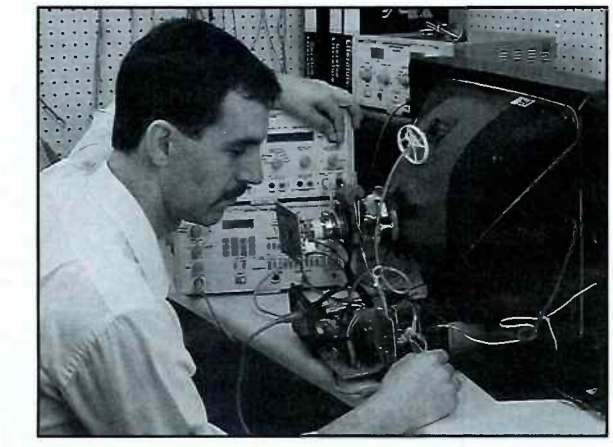


Fig. 2: The TVA92 detects high current loading and shorted conditions in the horizontal output circuit without turning on the TV.

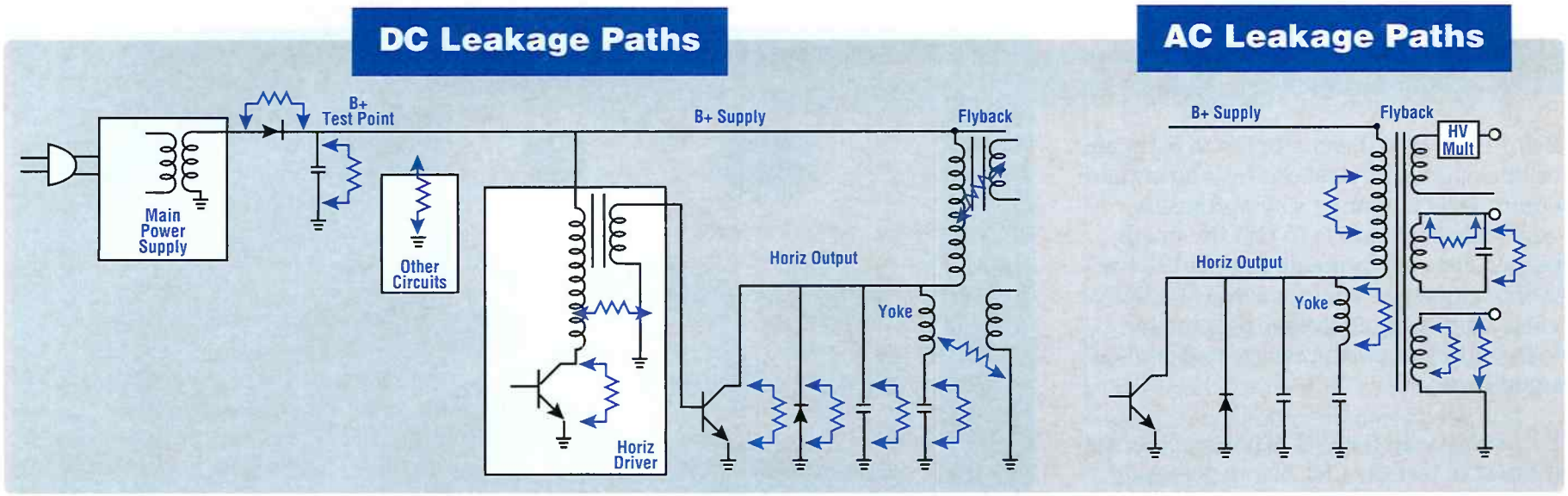


Fig. 3: Possible short or leakage paths which can load down the TV's B+ power supply.

power supply before you make an estimate. Again, there are some expensive components here, and you will want to make sure you aren't surprised by an expensive oscillator IC or switching transformer before you give an estimate to the customer.

Quick Tuner/IF Testing Saves Money And Reduces Confusion

The tuner of the television is a section that will trip up many technicians. To replace a tuner these days is very expensive and once again can approach the cost of buying a new television once you add labor and replacement parts into the set. Once you have repaired any problems in the power supply, horizontal, or vertical stages, be sure to make a quick performance test of the tuner using your VG91 Universal Video Generator.

With the number of channels that are now available from most cable companies, you'll want to test the set on the lower, midband, and hyperband channels. Testing the tuner section with your VG91 also allows you to review the picture clarity, color, and hue from a known good signal before you make your estimate to the customer. This could save you from callbacks once the customer gets the television back home and also provides a valuable customer service.

The VG91 provides accurate reference test signals and adjustable levels to fully test any NTSC video system. You can observe the operation of the video system by viewing the CRT, or by using an external video monitor or "Waveform Analyzer" to monitor the video output.

The VG91's tests fall into two general categories: 1) Testing tuner/IF circuits, and 2) Testing video and audio processing circuits. If you are testing tuner/IF circuits, apply the VG91's RF signals to the tuner input. To test audio and video processing circuits, apply the VG91's standard output signals to the corresponding Y/C, video, or audio input jacks.

Fully Analyze Any Video Tuning System

Cable ready tuners require extensive testing to ensure correct operation. Cable TV systems shift channel frequencies as much as 2 MHz from standard broadcast or conventional cable frequencies. Therefore, cable ready tuners must perform a tuning search to locate these shifted carriers. This digitally controlled search occurs when a channel is selected. A cable ready tuner may have problems tuning to either off-air or cable channels, have trouble tuning to shifted cable channels, or have trouble tuning to specific channels.

Imagine how much easier it would be to diagnose and troubleshoot TV tuning systems if you had access to every TV channel. Imagine having these channels with analyzing video test patterns and mono/stereo SAP audio test signals. This is really what the VG91's RF Generator is all about. The VG91 has four RF functions: STD TV, STD CABLE, HRC CABLE, and ICC CABLE.

Use the "STD TV" position of the VG91's RF-IF SIGNAL switch to test single channel or non-cable ready tuning systems. Use the "STD CABLE," "HRC CABLE," or "ICC CABLE" positions to duplicate the cable system that the tuner must receive or to test the tuning search function of the digital tuner. It's important to test several channels in each tuning band.

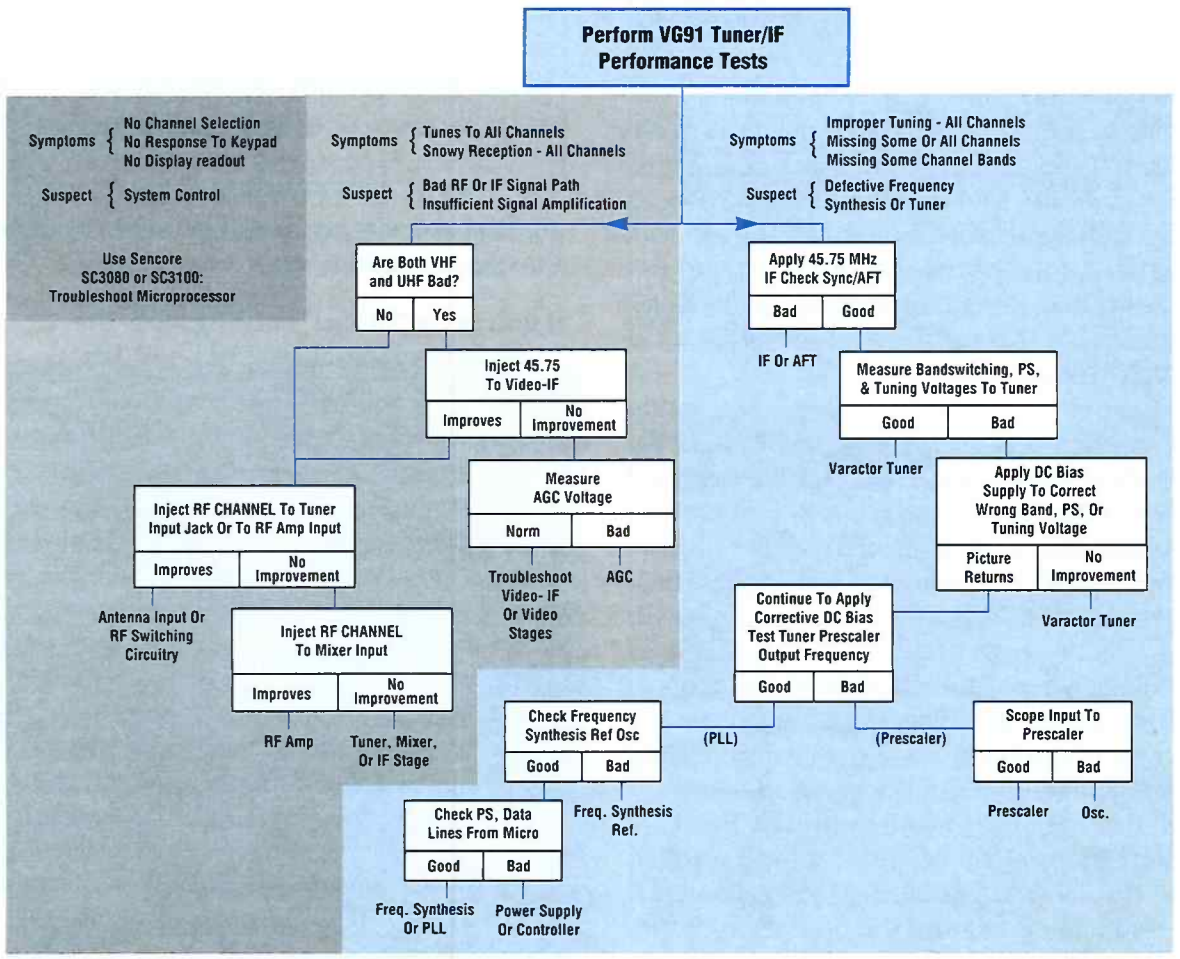
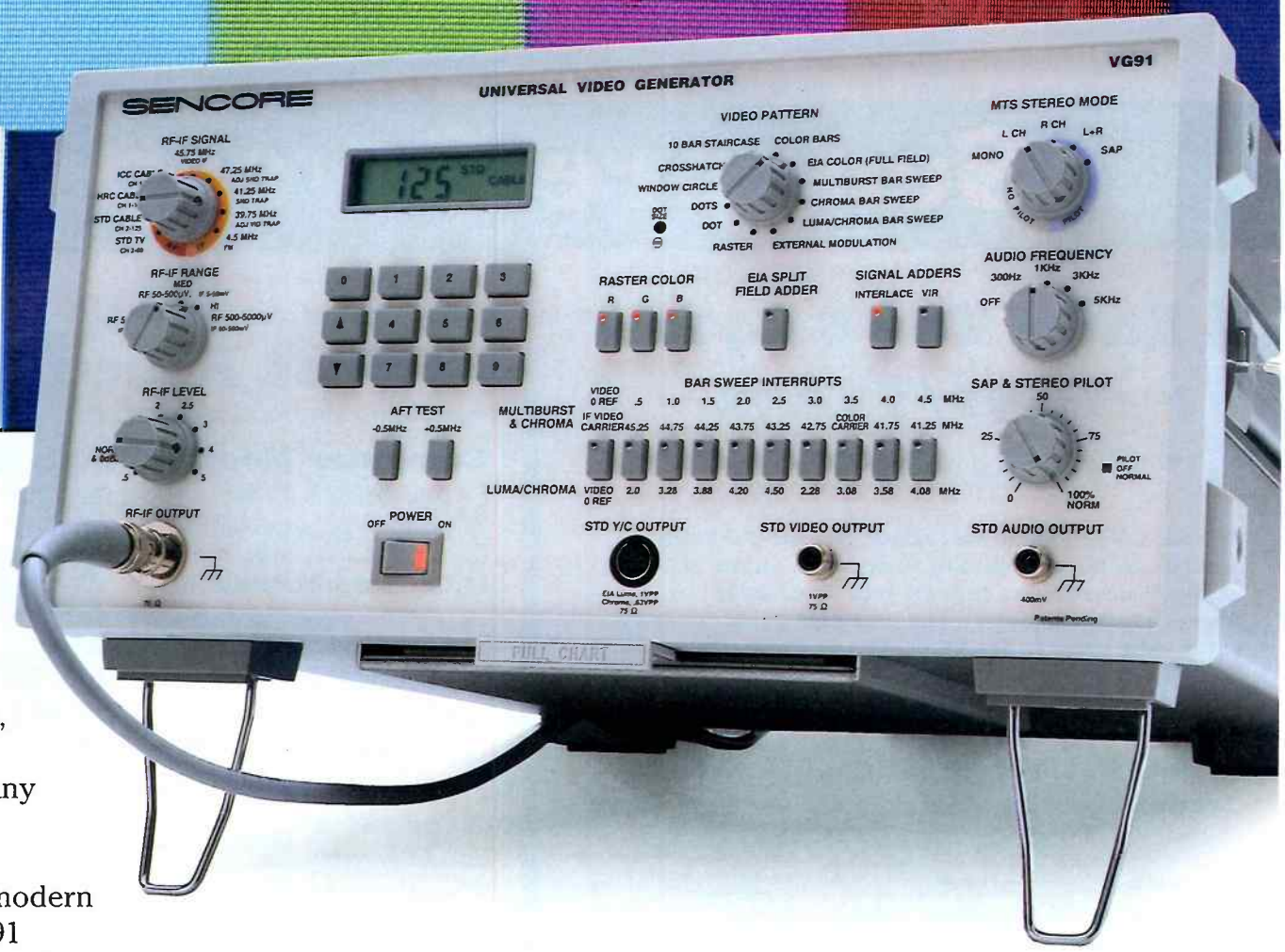


Fig. 4: Follow this guide to troubleshooting TV tuning systems with the VG91 Universal Video Generator.

Are You Getting The Picture?



Things start to happen in video troubleshooting when you get a picture. And when you get that picture, you need the signals, accuracy, and flexibility to analyze the performance of any video stage – fast.

Now there's a tool to tackle modern video challenges. It's the VG91 Universal Video Generator, an all-purpose video generator with all the accurate test signals combined into one easy-to-use instrument. The VG91 is a complete, all channel RF/IF/MTS Universal Video Generator designed to performance test and isolate defects in any NTSC video system.

TECH CHOICE SYSTEM

As part of the "Tech Choice System", the VG91 is the video system you can't outgrow – get the picture?

The VG91 Universal Video Generator is a tool you can depend on for years. For complete information on the VG91 or the "Tech Choice System", give us a call toll-free at **1-800-SENCORE.** (736-2673)

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Direct (605) 339-0100 Fax (605) 339-0317

To test a TV tuner, hook the RF-IF cable to the antenna input, select the VG91 channel, select video and audio test signals, and adjust the RF output level to 1000 µV. Select the tuner channel to match the VG91 and observe the video output to confirm proper reception. The tuner should produce a good picture and audio output. Switch through various channels and tuning bands for a thorough test.

Isolate IF Problems To The Defective Stage

IF stages amplify the video-IF from the tuner and reject adjacent signals. Improper gain or response causes snowy video pictures, loss of picture detail, interference from adjacent cable channels, or poor sound. IF problems produce symptoms similar to those of tuner problems misleading many servicers.

The VG91 provides modulated IF signals to troubleshoot or align video-IF or audio-IF stages. The VG91's IF Generator has three main sections: 1) 45.75 MHz video IF, 2) Video IF trap setting signals, and 3) 4.5 MHz sound IF generator. The IF signals are fully adjustable and modulated with video and/or audio.

To isolate tuner or IF problems, use the VG91's 45.75 MHz video IF signal to substitute into the first IF stage. Adjust the IF output of the VG91 to match the level of the IF stage, and monitor the results by viewing the CRT or VIDEO OUTPUT jack with a scope. If the video output is good with the proper frequency response, the IF stages beyond the point of injection are good. If the output is bad, continue to substitute the 45.75 MHz Video IF signal into latter IF stages to isolate the defect. The VG91's IF trap signals insure proper rejection to adjacent channel signals to eliminate interference on receivers hooked to cable systems. Use the VG91's IF trap signals to recreate the interfering carrier when testing or aligning the IF traps.

Observe the CRT and/or oscilloscope display as you adjust the appropriate trap coil for the least interference or noise.

To troubleshoot audio problems, use the VG91's 4.5 MHz FM signal to inject into the audio IF stages. Adjust the output level of the VG91 to match the level of the IF stage. If proper audio is heard from the speaker, the IF stages beyond the point of injection are good. Continue to substitute the 45.75 MHz Video IF signal to isolate the defective stage.

As you can see, the proper procedures and test equipment are essential in protecting yourself against inaccurate estimates, lost profits from high estimates, and wasted time troubleshooting the problem. If you would like more ideas about keeping those "dead" sets out of your service center, call your Area Representative toll-free at **1-800-SENCORE** today and ask about Sencore's "bench advantage!" SN

Sencore Sweepstakes

Enter The $4,490 VG91/TVA92 Sweepstakes!

Fill out the following worksheet and use your final number on the sweepstakes entry card on the outside of this Sencore News (or call your Area Sales Representative to enter). Mail the card to us and we'll enter your name in the VG91/TVA92 Sweepstakes.

Save 4,680 Per Year!

How Could More Efficient Horizontal Troubleshooting Affect Your Bottom Line?

	Example Savings	*Your Savings*
(A) Parts:	$15	_____
(B) Labor:	$25	_____
(C) Estimate:	$25	_____
(D) Time:	$25	_____
Total:	$90	_____
	x 52	
Total yearly savings	$4,680	_____

Example Savings:
(A) Parts savings – 1 horizontal transistor ($10), power supply IC ($3.50), fusible resistor ($1.50)
(B) Labor savings – soldering/unsoldering and ordering parts, 1/2 hour at standard rate
(C) Estimate savings – profit from 1 more repair each week
(D) Time savings – faster TV servicing allows you the extra time for a minimum of 1 extra repair per week.

Call 1-800-SENCORE now to start adding _____ to your bottom line!

Meet Sencore's Most Recent WINNERS!

Computer Monitor Analyzing Package

For participating in the Sencore Computer Monitor Analyzing 1995 Study, Pine Plaza TV of Fergus Falls, MN was selected the winner of the Computer Monitor Analyzing Package. The winning package (worth over $4,500) consisted of the following:

- CM2125 Computer Monitor Analyzer
- Computer Monitor Troubleshooting Self Study Guide
- Computer Monitor Interface Adapters
- Computer Monitor Reference Guide
- Video Tape Intro To Computer Monitor Repair

Congratulations to Pine Plaza TV!

Pine Plaza TV
Fergus Falls, Minnesota

VCR/Camcorder Sweepstakes

John Cunningham of Cunningham's Electronics was the name drawn for the $10,000 VCR/Camcorder Sweepstakes. John told us he had completely forgotten about the sweepstakes, but it couldn't have come at a better time. Here's what he won:

- VC93 All Format VCR Analyzer
- CVA94 "Video Tracker" Camera Video Analyzer
- VR940 Video Reference
- SC3100 "AUTO TRACKER"

Congratulations John!

John Cunningham
Cunningham's Electronics
Campbellford, Ontario

"Touch And Test" Your Way To Success With The SC3100 "AUTO TRACKER"™

If There's A Faster Method Of Analyzing Waveforms And Circuits – Buy It!

By Larry Schnabel
Sencore News Editor

Sencore Electronics

That's a bold claim, but we stand behind it 100%. The SC3100 "AUTO TRACKER" is the fastest and most complete waveform and analyzing system on the market. You simply move from test point to test point without reaching to adjust knobs or menus. The "AUTO TRACKER" is guaranteed to be the easiest to use waveform and circuit analyzer on the market - or we'll refund every penny of your investment. That's our promise to you.

But the real test for a waveform analyzer is seeing how it works in real-life situations. In this article, we'll show you the strategy how to analyze and/or align several key troubleshooting and analyzing waveforms with the SC3100 "AUTO TRACKER" Automatic 100 MHz Waveform & Circuit Analyzer. Carefully follow each example and compare it with your present methods. I think you'll see how the SC3100's "Touch And Test" approach to troubleshooting is the way to go. We'll analyze the following critical waveforms:

1. ***Horizontal Output Pulse***
2. ***VCR Headswitching***
3. ***VCR Tracking Fix***

We've chosen these signals because they are common signals that you may have already tried to analyze using another oscilloscope. And since these signals are common signals to many servicers, you've probably experienced some of the time consuming problems they present. So while reading this article, reflect back to your current waveform analyzing strategies, then think about the time you could save with an SC3100 "AUTO TRACKER."

#1 Safely Analyzing The Horizontal Output Pulse

Of all television and computer monitor waveforms, the horizontal output collector pulse is considered one of the most important. This pulse is responsible for high voltage and focus voltage production, blanking, and often a host of scan derived voltages, besides providing horizontal deflection.

Fig. 1: Only the SC3100 "AUTO TRACKER" lets you safely view the typical horizontal output pulse up to 2000 VPP without adjusting knobs or menus and without risk of damage to its input circuits.

But one problem prevents competitive oscilloscopes from analyzing the horizontal output collector pulse - the amplitude of the pulse. The horizontal output pulse ranges from 500 to 1,500 volts peak-to-peak. This pulse can cause serious front-end damage since the amplitude is several times greater than the input rating of most oscilloscopes (typically 200-500 volts).

The SC3100's exclusive 2,000 volt measuring range allows you to view and analyze the 500 to 1,500 volt peak-to-peak signal produced by these horizontal output stages. Only the SC3100 allows you to safely measure this pulse, while other scopes would likely be damaged by this high-powered signal. Even if you should happen to leave the SC3100's VOLTS/DIV control in the .02 V position, no damage will result. What would happen to your scope if you connected to this point and left the vertical attenuator in the .02 V position?

NOTE: *Always plug a hot chassis TV or monitor into an isolation transformer such as the Sencore PR570 "POWERITE II" before you begin troubleshooting with any test equipment.*

Here's how to analyze the horizontal output pulse with the SC3100:

1. Connect the SC3100's probe to the collector of the horizontal output transistor and ground to circuit ground.
2. Set the TIME/DIV and VOLT/DIV switches on the SC3100 to "AUTO" and observe the waveform.

It's that simple – and you'll be looking at two crisp, clear cycles of the signal. You'll want to carefully examine these waveforms for symmetry, extra ringing pulses, or the presence of a deep saddle. Any one of these symptoms could be the cause of present or future problems in the chassis which could create a callback. You'll want to investigate these symptoms further. But the "AUTO TRACKER" doesn't stop analyzing with just waveshape, and neither should you.

Now, you just press the "DCV" button and read the LCD. The displayed voltage should agree with the amount shown on the schematic (usually 110-130 VDC). Then press the "VPP" button and read the LCD. The measured voltage should be within 50 volts of the amount shown on the schematic (if shown). The peak-to-peak amplitude for this signal is usually between 500-1500 VPP.

Fig. 2: The "AUTO TRACKER" lets you measure the pulse width between the 10% amplitude points to check for proper timing (11.3-16 µS).

It's also very important to measure the retrace time of the horizontal pulse with the SC3100 "AUTO TRACKER" (refer to Fig. 2). To measure the retrace time, simply press the Delta Time button, adjust the Delta Begin and Delta End controls, and read the LCD display. The normal range for horizontal retrace time is 11.3 to 16.0 µS. Anything below or above this range indicates a problem. Here's what to look for in a horizontal output pulse:

Waveshape – The horizontal output waveform should look like Fig. 1. It should be symmetrical, free from extra ringing pulses, and should not contain a deep saddle. A deep saddle indicates an excessive load, possibly a shorted turn in the flyback. Extra ringing pulses indicate a cracked core in the flyback, bad damper, or drive signal problems.

DCV – The DC voltage is normally between 110 to 130 volts, but be sure to check the schematic for the exact amount. If this voltage measures incorrect, check the B+ regulator circuit or possible loading of the supply.

Pulse Amplitude – The amplitude of the output pulse ranges from 500 to 1,500 volts, depending on the chassis. The measured PPV amplitude should be within about 50 volts of the amplitude shown on the schematic. Readings that are considerably different from the schematic value indicate problems with the flyback, load, or drive signal.

Pulse Width – The duty cycle measurement can be considered one of the most important parameters. A normal pulse width (which is the output stage retrace time) varies from approximately 11.3 to 16 microseconds. A retrace time less than 11 microseconds indicates excessive loading such as a shorted flyback turn, excessive flyback load, or a retrace capacitor that has decreased in value. A pulse width longer than 16 microseconds indicates a problem in the yoke circuit.

#2 Adjusting VCR Headswitching The Easy Way

All VCR alignment instructions require you to adjust the headswitching signal for maximum video performance. But why is the headswitching adjustment so important? Here's why:

VCR circuits produce a visible noise bar when they switch from one spinning playback head to the other. If headswitching occurred halfway between vertical sync pulses, the picture would have a noise bar in the middle of the screen. On the other hand, if headswitching occurred during vertical sync, the picture on the TV receiver or monitor connected to the output would roll or jitter vertically. Either scenario could result in a dissatisfied customer and/or a callback.

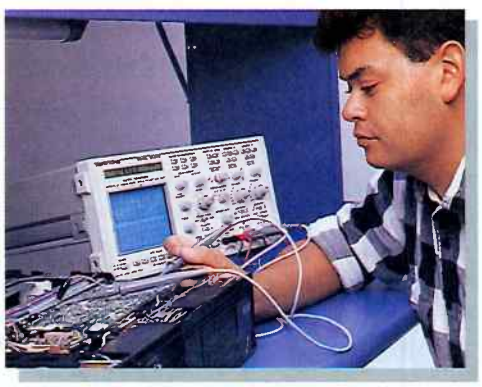
Speed And Performance!

SC3100 "AUTO TRACKER"
Automatic 100 MHz Waveform & Circuit Analyzer
Patented

The Fastest Measurement To Measurement Analyzer On The Market!

One probe connection is all you need to put the SC3100 "AUTO TRACKER" into the race of electronic circuit analyzing. You can track and measure the key parameters of any waveform at the push of a button for fast, precise troubleshooting.

The easy-to-use 100 MHz, dual trace oscilloscope has autoranged time-base and vertical attenuators so you can concentrate on the circuit – not on readjusting knobs and controls. The exclusive delta functions combined with the ohm/current meter provide you with troubleshooting performance without changing course to swap leads or meters.



To fully appreciate the speed and performance of the SC3100 "AUTO TRACKER," you need to use it on your bench – full speed ahead. Prepare yourself for high performance!

Call us for a no-obligation SC3100 "AUTO TRACKER" test drive today. You'll feel the difference in performance from the first measurement.

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To prevent a visible noise bar or interference with vertical sync, the VCR circuits are adjusted to switch video heads during the last few lines of each vertical field. The "Head Switch" (Head PG, Head Shifter, etc.) adjustment changes the timing of the head switch squarewave signal relative to the vertical sync pulses - placing the noise bar at the very bottom of the screen, below the viewable picture.

The SC3100 "AUTO TRACKER" provides stable triggering and a sharp, detailed waveform to view the headswitching waveforms with ease. The SC3100's fiddle-free sync circuits let you view the waveforms and make the VCR adjustment without worrying about adjusting the "AUTO TRACKER's" controls. Here's how you set up your "AUTO TRACKER" to perform the headswitching adjustment:

1. Connect the SC3100 probes to the test points specified in the VCR's service literature (usually the SW30 and the Video Out signal).
2. Set the TRIGGER SOURCE control to the channel connected to the 30 Hz signal.
3. Set the TIME/DIV switch to "1 mS", leave the VOLT/DIV switch on "AUTO", and observe the waveforms.

Turn the Horizontal Vernier control counterclockwise until the transition in the SW30 signal just becomes visible. Now, adjust the HORIZONTAL POSITION control to place the square wave transition on the CRT's center graticule. Then pull the HORIZONTAL POSITION control outward to expand the waveforms by a factor of ten.

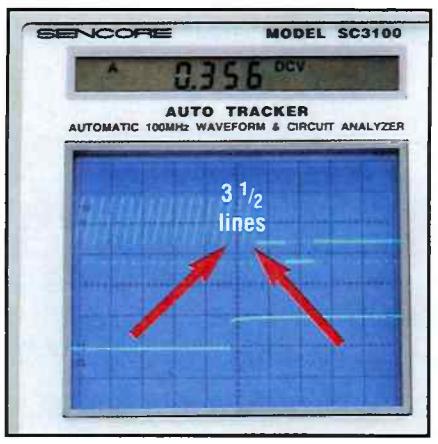


Fig. 3: The "AUTO TRACKER" lets you make the head switching adjustment with plenty of detail to satisfy your customer and prevent callbacks.

When you play back the VCR alignment tape, the CRT display will look like the photo in Fig. 3. Notice that you can clearly see the horizontal sync pulses ahead of the vertical sync interval. Set the VCR's PG adjustment so there are 3 1/2 horizontal lines before the start of vertical blanking, or 6 1/2 lines before vertical sync (check service literature for exact spec's). If the video signal contains equalizing pulses, be sure to count only every second pulse. For a more detailed explanation, call your Area Sales Representative for a free copy of the Tech Tip explaining VCR headswitching.

#3 Setting VCR Tracking Fix Helps Insure A Quality Repair

Another common VCR adjustment is called "Tracking Fix." The Tracking Fix adjustment electrically centers the detent of the front panel Tracking control of the VCR. This adjustment provides the best Tracking control range for the times when your customer (or you) need to adjust the Tracking control to get a good video image. Electrically speaking, the Tracking control determines the delay between the headswitching square wave signal and the tape's CTL (control track) signal.

Figure 4 shows an example of a typical manufacturer's Tracking Fix alignment procedure. Notice the procedure calls for setting a specified amount of time delay

3-4-1. Tracking Fix Adjustment

TP	AF	MODE	INPUT
TP2005 TP2006	R2022	SP SELF-RECORDING AND PLAYBACK	(VIDEO IN) VIDEO SIGNAL

Tape	M. EQ.	Spec
Blank Tape	Oscilloscope	T-7.3 ± 0.5 msec.

Fig. 4: The typical Tracking Fix procedure specifies the time delay between two signals and provides the best tracking range for your customer.

between the signals. The amount of delay and the specific test points will vary somewhat between VCRs. Most procedures call for setting the time delay between the 30 Hz switching signal and the CTL pulse when the front panel Tracking control is in the center detent position.

The SC3100 "AUTO TRACKER's" Delta functions simplify the measurement and greatly reduce the chance of errors associated with determining the time delay of the signals. Here's how you set up the "AUTO TRACKER" for this adjustment:

1. Connect the SC3100 probes to the test points specified in the VCR's service literature (usually the SW30 and the CTL pulse).
2. Leave the SC3100 controls set the same as earlier for the headswitching adjustment.
3. Press the Delta Time button (make sure the HORIZONTAL POSITION is pushed in for a non-expanded display).

Play back the VCR alignment tape and adjust the Delta Begin and Delta End controls until the highlighted Delta bar

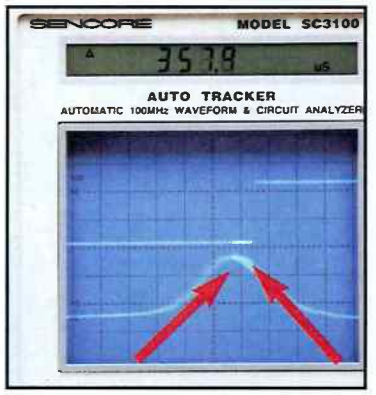


Fig. 5: The SC3100's Delta Bar quickly measures the Tracking Fix adjustment time delay between the two signals.

just covers the delay between the two waveforms, as shown in Fig. 5. Now, read and note the time delay in the SC3100's digital readout. If the time delay is not correct, adjust the Tracking Fix Adjustment and watch the "AUTO TRACKER's" digital display until the delay is correct. For more details on setting the Tracking Fix Adjustment, call your Area Sales Representative for free Tech Tip information.

As you've just read, the SC3100 analyzes waveforms quickly, typically in three steps or less. You'll be able to "Touch And Test" your way to success like you've never imagined. And again, if you find a faster way of analyzing waveforms and circuits, buy it. We don't think you'll go with any other system.

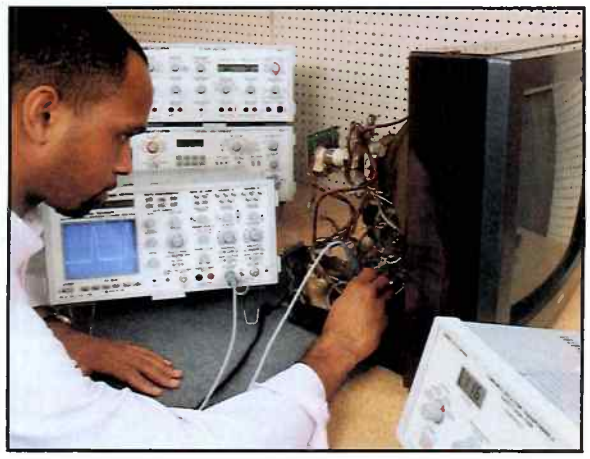


Fig. 6: The SC3100 "AUTO TRACKER" lets you "Touch And Test" your way to faster repairs and increased profits.

If you'd like to learn more about the SC3100 "AUTO TRACKER" Automatic 100 MHz Waveform & Circuit Analyzer, call your Area Sales Representative today toll-free at **1-800-SENCORE (736-2673).** We'll help put one on your own bench, risk-free, to prove to yourself how much the "AUTO TRACKER" can speed up your troubleshooting. And with our easy investment terms and special package deals, the opportunity is even better. SN

Giving More Accurate Camera/Camcorder Estimates With The CVA94 "Video Tracker's" Special Tests

By Tom Schulte
Application Engineer, CET

Sencore Electronics

How could you improve the accuracy of your camera and camcorder repair estimates? Can you quickly troubleshoot camera problems to the defective board or component? Are you confident that your completed camera repairs produce satisfactory pictures under all operating conditions?

This article takes a look at how the CVA94 "Video Tracker" Camera Video Analyzer helps you service video cameras with exclusive tests and techniques you won't find anywhere else. The "Video Tracker" has the technology to give you maximum troubleshooting confidence resulting in faster camera service and greater customer satisfaction.

Accurate Camera Service Estimates Are Essential To Future Business

Accurate service estimates are important to your customer and to your success as a camera servicer. After all, only the satisfied customers return to your shop when they require additional electronic service work. And they're the ones who are able to give positive recommendations of your shop to friends and acquaintances.

The CVA94 "Video Tracker" Camera Video Analyzer can play an important role in your video camera estimating process. The CVA94 "Video Tracker," along with the VR940 Video Reference light source, helps you completely check a video camera's operation in a matter of minutes to localize defects to the section of the camera causing the problem. The following series of standard camera tests will help you determine which sections of a video camera are working properly and which are not so you can provide service estimates to your customers quickly and accurately.

✦ Standard Frequency

This test allows you to quickly check whether the camera's master sync generator oscillator is operating at the proper frequency. The master oscillator is divided down to produce the camera's NTSC standard 3.58 MHz burst reference signal and sync signals. If the burst signal is too far from the proper frequency, no color or intermittent color operation will result on some televisions or monitors.

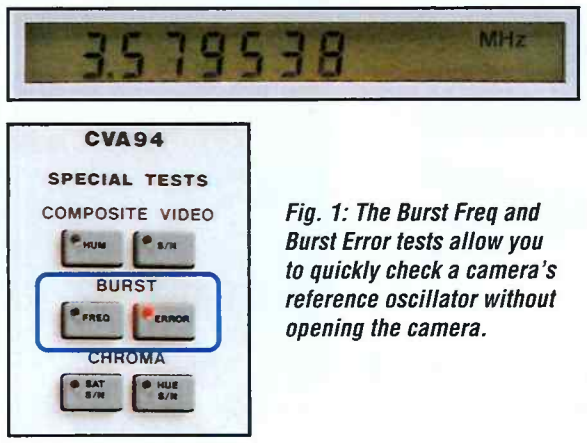


Fig. 1: The Burst Freq and Burst Error tests allow you to quickly check a camera's reference oscillator without opening the camera.

To perform the test, simply press the CVA94 BURST FREQ or BURST ERROR button (Fig. 1). The camera can be framed on any scene, or the lens can be capped. To insure color compatibility, the frequency of the burst output signal should be within 100 Hz (preferably 50 Hz) of the NTSC standard frequency of 3.579545 MHz. To adjust the camera's master oscillator to its proper frequency, push the BURST ERROR button and adjust the camera for zero error.

✦ Luminance Level

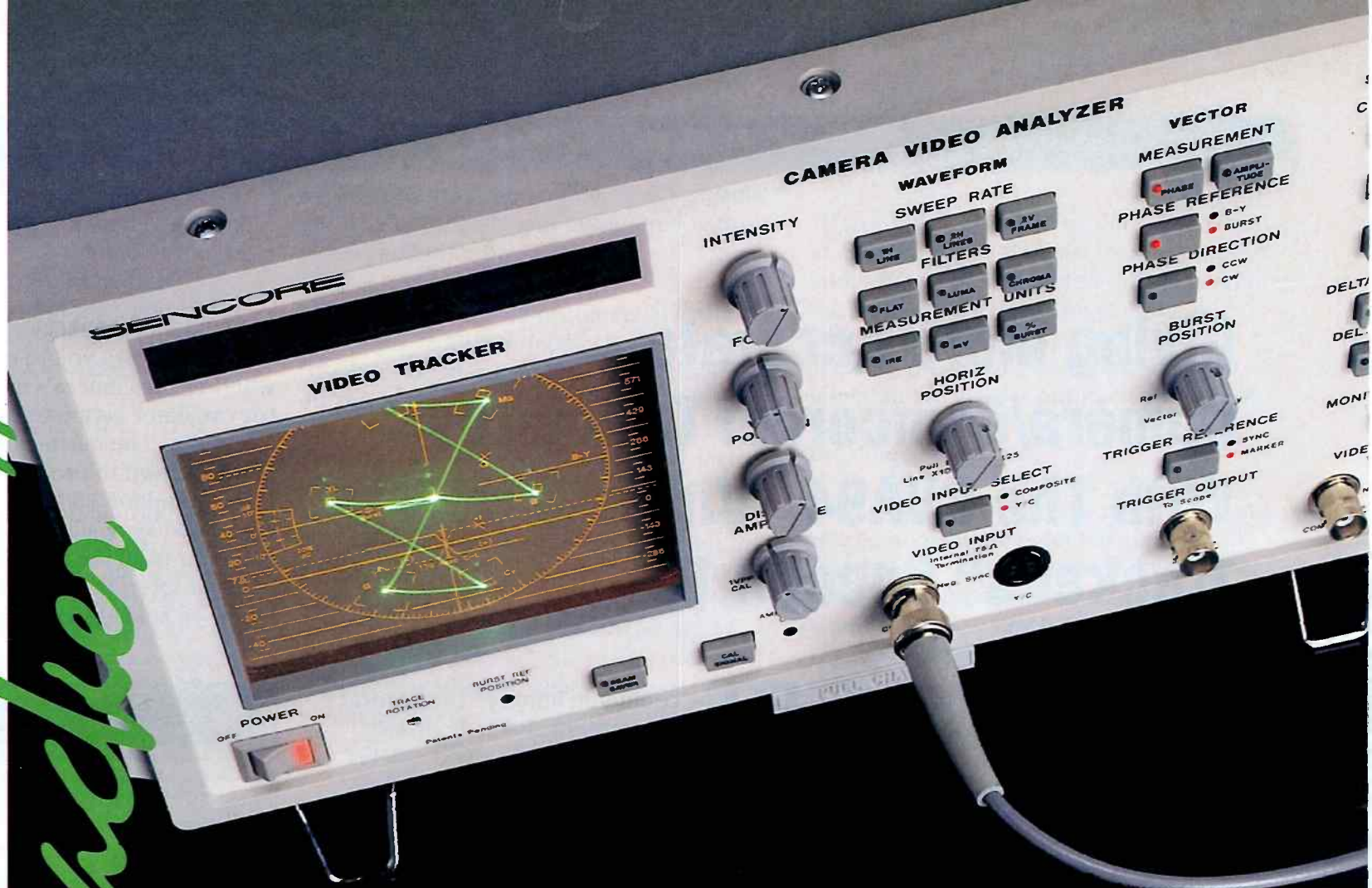
When the camera's luminance stages, including the auto iris (AIC) and automatic gain (AGC) stages, are working properly, the video output level will be constant, regardless of scene light levels. If these stages aren't working properly, the camera's luminance output will be missing, or will be too large or too small at some light levels.

To test the camera's luminance level, frame the camera on the VR940 Gray Scale Chart and press the 1H or 2H SWEEP RATE buttons on the CVA94. The black levels in the waveform displayed on the CVA94 CRT should fall close to the dotted 7.5 IRE line. The maximum white levels should fall close to the 100 IRE line (Fig. 2).

Improper black level indicates a misadjustment or failure of the black setup

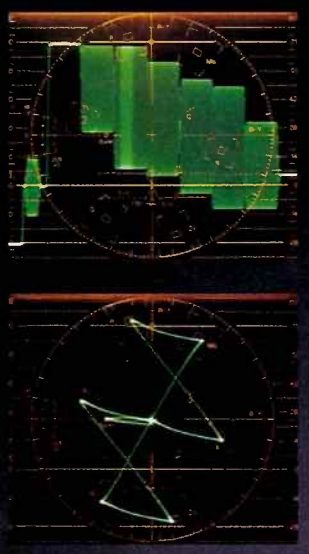
CAMERA VIDEO ANALYZER

Video Trader™ II



"If Only I Could..."

Only one instrument provides you with everything you need to analyze and troubleshoot cameras and camcorders. So, whether you're just getting started or are a seasoned professional, the exclusive digital analyzing tests of the CVA94 "Video Tracker" will help you better service all types of consumer camcorders.



Call 1-800-SENCORE and ask how the CVA94 will benefit your service center. We'll show you what the CVA94 can do for you and provide you with business building ideas to help ensure you a profitable year.

Call 1-800-SENCORE.
(736-2673)

Learn How To Diagnose And Isolate Camcorder Problems!

Call us today about our FREE Hands-On Camcorder Troubleshooting Technical Demonstrations scheduled across the country.

Class sizes are limited, call your Area Sales Representative to reserve your seat.

Fig. 2: The CVA94 shows the resultant video waveform of the VR940's Gray Scale Chart testing a camera's luminance levels to see if they are adjusted properly.

circuit. Improper white levels indicate a misadjustment of the luminance output level or a failure of the AIC or AGC circuits. To confirm which, repeat the test at a low light condition. Insert the Neutral Density Filter behind the Gray Scale Chart and check the level of maximum whites on the CRT display. If the whites are at approximately the same levels as before, the AIC and AGC circuits are working properly to automatically hold the white levels constant. If the white levels change from high light to low light conditions, look into the lens while you change the lighting. If you can't see the size of the iris changing, the auto iris circuit is defective or the lens is jammed. If the white levels are wrong, but are approximately the same at both high and low light conditions, the luminance output level is probably just adjusted improperly.

✦ Video Noise

The quality of the camera's luminance output signal depends greatly on the amount of noise generated in the CCD, prevideo, and luminance process stages. Excessive noise causes the luminance signal to be grainy or snowy. The amount of noise produced is usually compared to the standard signal level and is referred to as signal-to-noise ratio (S/N). Signal-to-noise ratios of 40 dB or greater result in very clean pictures, whereas ratios of 35 dB or less definitely indicate defective luminance circuits.

Fig. 3: The special video S/N test easily identifies noisy camera video signal sources with an automatic, digital readout of the results.

To test the camera's video noise, frame the camera on the VR940 Video S/N Chart and press the CVA94 VIDEO S/N button. The "Video Tracker" measures the video signal and automatically calculates and displays the S/N ratio on its digital display (Fig. 3). If the camera has excessive video noise, perform the chroma noise test to localize the problem even further.

✦ White Balance

In order to produce properly colored pictures, the camera's chroma circuits first have to be balanced to produce no chroma output when the camera is scanning a white or gray (non-colored) area of a scene. A camera with improper white balance will typically produce a picture with an overall reddish or bluish cast. Video cameras typically have manual indoor and outdoor white balance functions as well as an auto white balance function.

> ***"Before I had the CVA94 'Video Tracker,' I basically had no camcorder business. Now, I'm starting to have a steady flow of camcorder invoices of over $100."***
>
> Robert Willis
> Jayse Home Electronics
> Sacramento, CA

To test the camera's indoor white balance, frame the camera on the VR940 Gray Scale Chart, set the camera's white balance switch to "indoor", and press the CVA94 VECTOR PHASE button. Since the camera is framed on a chart containing no color, the camera's output signal should also contain no color information. The CVA94 CRT Vector display should show the burst reference vector extending to the left of center, but no other vectors should extend away from the center of the display.

To test the camera's outdoor white balance, frame the camera on the VR940 Gray Scale Chart with the Temperature Conversion Filter installed behind it, and set the camera's white balance switch to "outdoor." Again, check that the CVA94 CRT Vector display shows no vectors other than burst extending from the center.

To test the camera's auto white balance, set the camera's white balance switch to "auto" and frame the camera on the VR940 Gray Scale Chart, both with and without the Temperature Conversion Filter installed behind it. In each case, the CVA94 CRT Vector display should show no vectors other than burst extending from the center. Improper white balance indicates a problem with the camera's Chroma Process circuits, especially the white balance correction circuits.

✦ Chroma Phase

The phase of a camera's chroma signals determines the chroma hue or tint of the colors in a scene. Improper phase is most easily recognized as wrong fleshtones in camera scenes with people.

Fig. 4: Use the "Video Tracker" to measure a camera's chroma phase. A good camera's red signal output should be within 15° of 103°.

To test the camera's chroma phase, frame the camera on the VR940 Color Bar Chart and press the CVA94 VECTOR PHASE button. Press the left or right DELTA BAR POSITION button to highlight the red portion of the signal both on the CVA94 CRT and on the video monitor display. Read the phase of the camera's red signal on the CVA94 digital display. The red signal should be within 15° of 103° as measured CCW from the B-Y axis (Fig. 4). Press the left DELTA BAR POSITION button to highlight the yellow portion of the signal. The yellow signal should be within 15° of 167° CCW from the B-Y axis. Slight errors in chroma phase indicate the need for readjustment of the camera's chroma phase controls. Large errors indicate a probable defect in the chroma encoder circuits.

The answer to your camera servicing is just a phone call away. Call your Area Sales Representative toll-free at **1-800-SENCORE,** and we'll help put a CVA94 "Video Tracker" and VR940 Video Reference on your bench today. SN

Merrow Electronic Servicing — From A Part-Time Hobby To A Full-Time Passion

Editor's Note: I first visited with Randy Merrow at the NPEC convention in Washington, D.C. this past summer. Both of us were at Sencore's computer monitor training seminar when we talked about his business and the industry. One thing led to another, and now his business is the subject of this Sencore News' Service Center Profile. I think you'll see why Randy was able to make the jump from a part-time business to a full-time profession. Thanks again to Randy for providing the article and photos.

I first got interested in electronics watching my dad work on TVs on his bench. Then I reached out and grabbed a live second anode wire one day. Let me just say, I learned in a hurry why they called it a "flyback."

This all started about 15 years ago as a hobby business. I started fixing TVs out of my home as an extra income maker. While I attended Macomb Community College, my hobby business helped pay the bills and started building business and referrals for the future. After I graduated with an Associates Degree in Electronic Service Technology, I was ready to go full-time. I registered my business in January of 1984.

By Randy Merrow
Owner

Merrow Electronic Servicing

Merrow Electronic Servicing

- ***Owner's Name:*** Randal (Randy) R. Merrow
- ***Business Name:*** Merrow Electronic Servicing
- ***City:*** Mount Clemens
- ***State:*** Michigan
- ***Years In Business:*** 11¾
- ***Products Serviced:*** TV, VCR, computer monitors, FAX, camcorders, most consumer electronic products
- ***Number Of Employees:*** 1 (Randy)
- ***Sencore Instruments Owned:*** LC102, SCR250, CM2125, CM2000, TVA92, VA62, CVA94, VC93, SC3100, SR68, ST65, PR57, CR70, TF46

The first products I repaired were TVs and VCRs. During those early years, that gave me all the work I could handle until I was established and experienced. It was quite a transition from hobby to full-time, but I already had a good customer base and plenty of referrals, so I had an abundance of business.

I moved the business into a commercial building on a busier street near my home in July of this year. Since I moved from working out of my private residence into a permanent site, I've found that people seem to have less apprehensions about bringing items in for service. My customers seem to have a lot more confidence in my abilities now and they respect my opinion more. I think now with my permanent business location, people aren't as concerned about leaving their products with a "bad" business. I haven't had to do a lot of advertising to get business in the door. Word-of-mouth

Fig. 1: Randy Merrow has taken his electronic servicing from a part-time hobby to a full-time servicing business at this new location.

and referrals are the heart of my business and I wouldn't be anywhere without them. I haven't done any Yellow Pages advertising because of the cost, but my business is line listed in all the phone books.

Since we moved into our new building, we have been using a company called Effective Mailers for some advertising. Every month I have them mail out 10,000 coupons and target different areas of my city and surrounding areas. I also do some direct mailers to companies in the area trying to generate some business — especially computer monitor business. They've worked pretty good now that I'm getting established as a monitor repair source. I've started repairing some higher-end monitors now like CADs and MACs. So far I'm doing warranty work on Samsung and Radius monitors.

Besides computer monitors, I work on TVs, VCRs, camcorders, FAX machines,

and most consumer electronic products. I don't like to send any business out the door to a competitor if I can help it. Even if it's a small dollar item, if I can break even on it, they'll be back next time with their TV or VCR, and maybe they'll tell their friends, and so on. That's why I don't need to do much advertising. Word-of-mouth carries a lot more power than any printed ad or mailer.

So far, it seems that I'm taking away the business from my competition. Many customers that come in complain about the other guy. I've made it a policy not to bad mouth them and hope to get the same respect from them. As a member of NESDA, this service center is committed to the highest standards of integrity and professionalism.

Fig. 2: Randy's honesty with the customer and word-of-mouth advertising have been the keys to his success.

Handling Estimates

For estimates, I have been trying a $20 fee if they do not have the product repaired. I must say that it works with limited success. I've found that some people just never come back to pick up their units. You have to draw a line somewhere.

We have so many shops offering the so-called "free estimates." I don't think most people realize that these "free" estimates aren't really free since their estimate is either jacked up in the first place or it's just an average cost that they hope the repair falls under. As the owner of a professional service center, I plan to start collecting estimate fees up front. Once I'm more established in the new neighborhood, I'll feel more comfortable with charging the fee up-front.

The problem of "buying new" or repairing their products can be a problem. Many customers are of the opinion that new is better than repairing the old units.

In some cases this is true. If the unit they wish to have repaired is a very low end unit, I'll agree with that theory. However, if they have a reasonably good product, I explain that a lot of the newer units on the market today are not built with the same quality. I've found that being honest and up front with them has always been the best way of doing business. You may not always get the repair job setting on your counter. But you can bet they will trust you tomorrow for the next time they need advice on whether to repair or buy new.

How Sencore Has Helped

I first started buying Sencore equipment because I found it to be the best product for servicing electronics. I looked at other types of equipment, but only the Sencore gear fit for what I needed in my work. Since I started this all as a hobby business, Sencore also made it easy for me to buy. I couldn't afford to buy the equipment all at once, and making manageable payments helped me to get started.

Since I've been using the Sencore equipment, it's worked very well for me. With all the work that comes across my bench, I can't afford to have unreliable equipment. When I've had questions or needed support on my Sencore equipment, I've gotten good support on their toll-free number. Now as I learn more about the equipment and get more confident, I don't need as much help. It sure helps though to have someone help you as soon as you take an instrument out of the box. The *Tech Tips* and *Sencore News* are great, too.

Most importantly, Sencore equipment has helped increase my productivity. The TV Video Analyzer (TVA92) has really helped me with TV horizontal problems. Without the computer monitor tester (CM2125), I wouldn't be able to repair computer monitors, plain and simple. You can't put a pattern on a monitor screen with a regular video generator. The Sencore gear gives me everything I need even on the high end monitors. The "AUTO TRACKER" (SC3100) scope helps me on almost every repair, too.

Success At Merrow Electronic Service

I have to attribute most of my success here to honest, friendly service. It's one thing to change a set of heads on a VCR and give it back to the customer. But I try to follow through after the repair and explain how the problem could have happened and maybe how it could be prevented. That one-on-one contact with the customer seems to bring them back in the next time they need service work.

I try not to come across as just wanting their money. I've worked hard to get where I am today, and I plan on being here a long time. That means I have to satisfy the customer the first time, and I have to plant seeds for the future. If all my customers came in just once and never came back, I'd be out of business.

To sum things up, there's a lot of opportunity out there if you're willing to work for it. My business went from a hobby to a full time business. I've worked some long hours and put in a lot of perspiration. But now that my business is established and running smoothly, I wouldn't trade it for anything in the world — except for maybe a winning lotto ticket.

Are you just starting your business? Would you like to take your hobby and turn it into a full time profession? Give us a call at ***1-800-SENCORE*** *and talk with your Area Sales Representative about getting started. We can put Sencore equipment on your bench for low monthly investments so you can start off on the right foot.* SN

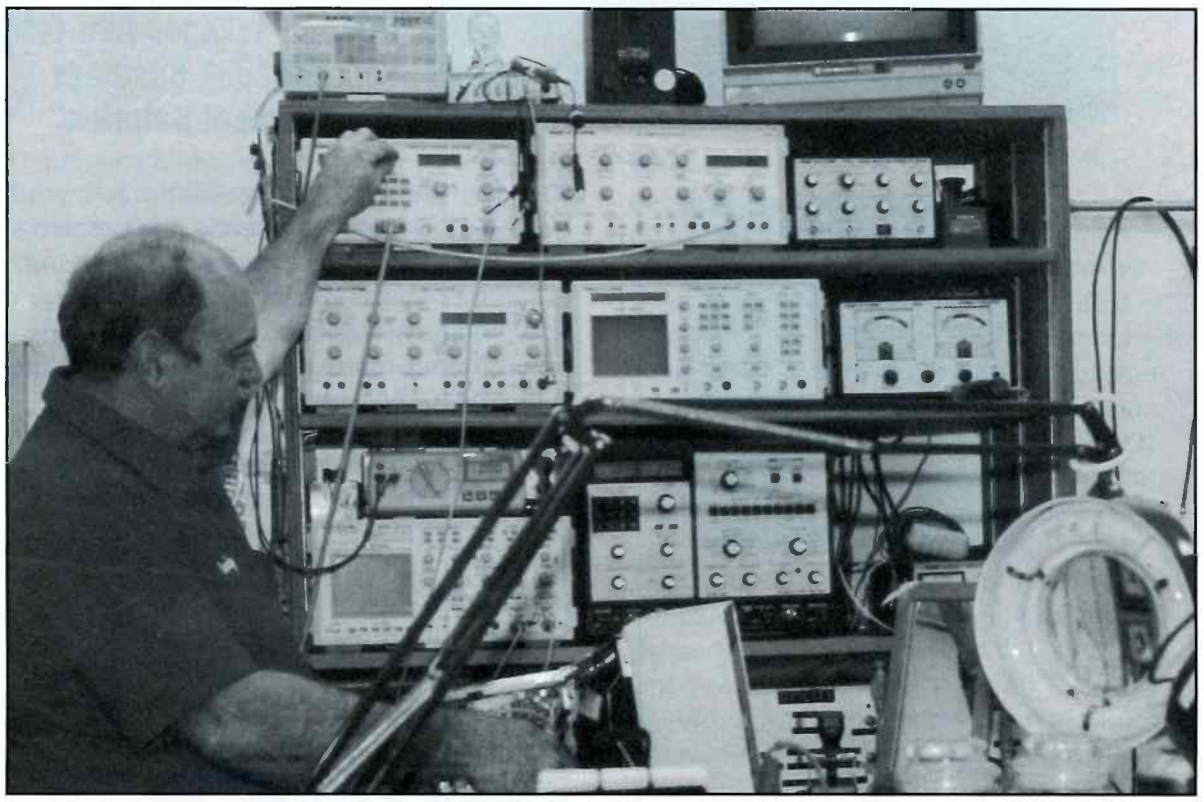
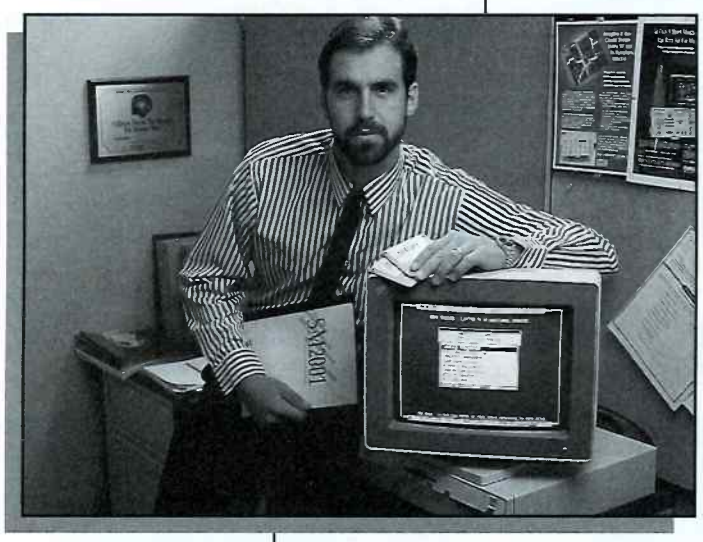


Fig. 3: Randy attributes much of his troubleshooting productivity to his Sencore equipment. He says the equipment fits the needs for his business perfectly.

How Could Your Service Center Become More Efficient?

Earn More Profits By Automating Your Repair Processsing

Business Management Solutions



By Brian Phelps
Market Manager,
Electronic Service Centers

Business Management
Solutions Manager

Sencore Electronics

Managing your business towards success isn't like it used to be. Anyone who's been in the service industry for a number of years knows that the products have changed, the customer has changed, and the revolutions in electronic capabilities has changed almost every aspect of our businesses. To survive in these changing times, many service centers have developed a new strategy of business management.

Today's successful service centers are using the new tools available to them. They're using the marvels of the electronic era as their business partner, and they're ending up on top. Thousands of software users throughout the country have taken the necessary step to incorporate the newer business management solution into their business.

Added Flexibility And Option Packages Add To Your SM2001 Business Management Solution

Sencore is now providing solutions to your business management needs. We're taking our "Tech Choice" concepts and applying them to business management solutions. Now you have the choice of several solutions to your management needs – our line is flexible to fit your strategy.

The module options we've selected are developed to solve specific/unique needs of an individual service center. Each module is fully detailed and adds a specific feature to the SM2001 "Base System." Some modules may be purchased and used separately from the SM2001 Service Center Manager, however, you'll quickly learn that the complete management system is much more powerful than the individual elements.

Here's a brief explanation of the solutions available to help you manage your service center towards success:

Electronic Filing Option
We all agree that the "Base System" is a must for a service center to survive these days, yet other features may fall into the category of "customized to my individual business". That's why, now when you invest in the SM2001 (single user) or SM2002 (multi-user) system, you have the option of which module(s) you'd like to add. For example, if you do a large warranty repair volume and/or want to speed your claim filing – add the Electronic Filing Option to your "Base System."

This option allows you to file all your warranty claims through KeyPrestige – the nation's largest independent warranty claims processor. You'll have an automated link to many electronic manufacturers and you'll be receiving your warranty claims much faster. You'll be keeping the profits where they belong – in your bank account.

Accounts Receivable Option
If you are needing to know exactly where your money is and how customers are paying you – the SM2001's Accounts Receivable Option is there to help. This module will take care of posting payments and credits, invoice aging, month end processing, and more. The Accounts Receivable Option works hand in hand with invoice processing to make managing your accounts quick, easy, and accurate.

These Service Centers Are Using The SM2001 — The New Strategy In Business Management Solutions

See what people in the field have to say. If you'd like to talk with a user of the SM2001, contact your SM2001 Technical Support Specialist, Michael Burakiewicz at **1-800-SENCORE.** He'll put you in touch with users throughout the country – perhaps even one in your area.

ABM VCR Repair
"We save 10-20 minutes on every invoice."

Garrett Electronics
"It does the work of three people."

Wilson Enterprises Of Maine
"We spend about 1/10th of the time used previously to invoice customers and track history."

Howard Sams Index

One of the leading challenges faced by service centers lies in the area of service literature. Do you have it on hand? Is there one close enough to use? Are you going to have to order the manufacturer's literature or is there something more affordable available? The Howard Sams Index Option solves many of the service literature questions you may be running into. Access to the index is quick and easy while in the SM2001 Service Center Manager.

Now you can check on the service literature while the customer is checking-in their product. You'll be able to quickly scroll by manufacturer and model/chassis number to locate the schematic you need. This allows you to identify if you'll be needing to order the literature and accurately predict your repair timeframe and your business' image, in your customer's eyes, will improve.

VCR Cross Reference Option

Finally, through the seemingly infinite list of pulleys, gears, belts, video heads, idler assemblies, etc., comes the first user-friendly VCR parts cross-reference solution. Never again will you need to consult volumes of supplier's parts catalogs to search for the common high-failure parts that you need in order to quickly and profitably repair your customer's VCR.

The VCR Cross Reference Option covers more than 5,800 VCR and camcorder models. The common high-failure parts are crossed to 17 parts distributors, complete with the part numbers for each part. This option is updated yearly to include new models and manufacturer's parts data.

Sum It All Into The Only Complete Business Management Solution

Are you starting to see the full power behind our new business management solution? You're not just adding the best invoice processing, parts order processing, inventory management, and business control system. You're integrating an entirely new business strategy that's proven to work. There's an old saying that a manager is only as good as his/her employees. Now (with the SM2001 Service Center Manager) you have the opportunity to be the best you can be.

The actual power to improve your business from a management, profitability, and customer service organization standpoint grows exponentially, especially when you've integrated the full system. Give it a try.

The SM2001 Service Center Manager is available in a FREE demonstration package. We'll provide this package and include samples of the options available by calling **1-800-SENCORE (736-2673).** Join the new strategy for the '90s. SN

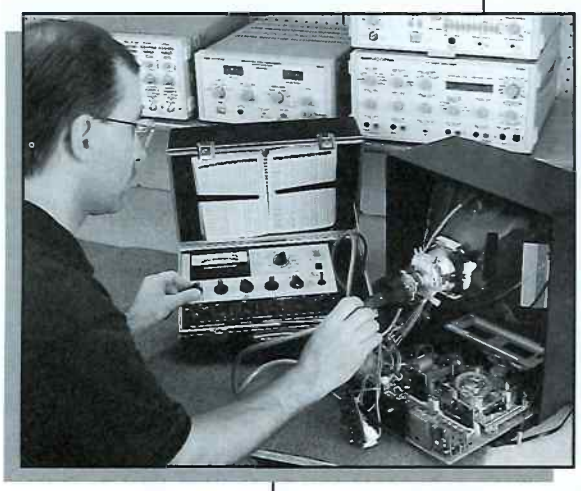
SM2001 Service Center Manager Option Chart

System	Price	w/Base
SM2001 Base System	$995	*****
Quarterly User Tips Newsletter	FREE to owners	*****
Accounts Receivable Option	$349	$325
Electronic Filing Option	$495	$475
Howard Sams Index Option	$159	$125
VCR Parts Cross Reference	$199	$175
SM2002 Multi-User Base System	$1,395	*****
(additional modules at price above)		
Upgrade Single-User To Multi-User	$425	*****
Updates - SM2001 Base & Multi-User	1 yr. Free - then $125 per year (2 updates)	*****
Technical Support	Unlimited - FREE	*****

Fig. 2: Only the SM2001 provides a complete list of options to ensure the flexibility and affordability you need for a complete business management solution.

Add Extra Profits With These Value Added Services

Build Customer Confidence With Safety Leakage Testing And CRT Restoration



By Larry Schnabel
Sencore News Editor
Sencore Electronics

Is your service center charging for all the services you perform? Many servicers are reluctant to charge for extra services that they perform on TVs, VCRs, etc – even if they add a value to the service. They either don't perform any extra services, or include those extra services with the repair job at no extra charge. Many service centers don't charge for alignments or safety testing. Some service centers don't charge for estimates. These value-added services can increase a service center's income while providing the customer with a better quality product, peace of mind, and greater satisfaction.

Your customer comes into your service center for one reason – he/she wants you to fix their consumer electronic product because they don't have the necessary skills to do it themselves. But the main thing they're buying is your training, experience, and good judgment you've developed over the years. And that's exactly why you should charge for your value added services.

You have the skill and expertise that's been acquired over many years. The average consumer doesn't know how to set VCR tracking fix or align the comb filter on a TV. Those skills are worth those small extra charges on any invoice – and more.

Investing in test equipment with value-added capabilities also lets you increase profits. Some test equipment comes with tests or features that let you perform value added services. Two of these value added services are AC safety leakage testing and CRT restoring. Let's see how each of these value added services helps improve the profits of your service center and your customer's peace of mind.

Protect Your Customers And Build Profits With Safety Leakage Testing

Imagine the thoughts that run through one of your customer's minds when she sees a story on a news program about a child who was shocked by touching a television which was recently repaired. Even though the accident happened hundreds of miles away, it hits home. Imagine the same customer looking at her TV set you just fixed two weeks ago. Do you think she's wondering if her child could be in danger?

Now imagine the peace of mind she would have if you had "safety certified" the set as part of that repair. How much is that added peace of mind worth?

Most service centers I talk to charge between $2 and $5 per repair for performing this all important safety leakage test. The service charge covers your time and the added equipment needed to do the job right. You see the test highly recommended in all manufacturers and SAMS literature. (Some states even require this test.)

But to perform this AC safety leakage test fast and accurately, you need the proper test equipment. The PR570 "POWERITE II" Isolation Transformer & Safety Analyzer provides a patented test to check the AC leakage between the AC line and the exposed metal on an AC operated device. This easy and simple safety leakage test lets you confirm the safety of every repaired set quickly and easily.

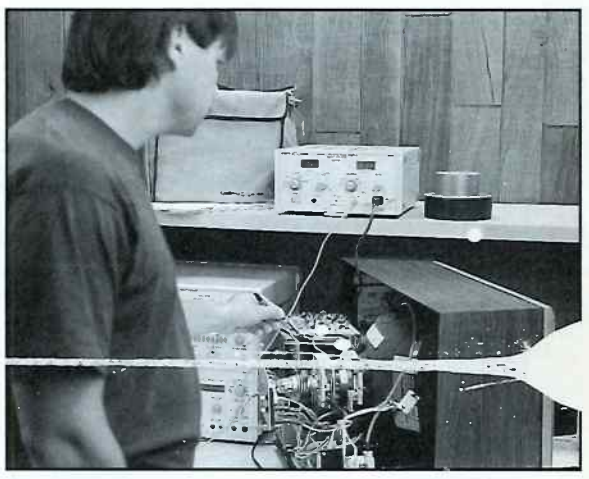


Fig. 1: The PR570's AC safety leakage test takes only seconds, but gives your customer peace of mind and improves your profits.

For your safety and convenience, the PR570 "POWERITE II" lets you make the test while the set you are testing is con-

nected to the isolated output. You just touch the PR570's Safety Leakage Probe to the exposed metal on the repaired set, and read the large LCD display. There are no calculations, no circuits to assemble, and no nightmares about lawsuits.

The safety leakage test applies to every television, VCR, stereo, microwave, and AC operated unit that you service. If you finish an average of 5 products each day, and you charge $5 for the safety leakage test, you would be adding $25 income each day. Multiplying $25 times 5 days per week yields $125 each week added income. Take that times 52 weeks per year and you have increased your shop income by $6,500!

CRT Restoration Adds More Profits

A second profit opportunity to consider is CRT restoration. Today, many service centers find that it provides income from TV receivers that are too old for a new CRT, but too good to throw away. Others find that projection TVs are creating a growing CRT service market, especially when you consider the price of these units.

The popularity of restoring and rejuvenating has gone through several cycles over the years. Today, restoring a CRT may give the customer the added time they need to fit a new set into their budget. Or, restoring the tube may give them a 19" second set to use in the basement or the kid's room, while a new 27" model gets priority in the entertainment center.

Restoration is also important when you've finished a major repair, such as a flyback replacement, and find out the picture is weak because of the CRT. Now, the customer has a relatively expensive parts and labor bill, but sees a poor picture on his TV (the picture may have been bad even before the flyback failed). Restoring the CRT produces a much better picture than before the flyback went bad. This value added service brings extra income, and a happier customer as well.

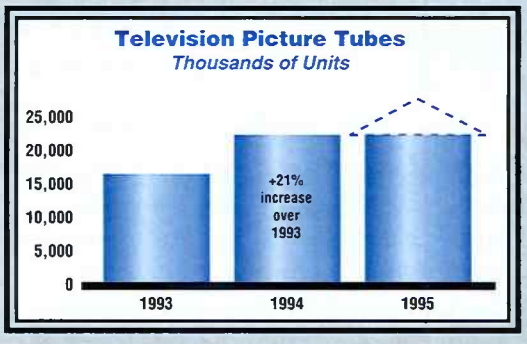
Projection sets give even more reason for restoration. Often, one of the three CRTs becomes weak before the other two. Normally, changing one CRT means changing all three tubes, since the two stronger tubes will not provide the same output light level as the single replacement. So, the question for the customer is one of changing all three tubes, continuing to run with one weak tube, or restoring the weak tube(s). Restoration of the weak tube lets you balance it with the other two and return an acceptable picture without the purchase of one or more of these expensive CRTs. Plus, the high cost of projection TVs prevents most of your customers from buying a new set every time they need service work.

CRT Tech Talk

Production of cathode ray tubes for color TV sets during 1994 increased to about 23 million in North America, up some 4 million tubes over 1993 or 21% growth in one year. There are at least three good reasons for such an increase, ones which will continue to assure growth in the coming years:

- ***NAFTA*** – This act evened out the duties paid on medium and larger sized tubes, leveling out the playing field between borders.
- ***Large Size Trend*** – North American market demand is shifting rapidly to larger tubes sizes which are difficult and more expensive to import.
- ***Set Production*** – With NAFTA and the zero duty rates, capacity for production has increased, especially in the Mexican border area.

Given the implications stated above for tube production growth and knowing some of the expansion plans already announced or on the drawing board, one forecast for total productive capacity by the year 2000 calls for 43 million tubes, about 87% greater than the production in 1994. Indeed, the tube industry has never looked brighter.



Source: EIA Market Research Dept., U.S. Dept. of Commerce

Build Profits And Customer Confidence By Restoring CRTs

Older CRT rejuvenators often don't have enough power to improve the picture. If they do have the power, it can't be harnessed and often damages the CRT. In either case, you cannot depend on this type of restoration to satisfy your customer or to generate added income. That's where "Progressive Restoration" with the CR70 "BEAM BUILDER" CRT Analyzer & Restorer makes all the difference. It gives you the balance between safety and effectiveness needed to profit from CRT restoration.

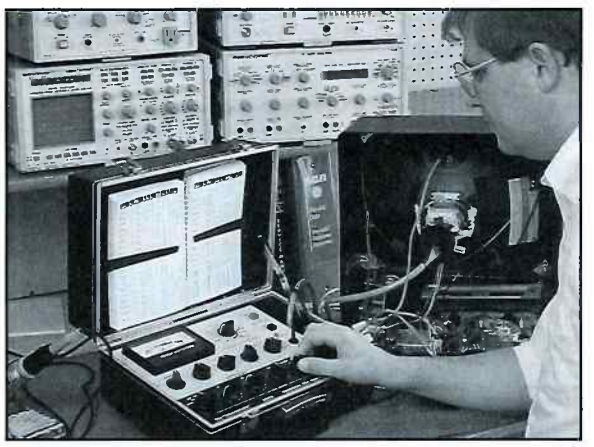


Fig. 2: The CR70's Progressive Restoration lets your customer keep an older set running, while generating value added billing for you.

Only the CR70 "BEAM BUILDER" gives you a choice of restoration levels. Progressive restoration starts with the lowest, safest restoring level. If it improves the CRT, you stop. You've done the job with the least risk to the CRT possible. If it doesn't improve the CRT, just step up to the next restoring level.

Unlike safety testing, you cannot apply a restoration bill to every unit you service - most TVs don't need it. But since the charge is higher, your profits still add quickly. Let's say you restore two CRTs per week, at a charge of $35 each. Multiplying $35 by 2 is $70 per week added income. Take $70 times 52 weeks per year, and you're earning $3,640 per year in additional income. Many service centers use that extra income to finance future test equipment purchases.

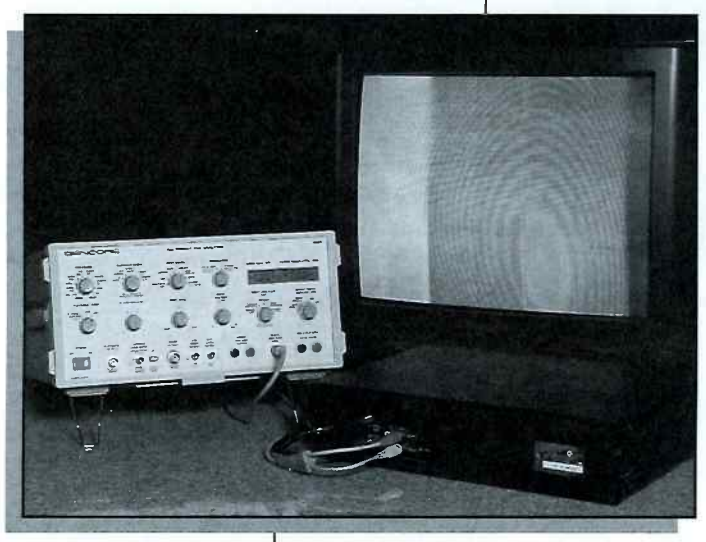
End The Socket War!

The CR70 "BEAM BUILDER" lets you test all CRTs with only six socket adapters and the Universal Adapter (all supplied). You don't have to pay $15-30 every time you run across a new CRT type, plus you don't have to wait 2-4 weeks to receive it. When you're ready to test a CRT, so is the CR70 "BEAM BUILDER."

You can improve your success by billing for the services you provide - even if they didn't involve soldering in a part or making an adjustment. This extra income from service can pay for all kinds of improvements for your business - new test equipment, a new sign, improved tools, or a well-deserved vacation. Just call us at **1-800-SENCORE** and we'll show you how to get started. SN

How To Isolate Confusing VCR Picture Problems And Prevent Callbacks

Use This Simple Three Step Strategy On Every VCR



By Lisa Kunkle
Application Engineer
Sencore Electronics

How much time should you spend fixing a $199 VCR? Many servicers ask us that question every day. If the repair is going to take over a couple hours or the total invoice is $100-plus, why should you or your customer repair the VCR?

This article will show you how the VC93 All Format VCR Analyzer can help you quickly determine which repairs are profitable. By using a simple three step strategy, you will quickly determine which repairs will be worth your time, and which ones aren't. You'll be able to verify good and bad parts without guessing, resulting in lower and more accurate estimates. This means more OK'd estimates - and the $199 VCR suddenly becomes a profit maker to your business.

When a customer brings a VCR into your service center for repair, what's the first thing you do? One of your first steps in the strategy of troubleshooting a VCR is to verify the customer's complaint. By finding out the customer's complaint, you can prevent callbacks caused by repairing a surface problem, then finding out later there's another hidden problem that was missed.

To verify the complaint, you first observe the operation of the VCR to determine what symptom or symptoms are apparent. Many times, this leads you to the problem, although several problems can produce similar symptoms. You can often waste valuable time trying to locate the true cause of these symptoms. This lost time cuts into the profits you make on other repair jobs and could open the door to callbacks due to hurried work.

Problems in the tape movement (capstan servos), head positioning (drum servos), tape path alignment, video head circuitry, and/or FM luminance circuits can produce almost identical symptoms. The key to your troubleshooting success is learning how to recognize these problems and provide an estimate to your customer that encourages him/her to go ahead with the repair while leaving room for a profit.

Start With Identifying The Symptom

Imagine a typical VCR that comes in with the complaint of a bad picture. To confirm the symptom, you hook up the VCR to a monitor and insert a work tape. The tape loads properly and the VCR begins to play. The picture is exactly as the customer described - noise throughout the entire picture. You move the VCR's tracking control, but the noise remains unchanged. It looks like dirty or defective video heads.

Fig 1: A noisy playback picture can mean a problem in the video head circuitry, servos, and even tape path alignment. With the right test equipment you can isolate these tough dog problems quickly.

You clean the video heads and try the work tape again. There is no improvement. You clean the heads one more time to be sure, but you find the noise remains unchanged. This virtually eliminates the chances of dirty video heads. You realize that this will not be a routine repair.

From experience, you realize that the noisy video can be a problem in the video head circuitry, luminance processing circuits, servos, or even tape path alignment. But, how do you immediately find out which one of these circuits is causing the defect so you can effectively determine if there is a profit to be made?

With the VC93 All Format VCR Analyzer and this three step procedure, you will quickly isolate where the defective stage is. Using the three step procedure, you first confirm proper servo operation. Second you check the video heads and

corresponding luminance circuitry. And finally, if these check out, you know you have a tape path alignment problem.

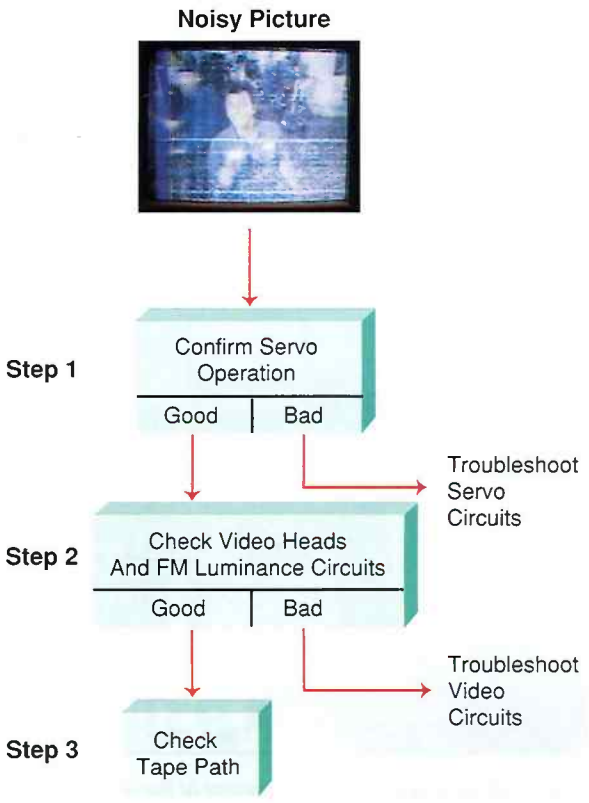


Fig 2: Using this three step strategy isolates confusing noisy VCR picture problems in the least amount of time.

Step One: Quickly Verify Proper Servo Operation To Eliminate Guesswork

The servo section commonly fails because it is a combination of mechanical and electrical components. The servos must line up a video head that is spinning at 1,800 RPM with a moving recorded track that is only a few thousandths of an inch wide (refer to Fig. 3). Even minor servo problems can cause partial or complete loss of video and/or audio.

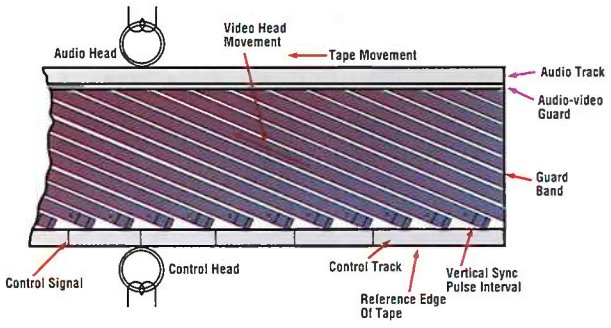


Fig. 3: The video heads traveling at approximately 1,800 RPM must follow a track on the video tape that is only a few thousandths of an inch wide.

With the VC93, you can confirm servo operation with either of two test leads - the Servo Performance Test Lead or Servo Troubleshooting Test Lead. The Servo Performance Lead uses the standard video and audio output signals present at the VCR's external jacks to analyze the servos. This lead analyzes the vertical sync pulses of the video signal and the linear audio tone from the Sencore Servo Performance Test Tape.

If the VCR's video is bad or missing, you will use a different strategy. The Servo Troubleshooting Test Lead analyzes the internal servo reference signals instead of the video and audio output signals. Hook this test lead to the SW30 signal of the drum circuit and the CTL signal of the capstan circuit. Then all you have to do is rotate the Servo Analyzer Tests switch through the five servo tests. Following is a brief discussion on these tests.

Servos Locked Test: This test quickly determines whether the capstan and cylinder phase loops are locked to the VCR's internal reference source. If the servos are not locked, use the remaining servo tests to help track down the defective phase servo loop. If the test shows "GOOD", then you know the servos are locked together.

Capstan Speed Test: This test tells you if the tape is being pulled through the VCR at the correct speed. This identifies capstan servo defects such as speed detect problems. The percentage reading tells you whether the capstan is turning too fast or too slow.

Capstan Jitter Test: This test checks for minor capstan speed variations caused by problems such as bad capstan motor bearings, slipping belts, or worn idlers. Use this test to isolate mechanical or phase loop problems within the capstan.

Drum Speed Test: This test quickly determines if the drum is turning too fast or too slow. It eliminates false starts and wrong conclusions so you can spend your time troubleshooting defective circuits. Use the GOOD/BAD percentage reading to determine if the drum is running too fast or too slow.

Drum Jitter Test: This test checks for short term variations in the speed of the drum. Excessive drum jitter is most often caused by problems such as bad drum motor bearings, excessive oxide buildup on the drum, a missing drum PG signal, or a defective drum servo control loop.

Once you have verified that you have a servo problem and isolated it to a specific servo path, refer to *Tech Tip 187* (Testing Capstan Servos With The VC93) and *Tech Tip 188* (Testing Drum Servos With The VC93). If the Servo Tests show no defects, you have quickly determined that the drum and capstan servo circuits are working properly electrically. Then the next step of the procedure is to check the video head and luminance circuitry.

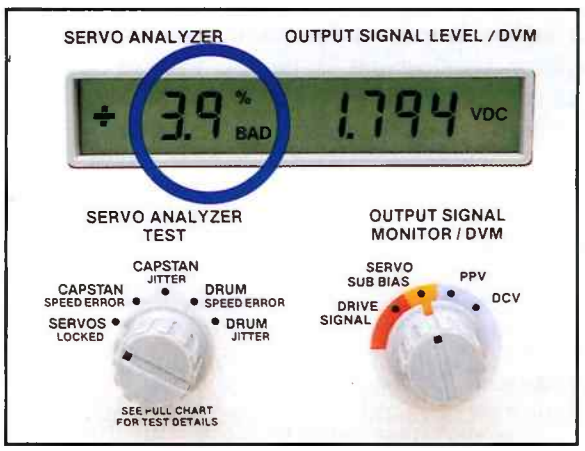


Fig. 4: You'll see a "GOOD" or "BAD" indication plus a percentage indication using the VC93's exclusive servo tests.

Step 2: Confidently Isolate Defects In The Video Head And FM Luminance Circuits

One of the most expensive parts in a VCR is the video head assembly. Your customer's decision to have his/her $199 VCR fixed often depends on whether the video heads are good or bad. For efficient servicing and reliable estimates, you need a system that can quickly determine if a video problem is in the video heads or the luminance circuits.

The VC93 All Format VCR Analyzer gives you the capability to inject a head substitution signal into the input of the preamps. If you get a good, locked-in color bar picture (with or without color) on your TV/monitor, you know everything from the preamps to the video output jacks can process a known good signal.

To further isolate defective heads, remove one lead while injecting into the preamp. You should see one field of Color Bars, and one field of the tape you are playing. If you see one field of VC93 Color Bars and one field of snow, then the channel you are not injecting into is the defective head or rotary transformer. Repeat this test for the other video head channel.

If the injection doesn't give a clear locked in picture, then you have to start breaking the luminance circuits into functional blocks. *Tech Tip 193* (Troubleshooting VCR Luminance Circuits) provides additional troubleshooting assistance.

So far, we have determined how to isolate servo problems and video head or luminance defects – two of the most time consuming repairs to isolate. By quickly locating where the problem is, you will have pinpointed the extent of the problem so you can provide an accurate estimate in a matter of minutes – perhaps saving that VCR repair.

We've covered how to isolate the servos, video heads, and luminance circuitry defects. But we need to discuss one more section in the VCR that causes the same symptoms as these problems – the tape path circuitry.

Step 3: Confirm Symptoms By Checking The Tape Path

There are many components that are instrumental in pulling the tape smoothly across the video and audio heads without causing poor video, noise lines, or warbly sound. Any of the mechanical components that experience normal wear can cause the same symptom as a defective servo or a video head. If you isolate the servos, video heads, and FM luminance circuitry, then there is only one thing left to check - the tape path. Following are some of the components that are likely suspects.

The drum mechanical components are responsible for the proper position of the tape with respect to the video heads. Anything that is slightly off or worn may cause a snowy picture or noise lines through the video.

Make it strict routine to check the guide rollers (P-Posts). Make sure the tape is riding on the air cushion and the rollers are fairly stable, although some movement is normal. Check that the guide rollers are against the V-blocks on both sides of the video heads. If they are not, the tape will not be positioned on the heads properly. Check the slant posts for proper position, also. If they are bent, the tape will no longer ride on the heads properly.

If the tape tension is misadjusted, the tape will be stretched or too loose across the heads (see Fig. 5). Check the adjustment of the tension arm and the alignment of the post. Often if you have oxide flakes on the lower drum assembly or in the grooves of the upper drum, you may see some noise lines or jitter in the picture. To identify this problem, take a magnifying glass and inspect the drum itself. Also check for dings or scratches on the drum when inspecting with the magnifying glass.

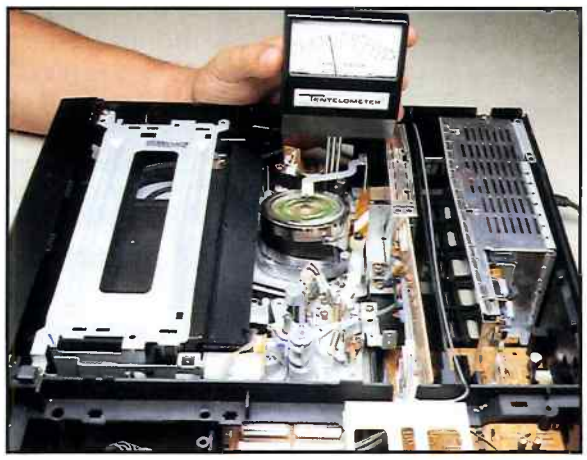


Fig. 5: Be sure to check the alignment of the entire tape path, including the tape tension.

The capstan circuitry is responsible for pulling the tape through at the proper speed. Any variations will affect the tape speed which affects both the video and audio. Make sure that the control and audio head are cleaned and positioned properly.

Since the take-up reel is not driven directly, make sure the clutch assembly is positioned properly. If it is not, you may hear some audio warble in the tape. Also, if the capstan pinch roller is glazed, then the tape may start to slip. Replace the pinch roller or use sandpaper to rough up the smooth surface (be sure not to leave flat spots).

These are some of the main mechanical components you should check, although there are other components and adjustments that will need to be done. Refer to your manufacturer's literature for the proper procedures.

Turn those $199 VCRs in profit generators. You can save time and money in isolating your picture problems with this three step procedure using the VC93 All Format VCR Analyzer. Give your Area Sales Representative a call today at **1-800-SENCORE.** We can help set up a VC93 no-obligation trial so you can develop a VCR analyzing strategy for the future. SN

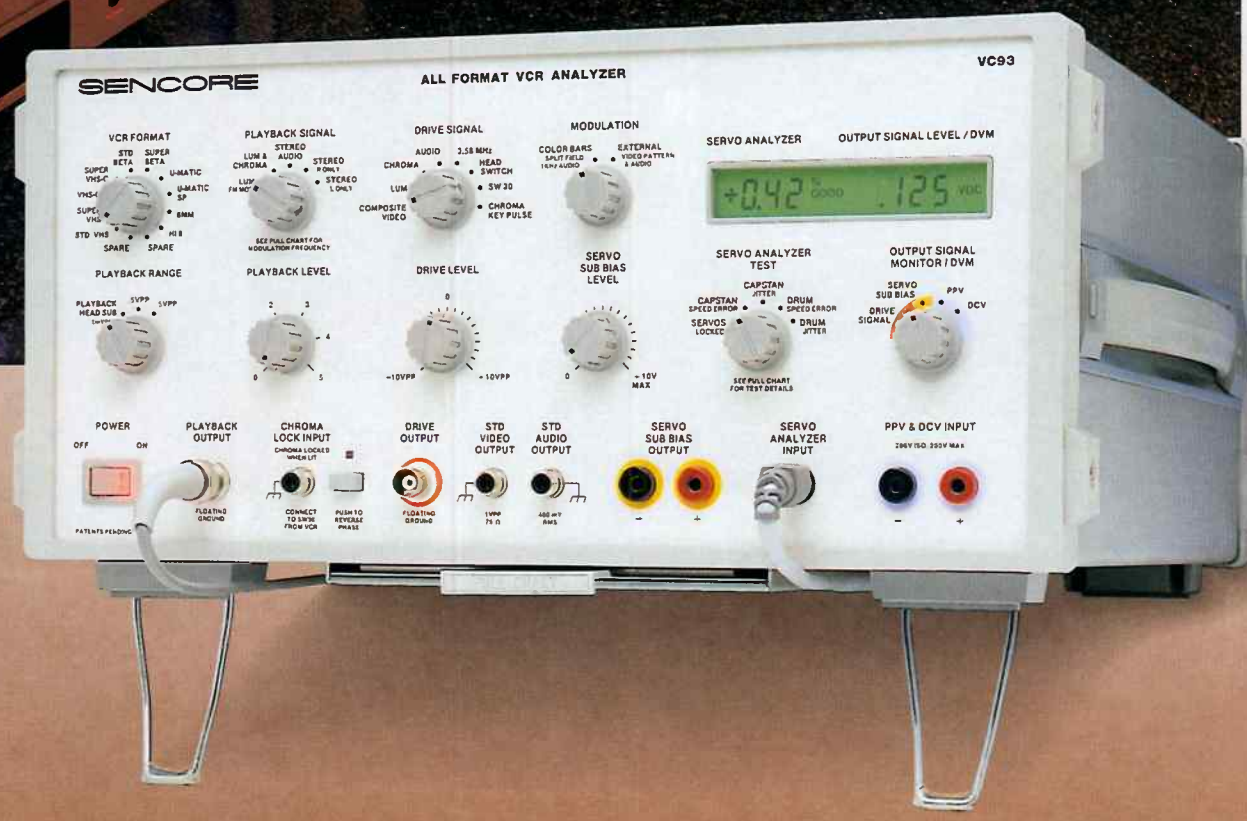
Call 1-800-SENCORE for a free copy of the Tech Tips mentioned in this article.

A VCR Is Like A Box Of Chocolates...

...You Never Know What You're Gonna Get!

When that next VCR walks in your front door, you never know what kind of problem you'll be looking at. Whether the problem is heads, servos, electrical, or mechanical, you need to find the source of the problem as soon and as accurately as possible.

When you need quick, simplified, yet complete VCR analyzing help, the VC93 All Format VCR Analyzer dynamically and completely analyzes all VCR video, audio, tuner, and servo problems. You'll have everything you need the next time you're looking for an answer to a confusing VCR problem. Thousands of proud VC93 owners already give it an outstanding "thumbs up."



VCRs and the VC93 All Format VCR Analyzer go together just like troubleshooting efficiency and profits. To discover more about the VC93 All Format VCR Analyzer and how it can help your business, call your Area Representative today.

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