

# 1998-99 Full Line Catalog

# SENCORE



## About Sencore...

For almost 50 years, Sencore has been dedicated to one goal – helping technicians succeed.

Sencore was started in 1951 by R.H. (Herb) Bowden. Herb witnessed the difficulty most technicians were having using test equipment. Using this first-hand experience, he started customizing and building innovative, time-saving instruments.

Sencore's innovative design has successfully led technicians into today's high tech troubleshooting field... and will continue to do so into the new and exciting 21st century.



## Sencore's Mission Statement



Al Bowden  
CEO and President

At Sencore we are striving to provide you with "Total Service Solutions" to optimize your time and productivity while maximizing your profitability.

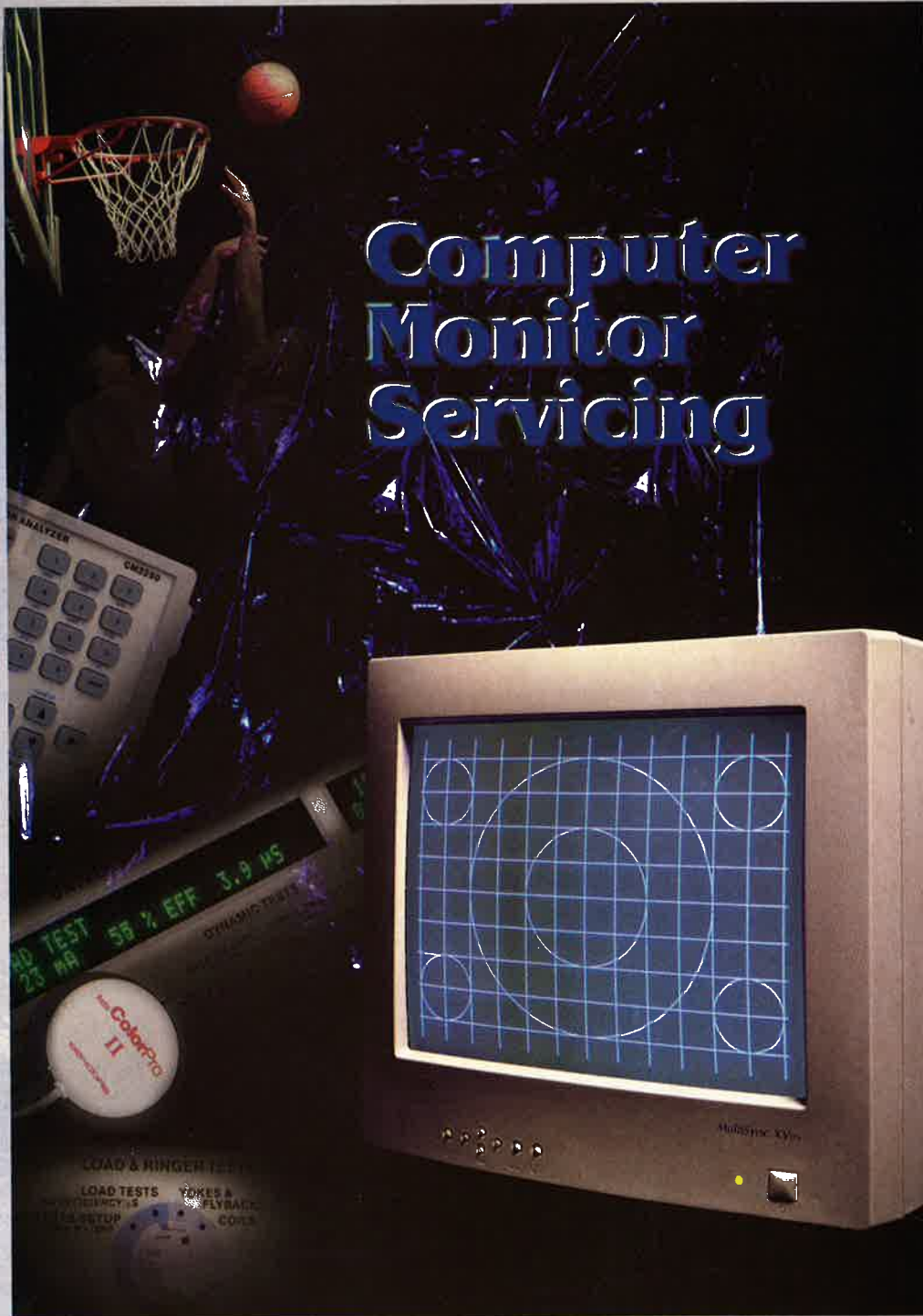
Highlighted throughout this catalog, you will find 7 key statements showing a portion of Sencore's commitment to you, our customer:

- Innovative** – unique, patented line of instruments
- Service** – equipment designed for the service industry
- Quality** – the highest reliability of any test instruments
- Technology** – state-of-the-art design for new technology product servicing
- Solutions** – efficient, effective, and profitable repairs
- Value** – equipment guaranteed to pay for itself
- Success** – our success is through your success



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## Innovative

*You always miss  
100% of the shots  
you don't take.*

Until now, 14 and 15-inch monitors have been the standard with businesses and the consumer. Back in 1993, for example, a 17-inch monitor cost between \$1,000 and \$1,500. Today, you can purchase a 17-inch plug/play for about \$750.

So what's the advantage? Besides more screen area (approximately 45 to 60 percent), 17-inch monitors offer higher resolution. VGA on a 14-inch monitor is good and SVGA is satisfactory. Seventeen inch models run well at SVGA and 1024 x 768 resolution, but 14-inch monitors at 1024 x 768 display the information too small. Running at higher resolutions, the 17-inch monitor lets you display more information on the screen, not to mention the benefit to those with poor eyesight.

The number of 17-inch monitors being shipped is increasing, too. Ask any CAD/CAM user where it's a requirement to have a larger screen area. Those involved with desktop publishing work with page layouts and high resolution graphics of 1280 x 1024 and beyond. Even more so, the advances in animation, mapping, and scientific visualization-designing DNA models are other examples. As these hi-tech professions rapidly expand, so will the need for high resolution monitors and their applications.

In this "Computer Monitor Analyzing" product section, you will see the following exclusive Sencore test instruments:

- CM125 "Pix Pak"™ Computer Monitor Signal Generator
- CM2125 Computer Monitor Analyzer
- CM2250 250 MHz Computer Monitor Analyzer
- CM2250-PC "Pro" Computer Monitor Analyzer
- EX220 Video Output Expander
- CP288 Auto "ColorPro II" Color Analyzer
- CP290 "ColorPro" Hand-Held Color Analyzer
- HA2500 Universal Horizontal Analyzer

# SENCORE

## Computer Monitor Analyzers

<b>Sencore's Exclusive Line Of Computer Monitor Analyzers</b>			
<i>(See which analyzer best fits your needs.)</i>			
Model #	Description	Points of Difference	Where Used
CM125 (page 4)	The easy-to-use, programmable, portable RGB generator.	<ul style="list-style-type: none"> <li>125 MHz bandwidth</li> <li>Generator only</li> </ul>	<ul style="list-style-type: none"> <li>Field testing</li> <li>Burn-in rack</li> <li>Quality assurance</li> </ul>
CM2125 (page 6)	Completely test and troubleshoot monitors from the input connector to CRT	<ul style="list-style-type: none"> <li>125 MHz bandwidth</li> <li>Signal injection</li> <li>Built-in DCV/PPV meter</li> <li>Patented "ringer"</li> </ul>	<ul style="list-style-type: none"> <li>"Tough Dog" repair</li> <li>Component level repair</li> <li>Analyzing and troubleshooting</li> </ul>
CM2250 (page 8)	RGB video generator system for testing and aligning high bandwidth monitors	<ul style="list-style-type: none"> <li>250 MHz bandwidth</li> <li>Integrated "Process Generator"</li> <li>Integrated color analyzer</li> </ul>	<ul style="list-style-type: none"> <li>High bandwidth repair</li> <li>Color analysis and alignment</li> <li>Guided troubleshooting and alignment</li> </ul>
CM2250-PC "Pro" (page 10)	PC based system for high bandwidth monitors including: RGB generator, process generator, and color analysis	<ul style="list-style-type: none"> <li>PC (card) based system</li> <li>250 MHz bandwidth</li> <li>"Process Generator"</li> <li>Color analyzer</li> <li>Windows compatible</li> </ul>	<ul style="list-style-type: none"> <li>High bandwidth repair</li> <li>Color analysis and alignment</li> <li>Guided troubleshooting and alignment</li> </ul>

# CM125 "Pix Pak"™ Computer Monitor Signal Generator



The Easy-To-Use,  
Programmable,  
Portable RGB  
Generator That  
Satisfies Your  
Computer Monitor  
Testing Needs!



- RGB video generator for bench and field computer monitor troubleshooting and testing
- A fully programmable scan frequency and pixel resolution RGB video generator
  - Video bandwidth to 125 MHz and 2048 X 2048 pixel resolution
  - Compatible with TTL, analog, and ECL video types
  - 100 monitor setup memory locations (43 preprogrammed)
  - Output protected to prevent damage from defective computer monitors
- A complete set of troubleshooting and performance testing video patterns to help you identify monitor defects
- Easy-to-use, portable, lightweight, and compact for all your field and bench testing needs
- Hook-up adapters available for all popular monitor types

RS232  
Compatible

Even though the CM125 "Pix Pak"™ is small, it packs a powerful pixel punch with 125 MHz video bandwidth and 2048 x 2048 pixel resolution. The sync, pixel, and blanking times are also fully programmable so you can adjust to match the monitor under test. The "Pix Pak"™ is also compatible with TTL, analog, and ECL video types so you're ready for any situation.

The CM125 has storage locations for 100 computer monitor formats with the most popular formats in 43 preprogrammed locations. You just recall the "Pix Pak"™ storage location and start testing. A complete set of dynamic video patterns help test the performance and operation of monitors and

point you toward defective circuits. Plus a special pattern sequence feature lets you automatically cycle the patterns several times a minute to prevent phosphor burns. The "Pix Pak"™ gives you these patterns:

- Raster
- Circle/Cross
- Color Bars
- Staircase
- Windows
- Multiburst
- Text

The CM125 "Pix Pak"™ was built lightweight, portable, and compact so it can go where your monitor testing takes you. And hook-up adapters are available for matching all common monitor formats.

## CM125 "Pix Pak"™ Specifications

<b>Video Bandwidth</b>	125 MHz
<b>Horizontal Sync</b>	RANGE: 10.0 kHz to 250 kHz. ACCURACY: ±200 nSec. STEPS: 10.0 kHz to 99.9 kHz, .1 kHz and 100 kHz to 250 kHz, 1 kHz. LEVEL: 5 VPP POLARITY: (+) or (-)
<b>Vertical Sync</b>	RANGE: 10.0 Hz to 250 Hz. ACCURACY: ± (1/H FREQ) x 6. STEPS: 10.0 Hz to 99.9 Hz, .1 Hz and 100 Hz to 250 Hz, 1 Hz. LEVEL: 5 VPP POLARITY: (+) or (-)
<b>Horizontal Pixel Resolution</b>	Range: 80 to 2,048 pixels in one pixel steps
<b>Vertical Pixel Resolution</b>	Range: 80 to 2,048 pixels in one pixel steps
<b>Video Patterns</b>	RASTER, CIRCLE/CROSS, COLOR BARS, STAIRCASE, WINDOWS, MULTIBURST, TEXT
<b>Digital Video</b>	LEVEL: 5 VPP. VIDEO POLARITY: (+) or (-). BLANKING POLARITY: (+) or (-). VIDEO OUTPUT: red, green, blue, and intensity
<b>Analog Video</b>	LEVEL: 1 VPP, white level .714 V, black 0.0, and sync -.286 into 75 ohms. VIDEO POLARITY: (+) or (-). SYNC ADDER: red, green, blue. MODE: Non-interlace or interlace. VIDEO OUTPUT: red, green, blue
<b>Blanking Timing</b>	The CM125 recognizes common computer monitor formats and adjusts to the correct sync, front porch, and back porch times
<b>ECL Video</b>	LEVEL: -0.9 to -1.6 V. VIDEO POLARITY: (+) or (-). VIDEO OUTPUT: red, green, blue
<b>Default</b>	If the CM125 does not recognize the computer format, it sets the output to 80% displayed video and 20% sync. The blanking pulse is divided into thirds between the front porch, sync, and back porch
<b>Programming</b>	Blanking time parameters can be changed through the front panel (FRONT PORCH, BACK PORCH, and SYNC) or with a personal computer through the RS232 port
<b>Minimum (Horizontal)</b>	The minimum blanking time is 1.5 uSec. Minimum sync time is 0.3 uSec
<b>Minimum (Vertical)</b>	The minimum blanking time is 1/H freq. Minimum sync time is 1/H freq
<b>Memory</b>	PREPROGRAMMED: 0 - 42. USER DEFINABLE: 43 - 99
<b>General</b>	DISPLAY: LCD readout for frequency, pixel, porch times, memory and error messages. SIZE: 6.00" X 11.75" x 4.50" (15.2 X 29.9 X 11.4 cm) HWD. WEIGHT: 4.75 pounds (2.1 kg). POWER: 100 to 240 VAC, 47 to 63 Hz, 60 watts

All specifications subject to change without notice.

## CM125 "Pix Pak"™ Accessory List

<b>Supplied Accessories</b>	AC Power Cable
<b>Optional Accessories</b> <i>(For complete connector descriptions, refer to page 17)</i>	39B273 Universal Connector 39B274A VGA 39B275 CGA, MDA, Hercules 39B377 Extension Cable 39B280 EGA 39B281 PGC 39B300 BNC 39B492 Male Apple-Mac 39B493 Female Input Apple-Mac



**SENCORE**

# CM2125 Computer Monitor Analyzer

Patented



Completely Test And Troubleshoot High Resolution And Multi-Scan Computer Monitors From The Input Connector To The CRT!

- A complete, easy-to-use, high resolution computer monitor analyzer
- A fully programmable scan frequency and pixel resolution RGB video generator
  - bandwidth to 125 MHz and 2048 x 2048 pixels
  - compatible with TTL, analog, and ECL video types
  - 70 monitor setup memory locations (43 preprogrammed)
  - outputs protected to prevent damage from defective computer monitors
- Special sync-locked signal substitutor for pinpointing monitor circuit problems
- Innovative performance pattern generator
- Patented "ringer" and HV multiplier tester that finds defective:
  - yokes
  - integrated high voltage transformers (IHVT)
  - switching transformers
- Integrated 2,000 volt DCV and PPV meter eliminates the need for a DVM for complete one-unit troubleshooting
- "Hook-up" adapters available

RS232  
Compatible

The CM2125 is a programmable RGB video and sync generator fully protected to prevent damage from defective computer monitors. Horizontal and vertical scan frequencies, pixel resolutions, and porch and sync times are all programmable so you can service any monitor that comes into your service center. With a bandwidth to 125 MHz and 2048 x 2048 pixels, you will be ready for all monitors – whether it's TTL, analog, or ECL.

With 70 monitor setup locations (43 preprogrammed), the CM2125 let's you recall the most common monitor formats, and store custom formats in the remaining locations. The innovative test patterns dynamically test the operation of computer monitors while exposing monitor defects that point you

toward the defective circuits. You get these dynamic video patterns:

- Raster
- Circle
- Staircase
- Multiburst
- Dots
- Color Bars
- Windows
- Text

The CM2125 uses sync-locked substitution signals so you can divide-and-conquer problems down to a single stage by injecting a known-good signal into the monitor. The patented "ringer" test finds shorted turns in flybacks, yokes, switching transformers, and IHVTs – even a single shorted turn. With its integrated DCV/VPP digital meter and the exclusive hook-up adaptors for all common monitors, the CM2125 is your total answer to computer monitor analyzing.



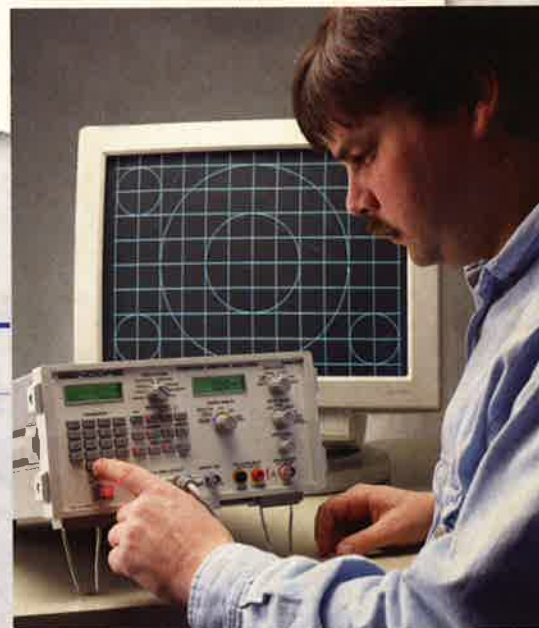
## CM2125 Computer Monitor Analyzer Specifications

<b>Outputs</b>	BANDWIDTH: 125 MHz. HORIZONTAL PIXEL RESOLUTION: 80-2048 pixels. VERTICAL PIXEL RESOLUTION: 80-2048 pixels. HORIZONTAL SCAN FREQUENCY: 10-250 kHz. VERTICAL SCAN FREQUENCY: 10-250 Hz. OUTPUT AMPLITUDE: TTL, analog, or ECL. MODE SELECTION: Interlaced or non-interlaced. GUN SELECTION: RGBI. SYNC ADDER: RGB. POLARITY SELECTION: Video, H-Sync, V-Sync
<b>Sync Timing</b>	The CM2125 recognizes common computer monitor formats and automatically adjusts for the correct sync, back porch, and front porch timing. Sync timing parameters can be changed through the front panel
<b>Memory</b>	70 computer monitor setup storage locations (43 preprogrammed)
<b>Video Patterns</b>	Raster, Dots, Circle/Crosshatch, Color Bars, Multiburst, Staircase, Text, Windows
<b>Drive Signals</b>	Signal at zero: Less than 3% of full range. Output at full level, 3 V range: 3 VPP, $\pm 0.5$ V into 100 ohms. 30 V range: 30 VPP, $\pm 5$ V into 100 ohms, 300 V range: 300 VPP, $\pm 50$ V into 10,000 ohms
<b>Peak-to-Peak Voltmeter</b>	3 ranges (autoranged): 0.0 - 19.9 VPP, 20 - 199 VPP, 200 - 1999 VPP. ACCURACY: (All) $\pm 1\%$ , $\pm 2$ counts. FREQUENCY RESPONSE: 0 - 200 V, 30 Hz to 5 MHz, $\pm 1$ dB from the average value across the band. INPUT IMPEDANCE: 15 Megohm
<b>DC Voltmeter</b>	3 ranges (autoranged): 00.00 - 19.99 V DC, 20.0 - 199.9 V DC, 200 - 1999 V DC. ACCURACY: (All) $\pm .2\%$ , $\pm 2$ counts. INPUT IMPEDANCE: (without probe) 15 Megohm
<b>Meter Protection</b>	2000 VDC (DC + peak AC), across the inputs. Maximum voltage between (-) lead and ground: 1500 (DC + peak AC)
<b>Ringling Test</b>	Dynamic test of coil's Q determined by counting the number of ringling cycles before reaching a preset damping point. The preset damping point is set at 25% of the excitation pulse. The number of cycles is displayed on the digital display and continually updated
<b>General</b>	DIGITAL METERS: 3 1/2 digit, LCD readout. DIGITAL DISPLAY: LCD readout. SIZE: 6" x 12" x 14.3" (15.2 x 29.1 x 38.1 cm) HWD. WEIGHT: 16 pounds (7.3 kg). POWER: 105-125 VAC, 60 Hz, 140 W max

All specifications subject to change without notice.

## CM2125 Accessory List

<b>Supplied Accessories</b>	39G221 Direct Test Lead 39G264 DVM Test Leads
<b>Optional Accessories</b> (For complete connector descriptions, refer to page 17.)	39B273 Universal Connector 39B274A VGA 39B275 CGA, MDA, Hercules 39B277 Extension Cable 39B280 EGA 39B281 PGC 39B300 BNC 39G346 ECL Adapter 39B492 Male Apple-Mac 39B493 Female Input Apple-Mac HP200 50 kV High Voltage Probe IB78 RS232 Interface Accessory PC263 Protective Cover TP212 10 kV Transient Protector Probe



**SENCORE**

# New! CM2250 250 MHz Computer Monitor Analyzer



The Only Complete System For Troubleshooting, Testing, And Aligning High Bandwidth Computer Monitors From The Input To The CRT (Including Color Output Analysis) For Servicing Security And Growth For Years To Come!

- A complete and programmable high bandwidth RGB video generator with color analysis, unique "Process Generator"™, and a complete set of video test patterns to help you identify monitor defects
- Fully programmable scan and pixel generator:
  - Video bandwidth to 250 MHz
  - Pixel resolution to 2048 x 2048
  - Scan frequencies to 250 kHz and 250 Hz
  - Adjustable blanking times, color levels, signal level, and aspect ratio
- Exclusive "Process Generator"™ for entering interactive guided alignment and performance testing procedures
- Integrated Auto "ColorPro II"™ Color Analyzer to give you the confidence every monitor you service is operating to the manufacturer's standards
- Complete analyzing system:
  - Data storage disc for saving and loading formats, alignments, and testing procedures
  - Keyboard interface for easy entering of alignments and procedures
  - DDC1 and DDC2B compatible for display data channel testing
  - Expandable for future accessories to enhance your monitor troubleshooting capabilities

RS232  
Compatible

The CM2250 250 MHz Computer Monitor Analyzer stores setup information by monitor manufacturer and model number so you can quickly recall all of a monitor's formats when troubleshooting or making alignments. The format editor feature lets you quickly set up scan frequencies, pixels, blanking times, and other format parameters. You can store over 2,000 monitor formats in the CM2250.

The CM2250 eliminates the need for a stand-alone color analyzer and signal generator. The CM2250 Computer Monitor Analyzer delivers high resolution RGB video signals as well as precise color analyzing capabilities. Now, you can align a computer monitor's white balance

without having to reach for another instrument. The CM2250 provides everything you need in an integrated unit.

The exclusive "Process Generator" in the CM2250 Computer Monitor Analyzer greatly simplifies the monitor alignment procedure. The process generator lets you enter alignment procedures in the CM2250. You set up the monitor format and video pattern for each step of the procedure and enter alignment instructions. When the service engineer runs a process, the CM2250 automatically sets itself up with the correct format and video pattern for the servicer to complete the alignment step. The "Process Generator" saves time and eliminates alignment errors.

## CM2250 Computer Monitor Analyzer Specifications

<b>Video</b>	ANALOG: VIDEO BANDWIDTH: 250 MHz VIDEO LEVEL: programmable 0.35 VPP to 1.5 VPP DC OFFSET: programmable $\approx$ 1.0 V to +1.25 V RISE TIME: less than 2.0 nS COLORS: 16 million color palette DIGITAL: Video Bandwidth: 80 MHz
<b>Horizontal</b>	SYNC RANGE: 10.000 kHz to 250.000 kHz PIXEL RANGE: 80 to 2048 pixels active video SYNC LEVEL: TTL POLARITY: (+) or (-) PIXEL RESOLUTION: 1 pixel SYNC RESOLUTION: 1 pixel to 125 MHz and 2 pixels 125 to 250 MHz
<b>Vertical</b>	SYNC RANGE: 10.00 Hz to 250.00 Hz PIXEL RANGE: 80 to 2048 pixels active video SYNC LEVEL: TTL POLARITY: (+) or (-) SYNC RESOLUTION: 1 horizontal line
<b>Composite Sync</b>	LEVEL: TTL
<b>Sync On Video</b>	LEVEL: programmable 0.1 VPP to 0.5 VPP
<b>Color Analysis</b>	SCREEN REFRESH: 30 to 120 Hz Y ACCURACY: $\pm$ 4 %, $\pm$ 1 digit xy: $\pm$ 0.002 LUMINANCE RANGE: 0.5 to 150 fL Y REPEATABILITY: 0.3 % $\pm$ 1 digit xy REPEATABILITY: $\pm$ 1 %, $\pm$ 1 digit
<b>Display Data Channel</b>	DDC1 DDC2B
<b>Audio</b>	1 kHz tone 500 mV into 10 k $\Omega$ load
<b>General</b>	OUTPUT PROTECTION (sync and video): $\pm$ 250 VDC, 250V Peak AC GUARANTEED OPERATING TEMPERATURE: 15° to 35° C SIZE: 6" x 11.5" x 15" (15.2 x 29.1 x 38.1 cm) HWD WEIGHT: 20 lbs (9.07 kg) POWER: 100 to 240 VAC, 47 to 63 Hz

All specifications subject to change without notice.

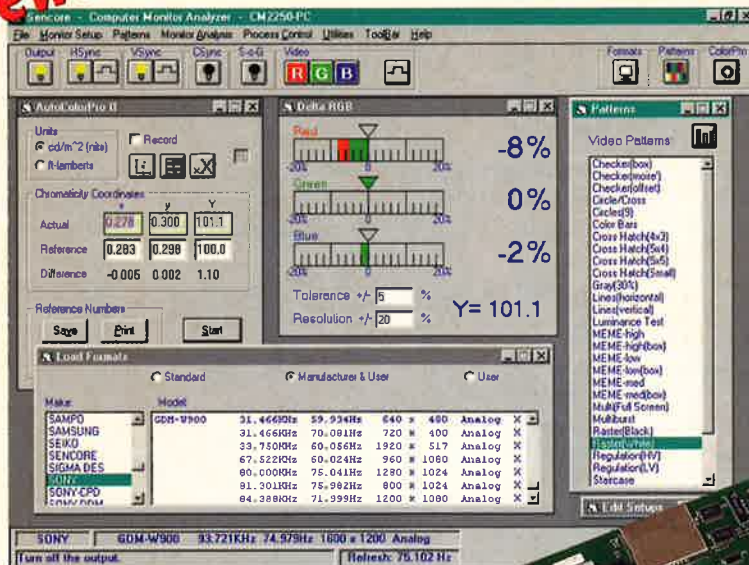
## CM2250 Accessory List

<b>Supplied Accessories</b>	39B443 EVC to 15 pin HD Extension Cable
<b>Optional Accessories</b> (For complete connector descriptions, refer to page 17.)	39B273 Universal Connector 39B274 VGA 39B280 EGA 39B281 PGC 39B300 BNC 39G346 ECL Adapter 39B441 EVC to 13W3 Extension Cable 39B492 Male Apple-Mac 39B493 Female Apple-Mac 39B555 EVC to 15 pin KB283 Keyboard PC263 Protective Cover

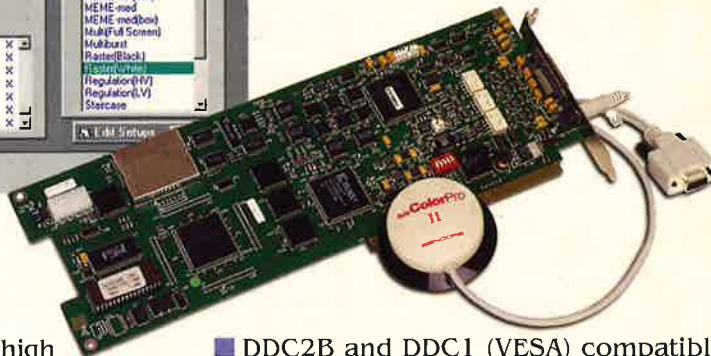


# SENCORE

# New! CM2250-PC "Pro" Computer Monitor Analyzer\*



The Only Multi-Featured "Plug & Play" Video Signal Generator For Testing And Aligning High-End Displays (Up To 250 MHz), With Complete Color Analysis At A Fraction Of The Cost!



- A fully programmable RGB high bandwidth video generator
- Easy to use Windows® GUI, compatible with Plug-n-Play® for simplified setup and easy testing
- NTSC, PAL, Analog, TTL, and ECL video outputs (ECL requires optional adapter)
- Superior output protection
- Exclusive "Process Generator"™ for entering interactive alignment and performance testing procedures
- DDC2B and DDC1 (VESA) compatible for testing the display data channel
- DPMS (VESA) automated testing
- Includes Auto "ColorPro II"™ Color Analyzer for fast, accurate chromaticity measurements over a wide range of luminance on all CRTs, including television and color monitors
- A complete set of video test patterns to help identify monitor defects

The CM2250-PC "Pro" has simplified the setup for troubleshooting monitors. Now all you do is select the make and model of the monitor, and the CM2250-PC "Pro" automatically configures to its setup. We have integrated the ability to access setups through a convenient charting system. Or, you simply scroll through the monitors and press enter – there's no need to refer to service literature and spend valuable time entering parameters, we've done that for you.

The CM2250-PC "Pro" integrates an exclusive "Process Generator" that does all the above and more. Now you'll be able to use one system (CM2250-PC "Pro") to control the testing and alignment process in your business. The CM2250-PC "Pro" will automatically change the video patterns,

signal parameters, wait for you to make a test or adjustment, and then take you through the next step. Simple, fast, and accurate!

As you can tell, the CM2250-PC "Pro" offers a complete listing of features including color output analysis with the CP288 Auto "ColorPro II" for servicing security and growth for years to come. These features are unmatched by other generators on the market – from the ease-of-use to the flexibility of operation. Plus, the CM2250-PC "Pro" is the only system that provides complete video generation (to 250 MHz) for complete monitor color analysis at one price that's less than single feature instruments.

## CM2250-PC "Pro" Computer Monitor Analyzer Specifications

<b>Video</b>	VIDEO BANDWIDTH: 250 MHz RISE TIME: Less than 2.0 nS
<b>Horizontal</b>	SYNC RANGE: 10.000 kHz to 250.000 kHz PIXEL RANGE: 80 to 2048 pixels active video PIXEL RESOLUTION: 1 pixel SYNC RESOLUTION: 1 pixel to 110 MHz and 2 pixels 110 to 250 MHz
<b>Vertical</b>	SYNC RANGE: 10.00 Hz to 250.00 Hz PIXEL RANGE: 80 to 2048 pixels active video SYNC RESOLUTION: 1 horizontal line
<b>General</b>	OUTPUT PROTECTION (sync and video): $\pm$ 250 VDC or 250 Peak ACV 16 bit ISA compatible

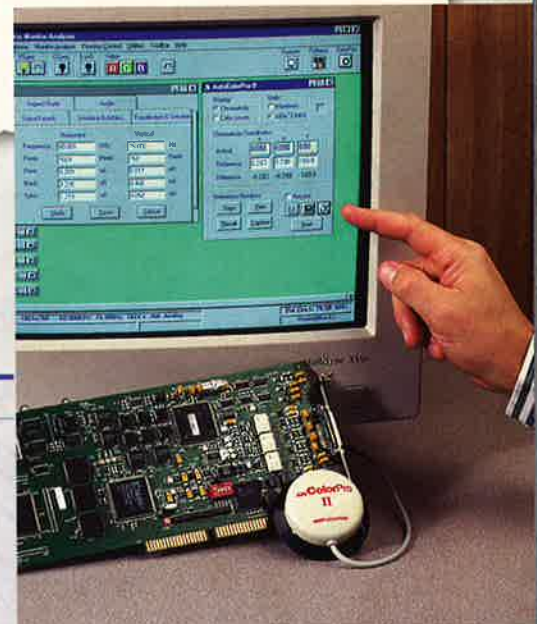
## CP288 Auto "ColorPro II" Specifications (see page 12)

All specifications subject to change without notice.

\* CM2250-PC "Pro" is available as a stand-alone instrument without the CP288 Auto "ColorPro II."  
Model # CM2250-PC

## CM2250-PC "Pro" Accessory List

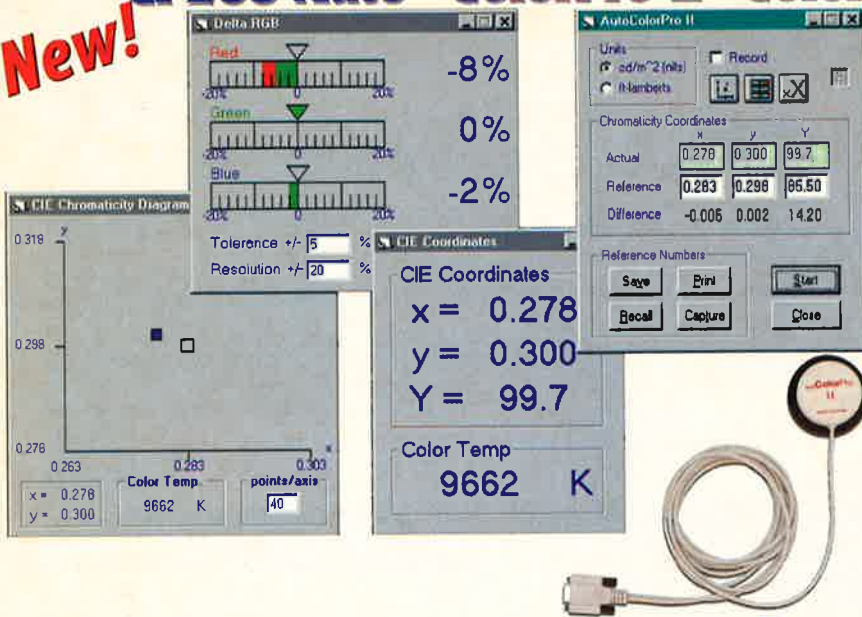
<b>Supplied Accessories</b>	39B443 EVC to 15 pin HD Extension Cable
<b>Optional Accessories</b> (For complete connector descriptions, refer to page 17.)	39B273 Universal Connector 39B274 VGA 39B280 EGA 39B281 PGC 39B300 Connector #6 39B441 EVC to 13W3 Extension Cable 39B492 Male Apple-Mac 39B493 Female Apple-Mac 39B555 EVC to 15 pin 39G346 ECL Adapter KB283 Keyboard PC263 Protective Cover



**SENCORE**

# CP288 Auto "ColorPro II" Color Analyzer

**New!**



The Only PC-Based Color Analyzer To Give You Fast, Accurate Chromaticity & Luminance Measurements On All CRTs, For A Lot Less Green Than You Would Expect!

- Easy-to-use Windows™ GUI, giving you four options for displaying your measured data, a CIE Chromaticity Diagram, large CIE coordinates, RGB Levels, and the Auto "ColorPro II" control window
- Sync-locked measurements - automatically reads and displays the refresh rate of the display under test
- Industry standard measurement units and display modes - readings are displayed in Yxy, RGB, and color temperature in degrees Kelvin. Luminance units are selectable between foot-lamberts and  $\text{cd/m}^2$  (nits)
- Programmable reference data - references may be entered and stored by the user, and is limited only by the amount of memory available on the host system
- Accuracy that only an engineer would require - the CP288 has the specs necessary to do a complete white-balance alignment, so you can be sure you match display manufacturer specifications
- Tracking data is made easy - print your analysis data straight from the measurement screen. The printed form will contain the manufacturer's name, model number, serial number, measured data, and comments

## CP288 Auto "ColorPro II" Specifications

Display Modes	xyY, $\Delta$ RGB, correlated temperature in Kelvins
Luminance Range	.05 to 150 fL; luminance units are selectable within the user interface for either foot lamberts or $\text{cd/m}^2$ (nits)
Accuracy	Y: $\pm 4\%$ $\pm 1$ digit, xy: $\pm 0.002$
Repeatability	Y: $\pm 0.3\%$ $\pm 1$ digit, xy: $\pm 1.0\%$ $\pm 1$ digit
Screen Refresh	30 to 120 Hz
Measurement Rate	(Vertical field rate)/12
Stored References	9300 Kelvin, references may be entered and stored by the user, and is limited only by the amount of memory available on the host system

All specifications subject to change without notice.



**SENCORE**

# New! CP290 "ColorPro" Hand-Held Color Analyzer



The Only Portable Color Analyzer That Allows You To Confidently Measure White Balance On All CRTs Offering The Specifications And Features Necessary To Make It "The Complete Solution!"

- Compact (hand-held) portable white balance testing and alignment wherever the display is located
- Simple to use, menu-driven features with total control at your fingertips
- Fast, accurate chromaticity measurements over a wide range of luminance on all CRTs, including color monitors and television
- Industry standard measurement units and display modes
- Sync-locked measurements, no external sync needed
- Bright, easy-to-read LED screen helps reduce strain on your eyes
- No-drift color probe with calibration traceable to NIST standards
- Pre-loaded with the most common CIE Chromaticity references
- Long-use rechargeable batteries will give hours of testing when AC is not available (AC adapter/recharger included with every unit)
- Built-in user-selectable energy saver to conserve battery power
- High dollar performance at an affordable price

## CP290 "ColorPro" Specifications

<b>Display Modes</b>	Yxy, Yu'v', XYZ, ΔRGB, correlated color temperature in Kelvins
<b>Luminance Range</b>	.05 to 150 fL; luminance units are selectable on the front panel for either foot lamberts or cd/m <sup>2</sup> (nits).
<b>Accuracy</b>	Y: ±4% ±1 digit xy: ±0.002
<b>Repeatability</b>	Y: ±0.3% ±1 digit xy: ±1.0% ±1 digit
<b>Screen Refresh</b>	30 to 120 Hz
<b>Measurement Rate</b>	(vertical field rate)/12
<b>Stored References</b>	9300 K, D50, D65, D75, and custom for ΔRGB measurement modes
<b>Battery Life (per charge)</b>	Approximately 4 hours of usage per charge

All specifications subject to change without notice.



**SENCORE**

# HA2500 Universal Horizontal Analyzer

Patented

**New!**



Now Everything You Need To Localize Horizontal And B+ Supply Defects In Computer Monitors In Less Time And More Profitably Than Ever Before!

- Unique frequency lock and variable horizontal frequency allows you to quickly service all horizontal circuits no matter the frequency
- Exclusive "Horizontal Output Load Test" makes setup and testing a snap – even without applying AC power for more accurate estimates, fewer damaged replacement parts, and faster diagnosis and repair
- Patented "ringer" proves the condition of flybacks and yokes in seconds – even a single shorted turn
- Exclusive "Dynamic Tests" help you analyze the horizontal circuit in powered-up conditions to catch even subtle defects in the power supply, noise, and drive signal
- Variable current limited & protected B+ substitute power supply permits testing of horizontal stages even when the power supply is dead
- Portable and field rugged to go on location when bringing the defective product to your bench isn't feasible

Sencore's HA2500 Universal Horizontal Analyzer is the one instrument designed specifically for analyzing all horizontal and B+ related defects. The HA2500 teams up with any of the Sencore computer monitor generators (or use it stand-alone) to give you complete monitor analyzing. Its patented and exclusive features give the HA2500 the capabilities to help you service computer monitors faster and more profitably than ever before.

The HA2500 provides exclusive analyzing tests and substitution capabilities to localize horizontal circuit defects faster than using

conventional methods. The "chassis off" test determines if the horizontal stage is free of severe defects or if problems exist. The patented "ringer" test dynamically tests coils and transformers for one or more shorted turns – a common failure of flybacks. The exclusive Dynamic Tests analyze the input and output voltage parameters of the horizontal output stage with the chassis powered on without worry of test instrument or lead damage. The Horizontal Driver test and Sub Drive give you the rest of the capabilities you need for pinpointing all horizontal difficulties in any computer monitor.



## HA2500 Universal Horizontal Analyzer Specifications

<b>Horizontal Frequency Generator</b>	FUNCTION: Squarewave generator for Load Tests and Sub Drive functions. FREQUENCY RANGE: <15 kHz to >125 kHz
<b>External Sync Input</b>	INPUT SIGNALS: Horizontal Sync, Composite Sync, Composite Analog Video ( $\pm$ Polarity). FREQUENCY RANGE: 15 kHz - 125 kHz. SENSITIVITY: Composite Analog Video > .5 VPP Horiz. or Composite Sync > 2 VPP
<b>Horizontal Output Load Test B+ Power Supply</b>	VOLTAGE RANGE: 0 - 18 VDC $\pm$ 0.5 volts. CURRENT LIMIT: 250 mA $\pm$ 10%
<b>Horizontal Output Load Test Setup</b>	EXCITATION DRIVE: Squarewave 50% duty cycle $\pm$ 2%. B+ VOLT RANGE: 0 - 19.9 volts. VPP RANGE: autoranged 0 - 400 VPP
<b>Horizontal Output Load Tests</b>	B+ mA RANGE: 0-250 mA. TIME $\mu$ S RANGE: 0.1 $\mu$ S - 50 $\mu$ S. TIME $\mu$ S TRIGGER LEVEL: 5% $\pm$ 1% of pos. pulses with VPP > 10 VPP
<b>Ringer Test</b>	FUNCTION: Approximate coil "Q" determined by exciting the coil and counting ringing cycles to a damped level.
<b>Dynamic Tests (COLLECTOR OR DRAIN METER)</b>	VDC RANGE: Autoranged, 0-400 volts. VPP RANGE: Autoranged, 0 VPP to 1500 VPP. TIME $\mu$ S RANGE: 0 - 50 $\mu$ S. TIME $\mu$ S TRIGGER LEVEL: 5% $\pm$ 1% of pulse VPP >20 VPP
<b>Dynamic Tests (BASE OR GATE METER)</b>	VPP RANGE: 0 VPP to 50 VPP
<b>Dynamic Tests (HORIZONTAL DRIVER TEST)</b>	FUNCTION: Measures the horizontal driver stage output current capability by simulating a low impedance base/emitter transistor junction. BASE mA RANGE: 0 - 2000 mA
<b>Dynamic Tests (SUB DRIVE )</b>	FUNCTION: Substitute drive optimized to properly drive the base or gate of any horizontal output transistor. BASE SUB OUTPUT: Squarewave 50%, -2/+6% duty cycle GATE SUB OUTPUT: Squarewave, 50% duty cycle $\pm$ 2%
<b>Substitute B+ Supply</b>	VOLTAGE RANGE: < 30 volts to > 180 volts. POWER OUPUT: 2 amps $\pm$ 10% to 40 volts, 80 watts $\pm$ 10% over 40 volts. POWER LIMIT RANGE: < 3 watt (min.) to > 80 watt
<b>General</b>	FLOATING GROUND ISOLATION: 600 volts (DC + peak AC) from "-" terminal to chassis ground with < 500 $\mu$ A. DIGITAL DISPLAY: Vacuum fluorescent matrix, 40 x 2 AC POWER: 105 to 125 VAC 50/60 Hz. May be factory converted to 220 VAC. SIZE: 6" X 11.5" X 15.5" (15.2 X 29.1 X 39.3 cm) HWD. WEIGHT: 14 lbs. (6.4 kg.)

All specifications subject to change without notice.

### HA2500 Accessory List

<b>Supplied Accessories</b>	39G469 Dynamic Test Lead 39G470 Load & Ringer Test Lead 39G481 B+ Supply Lead
<b>Optional Accessories</b>	39B296A Video Test Cable 39G348 Drive Sync Cable 39G494 Dynamic DVM Test Lead 39G508 Composite Sync Cable HP200 50 kV High Voltage Probe TP212 10 kV Transient Protector Probe PC263 Protective Cover



**SENCORE**

# EX220 Video Output Expander



Now You Can Operate  
Up To 10 Monitors  
With One Signal Source –  
Great For Burn-in Racks To  
Reduce Call-Backs!

- Drive multiple monitors from a single RGB video source for after repair burn-in
- 90 MHz video bandwidth produces sharp pictures on high resolution computer monitors
- Separately buffered outputs keep bandwidth and levels constant plus provide protection from computer monitors that fail during burn-in



**SENCORE**

Drive multiple monitors with a single RGB source using the EX220 Video Output Expander. The multiple RGB outputs are great for after repair burn-in and overnight testing. Use the EX220 with your Sencore Computer Monitor Analyzer or other RGB sources. The 90 MHz video bandwidth gives the capability you need to accurately test multiple monitors simultaneously.

The EX220's individually buffered outputs keep bandwidths and levels constant so each signal is independent of the other. This provides extra protection from computer monitors that fail during burn-in. And each sync and video output is individually buffered for signal integrity and output protection to prevent downtime.

## EX220 Specifications

<b>Input</b>	15 pin D-sub
<b>Output</b>	Ten 15 pin D-sub. Individually buffered for signal integrity and output protection. Short-circuit protected outputs. Video Bandwidth: 90 MHz
<b>General</b>	Size: 4.97" X 8.05" X 6.45" (HWD). Weight: 4 lbs. Power Requirements: 105-125 VAC, 50-60 Hz, 30 Watts

All specifications subject to change without notice.

**Connectors Available For Sencore's Computer Monitor Analyzer/Generators**

Connector #	Where Used	CM125	CM2125	CM2250	CM2250-PC/ CM2250-PC "Pro"
#1 (39B275)	15 pin to CGA	✓	✓	✓	✓
#2 (39B280)	15 pin to EGA	✓	✓	✓	✓
#3 (39B281)	15 pin to PGC	✓	✓	✓	✓
#4A (39B274)	15 pin to VGA, PS/2, SVGA, and XGA	✓	✓	✓	✓
#6 (39B300)	15 pin to male BNC	✓	✓	✓	✓
#7 (39B416)	15 pin to 13W3 Extension Cable	✓	✓	✓	✓
#8 (39B492)	15 pin to BNC (male) Apple-Mac	✓	✓	✓	✓
#8F (39B493)	15 pin to BNC (female) Apple-Mac	✓	✓	✓	✓
39B377	DB15 to DB15 Extension Cable	✓	✓	✓	✓
39B273 Universal Connector	15 pin to bare wire	✓	✓	✓	✓
39G346 ECL Adapter	Converts digital (TTL) to ECL		✓	✓	✓

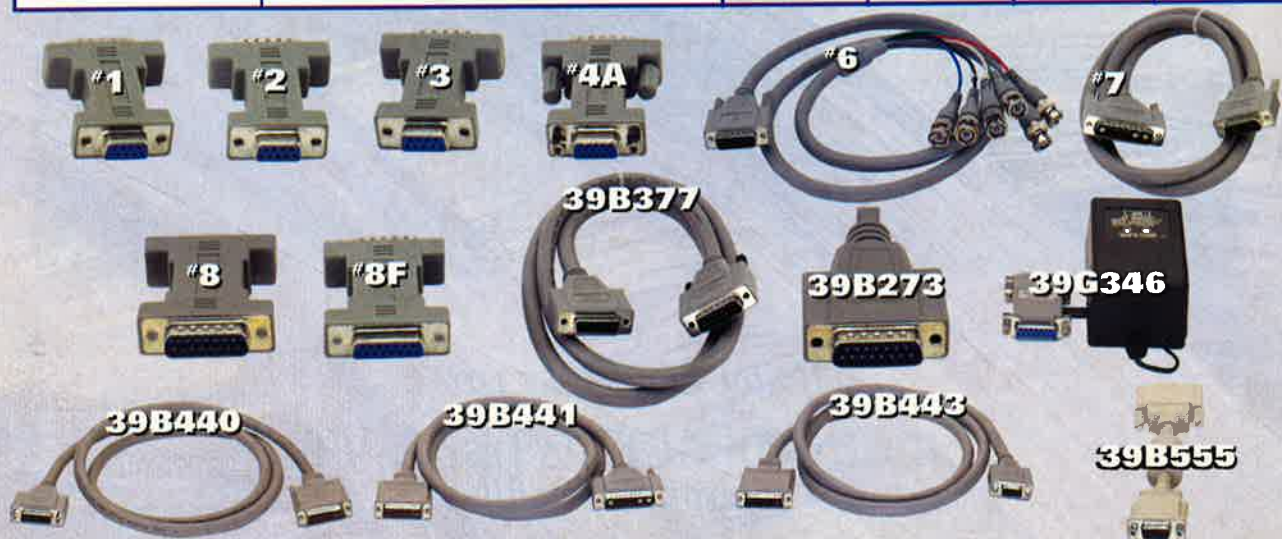
Above connectors require use of 39B440 or 39B560 when used with either the CM2250 or CM2250-PC

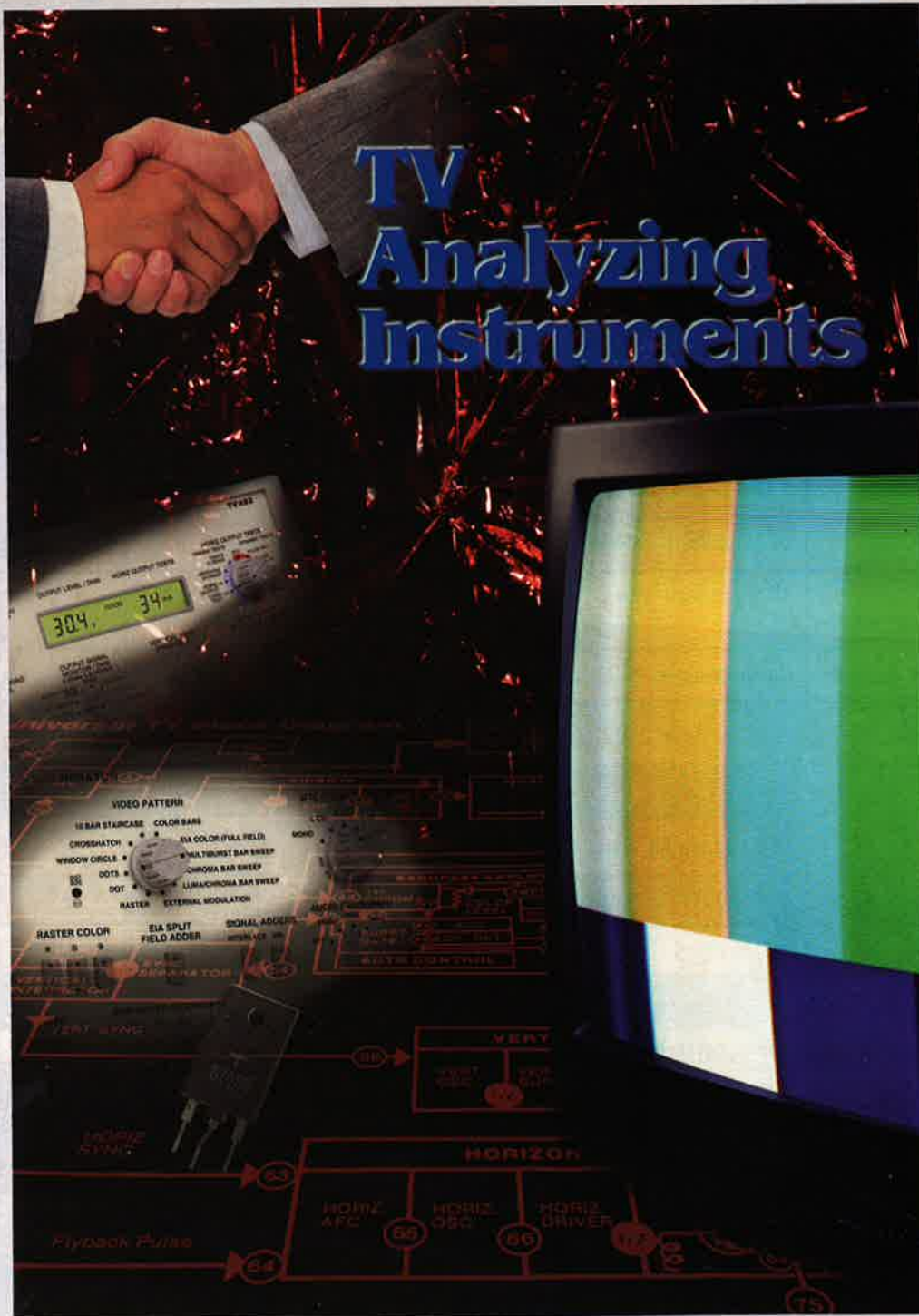
**Non-CE Approved EVC Connectors**

38B440	EVC - 15 pin 48" Extension Cable			✓	✓
39B441	EVC to 13W3 Extension Cable			✓	✓
39B443	EVC to HD15			✓	✓

**CE Approved EVC Connectors**

39B555	EVC to HD15 (9 inch)			✓	✓
39B560	EVC to DB15 (9 inch)			✓	✓
39B561	EVC to 13W3 (9 inch)			✓	✓
39B562	EVC to BNC female (9 inch)			✓	✓





## Service

*If you don't take care  
of the customer...  
someone else will.*

Can you remember any sets this past week that you sent back unrepaired? If you're like most servicers, you've had at least one or two sets that the customer decided to take home unrepaired.

After the customer walked out the door with the unrepaired set in hand, did you second-guess yourself or feel like you had lost a potential profit? You may be losing profits you weren't even aware of if the following examples sound familiar:

1. Are you able to provide your customer with an estimate that you can confidently stick with?
2. When you're unsure of the true defect of a repair, do you estimate high to protect your shop from embarrassment or loss of profits?

When a customer receives an estimate for what he thinks is too much money, he'll often reply, "I'll just buy a new one!" Then, most likely he'll take the set to another shop and have it repaired for possibly less.

That particular set may have turned out to be profitable for you, but you didn't know. So the bottom line is: **WILL THIS REPAIR BE PROFITABLE?** That's a decision you'll have to make in a minimal amount of time.

To make that prompt and wise decision, you need techniques and the instruments to back you up. Sencore understands your problems. That's why we offer you the methods and the instruments to help you make that estimate as soon and as accurate as possible. There are three key techniques you can use every day for estimating service repairs. A good, quality estimate is the key to keeping those profits inside your service center.

In this "TV Analyzing Instruments" product section, you will see the following exclusive Sencore test instruments:

VG91 Universal Video Generator  
TVA92 TV Video Analyzer

**SENCORE**

**TV Analyzing Instruments**

# VG91 Universal Video Generator

Patented



A Complete All Channel  
RF/IF/MTS Universal  
Video Generator  
Designed To Performance  
Test And Isolate Defects  
In Any NTSC Video System!

- All channel TV-RF generator for complete tuner analyzing
- Variable level 45.75 MHz video-IF troubleshooting and alignment generator
- Proof-positive tests for MTS Stereo/SAP on all channels.
- Exclusive and dynamic NTSC video test signals
- Standard Y/C, composite video, and audio line outputs
- Spare video output and exclusive interconnect design that permits future updates or expansion
- Portable and easy-to-use

RS232  
Compatible

The VG91 Universal Video Generator is an all-channel, TV-RF generator that simulates any off-air or cable channel to completely analyze all NTSC tuners. Variable level RF and IF signals allow you to prove the operation of tuner and IF circuits in seconds. The exclusive and dynamic video patterns provide you with the information you need to analyze the operation and performance of video equipment. You get these patterns:

- Raster
- Dot
- Window Circle
- Color Bars
- Chroma Bar Sweep
- Luma/Chroma Bar Sweep
- Crosshatch
- Dots
- 10 Bar Staircase
- EIA Color Pattern
- Multiburst Bar Sweep

The MTS audio generator of the VG91 provides both standard audio and MTS stereo signals for testing and troubleshooting both mono and MTS receivers. You also get standard Y/C, composite video, and line level audio found on consumer and most professional equipment. With the spare video output and exclusive interconnect design, the VG91 lets you add to your service bench as your needs grow.\*

- \* Tech Choice compatible instruments:
- TVA92 TV Video Analyzer
  - VC93 All Format VCR Analyzer

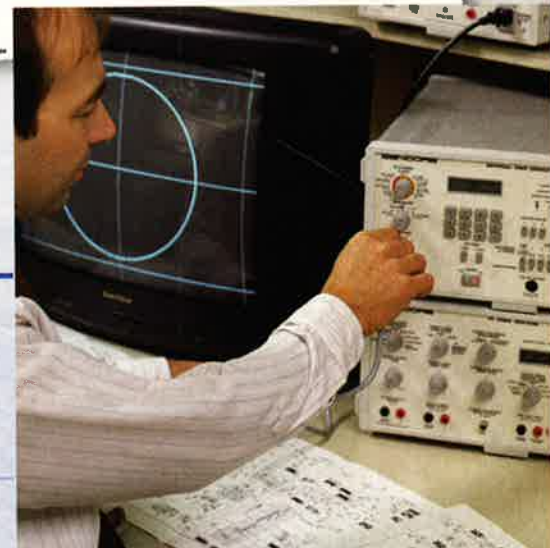
## VG91 Universal Video Generator Specifications

<b>TV-RF Generator</b>	STD TV 2-69, STD CABLE 2-125, HRC CABLE 1-125, ICC CABLE 1-125. RF CARRIER FREQUENCY ACCURACY: $\pm 50$ kHz. AURAL CARRIER: Visual carrier + 4.5 MHz, $\pm 1$ kHz. AUDIO MODULATING FREQUENCIES: 300 Hz, 1 kHz, 3 kHz, 5 kHz. RF AURAL STEREO SEPARATION: $> 25$ dB Typically $> 30$ dB
<b>Video IF Generator</b>	VIDEO IF FREQUENCY: Video: 45.75 MHz $\pm 10$ kHz; Aural: 41.25 MHz. IF TRAP SIGNALS: 47.25 MHz, 41.25 MHz, or 39.75 MHz $\pm 10$ kHz selectable. 4.5 MHz SOUND IF: 4.5 MHz $\pm 1$ kHz
<b>RF-IF Output</b>	RF-IF LEVEL STEP ATTENUATOR: RF Output = LO: 5-50 $\mu$ V, MED: 50-500 $\mu$ V, HI: 500- 5,000 $\mu$ V. RF-IF LEVEL VERNIER ACCURACY: RF "NORM" 1000 $\mu$ V; $\pm 3$ dB HI range. RF-IF OUTPUT IMPEDANCE: 75 $\Omega$ $\pm 10\%$
<b>Video Pattern Generator</b>	PATTERNS: Raster, Dot, Dots, Window Circle, Crosshatch, 10 Bar Staircase, Color Bars, EIA Color Full Field (Split Field Added), Multiburst Bar Sweep, Chroma Bar Sweep, Luma/Chroma Bar Sweep. External Modulation. INPUT: BNC jack, 1 VPP (negative sync) 75 $\Omega$ impedance
<b>Multichannel TV Sound Signal</b>	AUDIO MODES: Mono, L only, R only, L+R, SAP. MODULATING FREQUENCIES: 300 Hz, 1 kHz, 3 kHz, & 5 kHz, $\pm 2$ Hz. STEREO PILOT FREQUENCY: 15,734 Hz $\pm 2$ Hz, locked to horizontal sync. STEREO PILOT LEVEL: Variable 0-100%; 100% = 5 kHz deviation. STEREO SUBCARRIER FREQUENCY: 31,468 Hz $\pm 4$ Hz, phase locked to pilot. SAP CARRIER FREQUENCY: 78,670 $\pm 10$ Hz, phase locked to Pilot
<b>STD Y/C Output</b>	LEVEL: 1 VPP (Y) luminance $\pm 10\%$ into 75 $\Omega$ ; .63 VPP (C) chroma $\pm 10\%$ into 75 $\Omega$ . LUMA & CHROMA SOURCE: Selected by VIDEO PATTERN switch. FREQUENCY RESPONSE: (Y) Flat Multiburst Bars to 4.5 MHz, $\pm 10\%$
<b>STD Video Output</b>	STD VIDEO LEVEL: 1 VPP into 75 $\Omega$ , negative sync. FREQUENCY RESPONSE: Multiburst flat to 4.5 MHz, $\pm 10\%$
<b>STD Audio Output</b>	AUDIO SIGNAL: Selected by AUDIO FREQUENCY control. LEVEL: 400 mV $\pm 150$ mV into 10 k $\Omega$
<b>General</b>	POWER: 105-125 VAC, 60 Hz, 42 Watts. SIZE: 7" X 14" X 16.7" (17.9 X 35.8 X 42.5 cm) HWD. WEIGHT: 18.2 lbs

All specifications subject to change without notice.

## VG91 Accessory List

<b>Supplied Accessories</b>	39A161AF to RCA Female Adapter Cable 39A162AF to RCA Male Adapter Cable 39A302 RF-IF Troubleshooting Balun 39B241A Audio Test Cable 39B270 S-Video Y/C Cable 39B296 Video Test Cable 39G301 RF-IF Test Cable
<b>Optional Accessories</b>	39G72 RF-IF Matching Balun 39G232 BNC Cable 39G266 Synchronizing Interconnect Cable IB78 RS232 Interface Accessory PC259 Front Panel Protection Cover



**SENCORE**





## TVA92 TV Video Analyzer Specifications

<b>Audio &amp; Video Drives</b>	SIGNALS: Audio, MTS Composite Audio, Video Chroma, V&H Sync, Vert Sync, Vert Drive, Horiz Drive, Horiz Key Pulse. OUTPUT: 0-300V in 3 ranges, IMPEDANCE: <50 ohms.
<b>Simultaneous Drive Signals</b>	SIGNALS AVAILABLE: V&H Blanking (Sandcastle) & 3.58 MHz color oscillator. OUTPUT: 0-30V, IMPEDANCE: <50 ohms.
<b>Vertical Yoke Drive</b>	LINEAR CURRENT OUTPUT: 0-1.5 Amp peak. EXTERNAL VOLTS PROTECTION: ±500 Volts (DC + Peak AC).
<b>Horizontal Output Load Test</b>	FUNCTION: Tests the horizontal output/flyback circuit by applying 15V B+ source, exciting drive to the flyback primary, and metering the B+ current and flyback pulse time. VOLTAGE APPLIED: 15 VDC ±.5 volts, current limited to 250 mA. PROTECTION: Diode and fuse protected.
<b>Ringing Test</b>	FUNCTION: Approximate tests of coil "Q" determined by applying an exciting pulse and counting the ringing cycles before reaching a preset damping level. ACCURACY: ±1 count on readings between 8 and 13 rings. EXCITING PULSE: 5 VPP, 60 Hz.
<b>Horizontal Output Dynamic Measurements</b>	All tests are done with a simple 3 lead hook-up to H.O.T. DCV RANGE: 0 to +199V. RESOLUTION: 0.1 volts 0 to 99.9V; 1 volt 100 to 199V. PULSE PPV RANGE: Autoranged, 0-1500 VPP. PULSE PPV ACCURACY: < 2%, ±2 counts at 1 kHz. PULSE TIME RANGE: 0-50.0 μS. PULSE TIME ACCURACY: 1%, ±2 counts. INPUT DRIVE FUNCTION: Monitors base lead to horizontal output and indicates if drive is present. INPUT DRIVE RESPONSE TIME: Immediate display updates with status change. INPUT DRIVE PROTECTION: 2,000V (DC + Peak AC) across inputs; 1500V (DC + Peak AC) from "-" terminal to ground.
<b>Horizontal Output Device Sub &amp; Drive</b>	FUNCTION: Substitutes for the horizontal output transistor by switching the collector terminal to ground at 15,734 Hz rate and completing the flyback primary and yoke current paths. Current source is the chassis B+ power supply. SUB CONTROL "OFF": Permits normal chassis operation. CURRENT RANGE: Variable, 0-1.5 amps. Controlled by conduction time of transistor.
<b>DC Bias Supply</b>	RANGE: 0-30 volts, ±1 volt, current limited to 1 amp. CURRENT SINK CAPABILITY: 250 mA from external voltage source.
<b>Output Signal Monitor/DVM</b>	DCV RANGES: Autoranged, 0-1999 volts. DCV ACCURACY: <.5%, ±2 counts. DC BIAS mA: Autoranged, 0-1000 mA < 1%, ± 2 counts. PPV RANGE & ACCURACY: Autoranged, 0-1999 VPP < 2%, ± 2 counts.
<b>General</b>	POWER: 105-125 VAC 60 Hz. Power switched with generator, SIZE: 7" x 14" x 16.7" HWD (17.9 x 35.8 x 42.5 cm). WEIGHT: Approximately 20 lbs.

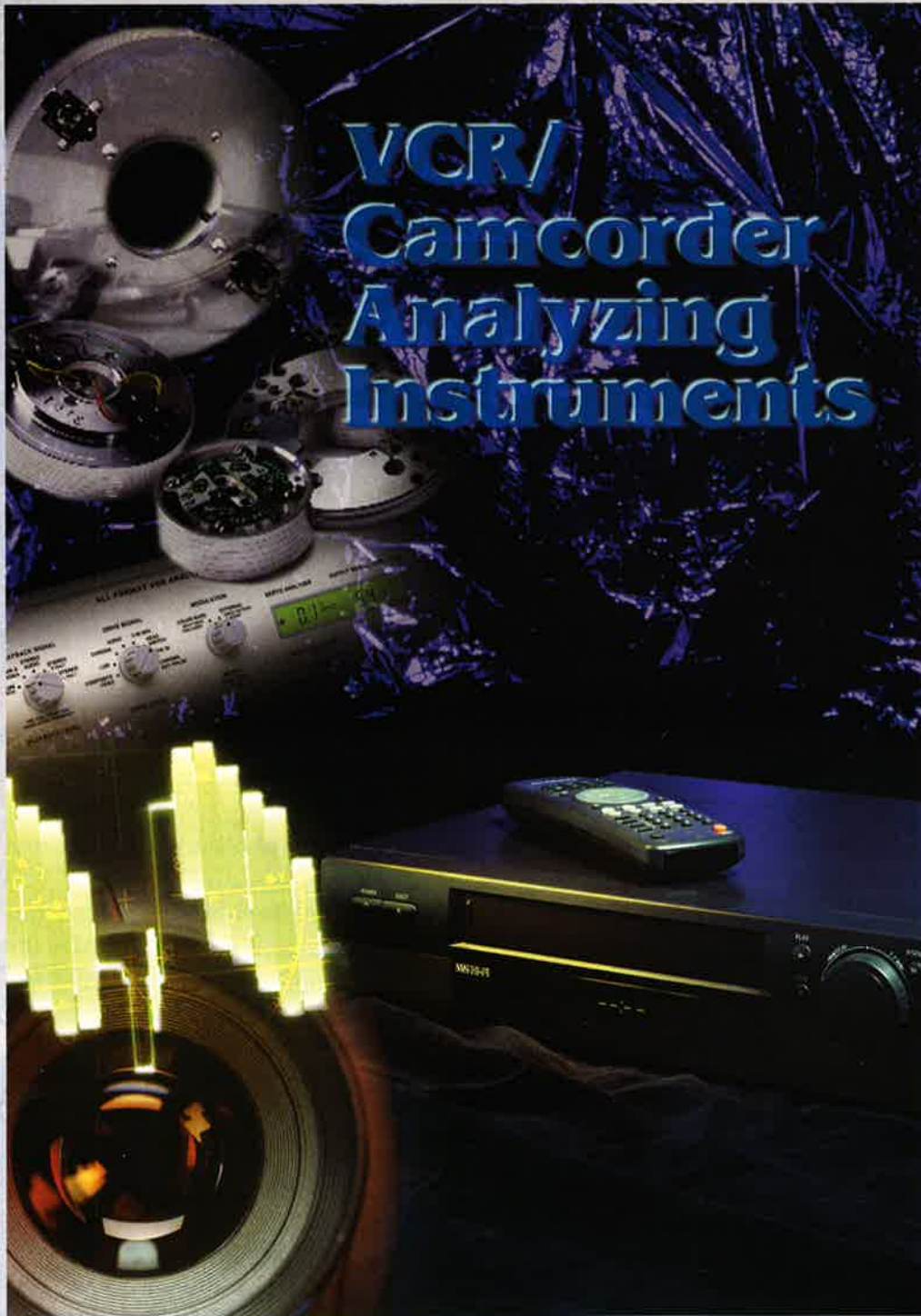
All specifications subject to change without notice.

### TVA92 Accessory List

<b>Supplied Accessories</b>	39G174 Direct Alligator Clip Test Lead
	39G175-R DVM Test Leads
	39G234 Direct Miniature Test Leads
	39G266 Synchronizing Interconnect Cable
	39G298 Ringer/Load Test Leads
	39G299 Dynamic Test Leads
	39G305 3.58 MHz & Blanking Drive Leads
<b>Optional Accessories</b>	HP200 50 kV High Voltage Probe
	PC259 Front Panel Protection Cover
	TP212 10 kV Transient Protector Probe



**SENCORE**



## Technology

*Technology is constantly changing our lives...  
you must stay up-to-date or  
you will quickly be left behind.*

**V**CR servicing can be a very rewarding business, both personally and financially. The high number of machines sold each year, combined with the high failure rate of the mechanical and electrical stages, make VCRs a great service income generating product for most service centers. Yet, many service centers simply are not equipping the technicians with the tools they need to get the job done in the most cost-effective means possible.

Many VCRs have dropped drastically in price as compared to 10 years ago. And all too often, consumers are apt to purchase new equipment instead of paying the \$100-\$150 service invoice. Also, many consumers simply don't recognize the fact that a VCR costing \$250 is much more complex than a \$250 vacuum cleaner (for example), and repairing the VCR requires a skilled electronic technician.

The VCR technician must accurately pinpoint both mechanical and electrical defects, and do so quickly while providing the best customer service possible. Many of Sencore's customers are telling us that word-of-mouth advertising is the best source of business they have. Yet many don't continually pursue steps to help insure the best possible service. That's exactly why you cannot be without the only VCR analyzer on the market.

Every service center should have a VCR analyzer available for them to use. But, ultimately you must decide for yourself:

1. Are my estimates accurate? If a customer takes the VCR to another shop, will my estimate be overpriced?
2. Can I accurately verify the condition of expensive VCR components or do I swap components (shotgun) to find the defects?
3. Is my servicing streamlined and accurate for the highest efficiency?
4. Am I ready for all the formats of VCRs that my customers bring to me?
5. Am I adding all the profits to my service center that I possibly can?

In this "VCR/Camcorder Analyzing Instruments" product section, you will see the following exclusive Sencore test instruments:

VC93 All Format VCR Analyzer  
CVA94 "Video Tracker"<sup>TM</sup> - NTSC Waveform  
Monitor/Vectorscope Analyzer  
VR940 Video Reference

**SENCORE**

## VCR/Camcorder Analyzing Instruments

# VC93 All Format VCR Analyzer

Patented



Isolate Any Playback Or Record Problem In All VCRs, In Less Than Half The Time It Presently Takes.... Now And In The Future, Or Your Money Back!

- All-format VCR analyzer
- Dynamic VCR head signal substituter for all formats
- Exclusive Hi-Fi Stereo all-format head signal substituter
- Innovative VCR luminance, chroma, and audio analyzer
- Automatic servo analyzer (patented)
- Stand-alone analyzer or companion to the VG91 Universal Video Generator
- Complete all-format troubleshooting tool includes:
  - Servo bias supply
  - Standard video & audio line outputs
  - Autoranging DCV and PPV meter
  - Output signal monitor
- Obsolete-proof and expandable

RS232  
Compatible

Now you'll have all the VCR signals you need in any format for your luminance, chroma, and Hi-Fi troubleshooting. The VC93's VCR head substitution signals give you dynamic proof if the heads are good or bad before you order the part. The substitute drive signals give you dynamic answers in any circuit - from the heads to the servos.

The VC93 catches servo defects with a patented good/bad test that pinpoints problems before you send the VCR out your door. You get these tests:

- Servo Locked Test
- Capstan Speed Test
- Capstan Jitter Test
- Drum Speed Test
- Drum Jitter Test

When used in conjunction with the Sencore VG91 or VA62A, you get extra test patterns and RF-IF testing capabilities. The built-in NTSC split-field test pattern makes the VC93 a standalone analyzer for added flexibility. With a DC servo bias, standard video/audio line outputs, and an autoranging DCV and PPV meter, the VC93 is your answer for every VCR problem that crosses your bench.

## VC93 All Format VCR Analyzer Specifications

<b>Formats</b>	VHS, Super VHS, VHS-C, Super VHS-C, Beta, Super Beta, U-MATIC, U-MATIC SP, 8mm, Hi-8, plus update capability
<b>Playback Signals</b>	(For substituting before detectors) LUM (FM MOD): FM luminance-only portions of signals selected by VCR FORMAT switch. LUM AND CHROMA: FM luminance and chroma signals selected by VCR FORMAT switch. STEREO AUDIO: FM Stereo audio signals corresponding to VCR format selected by VCR FORMAT switch. STEREO R ONLY: Right channel only FM Stereo audio signals. STEREO L ONLY: Left channel only FM Stereo audio signals
<b>Playback Output Level</b>	Continuously variable to 5 VPP in three ranges
<b>Chroma Lock</b>	Phase-locks VC93 to the VCR to produce locked color. INPUT SIGNAL: SW30 from VCR. INPUT SIGNAL LEVEL REQUIRED: Greater than 1 VPP. CHROMA PHASE SELECT: 0 or 180 degrees. LOCK LIGHT: Lights when proper signal type and level received
<b>Drive Signals</b>	All drive signals phase-locked to modulation source selected by the MODULATION switch. SIGNALS AVAILABLE: Composite Video, Luminance, Chroma, Audio, 3.58 MHz, Headswitch, SW30, and Chroma Key Pulse
<b>Drive Output Level</b>	Continuously variable from -10 to +10 VPP. FREQUENCY RESPONSE: Flat out to 4.5 MHz
<b>Modulation</b>	INTERNAL: Split field color bar pattern. UPPER PORTION: 75% white, yellow, cyan, green, magenta, red, blue, and black. LOWER PORTION: 100% white, black. AUDIO TONE: 1 kHz sinewave. EXTERNAL: VG91 Video Analyzer through 15 pin Sencore interface cable
<b>Servo Analyzer Tests</b>	All servo tests results displayed as percentage indication to 0.01% resolution and GOOD/BAD indication. TESTS AVAILABLE: Servos Locked, Capstan Speed, Capstan Jitter, Drum Speed, Drum Jitter
<b>Servo Sub Bias</b>	Continuously variable from 0 to 10.0 VDC current limited to 1 amp. VOLTAGE RESOLUTION: 0.01 V
<b>Standard Video Output</b>	LEVEL: 1 VPP $\pm$ 10% into 75 ohms. IMPEDANCE: 75 ohm $\pm$ 10%
<b>Standard Audio Output</b>	LEVEL: 400 mVRMS $\pm$ 150 mV into 10 kohm load. OUTPUT IMPEDANCE: Less than 1 kohm
<b>External Meter</b>	DC VOLTMETER: Autoranging in three ranges - 0.001 to 199.9V. ACCURACY: 0.5% $\pm$ 2 digits. PEAK-TO-PEAK VOLTMETER: Autoranging in three ranges - 0.001 to 199.9V. ACCURACY: 1% $\pm$ 4 digits at 1 kHz. FREQUENCY RESPONSE: 0.001 to 19.99V - 15 Hz to 5 MHz $\pm$ 1 dB; 20.0 to 199.9V - 30 Hz to 1 MHz $\pm$ 1 dB
<b>General</b>	POWER: 105-130 VAC, 60 Hz. SIZE: 7" x 14" x 16.7" (17.9 x 35.8 x 42.5 cm) HWD. WEIGHT: 15 pounds (6.8 kg). DIGITAL METER: 3 1/2 digit LCD readout for OUTPUT SIGNAL LEVEL/DVM plus 3 digit LCD readout for SERVO ANALYZER test

All specifications subject to change without notice.

### VC93 Accessory List

#### Supplied Accessories

39G235	Servo Performance Test Lead
39G236	Servo Troubleshooting Test Lead
39G237	Chroma Lock Test Lead
39G253	Head Substitution Test Lead
39G264	Bias Supply/DVM Test Lead
39G265	Direct Test Lead
ST264	VHS Servo Performance Test Lead

#### Optional Accessories

39G266	Synchronizing Interconnect Cable
IB78	RS232 Interface Accessory
PC259	Protective Cover/Lead Storage
ST265	Beta Servo Performance Test Tape
ST266	VHS-C Servo Performance Test Tape
ST267	U-Matic Servo Performance Test Tape
PL207	RF Pick-up Loop



**SENCORE**

# CVA94 "Video Tracker"™ — NTSC Waveform Monitor/Vectorscope Analyzer

Patented



Quickly And Accurately Analyze Camera Video Signals With Time-Saving Digital Measurements, Waveform And Vector Displays, And Exclusive Special Tests Designed For Fast Camera Servicing And Alignment!

- Digital waveform measurements for fast signal troubleshooting
- Digital vectorscope measurements for easy, error-free color checks
- Selectable video inputs compatible with both composite and high resolution Y/C camera outputs
- Special tests to positively identify and localize:
  - Power adapter and power supply problems with exclusive "Hum" test
  - Poor picture quality with exclusive "Video Noise" test
  - Chroma circuit problems with exclusive "Chroma Noise" tests
  - Reference oscillator problems with exclusive "Burst Frequency" and "Frequency Error" tests

RS232  
Compatible

The CVA94 "Video Tracker"™ provides a complete vectorscope and waveform monitor, plus digital waveform measurements for fast signal troubleshooting. It's the only instrument designed specifically for camera analyzing, saving time, and building customer trust. You get these special tests to positively identify and localize camera problems:

- HUM test
- Frequency Error test
- Video Noise test
- Burst Frequency test
- Chroma Noise test

The selectable video inputs are compatible with both composite and high resolution Y/C camera outputs. And the integrated "Monitor Marker" allows you to see, directly on the picture, exactly what parts of the picture you are measuring. From the first time you use the "Video Tracker,"™ you'll positively identify and localize camcorder problems for fast service and alignment.

## CVA94 "Video Tracker"™ Specifications

<b>Video Input</b>	COMPOSITE INPUT IMPEDANCE: 75 $\Omega$ , >40dB Return Loss, 50 kHz to 5 MHz. Y/C INPUT IMPEDANCE: Y; 75 $\Omega$ , >40dB Return Loss, 50 kHz to 5 MHz. INPUT PROTECTION: Max. externally applied voltage $\pm 12$ V (DC + Peak AC).
<b>CRT Waveform Display</b>	VERTICAL DEFLECTION FACTOR: $140 \pm 2.1$ IRE units at 1 VPP Cal with 1 VPP, 50 kHz input. FLAT FILTER RESPONSE: Within 2% from 25 Hz to 5 MHz, -3 dB at $\pm 6$ MHz. LUMA FILTER RESPONSE: 40 dB attenuation at Fsc. 50 kHz response within 1% of Flat. CHROMA FILTER RESPONSE: Lower -3 dB point; Fsc-1 MHz $\pm 300$ kHz. Upper -3 dB point; Fsc+1 MHz $\pm 300$ kHz. Fsc response within 1% of Flat. 60 Hz REJECTION: Hum Test; <2 dB. All other modes; >20 dB.
<b>Horizontal</b>	SWEEP LINEARITY: Within 5% TRIGGER SOURCE: Video signal input. TRIGGER MODE: TV trigger w/automatic level. TRIGGER POLARITY: Negative. Deflection Factor: With 756 mV $\pm 11.3$ mV of Fsc, deflects to outer vector circle. SUBCARRIER PULL-IN RANGE: Fsc $\pm 200$ Hz. PHASE ACCURACY: $\pm 1.5^\circ$ w/nominal burst. BURST POSITION RANGE: >360°. DIFFERENTIAL PHASE: $\leq 1\%$ . DIFFERENTIAL GAIN: $\leq 1\%$ .
<b>Digital Measurements</b>	WAVEFORM – DISPLAY UNITS: IRE, mV, V, %Burst. DISPLAY RANGE: 0-350 IRE, 0-999 mV, 1-2.5 V, 0-500% Burst. RESOLUTION: 1 IRE, 1 mV, 0.01 V, 1% Burst. ACCURACY: $\pm 1\%$ , $\pm 2$ counts at 50 kHz. Vector Phase – DISPLAY UNITS: Degrees. DISPLAY RANGE: 0-360° at 10-360 IRE of chroma. RESOLUTION: 0.1°. ACCURACY: $\pm 1^\circ$ w/nominal burst. Vector Amplitude – DISPLAY UNITS: %Burst (Referenced to nominal 40 IRE burst.) DISPLAY RANGE: 0-500% Burst. RESOLUTION: 1% Burst. ACCURACY: $\pm 2\%$ , $\pm 1$ count. Special Tests: Hum – DISPLAY UNITS: %. DISPLAY RANGE: 0-10%. RESOLUTION: 0.1%. ACCURACY: $\pm 5$ counts. Video S/N – DISPLAY UNITS: dB. DISPLAY RANGE: 30-56 dB. RESOLUTION: 1 dB. ACCURACY: Within 2 dB. Burst Freq – DISPLAY UNITS: MHz. DISPLAY RANGE: 3.579545 MHz $\pm 200$ Hz. RESOLUTION: 1 Hz. ACCURACY: $\pm 2$ PPM $\pm 1$ Hz to $\pm 200$ Hz. Burst Error – DISPLAY UNITS: $\pm$ Hz. DISPLAY RANGE: 0 $\pm 200$ Hz. RESOLUTION: 1 Hz. ACCURACY: $\pm 2$ PPM $\pm 1$ Hz to $\pm 200$ Hz. Saturation S/N – DISPLAY UNITS: dB. DISPLAY RANGE: 30-56 dB. RESOLUTION: 1 dB. ACCURACY: Within 2 dB. Hue S/N – DISPLAY UNITS: dB. DISPLAY RANGE: 30-56 dB. RESOLUTION: 1 dB. ACCURACY: Within 2 dB.
<b>Video Output To Monitor</b>	OUTPUT IMPEDANCE: 75 $\Omega$ . OUTPUT LEVEL: Within 10% of input level with 50 kHz sinewave. FREQUENCY RESPONSE: 50 kHz to 5 MHz, $\pm 10\%$ .
<b>General</b>	CRT DISPLAY GRATICULES: Etched, combination waveform and vector. BEAM SAVER™ TIMEOUT: CRT beam is blanked approx. 10 min after last control activation. SIZE: 7" x 14" x 16.7" (17.9 x 35.8 x 42.5 cm) HWD. WEIGHT: 17.4 lbs. (7.9 kg). POWER: 105 to 125 VAC, 50/60 Hz, 75 watts maximum.

All specifications subject to change without notice.

## CVA94 "Video Tracker"™ Accessory List

<b>Supplied Accessories</b>	39B270 Video Test Cable Y/C 39G32 Trigger Test Cable 39G348 Video Test Cable BNC-RCA
<b>Optional Accessories</b>	PC259 Front Panel Protection Cover

For broadcast applications, see page 53 for the VSA794 CATV Video Signal Analyzer.



**SENCORE**

# VR940 Video Reference Light Box



All The Accurate Reference Signals You Need For Dependable Camera Servicing In One Self-Contained Light Box!

- An industry standard source of indoor light allowing you to properly service and align all cameras
- A manufacturer specified source for reliable test results with uniform, and even illumination of all test patterns
- Self-contained 2,000 lux output meeting new camera test requirements
- A complete set of charts for both standard and special tests using the CVA94 "Video Tracker" Camera Video Analyzer
- Compact unit and built-in storage compartment to keep all charts at your fingertips and ready when you need them
- Portability for ease of movement on the bench or to storage

The VR940 Video Reference provides an affordable, high quality light source in a convenient package. The uniform 3200 Kelvin color temperature light output provides unvarying illumination of all the test charts without hot spots or dark spots to complicate camera testing or adjustment. It comes with a complete set of charts and filters needed to make tests and adjustments specified in camera service literature. These charts include:

**Color Bar Chart**

*Tests for color phase and amplitude*

**Gray Scale Chart**

*Tests for luminance level and linearity, plus white balance*

**Temperature Conversion Filter**

*Converts indoor color temperature to outdoor*

**Video S/N Chart**

*Tests for composite video signal-to-noise*

**Red Chart**

*Tests for Chroma Saturation S/N and Chroma Hue S/N*

**Registration/Response Chart**

*Checks registration and frequency response*

**Blooming Test Chart**

*Checks for video smearing or blooming*

**Focus Chart**




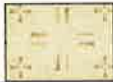


*Checks for back and auto focus operation*

**Neutral Density Filter**

*Checks focus at lower light levels*



## VR940 Video Reference Specifications

<b>Light Output</b>		LIGHT TEMPERATURE: 3200, $\pm 300^\circ$ Kelvin. LIGHT INTENSITY: 2000, -100, +500 lux. LIGHT UNIFORMITY VERTICAL PLANE: < 100 lux variation. HORIZONTAL PLANE: < 65 lux variation
<b>Charts Mechanical</b>		OVERALL SIZE: 10" x 12" x approx. 3/16" thick. CHART WINDOW: 7" x 9 1/3"
<b>Color Bar Chart</b>		DESCRIPTION: 7 equal width vertical bars; white, yellow, cyan, green, magenta, red, blue
<b>Gray Scale Chart</b>		DESCRIPTION: 11 equal width steps from 0% thru 100% white on top of pattern; repeated in reverse order on bottom of pattern; black, white, black in center of pattern; surround at level of center step. (2.2 gamma log corrected)
<b>Video S/N Chart</b>		DESCRIPTION: Left 1/7th of chart at 100% white. Remainder at 50% white (gamma corrected)
<b>Red Chart</b>		DESCRIPTION: Full screen red
<b>Registration Response Chart</b>		DESCRIPTION: Combination of cross-hatch, circles, and frequency response wedges
<b>Blooming Test Chart</b>		DESCRIPTION: Black w/center white rectangle. Rectangle dimensions equal to 10% of vertical and horizontal raster
<b>Focus Chart</b>		DESCRIPTION: Siemens Star. Black and white wedges converging in center of chart
<b>Neutral Density Filter</b>		DESCRIPTION: Reduces light intensity by 4 f-stops (6.25% transmission)
<b>Temperature Conversion Filter</b>		DESCRIPTION: Converts 3200° Kelvin to 5500°, $\pm 400^\circ$ Kelvin
<b>General</b>		SIZE: 19" x 13" x 11.25" (48.3 x 33 x 28.6 cm) HWD WEIGHT: 18.25 lbs (8.3 kg) with charts. POWER: 110 - 125 VAC, 75 watts maximum

All specifications subject to change without notice.

## VR940 Accessory List

Supplied Accessories		
163G45:A	Color Bar Chart	
163G5905	Gray Scale Chart	
163G5202	Video S/N Chart	
163G49:A	Red Chart	
163G5200	Registration/Response Chart	
163G259	Blooming Test Chart	
163G5199	Focus Chart	
163G51	Neutral Density Filter	
163G52	Temperature Conversion Filter	



**SENCORE**



# General Analyzing Instruments

Quality

*Countless, unseen details  
are often the only difference between  
mediocre and magnificent.*

**E**lectronic analyzing in one form or another, has been with us for over 50 years. Analyzing signals is one of the most basic, yet important functions performed by electronic professionals every day. Several years ago, new technology and innovative design produced a new revolution in signal analysis called waveform analyzing. Since that time, waveform analyzing has evolved even further and now allows you to digitally measure even more key parameters of the waveform.

You'll benefit from this revolution in waveform analyzing through decreased measurement time, less frustration, and improved accuracy. But, your analyzing doesn't stop with the waveforms. You're also faced with the many challenges of testing components once your waveform analyzing has narrowed the defect to a few suspect parts.

We depend on the proper operation of capacitors, inductors, transistors, CRTs, SCRs, and other components in almost every electronic device we service. If all these components perform their job, we see good video, hear good audio, and are generally happy with the results.

On the other hand, if one of these components fails to perform, the entire device could be affected. One leaky capacitor or SCR that fails to conduct can have minimal effects on a device, or it could shut the entire unit down.

The challenges facing you as a servicer is to find these defective components and find them fast. Sencore's exclusive line of general analyzing instruments provides quick and dynamic tests to make your troubleshooting more efficient and reliable.

In this "General Analyzing Instruments" product section, you will see the following exclusive Sencore test instruments:

SC3100 "AUTO TRACKER"<sup>™</sup> Automatic 100 MHz  
Waveform & Circuit Analyzer  
CR7000 "BEAM-RITE"<sup>™</sup> CRT Analyzer & Restorer  
LC103 "ReZolver"<sup>™</sup> Capacitor & Inductor Analyzer  
LC102 "AUTO-Z"<sup>™</sup> Automatic Capacitor/Inductor Analyzer  
PR570 "POWERITE II"<sup>™</sup> Variable Isolation Transformer &  
Safety Analyzer  
TF46 Portable Super Cricket<sup>™</sup> Transistor/FET Tester  
PSL60 Universal Power Supply Load

**SENCORE**

**General Analyzing Instruments**

# SC3100 "AUTO TRACKER"™ Automatic 100 MHz Waveform & Circuit Analyzer

Patented



Now Touch And Test Any  
Circuit Test Point And Make  
Autoranged Error-Free  
Measurements In A Fraction  
Of The Time!

- A complete waveform and circuit analyzing system in one instrument
- Auto-Tracking™ digital readout of waveform voltage and frequency with one probe connection
- Integrated measurements of all circuit parameters provide fast troubleshooting answers
- Full performance, 100 MHz dual trace oscilloscope
- Exclusive autoranged timebase and vertical attenuators eliminate wasted time
- Digital delta measurements to analyze every portion of any waveform
- All functions microprocessor integrated for ease-of-use

RS232  
Compatible

Now you can measure DC voltage, peak-to-peak voltage, frequency, DC current, ohms, continuity – and analyze waveforms up to 100 MHz in one complete, easy-to-use instrument. You simply connect one probe to the circuit and push a button for a digital readout of any of these parameters. With an autoranged timebase and vertical attenuators, the SC3100 "AUTO TRACKER"™ lets you view signals without resetting controls. You can keep your mind on the circuit – not on pushing buttons, surfing menus, or making calculations.

With an input capability of 2 kV, the "AUTO TRACKER"™ can handle any signal you need to measure – even the horizontal collector pulse! The "fiddle free" sync circuits give you hands-free analyzing all the way from sine waves to video waveforms. The Delta features let you analyze any portion of the waveform without counting graticules. The SC3100 "AUTO TRACKER"™ is your answer for fast, easy, and accurate waveform and circuit analyzing.

## SC3100 "AUTO TRACKER"™ Specifications

<b>Vertical Amplifiers</b>	DISPLAY MODES: Channel A, inverted channel A (-A), channel B, dual trace (A&B), algebraic sum (A+B) or difference (B-A), vector (X-Y). CALIBRATION ACCURACY: $\pm 3\%$ at 1 kHz. FREQUENCY RESPONSE (100 MHz): AC coupled: $\pm 3$ dB of 1 kHz level from 10 Hz to 100 MHz, usable to 150 MHz. SENSITIVITY: 20 mV/div. to 200 V/div. with supplied 39G292 10X probe; 2 mV/div. to 20 V/div. with (optional) DP270 Direct Probe. MAXIMUM INPUT PROTECTION: Supplied 39G292 10X Probe: 2500 volts breakdown (DC + Peak AC)
<b>Horizontal Sweep</b>	SWEEP RATES: 100 milliseconds/division to 20 nanosecond/division. Autorange automatically selects sweep rate to show approximately 2-5 cycles of waveform. ACCURACY: $\pm 3\%$
<b>Trigger Circuits</b>	TRIGGER SOURCE: CH A, CH B, AC power line, or external. TRIGGER MODES: NORM, AUTO, TV
<b>Auto-Tracking™ Digital Tests</b>	DC Volts – DCV FUNCTION: Provides direct reading of DC voltage on selected channel. ACCURACY: $\pm 0.5\%$ $\pm 2$ digits Peak-to-Peak Volts – VPP FUNCTION: Provides direct reading of peak-to-peak voltage on selected channel with either X10 or direct probes. ACCURACY: $\pm 2\%$ $\pm 4$ counts. FREQUENCY RESPONSE: $\pm 0.5$ dB from 20 Hz to 30 MHz, $\leq -3$ dB at 100 MHz AC Volts – ACV FUNCTION: Calculates RMS sinewave value from PPV measurement. dBm FUNCTION: Calculates dBm measurement from PPV sinewave measurement, referencing 1 mW across 600 $\Omega$ (0 dBm = .7746 volts RMS) Frequency – Automatically displays the frequency of the signal on selected channel. RANGES: 10.00 Hz to 150 MHz. ACCURACY: .001% $\pm 1$ digit Delta Peak-to-Peak – Measures amplitude of intensified area on selected channel Delta Time – Measures time of intensified waveform portion I/Delta Time – Converts Delta Time reading to equivalent frequency Delta DC Volts – FUNCTION: Measures DC voltage level of marked waveform point with respect to ground using the PPV and DCV functions. MARKER: Fully adjustable over entire range of waveform
<b>Digital Meter Tests</b>	Ohms – FUNCTION: Provides in- or out-of-circuit ohms. RANGES: 0.00 to 100 M $\Omega$ . ACCURACY: 0.2% $\pm 2$ digits Continuity Test – Provides audible tone of continuity. RANGE: 0 to 199 $\Omega$ . Audible tone turns on if resistance is $< 10$ $\Omega$ and turns off if resistance is $> 15$ $\Omega$ , $\pm 2$ $\Omega$ DC Current – Provides measurement of DC current. RANGES: .001 to 1.99 amp ACCURACY: 0.3% $\pm 2$ digits
<b>General</b>	SIZE: 7.25" x 13.75" x 15" HWD (18.4 x 34.9 x 38.1 cm). WEIGHT: 25 lbs (9.33 kg.). POWER: 105 to 125 VAC, 50/60 Hz

## SC3100 "AUTO TRACKER"™ Accessory List

<b>Supplied Accessories</b>	39G292 10X Low Capacity Probes (2) 39G295 DVM Test Leads 39G331 Probe Accessory Kit
<b>Optional Accessories</b>	39G81A 250 MHz Demodulator Probe 39G303 Probe Accessory Kit DP270 1-1 Direct Probe HP200 50 kV High Voltage Probe IB78 RS232 Interface Accessory PC269 Protective Cover PL207 RF Pickup Loop TP212 10 kV Transient Protector Probe



**SENCORE**

# CR7000 "BEAM-RITE"™ CRT Analyzer & Restorer

Patented



Easily Test And Restore  
CRTs With The Most  
Complete Tests Available  
For Added Profit And  
Security!



- Tests for all CRTs, including: computer monitors, video displays, televisions, projection TVs, scopes, and special application CRTs – the CR7000 now has full dynamic range to test all CRTs – old and new!
- The easiest-to-use CRT tester on the market
- The most accurate and thorough tests of any CRT tester
- The safest and most effective restoration techniques available
- Newly designed sockets allow easy connection to hard-to-reach CRTs – new socket design allows the user to test projection TVs and computer monitors faster and easier

Now you'll have tests for all CRTs, including computer monitors, video displays, televisions, projection TVs, scopes, and special application CRTs. The CR7000 "BEAM-RITE"™ is the only analyzer to provide simultaneous display of all guns tested with new testing parameters that closely duplicate normal operation of the CRT.

The dynamic tests of the CR7000 are easy-to-use and are the most accurate

of any CRT tester. CRT restoration is also as safe and effective as you need with the "BEAM-RITE's"™ progressive restoration system. You simply use as much power as you need to restore CRTs without worrying about stripping precious cathode material. The newly designed sockets allow easy connection to hard-to-reach CRTs and a universal adapter is included for the odd CRTs you encounter.

## CR7000 "BEAM-RITE"™ Specifications

### CRT Test Functions

Shorts Tests - G1 SHORTS: 20 megohm center scale. H-K SHORTS: 2 megohm center scale  
G2 Voltage - RANGE: 10-400 VDC Video 1, Proj, and Scope. CRT TYPES; 15-600 VDC Video 2 CRT type  
Bias Voltage - RANGE: Video & Projection: 20, 36, 52, 68, 84, 100, 116, 132, 148, 164, 184 VDC; Scope: all bias voltages divided by 10  
Cutoff & Low Tracking Test - Tests ratio of G2 voltages needed to produce cutoff current in all 3 guns of a color CRT. Cutoff current measured between K and G1. "Good" indication if the G2 voltages are within 1.25:1  
Emission Test - Measures true beam current reaching G2  
Life Test - Provides approximate indication of cathode reserve current by lowering filament voltage by 25%  
Hi Tracking Test - Automatically compares emission current between highest and lowest guns in "Simultaneous" gun test and indicates Good/Bad result with LED  
Filament Voltage - Range: 0-4; 4-8; 8-16 VDC

### Restore Functions

REACTIVE RESTORE: Filament voltage; 50% boost current limit: 1 mA max  
REACTIVE RESTORE: Filament voltage; normal current limit: 40 mA max  
NORMAL RESTORE: Filament voltage; normal current limit: 80 mA max. with 2 automatic cycles  
HIGH RESTORE: Filament voltage; 50% boost current limit: 100 mA max. with 3 automatic cycles  
EXTENDED RESTORE: Filament voltage; 50% boost current limit: 100 mA max  
REMOVE G1 SHORTS: Capacitive discharge between G1 and K/G2 after 20 second delay for filaments to cool  
REJUV: Capacitive discharge between G1 and K (400V)

### General

SIZE: 7 3/4" x 12 1/2" x 8 3/4" HWD. WEIGHT: 13 lbs  
POWER: 105-125 VAC 50/60 Hz (210-230 VAC available)

All specifications subject to change without notice.

## CR7000 "BEAM-RITE"™ Accessory List

### Supplied Accessories

39G454 Sockets 1 & 2  
39G455 Sockets 3 & 4  
39G456 Sockets 5 & 6  
39G457 Socket 7  
39G458 Socket 8  
39G459 Universal Adapter  
39G506 Pigtail Adapter  
CRT Setup Book - Form #6410 (current)

### Optional Accessories

39G460 Sockets 9 & 10  
39G461 Socket 11  
39G517 Socket 12



**SENCORE**

# LC103 "ReZolver"<sup>TM</sup> In-Circuit Capacitor/Inductor Analyzer

5 Patents, 2 Pending

**New!**



Now, For The First Time Ever, Reliably Pinpoint Bad Capacitors And Inductors In-Circuit, Or Completely Analyze Them Out-Of-Circuit With Exclusive, Dynamic, And Automatic Tests To EIA Standards.

**ReZolver**

- Pinpoints bad capacitors and inductors "in-circuit", and automatically tells you when further out-of-circuit tests are required
- Analyzes capacitors for all four failures out-of-circuit:
  - Value from 1 pF to 20F
  - Equivalent series resistance
  - Leakage with up to 1,000 volts applied
  - Dielectric absorption
- Tests SMT components in-circuit and accurately with exclusive, time-saving test accessories
- Analyzes inductors with exclusive, patented tests for:
  - Value from .1uH to 20 H
  - Opens or shorts
  - Even one shorted turn with patented "Ringer"
- Makes all tests, compares the results to EIA standards, and tells you "GOOD" or "BAD" - automatically
- Tests SCRs and triacs with optional SCR250 accessory

RS232  
Compatible

How often have you found yourself removing capacitors or inductors because you thought they might be bad - only to find they tested good? How many times do you go ahead and replace the cap or coil just because you went to the trouble of removing the component? Now, with the new LC103 "ReZolver"<sup>TM</sup> you'll dramatically reduce the use of your soldering iron by removing only the bad components. The LC103's quick, one-button in-circuit test catches defective components that other testers miss.

The LC103 also provides the industry standard tests made popular by other Sencore Z-Meters. You get complete capacitor tests that catch all 4 failure modes, and complete coil tests for value and shorted

turns. In fact, the LC103 is the newest addition to Sencore's exclusive Z-Meter line that provides complete dynamic tests that closely simulate normal circuit operating characteristics. The LC103 also does all the interpreting of test results for you by comparing the results to EIA standards and displaying "GOOD" or "BAD".

The "ReZolver"<sup>TM</sup> is guaranteed to save time when testing components - especially, surface mount components. **Now, you can test the component in-circuit** without fear of damage or dropping the tiny components on the bench. Plus, the LC103 allows you to test the larger SCRs, triacs, flybacks, and other transformers with the patented "Ringer" - catching even single shorted turns.



## LC103 "ReZolver"™ Specifications

### IN-CIRCUIT TESTS (Capacitors and Inductors)

Dynamic in-circuit tests to determine whether the component is good or bad.  
**COMPONENT TYPES:** Electrolytic, double layer lytic, tantalum, ceramic, and other capacitors. Yokes, flybacks, switching transformers, and coils. **RANGE: INDUCTORS -** 3.18 uH to 3.18 H. **CAPACITORS -** 0.002 uF to 20,000 uF **ACCURACY:** Same as Out-of-Circuit tests for known good inductors and capacitors with no parallel current paths.  
**SUGGEST REMOVAL Indication:** Initiated when AC test differs from DC test by more than 20%, or if low level DCR test indicates a leakage path greater than 20% of charge current for capacitors

### CAPACITORS (Out-of-circuit)

**VALUE:** Dynamic test of capacity value is determined by applying a constant current to the capacitor and measuring the  $dV/dt$ . **ACCURACY:**  $\pm 1\%$ ;  $\pm 1$  pF;  $\pm 1$  digit for values to 1990 uF;  $\pm 5\%$ ;  $\pm 0.1\%$  of range full scale for values 2000 uF to 20 F.

### EQUIVALENT SERIES RESISTANCE (ESR)

**ACCURACY:**  $\pm 5\%$ ;  $\pm 1$  digit **CAPACITOR RANGE:** 0.01 uF to 20 F

### DIELECTRIC ABSORPTION

**ACCURACY:**  $\pm 5\%$  of reading  $\pm 1$  count **RANGE:** 1 to 100% **CAPACITOR RANGE:** 0.01 uF to 20 F

### LEAKAGE

**ACCURACY:**  $\pm 5\%$ ,  $\pm 1$  digit. **APPLIED VOLTAGE:** keyboard entry 1.0 to 1000 volts in .1 volt steps short circuit current limited to 900 mA

### INDUCTORS (Out-of-Circuit)

**VALUE:** A dynamic test of value determined by measuring the EMF produced when a changing current is applied to the coil under test. **CURRENT RATES:** automatically selected

### RINGING TEST

A dynamic test of inductor quality determined by applying an exciting pulse to the inductor and counting the number of cycles the inductor rings before reaching a preset damping point. **INDUCTOR RANGE:** 10 uH and larger, non-iron core **ACCURACY:**  $\pm 1$  count on readings between 8 and 13 Rings **RESOLUTION:**  $\pm 1$  count **EXCITING PULSE:** 5 volts peak

### GENERAL

**TEMPERATURE:** operating range: 32° to 104° F (0° to 40° C) range for specified accuracy (after 10 minute warm-up): 50° to 86° F (10° to 30° C) **POWER:** 105-130V AC, 60Hz, 30 watts with supplied PA251 power adapter. Battery operation with optional BY289 rechargeable battery. **AUTO-OFF:** Removes power during battery operation if unit sits idle longer than 5 minutes. **BATTERY LIFE:** 2 hours typical operation.  
**SIZE:** 6" x 9" x 11.5" (15.2 cm x 22.9 cm x 29.1 cm) **HWD**  
**WEIGHT:** 6.0 lbs. (2.7 kg) without battery, 7.6 lbs. (3.4 kg) with battery.  
**GOOD/BAD INDICATION:** Functions on all tests. Requires user input of component type and value, or input of desired limits

All specifications subject to change without notice.

## LC103 "ReZolver"™ Accessory List

### Supplied Accessories

39G219 Out-of-Circuit Test Leads  
 64G37 Test Lead Mounting Clip  
 AP291 Adjustable In-Circuit Test Probe  
 PA251 110 VAC Power Adapter/Charger

### Optional Accessories

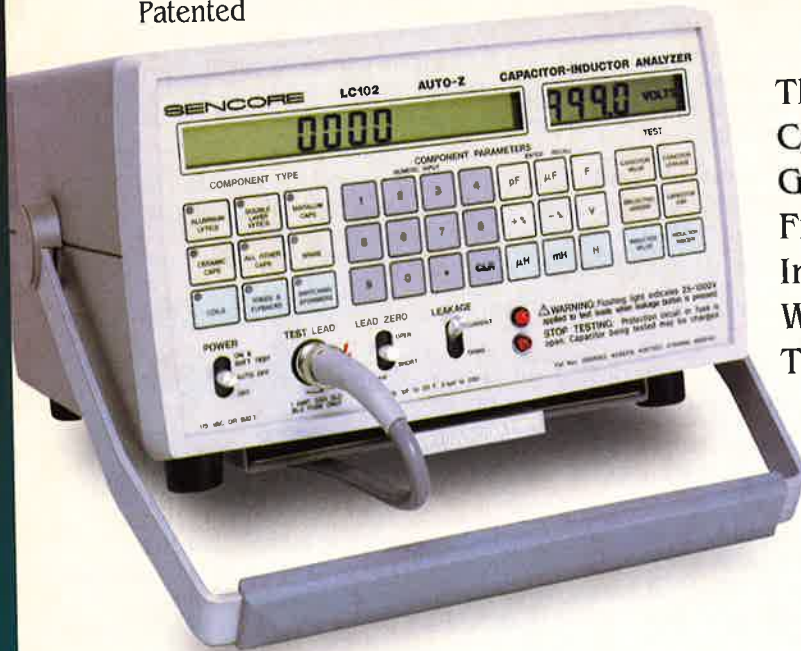
39G144 Test Lead Adapter  
 BY289 Rechargeable Lead Acid Battery  
 CC254 Carrying Case  
 CH255 Component Holder  
 PA252 220 VAC Power Adapter/Charger  
 SCR250 SCR/Triac Test Accessory  
 CH256 Chip Component Test Lead



**SENCORE**

# LC102 "AUTO-Z"™ Automatic Capacitor/Inductor Analyzer

Patented



The Only Dynamic Capacitor/Inductor Analyzer Guaranteed To Help You Quickly Find Any Defective Capacitor Or Inductor That Other Testers Miss, Without Calculations, Look-Up Tables, Or Error!

- Analyzes capacitors for:
  - Value from 1 pF to 20 F
  - Leakage with up to 1 kV applied
  - Dielectric absorption
  - Equivalent series resistance (ESR)
- Analyzes inductors from 1 uH to 20 H for opens, shorts, value, and even one shorted turn
- Analyzes SCRs and triacs (with accessory), high-voltage resistors, and transmission lines
- Makes all tests, compares results to EIA standards, and tells you "GOOD" or "BAD" – automatically
- Portable; 9-hour battery operation for remote sites – AC operation for your bench

RS232  
Compatible

The portable LC102 "AUTO-Z"™ brings speed, reliability, and extended ranges to cap/coil testing. Advanced digital technology allows you to completely analyze capacitors to 20 farads and inductors to 20 henries. The LC102 also tests for SCRs and triacs (with accessory) so you aren't slowed down by any component testing.

You simply enter the component's parameters: value, rated voltage, and tolerance. The "AUTO-Z"™ makes the readings, compares them against industry standard tables stored in memory, and displays whether the

component is good or bad. With the push of a button, you quickly obtain the exact reading for value, leakage, dielectric absorption, and ESR for all capacitors.

The LC102 "AUTO-Z"™ also analyzes inductors for value and shorts (even a single shorted turn). The patented "ringer" test dynamically pinpoints defective flybacks and IHVTs by testing for shorted turns, or the effective "Q" of the component. Take the LC102 "AUTO-Z"™ wherever you check components – from your bench to the customer's living room.

## LC102 "AUTO-Z"™ Specifications

<b>Capacitor Value</b>	RANGE: 1.0 pF to 19.99 F fully autoranged. ACCURACY: $\pm 1\% \pm 1$ pF $\pm 1$ digit up to 1990 uF. $\pm 5\% \pm .1\%$ of range fullscale for 2000 uF to 19.99 F. RESOLUTION: .1 pF on lowest range to .01 F on highest range: 12 ranges total. Automatically reads GOOD or BAD according to tolerance selected on keypad. Double layer lytics test patented
<b>Capacitor Leakage Voltage</b>	VOLTAGE RANGE: 1.0 V to 999.9 V in 0.1 V steps. VOLTAGE ACCURACY: +0% -5% POWER: Short circuit current limited to < 900 mA. Continuous power limited to 6 watts $\pm 10\%$ . Selected on keypad
<b>Capacitor Leakage (current)</b>	RANGE: 0.01 uA to 19.99 mA fully autoranged. ACCURACY: $\pm 5\% \pm 1$ digit. RESOLUTION: 0.01 uA to .01 mA for 0.01 uA to 19.99 mA in four ranges. VOLTAGE: Maximum reading determined by voltage setting
<b>Dynamic Ohmmeter</b>	RANGE: 100 ohms to 999 megohms depending on voltage setting. ACCURACY: $\pm 5\% \pm 1$ digit
<b>Capacitor Dielectric Absorption Test</b>	RANGE: 1 to 100%. ACCURACY: $\pm 5\%$ of reading, $\pm 1$ digit. CAPACITOR RANGE: 0.01 uF to 19.99 F. Automatically reads GOOD or BAD on electrolytics at 15 percent variation in reading after charge and discharge; less for other capacitors
<b>Capacitor Equivalent Series Resistance (ESR)</b>	RANGE: 0.10 ohm to 1999 ohms fully autoranged. ACCURACY: $\pm 5\% \pm 1$ digit. RESOLUTION: .01 ohms to 1 ohm on high end in three ranges. CAPACITOR RANGE: 1 uF to 19.99 F
<b>Inductor Value</b>	RANGE: 0.10 uH to 19.99 H fully autoranged. ACCURACY: $\pm 2\% \pm 1$ digit. RESOLUTION: .01 uH for 20 uH range to .01 H for 19.99 H range: 9 automatic ranges.
<b>Ring Test</b>	Excites inductor with sharp wavefront of 5 volts peak amplitude 60 Hz. ACCURACY: $\pm 1$ count from readings of 8 to 13: 10 rings or more automatically indicated as GOOD. Automatically selects correct impedance match to produce maximum rings. RESOLUTION: $\pm 1$ digit
<b>General</b>	DISPLAY: 6 digit LCD: auto decimal placement; leading zero suppression; pF, uF, F, uA, mA, %, K $\Omega$ , M $\Omega$ , ohms, uH, mH, H, V, RINGS, SHORT, OPEN, WAIT, GOOD, and BAD annunciators, overranged indication. POWER: 105-135 VAC 60 Hz with supplied PA251 power adapter. Battery with optional BY234, 2.0 AH battery for 9 hours continuous typical battery life. Auto-off approximately 20 minutes after use. Auto-off overridden when using external AC power. SIZE: 6" x 9" x 11.5" HWD (15.2 x 22.6 x 29.2 cm.). WEIGHT 6 lbs. (2.7 kg.) without battery. 7.6 lbs. (3.5 kg.) with battery

All specifications subject to change without notice.

## LC102 "AUTO-Z"™ Accessory List

<b>Supplied Accessories</b>	39G144 Test Lead Adapter 39G201 Test Button Hold Down Rod 39G219 Test Leads 64G37 Test Lead Mounting Clip PA251 Power Adapter
<b>Optional Accessories</b>	39G85 Touch Test Probe BY234 Rechargeable Battery CC254 Carrying Case CH255 Component Holder CH256 Chip Component Test Lead FC221 Field Calibrator IB78 RS232 Interface Accessory SCR250 SCR/Triac Test Accessory



**SENCORE**

# PR570 "POWERITE II"™ Variable Isolation Transformer & Safety Analyzer

Patented



Identify And Troubleshoot Virtually Any AC Supply Problem Fast...With The PR570 "POWERITE II"™!

- Insure your safety and the safety of your test instruments whenever servicing electronic products
- Conquer AC power source problems plus startup, shutdown, and regulator failures with a digitally accurate and variable 0-140 volt AC supply
- Have complete confidence your AC line is right with the AC line monitor
- An adjustable current trip feature minimizes expensive parts damage by automatically removing AC power when excessive current is being drawn
- Watch voltage levels and current draw with simultaneous current and voltage displays
- Test AC outlets with an exclusive receptacle checker to ensure correct earth grounding for the highest level of safety
- Protect your customers from electrical shock and protect your business from lawsuit with an automatic, auto-toggling AC line and safety ground leakage test (leakage to 10 microamps)

Now you get all the information you need with the PR570 "POWERITE II"™ for full control of your AC troubleshooting. Conquer AC power source problems plus startup, shutdown, and regulator failures with a variable 0-140 volt AC supply. The AC line monitor gives you confidence that your AC line is right with exclusive tests. Simultaneous digital displays of voltage and current draw help prevent parts damage and wasted time.

The PR570's isolated output reduces shock hazards and prevents damage to the chassis and your test equipment. The adjustable current trip feature minimizes expensive parts damage by automatically removing AC power when excessive current is being drawn – especially helpful in power supply and horizontal circuits. Plus, the safety leakage test builds additional profits while protecting your customer's safety, thus reducing the chance of lawsuits.