

**SENCORE**

*Full Product Line Catalog*

# *Sencore... For Over Forty Years*

For over 40 years, Sencore Electronics has been dedicated to one goal – making you more successful in electronic servicing. Today, Sencore is a leading manufacturer of electronic test equipment because we listen to your needs and design instruments that help you achieve that success.

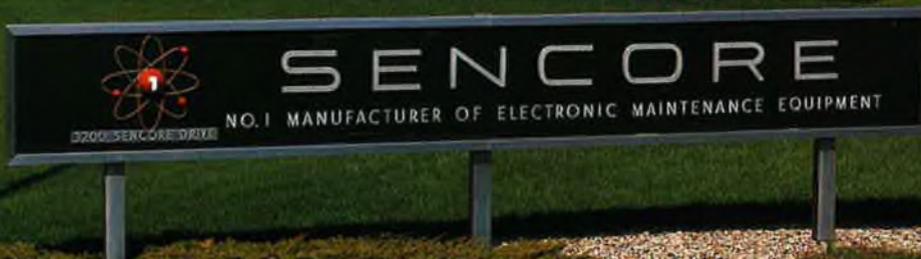
Sencore was started in 1951, in downtown Chicago, Illinois, by R.H. "Herb" Bowden. Herb witnessed the difficulty most servicers were having using their test equipment.

Most had hard-to-use equipment that really didn't help their servicing efficiency. Herb recognized this and started customizing and building "servicing" equipment.

The now-second generation business grew over the years because of innovative ideas and true benefits that helped servicers. Then, in 1970, Sencore moved to Sioux Falls, South Dakota. We've expanded our facilities into a high-tech, 92,000 square foot building that employs over 225 people dedicated to one goal – making you more successful.

Your success. It all comes back to that simple goal. Sencore is committed to meeting that objective with an exclusive product line and the absolute best support in the industry. Our obligation and support is just beginning when you say "yes" to Sencore equipment.

We're excited about being your test equipment company – now and in the future. We look forward to working with you.



# Toll-Free Access To Customer Support And Value-Added Services



One number, **1-800-SENCORE (736-2673)** connects you to a factory full of friendly professionals dedicated to making you and your business more successful. The same toll-free number that connects you to your Area Sales Representative also connects you to our Technical Application Engineers for help using Sencore test equipment.

All of this information is at your fingertips when you invest in Sencore test instruments. All you have to do is pick up the phone and call. Here's some of the "extras" you get when you invest in Sencore equipment:

## ✓ Easy Purchasing At Low Rates

Sencore's own financial division offers you flexible purchasing terms at low rates:

- Net 30
- 2 to 5 month split payment plan
- 6 to 48 month "Pay As You Grow" investment options
- MasterCard or Visa
- COD or cash in advance with free freight

## ✓ Fast Product Delivery

Most Sencore products are in stock and shipped within 48 hours of receipt of your order – guaranteeing you maximum productivity from each instrument right from the start.

## ✓ Friendly Follow-Up Call

We want to make sure everything is right when you invest in Sencore test instruments. That's why we follow-up every sale with a phone call to make sure everything is OK, including the operation of the instrument and how smooth your order process went. If we can do something better, let us know. Our goal is to keep you as a satisfied customer.

## ✓ After-The-Sale Support

Our Application Engineers are just a toll-free phone call away. If you need technical help using your Sencore equipment in today's challenging circuits, all you need to do is call **1-800-SENCORE**. Our Application Engineers are trained in the use of Sencore equipment and can give you tips to speed your troubleshooting. In addition, they're instrumental in researching and developing support items such as:

- Sencore News
- Tech Tip Technical Bulletins
- Servicer's Advantage
- Simplified Operating Guides
- Video Training Tapes
- Easy-To-Read Manuals
- Tech School workshops and seminars
- Training Guides and Courses



✓ **Fast After-The-Sale Service**

You get fast turn-around time on service repairs, and 48 hours on parts delivery, guaranteeing you maximum up-time and minimum downtime. Or, call **1-800-SENCORE** and talk to a Service Professional who will help you with instrument repair questions.

✓ **Exclusive Warranty And Guarantees**

If you are not completely satisfied with any Sencore instrument, you may return it during the first 30 days, and we'll give you a full refund, no questions asked. Also, our exclusive Lifetime Made Right Guarantee assures your instrument was made right the first time - or we'll make it right - for the lifetime of the instrument. (See more about Warranty and Service on page 64.)

## Computer Monitor Troubleshooting Self Study Guide

The **Computer Monitor Troubleshooting Self Study Guide** is a comprehensive, yet easy to use training course designed to help you become more efficient at computer monitor servicing. The course provides you with in-depth troubleshooting information on all of the complex computer monitor circuits, such as switched mode power supplies, horizontal output, and CRT circuits.

You'll gain troubleshooting processes and procedures for systematically servicing computer monitor circuits. With the help of block diagrams and "Decision Trees," this advanced course shows you how to make a test, what to look for, and what troubleshooting procedure to perform next. The Self Study Guide is great for everyone from technicians to instructors. Call **1-800-SENCORE** for more details.



## “Tech Choice” Technical Troubleshooting Demonstrations

Each Tech School and Seminar concentrates on a special subject providing technical troubleshooting information with demonstrations and/or hands-on activities. Each seminar provides service professionals with a better understanding and practical troubleshooting experience on each topic. Many valuable troubleshooting tips are demonstrated that help eliminate guesswork and reduce repair time. Plus, learn how the Sencore “Tech Choice” instruments will improve troubleshooting skills on today's modern circuits. For more details or to find out if a seminar is coming to your part of the country, call your Area Representative at **1-800-SENCORE**.

**Sample topics:**

- Hands-On Camcorder Troubleshooting
- Hands-On Computer Monitor Troubleshooting
- Profitable TV Troubleshooting Demonstration
- VCR Troubleshooting Demonstration
- Testing And Diagnosing Camcorders
- Basic Computer Monitor Troubleshooting

*\* Seminars have limited class sizes.*



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

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This full line catalog contains descriptions, specifications, accessories, and ordering information for Sencore's exclusive line of electronic test equipment. The instruments are grouped by function to help you find application specific instruments. You may request more information by directly contacting your Area Sales Representative at **1-800-SENCORE.**



Identifies products that can interface to the General Purpose Interface Bus.



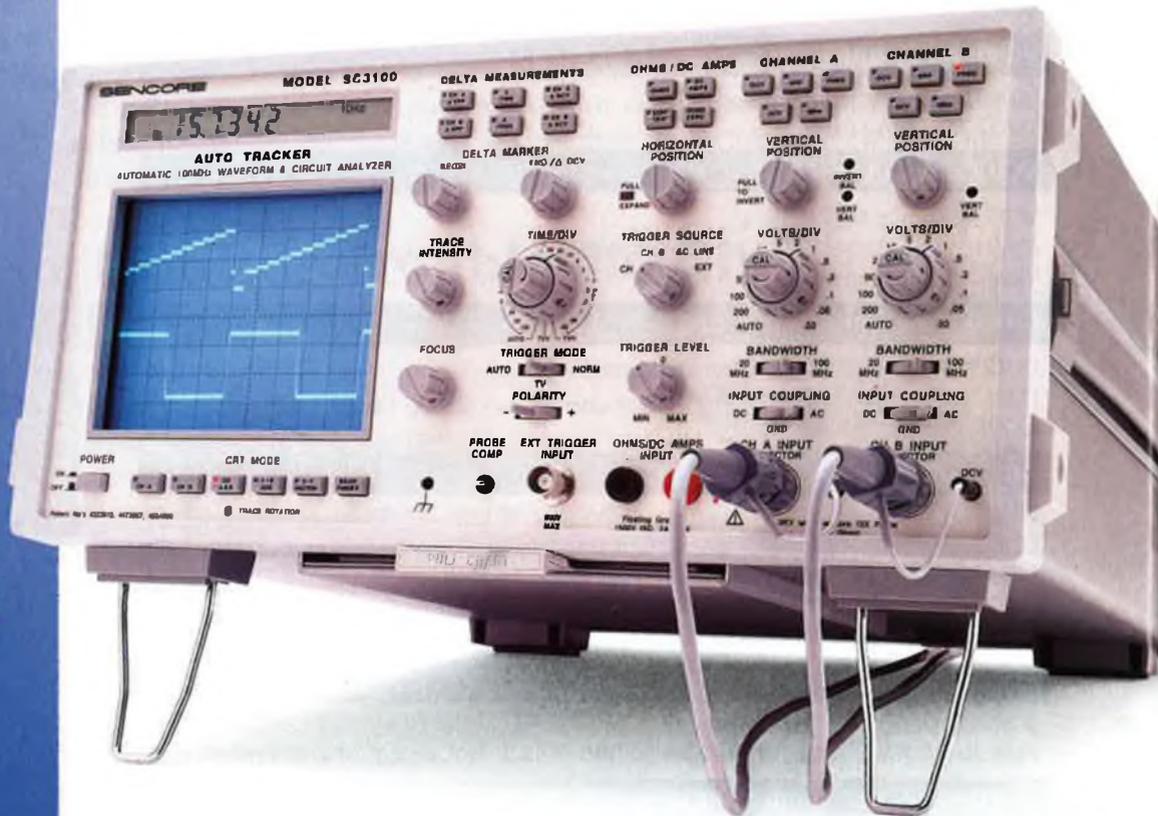
Identifies products that can interface to the RS232 serial configuration.

All specifications are subject to change without notice.

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

# 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!



IEEE488  
Bus-Compatible

RS232  
Compatible

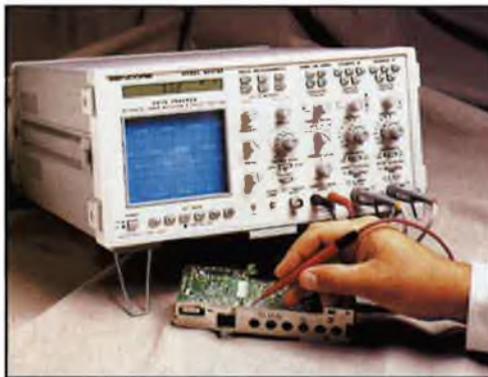
- A complete waveform and circuit analyzing system in one instrument
- Auto-Tracking™ digital readout of waveform voltage and frequency with one probe connection
- Integrated measurements of all circuit parameters provides fast troubleshooting answers
- Full performance, 100 MHz dual trace oscilloscope
- 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

Waveform  
Analyzing

**1-800-SENCORE** (736-2673)

**A complete waveform and circuit analyzing system.** Measure circuit parameters and view all of the waveforms shown in any service literature with one complete unit – the SC3100 “AUTO TRACKER”.

Now you can measure DC voltage, peak-to-peak voltage, frequency, DC current, ohms, continuity – and analyze waveforms in one complete, easy-to-use instrument. The SC3100 “AUTO TRACKER” is guaranteed to increase your analyzing capabilities with the push of a button. Just start tracing signals from point to point, and the patented SC3100 “AUTO TRACKER” will be the one instrument you can’t do without.



**Auto-Tracking™ digital readout of waveform voltage and frequency.** You simply connect one probe to the circuit and push a button to read DC volts, peak-to-peak volts, frequency, RMS AC voltage, or dBm level. The “AUTO TRACKER” measures the key parameters of any waveform with one probe connection, at the push of a button, for fast and accurate troubleshooting.

The SC3100 “AUTO TRACKER” lets you keep your mind on the circuit, not on making the measurement. We’ve added speed, accuracy, and pushbutton ease of digital readings to every waveform voltage and frequency measurement. Just connect one probe, push one button, and read the results. It’s fast, easy, accurate, and eliminates graticule counting once and for all.

**Integrated measurements of all circuit parameters.** The SC3100 “AUTO TRACKER” also measures ohms and current providing you with complete troubleshooting answers. The SC3100 is the only instrument you need to make all the measurements shown in service literature. Resistance tests up to 100 megohms, an audible continuity test, and two amp DC current measuring capabilities make the “AUTO TRACKER” the complete answer for all of your circuit measurement needs.

### Condensed Specifications

Patents: #4,323,972, #4,473,857, #4,564,805

**Vertical Amplifiers** – 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).

**Horizontal Sweep** – SWEEP RATES: 100 milliseconds/division to 20 nanosecond/division. Autorange automatically selects sweep rate to show approximately 2-5 cycles of waveform. ACCURACY:  $\pm 3\%$ .

**Trigger Circuits** – TRIGGER SOURCE: CH A, CH B, AC power line, or external TRIGGER MODES: NORM, AUTO, TV.

**Auto-Tracking™ Digital Tests – 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).

**Full performance, 100 MHz, dual trace oscilloscope.** View any waveform quickly, easily, and more accurately with the “AUTO TRACKER.” No signal is too large or too small with the “AUTO TRACKER’s” exclusive 2 mV to 2 kV input range. The SC3100’s “fiddle free” trigger circuits provide rock solid viewing of any signal so you don’t have to spend time adjusting controls trying to lock onto a waveform. You simply won’t find another instrument that locks onto signals as easily as the “AUTO TRACKER”.

**Exclusive autoranged timebase and vertical attenuators.** Simply set the “AUTO TRACKER’s” timebase and channel attenuators to “AUTO” to view

waveforms without resetting the controls. As you move your probe through the circuit, the “AUTO TRACKER” automatically adjusts the timebase and attenuators to display the waveform on the CRT. This hands-free analyzing allows you to concentrate on the circuit – not on your scope. The SC3100 “AUTO TRACKER” gives you the power to take control of your troubleshooting.

**Digital Delta measurements to analyze any portion of any waveform.** Highlight any part of a waveform with the “AUTO TRACKER’s” exclusive Delta Bar, and analyze the amplitude, absolute DC, time, or frequency. The SC3100 “AUTO TRACKER” totally eliminates confusing graticule counting or cursor settings resulting in reduced errors and increased troubleshooting confidence. You’ll never need to count graticules again.

**All functions microprocessor integrated for ease of use.** The “AUTO TRACKER’s” analyzing speed will increase your servicing capability. All measurements are based on digital circuits, not the analog CRT, for fast, easy, and accurate readings. There are no hidden menus, no multiple function buttons, no complicated setups, and no confusing on-screen displays. Just push a button and read the results on the SC3100’s LCD display.

**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 in respect to ground using the PPV and DCV functions. MARKER: Fully adjustable over entire range of waveform.

**Digital Meter Tests – 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  $> 15$   $\Omega$ ,  $\pm 2$ .

**DC Current** – Provides measurement of DC current. RANGES: .001 to 1.99 amp ACCURACY: 0.3%  $\pm 2$  digits.

**General** – 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.

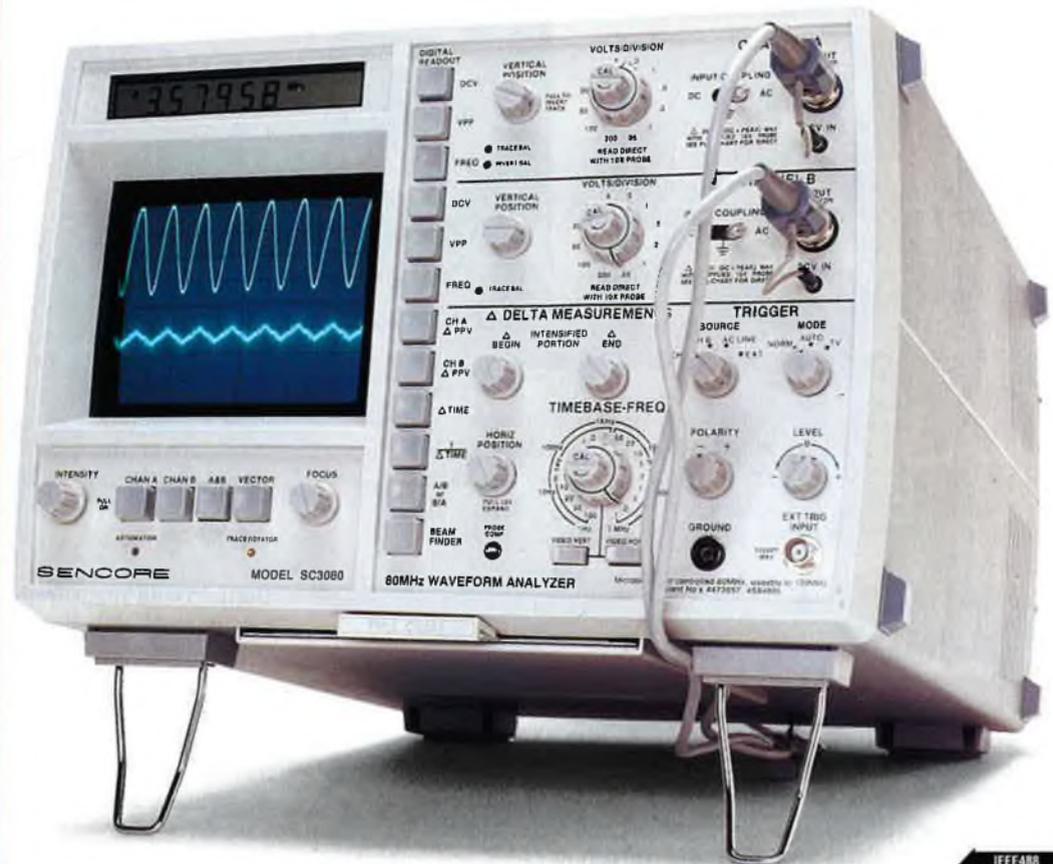


# SC3080 Waveform Analyzer

## 80 MHz Dual Trace Oscilloscope

Patented

Confidently  
Analyze A  
Waveform At  
The Push Of A  
Button, With  
One Probe  
Connection,  
And In Half  
The Time -  
Guaranteed!



- The Auto-Tracking™ digital readout provides 100% automatic digital readings of all the key waveform parameters through one probe at just the push of a button for unparalleled ease-of-use
- Dual trace with rock solid sync (including video) eliminates frustrating fiddling with complicated controls so you can concentrate on the defective circuit
- Five times the measuring capability of any conventional scope allowing you to analyze without fear of damage to the Waveform Analyzer
- 80 MHz (usable to 100 MHz) high performance will put confidence back into your waveform analyzing so you're 100% sure that what you're analyzing is what is in the circuit
- Plus many extra, exclusive features designed to save your waveform analyzing time

Waveform  
Analyzing

**1-800-SENCORE** (736-2673)

**A real troubleshooting confidence builder.** The SC3080 Waveform Analyzer may look like an ordinary conventional oscilloscope. But just pick up the probe, connect it to a test point, and the exclusive, patented, timesaving Auto-Tracking™ digital readout features of the SC3080 Waveform Analyzer are quick to prove themselves.

There are other scopes with digital readouts, but none completely eliminate graticule counting, extra lead hookups, and knob fiddling like the SC3080. The SC3080 Waveform Analyzer integrates a high performance scope with a patented autoranging digital display. You simply view the waveform on the CRT, then push a button to read DC volts, peak-to-peak volts, or frequency directly on the easy-to-read digital display. Plus, you only need one probe connection on either channel A or B – no additional setup and no graticule counting.

The SC3080 Waveform Analyzer also has Delta function capabilities that make it simple to analyze any portion of a waveform in just seconds. For example, you can accurately measure peak-to-peak voltage of the ripple on a power supply or the frequency of a small glitch on the leading edge of a square wave. Just lock the waveform on the CRT, adjust the DELTA BEGIN and DELTA END (intensified trace) over the desired portion of the waveform, and push the button for peak-to-peak volts, frequency, or time of the intensified portion.

**It's digitally accurate.** The SC3080 Waveform Analyzer eliminates inaccurate and frustrating graticule counting. The internal microprocessor monitors the signals that are applied to the CRT so there are no graticules to count or calculations to make. You get measurements that are 10 times

more accurate than conventional scopes. The pushbutton digital readout makes the SC3080 Waveform Analyzer much easier to use than any conventional scope. You'll gain valuable troubleshooting efficiency and confidence with the SC3080 Waveform Analyzer.



**It's fiddle free.** The SC3080 Waveform Analyzer, with its superb sync circuitry, locks quickly onto waveforms all the way to 100 MHz. This has been achieved through ECL (emitter coupled logic) circuits in the front end and noise cancelling differential amplifiers throughout the sync circuits. The SC3080 Waveform Analyzer provides "fiddle free" sync, meaning you can spend more of your valuable time on testing the circuit and not adjusting the trigger controls of the oscilloscope to lock in a waveform.

**Five times the capacity.** It handles five times the signal level of any conventional scope – and does it safely. Most conventional scopes are limited to 600 volts of input protection, but the SC3080 provides extra versatility with a voltage range from a sensitive 5 mV to 2000 volts...five times or more the range of the conventional oscilloscope. You gain troubleshooting confidence without worrying about an expensive front end repair job.

Plus many extra high performance features:

- Video Presets
- Beam Finder
- Video Sync Separators
- x10 Expand
- Channel A Invert
- Frequency Ratio Test
- Dual Delayed Trace
- Z Axis Input

## Condensed Specifications

Patents: #4,473,857, #4,564,805

**Vertical** – FREQUENCY RESPONSE:  $\pm 3$  dB, DC TO 80 MHz, usable to 100 MHz. SENSITIVITY: 50 mV/div. to 200 V/div. with supplied 10X probes, 5 mV/div. to 20 V/div. direct. ACCURACY:  $\pm 4\%$ . PROTECTION: 3000 V (DC + Peak AC) with supplied probes. DUAL TRACE: Automatic dual-alternate and dual-chopped. VECTOR (X-Y): A is Y axis, B is X axis. Z-Axis Input: BNC input on rear panel.

**Horizontal** – SWEEP RATES: 100 ms/div. to 0.1  $\mu$ s/div. ACCURACY:  $\pm 4\%$ . TRIGGER SOURCE: Channel A, B, AC line, or external.

**Auto-Tracking™ Digital Tests** – DC VOLTS: 4 ranges autoranged to 2000 VDC, direct reading with supplied probes. ACCURACY:  $\pm 0.5\%$ ,  $\pm 2$  digits including probes. PEAK-TO-PEAK: 4 ranges selected by Channel A or B input attenuator (unaffected by vertical vernier) to 3000 VPP.

RESOLUTION: 3  $\frac{1}{2}$  digits. ACCURACY:  $\pm 2\%$ ,  $\pm 5$  counts. FREQUENCY RESPONSE:  $\pm 0.5$  dB from 30 Hz to 30 MHz, -3 dB at 80 MHz. FREQUENCY: 7 ranges automatically selected from 1.00 Hz to 99.999 MHz. RESOLUTION: Up to 6 digits. ACCURACY:  $\pm 0.001\%$ ,  $\pm 1$  digit. FREQUENCY RATIO: Ratio of channel A or B. RANGE: 1 to 999,999. A/B or B/A display. ACCURACY:  $\pm 3$  digits.

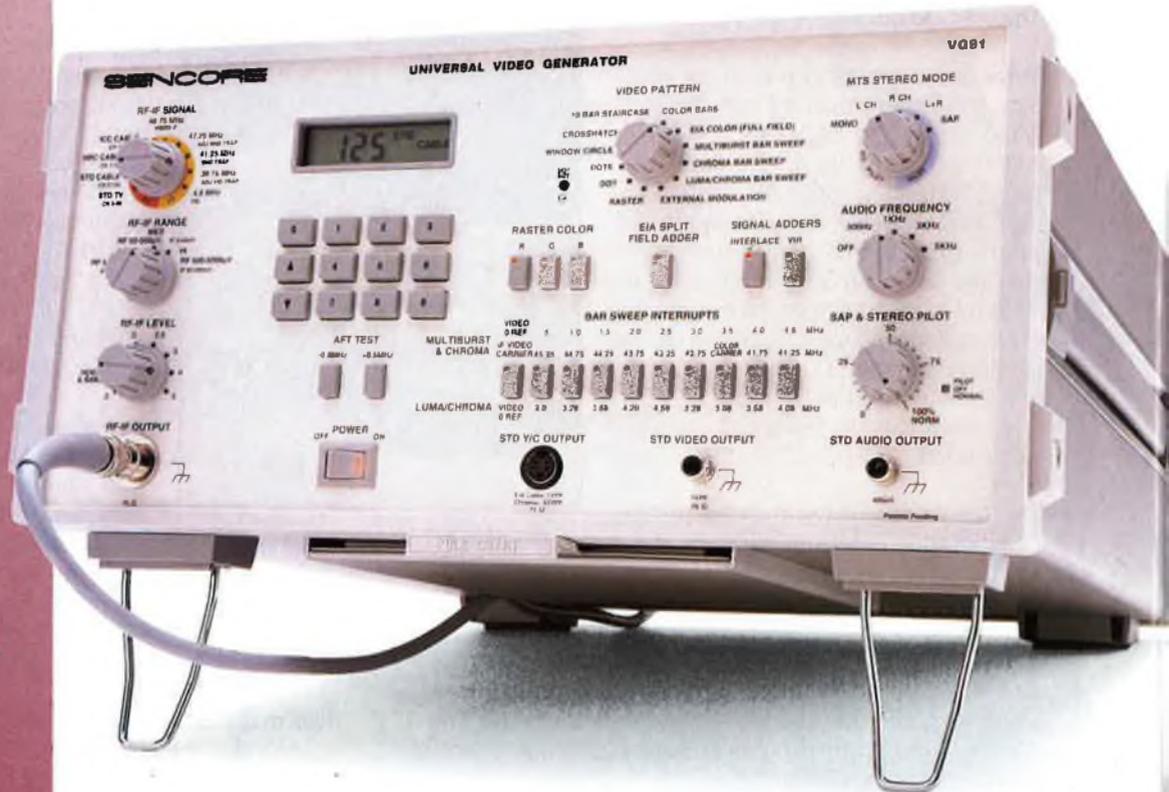
**Delta Digital Tests Measurement Bar** – Intensified area set to any portion of the waveform with Delta Begin and Delta End controls. PEAK-TO PEAK VOLTS: Amplitude of intensified area. DELTA TIME: Time of intensified area. 1/DELTA TIME: Equivalent frequency.

**General** – POWER: 105-130 VAC, 50/60 Hz. Convertible to 210-250 VAC, 50/60 Hz. SIZE: 9.5" x 12" x 17" (21.6 x 30 x 43 cm) HWD. WEIGHT: 31 lbs. (14.1 kg). Display: 5" CRT.



# 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
- Exclusive and dynamic NTSC video test signals
- Proof-positive tests for MTS Stereo/SAP on all channels
- 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

**1-800-SENCORE** (736-2673)

**All channel TV-RF generator.** The VG91 Universal Video Generator is an all-channel, TV-RF generator that simulates any off-air or cable channel to completely analyze all tuners. Each of the 125 channels is fully modulated with video and MTS audio signals using a wide range, variable attenuator for simulating weak or strong signal levels. Keypad entry gives you quick, random access to any channel in any of the RF tuning bands. And the exclusive HRC and ICC shifted carriers allow you to automatically match the RF signal to any cable format. Now you'll have every signal you need to verify performance before your customer takes the set home.



**Variable level 45.75 MHz video-IF troubleshooting and alignment generator.**

The VG91's dynamic IF injection signals allow you to instantly prove the operation of IF circuits. You'll be able to isolate problems to the tuner or IF stage, speed up AFT alignment, and easily set IF traps using patented IF signals.

Simply inject the VG91's known-good video modulated IF test signals, and watch for an improvement on the CRT. With no special hookups or calculations to worry about, the VG91 eliminates all guesswork.

**Exclusive and dynamic NTSC video test signals.** Now you'll have the analyzing ability required for modern video servicing. The video pattern generator of the VG91 produces many exclusive analyzing patterns plus the test patterns that have become standard. Each pattern provides specific information concerning the operation, performance, and alignment of video equipment. You get these dynamic patterns:

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

**Proof-positive test for MTS Stereo/SAP on all channels.**

The MTS audio generator of the VG91 Universal Video Gen-

erator provides both standard audio and MTS Stereo signals for testing and troubleshooting both monaural and MTS stereo receivers. The integrated MTS design of the VG91 allows stereo audio to be added to any RF channel or IF troubleshooting signal for MTS performance checks without switching to another generator. Plus, you get a variable stereo pilot and SAP level allowing you to accurately check MTS and SAP detection circuits.

**Standard Y/C, composite video, and audio line outputs.** These jacks on the VG91 match all standard Y/C, composite video, or line level audio found on consumer and most professional equipment. You can test the frequency response of video systems with the flat 4.5 MHz

bandwidth of the VG91's video patterns and standard output signals. In addition to the standard video signals, the VG91 provides a STD Audio Output consisting of baseband audio. This output provides the proper signal level needed to match the standard audio inputs found on VCRs, TV receivers/monitors, and other video products.

**Spare video output and exclusive interconnect design.**

The VG91 features an exclusive design that allows you to add to your service bench as your needs grow. For example, you can add the TVA92 TV Video Analyzer to increase your TV analyzing capabilities and the VC93 All Format VCR Analyzer for exclusive VCR playback and record troubleshooting. Combine the VG91 with these exclusive analyzing instruments, and you'll have a true analyzing team that will open the door to faster troubleshooting, increased efficiency, and higher profits.

**Portable and easy-to-use.** Take the VG91 Universal Video Generator wherever you analyze video. It helps you identify problems with cable channels, individual video components, or larger TVs so you can avoid unnecessary transportation and repair. If you are switching between test generators or spending hours troubleshooting because you don't have all the signals you need, the VG91 Universal Video Generator is your answer.

**Condensed Specifications**

Patents: #4,562,469, #4,736,427

**TV-RF Generator** - 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.

**Video IF Generator** - 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.

**RF-IF Output** - 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 $\Omega$   $\pm 10\%$ .

**Video Pattern Generator** - 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.

**Multichannel TV Sound Signal** - 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.

**STD Y/C Output** - 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,  $\pm 10\%$ .

**STD Video Output** - STD VIDEO LEVEL: 1 VPP into 75 $\Omega$ , negative sync. FREQUENCY RESPONSE: Multiburst flat to 4.5 MHz,  $\pm 10\%$ .

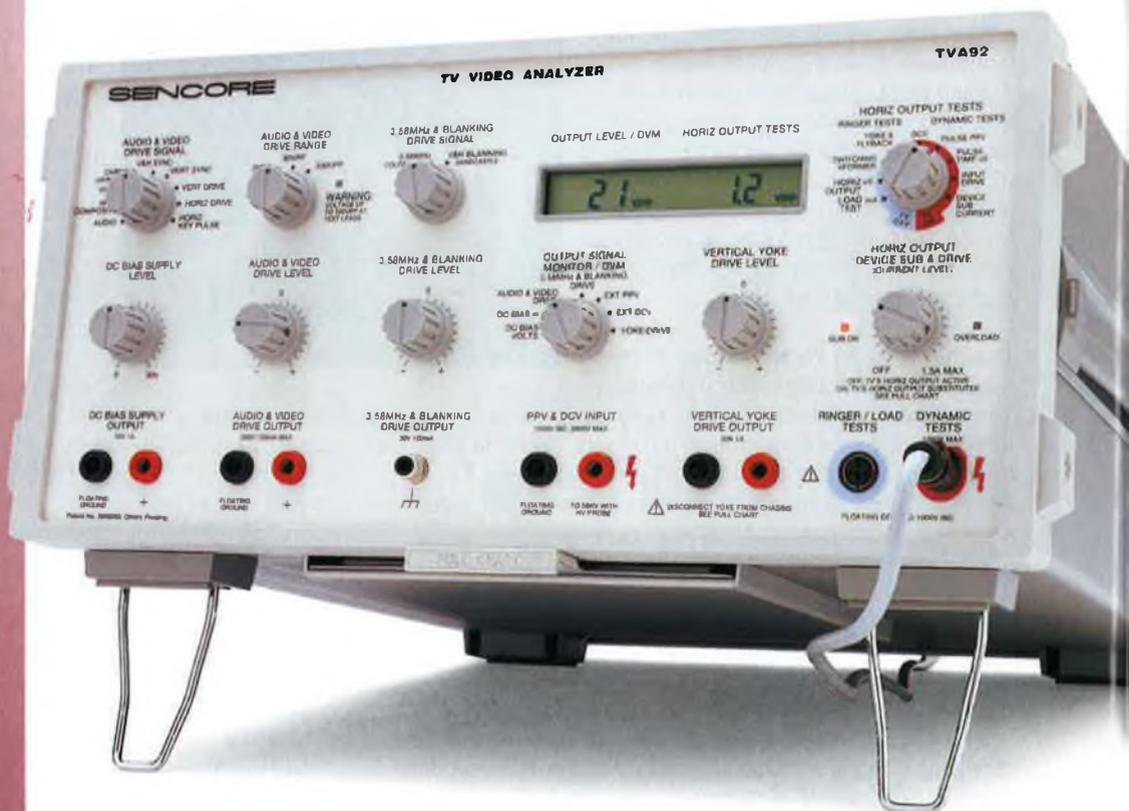
**STD Audio Output** - AUDIO SIGNAL: Selected by AUDIO FREQUENCY control. LEVEL: 400 mV  $\pm 150$  mV into 10 k $\Omega$ .

**General** - 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.



# TVA92 TV Video Analyzer Patented

Now You Can Isolate TV Defects, Troubleshoot Startup/Shutdown Problems, Test Expensive TV Components, Plus Accurately Estimate TV Repair Costs In Minutes!



- Exclusive “TV OFF” horizontal output load test
- Dynamic tests through a simple 3 lead hook-up to the horizontal output transistor
- Horizontal output transistor sub and drive
- Universal substitute TV signals
- Patented Ringer Test to quickly pinpoint shorted turns in flybacks, IHVTs, yokes, and switching transformers
- An exclusive yoke drive signal
- DC biasing supply
- Built-in monitor for all sub-signal results and making DCV and PPV measurements

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

**1-800-SENCORE (736-2673)**

**I**solate shutdown problems with the "TV OFF". The TVA92 provides a "TV OFF" Horizontal Output Load Test to detect high current loading or shorted conditions on the TV's main B+ power supply. The Horizontal Output Load Test works by supplying a low voltage (15 volts) to substitute for the TV's B+ supply and by simulating the switching action of the horizontal output transistor (HOT). You'll be able to troubleshoot problems in the horizontal output circuit and immediate flyback secondary circuits – *without turning on the TV.*



**Dynamic "TV ON" Horizontal Output Tests.** The TVA92's Dynamic Tests analyze four parameters of an operating horizontal output stage: 1) B+ supply voltage, 2) flyback pulse PPV, 3) flyback pulse time, and 4) presence of input drive signal. These "TV ON" tests are effective in pinpointing any loading or timing defect, including bad flybacks, bad power supplies, or timing component problems. These Dynamic Tests are especially helpful in quickly isolating symptoms of a blank raster, low or missing high voltage, startup, or shutdown problems.

**Substitute for the horizontal output transistor.** Now you can actually substitute for the TV's horizontal output transistor. The TVA92's Horizontal Output Device Sub & Drive Test provides an internal substitute horizontal transistor that can be used to substitute in any conventional transistor horizontal circuit. This exclusive feature guards you from the unexpected and helps isolate those difficult horizontal circuit problems.

The TVA92's substitute transistor is driven by an internal known-good horizontal drive signal. The internal transistor's conduction time is variable, giving you exclusive "on-time" control of current to the flyback and yoke. You'll be able to analyze the high voltage circuits at full operating potential and evaluate the rest of the TV by looking at the CRT.

**Universal substitute TV signals.** The TVA92 provides all the signals to inject into the functional blocks of any NTSC

receiver from the detector to the CRT. The signals are universal to all TVs. The TVA92's low impedance drive output lets you inject into any circuit, "swamping" out and replacing the existing signal with a known-good one. It's like having a working TV to take signals from – only much better.

**Pinpoint shorted turns in flybacks, IHVTs, yokes, and switching transformers.** The patented "Ringer Test" detects shorted turns among these high failure and expensive components with the fastest and most reliable test possible. The time-proven and dynamic "Ringer Test" checks coils' "Q" and locates shorted turns that cannot be detected by other troubleshooting methods. Now you'll have the confidence and assurance you need when an expensive part is bad or questionable. The TVA92 tells you if it's "GOOD" or "BAD" every time.

**An exclusive yoke drive signal.** The TVA92's Vertical Yoke Drive signal provides a simple, fast test to confirm the condition of the vertical deflection yoke. The exclusive sync-locked yoke drive signal provides full picture deflection with a "locked-in" video picture indicating a good yoke. The Yoke Drive provides the proper drive current needed to produce a near-linear deflection and allows you to visually confirm the yoke's operation by viewing the CRT.

**Simplify biasing, alignment, and troubleshooting.** The TVA92 includes a built-in, "current sinking" DC power supply that delivers up to 30 volts for a wide range of voltage requirements. In addition to supplying up to 1 amp of current, the bias supply "sinks" current from the circuit up to approximately 250 mA.

**Monitor all sub-signal results and make DCV or PPV measurements.** The TVA92's fully autoranged digital DCV and PPV meter monitors all voltages or signals generated or measured by the TVA92. The PPV meter's 5 MHz frequency response allows you to accurately measure any TV video waveform. The DCV meter measures 2,000 volts directly or up to 50 kV with optional Sencore multiplier test probes.

## Condensed Specifications

Patents: #3,990,002, #5,350,979

**Audio & Video Drives** – 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.

**Simultaneous Drive Signals** – SIGNALS AVAILABLE: V&H Blanking (Sandcastle) & 3.58 MHz color oscillator. OUTPUT: 0-30V, Impedance <50 ohms.

**Vertical Yoke Drive** – LINEAR CURRENT OUTPUT: 0-1.5 Amp peak. EXTERNAL VOLTS PROTECTION: ±500 Volts (DC + Peak AC).

**Horizontal Output Load Test** – 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.

**Ringing Test** – 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.

**Horizontal Output Dynamic Measurements** – 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.

**Horizontal Output Device Sub & Drive** – 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.

**DC Bias Supply** – RANGE: 0-30 Volts, ±1 volt, current limited to 1 amp. CURRENT SINK CAPABILITY: 250 mA from external voltage source.

**Output Signal Monitor/DVM** – 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.

**General** – AC 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.



# 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

VCR/Camera/  
Camcorder

**1-800-SENCORE** (736-2673)

**All format VCR analyzer.** The VC93 All Format VCR Analyzer matches the signals found in all consumer VCRs and camcorders as well as any other formats using a "color under" scheme. You'll be prepared for whatever format that comes into your service center, including VHS, Super VHS, VHS-C, Super VHS-C, Beta, Super Beta, U-Matic, U-Matic SP, 8mm, and Hi8. The VC93 matches all the luminance, chroma, and Hi-Fi signals that you need for proof-positive troubleshooting.



**Dynamic VCR head signal substituter.** The VC93 provides exclusive head substitution signals that confirm if the heads are really the problem. With adjustable levels and a modulated FM carrier exactly matched to the VCR's signals, you can isolate problems in the video heads, rotary transformer, head amp, head switcher, head select relay, and all the connections in between. By isolating head problems from all other circuit problems, you'll never install another video head without being 100% positive it will fix the problem.

**Exclusive Hi-Fi Stereo all-format head signal substituter.** Finally there's an answer for troubleshooting VCR Hi-Fi audio circuits. Use the VC93 All Format VCR Analyzer to inject a signal into all Hi-Fi audio circuits from the spinning heads to the audio output jacks. This special Hi-Fi signal is modulated, so all you need to do is listen for the audio tone to isolate defects to a single defective stage.

**Innovative VCR luminance, chrominance, and audio analyzing.** The VC93 provides all the drive signals you need to troubleshoot all luminance, chroma, and audio circuits in all VCRs. Functional analyzing and signal substitution with the VC93 are time-proven techniques developed to narrow a defect down to a single stage.

**Automatic servo analyzer.** The VC93 determines if the VCR

has a servo problem and tells you if the defect is in the capstan or cylinder servo circuits. You get a GOOD/BAD reading automatically, plus the percentage variance of acceptable levels – without even taking off the VCR cover. The VC93 catches servo defects in a fraction of the time you presently take with these five automatic servo analyzer tests:

- **Servo Locked Test** - determines if servo capstan and drum phase loops are locked to the 30 Hz reference signal.
- **Capstan Speed Test** - determines if the capstan servo is operating at the correct speed.
- **Capstan Jitter Test** - measures how constant the capstan moves and identifies capstan and mechanical problems.
- **Drum Speed Test** - determines if drum is operating at the correct speed.
- **Drum Jitter Test** - measures how constant the drum rotates and identifies drum-related phase loop and mechanical problems.

**Stand-alone analyzer.** Use the VC93's built-in NTSC split-field test pattern generator for stand-alone operation. When your troubleshooting takes you away from your bench, the VC93 gives you the flexibility you need. Extra test patterns and RF-IF troubleshooting capabilities for VCRs are available when the VC93 is used in conjunction with the VG91 Universal Video Generator (or VA62A).

**Special troubleshooting features.** To complete the VCR analyzing package, the VC93 includes many additional features to make your VCR troubleshooting fast and simple. You'll have an uncluttered bench keeping your mind clear and productivity high.

- Servo bias supply - up to 10 VDC
- Standard video & audio line outputs
- Autoranging DCV and PPV meter
- Output signal monitor
- Obsolete-proof and expandable.

## Condensed Specifications

Patents: #5,204,746, #5,247,350, #5,266,893

**Formats** – VHS, Super VHS, VHS-C, Super VHS-C, Beta, Super Beta, U-MATIC, U-MATIC SP, 8mm, Hi-8, plus update capability.

**Playback Signals** – (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.

**Playback Output Level** – Continuously variable to 5 VPP in three ranges.

**Chroma Lock** – 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.

**Drive Signals** – 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.

**Drive Output Level** – Continuously variable from -10 to +10 VPP. Frequency Response: Flat out to 4.5 MHz.

**Modulation** – 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.

**Servo Analyzer Tests** – 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.

**Servo Sub Bias** – Continuously variable from 0 to 10.0 VDC current limited to 1 amp. VOLTAGE RESOLUTION: 0.01 V.

**Standard Video Output** – LEVEL: 1 VPP  $\pm$  10% into 75 ohms. IMPEDANCE: 75 ohm  $\pm$  10%.

**Standard Audio Output** – LEVEL: 400 mVRMS  $\pm$  150 mV into 10 kohm load. OUTPUT IMPEDANCE: Less than 1 kohm.

**External Meter** – 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.

**General** – 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.



On GSA Contract

# CVA94 "Video Tracker"<sup>TM</sup> Camera Video Analyzer Patent Pending

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
- 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
- Selectable Video Inputs compatible with both composite and high resolution Y/C camera outputs

**1-800-SENCORE** (736-2673)

VCR/Camera/  
Camcorder

**P**erform digital waveform measurements for fast signal troubleshooting. The preset waveform mode sweep rates allow you to quickly view and measure the camera signal at standard 1H (single line), 2H (two lines), or 2V (two fields, one frame) sweep rates. Plus, the CVA94's sweep expand feature allows you to examine any part of a line or frame in expanded detail. A choice of three signal filters provides FLAT response for viewing and measuring the entire video signal, LUMA response for viewing and measuring only the low frequency luminance information, and CHROMA response for viewing and measuring the 3.58 MHz chrominance information.



**Perform digital vectorscope measurements for easy, error-free color checks.** The CVA94 allows you to quickly obtain a vector display and digital measurements of the phase and amplitude of a video camera's chroma output signals. This allows you to confidently tell your customer that the camera's color circuits are working correctly and will produce color that "looks right."

**"HUM" test quickly identifies power adapter and power supply problems.** The CVA94 "Video Tracker" includes a special HUM test to identify low frequency power supply ripple, whether it's just starting to develop, or whether it has become bad enough to show up in the picture. Plus, digital circuits automatically measure the amount of low frequency ripple signal and display a digital hum measurement on the LCD display.

**"Video Noise" test quickly identifies and localizes poor picture quality.** This test automatically determines the amount of undesired noise contained in the video signal. The VIDEO S/N test allows you to verify proper camera noise performance, or when used with the Chroma Noise

tests allows you to quickly localize the source of poor noise performance.

**"Chroma Noise" tests quickly identify and localize poor chroma quality.** The CHROMA SATURATION S/N and CHROMA HUE S/N tests check the amount of chroma amplitude and chroma phase noise present at the camera's video output. These tests allow you to easily verify camera chroma noise performance for troubleshooting or final performance checks.

**"Burst Frequency" and "Frequency Error" tests quickly identify reference oscillator problems.** Simply push the

BURST FREQ button and read the frequency of the burst signal on the LCD display. You don't have to open the camera, there are no extra instruments to connect, and the reference oscillator isn't loaded down. For a quick display of the amount of error from the standard burst frequency, simply push the BURST ERROR button and read the amount of frequency error on the LCD.

**Composite and Y/C outputs match any video monitor input.** The versatile CVA94 "Video Tracker" provides both composite and Y/C video outputs to allow you to easily connect video monitors with either composite or high resolution Y/C inputs.

**Integrated "Monitor Marker" positively identifies your signal measurement.** The MONITOR MARKER allows you to easily see, directly on the picture, exactly what parts of the picture you are measuring.

**Built-In CRT cal signals add measurement confidence.** The CVA94 "Video Tracker" includes built-in waveform and vector CRT calibration signals to quickly verify the accuracy of displayed CRT signals.

## Condensed Specifications

**Video Input** - 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).

**CRT Waveform Display: 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.

**Horizontal** - 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:  $\leq 1\%$ .

**Digital Measurements: 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.

**Video Output To Monitor** - OUTPUT IMPEDANCE: 75  $\Omega$ . OUTPUT LEVEL: Within 10% of input level with 50 kHz sine wave. FREQUENCY RESPONSE: 50 kHz to 5 MHz,  $\pm 10\%$ .

**General:** 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.



# VR940 Video Reference

All The  
Accurate  
Reference  
Signals You  
Need For  
Dependable  
Camera  
Servicing!



- 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, 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

**1-800-SENCORE** (736-2673)

VCR/Camera/  
Camcorder

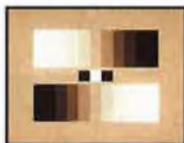
**E**verything you need for accurate, convenient servicing. The VR940 Video Reference provides the industry standard 3200 degree Kelvin color temperature light output. The uniform light output of the VR940 provides unvarying illumination of all the test charts without hot spots or dark spots to complicate camera testing or adjustment.

A complete set of charts and filters is included with the VR940 Video Reference. The VR940 provides an accurate, high quality light source in a convenient package, as well as the test charts you need as references for your complete camera servicing. Let's take a look at the individual test charts and see how each of them are used for camera servicing.

**Color Bar Chart** - Cameras can produce images that are washed out, too intense, or have the wrong hue on some or all of the colors. The Color Bar Chart is a high quality reference for checking and adjusting the phase and amplitude of a camera's color output signals. It's made up of equal width white, yellow, cyan, green, magenta, red, and blue vertical bars arranged according to RS-189 specifications.



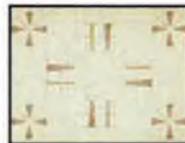
**Gray Scale Chart** - This chart is made up of 11 precision level bars stepping from black through gray, to maximum white on the top of the pattern, then in reverse order on the bottom of the pattern. This creates a distinctive crossed stairstep pattern on a video waveform display which is also convenient for signal tracing. The **Temperature Conversion Filter** converts the indoor color temperature of the VR940's light output to outdoor color.



**Video S/N Chart** - Excessive noise produced in any camera stage, except luma processing, produces objectionable noise in the chroma output signal. The Video S/N Chart is used to test the camera's composite video signal-to-noise ratio with the CVA94 Camera Video Analyzer. The **Red Chart** is used to test the camera's chroma saturation S/N and chroma hue S/N.



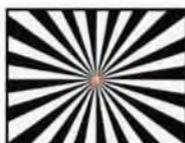
**Registration/Response Chart** - This chart is used to check and adjust the registration of multi-pickup cameras and the frequency response of all cameras. The chart is a combination of crosshatch and circles used to check registration, and frequency wedges used to check frequency response or lines of resolution.



**Blooming Test Chart** - Use this chart to check and adjust the camera's blooming adjustment, which minimizes the amount of bright smearing occurring in the picture. The chart is black with a white rectangle in the center 10% of the chart.



**Focus Chart, Paper Focus Chart, and Neutral Density Filter** - Check the camera's focus and back focus operation with the Focus Chart and Paper Focus Chart. The Neutral Density Filter is used with the Focus Chart to check and adjust the camera's back focus adjustment and auto focus operation at low light levels, where focus is most critical.



### Condensed Specifications

**Light Output** - LIGHT TEMPERATURE: 3200, ±300° Kelvin. LIGHT INTENSITY: 2000, -100, +500 lux. LIGHT UNIFORMITY VERTICAL PLANE: < 100 lux variation. HORIZONTAL PLANE: < 65 lux variation.

**Charts Mechanical** - OVERALL SIZE: 10" x 12" x approx. 3/16" thick. CHART WINDOW: 7" x 9 1/2".

**Color Bar Chart** - DESCRIPTION: 7 equal width vertical bars: white, yellow, cyan, green, magenta, red, blue.

**Gray Scale Chart** - 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).

**Video S/N Chart** - DESCRIPTION: Left 1/7th of chart at 100% white. Remainder at 50% white (gamma corrected).

**Red Chart** - DESCRIPTION: Full screen red.

**Registration/Response Chart** - DESCRIPTION: Combination crosshatch, circles, and frequency response wedges.

**Blooming Test Chart** - DESCRIPTION: Black w/center white rectangle. Rectangle dimensions equal to 10% of vertical and horizontal raster.

**Focus Chart** - DESCRIPTION: Siemens Star. Black and white wedges converging in center of chart.

**Neutral Density Filter** - DESCRIPTION: Reduces light intensity by 4 f-stops (6.25% transmission).

**Temperature Conversion Filter** - DESCRIPTION: Converts 3200° Kelvin to 5500°, ±400° Kelvin.

**General** - 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.



# CM125 "Pix Pak"<sup>TM</sup> Computer Monitor Signal Generator

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



RS232  
Compatible

- 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

Computer  
Monitor  
Analyzing

1-800-SENCORE (736-2673)

**Pixels & bandwidth for high resolution monitors.** 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. These capabilities let you test most of the high-end computer monitors at or near their full video bandwidth. When you send a repaired computer monitor back to the user, you'll have the confidence the display looks excellent, even on fine detail pictures.

**Sync, pixel, and blanking time programmability.** The CM125 "Pix Pak" is also fully programmable so you can adjust the horizontal and vertical scan frequencies, pixels, and porch timings (front porch, back porch, and sync) to match the computer monitor under test. This means the CM125 will test and troubleshoot the computer monitors on the market today as well as those that hit the market in the future.

**Compatible with TTL, analog, and ECL video types.** The CM125 Computer Monitor Signal Generator provides the digital, analog, and ECL video types for troubleshooting and aligning these monitor types. Just select the video type from the front panel and the CM125 "Pix Pak" generates the proper video levels.

**Storage locations for 100 computer monitor formats.** The "Pix Pak" has 100 monitor setup storage locations for fast setup and testing. Forty-three of the locations are preprogrammed with the complete setups of the most popular monitor types on the market (including setups for many high resolution computer monitors). Just recall the "Pix Pak" storage location, hook up the monitor, and start testing. We've left 57 of the storage locations open for storing your



unique computer monitor formats. This prevents the CM125 from becoming obsolete as new computer monitor formats are introduced.

**Complete set of video patterns help computer monitor testing and troubleshooting.** The CM125 "Pix Pak" Computer Monitor Signal Generator provides all of the patterns you'll need for complete troubleshooting and performance testing. You get patterns that dynamically test the operation of a computer monitor while exposing monitor defects that point you toward the defective circuits. These video patterns let you do a final performance test on the computer monitor before you return it to the end user. A special pattern sequence feature lets you automatically cycle the patterns several times a minute to prevent phosphor burns.

**Easy-to-use, portable, lightweight and compact.** The CM125 "Pix Pak" was built light weight and portable so it can go where your computer monitor testing takes you. Its compact size (less than five pounds) works great in the field and saves precious real estate on your bench. The easy-to-use CM125 will be your best asset in the field, at the test rack, or on the repair bench.

**Hook-up adaptors make the CM125 "Pix Pak" easy to use.** The CM125 "Pix Pak" has adaptors available that match the output of the CM125 to the input of the computer monitor under test. These connectors are available for all of the common computer monitor types. You simply hook up the monitor with these connectors and start the tests. It even comes with a universal adaptor for all those one-of-a-kind and seemingly incompatible computer monitors.

## Condensed Specifications

**Video Bandwidth** – 125 MHz.

**Horizontal Sync** – 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 (-).

**Vertical Sync** – RANGE: 10.0 Hz to 250 Hz. ACCURACY:  $\pm$  (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 (-).

**Horizontal Pixel Resolution** – RANGE: 80 pixels to 2,048 pixels in one pixel steps.

**Vertical Pixel Resolution** – RANGE: 80 pixels to 2,048 pixels in one pixel steps.

**Video Patterns** – RASTER, CIRCLE/CROSS, COLOR BARS, STAIRCASE, WINDOW, WINDOWS, MULTIBURST, TEXT.

**Digital Video** – LEVEL: 5 VPP. VIDEO POLARITY: (+) or (-). BLANKING POLARITY: (+) or (-). VIDEO OUTPUT: red, green, blue, and intensity.

**Analog Video** – 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.

**Blanking Timing** – The CM125 recognizes common computer monitor formats and adjusts to

the correct sync, front porch, and back porch times.

**ECL Video** – LEVEL: -0.9 to -1.6 V. VIDEO POLARITY: (+) or (-). VIDEO OUTPUT: red, green, blue.

**Default** – 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.

**Programming** – 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.

**Minimum (Horizontal)** – The minimum blanking time is 1.5 uSec. Minimum sync time is 0.3 uSec.

**Minimum (Vertical)** – The minimum blanking time is 1/H freq. Minimum sync time is 1/H freq.

**Memory** – PREPROGRAMMED: 0 - 42. USER DEFINABLE: 43 - 99.

**General** – 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.



# 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
- Innovative performance pattern generator
- Special sync-locked signal substitutor for pinpointing monitor circuit problems
- 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

Computer  
Monitor  
Analyzing

1-800-SENCORE (736-2673)

**A fully programmable scan frequency and pixel resolution RGB video generator.** The CM2125 includes a fully programmable RGB video and sync generator fully protected to prevent damage from defective computer monitors. You can enter the horizontal and vertical scan frequencies, pixel resolutions, and porch and sync times so the output of the CM2125 matches the input requirements of the computer monitor under test. This fully programmable feature gives you the capabilities to service the wide variety of monitor types that come into your service center.

**Bandwidth to 125 MHz and 2048 x 2048 pixels.** Newer computer monitors have faster scanning frequencies and display more pixels resulting in greater video bandwidth. The CM2125's high resolution capabilities let you test high-end computer monitors at their full video bandwidth. The CM2125 lets you send every monitor back with the confidence the display looks excellent, even on fine detail images.

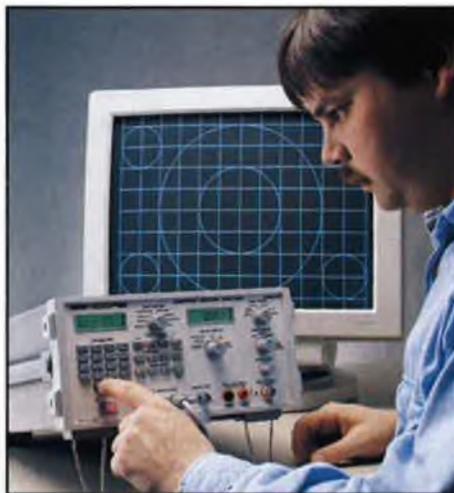
**Compatible with TTL, analog, and ECL video types.** You get troubleshooting and alignment signals for both digital and analog video formats with the CM2125 Computer Monitor Analyzer. And with the ECL adapter (optional), the CM2125 provides the signals necessary to analyze ECL computer monitors.

**70 monitor setup memory locations.** The CM2125 has 43 preprogrammed locations with complete setups of the most popular types on the market (including setups for many high resolution computer monitors). You just recall the storage location, hook up the monitor, and start testing. The remaining 27 storage locations let you store new or unique computer monitor formats.

**Innovative performance testing patterns.** The CM2125 gives you all the patterns you'll need for complete troubleshooting and performance testing. These exclusive video

patterns dynamically test the operation of a computer monitor while exposing monitor defects that point you toward the defective circuits.

You'll easily identify monitor defects like purity, resolution, power supply regulation, and more. The automatic burn-in mode also lets you cycle the video patterns to prevent phosphor burns.



**Sync-locked signal substitution.** The CM2125 Computer Monitor Analyzer uses the signal substitution troubleshooting technique to isolate problems. Signal substitution helps you narrow the problem down to a single stage by injecting a known good signal into the input of a functional block while watching the CRT. You get all the signals you need for troubleshooting from the input connector to the CRT to narrow down any monitor problem with ease.

**Patented "Ringer" Test.** Transformers and yokes are common sources of computer monitor failure. The CM2125's time-proven and patented "Ringer Test" provides an accurate and efficient means for determining if these components are good or bad. You just hook up the CM2125 test leads to the transformer or yoke, and read the results on the LCD display.

**Integrated 2,000 volt DCV and PPV meter.** The CM2125 contains a DC and peak-to-peak voltmeter eliminating the need for an extra DVM. This complete one-unit troubleshooting means you won't have to reach for another meter every time you need to take a voltage reading.

**Exclusive "hook-up" adaptors for all popular monitors.** The CM2125 has connectors and adaptors available for the most common computer monitor formats so you can hook up to the computer monitor and start your troubleshooting immediately. With adaptors for BNC, 9 pin D-Sub, 15 pin D-Sub, and more, you won't need to build a connector for each type of computer monitor you service.

## Condensed Specifications

Patent: #3,990,002

**Outputs** – 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.

**Sync Timing** – 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.

**Memory** – 70 computer monitor setup storage locations (43 preprogrammed).

**Video Patterns** – Raster, Dots, Circle/Crosshatch, Color Bars, Multiburst, Staircase, Text, Window, Windows.

**Drive Signals** – Signal at zero: Less than 3% of full range. Output at full level, 3 V range: 3 VPP, ± 0.5 V into 100 ohms. 30 V range: 30 VPP, ± 5 V into 100 ohms, 300 V range: 300 VPP, ± 50 V into 10,000 ohms.

**Clipping** – None up to 250 VPP typical. Protection from externally applied voltage: ± 500 V (DC +

peak AC). Floating ground (-) isolated by ± 500 V (DC + peak AC).

**External VPP** – 3 ranges (autoranged): 0.0 - 19.9 VPP, 20 - 199 VPP, 200 - 1999 VPP. Accuracy: (All) ± 1%, ± 2 counts. Frequency response: 0 - 200 V, 30 Hz to 5 MHz, ± 1 dB from the average value across the band. Input impedance: 15 Megohm.

**External VDC** – 3 ranges (autoranged): 00.00 - 19.99 V DC, 20.0 - 199.9 V DC, 200 - 1999 V DC. Accuracy: (All) ± .2%, ± 2 counts. Input Impedance: (without probe) 15 Megohm.

**Meter Protection** – 2000 V DC (DC + peak AC), across the inputs. Maximum voltage between (-) lead and ground: 1500 (DC + peak AC).

**Ring Test** – Dynamic test of coil's Q determined by counting the number of ringing 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.

**General** – 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.



# EX220 Video Output Expander

Now You  
Can Operate  
Up To Ten  
Monitors  
With One  
Signal!



- 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

**D**rive multiple monitors. Now you can drive up to 10 monitors from a single RGB source. The EX220 Video Output Expander multiple RGB outputs are great for after repair burn-in and overnight testing. Use the EX220 with your CM125 "Pix Pak" and CM2125 Computer Monitor Analyzer and other RGB sources.

#### 90 MHz video bandwidth.

The EX220's RGB outputs produce sharp pictures on high resolution computer monitors all the way to 90 MHz. You'll have the video bandwidth you

need to accurately test multiple monitors simultaneously.



**Buffered outputs.** 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.

#### Sync & video outputs.

Each is individually buffered for signal integrity and output protection. Short-circuit protected outputs prevent expensive repairs and costly downtime.

#### Condensed Specifications

**Sync & Video Outputs** - INPUT: 15 pin D-sub. OUTPUTS: Ten 15 pin D-sub. Individually buffered for signal integrity and output protection. Short-circuit protected outputs. VIDEO BANDWIDTH: 90 MHz.

**General** - SIZE: 4.97" X 8.05" X 6.45" (HWD). WEIGHT: 4 lbs. POWER REQUIREMENTS: 105-125 VAC, 50-60 Hz, 30 Watts.



Computer  
Monitor  
Analyzing

1-800-SENCORE (736-2673)

# TF46 Portable Super Cricket™ Transistor/FET Tester Patented



- Patented in-circuit “go/no go” transistor/FET test
- Automatically identifies transistor leads
- Tests for all possible leakage paths
- Dynamic gain test for thorough analyzing
- Portable operation with auto shut-off to save your batteries
- Needs no set-up book or instructions

Test Any  
Transistor Or  
FET With 99%  
Reliability In  
Less Than  
15 Seconds -  
In Or Out  
Of Circuit!

**F**ast, confident testing in-circuit or out-of-circuit. The TF46 Super Cricket takes the guesswork out of solid state servicing. You never need setup data of any kind. You simply connect the leads and rotate the switch. There's no setup data needed. If the device is good, you'll hear a chirp - guaranteed!

**Automatically identifies transistor basing.** Confirm replacement parts are correctly installed or identify basing of unknown parts. The TF46 Super Cricket quickly and reliably distinguishes the emitter, base, and collector of a bipolar transistor (or an FET).



**Tests every leakage path to uncover marginal failures.** Out-of-circuit leakage check finds those transistors that show

good gain, but are leaky from collector to base, or collector to emitter. Simply press the leakage button and rotate the switch to check every possible leakage path. Use the Super Cricket's leakage test to identify leaky or shorted diodes.

**Tests for transistor gain and matches parameters.** The TF46 dynamically tests the gain of transistors. Confirm replacement transistors or FETs have the correct parameters for critical circuits such as push-pulls, high frequency oscillators, etc. It matches the  $I_{dss}$  of FETs too.

## Condensed Specifications

Patents: #3,832,633, #3,898,559

**Cricket Good/Bad:** Detects ability of transistor to invert a square wave.

**Bi-Polar Transistor Beta:** Dynamic Beta.

**Bi-Polar Leakage:** Tests six paths with rotation of permutator switch (lcb0, lcb1, lcb2, lcb3, lcb4, lcb5).

**Field Effect Transistor Gm:** Dynamic mutual conductance.

**FET Leakage (I<sub>gss</sub>):** 0-2500 microamperes.

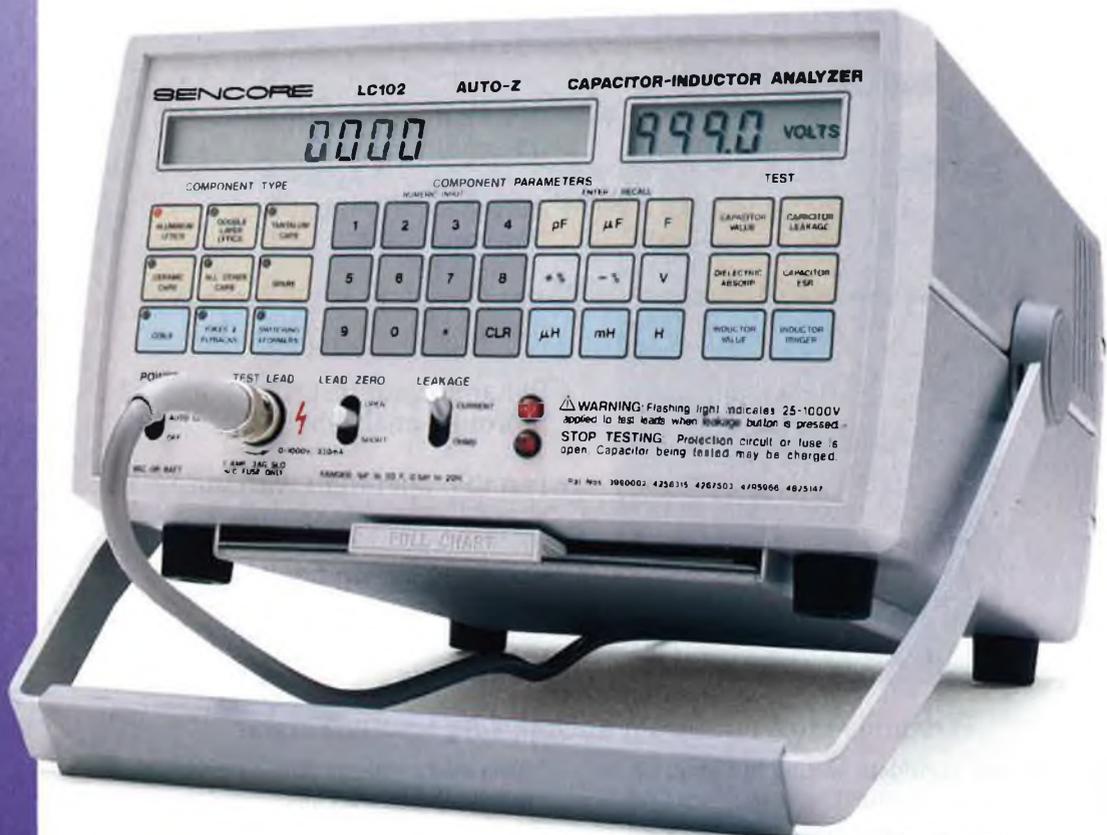
**Zero Bias Drain Current (I<sub>Dss</sub>):** 0-50 milliamperes.

**General:** TEST LEADS: Color-coded E-Z Hook® connectors. BATTERIES: Six alkaline, carbon zinc, or rechargeable “AA” cells (not included). Auto shut-off after 10 minutes. METER: 4 1/2", 100 uA, 5%, mechanical shock protected. SIZE: 10" x 5 1/4" x 3 1/4" (25.4 cm x 13.8 cm x 8.9 cm) HWD. WEIGHT: 4 1/2 lbs (2.0 kg).



# LC102 "AUTO-Z"<sup>TM</sup> 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

Analyzing  
Support

1-800-SENCORE (736-2673)

Only the LC102 "AUTO-Z" allows you to test today's high tech components. Its advanced digital technology completely analyzes capacitors, inductors, and special components with dynamic and reliable tests. The totally automatic "AUTO-Z" is microprocessor controlled for speed and accuracy in all of your component testing.

**Dynamic capacitor testing.** With the push of a button, you obtain the exact readings for all four capacitor failures: value, leakage, dielectric absorption, and ESR. The "AUTO-Z" gives you dynamic tests with results you can trust.

The "AUTO-Z" measures capacitance value from 1 pF to 20 F with a one-step, automatic test. Exclusive leakage tests to 1000 volts and ESR measurements from 0.10 ohms to 2000 ohms find capacitors just starting to fail. The patented dielectric absorption test finds capacitors that cause problems in circuits because they can't completely discharge. The LC102 gives you a direct percentage reading of dielectric absorption so you know the exact condition of the capacitor. If you need to find bad capacitors, the LC102 "AUTO-Z" is the instrument for you.

**Patented inductor tests.** The LC102 "AUTO-Z" measures the true inductance of coils up to 20 H. This patented test lets you find inductors that drift out of tolerance or exhibit a large change in value.

The automatic Ringing Test dynamically checks inductors, yokes, flybacks, and switching transformers with 100% reliability. This patented test finds shorted turns in coils – even a single shorted turn. The Ringing Test is an industry



standard that finds the coils that fail, but test good with all other testers.

**Find bad SCRs/triacs and more.** The LC102 analyzes more than just capacitors and inductors. With the optional SCR250 SCR & Triac Test Accessory, the "AUTO-Z" becomes a dynamic SCR and triac analyzer. Turn-on tests and leakage checks (up to 1000 volts) make the LC102 and SCR250 the most complete SCR and triac analyzing team anywhere. Added tests for transmission lines, hi-pot testing, and more give you the versatility you need on any job.

**Automatic "GOOD/BAD" tests.** Just enter the cap's or coil's rated parameters and tolerance. The "AUTO-Z" makes the readings, compares them against EIA tables stored in memory, and displays whether the component is good or bad. You don't need standards tables and you don't need to make calculations. You get

a "GOOD" or "BAD" reading automatically – leaving no guesswork or interpretation.

**Portable to use in the field or in the factory.** The full potential of the LC102 "AUTO-Z" is packed into a light-weight, portable (battery and AC) package. The "AUTO-Z" is designed with CMOS logic, LCD technology, and an automatic shut-off feature for low power consumption (eight hours on one charge). Take the LC102 wherever you check components - in the field, on the bench, or at the factory

**Automated testing.** The LC102 is IEEE 488 and RS232 compatible for automated testing and data collection. Use the "AUTO-Z" with Sencore's IB72 or IB78 for data collecting, incoming inspection, and quality assurance testing.

## Condensed Specifications

**Capacitor Value** – 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.

**Capacitor Leakage Voltage** – VOLTAGE RANGE: 1.0V to 999.9V in 0.1V steps. VOLTAGE ACCURACY: +0% -5% POWER: Short circuit current limited to < 900 mA. Continuous power limited to 6 watts  $\pm 10\%$ . Selected on keypad.

**Capacitor Leakage (current)** – 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.

**As A Dynamic Ohmmeter** – RANGE: 100 ohms to 999 megohms depending on voltage setting. ACCURACY:  $\pm 5\% \pm 1$  digit.

**Capacitor Dielectric Absorption Test** – 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.

Patents: #3,990,002, #4,258,315, #4,267,503, #4,795,966, #4,825,147

**Capacitor Equivalent Series Resistance (ESR)** – 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.

**Inductor Value** – 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.

**Ringing Test** – 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.

**General** – 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 AND WEIGHT: 6" x 9" x 11.5" HWD (15.2 x 22.6 x 29.2 cm.). 6 lbs. (.27 kg.) without battery. 7.6 lbs. (3.5 kg.) with battery.



# CR70 "BEAM BUILDER"®

Universal CRT Analyzer & Restorer Patented

Test Virtually  
Every CRT On  
The Market -  
Now And In  
The Future,  
Plus Restore  
90% Of All  
Weak Or  
Shorted CRTs!



- Guaranteed to test virtually every CRT (old, new, projection, camera, scope, video monitor, and more)
- Guaranteed dynamic tests you can trust
- Guaranteed to safely restore 9 out of 10 weak or shorted CRTs
- Guaranteed to be totally protected from damage by charged CRTs

Analyzing  
Support

**1-800-SENCORE** (736-2673)

**T**est virtually every CRT on the market. The CR70 is the only CRT tester that gives you the ability and confidence to test virtually every type of CRT in use today!

- B&W and color video CRTs
- Projection CRTs
- Computer display CRTs
- Closed circuit video CRTs
- Camera pickup tubes (broadcast, industrial, and surveillance)
- Even scope, radar, and other industrial CRTs

**Finally - you'll win the socket war.** The CR70 "BEAM BUILDER" solves an age-old CRT tester problem - the adapter sockets. Conventional CRT testers need a separate, expensive adapter socket for each mechanical or electrical CRT variation. At a cost of \$10-\$30 for each of the 100-plus sockets needed, you could run up a sizeable socket debt, especially since it seems like you're always one socket short. The CR70 tests all CRTs with six adapters and the Universal Adapter that connects to even "non-standard" CRTs.

**Dynamic tests you can trust.** The CR70 tests the CRT over its entire operating range, from black (cutoff) to white. It's the only tester that tests emission as "true beam current" (current that passes through the control grid to the screen grid). Its exclusive cutoff test accurately identifies CRT problems related to bad contrast that other testers miss. The patented color tracking test gives a direct good/bad comparison of all three guns of a color CRT or all three CRTs of a projection system to confirm they will balance properly for any color or B&W picture. The CR70 also tests for shorts between CRT elements with both good/bad and linear results.

**Restore CRTs effectively and profitably.** The CR70 is guaranteed to extend the life of 9 out of 10 weak or shorted

CRTs including industrial, broadcast, and surveillance CRTs. This saves thousands of dollars per year as you stretch the life of computer display tubes, camera tubes, or high-priced scope tubes (or salvage that instrument for which you can't get a CRT). This is a real profit generator as you charge \$25 to \$35 for restoration and keep your customer from throwing away an otherwise good TV.



**Safe and effective CRT restoration.** The CR70 is the only CRT restoring instrument that uses different restoration levels for each CRT type. We call it "progressive restoration." Progressive restoration means you start with the lowest (safest) level of restoring current. If the CRT responds to the lower level, you stop. If it

doesn't, you step up the restoring level until you improve the tube or run out of steps. (If you've ever destroyed a CRT with another restorer, you'll really appreciate progressive restoration). Nothing on the market is safer or more effective at restoring CRTs.

**Prevents costly overload damage.** CRT testers are often damaged by high voltage left on the CRT, or by shorted filaments. The CR70 is fully protected with special metal oxide varistors (MOVs) and a current limited power supply to prevent costly damage.

**Exclusive 4-way money back guarantee.** The CR70 is so unique and different from any other CRT tester that it has a money back guarantee that protects you four ways. The CR70 "BEAM BUILDER" is guaranteed to:

- Test virtually every CRT you encounter
- Provide the most reliable tests available
- Restore 9 out of 10 weak CRTs
- Be totally protected from damage from charged CRTs..... or your money back!

### Condensed Specifications

**CRT Tests** - H-K SHORTS: 2 megohm good/bad calibration,  $\pm 10\%$ . G1 SHORTS: 20 megohm good/bad calibration,  $\pm 10\%$ . CUTOFF TEST: Switch selectable G1 bias: -20, -36, -52, or -68 VDC. EMISSION TEST: G1 bias at zero volts. EMISSION LEVELS: Video CRTs - 300  $\mu$ A; Projection CRTs - 800  $\mu$ A; Scope CRTs - 10  $\mu$ A; all  $\pm 5\%$ . TRACKING: Stored emission current levels compared between highest and lowest guns.

**Cathode Recovery Methods** - REMOVE G1 SHORTS: R/C discharge at zero filament voltage. REJUVENATION: R/C discharge with current limiting; time automatically determined by CRT

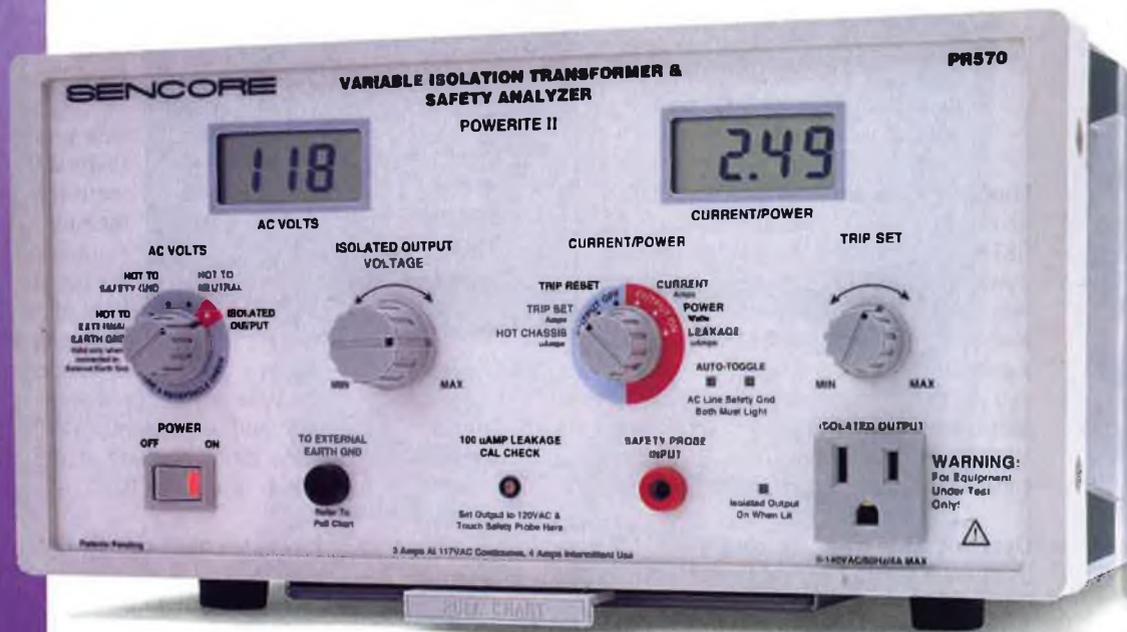
cathode. RESTORATION: Cathode super-heating using elevated filament voltage and increased beam current. Current limited to 100 mA in "Auto" and "Manual 1" and 150 mA in "Manual 2".

**General** - POWER: 105-130 VAC, 50/60 Hz. SIZE: 7.5" x 14" x 9.7" (19 x 35.6 x 24.8 cm) HWD. WEIGHT: 12 lbs (5.4 kg). METER: 4", 100  $\mu$ A, 2%.

Patent: #4,563,649



# PR570 "POWERITE II"<sup>TM</sup> Patent Pending Variable Isolation Transformer & Safety Analyzer



Identify And  
Troubleshoot  
Virtually Any  
AC Supply  
Problem  
Fast... With  
The PR570  
"POWERITE II"<sup>TM</sup>



- 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)

Analyzing  
Support

1-800-SENCORE (736-2673)

**Safe testing.** The PR570 "POWERITE II" provides the isolation you need for servicing any hot chassis. It protects you and your test equipment from shock or overloads by isolating the equipment under test from the AC line. Plus, the PR570's 470 watt isolation transformer eliminates dangerous shock hazards for you and your employees.

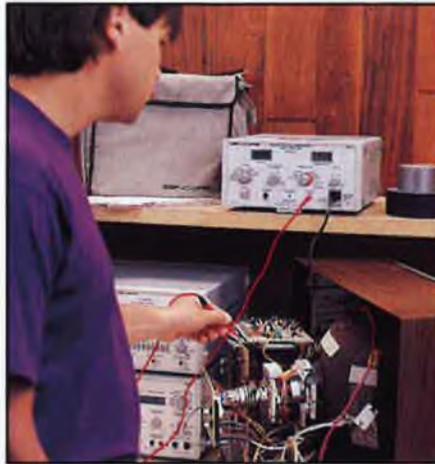
#### Conquer AC power source problems.

The PR570 allows you to make all recommended tests on startup, shutdown, and regulator circuits by providing a continuously variable source of AC from 0-140 volts. Test AC powered products at high and low voltages to sweat out intermittents, voltage sensitive circuits, or regulation problems before delivery to your customers.

**Quickly identify AC line problems.** The PR570's AC line voltage monitor quickly identifies low or high line voltage conditions. Now you can test every set at low or high line voltage to identify line voltage-related problems and avoid embarrassing callbacks.

**Minimize expensive parts damage.** The "POWERITE II" provides you with an exclusive feature that allows you to adjust the amount of available current to prevent expensive component damage. The adjustable current trip feature minimizes parts damage by automatically removing AC power

when excessive current is being drawn. The 0-4 amp adjustable trip feature is a must for power supply and horizontal circuit troubleshooting.



**Simultaneous current and voltage displays.** You can watch voltage levels and current or power draw simultaneously with the PR570's dual digital meters. This dual display shows you all the information you need, giving you full control of your AC troubleshooting.

**Test AC outlets.** The PR570 provides you with an exclusive receptacle checker to ensure correct earth grounding for the highest level of safety. Now you can make sure the AC power source is right and safe, eliminating wasted time and confusion.

**Build additional profits with safety leakage checks.** Protect your customers from electrical shock and protect your business from lawsuits with an automatic, auto-toggling AC line and safety ground leakage test (leakage down to 10 microamps). The PR570 "POWERITE II" lets you perform the recommended safety leakage tests in seconds with just one probe. These safety leakage tests protect your customers and build profits at the same time. Use the safety leakage test for security, safety, or financing your future test instrument needs.

### Condensed Specifications

**Isolated Output** – VOLTAGE: 0-140 VAC typical at 117 VAC input, continuously variable. CURRENT: 3 amps continuous; 3-4 amps, 470 watts maximum intermittent use (5 minutes on, 5 minutes off). OUTPUT LOADING: Less than 12 volts drop in output with 3 amp load at 120 VAC.

**AC Volts Functions** – AC LINE VOLTAGE TESTS: Measures and displays the selected voltage: Hot to External Earth Ground, Hot to Safety Ground or Hot to Neutral. RANGE: 0-150 VAC. ACCURACY:  $\pm 3\%$  reading  $\pm 2$  counts, calibrated at 117 VAC. RESOLUTION: 1 volt. PROTECTION: 240 VAC. ISOLATED OUTPUT VOLTAGE: Measures and displays voltage at isolated output. Same as Line Voltage Tests.

**Output Current Monitor** – MEASUREMENT: True Power. RANGE: 0 to 470 watts. ACCURACY:  $\pm 5\%$  of reading,  $\pm 2$  counts. RESOLUTION: 1 watt.

**Adjustable Current Trip** – RANGE: 0-4 amps. ACCURACY:  $\pm 10\%$  of reading,  $\pm 20$  mA. RESOLUTION: Adjustable in 10 mA increments. TRIP TIME: 0.3 seconds max. with 200% overload.

**Hot Chassis Test** – MEASUREMENT: Ties high and low lead of primary together and measures leakage to exposed metal with power off. RANGE: 0 to 1999  $\mu$ A. ACCURACY:  $\pm 3\%$  of reading,  $\pm 2$  counts. RESOLUTION: 1  $\mu$ A. PROTECTION: 150 mA RMS, 150 V max.

**Safety Leakage Test** – MEASUREMENT: Referenced to either side of isolated output jack. (Automatically toggles high and low line and opens and closes safety ground and displays highest reading.) RANGE: 0 to 1999  $\mu$ A. ACCURACY:  $\pm 3\%$  of reading,  $\pm 2$  counts. RESOLUTION: 1  $\mu$ A. PROTECTION: 150 mA RMS, 150 V max. CAL CHECK: 100  $\mu$ A,  $\pm 3\%$  of reading,  $\pm 2$  counts with isolated output at 120 VAC.

**Protection** – AC INPUT: 4 amps, type 3AG slo-blo fuse. ISOLATED OUTPUT: Adjustable current trip, 1 to 4 amps.

**General** – SIZE: 6" x 11.5" x 12" (15.2 x 25.4 x 29.2 cm) HWD. WEIGHT: 22 lbs. (10 kg). POWER: 105 to 125 VAC, 60 Hz, 4 amps idle current with no output load.



# FC71 Portable 1 GHz Frequency Counter Patented

The Only  
Portable 1 GHz  
Counter  
Designed  
(Exclusive  
Microprocessor  
Controlled  
Timebase)  
With .5 PPM  
Accuracy Even  
In High RF  
Environments!



- Five times more accurate than FCC requirements even on the toughest job; .5 parts per million
- Portable - 9.5 hours on one charge
- Exclusive microprocessor timebase
- Measures all signals, even noisy signals
- Super 5 mV average sensitivity over full range
- Automatic crystal check
- Frequency ratio compares two frequencies
- Automatic readings with IEEE 488 or RS232

Analyzing  
Support

**1-800-SENCORE (736-2673)**

**T**he only truly portable 1 GHz counter that makes every reading better than FCC requirements. The FC71 uses a unique, microprocessor-controlled timebase. This patented counter provides 0.5 ppm accuracy (0.5 ppm/y aging) from 10 Hz to 1 GHz. The 8 1/2 digit LCD display gives you superior accuracy on the high end while allowing .01 Hz resolution for low end audio work.

Since there is no power robbing oven, the FC71 gives you nine hours of continuous operation. Take it wherever it's needed: broadcast towers for FCC documentation; repeater shacks for troubleshooting, or airplane cockpits for avionics tests.

**The highest stability available to count signals that drive other counters crazy.** The FC71 is guaranteed to be the most stable counter you can buy. It counts signals others can't, such as AM or FM signals, digital signals with ringing, or audio signals with noise. There's such a striking difference between the FC71's stability, and that of a conventional counter, you have to try it to believe it.

**The most sensitive frequency counter available - counts signals other counters miss.** The FC71's 5 mV input sensi-

tivity lets you count signals in more circuits than with any other counter - without external amplifiers. Even measure the output of RF generators and communications monitors that can't be tested with other counters.



**Extra tests make the FC71 more than just a counter, it's an analyzer for troubleshooting tough RF problems.** The FC71 takes the doubt out of oscillator repairs by checking any crystal at its fundamental operating frequency - automatically. The frequency ratio test simplifies troubleshooting in digital and RF multiply and divide stages. Solve modern digital and 2-way radio circuit problems quickly and confidently. Measure the input, measure the output, press a button, and read the exact ratio. Plus, the optional interface accessories let you automate your testing for documentation.

**The best RF shielding of any counter gives interference-free measurements - even in high RF fields.** With most counters, you cannot make measurements near a broadcast or two-way transmitter because the counter picks up the transmitter signal through the case. The FC71's double shielding lets you measure signals in RF fields that are just plain impossible to measure with other counters.

### Condensed Specifications

Patent: #4,616,173

**Frequency Counter** - RANGE: 10.00 Hz to 1 GHz. Sensitivity: 5 mV av.; 14 mV typical at 1 GHz; adjustable for special signals. ACCURACY: 0.5 ppm (0-40° C); microprocessor compensated, 0.5 ppm/year aging (Patented). FREQUENCY RATIO: 1.000 to 99,999,999; automatically calculated. CRYSTAL: Test crystal for approx. fundamental frequency. UPDATE TIME: Selectable. Approximately 0.1 and 1 second.

**Input Frequency** - 1 MEGOHM INPUT: 10 Hz to 100 MHz. 50 OHM INPUT: 10 MHz to 1 GHz. CRYSTAL CHECK: 1 MHz to 20 MHz.

**Input Protection** - 1 MEGOHM: 400 VPP to 100 Hz, 250 VPP to 10 kHz, 50 VPP to 30 MHz, 8

VPP to 100 MHz. 50 OHMS: 5 VRMS, 0.5 watt; 100 V max. DC fuse protected. DC Diode protected.

**General** - POWER: 105-130 VAC with supplied PA235 Power Adapter. 12 VDC from car battery with supplied 39G176 DC Power Lead. Battery operation with optional BY234 rechargeable battery. Shuts off automatically after 30-45 minutes of battery use. SIZE: 4" x 8" x 11.5" (10.2 x 20.3 x 29 cm) HWD. WEIGHT: 5 lbs (2.3 kg) without battery. DISPLAY: 8 1/2 digit LCD. RFI EMISSION: Meets or exceeds FCC code 47 CRF 15.840.



# SG80 AM Stereo – FM Stereo Analyzer Patented

Pinpoint Any Receiver Problem From The Antenna To The Output With The Only Fully Integrated AM Stereo – FM Stereo Analyzer!



- Every signal you need to troubleshoot and performance test any AM Stereo or FM Stereo receiver
- Rock-solid digital tuning gives you fast, accurate, channel-by-channel control
- Microprocessor calibrated attenuator provides accurate signal levels for all your testing and troubleshooting needs
- Patented analyzing signals let you use the same troubleshooting techniques for both AM Stereo and FM Stereo receivers
- Exclusive tuneable IF sweep system allows you to dynamically analyze the latest FM IF stages
- Isolated audio drive signal lets you troubleshoot from the stereo decoder to the audio amplifier
- High quality signals give you confidence the receiver is operating at peak performance
- Automate your testing with optional IEEE 488 or RS232 computer interface accessories

Audio  
Analyzing

**1-800-SENCORE** (736-2673)

**E**very FM and AM signal you need. Isolating problems to a single circuit separates an analyzer from a test generator. Only an analyzer helps you identify the source of the problem.

The SG80 AM Stereo - FM Stereo Analyzer provides every FM and AM analyzing signal you need to track down any receiver problem - from the antenna to the outputs. You get all the FM and AM signals you need through one output jack, making it easy to use. It's a complete analyzer.

**Rock-solid digital tuning.** Digital tuning is virtually standard in modern receivers. The only way to properly test digital receivers is with a signal more accurate than the receiver's tuning system.

The SG80's exclusive digital generator tunes in the same steps as a digital receiver for fast, efficient testing. You get a crystal referenced signal that you know is on-frequency to quickly identify tuner problems. Two-speed tuning simplifies AFT testing and a special wraparound feature makes linearity checks a snap.

**Microprocessor calibrated attenuator.** Tests of receiver sensitivity, FM muting, and auto-seek circuits require precise signal levels at all frequencies. From less than one microvolt to 250,000 microvolts, the SG80 gives you accurate signal levels at every frequency. The microprocessor-calibrated attenuator supplies the precision you need for setting exact levels with confidence.

**Patented analyzing signals.** FM and AM receivers have nearly identical circuits, yet most generators force you to use different troubleshooting techniques for each. Wouldn't it be easier to use the same tests and methods for both?

The SG80 and its integrated FM and AM analyzing signals

give you smart troubleshooting. It uses the same troubleshooting methods, audio frequencies, and modulation features to make FM and AM troubleshooting look alike.

**Exclusive tuneable IF sweep system.** Many high quality receivers now have multibandwidth IF sections. If you don't have proper IF alignment equipment, you may be sending out mistuned receivers.

You can positively test and align all FM IF circuits with the SG80's exclusive tuneable FM IF generator. You get the frequency range you need to ensure your customers the cleanest sound possible.

**Isolated audio drive signal.** What do you do once you've narrowed a problem to a stage after the stereo decoder? The SG80

audio injection analyzing signal is phase-locked to the RF and IF signals to quickly pinpoint audio problems. This dynamic drive signal is protected and isolated so you can divide and conquer with confidence.

**High quality signals.** Today's receivers sound better than ever. And since off-air signals aren't stable enough to use for testing, you need a high quality signal source for reliable test results.

All of the SG80's analyzing signals are high performance for high quality testing starting from the antenna. A patented FM stereo multiplex system, with separation greater than 63 dB, makes the SG80 your ultimate receiver analyzing tool. High quality signals give you high quality troubleshooting.

**Automated testing.** Most servicers don't have the time to perform complete performance tests on every receiver they service. Automate your SG80 testing with the IB72 IEEE 488 or IB78 RS232 computer interface accessories and let the SG80 do the work automatically. You'll save valuable time and have documentation for later use.



## Condensed Specifications

Patent: #4,823,390

**FM RF Generator** - Tuning Range: 87.9 to 108 MHz. TUNING STEPS: Coarse: 200 kHz steps/Fine: 10 kHz steps. ACCURACY:  $\pm 20$  PPM. MODULATION PERCENTAGE: 100% =  $\pm 75$  kHz Deviation  $\pm 2$  kHz. MODULATION DISTORTION: < or equal to 0.01% THD with a 1 kHz sinewave @100% mod. STEREO SEPARATION: > 63 dB @ 98.1 MHz and 1 kHz sinewave modulation.

**FM IF Generator** - (Specs guaranteed from 10.2 MHz to 11.2 MHz). TUNING RANGE: 9.7 to 11.7 MHz. TUNING STEPS: Coarse: 100 kHz/Fine: 10 kHz. ACCURACY:  $\pm 20$  PPM. MODULATION PERCENTAGE: 100% =  $\pm 75$  kHz deviation  $\pm 2$  kHz. MODULATION DISTORTION: < or equal to 0.01% THD with a 1 kHz sinewave @100% mod.

**FM Multiplex Generator** - PILOT FREQUENCY: 19 kHz  $\pm 2$  Hz. Pilot Level: 0 to 11% of overall modulation continuously variable. Stereo Separation Through Composite: >65 db at 1 kHz.

**SCA** - FREQUENCY: 53 to 95 kHz internally adjustable. Preset at factory to 67 kHz. Accuracy of Carrier:  $\pm 1.5$  kHz. MODULATION: 2.5 kHz audio sinewave. MODULATION DISTORTION: < or equal to 3% at 2.5 kHz.

**FM Sweep Generator** - SWEEP WIDTH:  $\pm 600$  kHz. CENTER MARKER FREQ: Selectable between 9.7 and 11.7 MHz in 100 kHz steps (Coarse) and 10 kHz steps (Fine). ACCURACY:  $\pm 20$  PPM. AMPLITUDE: 1.2 VPP Minimum. MARKERS: Every 100 kHz from center marker to  $\pm 600$  kHz.

**AM RF Generator** - FREQUENCY RANGE: 520 kHz to 1720 kHz minimum. TUNING STEPS: COARSE: 10 kHz steps/Fine: 1 kHz steps. ACCURACY OF CARRIER:  $\pm 20$  PPM. MODULATION PERCENTAGE: 0% to 125%  $\pm 2\%$  in Mono, L+R, L-R, and Stereo 0% to 65% in R and L. MODU-

LATION DISTORTION: < or equal to 0.5% THD with a 1 kHz audio sinewave signal @ 30% mod.

**AM IF Generator** - FREQUENCY RANGE: 200 to 500 kHz. TUNING STEPS: Coarse: 10 kHz steps/Fine: 1 kHz steps. ACCURACY OF CARRIER:  $\pm 20$  PPM. MODULATION PERCENTAGE: 0% to 125%  $\pm 2\%$  in Mono, L+R, L-R, and Stereo 0% to 65% in R and L.

**C QUAM AM Stereo** - MAIN CHANNEL: < or equal to 0.5% with a Mod. Dist. 1 kHz audio sinewave signal @ 30% mod. SUB-CHANNEL MOD. DIST.: < or equal to 0.5% with a 1 kHz audio sinewave signal @ 30% mod. STEREO SEPARATION: > or equal to 35 dB from 200 Hz to 7.5 kHz at 50% modulation. ID PILOT FREQUENCY: 25 Hz  $\pm 0.25$  Hz.

**RF/IF/MPX Attenuator** - RANGE: 0 to 120 dBf Continuously Variable (0.27  $\mu$ V to 0.27V). ACCURACY:  $\pm 1$  dB at 98.1 MHz at 65 dBf.  $\pm 1.5$  dB over 20 dBf - 120 dBf ranges,  $\pm 2.5$  dB over 0 dB range. OUTPUT IMPEDANCE: 75 Ohm RF. 1 k Ohm MPX. OUTPUT PROTECTION: Protected from externally applied voltages up to  $\pm 400$  V(DC + -Peak AC).

**Audio Output** - FREQUENCIES: Off, 400 Hz, 1 kHz, and 5 kHz,  $\pm 20$  PPM Sinewave and Squarewave. SINEWAVE DISTORTION: < 0.02% THD at 1 kHz into 100 ohms. OUTPUT AMPLITUDE: 0 to 3 VPP continuously variable into 100 ohms. OUTPUT IMPEDANCE: 100 ohms.

**General** - POWER: 105-130 VAC, 60 Hz. SIZE: 7" x 14" x 16.7" (17.9 x 35.8 x 42.5 cm) HWD. WEIGHT: 20 lbs (10.8 kg).



On GSA Contract

# PA81 Stereo Power Amplifier Analyzer

“The Missing Link In Audio Servicing”

Dynamically  
Analyze  
Stereo Power  
Amplifiers  
Anywhere, In  
Less Than 1/2  
The Time  
You Now  
Take, With  
Superior  
Accuracy  
And Reduced  
Measurement  
Errors!



IEEE488  
Bus-Compatible  
RS232  
Compatible

- Twin frequency compensated autoranged wattmeters make the job a snap
- Built-in EIA/IHF testing components at your fingertips guarantee accuracy and ease
- Monitor sound quality at every step to prevent back tracking
- RMS and dB audio signal tracing lets you tie down troubles in any stage
- Prevent amplifier damage and save time by monitoring intermittents
- Audio line test ensures the signal source is “OK”
- Stereo separation tests to 126 dB speed AM, FM, and Stereo TV work

Audio  
Analyzing

1-800-SENCORE (736-2673)

**M**onitor the quality and quantity of audio signals with complete confidence. The PA81 Stereo Power Amplifier Analyzer is a stand-alone, portable instrument you can take with you wherever you service audio equipment - in the shop, the home, automobiles, hotels/motels, stadiums, and other commercial settings.



**Dual-channel convenience.** Today's audio servicers need to measure signals from milliwatts, to 500 watts or more in one amplifier. The PA81's dual-channel metering and tracking accuracy lets you analyze the smallest voltage to the highest power ratings in any format you want - DCV, RMS, dB, or watts. Finally you can accurately measure up to 500 watts (250 watts/channel) with a flat frequency response over the entire range of audio.

**Guaranteed accuracy.** End the time-consuming frustration of coupling resistors together for impedance matching. Dual, highly accurate (2, 4, 8, 16, and 32 ohm), zero reactance dummy loads rated at 250 watts let you meet industry standards while testing any audio system. Built-in bandpass filters allow you to pinpoint hum and eliminate unwanted signals such as CD noise without building makeshift circuits.

**Monitor audio every step of the way.** Verify the clarity of the audio signal at any stage in the amplifier by listening to the output via two high quality, built-in speakers and/or headphones. Dual volume controls and automatic attenuators let you keep the sound at a comfortable level. Plus, two isolated output jacks let you watch the signal with your oscilloscope for clipping and distortion.

**Isolate problems to any stage.** Conquer audio amplifier dri-

ver and preamplifier faults with the external input RMS volt and dB meter. Use the programmable dB function for fast tests of amplifier stage gain. Simply store the signal level at the beginning of a stage and measure the level at any other point. The PA81's meter tells you the amount of gain or loss - no calculating necessary.

**Find costly, time-consuming intermittents.** Let the PA81's built-in DC balance tester zero in on intermittents while you are working on other projects. If the channels ever go out of balance by more than one volt DC, the PA81 automatically disconnects the loads. An indicator light identifies the defective channel so you can avoid the component damage that may result if the audio amplifier is left to operate out of balance with a load.

**Test audio line signals.** Save time by making sure the signal coming from the audio source is correct before you begin troubleshooting the power amp. Check phono cartridges, AM tuners, FM tuners, CD players, audio preamps, tape decks, VCRs, or any other audio source for the standard "Audio Line" level into the industry specified 10 k ohm input.

**Measure separation up to 126 dB.** Monitor, troubleshoot, or align AM, FM, or TV audio circuits by connecting to the signals and directly reading separation levels on the dual meters. The PA81 shows you up to 126 dB of separation at all power levels - large or small.

**Analyze all audio power amplifier systems.** Gives you one approved, integrated system to reduce analyzing time, eliminate costly callbacks, and prove to your customers that their system or audio component is serviced right.

### Condensed Specifications

**Separation Between Channels** - Greater than 100 dB at 1 kHz. RMS VOLTS (any input). DYNAMIC RANGE: 0.2 mV to 200 volts RMS in six autoranged or manually selected ranges for Audio Line and Dummy Load inputs. 2 mV to 200 Volts in five autoranged or manually selected ranges for Ext Inputs. RANGE: 0.2 mV to 2 mV except Ext Input

2 mV to 20 mV	20 mV to 200 mV
200 mV to 2 V	2 V to 20 V
20 V to 200 V	

ACCURACY:  $\pm 2\%$  of range full scale at 1 kHz. FREQUENCY RESPONSE (1 kHz Reference): 20 Hz to 20 kHz =  $\pm 2\%$ , 15 Hz to 100 kHz =  $\pm 10\%$ , 10 Hz to 200 kHz =  $\pm 5$  dB.

**dBm (any Input)** - DYNAMIC RANGE: 120 dB total dynamic range from -72 dBm to +48 dBm in six autoranged or manually selected ranges for Audio Line and Dummy Load inputs. 100 dB total dynamic range from -52 dBm to +48 dBm in five autoranged or manually selected ranges for Ext Inputs. RANGES: -72 dBm to -52 dBm except Ext Input

-52 dBm to -32 dBm
-32 dBm to -12 dBm
-12 dBm to +8 dBm
+8 dBm to +28 dBm
+28 dBm to +48 dBm

ACCURACY:  $\pm 0.5$  dBm at 1 kHz. FREQUENCY RESPONSE (1 kHz Reference): 20 Hz to 20 kHz =  $\pm .2$  dB, 15 Hz to 100 kHz =  $\pm 1$  dB, 10 Hz to 200 kHz =  $\pm 5$  dB.

**dB Prog (any Input)** - DYNAMIC RANGE: Same as dBm for reference and subsequent inputs. RANGES: Same as dBm. ACCURACY:  $\pm 1$  dB at 1 kHz. FREQUENCY RESPONSE: Same as dBm.

**RMS WATTS (Dummy Load Input Only)** DYNAMIC RANGE - 0 to 250 watts in two autoranged or manually selected ranges. RANGES: 0 to 25 watts / 0 to 250 watts. ACCURACY:  $\pm 3\%$  of range full scale at 1 kHz, 8 ohm load.

**DC Volts (External Input Only)** - DYNAMIC RANGE: 0 to  $\pm 200$  VDC in four autoranged or

manually selected ranges. RANGES: 0 to  $\pm 0.2$  VDC,  $\pm 0.2$  to  $\pm 2$  VDC,  $\pm 2$  to  $\pm 20$  VDC,  $\pm 20$  to  $\pm 200$  VDC. ACCURACY:  $\pm 3\%$  of range full scale.

**250 W IHF Dummy Loads Inputs** - LOADS: Front panel selectable 2, 4, 8, 16, 32 ohms, or open. TOLERANCE:  $\pm 1\%$  any load. REACTANCE: less than 10% reactive at any frequency less than 200 kHz. POWER HANDLING: Up to 250 watts intermittent or up to 100 watts continuous power per channel.

**External Inputs** - IMPEDANCE: 1 Megohm for AC tests. 15 Megohm for DC tests.

**Audio Line Inputs** - IMPEDANCE: 10 k ohms, shunted by 100 pf. TOLERANCE:  $\pm 10\%$ .

**IHF Input Filters** - FILTERS:

NONE: 20 Hz to 200 kHz.
BAND PASS: 200 Hz to 15 kHz.
HI PASS: Above 200 Hz. LO PASS: Below 15 kHz.
LO PASS: Below 30 kHz.

ATTENUATION AT CUTOFF: Less than 3 dB. ROLL-OFF: At least 18 dB per octave. 10 kHz ATTENUATION: At least 30 dB on Bandpass and 15 kHz Lo Pass filters.

**Scope Outputs** - OUTPUT LEVEL: 2 volts  $\pm 5\%$  RMS out at full scale meter indication.

**DC Trip Protection** - LEVEL: 1 VDC or greater will cause the relays to trip open and remain open until manually reset. RESPONSE TIME: 50 milliseconds typical.

**General** - POWER: 105-130 VAC, 60 Hz with supplied PA241 power adapter. 12 VDC with optional BY234 rechargeable battery or supplied 39G176 fused DC leads. SIZE: 7" x 14" x 16.7" (17.9 x 35.8 x 42.5 cm) HWD. WEIGHT: 15.8 lbs. (7.18 kg), 17.2 lbs. (7.8 kg) with battery.



# SM2001 Service Center Manager Copyrighted

The Fastest,  
Most Complete,  
Customized,  
And Easy-To-  
Use Program  
On The Market!  
Designed  
Specifically To  
Help You  
Manage All  
Aspects Of Your  
Business More  
Efficiently,  
Effectively, And  
Profitably!



**Business  
Management Solutions**

- Manage customer invoicing and workflow from creation to tracking and billing - automatically!
- Automatically generate, track, and control parts orders to save effort, time, and money
- Gain inventory control through searching, cross referencing, pricing levels, reordering advice, general ledger codes, gross profit reports, and more
- Customize business reports from any or all of the invoices you've ever processed
- Automate accounts receivable functions such as posting payments & credits, aging, month end processing, and more with just a few keystrokes
- Perform daily and end-of-month transaction reports showing cost, sale price, and profit in just seconds
- Electronically file warranty claims with an automated link to many electronics manufacturers
- Utilize unique and special features specifically designed for the servicing industry, with your time in mind
- Rapidly execute reports and file searches to provide information in just seconds. You never have to archive a file - ever! *A Sencore exclusive.*

**Business  
Management  
Solutions**

**1-800-SENCORE (736-2673)**

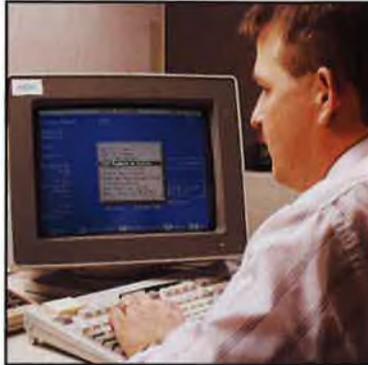
*The New SM2001 Service Center Manager is guaranteed to be the fastest, most complete, customized, and easy-to-use program on the market. The SM2001 is designed specifically to help you manage all aspects of your business more efficiently, effectively, and profitably. But we'll let you see that fact for yourself. Let's start with the invoice.*

**Invoicing.** When a product is taken in for service, you simply enter the customer's information and make a few selections to customize the invoice on how you want the unit processed. Once the information is saved, you can update the invoice and track the unit as it moves through your repair process.

The Service Center Manager is powerful enough to manage and control every aspect of your invoice processing. Yet it's so easy to use, you can jump in and start using it from day one.

**Parts Ordering Processing.** With the SM2001 Service Center Manager, you can order parts whenever you want and from whomever you want, saving you time and money. The SM2001 will even track them by invoice number and by PO number – automatically.

The Service Center Manager automates your parts order processing and ties the various functions of the program together. This interaction lets you know exactly what's happening with the repair and provides quick, accurate information for customer inquiries. When parts are received,



the program will even update the inventory file with the cost of the part. Automating your parts order processing will save you effort, time, money, and headaches.

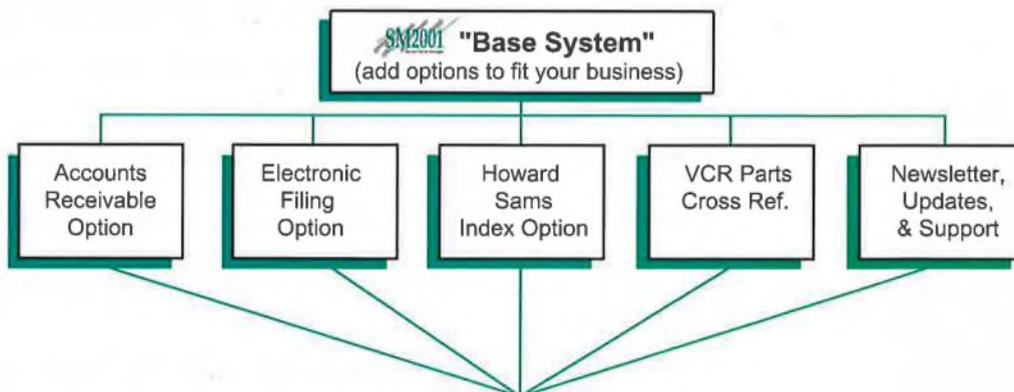
**Inventory Management.** The Service Center Manager lets you manage and control your inventory with ease. You can perform simple functions like add, edit, search, sort, and cross reference items in inventory. You also have the power to track month-to-date and year-to-date figures, receive reordering advice, run a history of parts used report, and more.

The SM2001 Service Center Manager is the only program available that provides intelligent information to help you make wise inventory management decisions quickly and easily.

**Transaction Register.** The SM2001's transaction register will provide you with detailed reports showing cost, sales price, and profit on a line-by-line basis in seconds. You can even run reports for end-of-month and end-of-year processing. What will this mean to you?

**Utility Programs.** One difficulty with other programs is the limitations set by the software designer. That's not a concern with the Service Center Manager. The SM2001 was designed by a servicer who understands your needs and knows that each business does things a little differently. That's why you are able to set up the SM2001, through the Utility Programs, for the way you run your business. Only the Service Center Manager is this flexible and easy to use.

### Business Management Solutions For The '90s



**Profit, Customer Service, Efficiency, Unity, Solutions**



# SL750A "CHANNELIZER"™

TV-RF Signal Analyzer Patented

Pinpoint  
RF/Video  
Problems And  
Performance  
Test Any  
Headend,  
Trunk, Or Line  
Equipment In  
Any RF  
Distribution  
System More  
Accurately  
Than With  
Any Other  
Signal Level  
Meter On The  
Market...  
Guaranteed!



- On-channel and off-channel C/N measurements provide true picture quality measurements
- Sensitivity to -40 dB provides greater range for C/N and leakage measurements
- On-channel and off-channel Hum measurements provide true picture quality measurements and testing flexibility
- Multi-line LCD display provides more information with fewer keystrokes
- Standard 5 to 810 MHz tuning range including VHF/UHF/FM
- RF tracking generator tests passives and actives in the field
- Optional color TV monitor aids in troubleshooting distortion and ingress
- Programmable testing and data logging for FCC proof of performance tests

**1-800-SENCORE (736-2673)**

RF Distribution  
Analyzing

**Test C/N on active channels.** The SL750A "CHANNELIZER" lets you make true picture quality measurements with its exclusive on-channel C/N test. Now there's no need to tune off-channel or remove modulation to make important parameter tests. Just tune in a carrier and push the C/N button. You get a digital readout of true picture quality in just seconds, automatically!

**Best sensitivity available.** The SL750A provides greater range for C/N and leakage measurements – all the way down to -40 dB. Simply connect a cable and measure signals up to +60 dBmV without changing attenuators or fiddling with inputs. From the headend all the way to the receiving antenna, the SL750A is all you need for fast, accurate measurements.

**On-channel and off-channel Hum measurements.** Tuning off-channel or removing modulation is a thing of the past. The SL750A checks Hum on- or off-channel with an exclusive, automatic test. You get true picture quality measurements and testing flexibility at your fingertips when you're using the SL750A "CHANNELIZER".

**Simultaneously monitor both high and low pilots.** The SL750A's multi-line LCD display provides more information with fewer keystrokes. The exclusive pilot test lets you monitor both high and low pilots simultaneously, making system balancing a breeze.

**Tune to any RF carrier from 5 to 810 MHz.** The SL750A's direct keypad entry lets you tune any RF carrier from 5 to 810 MHz. Whether it's a VHF/FM/UHF channel or "off-air" frequency, you can select the specific channel number or choose the exact frequency to match the RF carrier. The SL750A gives you the capabilities you need to test any channel in today's challenging and sophisticated systems. Now you'll be able to digitally tune any cable or RF signal quickly and automatically.

**Test passives and actives in the field.** The SL750A is the only meter with a built-in generator to test passives in the field (measurements like terminal isolation). Passives can be tested where you need, with gain or loss measurements up to 40 dB. The RF tracking generator tests passives and actives in the field so you don't have to carry along extra gear for the job.



**Built-in color monitor.** The optional TV monitor (VM4S) makes the SL750A your complete answer to RF signal analyzing. The exclusive color LCD monitor aids in troubleshooting problems like interference, ghosting, and ingress. The SL750A "CHANNELIZER" provides you with a quick signal quality test anywhere in the system. That means no more extra cables, cords, or portable TVs to take along on service calls.

**Automated performance testing.** Simply program any test sequence, and the SL750A "CHANNELIZER" will take your readings automatically and store them. The information can then be downloaded to either a computer or printer for system analysis, FCC documentation, or 24-hour testing. The SL750A provides 10 different programs activated by its internal clock. And the same program can be run up to 24 times per 24 hour period. The SL750A will stay up all night performing tests, so you don't have to.

Plus these exclusive features:

- External DVM inputs (AC and DC)
- Built-in ohmmeter
- Automatic fine tuning (AFT)
- Frequency measurement capability
- 0.5 dB accuracy ± 0.5 dB flatness – the best in the industry!
- Back-lit LCD readout
- Completely portable (battery operated)
- Rugged, durable, and water resistant



### Condensed Specifications

Patents: #4,760,448, #4,721,997

**Tuner** – FREQUENCY RANGE: 5-810 MHz. RF BANDS: Cable 50-75 MHz, T-Band 5-50 MHz. VHF/UHF 50-810 MHz, FM Band 88-108 MHz. CABLE SYSTEMS: FCC, HRC, ICC. TUNING ACCURACY: ± 1-PPM. TUNING METHOD: direct channel or frequency. FREQUENCY READOUT RESOLUTION: 10 kHz. AFT LOCK-IN RANGE: ± 1.25 MHz frequency/channel in TV bands; ± 150 kHz in FM Band. AFT SENSITIVITY: -20 dBmV. AFT READOUT RESOLUTION: 1 kHz.

**RF Input** – SENSITIVITY: -40 dBmV. ATTENUATOR: 7 ranges (automatic or manual): -40 or 0 dB, -30 to 10 dB, -20 to +20 dB, -10 to +30, 0 to +40 dB, 10 to 50 dB, and 20 to 60 dB. INPUT IMPEDANCE: 75 ohm. RETURN LOSS: 15 dB minimum. MAXIMUM RF INPUT: 300 V (DC + peak) at frequencies < 1 kHz, 65 dBmV for frequencies > 1 kHz.

**RF Carrier Level** – ACCURACY: ± .5 dB Flatness, ± .5 dB Level Linearity. TYPICALLY: < 75 dB total. MEASURING RANGE: -40 dBmV to +65 dBmV. Display Resolution: 0.1 dB.

**Audio/Video Ratio** – (channel mode only) RANGE: 0 to 30 dB. DISPLAY RESOLUTION: 0.1 dB.

**Carrier/Noise** – (on channel test) RANGE: 40 to 60 dB. MAXIMUM C/N: 60 dB at +30 dBmV input level.

**Hum** – (input level > -10 dBmV) RANGE: 0.1 to 10%. ACCURACY: .5% ≤ 5% HUM, .7% > 5% HUM.

**Pilot** – RANGE: 0 to 90 dB. RF & EXTERNAL AC VOLTS (True AC Voltage) RANGES: autoranged, 0-20 V, 20-200 V. ACCURACY: ±1% of full scale ±2 counts at 60 Hz. RESOLUTION: 0.01 V on 20 volt range, 0.1 V on 200 volt range. FREQUENCY RESPONSE: 30 Hz-1 kHz, ±0.5 dB of reading. INPUT: RF Input or EXT DVM Input.

**RF & External DC Volts** – RANGES: autoranged, 0-20 V, 20-200 V. ACCURACY: ±0.5% of full scale, ±1 count. RESOLUTION: 0.01 V on 20 volt range, 0.1 V on 200 volt range. INPUT: RF Input or EXT DVM Input. AC REJECTION: greater than 40 dB at 60 Hz.

**External Ohms** – RANGE: 0-200 Ohms. ACCURACY: ±1% of full scale, ±2 counts. RESOLUTION: 0.2 Ohm. INPUT: EXT DVM Input only.

**General** – POWER REQUIREMENTS: internal batteries charged with PA272 power adapter (13.8 V and 2 amp). AUTO-OFF: Removes power during battery operation if unit remains idle for approximately 15 minutes. SIZE: 11" x 12" x 8" (H x W x D). WEIGHT: 21 lbs.



# SL750M "CHANNELIZER"™

TV-RF Signal Analyzer Patented

Completely  
Performance  
Test Every TV  
Channel, In Any  
RF Distribution  
System, To FCC  
Specifications,  
Automatically,  
And Faster Than  
Ever Before!



IEEE488  
Bus-Compatible

RS232  
Compatible

- Tune to any cable or RF carrier from 5-810 MHz or any "off-air" VHF/UHF/FM signal
- Measure RF signal levels down to -40 dBmV
- Simultaneously monitor the RF level of both your high and low pilots with the exclusive pilot test
- Test C/N and Hum on active channels
- Field durable and weather ready

**1-800-SENCORE** (736-2673)

RF Distribution  
Analyzing

**Tuning range from 5 to 810 MHz.** The SL750M lets you digitally tune any cable or RF signal from 5 to 810 MHz quickly and automatically. The SL750M's direct keypad entry lets you tune to any VHF/FM/UHF channel or "off-air" frequency. You just select the specific channel number or choose the exact frequency to match the RF carrier. The SL750M gives you the capabilities you need to test any channel in today's ever-changing and complex RF systems.

**Sensitivity to -40 dB.** The SL750M lets you measure RF signals from as low as -40 dB all the way up to +60 dB. This extended measuring sensitivity provides greater range for crucial C/N and leakage measurements. Simply connect a cable and confidently measure RF signals without changing attenuators or fiddling with inputs. The SL750M is the only instrument you need for fast, accurate measurements from the headend all the way to the customer's home.

**Exclusive pilot test.** Simultaneously monitor both high and low pilots with the SL750M's multi-line LCD display. The exclusive pilot test lets you monitor both high and low pilots, making system balancing a snap. No more wasted time from switching carriers trying to achieve that perfect system balance.



**Test C/N and Hum on active channels.** The SL750M "CHANNELIZER" lets you make true picture quality measurements with its exclusive on- or off-channel C/N and Hum tests. Now there's no need to tune off-channel or remove modulation to make important parameter tests. Just tune in a carrier and push a button. You get a digital readout of true picture quality in seconds, automatically. Maximum testing capability and flexibility are at your fingertips when you're using the Sencore SL750M "CHANNELIZER."

**Durable, rugged, and ready-to-use.** Best of all, the SL750M is ready for the field and the weather. The rugged lightweight case with its water "run-in" resistant front panel are designed for even the most adverse conditions. The SL750M's durable design will provide years of worry-free, dependable use wherever your testing takes you.

You also get these features:

- AC and DC DVM inputs
- Autoranging ohmmeter
- Automatic fine tuning
- 0.5 dB accuracy  $\pm$  0.5 dB flatness
- Back-lit LCD readout
- Optional color video display (VM4S)
- Portable battery operation



### Condensed Specifications

Patents: #4,760,448, #4,721,997

**Tuner** – FREQUENCY RANGE: 5-810 MHz. RF BANDS: Cable 50-75 MHz, T-Band 5-50 MHz. VHF/UHF 50-810 MHz, FM Band 88-108 MHz. CABLE SYSTEMS: FCC, HRC, ICC. TUNING ACCURACY:  $\pm$  1-PPM. TUNING METHOD: direct channel or frequency. FREQUENCY READOUT RESOLUTION: 10 kHz. AFT LOCK-IN RANGE:  $\pm$  1.25 MHz. FREQUENCY/CHANNEL IN TV BANDS:  $\pm$  150 kHz in FM Band. AFT SENSITIVITY: -20 dBmV. AFT READOUT RESOLUTION: 1 kHz.

**RF Input** – SENSITIVITY: -40 dBmV. ATTENUATOR: 7 ranges (automatic or manual) -40 or 0 dB, -30 to 10 dB, -20 to +20 dB, -10 to +30, 0 to +40 dB, 10 to 50 dB, and 20 to 60 dB. INPUT IMPEDANCE: 75 ohm. RETURN LOSS: 15 dB minimum. MAXIMUM RF INPUT: 300 V (DC + peak) at frequencies < 1 kHz, 65 dBmV for frequencies > 1 kHz

**RF Carrier Level** – ACCURACY:  $\pm$  .5 dB Flatness,  $\pm$  .5 dB Level Linearity. TYPICALLY: < .75 dB total. MEASURING RANGE: -40 dBmV to +65 dBmV. DISPLAY RESOLUTION: 0.1 dB.

**Audio/Video Ratio (channel mode only)** – RANGE: 0 to 30 dB. DISPLAY RESOLUTION: 0.1 dB.

**Carrier/Noise (on channel test)** – RANGE: 40 to 60 dB. MAXIMUM C/N: 60 dB at +30 dBmV input level.

**HUM (input level > -10 dBmV)** – RANGE: 0.1 to 10%. ACCURACY: .5%  $\leq$  5% HUM, .7% > 5% HUM.

**Pilot** – RANGE: 0 to 90 dB.

**RF & External AC Volts (True AC Voltage)** – RANGES: autoranged, 0-20 V, 20-200 V. ACCURACY:  $\pm$  1% of full scale  $\pm$  2 counts at 60 Hz. RESOLUTION: 0.01 V on 20 volt range, 0.1 V on 200 volt range. FREQUENCY RESPONSE: 30 Hz-1 kHz,  $\pm$  0.5 dB of reading. INPUT: RF Input or EXT DVM Input.

**RF & External DC Volts** – RANGES: autoranged, 0-20 V, 20-200 V. ACCURACY:  $\pm$  0.5% of full scale,  $\pm$  1 count. RESOLUTION: 0.01 V on 20 volt range, 0.1 V on 200 volt range. INPUT: RF Input or EXT DVM Input. AC REJECTION: greater than 40 dB at 60 Hz.

**External Ohms** – RANGE: 0-200 ohms. ACCURACY:  $\pm$  1% of full scale,  $\pm$  2 counts. RESOLUTION: 0.2 ohm. Input: EXT DVM Input only.

**General** – POWER REQUIREMENTS: internal batteries, charged with PA272 power adapter (13.8 V and 2 amp). AUTO OFF: Removes power during battery operation if unit remains idle for approximately 15 minutes. SIZE: 11" x 12" x 8" (H x W x D). WEIGHT: 21 lbs.



# SL750I "CHANNELIZER"™

Signal Level Meter Patented

The First Hand-Held Signal Level Meter Designed To Provide You With Quick And Accurate Measurements In An Easy-To-Use, Rugged Package!



- Automatic measurements of both the audio and video carriers on all cable channels (FCC, HRC, IRC, VHF, and UHF)
- A hand-held, waterproof meter that is designed to stand up to daily use in the field in all types of weather conditions
- Exclusive "on-channel" Hum test for quick and accurate troubleshooting
- An easy-to-read, LCD readout gives you just the information you need for quick, reliable signal level measurements
- Dual battery pack provides you with back-up power so you're never caught short in the field

RF Distribution  
Analyzing

**1-800-SENCORE** (736-2673)

**All-channel measuring capability.** You get automatic measurements of both the audio and video carriers on all channels (FCC, HRC, IRC, VHF, and UHF) with the SL750I. Simply enter the channel number on the SL750I's keypad, and the readings are displayed automatically. The large, easy-to-read keypad allows you to choose any channel by random access, or sequentially with the convenient up/down buttons.

**Handheld, waterproof, and durable.** The SL750I is specially designed to stand up to the rigors of field service. Its rugged, lightweight case will provide years of worry-free, reliable use. The SL750I is specifically designed to keep weather climates on the outside – so you can use it in even the most adverse conditions. No matter where your testing takes you, the SL750I is ready to go.

**“On-channel” Hum test.** The SL750I checks Hum on active channels (or off) with a quick and automatic test. You will



no longer have to tune “off-channel” or remove modulation to measure Hum. The SL750I “CHANNELIZER’s” exclusive “on-channel” Hum test gives you true picture quality measurements at the push of a button.

**Easy-to-read, LCD readout.** The SL750I comes with a large LCD display that's easy to read, even at just a glance. You get all the information you need for quick, reliable signal level measurements. Its large lettered, alphanumeric readout makes the SL750I the best answer for all of your field testing and verification purposes.

**Power when you need it.** The SL750I's dual battery pack gives you back-up power so you're never caught short in the field. You get four hours of continuous use on the internal battery, plus another four hours on the backup battery. A special auto-off feature and internal battery test give you even more assurance that your SL750I is charged and ready to use.



### Condensed Specifications

Patent: #4,780,448

**Tuning** – FREQUENCY RANGE: 50-810 MHz. RF BANDS: Cable & VHF/UHF. CABLE SYSTEMS: FCC, HRC, ICC. TUNING METHOD: Direct Channel. CHANNEL READOUT: Channels 01-117.

**RF Input** – SENSITIVITY: -20 dBmV. INPUT IMPEDANCE: 75 Ohm. MAXIMUM RF INPUT: 65 dBmV, FREQ> 1 kHz. MAXIMUM AC/DC: 300 V Peak < 1 kHz.

**RF Carrier Level** – ACCURACY: ±1 dB. MEASURING RANGE: -20 dBmV to +20 dBmV. DIGITAL DISPLAY RESOLUTION: 0.1 dB. RF Audio & Video Carrier Test: Displays level of either Audio or Video.

**Hum** – HUM DISPLAY RANGE: 0-10%. HUM ACCURACY: ± 1%. HUM BANDWIDTH: 20 Hz-400 Hz. DIGITAL DISPLAY RESOLUTION: 0.1%.

**Power Requirements** – Power Adapter or Battery Pack. BATTERY OPERATION: 4 Hours of continuous use on internal battery. BATTERY TEST: Depress battery test button. UNIT AUTO-OFF: Unit shuts off after 10 minutes if no buttons are pressed.

**General** – SIZE: 10.2" x 5.1" x 2.4" HWD. WEIGHT: <25 lbs.



On GSA Contract

# CA780 "Cableizer"<sup>TM</sup>

Metallic Cable Analyzer Patent Pending

Quickly And Easily Locate Defects In All Metallic Cable With A Highly Sensitive Analyzer And Easy-To-Read LCD Display!



- Minimize downtime by accurately pin-pointing cable faults or shorts
- Automatically determine the length of a buried cable or spools for accurate documentation and verification
- Automatically determine the VOP of a known length of cable with no calculations or interpretation errors
- Positively identify the exact distance to cable faults, the first time, every time
- Store all types of cable signatures for system documentation and future system troubleshooting reference
- Built tough to stand up to field operation

RF Distribution  
Analyzing

**1-800-SENCORE** (736-2673)

**Accurately pinpoint cable faults.** The CA780 "Cableizer" minimizes downtime by quickly and accurately locating cable faults, including kinks, splits, radial cracks, and more. Superior sensitivity (65 dB) provides the capability to locate even minor faults. The CA780 can even find broken or damaged shielding and loose or corroded connectors – in just seconds.

**Determine the length of cable, automatically.** Now you can automatically determine the length of buried cable or a new spool of cable. The CA780 quickly shows you the cable length with just the push of a button. You get an automatic, digital readout with all the information you need for documentation or verification in just seconds.

**Determine VOP of cables automatically.** The CA780 measures and calculates the VOP of unknown cables automatically. Simply enter the known cable length, and the CA780 does the rest. It measures and calculates the VOP, then displays the results on the easy-to-read LCD readout. Plus, the CA780 "Cableizer's" direct percentage readout saves calculation time and chance of interpretation error.



**Identify the distance to cable faults.** The CA780 identifies the exact distance to cable faults, the first time, every time. The CA780 quickly isolates any cable defect so you can get it repaired. You get a visual indication of the fault and its type, plus a digital readout of the distance to the defect. From a few feet up to 65,000, you'll never miss a cable problem again. Use the Delta measurement to determine the fault's distance from a known location.

**Store all types of cable signatures.** Just push a button and the CA780 stores the signature of the cable you're testing. You can use this information for system documentation and system troubleshooting future reference. And it's so easy to use, even non-technical personnel can use it without difficulty.

**Built tough to stand up to field operation.** The CA780's rugged, durable design makes it ready to use in all situations. Its water resistant front panel makes the CA780 perfect even under the most adverse conditions. The rugged, lightweight case resists the day-to-day use in the toughest field environment. Wherever your testing takes you, the CA780 will provide years of dependable use.



### Condensed Specifications

**Measurement Functions** – Cable Length: MAXIMUM RANGE: 65,000 feet at VOP = .99. 35,000 feet at VOP = .60. RESOLUTION: .1 feet from 0.0 to 99.9 feet, 1 foot from 100 to 999 feet, 10 feet from 1.0 to 9.99 K feet, 100 feet from 10.0 K feet to 65.0 K feet. ACCURACY: ±.01%, ±.5 feet, ±1 count, <.5 feet from 0.0 to 99.9 feet, <1.7 feet from 100 to 999 feet, <11 feet from 1000 to 9.99 K feet, <100 feet from 10.0 K feet to 65.0 K feet.

**VOP** – RANGE: 30% to 99% on 10 to 1000 feet of cable. RESOLUTION: 1%. ACCURACY: ±1.0%.

**Z (Impedance)** – RANGE: 40 to 140 Ohms. RESOLUTION: 1 Ohm. ACCURACY: ±5%.

**VSWR** – RANGE: 1.000 to 99. RESOLUTION: .001 from 1.000 to 1.199, .01 from 1.20 to 1.99, .1 from 2.0 to 9.9, 1.0 from 10 to 99. ACCURACY: 1% from 1.000 to 1.199, 2% from 1.20 to 1.99, 5% from 2.0 to 9.9, 10% from 10 to 99.

**Delta Distance** – RESOLUTION: 1 pixel; one pixel = Horizontal magnitude divided by 50. ACCURACY: ±.01%, ±.5 feet, ±1 pixel.

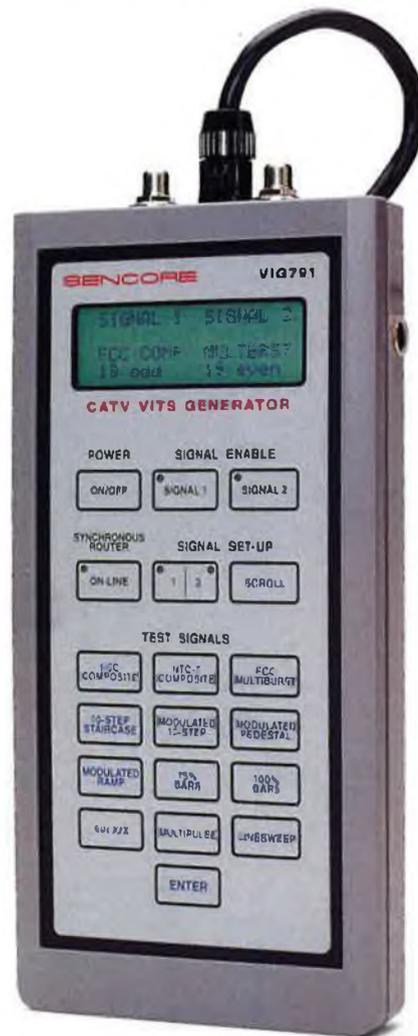
**Delta Return Loss** – SENSITIVITY: > 65 dB. RESOLUTION: .1 dB from 0.0 to 9.9 dB, 1.0 dB from 10 to > 65 dB. ACCURACY: ±.5 dB from 0.0 to 9.9 dB, ±1 dB from 10 to 30 dB, ±3 dB from 30 to 65 dB.

**General** – POWER: BATTERY LIFE: > 6 hrs continuous. BATTERY LIFE: > 4 hrs. (with display light). BATTERY SAVER TIME-OUT: 10 min. nominal. BATTERY CHARGE TIME: 12-14 hrs. CHARGER: 13.8V at 700mA. SIZE: 8" x 12" x 8" HWD. WEIGHT: < 10 lb.



# VIG791 CATV VITS Generator Patent Pending

The First  
VITS Insertion  
Generator  
Designed  
Exclusively  
For CATV That  
Generates  
And Inserts  
Both Required  
Signals  
Simultaneously!



- Insertion of two test signals without interrupting system operation
- Complete testing and accurate FCC measurement capability on active channels without interference
- Special test signals for analyzing:
  - Differential Gain and Phase
  - In-Channel Frequency Response
  - Chroma to Luma Delay
  - Percent Modulation
  - S/N and Hum
  - .....all combined in one live channel!
- VITS test signal insertion for testing that is transparent to your customers
- A four line display with simple menu setup of all test signal parameters

The VIG791 can be used to generate and insert two VITS video test signals in the VBI (vertical blanking interval) of any channel. VITS test signals are transparent to the customers and can be measured by the VSA794 or other video analyzer – providing a complete quality test of the channel video performance. The router accessory can be permanently installed in a channel's video path, providing test signal insertion without interference to the channel's operation.

**Router Port:** The VIG791 quickly connects to the synchronous router for signal insertion without service interruption or interference.

**Signal 1 Status:** VIG791 sets one test signal to FCC composite and VITS mode to make all of the new "Color Tests" without interfering with the channel's operation.

**Test Signal Selection:** Choose any two of 12 test signals with the VIG791, including the most popular - FCC Composite and FCC Multiburst.

**Signal 2 Status:** Set the second test signal to any other vacant line in the VBI. The Multiburst signal can be used to measure in-channel frequency response.



**LCD Display:** The VIG791 has a four line digital display that shows current test signal information and provides menus for quick and easy setup of each test signal, VITS, or Full Field.

**Individual Enable Controls:** On the VIG791, each signal is individually controlled to simplify testing. Both signals can be enabled in the VITS mode so that all tests can be done with one setup.

**Signal Setup Controls:** The VIG791 also provides setup menus for each test signal. Any of 12 test signals may be selected. Each test signal may be set up for VITS or full field operation for active system or bench testing.

**Synchronous Router:** The synchronous router in the VIG791 lets you put the unit on-line without service interruption or interference.

The VIG791 is ideal for use with the Sencore VSA794 CATV Video Signal Analyzer. Now you can perform complete FCC testing of Differential Gain, Differential Phase, Chroma to Luma Delay, In-Channel Frequency Response, plus S/N, Hum, and % Modulation.

### Condensed Specifications

**Signal Insertion** – VITS: Signal 1, Signal 2, or both. FULL FIELD: Signal 1 or Signal 2. LINE SELECT LINES: 10 through 19 – Signal 1 and Signal 2. FIELDS: Even or odd. VIDEO OUTPUT IMPEDANCE: 75 ohm, 30 dB return loss. TEST SIGNAL DISTORTION CHROMA TO LUMA GAIN:  $\pm 1\%$ . CHROMA TO LUMA DELAY:  $< \pm 10$  nS. LUMINANCE AMPLITUDE:  $\pm 1$  IRE. Ringing:  $< 1\%$ . DIFFERENTIAL PHASE:  $< 1$  degree. STAIRCASE LINEARITY:  $< 1\%$ . FREQUENCY RESPONSE: DC to 5 MHz.  $\pm 2$  IRE LINE TILT:  $\pm 1$ . IRE FIELD TILT:  $\pm 1$  IRE. SIGNAL TO NOISE:  $> 60$  dB, Conforms to RS170A.

**NTSC Levels** – BURST AMPLITUDE: 40 IRE,  $\pm 2\%$ . SYNC AMPLITUDE: 40 IRE,  $\pm 2\%$ . BLANKING LEVEL: 0 IRE, 0 V,  $\pm 2$  IRE. NTSC TIMING: Standard NTSC: Meets RS170A. BURST FREQUENCY:

3.579545 MHz,  $\pm 10$  Hz. SYNCHRONOUS ROUTER I/O IMPEDANCE: Transparent to system. TEST SIGNALS: FCC Composite, NTC-7 Composite, FCC Multiburst, Swept Burst, 10 Step Staircase, 10 Step Modulated Staircase, Modulated Pedestal, 75% Bars, 100% Bars, (Sin x)/X, Multipulse, Modulated Ramp.

**General** – POWER: 105-125 VAC with supplied power adapter. SIZE: 2" x 5" x 11". WEIGHT:  $< 5$  lbs.



# VSA794 CATV Video Signal Analyzer Patent Pending

Now You  
Have The  
Versatility  
And  
Convenience  
Needed For  
Complete  
Headend  
Testing!



- One button automatic tests of key CATV video measurements
- Easy and accurate FCC required tests with minimum training and capital investment
- Complete testing capability without interference to your system operation
- Automated measurements of the key CATV baseband measurements including:
  - Differential Gain and Phase
  - In-channel Frequency Response
  - Chroma to Luma Delay
  - Percent Modulation
  - S/N and Hum
- Direct digital readout of all key parameters without complex calculations or interpretation to insure accurate measurements
- Full manual waveform and vector measurement capabilities provide maximum usability in testing and troubleshooting

**B**aseband video testing in the headend has long been a difficult and sometimes neglected process. You already know you really should have a waveform monitor and vectorscope to set up your system. Plus, increasing technological complexity, new FCC rules, and emphasis on picture quality are all contributing to increased video testing requirements.

Now add the new FCC "Proof Of Performance" tests requiring you to measure the Differential Gain, Differential Phase, Chroma to Luma Delay, and In-Channel Frequency. That is why Sencore developed the VSA794 CATV Video Signal Analyzer — the first video instrument designed specifically for CATV.

The VSA794 gives you the versatility and convenience that you need for complete headend video testing in one complete waveform monitor/vectorscope. This exclusive instrument provides digitally accurate, automated measurements for complete testing without interference to your system.

**LCD Display** – The VSA794 digitally displays automated test results for easy to make, accurate, and repeatable measurements for added confidence.



**Programmed Timebase** – The VSA794 provides horizontal sweep rates for line and field measurements. Plus, the VSA794 is able to expand to "zoom" in on problems

**Video Tests** – You get automated one key measurements of FCC specifications and other key video tests with the VSA794. You get a direct reading - no calculations or interpretations are needed.

**Color Tests** – The VSA794 provides you with automated one key measurements of Diff. Gain, Diff. Phase, and C/L Delay – no calculations or interpretation needed.

**Digital Markers** – With the VSA794, you are able to select any portion of the waveform displayed on the CRT for digitally accurate measurements on the LCD easy-to-read display.

**Line Select** – The VSA794 allows you to use VITS testing so that all measurements can be made without interfering with system operation.

**Calibrator** – The VSA794 also features a built-in calibrator, for both the waveform and vector mode, providing confidence, and insures accuracy in measurements.

### Condensed Specifications

**Composite Input** – INPUT IMPEDANCE: >15k Ohms, 25 Hz to 5 MHz, power on or off. FEEDTHROUGH TERMINATOR: 75 Ohms > 40 dB return loss 25 Hz to 5 MHz, power on or off.

**Line Select** – Lines Off or line 8 through 21. Fields Odd or Even field selectable.

**Digital Waveform Measurements** – DISPLAY UNITS: IRE, mV, V. DISPLAY RANGE: 0-280 IRE, 0-999 mV, 1.00-2.00 V. RESOLUTION: 1 IRE, 1 mV, .01V. ACCURACY: ± 1%, ± 2 counts at 50 kHz.

**Frequency Response** – DISPLAY RANGE: 0-20 dB. RESOLUTION: .1 dB. ACCURACY: ± 4 dB.

**Percent Modulation** – DISPLAY RANGE: 50-100%. RESOLUTION: .1%. ACCURACY: ± 2 %.

**HUM** – DISPLAY RANGE: 0-15%. RESOLUTION: 0.1%. ACCURACY: ± 5 counts or .5%.

**Video S/N** – DISPLAY RANGE: 30-56 dB, with Ref. 1V input. RESOLUTION: 1 dB. ACCURACY: <2 dB.

**Differential Gain** – DISPLAY RANGE: 0-40% RESOLUTION: 1%. ACCURACY: ± 2 %.

**Differential Phase** – DISPLAY RANGE: ± 15 Degrees. RESOLUTION: .1 Degrees. ACCURACY: ± 1.5 Degrees.

**Chroma/Luma Delay** – DISPLAY RANGE: ± 20-300 nSec. RESOLUTION: 1 nSec. ACCURACY: ± 10 nSec.



# Accessories...

## Test Probes

### 39G81A RF Demodulating Scope Probe

Light, compact, with very flat response, this demodulator scope probe shows the amplitude modulation envelope of RF carriers up to 250 MHz. It works with oscilloscopes that have BNC input connectors.

### 39G85 Touch-Test Probe

This probe accessory is guaranteed to save you time with in-circuit transistor or inductor checking. No need to unsolder leads, just touch the three needle tip points to the transistor pads on the PC board or connect to a Z Meter for in-circuit inductor testing.

### 39G170 Universal CRT Adapter

This handy universal adapter makes your CR70 "BEAM BUILDER" obsolete-proof by allowing you to hook directly to the pins on any CRT. Perform all the tests and restoration on any CRT without purchasing expensive sockets.

### 39G266 Synchronizing Inter-Connect Cable

Provides a connection between the VG91 Universal Video Analyzer's accessory output jack and the input jack of the TVA92 TV Video Analyzer or future accessories. This sturdy cable is designed for years of durable use.

### HP200 50 kV DC High Voltage Probe

Just slip this probe over the standard Sencore meter probe and measure DC voltages to 50,000 volts. Use with any Sencore 15 megohm input digital meter. This probe increases your meter's range 100 times and increases the meter's input impedance to 1500 megohms. The HP200 provides the safety and protection you need for all types of high voltage testing.

### TP212 10 kV DC, 1% Transient Protector Probe

Extend the input protection and measuring capabilities of your Sencore meter to 10,000 volts DC. This durable probe prevents damage and downtime each time it protects your instrument from high voltage surges. The TP212 increases the input impedance of your meter from 15 megohms to 150 megohms.

### DP213 Universal Meter RF Detector Probe

Use this low cost RF detector probe to trace RF signals. The DP213 converts the RF signal to DC for easy measuring by a DC voltmeter. The supplied conversion chart helps to determine the RF level applied. Usable to 250 MHz.

### TP222 10 kV DC, 0.5% Accuracy Transient Protector Probe

Attach the transient protector probe to your standard meter probe to extend both input protection and measuring capabilities to 10,000 volts DC. Also decreases loading of critical circuits by increasing the meter's input impedance from 15 megohms to 150 megohms.

### TP225 "Sure-Hold" Alligator Clip Adapter Probe

Convert any standard alligator clip into a "sure-hold" test clip. This durable probe lets you make measurements in "tight fit" circuits because the nose of the probe is narrow enough to clip onto the leg of a transistor or a pin of an IC. Purchase a "sure-hold" alligator clip adapter probe for each instrument you own.

### DP226 1:1 Scope Probe

Take full advantage of your scope's sensitivity. This direct (1:1) probe works with any scope that uses a BNC input connector and standard 1 megohm input. The special design gives a frequency response to 15 MHz.

### RE248 External DVM Range Extender

Increase the measurement range of your FS74A to 2,000 volts with this special range extender. This low cost investment protects your FS74A from line surges. It also decreases meter loading because the probe increases the input impedance to 15 megohms.

### DP270 Direct Probe For The SC3080 & SC3100

Connect directly to the DCV input jacks of the SC3080 and SC3100 "AUTO TRACKER." This special probe lets you take a separate DC voltage measurement while viewing a different waveform on the scope's CRT.

### RFP274 RF Range Extender Probe For The SL750A and SL750M

The RFP274 is an RF probe which can be used to test the signal level on any cable system through the seizure screw port on an amplifier or passive devices which utilize a 5/8" access plug. The probe has a high input impedance so it will not affect system performance. The 75 ohm output matches the SL750 input, thus transforming the signal from a high impedance level and maintaining a calibrated 20 dB loss.

### RFA275 RF Amplifier For The SL750A and SL750M

The RFA275 is a 20 dB low noise amplifier, which can be used with the SL750A or SL750M to increase the measurement range of the meter. This is especially useful when making C/N measurements at drops or other low signal level points in any RF distribution system. The RFA275 is powered by the internal battery of your SL750 "CHANNELIZER" from the accessory jack of the unit.

## Power Supplies & Batteries

### PA208 Universal AC Adapter/Charger

This adapter/charger has been specially designed to operate several Sencore portable instruments equipped with an AC adapter jack. The PA208 is protected to 1500 volts (DC plus peak AC) to protect your instrument when it is necessary to float the common lead above earth ground.





### **BY234 12 Volt Rechargeable Battery**

For use with many of Sencore's portable instruments including the Z Meters, PA81, ST66, SR68, and FC71. These heavy duty, rechargeable, lead acid batteries are guaranteed to provide hours of continuous operation.



### **BY242 6 Volt Rechargeable Battery**

For use with the Sencore FS73 and FS74A signal level meters. These special batteries are heavy duty, rechargeable, lead acid batteries for long life.



### **PA251 AC Power Adapter For Portable Z Meters**

Use this special power adapter to operate Sencore's portable Z Meters. It is protected to 1500 volts (DC plus peak AC) to protect your instrument when it is necessary to float the common lead above earth ground. These Sencore instruments can be equipped with rechargeable batteries, in which case the PA251 also serves as a battery charger.



### **PA272 AC Power Adapter For The SL750A & SL750M**

The PA272 was specially designed to provide continuous operation to the SL750A and SL750M. This special power adapter also serves as a battery charger for these special portable instruments.



### **PA273 AC Power Adapter For The SL750I, CA780, & VIG791**

Use this special power adapter to operate Sencore's SL750I, CA780, and VIG791. When it's necessary to float the common lead above earth ground, the 1500 volt protection (DC plus peak AC) prevents damage to your instrument. When used with rechargeable batteries, the PA273 also serves as a battery charger.

## **Component Testing/General Support Accessories**



### **VM4S Color LCD Video Monitor**

The VM4S color LCD monitor provides you with an indication of the quality of the signal being delivered to your customer. The VM4S gives you the same video resolution as a 19 inch color television, but makes it much easier to carry to the job site. Accessory to the SL750A and SL750M "CHANNELIZER" TV-RF Signal Analyzers.



### **IB72 IEEE 488 Interface Accessory**

Automation is the answer when your challenges include repeated good/bad testing, data collection, and fault analysis. You can control up to 16 separate instruments with a personal computer or instrument controller and the IB72. Collect and store readings or direct personnel doing tests (keep, reject, move probe, etc.). When you need to automate your Sencore instrument features to simplify data collecting, testing, design, or troubleshooting, take a close look at the advantage offered by the IEEE 488 data bus and the IB72 Interface Accessory.

### **IB78 RS232 Interface Accessory**

The IB78 is good news for servicers that want to take advantage of computer control. For the first time ever, all the confusion and setup hassles of RS232 are eliminated - the IB78's automatic circuits monitor for software or hardware handshaking and adapt accordingly. It automatically configures to DCE to DTE equipment without special cables or null modem adapters. To further simplify setup, the IB78 sends a message to guide you in setting up the data format, baud rate, parity, and echo, completely eliminating the need for a "breakout box."

### **AN210 Frequency Counter Pick-Up Antenna**

This pick-up antenna lets you measure the output frequency of a transmitter by simply counting the RF transmitted through the air. Just connect this adjustable antenna to the 50 ohm or 1 megohm input of the FC71 and measure off-the-air frequencies of commercial AM, FM, TV, hand-held transmitters, and mobile radios - all without any time consuming connections.

### **DM115 Z Meter Dynamic Demonstrator**

The DM115 provides samples of good/bad capacitors, coils, SCRs, and transmission lines. An informative booklet shows you how each component fails. Use at no charge when evaluating the Z Meters.

### **FC221 Capacitor/Inductor Field Calibrator**

This handy calibration tester lets you confirm your Z Meter is within its published specification. Low drift capacitors and inductors are individually compared to Sen-core's NBS traceable standards, and their exact value written on the FC221 front panel. Note: These standards are only accurate with the dynamic DC tests used by our line of "Z Meters". We suggest that you return your FC221 to the Factory Service Department whenever you return your unit for service or calibration so the calibration of the FC221 can be rechecked against our standards.

### **EX231 Expander Jack**

Make your VA62 or VA62A capable of driving up to four separate accessory packages without unnecessary hooking and unhooking. One single hookup to the VA62A accessory jack is all that is required.

### **AD232 Banana/Scope Adapter**

Double banana jacks provide a special hookup for oscilloscope probes to eliminate lead connector problems. Can be used to hook an oscilloscope to the DRIVE SIGNAL output of the VA62A.

### **PL246 External Panel Light**

You never know when you are going to have to operate in dim light or even in the dark. A backlighted meter may enable you to read the meter, but not the front panel. This simple, but effective battery operated light snaps on and lights up the front panel.

### **HF247 Earphone**

Get clear sound when working in noisy environments. Lets you defeat the FS73's or FS74A's built-in speaker.





### SCR250 SCR & Triac Accessory For Any Z Meter

Tests all SCRs and triacs with dynamic, reliable tests. The SCR250 is completely isolated and dynamically tests components at their full working voltage (up to 1000 volts). The controlled internal battery supply tests sensitive gate SCRs while guaranteeing turn-on of the most demanding high current industrial SCRs and triacs. The SCR250 is easy to set up and you don't need any specifications. Just select the test, push a button, and test. You'll never again have to guess whether or not an SCR or triac is good.



### CH255 Component Holder

A timesaving test fixture for the Sencore line of Z Meters. This holder allows you to test axial and radial lead components without hooking up test leads each time. Fully adjustable to test any size component.



### CH256 Chip Component Test Lead

A specially designed test lead for the Sencore line of Z Meters. The special prongs on the end allow you to test clip-type or surface mount components. Gives you the satisfaction of testing these tiny components with confidence.



### SH257 Strand Hook

This strand hook is an accessory for your Sencore FS73 or FS74A field strength meters. It provides a convenient means of suspending your FS73 or FS74A while freeing up your hands for testing and troubleshooting. Attach the SH257 to the meter's carrying case to safely support the whole assembly on a strand or messenger cable. Steel construction gives it extra strength and durability for years of reliable service.



### Servo Performance Test Tapes For The VC93

Provides special phase-locked audio and video test signals for use with the VC93's Servo Performance Test Lead and the Servo Analyzer Tests.

- ST264 - Used for VHS and S-VHS formats
- ST265 - Used for standard Beta, Super Beta, and Betamovie formats
- ST266 - Used for VHS-C and Super VHS-C formats
- ST267 - Used for standard U-Matic and U-Matic SP formats



### SR280 Synchronous Router For VIG791

This signal insertion device provides high reliability loop-through of live video program and convenient VITS insertion without program interruption. Used with the VIG791 CATV VITS Insertion Generator, the SR280 permits testing without interruption to the customers' signals. Install additional routers permanently in the video path for future troubleshooting and measurements without channel service interruption.



### PC230 Protective Cover For The VA62A

Use this snap-on cover to protect the controls when your instrument is not in use. It will keep your VA62A's front panel looking like new. It's easy to install because it snaps into place with one simple latch.

## Cases And Covers

### **CC237 Black Plastic Lead Pouch**

This "kangaroo" pouch fits any instrument larger than 8 x 11 inches. It uses tough Velcro strips that you can apply in the field. No special glues or applicators needed.

### **CC254 Z Meter Carrying Case**

This handy carrying case is recommended for the protection of the portable Z Meters (LC76, LC77, & LC102). The stylish CC254 is waterproof and padded to prevent damage caused by portable use. Featured are three pouches, one for application manuals and two for extra batteries or leads, allowing you to take everything you need in one case. And it's washable for years of attractive use.

### **PC259 Dust Cover And Lead Storage Compartment**

Use this snap-on cover to help keep your instrument's (SG80, PA81, PM82, VG91, TVA92, VC93, CVA94, VSA794, or SC3100) front panel looking like new. Built-in lead compartment stores leads and tools during portable use. Made of high impact, tough ABS plastic for extra strength and durability.

### **PC263 Monitor Analyzer Dust Cover & Lead Storage Compartment**

Keep your CM2000 and CM2125 Computer Monitor Analyzer's front panel looking like new with this handy snap-on cover. Stores leads and tools with built-in lead compartment. Made of rugged ABS plastic for extra strength and durability.

### **PC269 Protective Cover For The SC3080**

Use this snap-on cover to help keep your Waveform Analyzer's front panel looking like new. Made of high impact, tough ABS plastic for extra strength and durability.

### **CC271 Protective Carrying Case**

The protective carrying case provides additional protection and easy carrying for the SL750A and SL750M plus accessories. The CC271 is field installed without tools and insulates your SL750A against the knocks and bumps that are typical of everyday field use. The additional protection will help keep your SL750 looking new longer and working long after other equipment has failed.

### **CC276 Protective Carrying Case For The SL750I**

This protective carrying case provides additional protection and easy carrying for the SL750I. The CC276 insulates your SL750I against the knocks and bumps that are typical of everyday field use. The additional protection will help keep your SL750I looking new longer and working long after other equipment has failed. Plus, the SL750I can be operated through the vinyl window without removing the unit from the protective carrying case and is field installed without tools.

### **CC277 Protective Carrying Case For The CA780**

The CC277 protective carrying case for the CA780 provides additional protection against the bumps and bruises of everyday field service work. The CC277 also provides handy storage pockets for the PA273 charger and test leads. The additional protection provided by the CC277 will help keep your CA780 looking new and working long after other equipment has failed.





## Computer Monitor Interface Adapters

“Special hook-up” adapters are available that interface your Sencore computer monitor analyzer to any of the common computer monitor types. Adapters are available for the most common monitor formats plus a universal adapter for monitors having non-standard connectors.

39G273 Universal Connector

39G346 ECL Adapter

39B377 Extension Cable

#1: 39B275 CGA-MDA-Hercules

#2: 39B280 EGA

#3: 39B281 PGC

#4: 39B274 VGA-PS/2

#5: 39B276 Apple/Mac

#5F: 39B356 Male Input Apple/Mac

#6: 39B300 BNC

## Servicing Guides

Sencore's simplified reference guides help you gain “know how” and enjoy success in the expanding electronic servicing markets. Shows how to troubleshoot, how to locate bad components, and gives functional backgrounds to help your troubleshooting skills.

### Guide To Stereo TV Theory, Troubleshooting, And Test Equipment (Form 3611)

Learn all about MTS Stereo theory and how to troubleshoot in practical terms. Simplified block diagrams and easy-to-follow descriptions make this a great reference piece for any technician.

### Taking The Mystery Out Of Audio (Form 4435)

This informative reference piece covers the basics of audio and how technology has changed the industry over the years. You'll also get practical troubleshooting ideas and tips on how to use the PA81 Stereo Power Amplifier Analyzer in today's challenging audio circuits.

### Servicer's Guide To Component Analyzing (Form 4336)

This comprehensive handbook contains in-depth and practical information on many different components involved in everyday electronic troubleshooting and maintenance. You'll learn all about capacitors, inductors, SCRs, plus much more. Learn how to use the Sencore Z Meters in various applications including video, industrial, and cable.

### Sencore Tech Tips

These helpful troubleshooting tips are designed to answer the most common service questions asked by Sencore customers. Call for a FREE listing.

### CR70 “BEAM BUILDER” CRT Setup Book

Contains setup information on more than 9,000 CRTs. Updated annually. Call for most recent update.



### Original Replacement Test Leads (Form 5720)

Uncertain what leads you need? This FREE listing includes all leads used with Sencore's current instruments. Includes a description, part number, and price so you can order exactly what you need.

### Computer Monitor Reference Guide (TB100)

This informative reference guide gives you the parameters and formats of over 600 formats to help you set up your Sencore Computer Monitor Analyzer. You get a brief overview of computer monitors and loads of reference material to keep for future use.

## Business Building And Reference Books

### Ten Ways To Get Your Customer To Say Yes (Form 3454)

Have you found yourself in a position to sell? Need to know more about marketing and advertising? Are you just a little weak on running a sales organization or motivating people? If you say "yes" to any of these questions, then you will profit from "Say Yes", a practical (how-to) sales book for technical personnel. Written and edited by a technical engineer, Herb Bowden (founder of Sencore), for technicians in terms they understand. See how Sencore was built from an \$800 start to a leader in the industry. Worth twice what you pay, or your money back. Author: Herb Bowden

### Using The Triggered Sweep Oscilloscope (TB258)

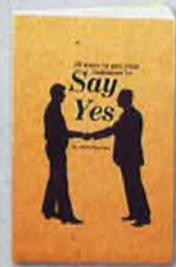
Learn how to use the triggered sweep oscilloscope using the SC61 Waveform Analyzer. This book helps you become more familiar with your triggered sweep oscilloscope and helps you use it more efficiently. Hard bound with over 290 pages of helpful information including many figures and photos. Author: Robert L. Goodman

## Tech Tape Video Demonstrations

Sencore's informative "Tech Tape" video demonstrations show you features and applications of Sencore instruments. You'll learn how to use the Sencore instrument and see how it fits your testing needs. Available on VHS and Beta. (Call for details.)

#### Tape

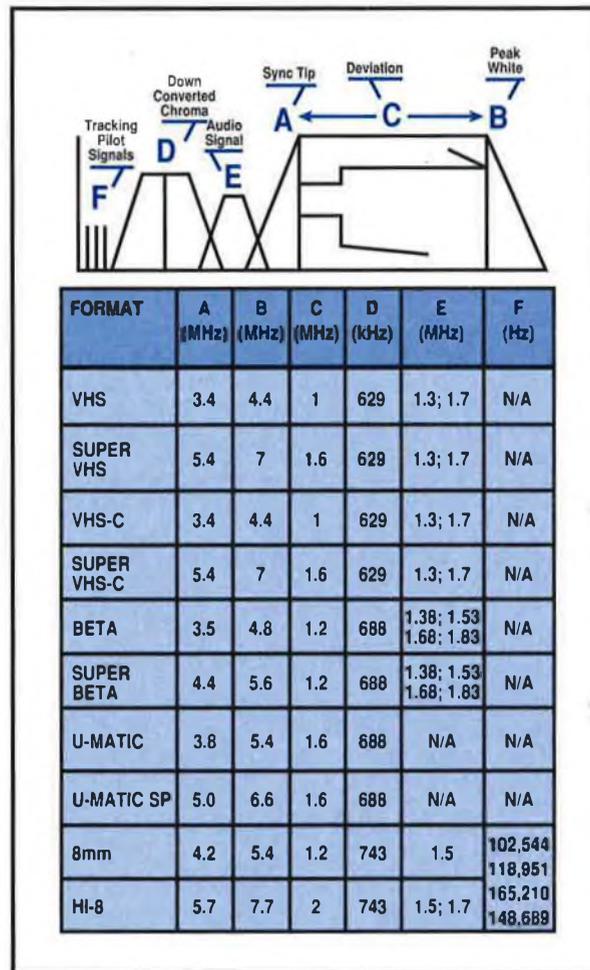
Number	Title	Instrument(s)
VT861A	Universal CRT Analyzing	CR70
VT871	Missing Link In Audio Servicing	PA81
VT872	Learning To Use The Z Meters	LC101/LC102
VT875	Introducing The SG80	SG80
VT883	Using The VC93 All Format VCR Analyzer	VC93
VT884	Making Estimates Profitable	VA62A
VT885	Using The Z Meter In Industry	LC101
VT888	Complete VCR Analyzing	VC93
VT889	Introducing The CM2000	CM2000
VT891	Using The VC93 VCR Analyzer	VC93
VT893	Troubleshooting TV With The VG91 & TVA92	VG91/TVA92
VT894	Using The SC3100 "AUTO TRACKER"	SC3100







# Key VCR Format Characteristics



## Common Computer Monitor Standards

FORMAT	HORIZ FREQ (kHz)	VERT FREQ (Hz)	HORIZ PIX	VERT PIX	VERT FP	VERT BP	VERT SYNC	HORIZ FP	HORIZ BP	HORIZ SYNC	
CGA, EGA Lo	640x200/60Hz	15.8	60.5	640	200	1.580	2.150	0.190	6.600	7.200	4.200
MDA, Hercules	720x350/50Hz	18.4	50.0	720	350	0.001	0.200	0.900	0.600	1.100	8.300
EGA Hi	640x350/60Hz	21.8	60.0	640	350	0.001	0.080	0.600	0.001	1.600	4.900
VGA 1	640x350/70Hz	31.5	70.1	640	350	1.180	1.910	0.060	0.640	1.910	3.810
MAC	640x480/67Hz	35.0	67.0	640	480	0.086	1.120	0.086	2.120	3.170	2.120
SVGA	800x600/56Hz	35.2	56.0	800	600	0.030	0.630	0.060	0.670	3.560	2.000
8514A, XGA	1024x768/87Hz	35.5	87.0	1024	768	0.030	0.563	0.113	0.180	1.250	3.920
VESA	640x480/72Hz	37.9	72.0	640	480	0.238	0.740	0.079	0.762	4.063	1.270
XGA-2	720x350/88Hz	39.4	87.9	720	350	0.811	1.344	0.051	0.254	1.268	3.042
Sony	1024x768/60Hz	48.8	60.0	1024	768	0.062	0.800	0.062	1.000	1.500	2.000
DEC	1024x864/60Hz	54.0	60.0	1024	864	0.001	0.629	0.056	0.160	1.680	1.850
Samsung	1006x1048/60Hz	62.8	59.8	1006	1048	0.001	0.542	0.127	0.150	1.580	1.880
Radius	1152x882/72Hz	66.0	72.0	1152	882	0.001	0.380	0.200	0.138	2.420	1.280
Radius/MAC	640x870/75Hz	68.9	75.0	640	870	0.044	0.610	0.044	0.559	1.120	1.680
DEC	1280x1024/60Hz	70.7	66.5	1280	1024	0.042	0.467	0.042	0.267	1.870	1.330
Sun	1600x1280/67Hz	89.2	66.9	1600	1280	0.011	0.471	0.112	0.001	1.400	2.030

# Channel Assignments And Video Carriers

Cable channel frequency plans on FCC, HRC, IRC, 50-750 MHz based on joint EIA/NCTA Eng. Committee (EIA IS-6 Interim Standard). Frequencies include \*Aeronautical FCC designated offset frequencies. HRC carriers are computed with 6.000300 MHz  $\pm$  1 Hz comb gen. accuracy.

## Sub-Band VHF Cable TV Channels, 5-50 MHz

Channel #	FCC	HRC	IRC
T-7	7.00	—	—
T-8	13.00	—	—
T-9	19.00	—	—
T-10	25.00	—	—
T-11	31.00	—	—
T-12	37.00	—	—
T-13	43.00	—	—

## Low-High VHF EIA/NCTA TV Channels

Channel #	FCC	HRC	IRC
1	—	72.0036	73.25
2	55.25	54.0027	55.25
3	61.25	60.0003	61.25
4	67.25	66.0033	67.25
5	77.25	78.0039	79.25
6	83.25	84.0042	85.25
7	175.25	174.0080	175.25
8	181.25	180.0090	181.25
9	187.25	186.0093	187.25
10	193.25	192.0096	193.25
11	199.25	198.0099	199.25
12	205.25	204.0102	205.25
13	211.25	210.0105	211.25

## Midband Cable Channels (\*Aeronautical Offset Freq. Allocation)

Channel #	FCC	HRC	IRC
14	*121.2625	120.0060	*121.2625
15	*127.2625	126.0063	*127.2625
16	*133.2625	132.0066	*133.2625
17	139.25	138.0069	139.25
18	145.25	144.0072	145.25
19	151.25	150.0075	151.25
20	157.25	156.0078	157.25
21	163.25	162.0081	163.25
22	169.25	168.0084	169.25

### Superband Cable TV Channels (\*Aeronautical Offset Freq. Allocation)

Channel #	FCC	HRC	IRC
23	217.25	216.0108	217.25
24	223.25	222.0111	223.25
25	*229.2625	228.0114	*229.2625
26	*235.2625	234.0117	*235.2625
27	*241.2625	240.0120	*241.2625
28	*247.2625	246.0123	*247.2625
29	*253.2625	252.0126	*253.2625
30	*259.2625	258.0129	*259.2625
31	*265.2625	264.0132	*265.2625
32	*271.2625	270.0135	*271.2625
33	*277.2625	276.0138	*277.2625
34	*283.2625	282.0141	*283.2625
35	*289.2625	288.0144	*289.2625
36	*295.2625	294.0147	*295.2625

### Hyperband Cable Channels (\*Aeronautical Offset Freq. Allocation)

Channel #	FCC	HRC	IRC
37	*301.2625	300.0150	*301.2625
38	*307.2625	306.0153	*307.2625
39	*313.2625	312.0156	*313.2625
40	*319.2625	318.0159	*319.2625
41	*325.2625	324.0162	*325.2625
42	*331.275(+25K)	330.0165	*331.275(+25K)
43	*337.2625	336.0168	*337.2625
44	*343.2625	342.0171	*343.2625
45	*349.2625	348.0174	*349.2625
46	*355.2625	354.0177	*355.2625
47	*361.2625	360.0180	*363.2625
48	*367.2625	366.0183	*367.2625
49	*373.2625	372.0186	*373.2625
50	*379.2625	378.0189	*379.2625
51	*385.2625	384.0192	*385.2625
52	*391.2625	390.0195	*391.2625
53	*397.2625	396.0198	*397.2625
54	403.25	402.0201	403.25
55	409.25	408.0204	409.25
56	415.25	414.0207	415.25
57	421.25	420.0210	421.25
58	427.25	426.0213	427.25
59	433.25	432.0216	433.25
60	439.25	438.0219	439.25
61	445.25	444.0222	445.25
62	451.25	450.0225	451.25
63	457.25	456.0228	457.25
64	463.25	462.0231	463.25
65	469.25	468.0234	469.25
66	475.25	474.0237	475.25
67	481.25	480.0240	481.25
68	487.25	486.0243	487.25
69	493.25	492.0246	493.25

### Hyperband Cable Channels

Channel #	FCC	HRC	IRC
70	499.25	498.0249	499.25
71	505.25	504.0252	505.25
72	511.25	510.0255	511.25
73	517.25	516.0258	517.25
74	523.25	522.0261	523.25
75	529.25	528.0264	529.25
76	535.25	534.0267	535.25
77	541.25	540.0270	541.25
78	547.25	546.0273	547.25
79	553.25	552.0276	553.25
80	559.25	558.0279	559.25
81	565.25	564.0282	565.25
82	571.25	570.0285	571.25
83	577.25	576.0288	577.25
84	583.25	582.0291	583.25
85	589.25	588.0294	589.25
86	595.25	594.0297	595.25
87	601.25	600.0300	601.25
88	607.25	606.0303	607.25
89	613.25	612.0306	613.25
90	619.25	618.0309	619.25
91	625.25	624.0312	625.25
92	631.25	630.0315	631.25
93	637.25	636.0318	637.25
94	643.25	642.0321	643.25

### FM Midband Cable Channels (\*Aeronautical Offset Freq. Allocation)

Channel #	FCC	HRC	IRC
95	91.25	90.0045	91.25
96	97.25	96.0048	97.25
97	103.25	102.0051	103.25
98	*109.2750(+25K)	108.0054	109.2750
99	*115.2750(+25K)	114.0057	115.2750

### Hyperband Cable Channels (continued)

Channel #	FCC	HRC	IRC
100	649.25	648.0324	649.25
101	655.25	654.0327	655.25
102	661.25	660.0330	661.25
103	667.25	666.0333	667.25
104	673.25	672.0336	673.25
105	679.25	678.0339	679.25
106	685.25	684.0342	685.25
107	691.25	690.0345	691.25
108	697.25	696.0348	697.25
109	703.25	702.0351	703.25
110	709.25	708.0354	709.25
111	715.25	714.0357	715.25
112	721.25	720.0360	721.25
113	727.25	726.0363	727.25
114	733.25	732.0366	733.25
115	739.25	738.0369	739.25
116	745.25	744.0372	745.25
117	751.25	750.0402	751.25

### UHF Channel Frequency Allocations

Channel #	Frequency	Channel #	Frequency
14	471.25	42	639.25
15	477.25	43	645.25
16	483.25	44	651.25
17	489.25	45	657.25
18	495.25	46	663.25
19	501.25	47	669.25
20	507.25	48	675.25
21	513.25	49	681.25
22	519.25	50	687.25
23	525.25	51	693.25
24	531.25	52	699.25
25	537.25	53	705.25
26	543.25	54	711.25
27	549.25	55	717.25
28	555.25	56	723.25
29	561.25	57	729.25
30	567.25	58	735.25
31	573.25	59	741.25
32	579.25	60	747.25
33	585.25	61	753.25
34	591.25	62	759.25
35	597.25	63	765.25
36	603.25	64	771.25
37	609.25	65	777.25
38	615.25	66	783.25
39	621.25	67	789.25
40	627.25	68	795.25
41	633.25	69	801.25

## Voltage to dB Conversion Chart

Voltage Ratio	dB Equivalent	Voltage Ratio	dB Equivalent
1.0:1	0.0	24:1	27.6
1.2:1	1.6	26:1	28.3
1.4:1	2.9	28:1	28.9
1.6:1	4.1	30:1	29.5
1.8:1	5.1	35:1	30.9
2.0:1	6.0	40:1	32.0
2.2:1	6.8	45:1	33.1
2.4:1	7.6	50:1	34.0
2.6:1	8.3	60:1	35.6
2.8:1	8.9	70:1	36.9
3.0:1	9.5	80:1	38.1
3.2:1	10.1	90:1	39.1
3.4:1	10.6	100:1	40.0
3.6:1	11.1	120:1	41.2
3.8:1	11.6	140:1	42.9
4.0:1	12.0	160:1	44.1
5.0:1	14.0	180:1	45.1
6.0:1	15.6	200:1	46.0
7.0:1	16.9	220:1	46.8
8.0:1	18.1	240:1	47.6
9.0:1	19.1	260:1	48.3
10:1	20.0	280:1	48.9
12:1	21.6	300:1	49.5
14:1	22.9	320:1	50.1
16:1	24.1	340:1	50.6
18:1	25.1	360:1	51.1
20:1	26.0	380:1	51.6

# Warranty And Service

**Y**ou can't make a wrong buying decision when you say "yes" to investing in Sencore test equipment. You're not investing in just an instrument, you're investing in your own piece of an entire organization dedicated to making you more successful.

## 30 Day Money Back Guarantee

Sencore's no-nonsense 30 Day Money Back Guarantee assures you that you've made the right choice. Every Sencore instrument and accessory is covered by this guarantee of satisfaction. Simply stated:

*"If you are not completely satisfied with any Sencore instrument, you may return it during the first 30 days and we'll give you a full refund, including freight, no questions asked!"*

You're always sure you've made the right decision when you say "yes" to a Sencore investment.

## Sencore One Year Warranty

Every Sencore instrument is warranted for one year against defects of any cause except acts of God and abusive use. During this warranty period, Sencore will correct any covered defects without charge for parts, labor, or recalibration.

## Extended Made Right Workmanship Guarantee

We guarantee your Sencore instrument was "Made Right" or we will make it right without charge for parts and labor for as long as you own the instrument. This lifetime guarantee covers any defects caused by faulty design or workmanship errors. All parts and labor necessary to correct a workmanship defect covered by this guarantee will be at no

charge to you. There will be a recalibration and handling charge if the instrument is no longer covered by Sencore's one year warranty.

## Toll-Free Support

Dial us now. One toll-free number, **1-800-SENCORE**, connects you to a factory full of people dedicated to making you and your business more successful. We'll answer any questions you have concerning a new product, applications of a Sencore instrument, ordering information, or technical service. We look forward to supporting you even better in the future!

## Service Support

In the event your instrument should need repair or calibration, Sencore's factory service center backs your purchase with quality service and toll free support. Your instrument receives the same quality care and must pass the same exacting tests of new equipment (it must even meet the same specs).

To have your Sencore instrument serviced, just return the instrument to:

Sencore  
Factory Service Dep't  
3200 Sencore Drive  
Sioux Falls, SD 57107

You never need a return authorization. Just include a note with your name, address, and a brief description of the problem. Then we'll give you the industry's #1 service after the sale with:

- Toll-Free Support And Technical Help
- Instrument Renovation
- Traceable Standards
- Genuine Sencore Parts
- 48 Hour Parts Shipping
- Instrument Loaners

and many more services to keep your Sencore instrument working and looking like new.

## Application Support

If you need assistance using any of Sencore's instruments, a phone call is all you need to make. Our Application Engineers are fully trained on the operation and uses of every item in the Sencore line. You receive specialized and personalized help on questions like:

- How to perform a test or use a function of your Sencore instrument
- Can your instrument perform a special test not covered in the operating instructions, or
- Will the instrument you're thinking about buying meet all the needs of your applications?

We'll even pay for the call. To reach an Application Engineer, just dial **1-800-SENCORE**.

When you choose Sencore, you are choosing test equipment from the leader in American made analyzing equipment for over 40 years. Every Sencore product is supported by specialists dedicated to helping you use your Sencore instrument effectively.

**Call Toll-Free  
1-800-SENCORE (736-2673)**  
today and let us go  
to work for you!



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# *Here's How To Order:*

*Call our toll-free number,  
**1-800-SENCORE** (736-2673)*

A friendly and knowledgeable Sales Representative will assist you with your test equipment needs. The same toll-free number puts you in touch with:

- Ⓞ Application Engineers for technical consultation on instrument use
- Ⓞ Service Technicians for quick field repair tips
- Ⓞ An entire factory of people dedicated to making you and your business more successful

## *Flexible Investment Options*

Sencore gives you easy purchasing terms at low rates. Your options include:

- Ⓞ Net 30
- Ⓞ 2 to 5 month split payment plan
- Ⓞ 6 to 48 month "Pay As You Grow" investment plans that include add-on with zero dollars down, on approved credit
- Ⓞ MasterCard or Visa
- Ⓞ COD or cash in advance

## *Fast Product Delivery*

Most Sencore products are in stock and are shipped within 48 hours of receipt of your order - guaranteeing you maximum productivity right from the start. Overnight delivery is available for immediate needs.

## *We Stand Behind Everything We Sell*

If you're not satisfied with your investment of Sencore equipment for any reason, just return it within 30 days. We'll give you a full refund, no questions asked.

**Call Now!**  
**1-800-SENCORE** (736-2673)  
**Fax 605-339-0317**

**SENCORE**

**3200 Sencore Drive, Sioux Falls, SD 57107  
Call 1-800-SENCORE (736-2673)  
FAX 605-339-0317**