

# CR7000 "BEAM-RITE"™

CRT Analyzer & Restorer



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



SENCORE

# New Demands From Higher Performance CRTs Require New Analyzing Techniques



The cathode ray tube (CRT) is still the display of choice.

CRTs are virtually everywhere – from home TV, projection TV, studio monitors, video walls, computer monitors, data terminals, medical displays, video games, security systems, radar, business, industry, and more. They remain the “king of displays” providing the best overall display performance vs. cost of any display technology.

Refinements to CRTs over the past decade have improved contrast, resolution, convergence, focus, and deflection angles. CRTs are now larger and displaying higher resolution than just a decade ago. CRT displays now commonly offer resolutions of 1280 x 1024 producing over 1.3 million picture elements. Just a decade ago, VGA monitors were being introduced with resolutions of only 640 x 350.

But like CRTs of the past, an electron gun consisting of a filament, cathode, control grid, and accelerating grid is at the heart of the CRT’s performance. The electron gun emits the electrons which are accelerated to the CRT’s phosphor screen. The electron gun of the CRT is susceptible to aging and a gradual decrease in performance.

A decade ago, marginal decreases in CRT electron gun performance had only a slight impact on the displayed video. But today the same minor decreases in the CRT’s electron gun performance impacts the displayed video resulting in unacceptable contrast, brightness, or focusing. Refinements to

the electron gun have left it more vulnerable to damage with restoration attempts from existing CRT rejuvenators.

What does all this mean to you as a servicer, maintenance technician, or business manager? It means to accurately identify CRT electron gun problems today, a CRT Analyzer & Restorer must provide more precision tests than a decade ago. It must more closely duplicate the circuit’s biasing voltages on the CRT electron gun. It must compare gun conduction currents to the CRT manufacturer’s specified performance levels to accurately identify emission related focus, contrast, or smearing problems. It must more closely compare the levels of conduction currents from black video (cutoff) to full emission to detect contrast and color tracking problems. It must provide more delicate restoration options. A CRT analyzer today must also perform these needed tests faster with easier hookup and test interpretation.

**CRT Displays:  
Slow But Steady Growth**  
Worldwide sales of CRT displays for desktop computers, workstations and terminals (millions of units)

Year	Worldwide sales (millions of units)
1994	40
1996	50
1998	60
2000	70
2002	75

Source: Stanford Resources Inc.

**The new Sencore CR7000 “BEAM-RITE”™ CRT Analyzer & Restorer provides the precision CRT gun analyzing tests and improved restoration capabilities demanded by the CRTs of this decade and beyond.**

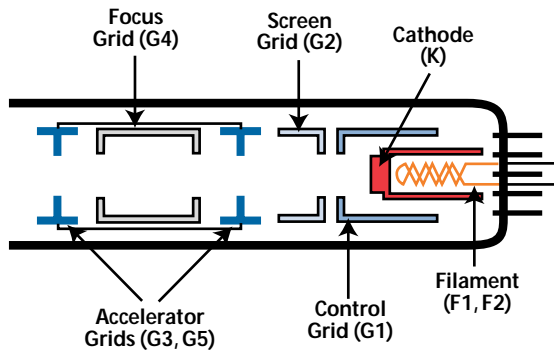
# Knowing How CRTs Work And How They Fail Shows Why You Need A Complete CRT Analyzer Like The CR7000 "BEAM-RITE"™

The cathode ray tube (CRT) is a vacuum tube that converts electrical impulses into visual images. The CRT is used to display images on televisions, computer and information terminals, oscilloscopes, RGB monitors, and radar displays. Let's take a look at how the CRT works, and what makes it fail.

## How Does The CRT Work?

The major elements of the CRT are the:

- Heater or Filament (H)
- Cathode (K)
- Control Grid (G1)
- Screen Grid (G2)
- Accelerating Grids
- Phosphor Coated Screen



The cathode is coated with a material that releases a large number of electrons when heated. As the filament heats the cathode, the negatively charged electrons are released as a positive voltage attracts them.

The control grid (G1) controls the amount of electrons that are pulled from the cathode surface to form the beam that strikes the CRT screen. As the negative bias applied to the grid changes, G1 opens and closes (much like the iris of a camera lens), to change the intensity of the electron beam.

The screen grid (G2), biased with 200 to 600 volts, attracts the negatively charged electrons through the tiny hole in the control grid.

The accelerating grids have even higher voltages that increase the velocity of the electrons through the neck of the CRT until they strike the phosphorous coated screen. Internal plates or external coils deflect the beam vertically and horizontally across the screen, producing the visual image.

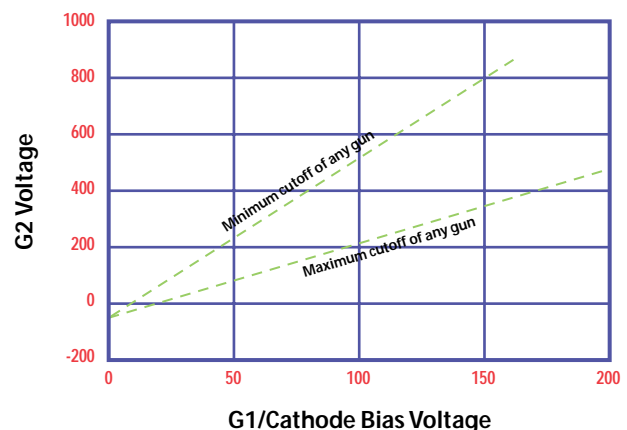
## What Fails In The CRT?

When a CRT fails, it produces a noticeably degraded picture. A defective CRT can produce pictures with excess or absence of a color, full beam conduction, no picture, dark picture, silvery look, or even arcing. A CRT can fail for several reasons: open filaments, H-K short, poor cutoff, poor emission, and bad color tracking to name a few.

Fortunately, a good working CRT has specific operating characteristics for beam current with specific biasing and G2 voltage. The CRT manufacturers use items like the "cutoff chart" shown here to specify the operation of their CRTs. You'll notice that the proper beam current is relative to the voltages applied, and thus requires the CRT tester to adjust its good and bad measurement points accordingly. This is called a sliding good/bad scale that changes with the bias voltages applied to the specific CRT.

CRT manufacturers are also specific that the three beams in a color CRT must track each other. Small variances can be compensated by the service controls (drive and screen) as long as the beams are within a specific range. Specification call for the low level tracking to be within a ratio of 1.25:1 and the high level tracking of 1.55:1. There's only one CRT analyzer that tests CRTs to these ratios.

Only the **New** and **Exclusive** CR7000 "BEAM-RITE" CRT Analyzer & Restorer tests CRTs to manufacturer specifications. Only the CR7000 provides a complete set of tests along with the safest restoration levels (progressive restoration) to ensure that you catch all defective CRTs and can safely restore most defects.



# CR7000 "BEAM-RITE"™

## CRT Analyzer & Restorer

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

**Test All CRTs, Including: Computer Monitors, Video Displays, Televisions, Projection TVs, Scopes, & Special Application CRTs** – The CR7000 now has full dynamic range to test older CRTs and the new ones

#### **The Easiest To Use CRT Tester On The Market**

- Simply connect one of the supplied adapters to test virtually all new CRTs without setting and resetting setup switches
- All three guns of color CRTs are tested, and results displayed, simultaneously
- All gun tests are displayed with interpretation-free "Good/Bad" results

#### **The Most Accurate And Thorough Tests Of Any CRT Tester**

- Full bias ranges with a sliding "good/bad" scale
- Exclusive "Lo Level" and "High Level" emission tracking
- Detects all gun element shorts or leakage

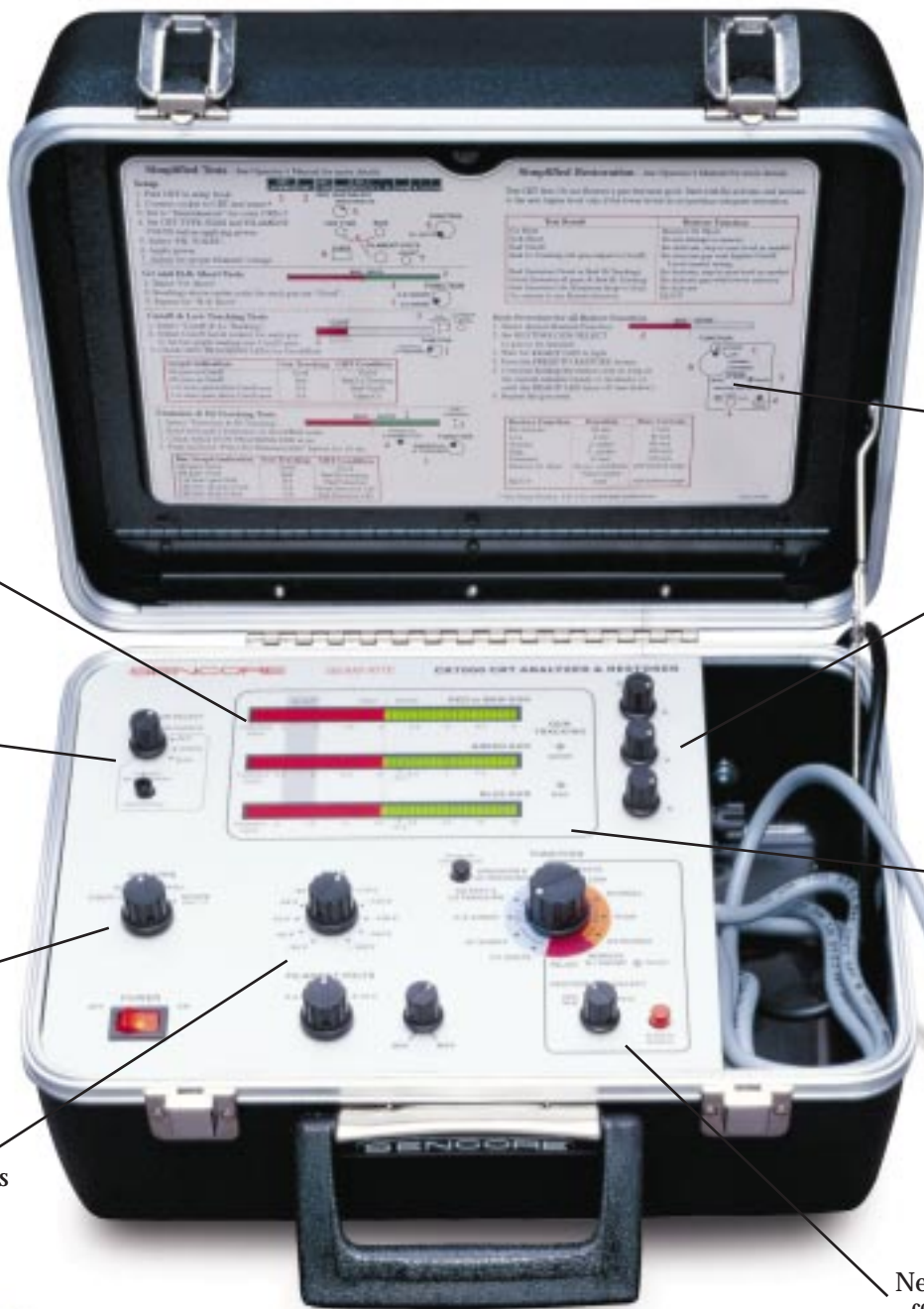
#### **The Safest And Most Effective Restoration Techniques Available - The multiple levels of restoration guarantee the safest possible restoration**

- Six levels of "Progressive Restoration"
- Self-limiting shorts removal function
- Three times the restoration range of other testers

**Newly Designed Sockets Allow Easy Connection To Hard To Reach CRTs** – New socket design allows the user to test projection TVs and computer monitors faster and easier

### *The CR7000 "BEAM-RITE" CRT Analyzer & Restorer Enables You To:*

1. More confidently and quickly determine if defects are in the CRT gun or TV chassis.
2. Positively determine if the CRT gun is defective before investing service time and money that cannot be recovered.
3. Confidently give repair estimates and make repair feasibility decisions.
4. Increase user or customer repair satisfaction by confidently restoring CRT performance.
5. Increase the number of successful repairs and add profit by restoring the CRT vs. recommending CRT replacement.
6. Save money by restoring the CRT adding years of useable display life while avoiding costly CRT replacement.
7. Reduce CRT analyzing time to less than three minutes to service/refurbish faster.



Easily compare the emission of all three projection CRTs simultaneously as the CR7000 stores the reading for you

View all tests of all three color CRT guns simultaneously for faster analyzing and quick gun comparisons

Accurately test all CRT types

Full bias range tests CRT guns at their normal operating bias to closely duplicate normal operation

Durable, flexible sockets provide easy connection to CRTs – especially projection and computer monitors

Easy-to-follow directions walk you through all CRT tests

Separate G2 controls for each gun provide accurate and dynamic tracking tests

Interpretation-free color CRT gun tracking tests

New restore functions offer the safest and most effective restoration of any tester

- "Ready" LED guides you through each restoration
- Safely remove G1 shorts
- Rejuvenation feature helps with stubborn cathodes
- Full control over the amount of restoration

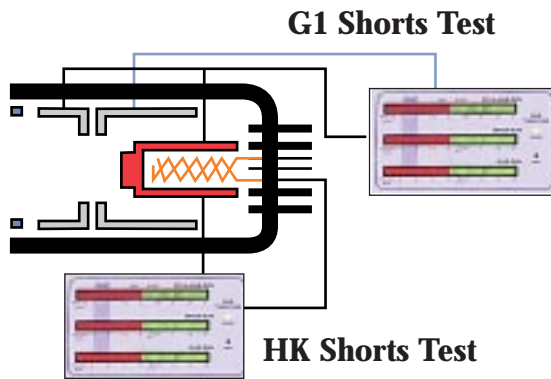
**Exclusive –  
Only From Sencore**



# Seven Analyzing Tests Accurately Pinpoint CRT Gun Problems Other Testers Miss

## G1 & H-K Short Tests

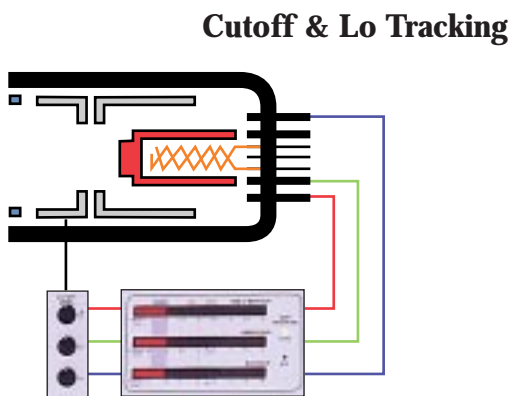
When testing a color CRT gun, the G1 Short and H-K Short tests are performed simultaneously on the red, green, and blue electron guns. The three-bar graph display indicates the resistance of the respective guns simultaneously. You know at a glance if any of the color guns has an inter-element short.



These common shorts are automatically tested with the CR7000 and the display shows which elements have the short.

## Cutoff Test

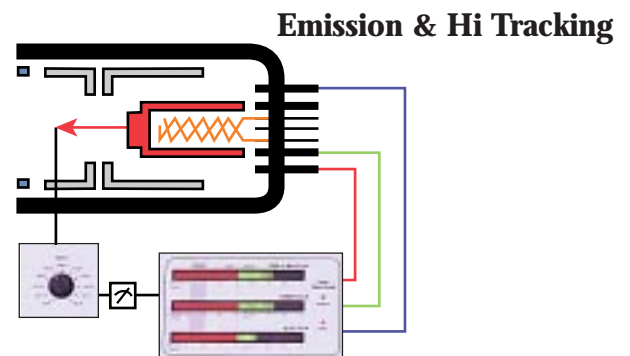
The CR7000 is the only CRT analyzer that accurately simulates cutoff bias conditions relating to the manufacturer's specified range and circuit bias conditions. Other CRT testers offer only a few bias voltages to -100 volts and do not properly duplicate true cutoff voltage conditions or measure true beam current to the G2 grid. As a result, these testers may produce setup or cutoff current that shows the gun is OK, when it really isn't.



Automatically tests the cutoff of all 3 guns and compares the ratio of the test results to manufacturer standards of 1.25:1.

## NEW Lo Tracking Test

The Lo Tracking test compares the level of G2 voltage needed by each gun to produce cutoff current. It is automatically performed while testing cutoff of all three guns of a color CRT. The "Good" GUN TRACKING LED lights when all three guns are conducting within the "Cutoff" area of the display, and the G2 voltages are within a ratio of 1.25:1.



Measure the emission "true beam" current with a sliding Good/Bad scale while testing the gun tracking ratio to manufacturer standards of 1.55:1.

## Emission Test

First, the CR7000 measures "true beam" current or the current passing from the cathode, through the opening in G1, and on to G2. This provides the best representation of the actual CRT beam current that strikes the phosphor screen. A second and **exclusive** feature of the CR7000 is a "sliding" Good/Bad scale for testing emission to manufacturer specifications.

## NEW Hi Tracking Test

The CR7000's Hi Tracking test compares the peak emission levels of each gun of the color CRT. The Hi Tracking test automatically calculates the tracking ratio as it simultaneously displays the emission readings for all three guns. The "Good" GUN TRACKING LED lights when all three guns have emission currents resulting in a ratio within 1.55:1.

## Emission Life Test

The CR7000's Emission Life Test cools the cathodes slightly by decreasing the filament voltage by 25%. A cooled cathode produces less emission, but most good cathodes are capable of producing more current than is needed for full beam current (white picture level).

# Six Levels Of Progressive Restoration – Safely Restore More CRTs

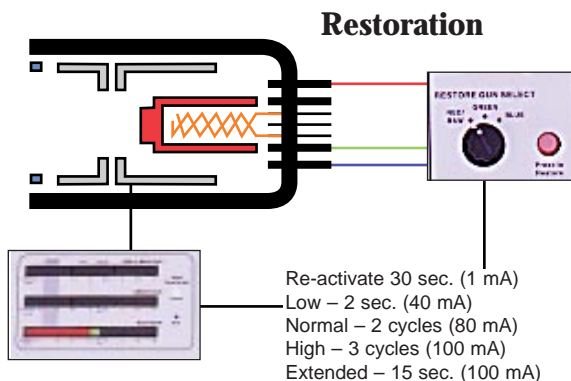
The six levels of the CR7000's progressive restoration helps prevent CRT over-restoring and minimal potential damage.

## Re-activate

The CR7000 "Re-activate" function safely activates the existing cathode emitting material with little or no threat to the CRT gun. Re-activation also works well on some CRT guns that have aged causing minor cathode contamination or poisoning. You can use the Re-activate function repeatedly with little threat of damaging the CRT cathode.

## Restore

The CR7000 "BEAM-RITE" offers four automatic CRT "Restore" functions to return near normal performance to the CRT cathode. The four functions are progressive levels of current and current durations including Low, Normal, High, and Extended.



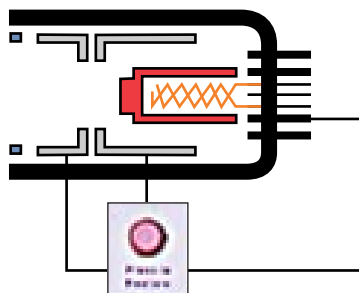
Four exclusive levels of progressive restoration allow you to use only what the gun needs to restore its operation.

The **Low Restore** function uses a brief two second current, limited to 40 mA, to heal the contaminated cathode surface. The Low Restore function uses a much lower current and shorter current duration than offered by any other CRT tester. On many weak cathodes, this is enough to be effective while eliminating the cathode damage that would result from other testers and higher levels of restore currents.

The **Normal Restore** function offers additional restore current, limited to 80 mA, and two automatic cycles lasting three seconds each. The higher current and duration removes the contamination more aggressively from the cathode while permitting a three second pause between current cycles.

The **High Restore** functions boost the filament voltage to superheat the cathode while increasing the maximum current to 100 mA. The High Restore function is effective in removing thicker cathode contamination. For tougher cathode contamination, the **Extended Function** draws continuous restore current up to 15 seconds.

## Remove G1 Shorts



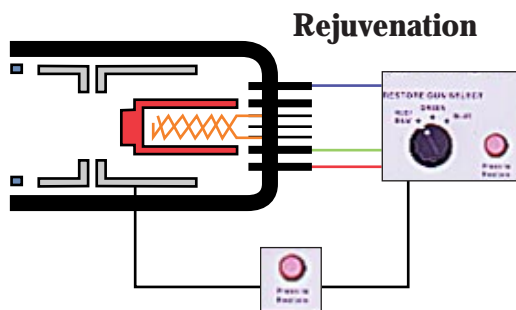
The CR7000 connects the cathode to G2 and applies a 450 volt charge to the G1 to remove any shorts.

## Remove G1 Short

In the "Remove G1 Short" function, the cathode (K) and G2 grids are connected together. The filament voltage is removed to cool the cathode and prevent filament or cathode damage. After a delay, pressing the "Press To Restore" button discharges a 450 volt capacitor through the short path between the G1 and the K/G2 connection.

## Rejuvenation

Rejuv applies the normal filament voltage and a high positive voltage potential of a charged capacitor to the G1 grid. This produces momentary high forward or positive bias on the CRT cathode. Rejuv often successfully breaks open the contamination layer on severely contaminated cathodes producing a high, fast discharge current between the cathode and G1.



Used on CRTs with severe cathode contamination, this function will break through the contamination.

# CR7000 "BEAM-RITE"™ Condensed Specifications

## G2 Voltage

Range: 10-400 VDC Video 1, Proj. and Scope; 15-600 VDC Video 2  
Range: Video & Projection - 20, 36, 52, 68, 84, 100, 116, 132, 148, 164, 184 VDC Scope - all bias voltages divided by 10

## Shorts Tests

Tests inter-element resistance and displays result on bar graph.

## Filament Voltage

Range: 0 - 4; 4 - 8; 8 - 16 VDC. Continuously variable within selected range.

## Cutoff & Lo Tracking Test:

Tests ratio of G2 voltages needed to produce cutoff current in all 3 guns of a color CRT or projection system.

## Emission Test

Measures true beam current reaching G2. Without momentary 0 bias.

## Life Test

Provides indication of cathode reserve current by lowering filament voltage 25%.

## Hi Tracking Test

Automatically compares emission currents between highest and lowest guns in "Simultaneous" gun test and indicates Good/Bad result with LED.

## Restore Functions

Progressive restore functions apply positive biases and increased filament voltages for cathode super-heating.

## Reactivate Restore

Filament voltage: 50% boost,  $\pm$  5%  
Current limit: 1 mA max. all CRT types at 117 VAC (or 220 VAC) line voltage  
Time: user controlled button, automatic time-out after 30 seconds



## Low Restore

Filament voltage: normal, (no boost)  
Current limit: 40 mA max. all CRT types at 117 VAC (or 220 VAC) line voltage  
Time: user controlled; automatic time-out after 2 seconds

## Normal Restore

Filament voltage: normal, (no boost)  
Current limit: 80 mA max. all CRT types at 117 VAC (or 220 VAC) line voltage  
Time: 2 automatic cycles of 3 seconds ON and 3 seconds OFF.

## High Restore

Filament voltage: 50% boost  $\pm$  5%  
Current limit: 100 mA max. Video & Projection, 80 mA scope type at 117 VAC (or 220 VAC) line voltage  
Time: 3 automatic cycles of 4 seconds ON and 2 seconds OFF.

## Extended Restore

Filament voltage: 50% boost,  $\pm$  5%  
Current limit: 100 mA max. Video & Proj, 80 mA Scope at 117 VAC (or 220 VAC) line voltage  
Time: user controlled; automatic time-out after 15 seconds

## Remove G1 Short

Method: Capacitive discharge between G1 & K/G2 occurs after 20 second delay for filaments to cool.

## Rejuv

Method: Capacitive discharge between G1 & K (positive bias) with normal filament voltage.

## General

**Display:** Three, 40 segment LED bar graphs (20 green and 20 red segments) with Filament Voltage scale and Cutoff set box.

**Size:** 7" x 12" x 8" HWD

**Weight:** 13 lbs.

**Power:** 105-125 VAC 50/60 Hz, 90 watts max. 210-230 VAC operation is available.

## 30 Day Money Back Guarantee

Sencore's 30 day Money Back Guarantee assures that you've made the right choice in instrumentation. Every Sencore instrument and accessory is covered by this guarantee of satisfaction.

## Toll Free Support 1-800-SENCORE

One number connects you to a factory full of people dedicated to making your job easier and more successful. We will answer any questions you may have concerning a new product, application of a Sencore instrument, ordering information, or technical service.

## Made Right 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. Call for details.

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

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- 6-48 month "Pay As You Grow" investment plans
- MasterCard or Visa
- COD or cash with free freight