

# SENCORE NEWS

3200 SENCORE DRIVE, SIOUX FALLS, S.D. 57107



PATENT PENDING

**ONLY \$495**  
INCLUDING 10X  
LO-CAP PROBE  
WITH 5KV RATING

## SENCORE PRICE INCREASE EFFECTIVE APRIL 1, 1975

RC24	\$45.00	MU150	\$350.00	SG165	\$595.00
TC28	\$260.00	BE156	\$39.00	RC167	\$99.00
PS29	\$595.00	TC162	\$150.00	CR168	\$275.00
PS148	\$395.00	PS163	\$795.00	CG169	\$225.00
		UPS164	\$260.00		

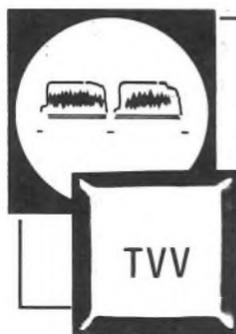
OTHER MODELS AT PREVIOUS PRICES

*If You Can  
Push A Button  
You Can Operate*

# THE PS29 MINUTE MAN

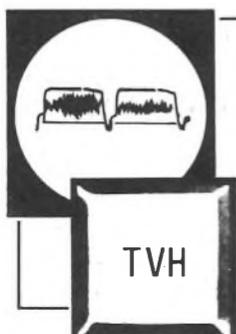
AUTOMATIC TRIGGERED PUSHBUTTON OSCILLOSCOPE

**LETS YOU TROUBLESHOOT HARD-TO-HOLD  
VIDEO WAVEFORMS IN MINUTES... JUST PUSH**



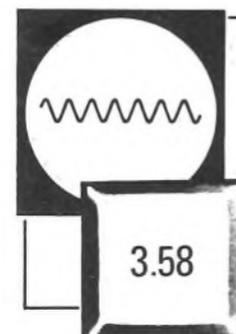
**WANT TV VERTICAL?  
JUST PUSH...**

for two locked - in cycles of any TV vertical signal . . . . . including the hard to hold composite video waveform. It's automatic - you just push.



**WANT TV HORIZONTAL?  
JUST PUSH...**

for two complete cycles of any TV horizontal signal that you can compare directly to the schematic. It's automatic - you just push.



**WANT 3.58 COLOR?  
JUST PUSH...**

for solid sync color signals automatically. Lets you isolate your color problems in minutes and it's automatic - you just push.



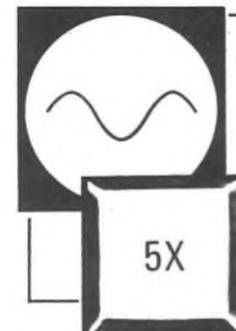
**WANT SWEEP GEN?  
JUST PUSH...**

for a 60Hz line sweep that will lock in the response curve from your sweep and marker. Scope set up is automatic - you just push.



**WANT VECTOR?  
JUST PUSH...**

for a big, bright petal pattern display. All front end hook up for fast, easy color troubleshooting. It's automatic - you just push.



**WANT 5X EXPAND?  
JUST PUSH...**

for a 5 times expanded look at any signal displayed for faster, more accurate troubleshooting - automatically, you just push!

**THE PS29 MINUTE MAN IS A PRE-SET, PRE-"SYNCED"  
PUSHBUTTON VIDEO TROUBLESHOOTER . . . . .**

There are a multitude of different oscilloscopes available today. They range from low cost, limited application scopes to extremely high priced, laboratory instruments. Until now, however, there hasn't been a scope designed specifically for TV and video applications. With the present increase in TV service, plus the increase in new video products hitting the market, the need for a fast, reliable video troubleshooting scope has increased as well.

We are using this issue of the Sencore News to introduce Sencore's answer to this growing need – the PS29 Minute Man automatic triggered pushbutton oscilloscope.

We feel that the Minute Man can be the single most time saving piece of test equipment that anyone in TV and video service, design or instruction can use. The full story on the PS29 Minute Man is told here through a film presentation that you can see and discuss at the next Sencore

Tech-A-Rama in your area.

This issue of the News also contains the first in a series of three economic articles. In this issue we look at the question, "Does Test Equipment Cost or Pay?"

We're sure you will find this issue of the News interesting and informative and suggest you see your local Sencore FLPD distributor about trying either of the Sencore scopes featured in this month's issue.



BOB BOWDEN  
TECHNICAL MARKETING

# PS29 MINUTE MAN

## a pushbutton video troubleshooter

1

**RELIABLE CONTINUOUS RUNNING BASELINE** sweeps the scope face whenever the Minute Man is "ON" and there is no input signal. Saves time searching for a waveform because you know the Minute Man is set and centered before you start. Other scopes require an input signal for a baseline. It's automatic so you know where you are with the Minute Man.

2

**DEPENDABLE BUILT-IN TV SYNC SEPARATOR** locks in those hard to hold video waveforms on both TV horizontal and TV vertical frequencies automatically – you just push.

3

**VERSATILE AC AND DC COUPLING** allows you to measure any complex waveform then switch to DC for fast solid state DC voltage troubleshooting just like you would with a meter.

4

**LARGE 5" SCREEN** offers big bright waveform displays for easier, faster troubleshooting of the complex video waveforms.

5

**LOW LEVEL AUTO-TRIGGERING** automatically locks in any waveform as small as 2/10 of a centimeter high, all the way down to .005 volts, without a trigger level control to adjust. Simply select sync source of internal, external or line and slope. The rest is automatic – you just push.

6

**TIME SAVING DIRECT FREQUENCY CALIBRATION** as well as time/division calibration lets you dial in 10KHz directly, as listed on schematics, without pencil, paper or calculator. You know the frequency at a glance.

7

**HIGH SENSITIVITY** down to 10 millivolts per division allows you to display even the low level tuner output directly, using a demodulator probe, for fast isolation of "tough dog" problems.

8

**COMPLETE FRONT PANEL VECTOR HOOK-UP** lets you display the petal pattern for color troubleshooting and aligning with one extra lead and the push of the vector button. Vector grid automatically lights up.

9

**TWO VOLT VECTOR SENSITIVITY** lets you tap the low level R-Y, G-Y and B-Y amplifier inputs. You can only go to the high level CRT elements direct with other scopes which is time consuming and limits your troubleshooting. The Minute Man takes you all the way. 20 volt sensitivity capabilities with the flip of a switch.

10

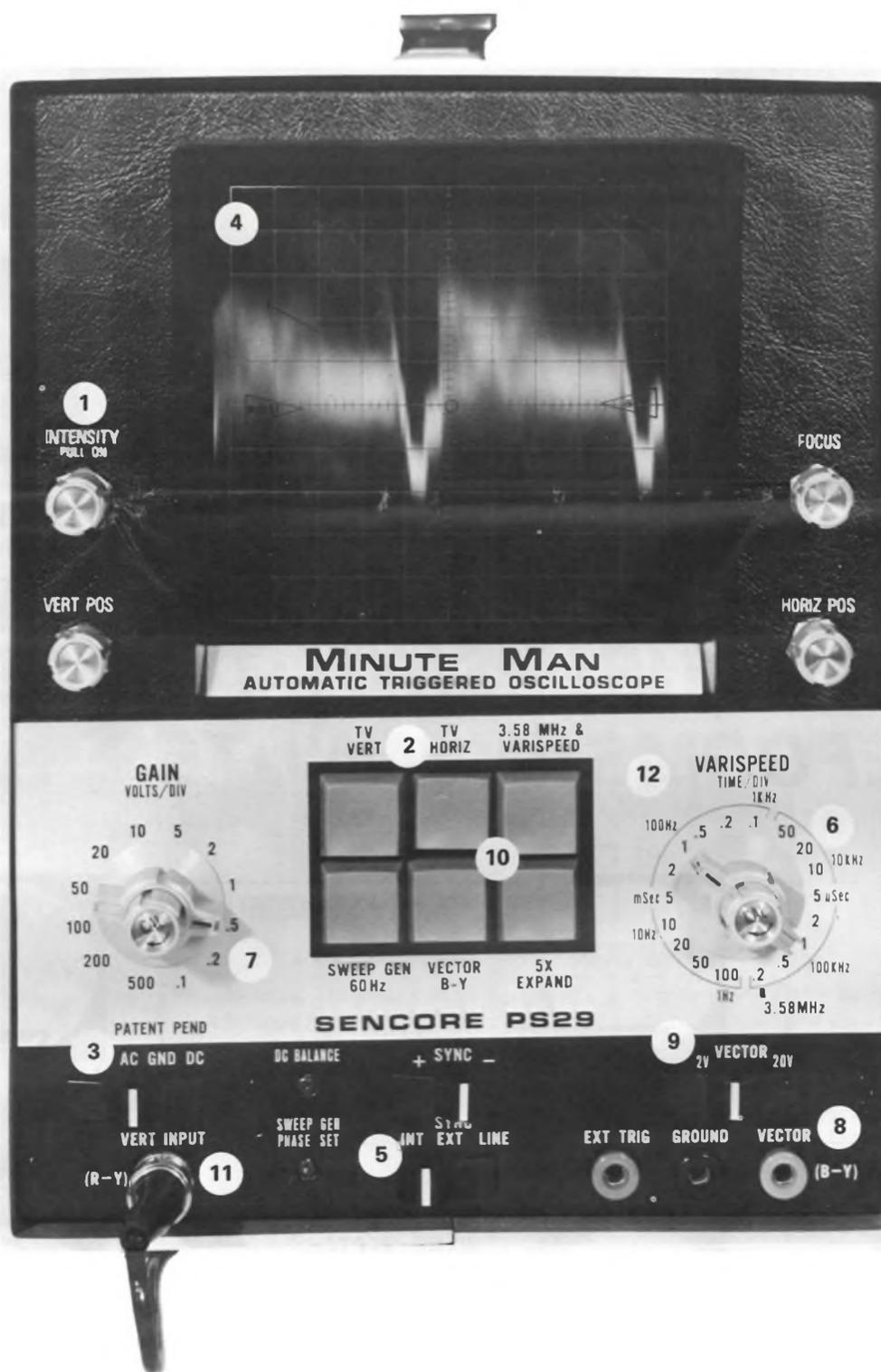
**PATENT PENDING PUSHBUTTON VIDEO SELECTION** with pre-set frequencies and pre-"synced" triggering circuits make the Minute Man a pushbutton video troubleshooter. Just push to lock in any color video waveform including TV vertical, TV horizontal, 3.58MHz color oscillators, 5X expand, vector patterns, and sweep response curves using a sweep generator. Front panel "Sweep Gen. Phase Set" matches scope sweep phase to sweep generator.

11

**EXCLUSIVE 5000V AC INPUT PROTECTION** that lets you measure boost voltage waveforms or even brush up against the horizontal output plate without blowing the front end. Other scopes are rated at only 600 volts. The Minute Man takes you all the way.

12

**IT'S A GENERAL PURPOSE 10MHZ BROADBAND SCOPE TOO.** Push the varispeed button, which activates the varispeed control, for true reproduction of any non-video waveform from DC to 10MHz without peaking coils that cause ringing and distortion.



Sencore Presents

# PUSHING YOUR TROUBLES AWAY



1. Would you like to increase your video servicing business with no increase in personnel? Would you like to increase your servicing profits and do it in less than half the time it takes you now? You can and all you have to do is "push" six little buttons. Interested? Then read on as Sencore presents their all new automatic triggered, push-button oscilloscope, the PS29 Minute Man, in "Pushing Your Troubles Away."

2. Hello, my name is Tom. I'm a Sencore Tech-Rep. About a month ago one of our FLPD distributor salesmen, Joe, and I took this new PS29 Minute Man out to some dealers in his area. The last call of the day was on Joe's old friend, Charlie. I'm never going to forget that call. I didn't think we were going to get past the front door. I'd like to tell you about it so you might see yourself in my customer's shoes that day. Let me start it out for you as I recall it.

3. "Howdy Charlie. How's our ace TV service technician doing today?"

"See that door fellas? Close it on your way out. Don't have the time today. I've got a real "dog" on my hands and I've got to get this set out today. So . . . see ya later."

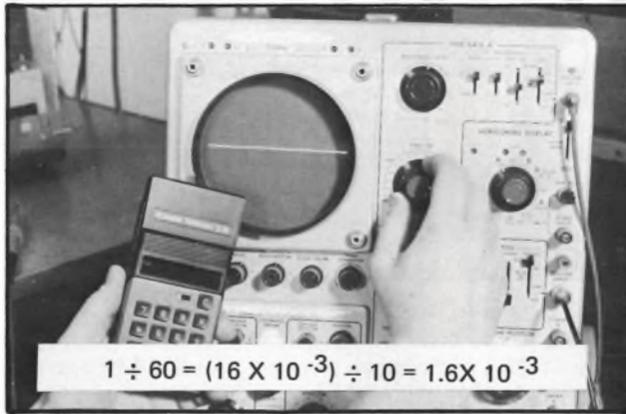
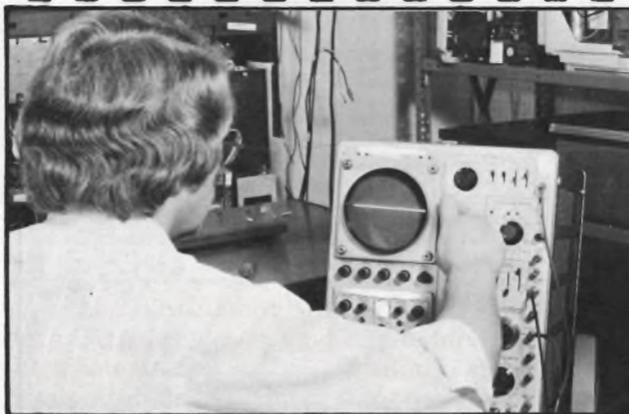
"What's the problem, Charlie? I thought you could fix any TV set that came along."



4. It's not the TV set, Joe. It's this scope. I've spent half a day just trying to figure out how to use it, and I'm still not sure I'm on the right track. You know, if I wasn't in this business to make a living this type of thing wouldn't bother me, but I've got a wife and kids to feed. Hey, since you're here, maybe you can give me a hand.

5. I borrowed this scope a few weeks ago, from a teacher friend of mine. He told me it was my answer to troubleshooting video circuits. He said that it had automatic triggering and should lock in on anything, including these complex video waveforms. Well I'm ready to give that guy a call and tell him just what he can do with his complex video waveform. I'm just not getting anywhere. Let me show you the problems I had with this set I'm working on.

6. This set has poor horizontal sync, so the first thing I want to see are the sync pulses on the composite video waveform. If the sync pulses are there, I can work my way through the circuit until I isolate the problem. I connect the probe to the output of the video detector and the fun begins.



7. First I select the input channel, "Channel A." Then select the trigger mode, slope, coupling and source. Then I have to select my display mode. Next I want to adjust the time base for the proper frequency, but I found out that this requires a little figuring.

8. The composite video sweeps at 60Hz so I divide 1 by 60 on my calculator and come up with 16 milliseconds per cycle. The scope setting should be one tenth of that for one cycle on the scope face, or 1.6 millisecond per division, so I set the time base to this setting. You guys with me so far? O.K.

9. But all I have so far is a straight line that doesn't look any different than when I started, so I adjust the vertical gain control, but the line only gets fatter. Next I adjust the triggering level and at last the signal comes in. I am fast becoming a scientist and I just want to get these repairs out.



10. Now, for my use, I'd like to see two complete cycles of the waveform, so I can compare the trace directly to the pictures in "Sam's" schematic. So I re-adjust the time base control, and I've got it. But not for long - it starts jumping every few seconds. I know the scope isn't defective because my friend was using it when I picked it up. Is it me?

11. I'm really not sure if I have the scope set up right or not, but I can't afford the time to find out. Between jumps I can pretty well see that the sync pulses are there, and that's just going to have to be good enough. I'll move on to the sync separator output to see if we're losing sync there.

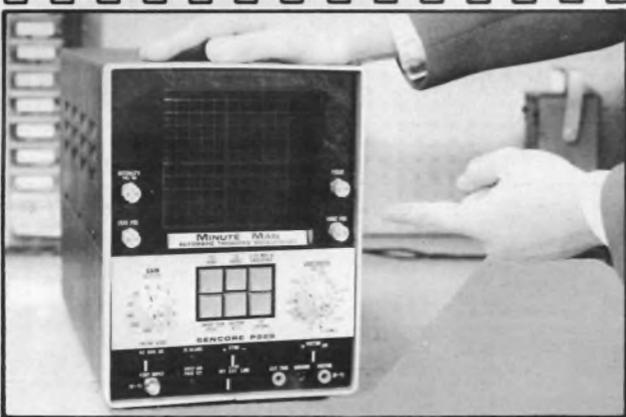
12. I change test points, change the vertical sensitivity control, change the sweep rate and adjust the trigger level and oh brother . . . the waveform doesn't lock in. Now where is this automatic triggering I've heard so much about? I play with the trigger level some more, but I still can't lock anything in. And then once it locks in how can I be sure that this is exactly what I want to see? It must be me.



13. What I'm saying is - when a picture perfect waveform locks in, I know the scope is set up properly, but these signals aren't perfect. There's something wrong with them. My customers bring in defective sets you know. I guess I might be alright if they would bring in good sets - hah. Now everytime a waveform shows up on the scope that doesn't look like the schematic, I really don't know if it's the circuit, the scope or me!!

14. You almost have to be a "Bowmar Brain" to stay in business these days. I spend more time worrying about the scope than I do the TV. I'm going to call Mrs. Jones and tell her to take her set somewhere else. I'll never finish it today. Fiddle, fiddle, fiddle, that's all I've been doing. Why can't someone make a fiddle free scope for this TV work? Then I'd really be in business.

15. *Hold everything, Charlie! It's a good thing we stopped by today or you might have just talked yourself right out of this profitable expanding business. Our Sencore Tech-Rep has a scope to show you that is really and truly fiddle-free. You can operate it with one finger. You want to see it? O.K., Mr. Sencore, it's all yours.*

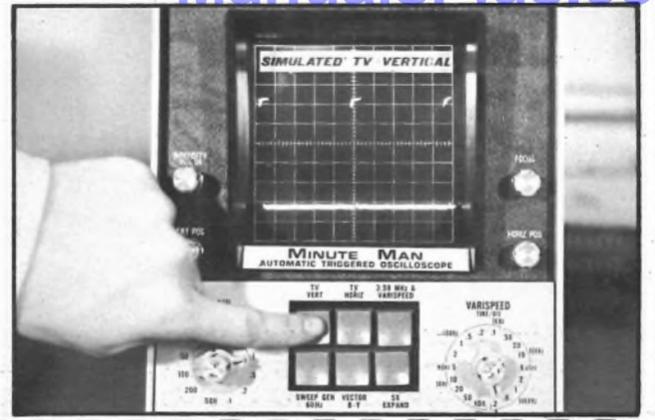
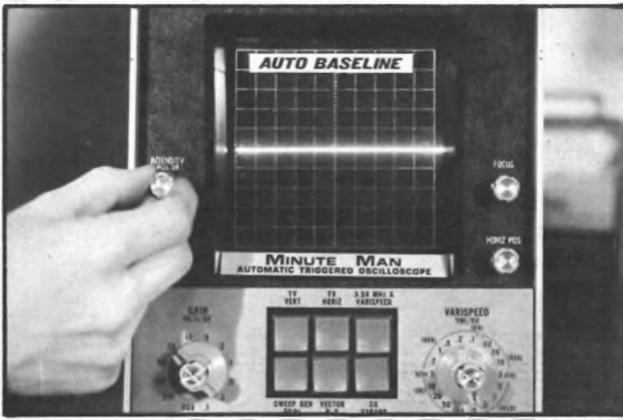


16. Charlie, that scope you have is a very good piece of equipment, but it wasn't designed for TV and video troubleshooting like Sencore's new Minute Man. You'd better get ready for this, Charlie, because this could be the greatest profit maker you'll ever see.

17. Charlie, meet the PS29 Minute Man, automatic triggered pushbutton oscilloscope. It's a pre-set, pre-"synced" video troubleshooter that eliminates all that fiddling. Each one of these buttons is pre-set to one of the key video frequencies, so you never have to calculate and dial in the waveforms. You just push. It's pre-"synced" to trigger on any video signal too, including that composite video waveform, without a trigger level control to fiddle with, like on that scope you are using. You just push the button; it's automatic.

18. What's this mean for you Charlie? It means you can troubleshoot sync problems, AGC problems, phase problems . . . you name it and you can troubleshoot it in minutes with the simple push of a button. Let's show you with this specially designed scope demonstrator. The waveforms aren't quite the same as your TV waveforms but the frequencies are the same and it gets the point across faster.

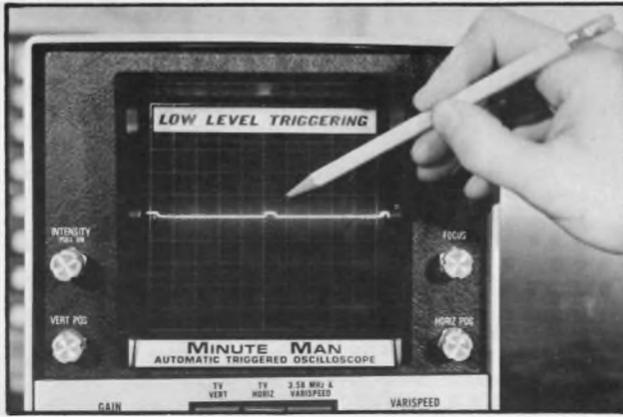
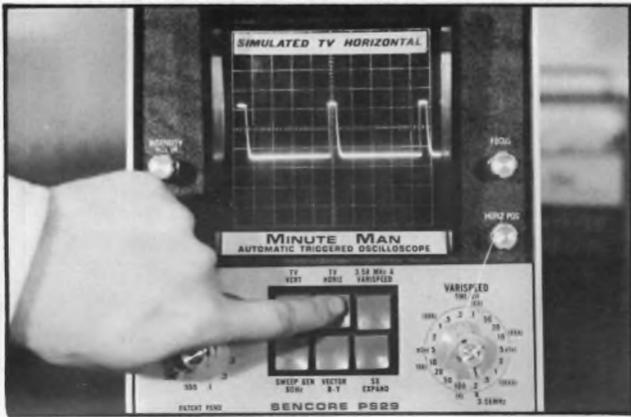
# The six video pushbuttons



19. We will double check it on your TV waveforms later. Get your pushing finger ready, Charlie, because you're going to learn fast troubleshooting with the six video pushbuttons.

20. First turn the scope on and a baseline appears on the screen. Simple? This baseline tells you that the trace is centered and can save you a lot of time searching for that signal. You know the scope is ready for a waveform right now. You don't know this on many other scopes because it requires a signal to give you that trace.

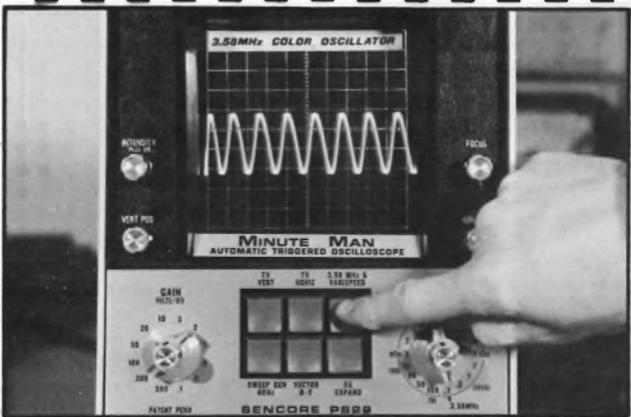
21. Let's start with the toughest waveform in a TV circuit: the TV vertical sync pulse. Just connect the probe to the test point and push the TV vertical button. It's pre-set to lock in two complete cycles of the vertical sync pulse just like you see on Sam's schematics. Hard to believe? O.K., let's go to horizontal.



22. TV horizontal is just as easy. Connect the probe to the test point and push the TV horizontal button, and two complete cycles of horizontal sync pulses lock onto the screen. If two cycles didn't show up, or it didn't look like the waveform on the schematic, you know something is wrong in the circuit and not the scope. The Minute Man really is a video troubleshooting standard that you can rely on, Charlie.

23. The only adjustment you might want to make is to change the height of the waveform. Simply adjust the gain control. It won't lose sync, even down to two tenths of a centimeter. Now that's automatic triggering at it's best.

24. That's terrific! You guys really have a scope here that was designed with guys like me in mind. It selects the frequency for two cycles, and selects the trigger level automatically, and all I have to do is push. Seems like you have the sync circuits taken care of, but what about color circuits? Do you have a color troubleshooting button?



25. Right again, Charlie. If your color goes out, the first thing you want to check is the 3.58MHz color oscillator, right? All you do is push the 3.58MHz button. You can change that frequency off 3.58MHz, if you want, for audio work and such. But you set it once, if that's what you want, and push the button. Color at your fingertips.

26. Let's go on with color. Another place to check problems is the color burst on the back porch of the horizontal pulse. Let's look at one on this TV. To be able to see this burst clearly you have to stretch it out, so we have a big 5X expand button right up front. The 5X expand comes in handy in other circuits too, and you just push.

27. What if you have color, but the complaint is poor flesh tones. The problem could be a lot of places, but you can isolate it fast with the Minute Man using this exclusive pushbutton front end vector operation. It only requires one extra lead that you connect to the front panel vector input. Just push the vector button and the vector grid automatically lights up for easy troubleshooting of the petal pattern. One lead and one button. How's that for simple and automatic? You can go all the way with the Minute Man.



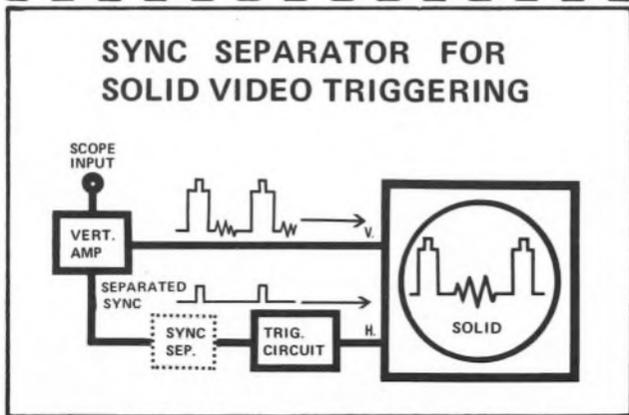
28. The Minute Man's 2 volt high gain horizontal sensitivity let's you hook right up to the input of the R-Y, G-Y, or B-Y amplifier. You can only go to the high level CRT input with other scopes, which is time consuming and restrictive in troubleshooting. The Minute Man takes only seconds to set up for vector operation. Think of the time you can save, Charlie. And all you have to do is make one extra connection and push.

29. Let's cover the last button, while we are at it. I don't think you want to turn to another scope for that all important sweep alignment work. Do you Charlie? Naturally not. So, we have added a sixth button: sweep generator. This button automatically sets the Minute Man with a 60Hz sweep that will hold that response curve steady so you can tweak the coils to the best response. You just push to set the scope up and connect your sweep and marker. Fast, isn't it? Are we unconfusing you, Charlie?

30. You bet. All I have to do is find the test point, push the button and compare it to the schematic waveforms. I can keep my mind on the circuit rather than the scope. But wait a minute. How can the Minute Man lock in those complex video waveforms so fast and solid when I couldn't do it with this \$2,000 lab scope?



ONE AUTOMATIC MODE.

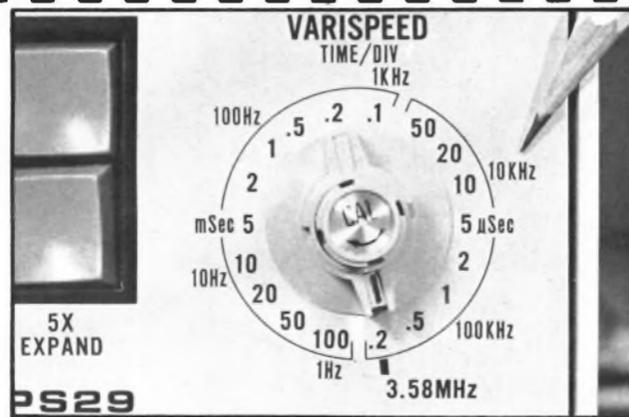
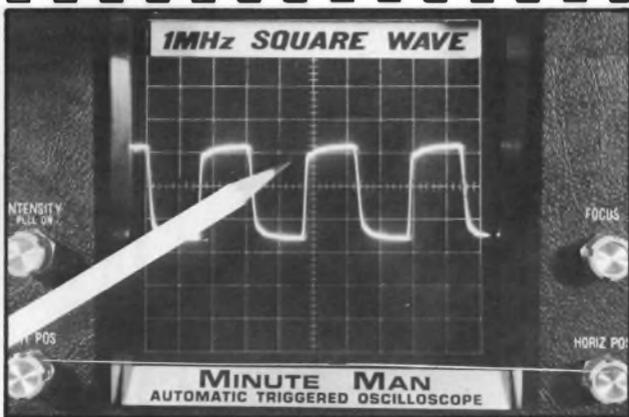


**What about non-video signals?**

31. Two big reasons, Charlie. First the Minute Man has only one automatic mode for displaying video signals. No mode controls to adjust like on that other scope. You just push for the waveform you want. The rest is automatic. That's why the Minute Man is so fast and easy to use.

32. Secondly, the Minute Man's solid triggering is backed by a built-in TV sync separator which actually separates the sync pulses just like in a TV set. That composite video waveform is tough to lock in, for both a TV and oscilloscope. That's why every TV manufactured needs a sync separator circuit to hold a stable picture. Any scope that is going to display these same video signals needs a sync separator too. That's why the Minute Man can hold the composite video when others can't.

33. Wow! A TV sync separator automatically locks in the sync pulses when you push the button. Now that's what I call a video troubleshooter. But what about non-video signals? Can I measure them too?



34. Sure can. Remember the varispeed button? When you push this button you activate the varispeed or time base control. You can dial in any frequency from DC to 10 megahertz for sharp, solid reproduction of any non-video signal.

35. This is true 10 megahertz bandwidth without any peaking coils. Look at this 1 megahertz square wave from our demonstrator. It's clean and solid. No overshooting or ringing at the top. That's true wideband performance for you.

36. Hey, remember when we came in, you were having trouble with those microseconds of time versus frequency as the schematic shows? Well here's a real time saver for you. The varispeed control is calibrated directly in frequency, too, so you can tell that you are measuring 10 kilohertz rather than 10 microseconds per division.

The all American line of innovative high quality test equipment . . . . .backed nationwide with scheduled monthly calls by Sencore factory trained tech-reps

SENCORE, 3200 SENCORE DRIVE, SIOUX FALLS, SOUTH DAKOTA 57107

**Choose From Sencore's Most Popular Instruments**

## TRANSISTOR TESTERS



PATENT PENDING  
\$150.00

### TF26 Touch Tone Cricket Transistor and FET Tester

HOP THROUGH SOLID STATE CIRCUITS IN SECONDS

- COMPLETE IN-CIRCUIT PUSHBUTTON TEST in one simple operation.
- NO SET-UP DATA or technical knowledge required. Hook leads up any way you want and push the buttons for simple GOOD - BAD readout.
- CHECKS THEM ALL - both NPN, PNP transistors and N-channel, P-channel FET's, in or out of circuit.
- SENSITIVE LEAKAGE TEST in microamps for out of circuit testing to back you up.



PATENT PENDING  
\$240.00

### TF30 Super Cricket Dynamic Transistor Analyzer

COMPLETELY ANALYZE ANY TRANSISTOR OR FET WITHOUT ANY SET-UP INFORMATION.

- IT'S A CRICKET for a proven 99.9% reliable in - circuit "GOOD - BAD" check.
- IT'S A SUPER CRICKET for exact measurements of Beta, I<sub>cbo</sub>, G<sub>m</sub>, I<sub>dss</sub> and I<sub>gss</sub> with the push of a button. No calibrating - no zeroing, no set - up information.
- LEAD IDENTIFICATION roll chart instantly tells you basing configuration.
- GUARANTEED 100% SAFE to tester, transistor and you.



PATENTED  
\$190.00

### TF166 Automatic Transistor Analyzer

A COMPLETE ANALYZER FOR ALL TRANSISTOR PARAMETERS

- AUTOMATIC PUSHBUTTON OPERATION All you do is select the button and push.
- GAIN TEST, both in and out of circuit, measured as good - bad or in Beta for transistors and G<sub>m</sub> for FET's.
- SENSITIVE LEAKAGE TEST in microamps measures I<sub>cbo</sub> in transistors and I<sub>gss</sub> in FET's.
- I<sub>dss</sub> ZERO BIAS TEST for industrial culling and power amplifier matching.
- DAMAGE PROOF: Guaranteed not to damage transistor, circuit or tester on any test.

## TUBE TESTERS



TC162  
Mighty Mite VII Tube Tester

\$140.00

MIGHTY MITE - THE WORLD'S MOST POPULAR TUBE TESTER.

- NEW PIN ELIMINATION SWITCHES eliminate normal shorts caused by internal connections.
- CHECKS MORE TUBES THAN EVER BEFORE. Pin elimination allows tubes to be tested which could not be checked before.
- FULL RATED CATHODE EMISSION TEST.
- 100 MEGOHM GRID LEAKAGE TEST.
- SENSITIVE STETHOSCOPIC SHORTS TEST.



MU150 Continental II Gm Tube Tester

\$290.00

WORLD'S ONLY TUBE ANALYZER

- TRUE MUTUAL CONDUCTANCE TEST using a 5000 Hertz square wave for true tube test.
- TWO TESTERS IN ONE. The MU150 can be used to make the Mighty Mite tests as well as mutual conductance.
- FULL RATED CATHODE EMISSION TEST.
- 100 MEGOHM GRID LEAKAGE TEST.
- SENSITIVE STETHOSCOPIC SHORTS TEST.



TC28 Hybrider Tube and Transistor Checker

PATENT PENDING

\$240.00

THE ONLY HYBRID AMPLIFIER CHECKER ON THE MARKET TODAY FOR TUBE, SOLID STATE AND HYBRID CIRCUITS

- IT'S AN AMPLIFIER CHECKER that totally equips you to troubleshoot tube, solid state or hybrid circuits.
- IT'S A MIGHTY MITE that checks over 3000 tubes, foreign and domestic.
- IT'S A CRICKET for in and out of circuit transistor and FET testing - without a set-up book.
- ONE BIG METER for all tube and transistor tests. No more indicator lights to confuse you or your customers.



**\$240.00**

## UPS164 Universal Power Supply

THE MOST RUGGED, PROTECTED POWER SUPPLY ON THE MARKET.

- **REGULATED**, low ripple supply for every servicing need.
- **MONITORS VOLTAGE AND CURRENT** at all times to speed troubleshooting and design work.
- **MONEY SAVING** current limiting on all outputs - it can even take a dead short.
- **VOLTAGE RANGES:** 6 volts to 20 amperes fixed. 12 volts to 10 amperes fixed. 0 to 35 volts variable to 2 amperes.
- **CURRENT ADJUST:** 0 to 2 amps adjustable to any in-between level. Protects supply and circuit under test.



## FE23 Little Henry FET Multimeter

**\$99.00**



## FE27 Big Henry Field Effect Multimeter

**\$175.00**

THE MOST DEPENDABLE MULTIMETERS ON THE MARKET TODAY OFFERING THESE FEATURES:

- **INDESTRUCTIBLE ACRYLIC CASE** that can withstand 10 foot drop tests.
- **FULL INTERNAL PROTECTION** to 1000V on all ranges.
- **MINIMUM CIRCUIT LOADING** with 15 megohm DC input impedance.
- **AUTOMATIC SHUTOFF** when lead storage compartment is closed. Prevents run down batteries.
- **ILLUMINATED METER** is fully protected with exclusive sliding cover.
- **ALL WITH 1.5% DC ACCURACY - 3% AC.**

### FE23 SPECIFICATIONS

5 DC VOLTAGE RANGES of 3, 30, 300, 1KV and 6KV full scale.

4 AC VOLTAGE RANGES of 3, 30, 300 1KV full scale.

4 RESISTANCE RANGES for 1K to 100 megohms full scale. 10 ohms center scale.

DC CURRENT RANGE of 0 to 1 amp full scale.

### FE27 SPECIFICATIONS

9 DC VOLTAGE RANGES from 0 to 3000 volts full scale, both positive and negative.

9 DC ZERO CENTER RANGES from .15 to 1.5KV.

8 AC RMS VOLTAGE RANGES from .3 to 1KV full scale.

8 AC PEAK-TO-PEAK RANGES from .3 to 1KV full scale.

5 RESISTANCE RANGES from 1K to 1000 megohms. 10 ohms center scale.

3 DC CURRENT RANGES of 1 milliamp, 100 milliamp and 1 amp full scale, both positive and negative.

# COMPONENT SUBSTITUTORS

## RC24 Parts Pak Caddy Component Substitutor

IT'S A TUBE CADDY JANITOR

- **PROVIDES THE MOST OFTEN USED VALUES** of resistors, capacitors and electrolytics in one small, neat handsized unit.
- **24 VALUES OF RESISTORS** from 10 ohms to 5.6 megohms. 1 watt to 5.6K, 1/2 watt over 5.6K.
- **9 CAPACITOR VALUES** 100pf to .5mfd at 600 volts.
- **ELECTROLYTICS:** 10mfd and 100 mfd at 450 volts, 1000mfd at 75 volts.



**\$38.00**

## RC167 Component Substitutor



**\$90.00**

IT'S A LEG SAVER

- **EXCLUSIVE** parts in a drawer to help you save time and leg strain.
- **24 RESISTOR VALUES** from 10 ohms to 5.6 megohms. 1 watt up to 5.6K, 1/2 watt over 5.6K.
- **10 VALUES OF CAPACITORS** from 100pf to .5mfd at 600 volts.
- **ELECTROLYTICS:** 2mfd, 5mfd, 20mfd, 50mfd, 100mfd, 200mfd at 450 volts. 500 mfd, 1000mfd and 2000mfd at 750 volts.
- **RECTIFIERS:** Universal selenium and silicon, 1/2 amp forward; 800PIV.
- **SURGE PROTECTION SWITCH** with over-voltage warning light.

# COLOR GENERATORS

## CG25 Little Huey Color Bar Generator (Digital)

**\$99.00**

- **DIGITAL TIMING** for locked in patterns that just can't bounce.
- **BIG GENERATOR FEATURES** with color adjust and channel tuning.
- **LOW POWER DRAIN** for long battery life. Automatic shutoff after 15 minutes to back you up.
- **CABLE STORAGE COMPARTMENT.** No messy cords to untangle.
- **"POCKET SIZED"** measuring the size of two 5U4 tubes.
- **PUSHBUTTON OPERATION** for fast and easy pattern selection.



## CG169 Deluxe Color King Color Bar Generator (Digital)



**\$195.00**

- **EXCLUSIVE ALL-CHANNEL TUNING** for operation in any part of the world.
  - **EXCLUSIVE TEMPERATURE CONTROL** to warm unit up on cold days or dry out moisture in humid areas.
  - **EXCLUSIVE CONVERGENCE PATTERNS.** Moveable single dot and single cross makes convergence a snap.
  - **75 OHM OUTPUT** for MATV, CATV systems, with 300 ohm balun for conventional antenna systems.
  - **100% DIGITAL** for Rock Solid patterns.
- ONLY ALL-CHANNEL, ALL-WEATHER DIGITAL COLOR GENERATOR.

STANDARD RCA LICENSED PATTERNS

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.



**FE21**  
4 1/2"  
Hi/Lo  
FET  
Multimeter

**\$140.00**

NOW . . . MEASURE RESISTANCES IN CIRCUIT IN SOLID STATE DEVICES WITH THESE HI-LO FIELD EFFECT MULTIMETERS.

- **LOW POWER OHMS** using .08 volts to make in-circuit resistance measurements accurately. Allows you to use latest Howard Sams service information. Sams specifies it, only Sencore has it.
- **HIGH POWER OHMS** for routine resistance measurements and to check front-to-back ratios of diodes. Meters would not be complete with low power ohms only.
- **ONE-TENTH VOLT FULL SCALE** sensitivity on both AC and DC voltage. A must when servicing in solid state circuits with critical low voltage biases.
- **PROTECTED TO 1000 TIMES OVER-LOAD.** A truly burnout proof multimeter. Tested in production with 1,000 volts on .1 volt range. Multimeter resistors protected by



**FE20**  
6" Portable Hi/Lo  
Field Effect Meter

**\$175.00**

.6 amp fuse to save these valuable and expensive components. No more trips to factory when you accidentally measure volts on ohms range.

**SPECIFICATIONS  
FE20 AND FE21**

- 9 DC Voltage ranges from .1 to 1000 volts full scale.
- 3 High Voltage ranges of 3, 10, and 30KV
- 9 DC Zero Center ranges from .05 to 500 volts
- 9 AC Peak-to-Peak ranges from .28 to 2800 volts
- 9 DC Current ranges from 100 microamps to 1 amp full scale



**FE160**  
Senior  
Hi/Lo  
Field  
Effect  
Meter

**\$195.00**

7 Hi and Lo Power ohms ranges from 1000 ohms to 1000 megohms.

**FE160**

- 10 DC Voltage ranges from .1 to 3000 volts full scale
- 10 DC Zero Center ranges from .05 to 1500 volts
- 9 AC Voltage ranges from .1 to 1000 volts
- 9 AC Peak-to-Peak ranges from .28 to 2800 volts
- 10 DC current ranges from 30 microamps to 3 amps full scale
- 8 Hi Power ohms ranges from 600 ohms to 6000 megohms
- 7 Lo Power ohms ranges from 600 ohms to 600 megohms

## TIME SAVING INSTRUMENTS

### SS137 Sweep Circuit Analyzer

ALL SIGNALS NECESSARY FOR TROUBLESHOOTING HORIZONTAL AND VERTICAL SWEEP CIRCUITS.



**\$150.00**

- **HORIZONTAL OSCILLATOR** substitutes directly for any horizontal signal.
- **VERTICAL OSCILLATOR** for direct substitution of any vertical signal.
- **HORIZONTAL YOKE** substitutes directly for horizontal deflection yoke.
- **VERTICAL OUTPUT SIGNAL** for direct substitution.
- **FLYBACK DYNAMIC TEST** determines capability of horizontal output transformer.

### FS134 Portable Field Strength Meter

- **HIGHLY SENSITIVE** all the way down to 30 microvolts.
- **COMPLETE COVERAGE** of all VHF, UHF, and FM bands.
- **STANDARD REFERENCE** of zero DBJ. 1000 microvolts into 75 ohms for CATV and MATV work.
- **ACCURATELY CALIBRATED** in microvolts for direct signal strength reading, 3DB VHF and FM, 6DB UHF.
- **COMPLETELY PORTABLE** to go where you need it without extension cords.
- **BOTH 75 AND 300 ohm inputs.**



**\$275.00**

EQUIP YOURSELF FOR CATV, MATV AND ADDITIONAL ANTENNA WORK.

## STEREO ANALYZER

KICK OUT THOSE TIME CONSUMING TOUGH DOG STEREO'S IN MINUTES WITH THE . . . . .

### SG165 AM-FM Stereo Analyzer

ONLY COMPLETE STEREO ANALYZER WITH SPECS BETTER THAN YOUR FM STATION.

PATENT PENDING

**\$495.00**



- **12 SIGNALS** that you need to completely service every stage of any FM, FM stereo or AM receiver.
- **CHECKS EVERY STAGE OF** a receiver, from antenna to speaker, with a complete front to back check, all from a single output cable.
- **SWEEP AND MARKER** for alignment and IF band width check.
- **PATENT PENDING** phase - locked 19KHz pilot guarantees you are aligning to a signal identical to your station.
- **FM RF COVERAGE:** 86 to 110 Megahertz; unmodulated, MPX or 400Hz sine modulation.
- **AM RF COVERAGE:** 525 to 1625 Kilo-hertz; unmodulated or 400Hz sine modulation.
- **FM IF COVERAGE:** 10.7 Megahertz crystal controlled CW, MPX or 400Hz sine modulation.
- **AM IF COVERAGE:** 262 or 455 Kilo-hertz; unmodulated or 400Hz sine modulation.
- **FM IF SWEEP:** 10.7MHz fixed with markers at 10.7, 10.6, and 10.8MHz.
- **MARKER INJECTION:** Post injection method with two simple leads; from detector and to scope.
- **MULTIPLEX SIGNAL:** FCC regular stereo or IHF (institute of high fidelity) modulation.
- **SUBSCRIPTION SIGNAL:** 67 Kilo-hertz SCA signal for setting traps.
- **AUDIO SIGNALS:** 400Hz square and sine for final amplifier distortion test.
- **DUAL MONITORING METERS** for a constant check on outputs of each stereo channel separately.
- **METERS:** 3 1/2" D'Arsonval calibrated from 0 to -40DB, 0 to 10 watts, and 0 to 100 watts.
- **OUTPUTS:** RF, IF sweep and audio . . . all one common cable.
- **SPEAKER DUMMY LOADS:** Speaker direct, 4, 8, 16 and 32 ohms switchable for receiver being tested. Up to 100 watts for testing purposes.

## CRT TESTER

### CR168 Big Mack Automatic CRT Tester



PATENTED

**\$240.00**

IT'S YOUR NUMBER ONE  
CUSTOMER CONVINCER

- TESTS THEM ALL including new RCA 1100 color tube, the thin neck, in line tubes and the 17" Japanese Trinitron.
- PATENTED AUTOMATIC TRACKING: You simply read tracking on the big meter after making emission tests.
- COMPUTER MEMORY CIRCUITS store CRT information for the tracking test.
- LARGE 7 INCH METER with easy to read "GOOD-BAD" test that convinces your customer "she" needs a new CRT.
- SAFE REJUVENATION with RC timed voltages. Takes all the guesswork and hazard out of rejuvenation.

## SWEEP-MARKER EQUIPMENT

### SM158 Speed Aligner Sweep and Marker Generator

- SWEEP OUTPUT: Chroma, IF, or RF with front panel fine tuning.
- CRYSTAL CONTROLLED MARKERS for alignment accuracy.
- 15 MEGAHERTZ SWEEP WIDTH to cover the entire IF band.
- PUSHBUTTON MARKERS for the 8 most often used IF frequencies: 39.75, 41.25, 41.67, 42.17, 42.67, 44.25, 45.75, 47.25. Trap and carrier markers listed right on front panel. 3.08, 3.58, 4.08, and 4.5MHz for chroma.
- HORIZONTAL MARKERS available at the flip of a switch.
- 2 EXTRA RF CHANNELS to assure interference-free response curves on RF - 4RF channels in all.



**\$275.00**

THE INDUSTRY'S EASIEST TO USE SWEEP AND MARKER.

### BE156 7-in-1 D.C. Bias Supply

- 3 SEPARATE SUPPLIES for fast alignment work.
- NEGATIVE AND POSITIVE SUPPLIES for both tube and solid state work.
- NEGATIVE 75 VOLTS for sets requiring high negative bias in chroma amplifiers.

**\$29.95**



PROVIDES THE BIAS YOU NEED  
FOR ANY SET - IN ANY STAGE.

## OSCILLOSCOPES

### PS148 Wide Band Oscilloscope/Vectorscope **\$295.00**



THE FIRST REALLY COMPLETE  
SERVICE SCOPE - IT'S A WORKHORSE.

- WIDE BAND 10Hz to 6MHz  $\pm$  6DB.
- HIGH SENSITIVITY 17mv RMS per inch.
- HIGH INPUT IMPEDANCE 27 megohms shunted by 11pf low cap.
- SEVEN THOUSAND VOLT input rating with low cap probe, not 600 volts like other scopes.
- DIRECT VERTICAL PEAK - TO - PEAK VOLTAGE READING with input controls calibrated directly in volts p-p.
- CONVERTS TO PROFESSIONAL VECTORSCOPE with the flip of a switch. A truly complete scope with this feature.
- FULL RANGE HORIZONTAL SWEEP frequencies from 5Hz to 500KHz in five overlapping ranges.
- POSITIVE SYNC with variable control locks complex waveforms with triggered ease.
- EXTERNAL INPUTS for sync, sweep, Z axis and direct connections to deflection plates. Form 999P

### PS29 Minute Man Automatic Triggered Pushbutton Scope



PATENT

PENDING

**\$495.00**

- IT'S A PRE-SET PRE-"SYNCED" PUSH-BUTTON TROUBLESHOOTER. YOU JUST PUSH A BUTTON FOR . . . . .
- TV VERTICAL and TV HORIZONTAL backed by built-in TV sync separators for positive sync automatically.
- 3.58 COLOR and 5X EXPAND instantly isolates troubles in color oscillator circuits with an expanded look of single waveforms for more accurate analyzing.
- VECTOR PATTERNS with high sensitivity and low phase shift for fast, accurate color demodulation work.
- SWEEP GENERATOR automatically establishes a 60Hz line sweep for response curves in sweep alignment work.
- PLUS - IT'S A GENERAL PURPOSE BROADBAND SCOPE  
True DC to 10MHz bandwidth.  
High sensitivity down to 10 millivolts/div.  
Full sweep capabilities from .2 microseconds to .1 sec per div.  
Exclusive 5KV - (AC) input protection using 10X probe.

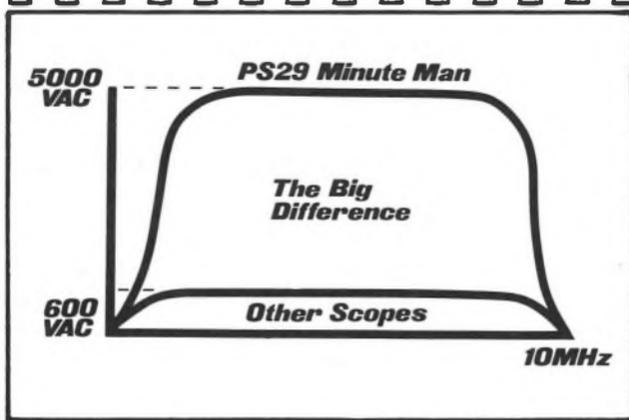
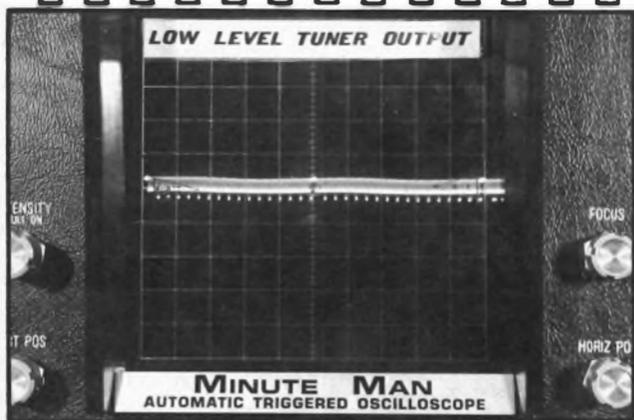
### PS163 Dual Trace Triggered Scope

**\$695.00**



LAB SPECIFICATIONS THAT COMPARE  
TO SCOPES COSTING 3 TIMES AS  
MUCH.

- PHASE-LOCKED MATCHED CHANNELS allow you to compare simultaneous waveforms with less than 1% phase shift between channels at any setting of the controls.
- TRIGGERED SCOPE with absolute positive sync, backed by built-in TV sync separators.
- TRUE SERVICE SCOPE with 8MHz bandwidth and 5mV/div. sensitivity on both channels.
- EXCLUSIVE 5KV INPUT PROTECTION. No blown front ends and trips back to the factory for this scope.
- VERSATILITY with pushbutton selection of free running, manual or automatic triggering, AC or DC coupled.
- PUSHBUTTON VECTORSCOPE: High sensitivity, direct hookup from front of scope.



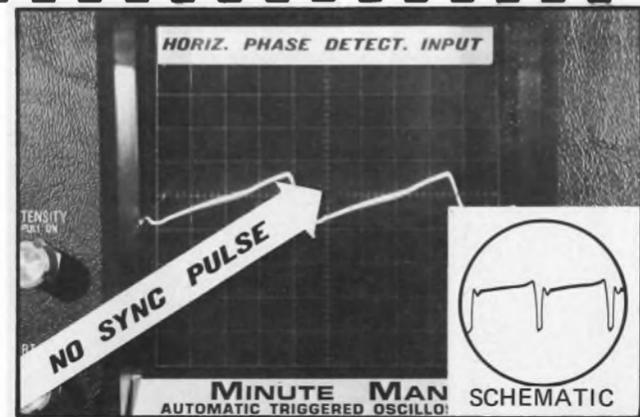
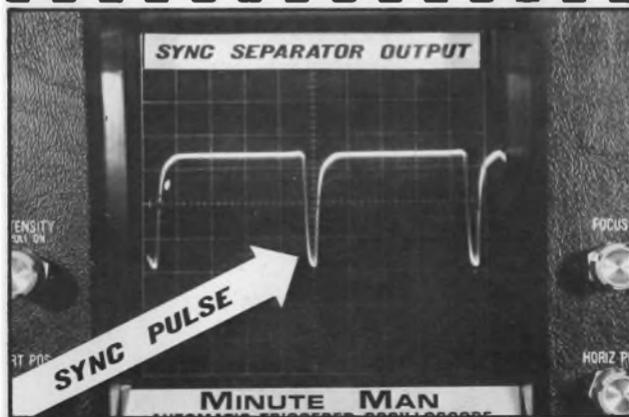
**The MINUTE MAN  
in actual  
circuit application**

37. The Minute Man takes you all the way, Charlie. It keeps on working in those very low level voltage circuits, too, with 10 millivolt per division sensitivity that let's you measure even tuner output directly using a demodulator probe. You can go all the way down to DC voltages if you want because the Minute Man is both AC and DC coupled. You can use it to troubleshoot solid state circuits, just like you would with a DC meter because it measures DC voltages too.

38. You might think that a sensitive scope like this would be restricted to low level voltages. Not the Minute Man. The special 5000VAC input protection enables you to look at any TV waveform. Most other 10 megahertz scopes only take you up to 600 volts. Now that's the big difference that lets you measure even boost voltage in a TV set without worrying about blowing the front end of the scope. We think this is a real plus and it is exclusive with Sencore.

39. It really sounds too good to be true, you guys. But the proof is in the performance. Let's see some actual circuit application. If you can troubleshoot this horizontal sync problem I have here, I'll be impressed plus get Mrs. Jones off my back.

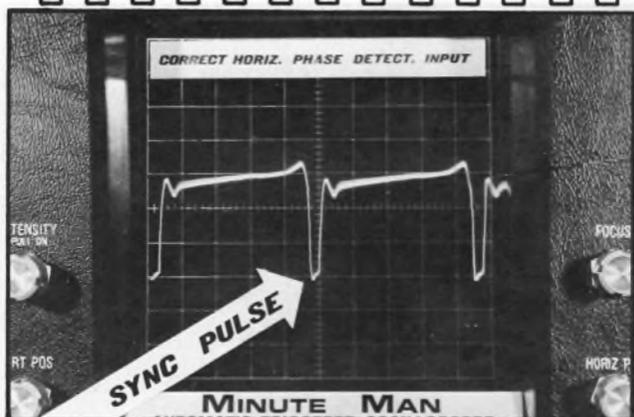
Okay, Charlie. If the sync pulses are on the composite video signal, you're probably losing your sync in the sync circuit. We can isolate this problem in a minute.



40. We'll start at the output of the video detector to check the composite video signal. Hook the lead to the test point and push TV horizontal. Two complete cycles of the composite video lock onto the scope face. It looks just like the schematic drawing with the sync pulses present, so we'll move onto the sync separator output.

41. Change the test point and two cycles of horizontal sync pulses lock onto the screen. The sync pulses are present so our problem must be further down the line. Let's move to the input of the horizontal phase detector.

42. The scope is still set for TV horizontal, so all we have to do is change the test point. Hey, look at this. The two cycles of the waveform we see on the scope are different from the test point waveforms shown on the schematic. The darned sync pulses are missing. Our problem is between these last two stages, no doubt.



43. C515 is the only element between these two stages. A quick check shows us the sync is present on one side of the capacitor and not the other. Replace it, Charlie, and let's have another look. What do you think?

Hey, that did it.

44. I'm impressed. I get the point. You've been here less than a half hour and you talked half of that time. Sure, I see why you call it the Minute Man. Why, with these six pushbuttons I believe I can double the output of my bench TV repair, almost immediately. But more than that, I can take on other video repair jobs around town. I am passing up that profitable business now.

45. MATV, CATV, the closed circuit TV's at the high school, home video tape systems, the TV stations in town and maybe even the video equipment at the hospital. Somebody has to service this stuff. Why not me? They are all based on the same video frequencies, aren't they?



TEN DAY FREE TRIAL



46. You bet, Charlie . . . the same exact frequencies to guarantee that the Minute Man will give you the answers you need in any video circuit. Want to try one, Charlie? Your Sencore FLPD distributor will let you keep this Minute Man on a ten day free trial if you want. If the Minute Man doesn't do everything that I just told you it would, return it after the ten days. Sencore stands behind their claims 100 percent. What do you say?

47. I couldn't pass a deal like that up fellas. You know, with our economy being what it is today, I've got more service than I can handle. If I can keep up, this could be a record year for me. If not, I'll have disgruntled customers who may even start going over to other shops, and I can't afford that.

48. I believe I could keep up and even expand my business with the Minute Man. It will save me time, labor and money. And the best thing is, all I have to do is push. Thanks fellas, you've made my day and maybe even my year.



49. Well, that's the story. Charlie bought that Minute Man and so did the school, the industrial design engineer and the other dealer we called on that day. The Minute Man did just what we said it would do and paid for itself the first month for Charlie. He was going to put on another man but found he didn't need him. He needed the Minute Man, but didn't know it.

50. Your participating Sencore FLPD distributor has a PS29 Minute Man ready for you to take on a 10 day free trial too. Why not pick one up and see if you too can't punch out those profits with your fingers and this PS29 Minute Man, automatic triggered pushbutton oscilloscope. It is the only scope ever designed exclusively for video service - and all you do is push.

## SENCORE

The all American line of innovative high quality test equipment . . . . .

. . . backed nationwide with scheduled monthly calls by Sencore factory trained Tech-Reps.

Sold through Sencore FLPD\* distributors.  
\* Full Line Promotional Distributor.

## THE PS29 MINUTE MAN SPECIFICATIONS

### VERTICAL SPECS

#### ALL SIGNAL SENSITIVITY

.1 volt per division to 500 volts per division in 12 calibrated ranges with supplied 10:1 low capacity probe.

.01 volt per division to 50 volts per division direct input. Continuously variable between ranges.

#### BANDWIDTH

DC to 8MHz within -3db; -4db at 10MHz; Triggering to 15MHz at 4 division deflection. 45 nanosecond risetime. Negligible overshoot: Less than 1%.

#### ACCURATE VERTICAL CALIBRATION

± 5% vertical input calibration. Typically 3% on all ranges.

#### INPUT PROTECTION

5KV peak-to-peak AC, 1KV DC through supplied 10:1 Lo Cap probe.

#### HIGH INPUT IMPEDANCE

10 Megohms shunted by 11pf using low capacity probe.  
1 Megohm shunted by 35pf at input.

### HORIZONTAL SPECS

#### AUTOMATIC TRIGGERING

Triggers solidly and automatically on any signal above ½ division on scope graticule. Automatic baseline in absence of trigger input signal to insure you that scope is adjusted properly and working.

#### PUSHBUTTON VIDEO SELECTION

TV Vertical and TV Horizontal sweep settings with built-in sync separator to prevent any video jitter.

#### CALIBRATED VARISPEED

.2 microsec per division to .1 sec per division in 18 calibrated ranges. Continuously variable between ranges. Also calibrated in frequency for easy conversion. ± 5% calibration. Typically 3%.

#### PUSHBUTTON 5X EXPAND

Expand any horizontal deflection by 5 times with accurate ± 5% calibration.

#### EASY SWEEP ALIGNMENT

60Hz horizontal sweep switched in with the push of a button. Automatic with any line swept commercial sweep generator. Easily phase adjusted to your sweep generator with exclusive front end screw driver type phase set control.

#### PUSHBUTTON VECTORSCOPE

Used with External Horizontal input (B-Y), plus regular vertical input (R-Y). Full front end amplification with two ranges of 2 volts per division or 20 volts per division uncalibrated. External Horizontal input impedance of 1 megohm shunted by 40pf. Horizontal bandwidth to 1MHz within -3db. Less than 1% phase shift.

### GENERAL

#### REAR ACCESS

Z Axis Input Sensitivity: 5V peak-to-peak input for visible modulation.

Sweep output: 15V peak-to-peak sawtooth at horizontal sweep rate obtained from rear access banana plug. Convenient for

testing flyback transformers and yokes. AC coupled for protection.

#### BRIGHT CRT DISPLAY

Shielded 5UP1 flat face 5" round CRT, with P1 phosphor. 2000 volt regulated supply. DC coupled unblanking of CRT.

#### ILLUMINATED 10 cm X 10 cm GRATICULE.

Makes for easy viewing and serves as pilot light. Special vector grid lights when vector button is pushed for more accurate phase comparison. Speeds color TV service.

#### EASY VIEW TILT STANDS

Spring returned under both front and rear of scope for best viewing on bench or equipment shelf.

#### POWER

105 - 130 VAC, 50 - 60Hz, only 60 watts.  
All solid state instant on. Restricted by CRT filament only.

#### SIZE: 8" X 10½" X 16"

Less than 1 inch bigger than cramped horizontal models but oh so much more roomy and easier to use.

#### WEIGHT: 25 pounds

#### ACCESSORIES

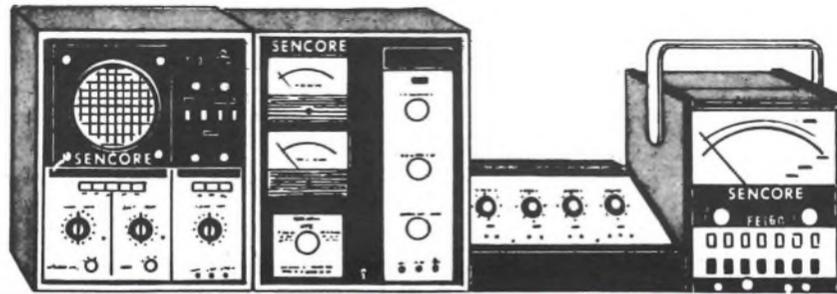
Lo Cap Probe: 39G80, molded 10X probe, 5KV rating (included with unit)

Demodulator Probe: 39G81, ordered from factory service department (not supplied).

BNC to Phono Connector: 39G47 used to connect PS29 to SM158 Sweep/Marker Generator.



Bob Baum



Norm Pedersen

**BOB AND NORM'S**

**SHOP**

- SERVICE TIPS
- SHORT CUTS

This is the first in a series of three business articles dealing with several of the basic economic questions many people in the service industry are confronting today.

In this article we take a close look at test equipment as being an answer to greater profits in the '70s as we answer the question, "Does test equipment cost or pay?"

(This editorial is a reprint from the June, 1973, issue of the Sencore News. All costs and prices have been updated to reflect the current market values.)

How many times have you said to yourself or your distributor salesman, "I sure would like to have that new piece of Sencore equipment but I can't afford to buy it?" What you probably should have said is "I can't afford to be without it!"

The Electronic Industries Association (EIA), made up of all the electronic manufacturers in the United States, has coined a phrase very appropriate for this topic. "You are already paying for the equipment you don't have." You may not believe this statement, so let's take a closer look at what the equipment you don't have is really costing you.

To make an intelligent analysis of costs, we must first establish some basis for comparisons. We will work with a shop labor charge

of \$12.00 per hour, an 8 hour work day, and 220 working days per year. These are figures which seem to hit the average across the nation.

If you have not analyzed your costs recently, you may be in for a big surprise. For example, every minute of your technician's time spent at the bench is worth 20 cents. That's a labor cost of one cent for every 3 seconds! If you have a technician tapping the bench, trying to determine the problem with a receiver because he doesn't have the equipment to help him, every three taps is one cent lost - down the drain! All other expenses continue while the technician is non-productive.

Consider a technician working on the new AM-FM Stereo receivers or solid state and modular color sets. He can lose as much as 18 minutes every hour if his equipment is not up to date enough to help him locate the problem. Meters that won't measure the low voltages accurately, a scope that won't display the color waveforms properly, or a complete lack of equipment to analyze faults in a stereo receiver can all contribute to this lost time and money. Using a figure of 18 minutes an hour wasted (70% efficiency), this amounts to a labor waste of \$3.60 an hour or \$28.80 that you could have "invoiced out", each day. In one year, over \$6,000 will be wasted because of the lack of test equipment. This is lost profit - a direct cost to you. This amount of money would

Direct dollar loss due to lack of test equipment	Our example	Figures for your shop
Shop labor charge per hour	\$12.00	
Times average efficiency loss of technician without proper or up-to-date test equipment (Bench tapping time) 100% - estimated efficiency (100% - 70%=30% efficiency loss)	.30	
Loss per hour	3.60	
Times working hours in day	8	
Loss per day	28.80	
Times working days in year	220	
Lost income per year without proper test equipment	\$6336.00	
Times number of technicians employed	1	
Grand total of cost of equipment you don't have	\$6336.00	
Compare to cost of one each of every instrument in Sencore line.	\$5880.90	
Compare to cost per year of one each of every instrument in Sencore line (written off over 4 years)	\$1470.23	

EFFECT ON INCOME OF ADDING NEEDED TEST EQUIPMENT

Equipment investment	PS163	\$695.00	
	FE160	195.00	
	SG165	495.00	
Total investment		\$1385.00	
Cost per year, written off over 4 years		346.25	
Cost per day (220 working days)		1.57	1.57
ADDITIONAL INCOME CREATED BY IMPROVED EFFICIENCY			
Efficiency improvement (productive time)		12 minutes/hr.	
Time improvement X labor cost per minute (12 minutes X .20 (based on labor rate of 12.00))		.20 2.40/hr.	
Additional income per day (savings/hr X hours) (2.40 X 8)		X8 19.20	
Additional income per year (daily increase X days) (19.20 X (220))		X220 \$4224.00	\$4224.00
ADDITIONAL DAILY INCOME VS DAILY COST (19.20/1.57 times 100)			
Return on investment		1223%	1223%

buy one of every item in the Sencore line with cash to spare the first year.

IRS allows test equipment to be written off over a four year period, so you would actually have only one fourth the total equipment investment each year for four years. This \$6,000 annual loss would now pay for one of every Sencore instrument over a four year period with \$4,500 to spare each year.

Let us see what changes would result if the technician were supplied with the latest equipment. We will consider the addition of only 3 items, an FE160 Field Effect Multimeter, a PS163 Dual Trace Scope, and the SG165 AM-FM Stereo Analyzer. We have purposely picked 3 of the most expensive items in the line to point out that even expensive equipment can pay for itself quickly.

Because the technician can now measure low voltages accurately, make accurate waveform measurements and comparisons, and have at his fingertips every signal he needs to troubleshoot that stereo receiver, his time will be productive. We recognize all the equipment in the world will not make him 100% efficient, so let us consider that his efficiency improves to the point that he is tapping the bench for only one-third the amount of time as before. Two thirds of that \$28.80 per day loss now becomes in-

come. This amounts to an additional income of \$19.20 per day, or \$4,224 per year. This amount of additional income will allow you to buy all the remaining items in the Sencore line PLUS take a nice vacation!

Now it is time that we have a look to see what kind of costs we would have to get this increased income. First of all, test equipment should be considered an investment, not an expense. The equity you have in the equipment will increase your net worth. What is the cost of your investment per year? Probably a lot less than you realize.

The investment involved in our example is \$1385. You should be writing your test equipment off for tax purposes over a four year period. If you are not now doing this, you are cheating yourself on your tax returns. Written off over four years, your investment is \$346.25 per year. This is only \$1.57 per day! Your return is \$19.20 per day on the \$1.57 investment. That's a return on investment of over 1220%! You can't even hope to do that well on the stock market, if you hit big!

There are other factors which will improve the investment return which we haven't even considered in our example. Better customer relations, less call backs, and additional business should be a direct result of the increased efficiency and service capa-

bility. These business building factors can easily be seen. Probably the biggest additional benefit of the new test equipment will be greater technical knowledge on the part of you and your technicians. Electronics training is basically on theory. The real understanding of electronics comes from practical application of the theory. When you or your technicians can observe waveforms

properly, make accurate voltage measurements, and walk through a receiver stage by stage to determine what is actually taking place, you are obtaining a real knowledge of the field of electronics. This greater understanding and knowledge leads to higher and higher efficiency. **This is knowledge and efficiency that only good test equipment can give you.**

Let's look at the figures again. Without proper, up-to-date test equipment you may be losing over \$6,000 in income each year per man. By making an investment of as little as \$1.57 per day, you can increase your present income over \$4,224. In addition you and your technicians are becoming more knowledgeable and skilled in your profession. Can you really afford to go

without the needed test equipment? Consider this question very carefully, because you are already paying for the equipment, whether you have it or not!

The 2nd article in this series is titled, "Equipment or Man" appearing in the next edition of the Sencore News.

## SENCORE IS DEDICATED TO SERVICE SIX FACTORY SERVICE CENTERS TO SERVE YOU BETTER

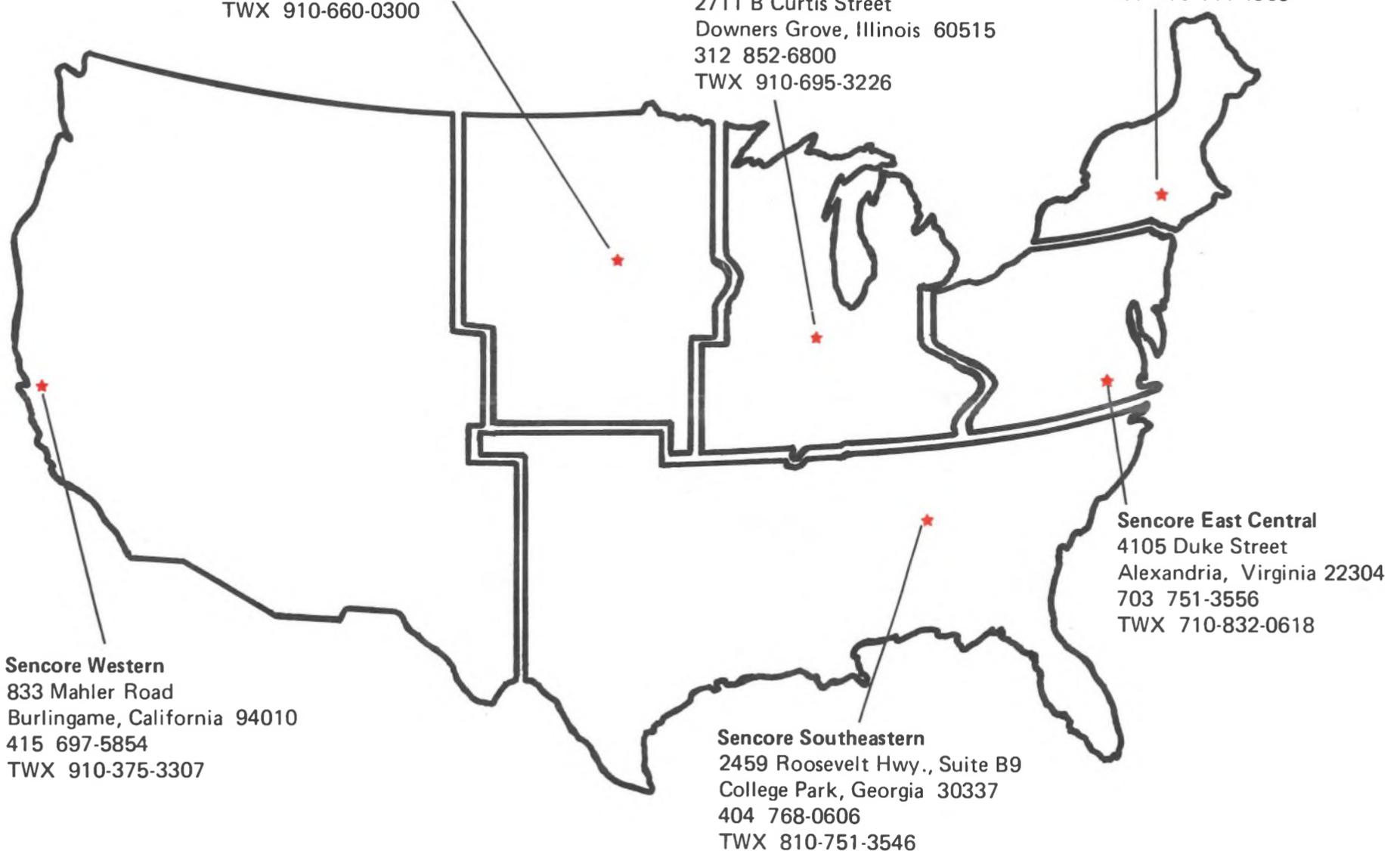
Each of our service centers is there to serve your every need. Each is fully equipped with parts, instruction books and other service data, is staffed with a field engineer on duty to help you with your technical problems, a service department for instant service, (should you need it), and a customer service gal to be sure your requests are followed through.

Each station is TWX connected to the main factory in Sioux Falls. Call the service center in your area when you need help or have a question, or contact your local Sencore FLPD (Full Line Promotional Distributor). You will get the right answer.

**Sencore Factory**  
3200 Sencore Drive  
Sioux Falls, South Dakota 57107  
605 339-0100  
TWX 910-660-0300

**Sencore Central**  
2711 B Curtis Street  
Downers Grove, Illinois 60515  
312 852-6800  
TWX 910-695-3226

**Sencore Northeastern**  
1593 H Central Avenue  
Albany, New York 12205  
518 869-0996  
TWX 710-444-4969



Check with your nearest Sencore Full Line Promotional Distributor for more information on the entire Sencore line of high quality test equipment.

### **Special 10 day free trial offer;**

Prove the speed and dependability of the Minute Man to yourself, by trying one on your own bench for a 10 day free trial. Just complete the coupon below and mail to: Sencore Customer Service Dept. 3200 Sencore Drive Sioux Falls, South Dakota 57107

I have read about the instrument explained in this Sencore News, Model \_\_\_\_\_ . I'm interested in trying this instrument. Please have your nearest FLPD distributor bring one to me so that I may try it. I understand Sencore has no refurbish-

ing charges if I should damage it in any way while I am trying it. No charges will be made back to the distributor either, and Sencore does all they can to recommend that distributors offer a 10 day trial.

Name \_\_\_\_\_  
Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_  
Phone \_\_\_\_\_

The Sencore News is written, edited, and published by the Field Engineering Department of Sencore, Inc., 3200 Sencore Drive, Sioux Falls, South Dakota, 57107. The Sencore News is distributed without charge to all individuals or companies who have registered the purchase of any Sencore instrument by means of the warranty card packed with that instrument. The information herein has been taken from one or more sources which we consider reliable. Although such information has been carefully prepared, we make no representations as to its accuracy or completeness. Prices and specifications are subject to change without notice.

# STEP UP TO THE PS163 DUAL TRACE TRIGGERED SWEEP OSCILLOSCOPE....

**They call it the good scope for school, lab and shop.**

**Compare cost to performance...**

- WITH COMPETITIVELY PRICED SCOPES AND YOU WILL CHOOSE THE PS163 ON PERFORMANCE.
- WITH SCOPES COSTING 3 TIMES AS MUCH AND YOU WILL AGREE THE PS163 GIVES YOU LAB ACCURACY WITH ONLY 1% PHASE SHIFT BETWEEN CHANNELS AND AT 1/3 THE COST.



**\$695**

(PRICE INCLUDES BOTH LO-CAP, HIGH VOLTAGE PROBES, WITH 5KV RATING, COSTING \$50 IF ORDERED SEPARATELY.)

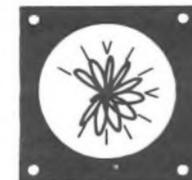
## 6 big reasons why the PS163 belongs on your bench



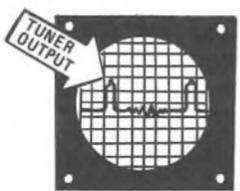
PHASE LOCKED MATCHED CHANNELS ALLOW YOU TO COMPARE ANY SIMULTANEOUS WAVEFORMS WITHIN 1% LAB ACCURACY. THAT'S PERFORMANCE!



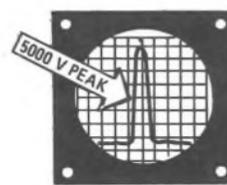
TRUE BANDWIDTH USING NO PEAKING COILS OR OTHER GIMMICKS TO CAUSE RINGING OR SIGNAL DISTORTION. NOW YOU CAN VIEW CLEAN WAVEFORMS FROM DC TO 8MHz IN THE SCHOOL, LAB, OR SHOP.



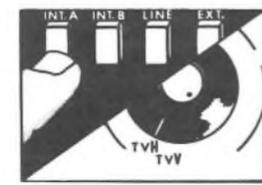
IT'S A VECTORSCOPE WITH A SIMPLE FRONT PANEL PUSHBUTTON CONTROL. MATCHED GAIN IN X AND Y AMPLIFIERS PROVIDE HIGH SENSITIVITY FOR COLOR DEMODULATION AND INSTRUCTIVE PHASE SHIFT PATTERNS. ALL FRONT PANEL HOOK UP FOR SPEED AND CONVENIENCE.



HIGH SENSITIVITY DOWN TO 5 MILLIVOLTS PER CENTIMETER. AS AN EXAMPLE, YOU NOW CAN READ TELEVISION TUNER OUTPUT DIRECTLY FROM IF JACK USING DEMODULATOR PROBE IN SERVICE WORK. THAT'S LABORATORY SENSITIVITY IN A SERVICE SCOPE.



IT'S PROTECTED UP TO 5000V AC A REAL BENEFIT TO INSTRUCTORS CONCERNED ABOUT STUDENT USE AND TO SERVICE TECHS WHO NO LONGER NEED TO WORRY ABOUT BRUSHING AGAINST THE 5KV OFF THE HORIZONTAL PLATE OF A TV SET. SAVES YOU FROM NEEDLESS DOWNTIME YOU EXPERIENCE WITH OTHER SCOPES RATED AT ONLY 600V. THE PS163 TAKES YOU ALL THE WAY.



TIME SAVING INSTANT MODE SELECTION FOR MANUAL, FREE RUNNING, OR AUTOMATIC TRIGGERED SWEEP WITH SELECTABLE A OR B CHANNEL TRIGGERING.

TV VERTICAL AND TV HORIZONTAL SWEEP SETTINGS WITH SYNC SEPARATOR STABILITY. THE PS163 WILL LOCK IN THAT HARD-TO-HOLD COMPOSITE VIDEO WAVEFORM WHEN LAB SCOPES COSTING 3 TIMES AS MUCH WON'T.

### KEY SPECIFICATIONS

**Vertical Input** (both amplifiers): Sensitivity: .005 volt per centimeter of deflection. Accuracy: 2 percent.

**Vertical Amplifier Frequency Response** (both amplifiers): DC to 8 Megahertz within 3DB. Usable to 15MHz.

**Vertical Amplifier Breakdown Voltage** (both channels): 5,000 volts AC. 1000 volts DC with low cap probe.

**Horizontal Sweep Speed:** Triggered: .1 microsecond per cm to .1 second per cm in 19 overlapping ranges. Free Running: 1 Hertz to 1 Megahertz, overlapping. Accuracy: 2 percent.

**Synchronization:** Free Running, manual or automatic triggered. Synchronized to either input, line or external.

**Vertical Input Calibrator:** Built-in for both channels.

**Display Capability:** Either channel, alternating between channels or chopped mode of switching between channels.

**Vectorscope:** Direct from front of scope. High sensitivity: .005 volt per cm to 50V per cm direct. .05V per cm to 500V per cm using low cap probe. Frequency response: -3 DB from 0 to 7MHz.

**Sync Separators:** Additional TV vertical and horizontal sweep settings provide correct time base to view vertical and horizontal frames of waveforms.

**Power:** 105-130 volts, 60Hz AC, 60 watts. Solid state, regulated, instant-on.

**Mechanical Description:** Black vinyl case with aluminum panel and trim. 12" x 10" x 15". 30 pounds.

**Accessories:** Lo-Cap Probe: 39G34, 10X probe with 5KV rating (supplied with unit)  
Demodulator Probe: 39G41 (not supplied) BNC to Phono Connector: 39G47 for use in connecting PS163 to SM158 Sweep/Marker Generator. (not supplied)

**TEN DAY FREE TRIAL**

ASK YOUR LOCAL PARTICIPATING SENCORE FLPD DISTRIBUTOR FOR A PS163 FACTORY BACKED 10 DAY FREE TRIAL OR CALL THE LOCAL SENCORE REGIONAL SALES AND SERVICE OFFICE IN YOUR AREA

featured  
next  
month

**NOW - COMPLETELY ANALYZE ANY TRANSISTOR OR FET. . IN SECONDS**  
WITHOUT ANY KNOWLEDGE ABOUT THE TRANSISTOR WHEN YOU START

ManualsPlus.com

WITH THE  
UNBELIEVABLE

# TF30 SUPER CRICKET

DYNAMIC TRANSISTOR/FET ANALYZER



## NOW YOU CAN GO ALL THE WAY . . . AUTOMATICALLY

**1st IT'S A PROVEN CRICKET FOR FAST IN-CIRCUIT TROUBLESHOOTING . . WITHOUT SET-UP INFORMATION**



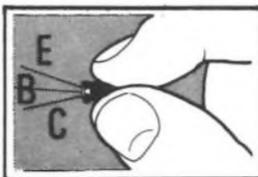
Connect the leads in any order and push the six big buttons for the 99.9% reliable patent pending "Good - Bad" CRICKET test. It even chirps to tell you a transistor is good. The CRICKET has become an industry standard with 20,000 in use the first year. But now you can go all the way.

**2nd IT'S A PARAMETER TESTER FOR COMPLETE TRANSISTOR AND FET ANALYZING . . .**



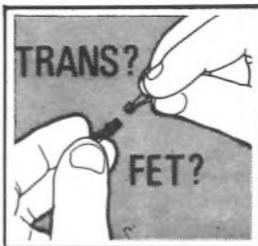
Simply rotate the function knob and push for a true AC gain test or an accurate DC leakage check, including Beta,  $I_{cbo}$ ,  $G_m$ ,  $I_{gss}$  and  $I_{dss}$  needed in matching transistor pairs, selecting replacement parts, back up leakage checks, industrial culling, lab design and many others. All without a set-up book. (A reference book is supplied as a guide only.) No zeroing or calibration. It's automatic!

**3rd IT IDENTIFIES ALL THREE LEADS FOR COMPLETE BASING INFORMATION . . .**

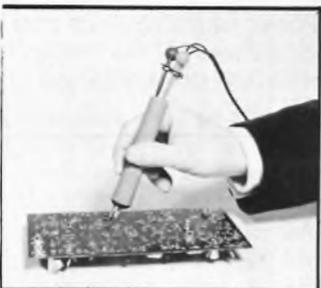


Dial in the number on the front panel roll chart for the CRICKET button used in the gain test and read the complete basing information for the transistor under test — not just the base lead that other testers indicate, but all three — you'll never need a set-up book again.

**4th IT WILL EVEN TELL YOU WHETHER YOU'RE TESTING A TRANSISTOR OR FET**



What if you're not sure whether you have a transistor or FET? Use this Super Cricket quick check: Simply measure the gain on FET - GATE 1. If you get a gain — it's an FET. If no gain — it's a transistor. (Works for all transistors except seldom used enhancement FET's and germanium types. If you suspect one of these types, the reference book backs you up for 100% accuracy.)



**ONLY \$240**  
PATENT PENDING

Touch test P.C. board probe included with Super Cricket for fast in-circuit checks. . . .

# THE UNBELIEVABLE TF30 SUPER CRICKET

## IT'S A SOLID STATE COMMUNICATOR

NOW AVAILABLE AT YOUR NEAREST FLPD DISTRIBUTOR

FORM 998SN