

"HOW TO" WITH INSTRUMENTS THRU PIX FACTS

**CR168  
BIG MACK  
UNIVERSAL  
CRT TESTER**

# SENCORE NEWS

FIELD ENGINEERING REPORT FOR JUNE, 1973

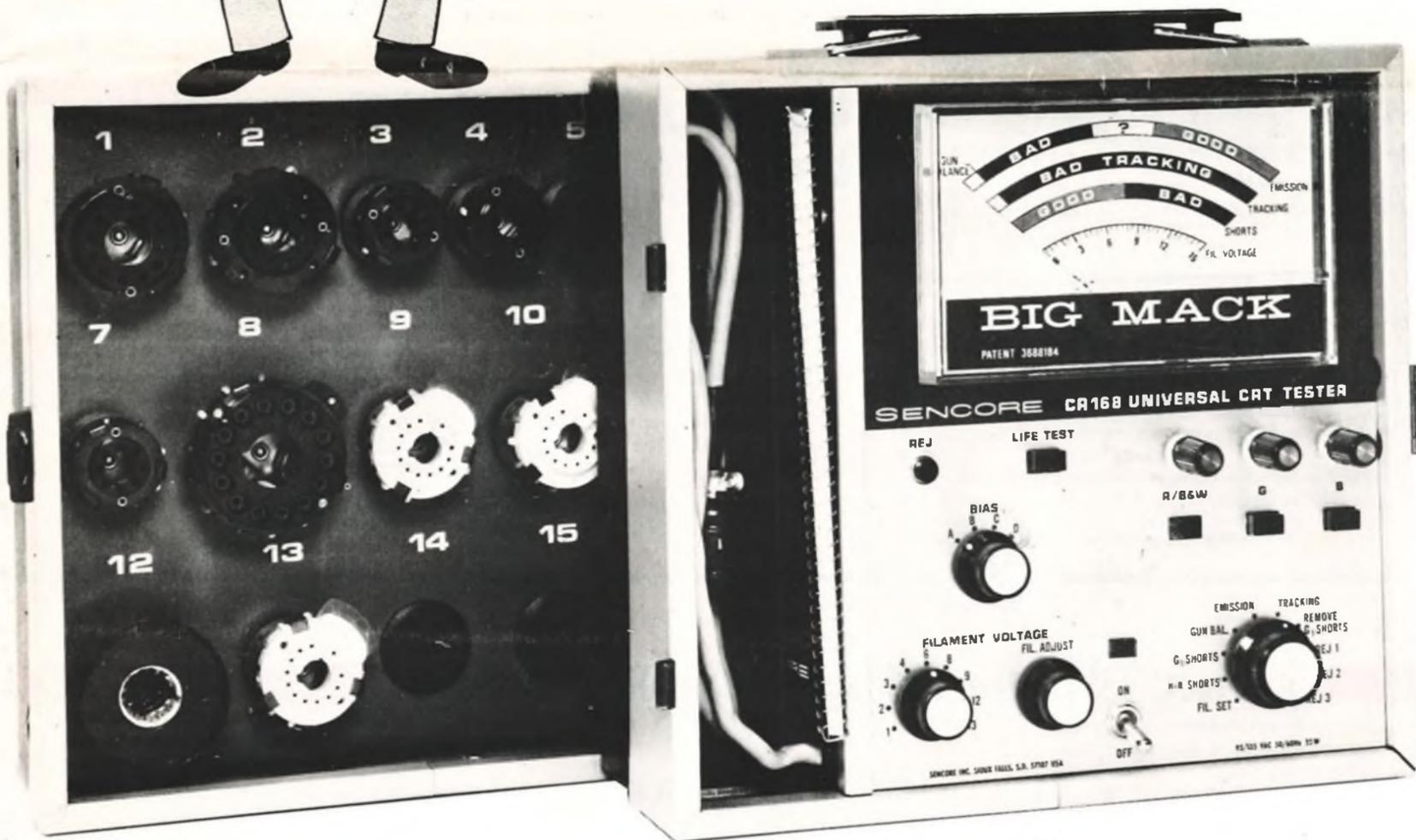
**BIG MACK WILL GET  
THAT CUSTOMER  
OFF YOUR BACK**



REPLACEABLE  
SOCKETS

AUTO-TRACKING

*He's your No. 1  
Customer Convincer!*



*Lowest Price Going  
\$195*

*add up the cost of  
competitor's sockets  
and you'll see why.*



**EVERY TEST ON MY METER**

BIG MACK IS THE ONLY CRT TESTER THAT SHOWS YOUR CUSTOMER EVERY TEST RIGHT ON THE METER. He convinces them and makes money for you. Gosh how you hate to be wrong on diagnosing a \$160 color tube as bad when its not. You never get the CRT back if you have BIG MACK.



**I'M OBSOLETE PROOF**

BIG MACK IS OBSOLETE-PROOF. New exclusive plug-in low cost sockets available if tubes are announced. Price even includes certificates for next two sockets free (if they are announced). ONLY BIG MACK HAS IT. Protects your investment too.



**I'M AUTOMATIC**

NO TIME CONSUMING CALCULATIONS OR METER COMPARISONS ON BIG MACK. Just flip a switch and gun tracking is read automatically. ONLY BIG MACK WILL EVER HAVE IT. THAT'S WHY IT'S PATENTED.



**I TEST 'EM ALL**

BIG MACK TESTS THEM ALL, LARGE AND SMALL, DOMESTIC AND FOREIGN. Big Mack is the only CRT tester that tests B&W, tri-color and Trinitron with one simple patented feature.

# introduction



**NORM PEDERSEN**  
CHIEF FIELD ENGINEER

The main reason that any of us are in business is to make a living for ourselves and our families. Your business, and ours, must be profitable to make our life what we want it to be. Yet, you are probably walking right past profits every day.

The biggest profit item in the servicing business is the CRT replacement, especially color tubes. The feature instrument this month, CR168 Big Mack Universal CRT Tester, has been designed to help you cash in on even bigger CRT sales. Follow along with us as we look at some of the problems you can run into, and see how Big Mack can be your "Customer Convincer" to land those big CRT sales.



## BIG MACK-"YOUR CUSTOMER CONVINCER"

INDIVIDUAL, LOW-COST, REPLACEABLE SOCKET ADAPTERS TO HELP YOU SAVE DOLLARS.

EASY TO USE, TABBED SET UP BOOK TO MAKE YOUR TESTING FASTER.

PATENTED AUTOMATIC TRACKING TEST TO MAKE THE ALL-IMPORTANT COLOR TRACKING TEST WITH THE FLIP OF A SWITCH - A REAL CUSTOMER CONVINCER.

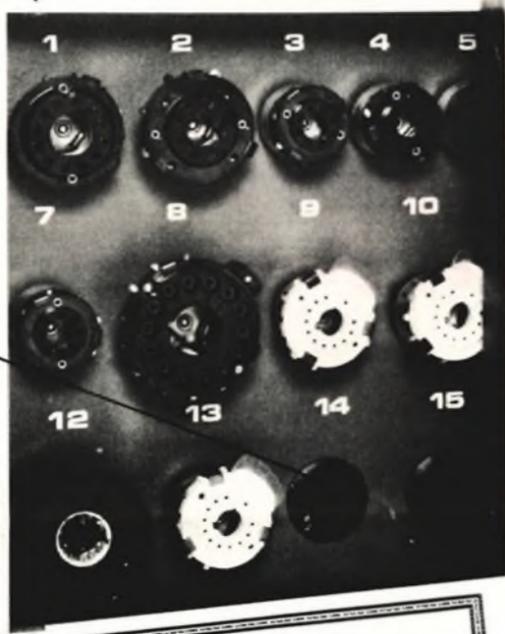
BIG, COLOR CODED METER WITH EVERY TEST SHOWN ON GOOD - BAD SCALES TO CONVINCHE YOUR CUSTOMERS.

ROOMY, NUMBERED SOCKET COMPARTMENT TO END WASTED TIME SEARCHING FOR THE SOCKET YOU NEED.

ADD-A-SOCKET FEATURE TO KEEP YOU UP-TO-DATE.

EVERY SOCKET YOU NEED, INCLUDING NEW RCA 110°, 17" TRINITRON, AND ALL G.E. IN-LINES - YOU CAN TEST THEM ALL WITHOUT "OPTIONAL" SOCKETS.

FREE SOCKET CERTIFICATES FOR NEXT TWO ADAPTER SOCKETS, IF ANNOUNCED, TO PROTECT YOUR INVESTMENT.



**CERTIFICATE**  
Good for CR168 BIG MACK  
CRT Adapter Socket No. 15, if and when announced.  
From socket adapter, simply fill

**CERTIFICATE**  
Good for CR168 BIG MACK  
CRT Adapter Socket No. 14, if and when announced.  
To receive your free socket adapter, simply fill in the information below and mail to:

Sencore National Service Office  
3200 Sencore Drive  
Sioux Falls, South Dakota 57107  
A/C 605 338-0100

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY, STATE, ZIP CODE \_\_\_\_\_  
CR168 SERIAL NUMBER \_\_\_\_\_

Form 750



FOUR LEVEL, ZENER REGULATED BIAS VOLTAGES FOR CORRECT BIAS ON EVERY TUBE TESTED.

METERED FILAMENT ADJUSTMENT FOR ACCURATE TESTS EVERY TIME, ANYWHERE.

SINGLE, SIMPLIFIED TEST FOR ALL TUBES - STANDARD TRI-GUN COLOR, TRINITRONS, OR BLACK AND WHITE. SAVES YOU TIME ON EVERY CALL.

PUSHBUTTON GUN SELECTION FOR FAST TUBE TESTING.

SAFE, TIMED REJUVENATION TO RESTORE TUBES WHEN THE CUSTOMER IS SHORT ON CASH.

INDIVIDUAL G2 ADJUSTMENTS TO TEST THE TUBE "LIKE IT IS STILL IN THE SET".



## Big Mack Takes the CRT Sales Load Off Your Back

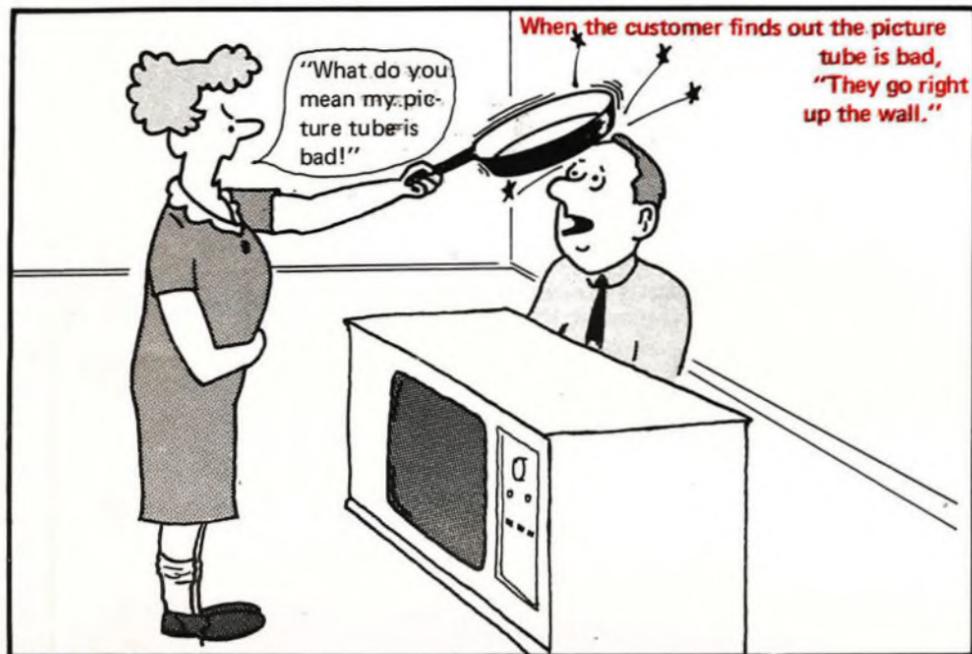
Servicing involves more than just technical knowledge about the unit to be serviced. Most service managers place as much importance on customer relations and the sales aspects of servicing, as they do on the technical ability of the people hired to do the actual electronics work. This emphasis on factors other than technical background is justifiably important. Most shops rely on repeat business from their customers as their main source of income. It should be quite obvious that good customer relations, therefore, is an integral part of the success or lack of success of a service organization. Now, what about sales?

Your first thought may be that sales has little place in a service oriented business. In reality, sales psychology is as important as any other part of the service business. When you walk into the customer's house, you must gain the confidence of the customer if you are going to earn their repeat business. This is selling. You are selling yourself, your technical knowledge, your

equipment, your service guarantee and many other items. After finding the problem with the unit being serviced, you are again faced with a sales situation. You must now sell the customer on the repair of the unit, whatever the problem may be. If it is a tube or transistor that you can replace in the home, the sales job is easy. If the set must be taken to the shop, the job becomes more difficult and requires a better presentation. The toughest job for most television service technicians is selling the picture tube replacement. The customer is faced with a substantial expenditure to have the tube replaced and the sales job is much more difficult. Let us see if we can illustrate more clearly the point we are trying to make.

Mrs. Smith calls you to check her 25" color set and complains, "Everything is purple." You arrive at the house and the first question she asks as you walk in the door is, "Is my picture tube bad?" You reassure her that many other things could cause the symptoms she describes and proceed with your

service checks. When the set is turned on, it is immediately evident that the problem could be a bad picture tube. You remove the back, make the necessary checks to eliminate all the other possibilities, all the time bracing yourself for the task of explaining that the problem is the picture tube, if it should turn out to be bad. Everything else is eliminated and you check the CRT. Open green gun. The worst has come. Here is how hundreds of technicians have expressed the situation: "You literally sweat blood while trying to come up with some foolproof method of breaking the news to the customer." After mulling all the possible facts, you come up with the very original statement, "Ah. . . . Mrs. Smith, your picture tube IS bad." This is followed by a few seconds of absolute silence and then the statement soaks in.



"The customer goes right up the wall!" After all, losing the picture tube in their television receiver is as big a loss to many of your customers as losing their best friend. When something happens to that picture tube, it is a personal tragedy. You are now faced with the biggest selling job of them all. You must find some way to calm the customer down so you can explain to them the reasons why the replacement is necessary. How do you get them calmed down so you can make the sale? Here is where Big Mack comes to your rescue.

Big Mack can take over for you and get the customer off your back! He has been designed to provide you a means of calming the customer down and pointing out exactly what has caused the failure of their dearest friend. Big Mack will show the customer every fault that can occur with the CRT, right on the big meter, with simple good-bad scales that the customer can understand. Even the shorts and leakage tests, and the all-important color tracking test for color CRT's, are shown on good-bad meter scales for easy interpretation. No more blinking lights or calculations to explain to your customer. They can see it all in terms they can understand.



## Big Mack "Customer Convincer" Increases CRT Sales & Profits

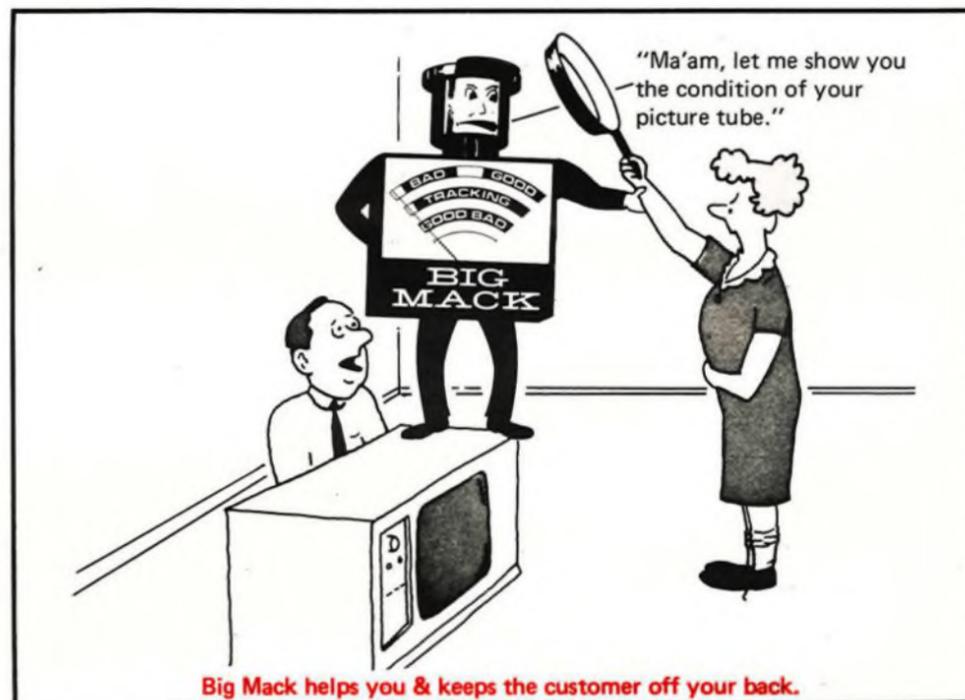
We have all faced the situation of "breaking the news gently" to a customer about the big repair bill necessary to get the set back in operation. Most of us would have to think a few minutes before WE okayed repairs that would amount to \$100 to \$175, plus labor and service call. Here are a couple of things that may happen or may have happened to you in the past.

You have checked the television receiver and the picture tube is bad. It's a color set, so we are looking at well over a hundred dollars, possibly two hundred for the newer tubes, to make the replacement. You inform the customer, lady of the house, that the picture tube is the problem and the approximate cost of the replacement. She says that she must first talk to her husband, and will then give you a call. The sale is half lost already. When her husband gets home that evening she tells him the good news. He asks her for the details about the situation and she simply tells him that you told her the tube was bad. Hubby decides that this is too big an expense to just go on someone's word so he has his wife call another technician to double check the diagnosis. When the second technician comes up with the same results, he will undoubtedly be the one to get the business. You have walked right past a profitable sale!

Second possibility. You have the customer observe the test results with you while checking the tube. The meter is so small that the customer has to get down on her hands and knees to see what is going on. If the tube is shorted, you have to cup your hands around the shorts lights to show her that there is a light there, and then explain the best you can what the light means. Or the color tracking is bad and you show her an impressive sheet of calculations or a chart to point out this fact for her. She still has to talk to her husband and can say nothing other than the fact that you did show her something with a tester and explained that this was an indication that the tube is bad. Tough sale.

Big Mack is so simple to operate that you may want to have the customer make the test themselves, to be sure they see and understand the problem. If they can check the tube themselves and find it bad, they will be convinced that it does need replacement.

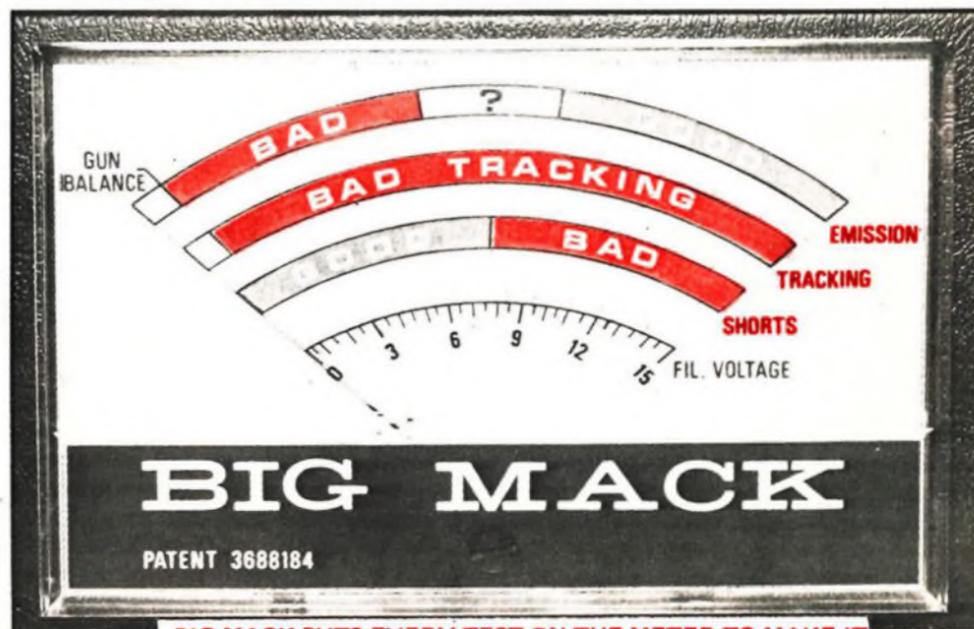
Big Mack won't let you down when you really need him either. He is equipped with 13 individual sockets to test every color or black and white tube you will need to test. But that's not all! To make sure you are never left out on a limb alone, Big Mack also gives you 2 socket certificates to make sure you have available any new sockets that are needed to test new tubes, should they be announced. Best of all, the new sockets are provided FREE; you don't have to increase your investment one dollar to check the new tubes. Big Mack will test them all, test them right, and will do it with a simplified, patented test to save you time. Big Mack does it all to take the customer off your back and increase your service profits. Now, let's see what would happen if Big Mack takes over to help you make that CRT sale, and still keep the customer calm.



"Mrs. Smith, why don't we both follow along as Big Mack tests your picture tube? That way we can both find out whether it is bad or not." Then go through the simplified test with Big Mack and your customer. When the problem does show up, Big Mack is the one doing the testing and selling, taking the customer through a simple step by step analysis of the tube. The customer can see and understand the results, merely by observing the Good - Bad scales on the big Big Mack meter, and is convinced that the tube is bad. Big Mack does the work for you, and the customer is confident that the decision they make about the picture tube replacement is correct. You gain the sale without having the customer "climb the wall" and customer confidence in your service is raised to a new level.

There is an easier way and it is called Big Mack.

Big Mack has a big, color keyed meter that shows every test in simple Good-Bad terms that your customer can understand. All tests are on the meter, too, so you don't have to make calculations, look at charts, or explain the feeble blinking glow of a neon bulb.



**BIG MACK PUTS EVERY TEST ON THE METER TO MAKE IT EASY FOR YOU TO CONVINCE YOUR CUSTOMER.**

Here are the customer convincing tests shown on the meter to help you make and keep that sale.

1. Heater to Cathode shorts. Shown clearly on color coded GOOD - BAD SHORTS scale. It is a separate test too, so you don't have to try to figure out what is shorted and what gun is involved.
2. Cathode to G1 shorts. Another separate shorts test shown on the color coded Good-Bad SHORTS scale on the meter.
3. Emission test. Big color keyed scale on top of the meter showing Good - ? - Bad to point out exact condition to your customer.
4. Color tracking. Only Big Mack has the all-important color tracking test made automatically by means of a computer-type memory circuit with a simple Good - Bad meter scale. The automatic tracking test is patented too, so only Sencore can give you this big customer convincing feature.

In addition, the filament voltage for each tube is set on a clearly marked meter scale so you know every test is right, regardless of line voltage or filament current of the tube. Compare these customer convincing test indicators to any other CRT tester and see why we call Big Mack "Your Customer Convincer".

No complex technical scales, no need for comparisons or calculations, no blinking lights and just one BIG, easy to read meter for all tests. Put this together with a test simple enough for your customer to perform and you have a real sales tool working for you. Sure, the customer will have to check with her husband, but when she tells him that she checked the tube herself with Big Mack and that it definitely needs to be replaced, you have another salesman on your side. . . and you will keep the sale! For bigger CRT sales and profits, let Big Mack get into your sales act.

## CRT Tester Comparison Chart

FEATURE OR SPECIFICATION	SENCORE CR168 BIG MACK	BRAND R	BRAND B
Simple customer convincing test procedure.	YES Single test procedure for all tubes.	NO General test for most tubes, 2 additional tests for One gun and In-Line tubes.	NO 8 step test procedure in technical terms.
Large, customer convincing, color keyed meter.	YES 7" Color-keyed meter with 3 Good-Bad scales, 1 filament adjust scale.	NO 3 small meters with combined scales. No good or bad indications.	NO One small meter with 8 separate scales. Good-Bad for emission only.
All needed socket adapters applied.	YES 13 individual socket adapters plus two free socket certificates.	NO 4 socket adapter harnesses supplied, others optional.	NO 3 socket adapter harnesses provided, others optional.
Number of tubes tested (based on information in set up book).	Over 1950 tubes listed and tested.	Over 1800 tubes listed - less than 1700 can be tested with adapters supplied.	1900 tubes listed. Requires additional adapters for several tubes.
Checks Trinitron and new In-Line color tubes.	YES Sockets supplied for GE In-Line and Trinitron tubes. Free certificates included for new adapters when announced.	NO Sockets not supplied for GE In-Line RCA In-Line or Trinitron. No listing for standard 7 pin base.	NO Sockets not supplied for GE In-Line, RCA In-Line or new 17" Trinitron.
Checks import tubes	YES 364 import types listed and sockets provided.	YES Additional adapters needed to test 14% of imports listed. No adapter listed for some 7 pin miniature bases.	YES Additional adapters needed to test several tubes.
Automatic Tracking test with Good-Bad meter readout.	YES U. S. Patent Number 3,688,184	Requires chart or calculations to determine tracking.	NO Requires meter comparisons for tracking test.
Rejuvenation	YES Sencore's proven safe, effective, timed RC rejuvenation.	YES RC timed rejuvenation 200% over rating on filament for Rej. High.	YES RC timed for Rej. 1 and 2 - Direct, untimed power supply output for Rej. 3
Operating ease	Single 10 position function control, simplified test with automatic test readout. Pushbutton gun selectors with individual controls for filament, bias & G2 adjustments.	One five position switch, 8 push-buttons, 6 additional controls and switches.	12 position switch, 8 controls.
Bias	4 position, bias switch with zener regulated supply.	3 position slide switch for G1 and G2 voltages.	Variable - only 2 bias voltages recommended for testing.
Life test	Single pushbutton test.	Complex test using up to 7 controls.	Reduce filament setting.
Lead and socket storage compartment.	Lid storage with numbered holders for each adapter socket, 3 extra holders provided. Separate lead compartment in unit.	Single compartment with bulky harness type adapters. Insufficient room for all adapters.	Single compartment for leads and adapters. Bulky harness type adapters.
Price with all adapters.	\$195.00 including two free socket certificates, (minimum value \$10.00)	\$206.50 (\$169.00 plus \$37.50 for adapters.) Not including standard 7 pin or 7 pin miniature sockets.	\$161.75 (\$139.95 plus \$21.80 for adapters, not including RCA In-Line or 17" Trinitron.)
Rugged, unbreakable vinyl-clad steel case.	YES	NO	NO
Five year rust proof guarantee.	YES	NO	NO

Comparison chart based on information published by manufacturers and is believed to be accurate and reliable.

SENCORE NEWS



# Big Mack Tests Them All, He Won't Let You Down

## You Won't Ever Feel Like an A... Again in Front of Your Customer

It started as a beautiful day; bright, sunny and mild. A good day to play a round of golf. But, business is calling so you trot off on your calls for the day.

"Lovely day for a drive," you think as you spend the first 35 minutes driving across town. First stop is a complaint of a poor picture on a GE color set. You pick up your caddy and tube testers and walk up to the door, ready to do battle. You knock on the door, introduce yourself, and exchange pleasantries with the lady of the house as you are shown to the sick TV.

When you turn the set on, you see why the picture is poor. . . it is so dark that it can hardly be seen. It gets lighter as the set warms up but, at best, is very poor. "We'll make some money today," you think as you see a picture tube job in front of you. "Ma'am, I can't be sure until I check it, but it looks like it could be the picture tube," as you start bracing the customer for the bad news. "Let's check that first, just to be sure." You remove the set back and grab your trusty picture tube tester. You look up the tube, GE 15MP22 in the set-up book and it gives you the filament setting and socket to use. Then it dawns on you. That socket is optional and you never got around to ordering it!

The customer is peering over the set watching the proceedings as you gradually turn pale and become ill. "I can't even check the tube to confirm the problem to the customer. What do I do now?" You fumble around for a bit and finally make some excuse to take the set to the shop to "test the special color tube used in this receiver." By now your customer is beginning to wonder what is going on.

You have just made a fool of yourself, or rather your picture tube tester has made a fool out of you. Instead of helping you with your work, it has given you a tremendous set-back. Will you trust it to do the job for you on the next call, or the next? Well, not really. You have lost confidence in the tester and won't feel really secure in using it. It is time to think about getting something different that you can trust and rely on.



Big Mack tests them all, and he won't let you down when you need him to help you find the problem or make the sale. Big Mack comes equipped with 13 individual sockets, neatly stored right in the cover, so you can test any tube that you run across. This includes the GE in-line color tubes, the RCA 110 degree "slim-line" color tubes, both the older Trinitrons and the new 17" Trinitron, plus all the foreign and domestic black and white tubes. Big Mack has them all, with no optional sockets you must buy to make the tester complete. The socket adapters are all numbered, and store away neatly in numbered holders in the cover for quick location of the one you need. You won't be wasting time hunting through a bunch of bulky socket harnesses, tangled up in a small storage compartment, trying to find the one you need (Continued on page 11)

### BIG MACK TESTS THEM ALL

Standard 12 pin Black & White

Standard 14 pin 70° Color

\*Small Screen Trinitron

\*R.C.A. 110° Spline Base

All Sockets and Holders Numbered for Easy Location

PLUS Two Free Socket Certificates Included for Next Two Socket Adapters if announced.

\*Standard 7 pin Black & White

Standard 8 pin Black & White

\*Miniature 7 pin Black & White for imports

\*14 pin 90° G.E. In-Line

3 Extra Socket Holders for Up-dating

\*New 17" Trinitron

Standard 14 pin 90° Color

\*These sockets are supplied with Big Mack and are optional at extra cost, as much as \$37.50, with other CRT testers.

## Editorial - Does Test Equipment Cost or Pay

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 buy one of every item in the Sencore line with over \$1500 to spare.

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.	\$4495.00	

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 income. This amounts to an additional income

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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.

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 \$1295. 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 \$323.75 per year. This is only \$1.47 per day! Your return is \$19.20 per day on the \$1.47 investment. **That's a return on investment of over 1370%!** You can't even hope to do that well on the stock market, if you hit big!

EFFECT ON INCOME OF ADDING NEEDED TEST EQUIPMENT		
Equipment investment	PS163 FE160 SG165	\$650.00 195.00 450.00
Total investment		\$1295.00
Cost per year, written off over 4 years		323.75
Cost per day (220 working days)		1.47
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 22) (220)		x220 \$4224.00
ADDITIONAL DAILY INCOME VS DAILY COST (19.20/1.40 times 100)		
Return on investment		1370%

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 capability. 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 \$1.47 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!

### SENCORE REGIONAL OFFICES:

Central West Sales & Service  
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Sioux Falls, South Dakota 57107  
605 339-0100

Western Coast Sales  
833 Mahler Road  
Burlingame, California 94010  
415 697-5854

Northeastern Sales & Service  
1593H Central Avenue  
Albany, New York 12205  
581 869-0996

Central Sales & Service  
2711 B Curtis Street  
Downers Grove, Illinois 60515  
312 852-6800

East Central Sales & Service  
4105 Duke Street  
Alexandria, Virginia 22304  
703 751-3556

Southeastern Sales & Service  
2459 Roosevelt Hwy Suite B-9  
College Park Ga. 30337  
404 768-0606

# SENCORE

THE ONLY COMPLETE TEST EQUIPMENT LINE THAT IS  
**ALL AMERICAN MADE**

CHOOSE FROM SENCORE'S 21 MOST POPULAR INSTRUMENTS

## CRT TESTER

### BIG MACK



## UNIVERSAL CRT TESTER

YOUR AUTOMATIC COLOR PICTURE TUBE SALESMAN

**CR168 \$195.00**

- **SIMPLIFIED OPERATION** with just one test procedure for all tubes. So simple your customer can see the results on the big 7" color keyed meter. A real customer convincer.
- **NEW INDIVIDUAL SOCKETS** with special storage compartment in the cover. Includes new sockets for RCA 110<sup>0</sup> and 17" Trinitron color tubes. Only Big Mack has them.
- **FREE SOCKET CERTIFICATES** included to keep your Big Mack right up to date without additional investment. Just send in the certificates when new sockets are announced.
- **PATENTED AUTOMATIC COLOR TRACKING TEST.** Computer memory circuit simplifies the test and gives the color CRT a complete test without calculations. Only Sencore has it.
- **FILAMENT VOLTAGE AND SHORTS TEST READ RIGHT ON THE METER.** No more confusing lights or misleading test results.
- **SAFE, TIMED REJUVENATION** for those instances when your customer can't make an immediate purchase of a new tube. Keeps the customer on your side.
- **NEW QUICK REFERENCE SET UP BOOK** with tabbed indexing to help you find the tube information fast.

## STEREO ANALYZER

### AM-FM STEREO ANALYZER

**SG165 \$450.00**

THE ONLY INSTRUMENT THAT PRODUCES ALL 12 SIGNALS YOU NEED FOR COMPLETE STEREO SERVICING



- **AM and FM RF OUTPUT** variable over full range of both FM and AM broadcast frequencies for complete RF troubleshooting.
- **AM and FM IF OUTPUT**, modulated or unmodulated for any alignment or troubleshooting need.
- **FM IF SWEEP AND MARKER GENERATOR** to do the complete job.
- **COMPLETE STEREO GENERATOR** with MPX output available on both FM RF and IF, plus composite stereo output without carrier for direct injection. High level outputs provided for IHF tests.
- **AUDIO GENERATOR** producing 400Hz sine and square wave signals for amplifier troubleshooting.
- **SEPARATION METERS AND SPEAKER SUBSTITUTE** - Meters tell at a glance the operation of the MPX decoder. High wattage dummy speaker loads eliminate that annoying howl in the shop.

## COLOR GENERATORS

### Little Huey DIGITAL COLOR BAR GENERATOR

THE WORLD'S SMALLEST BUT PERFORMS LIKE A GIANT.

**CG25 \$99.00**



- **REMARKABLE BREAKTHROUGH!** Only battery operated digital color generator on the market. New low drain IC's assure shelf life from battery.
- **100% DIGITAL TIMING** with crystal controlled stability. No more pattern bounce or weave - ever!
- **ROCK SOLID PATTERNS** and flawless performance at any temperature, whether it's Artic cold or Desert heat.
- **MOST COMPLETE PORTABLE COLOR GENERATOR** on the market with channel tuning and color level control - just like the big generators.
- **PUSHBUTTON SELECTION** of standard RCA licensed color bars and digital controlled convergence patterns: Crosshatch, vertical lines, horizontal lines, dots and blank raster for purity adjustments.
- **EXCLUSIVE AUTOMATIC SHUTOFF.** Computer timing circuit automatically opens batter circuit to prevent battery run-down, if you should forget.
- **EXCLUSIVE DOT SIZE CONTROL** so you can adjust dot size to your preference.
- **SMALL AND LIGHTWEIGHT** with unbreakable Acrylic case. Built-in lead storage compartment ends tangled and draggy leads in your caddy.

### COLOR KING IV DELUXE COLOR GENERATOR

THE INDUSTRY'S ONLY ALL CHANNEL,  
ALL WEATHER COLOR GENERATOR

**CG169 \$180.00**



- **FIRST ALL CHANNEL COLOR GENERATOR** - covers both UHF and VHF channels for full receiver testing.
- **100% DIGITAL TIMING** with all convergence patterns locked to crystal controlled clock for the ultimate in stability. Guaranteed to be 100% stable or your money refunded.
- **EXCLUSIVE RF LEVEL ADJUSTMENT** to simulate fringe conditions for color assurance tests. Perfect check for fringe reception and color killer action.
- **EXCLUSIVE TEMPERATURE CONTROL** to prevent RF drift, electrolytic freeze-up or humidity build-up. The King is always "on time" whether you're in the Klondike or the Florida Everglades.
- **EIGHT DIGITAL CONTROLLED CONVERGENCE PATTERNS:** crosshatch, vertical bars, horizontal bars, dots, plus movable single dot and single cross patterns for easier dynamic convergence. Centered single dot and cors patterns for precise centering and purity adjustment.
- **EXCLUSIVE DOT SIZE CONTROL** to let you adjust dot size to your liking for best convergence.
- **STANDARD RCA LICENSED COLOR BARS** for receiver adjustments and troubleshooting.
- **RUGGED, PROFESSIONAL APPEARANCE** with vinyl clad steel case with aluminum trim. A beauty you are proud to take in the home.

**FAST REPLACING OLD FASHIONED VTVMs AND VOMs**



**SENCORE FE METERS**

Sencore pioneered the idea of using Field Effect Transistors to provide a high impedance, stable and reliable replacement for the troublesome and easily damaged VOMs and VTVMs. Many changes and improvements have been added since the first Sencore FE Multimeter was introduced. The newest FE meters are shown here. Each of these instruments has the same, high 15 megohm input impedance on DC which provides minimum circuit loading. The stability and accuracy of these instruments makes troubleshooting a pleasure rather than a task.



*Little Henry*

**FIELD EFFECT MULTIMETER**

**\$85.00**



**THE TOUGHEST LITTLE METER IN THE WHOLE WIDE WORLD . . . WITH 1.5% FET ACCURACY AND PUSHBUTTON EASE OF OPERATION.**

**FULLY PROTECTED** to 500 times overload

**MINIMUM CIRCUIT LOADING** with 15 megohm DC input impedance

**AUTOMATIC SHUTOFF** to prevent battery run-down

**COMPARTMENT FOR STORING LEADS** has snap action cover to prevent loss of leads

**ILLUMINATED** meter is fully protected with exclusive sliding cover

**SIMPLE PUSHBUTTON OPERATION**

**1.5% DC ACCURACY - 3% AC**



**FE16**

**\$95.00**

Lab Accuracy  
1.5% DC  
3% AC

**ACCURATE RUGGED**

**LESS CIRCUIT LOADING THAN VTVM.** 15 megohms on DC, 10 megohms on AC.

**INSTANT STABILITY.** Zero warmup time . . . ready with the flip of a switch.

**FULL METER PROTECTION** to 100 times AC overload. No more damaged meters.

**SPECIAL SHIELDED INPUT LEADS** prevent stray pick-up and erroneous readings.

**SPECIFICATIONS**

14 DC Voltage ranges from 1 volt to 1000 volts full scale, 7 negative and 7 positive.

7 Zero Center ranges from .5 to 500 volts.

7 AC Voltage ranges from 1 to 1000 volts full scale.

5 DC current ranges from 100 microamps to 1 ampere full scale.

5 Resistance ranges from 1000 ohms to 100 megohms. 10 ohms center scale.

**TUBE TESTERS**



**TC162 \$115.00**

**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 \$270.00**

**WORLD'S ONLY TUBE ANALYZER**

**TRUE MUTUAL CONDUCTANCE TEST** using a 500 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.**



**CR161 \$150.00**

**NEW CRT AUTO-TRACKER WITH COMPUTER MEMORY CIRCUITS.**

**PATENTED PUSHBUTTON AUTOMATIC TRACKING TEST.** Simply push a button to make the previously complicated tracking test.

**COMPUTER MEMORY CIRCUITS** store CRT information for the tracking test.

**CHECKS BLACK AND WHITE TUBES** using the same procedure as color.

**TESTS TRINITRON TUBES** the same as domestic tri-gun tubes. Only one procedure for all tubes, all made possible through computer memory.

**FILAMENT VOLTAGE** now precisely set on meter.

# MULTIMETERS

## HI-LO FIELD EFFECT MULTIMETERS — A New Concept in FE Meters

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



**FE21**  
**\$115.00**  
4½ INCH  
METER  
LAB OR  
BENCH



**FE20 \$150.00**  
with 30KV hi voltage probe  
A  
SERVICEMAN'S  
DREAM



**FE160**  
**\$195.00**  
PUSHBUTTON  
OPERATION  
with 7 inch meter  
112 RANGES  
AT YOUR  
FINGERTIPS

### 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 Voltage ranges from .1 to 1000 volts full scale
- 9 AC Peak-to-Peak ranges from .28 to 2800 volts
- 9 DC Current ranges from 100 microamps to 1 amp full scale
- 7 Hi Power ohms ranges from 1000 ohms to 1000 megohms
- 6 Lo Power ohms ranges from 1000 ohms to 100 megohms

### SPECIFICATIONS for 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-Peak ranges from .28 to 2800 volts
- 10 DC current ranges from 30 microamps to 30 amps full scale
- 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

- **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 circuit with critical low voltage biases.
- **PROTECTED TO 1000 TIMES OVERLOAD.** A truly burnout proof multimeter. Tested in production with 1,000 volts on .1 volt range. Multimeter resistors protected by .6 amp fuse to save these valuable and expensive components. No more trips to factory when you accidentally measure volts on ohms range.

# OSCILLOSCOPES

## DUAL PURPOSE OSCILLOSCOPE VECTORSCOPE

THE FIRST REALLY  
COMPLETE SERVICE  
SCOPE

- **WIDE BAND 10Hz**  
5.2MHz ± 1DB
- **HIGH SENSITIVITY**  
17mv rms per inch.
- **HIGH INPUT IMPEDANCE** — 27 megohms  
shunted by 11 pf 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 500Hz 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.



**PS148 \$275.00**

## ALL NEW DUAL-TRACE TRIGGERED OR FREE RUNNING OSCILLOSCOPE

DC OR AC  
COUPLED

**PS163 \$650.00**  
WITH PROBES



**YOUR PRESTIGE BUILDER** — Your customers know you can service everything when you have the PS163. Simple to operate, too . . . just push the button and view the screen.

- **A SERVICE SCOPE:** AC coupled, free running, wide band scope to 8 MHz at 3 DB with direct peak to peak readout enables you to service fast with no interpretations.
- **A SERVICING WAVEFORM ANALYZER** for complex circuits. Dual trace and triggering action enables you to determine right on the nose whether or not two waveforms are appearing at the same time, and their amplitudes, in gated AGC, gated sync separators, burst amplifiers, color killers, etc.
- **A DESIGN SCOPE COSTING ONE FOURTH OF COMPETITORS!** 5 millivolt sensitivity, calibrated sweep speed, dual chopped and alternate displays, and other such specs means performance personified for the lab.
- **A VECTORSCOPE:** Right from the front with sensitivity to spare.

## SWEEP GENERATOR



### SPEED ALIGNER

SM158

\$275.00

If it is speed and simplicity that you want, the all crystal controlled SM158 is your answer and at \$120.00 savings over competition.

- SIMPLE HOOKUP with just four cables; 2 to TV, 2 to scope.
- 15 MEGAHERTZ SWEEP WIDTH to cover the entire IF band.
- CRYSTAL CONTROLLED, POST INJECTION, PUSHBUTTON MARKERS for the eight most often used IF frequencies: 39.75, 41.25, 41.67, 42.17, 42.67, 44.25, 45.75 and 47.25. Trap and carrier markers are listed right on front panel for fast identification.
- HORIZONTAL MARKERS available at the flip of a switch.
- ZERO BASE LINE for reference when adjusting traps and positioning carrier markers.
- 2 EXTRA RF CHANNELS to assure interference free response curves on RF. 4RF channels in all.

## TRANSISTOR TESTER

### AUTOMATIC TRANSISTOR ANALYZER

TF166 \$190.00



TESTS OVER 20,000 TRANSISTORS - IN CIRCUIT, AUTOMATICALLY, IN SECONDS WITHOUT A REFERENCE BOOK.

- DYNAMIC IN-CIRCUIT AC TESTS for both transistors and FET's. No need to waste time removing components or risking transistor damage from soldering iron heat.
- AUTOMATIC OPERATION - The push of a button sets all test conditions automatically. Ends guesswork and the need for reference books or transistor data sheets.
- FULL PUSHBUTTON OPERATION for the fastest, easiest transistor testing ever.
- EASY TO INTERPRET GOOD - ? - BAD SCALE - Tells you transistor condition at a glance. Calibrated Beta and Gm scales too.
- DC OUT OF CIRCUIT TEST for 100% testing capability. Only the Sencore TF166 gives you both AC and DC tests for fast problem solving.
- LEAKAGE TESTS for transistors (Icbo) and FET's (Iqss) with direct readout in microamps of leakage current.
- ZERO BIAS IDSS TEST FOR FET's - A must for matching FET's in cascode circuits and industrial applications.
- SAFE, LOW LEVEL TESTS - Patent pending circuits give sensitive, accurate test without any change for transistor or circuit damage.

## POWER SUPPLY



### UNIVERSAL POWER SUPPLY

A SINGLE INSTRUMENT TO EQUIP YOU FOR MODULE SERVICING

UPS164 \$240.00

- 1 - 15 and 1 - 30 VOLT VARIABLE OUTPUT to power any experimental circuit or operate TV modules for service.
- HIGH FILTERING ASSURES VIRTUALLY DC OUTPUT. A must when powering solid state and integrated circuit units.
- FULL ADJUSTABLE CURRENT LIMITING up to 2 amps to protect the circuit being powered and the supply.
- DUAL D'ARSONVAL OUTPUT METERS constantly monitor load current and output voltage. Gives you load condition at a glance.
- FILTERED 6 and 12 VOLT HIGH CURRENT OUTPUTS give you hum free operation of car radios, tape players and other units requiring high power.

## SUBSTITUTORS

### PARTS PAK RC24

- SMALL and LIGHTWEIGHT
- LEAD STORAGE COMPARTMENT to prevent lost or tangled leads.
- 10 & 100mfd ELECTROLYTICS at 450 volts for in home substitution.



COMMON FEATURES

\$38.00

- 24 VALUES OF RESISTORS from 10 ohms to 5.6 megohms in 1/2 and 1 watt.
- NEW! HIGH VALUE low voltage electrolytics for solid state substitution.
- 600V TUBULAR CAPACITORS from 100 pf to .5mfd.
- NEW OVERLOAD INDICATOR to prevent accidental overload of low voltage electrolytics PLUS surge protection.

### RC167



\$90.00

### "THE SUBSTITUTOR"

- SPACE-SAVING GIMBAL MOUNT. Set on the bench or hang on the wall.
- EXCLUSIVE PARTS DRAWER to keep those little extras handy and save legs.
- UNIVERSAL selenium and silicon rectifier substitutes.
- POWER RESISTORS from 2.5 ohms to 150K at 20 watts.
- 7 ELECTROLYTICS from 2 to 200mfd at 450 volts.

## TIME SAVING INSTRUMENTS

### FS134



\$250.00

### FIELD STRENGTH METER

LOWEST PRICED FIELD STRENGTH METER ON THE MARKET TODAY.

- HIGHLY SENSITIVE all the way down to 30 microvolts.
- STANDARD REFERENCE of zero DBJ. 100 microvolts into 75 ohms for CATV and MATV work.
- COMPLETE COVERAGE of all VHF, UHF, and FM bands.
- 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.

### POWER MONITOR

THE MOST PRACTICAL SERVICE TOOL EVER DEvised

- AC VOLTMETER from 65 to 135 volts. Calibrated at 115 volts for more accuracy than VOM.
- AC AMMETER up to 10 Amps. Check fuse and circuit breaker currents in a flash.
- AC WATTMETER up to 1150 watts. A real troubleshooter.
- DC AMMETER up to 10 Amps.
- FUSE RESISTOR CHECKER with special scales for each resistor.
- MAKE ALL TESTS with interrupted line cord or test leads.
- FULLY PROTECTED against shock hazard to appliance, instrument and operator.

### PM157



\$75.00

Printed in U.S.A.

(Continued from page 5)

for the job. The individual design of the sockets provides greater reliability too. There are no wires to break off and leave you stranded in the middle of a test. Here is the best part. Big Mack comes with two FREE socket certi-



ates packed right with the unit. You will never be out of date with Big Mack because you simply send in a FREE SOCKET CERTIFICATE whenever a new socket adapter is announced.

Big Mack is your best CRT tester value. Compare the price of the CR168 Big Mack to competitive CRT testers (supplying only a few of the needed socket adapters) and you will soon see the BIG value of the Big Mack. For example:

Sencore Big Mack (with free socket certificates and 13 socket adapters supplied).	\$195.00	Brand R (supplying one socket on cable and 4 adapter harnesses).	\$169.00
Plus optional sockets	-----	Plus optional sockets	37.50*
<b>Total</b>	<b>\$195.00</b>	<b>Total</b>	<b>\$206.50*</b>

\*Prices do not include free certificates or socket adapters for the standard 7 pin and some of the import 7 pin miniature basings. (Manufacturers literature does not list equivalents to Big Mack sockets 2 and 6 as being available).

Big Mack is up-to-date for all your testing, and gives you the next two adapters free, if they are needed. You won't have to order special, optional adapters, or increase your investment tomorrow because of new tubes when you go with Big Mack. Big Mack will help you with your job, whenever he is called upon, and make you look the professional you are.



## Throw Away Your Slide Rule, Throw Away Your Comparison Charts. You Now Own Big Mack With Patented Time Saving Automatic Tracking.

Charts, comparisons and calculations to determine color tracking ratios on color tubes are a thing of the past. Big Mack with patented automatic color tracking test gives instant tracking test with simple good-bad meter indication for both you and your customer to see.

Both set and picture tube manufacturers are placing more and more importance on the color tracking of their products. Every CRT manufacturer publishes average and maximum tracking between guns for their color CRT's. A large manufacturer is stressing the importance of color tracking in their new solid state receivers with television commercials using broadcast engineers to laud the exceptional color tracking of these sets. Tracking is important, but how do you go about checking the tracking of a color tube and then interpret the test for your customer so they can understand?

There are three common methods of testing a color CRT for its tracking ability. Which do you feel is the one that is the easiest and simplest for you and the one that your customer will be able to understand?

1. Measure the cathode currents of each gun with a meter or calibrated CRT tester. Then calculate the ratio existing between the gun with the highest emission current and the gun with the lowest emission current.

**TRACKING TEST**

Red 530UA	Blue 845UA	GREEN 760UA
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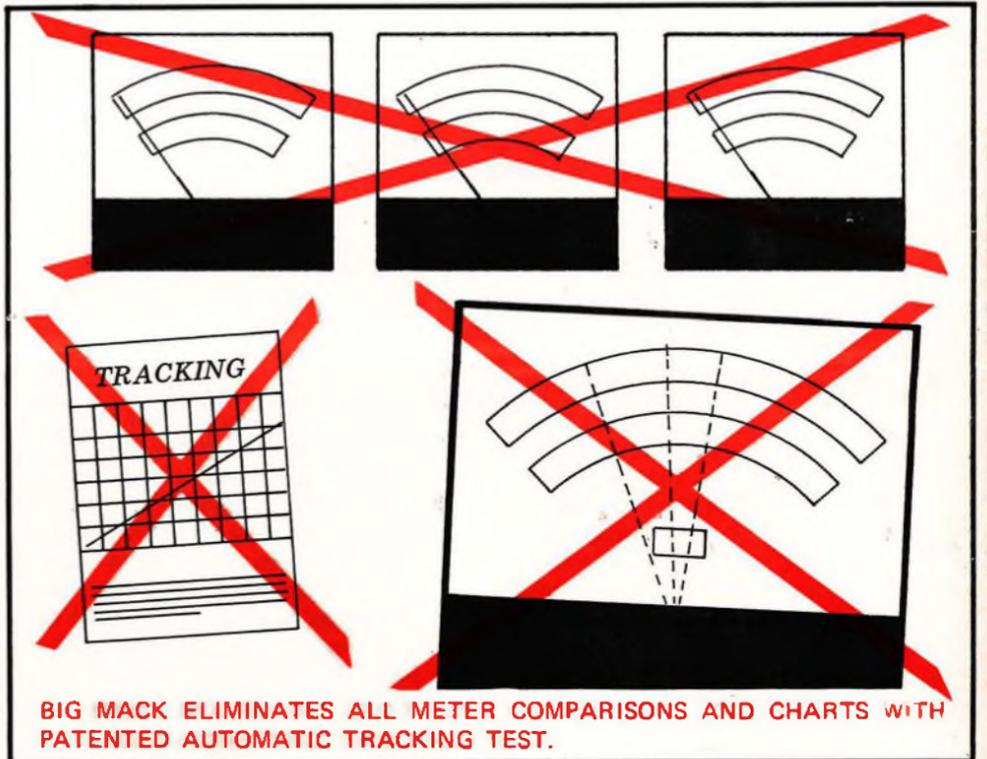
$$\begin{array}{r}
 159 \\
 530 \overline{)845.00} \\
 \underline{530} \\
 3150 \\
 \underline{2650} \\
 5000
 \end{array}$$

**TRACKING RATIO**

1.59:1

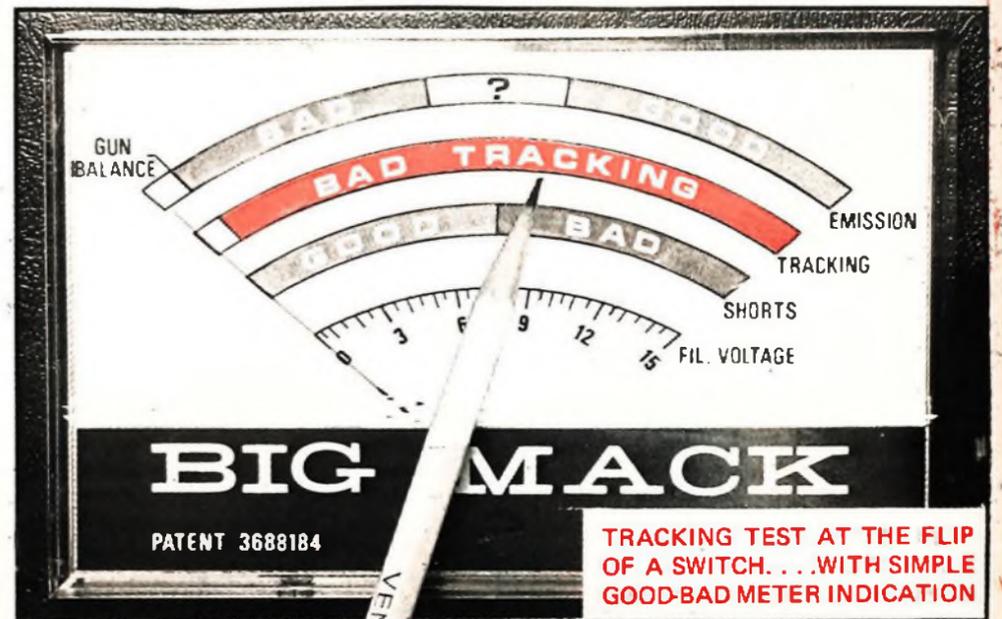
**Bad!**

YOU DON'T NEED PENCIL & PAPER TO TEST WITH BIG MACK



This is certainly a better method than a pencil and paper but still doesn't give results that your customer can easily interpret, especially when you have to look in the manual to obtain test results for yourself.

3. Computerized automatic tracking test that gives a simple good-bad meter indication, without calculations, comparisons, charts, or complicated set-ups. Emission comparisons made automatically, instantly by a computer type memory circuit and an FET/diode comparator.

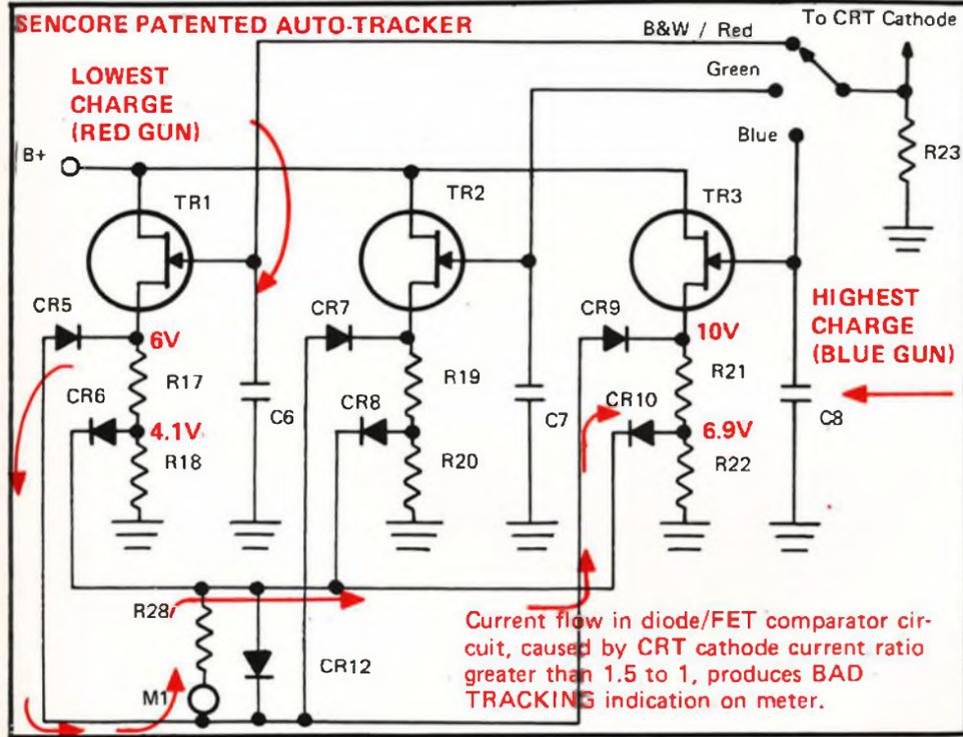


This method is still used to check tracking with a large percentage of the CRT testers in use. This is a time consuming method, requiring pencil, paper and calculations to obtain the test results. Will your customer be sold on a replacement tube with a sheet full of calculations?

2. Measure the emission of each gun and then make a comparison between guns on the CRT tester meter. If the pointer stays within a specified meter range for all guns, the tracking is acceptable. Or the alternate method to this used by a new tester with three meters; determine the numerical indication of the highest and lowest meters and compare these to a chart printed in the instruction manual.

This is the patented automatic tracking test used by Big Mack to make your testing easier and to provide test results that your customer can understand. The test is as easy as turning the function control one step after making the emission test and reading the meter. Just one more customer convincing feature of the CR168 Big Mack.

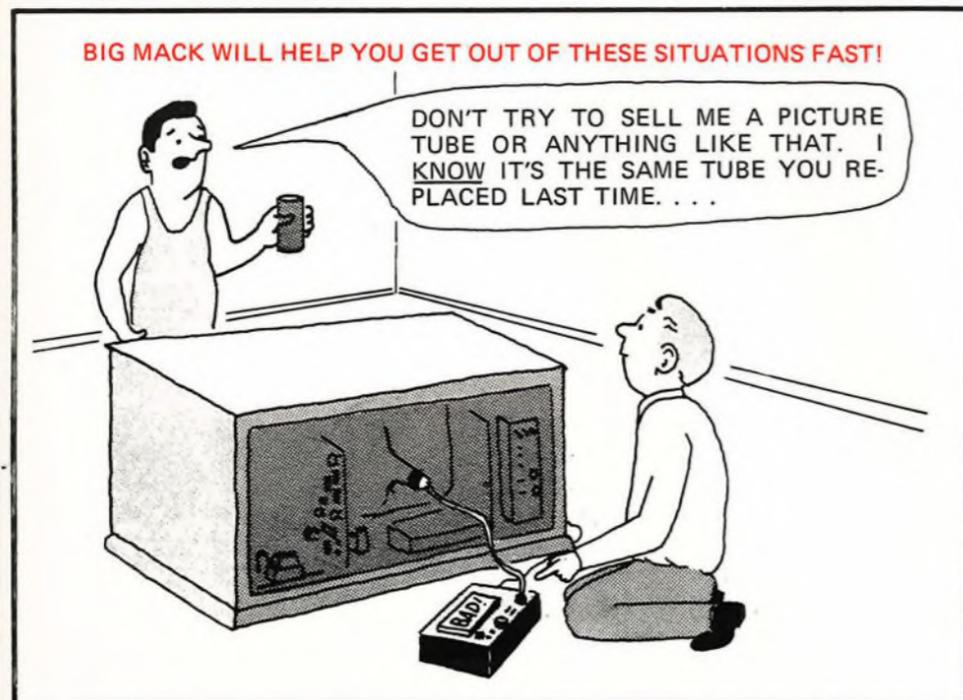
Let us take a moment to look closer at this unique, patented automatic tracking test. The computer type memory circuit automatically compares the emission of the highest gun to that of the lowest gun. The readout is on an easy to read Good-Bad scale on the big meter for both you and your customer to see. Here is how it works.



## Simplified Test Lets Customers Sell Themselves

Here is the toughest call of them all. You probably have run across this situation or have someone that you call on that is the parallel to this character. This is the guy that knows it all, or at least thinks he does. He is an amateur technician and has decided what the problem is even before he calls you. At any rate, you get to the house and he informs you of his diagnosis. The picture is a greenish-blue and somewhat out of focus. His diagnosis of the problem is the same tube that you replaced last time, the difference amplifier. "I know its not the picture tube because it looks just the same as the trouble we had last time. I'm sure if you replace that same tube it will be going great again." You humor him along while you are trying to make your own determination of the problem and find that it's not the difference amp at all, its the red gun of the picture tube. Now you have a real job on your hands. The customer is firmly convinced that the problem is just a \$5.00 tube, not the picture tube. How do you go about changing his mind in an easy way? Just telling him that the picture tube is the real problem is certainly not the answer, you're going to have to give him some real proof that the picture tube is the part at fault.

The only sure way is to let him make the test on the picture tube himself, so he is completely convinced of the problem without getting involved in a discussion of whose diagnosis is correct. You whip out your CRT tester and ask him to make the test so he will be convinced. The tester has multiple test steps for all the various tests and 8 or 10 technical scales on the meter.



When you check the CRT for emission, a capacitor in the Automatic Tracking circuit is charged providing the "memory" for the emission reading of the gun. A capacitor is charged to the level of voltage developed across a common cathode resistor by the emission current. After the emission has been checked on each gun, the memory bank of capacitors is fully charged and ready for the Tracking test. When the function switch is placed in the tracking position, supply voltage is applied to the FET's. The FET's conduct, according to the bias placed on their gates by the memory capacitor.

When the FET's conduct, a voltage drop occurs in their source circuits, proportional to the charge on each of the capacitor. The diodes connected between source resistors and the meter, along with the carefully chosen resistor values in the source circuits, are designed to conduct whenever the differential between the gun with the highest current and the gun with the lowest current exceeds 1.55 to 1. Current flow when the diodes conduct is through the meter, causing an up scale indication into the BAD TRACKING area of the meter. If the tube has less than a 1.5 to 1 ratio, the diodes are cut off and no meter indication occurs. The circuit is completely automatic and provides a direct Good - Bad meter reading, eliminating the need for time consuming measurements and calculations. If the tracking is incorrect and you rejuvenate the low CRT gun to attempt to balance out the tracking, you can check the results of the rejuvenation in seconds. Just recheck the emission of each gun to charge the memory capacitors, and then switch to Tracking test. It is that simple and that fast. No calculations, no guesswork - just a simple, no nonsense Good - Bad reading on the meter.

The unique operation of the circuit and the simplicity of its design was granted a patent by the United States patent office, number 3,688,184. This assures you that only your Sencore CRT tester will have this great customer convincer. Sencore's advanced engineering develops patented circuits and gives you the simplest and easiest to interpret test instruments available today. You're always on the right "track" when you own Big Mack!

The customer is lost and you have to guide him through the test, all the time hoping he will buy the test and change his mind. You complete the test and he comes back with something like this: "I don't understand that much about the test. You probably set it up to make the picture tube look bad!" You're right back where you started and time keeps moving on. There must be a better answer to make it easier for you to convince that customer, make the sale, and get on with your other calls.

Big Mack is your answer with a test procedure so simple that even your know-it-all customers, or the housewives that you deal with most often, can do it for themselves and understand the results. With Big Mack, all the customer has to do is rotate the function control through all test positions and watch the meter. The function control tells them what test they are making and the meter gives them the results, not in technical terms but in simple Good-Bad indications. The test is the same, whether you are dealing with a standard color tube, a Trinitron or in-line type, or a black and white tube. You don't have to explain the test and they will convince themselves that the tube is bad, without wasting your time with argument. Let's take a look at the simplified Big Mack test so you can see how easy it is for you and your customer to check that picture tube.



Step 1. FIL. SET. Just a matter of adjusting the filament voltage controls to set the exact filament voltage for the tube on the calibrated filament voltage scale of the meter.

Step 2. H-K SHORTS. Rotate function control and observe meter. If a color tube is being tested, each of the gun selector pushbuttons would be depressed in turn to check each gun.

Step 3. G1 SHORTS. Rotate function control and watch the meter. A separate color coded Good-Bad scale is used for the shorts tests to make interpretation easy. Depress each gun selector pushbutton for color tubes.

Step 4. GUN BAL. Rotate function switch, and adjust each gun balance control until meter reads at GUN BALANCE line.

Step 5. EMISSION. Rotate function switch to EMISSION and observe meter. Depress each gun selector switch for color tubes.

Step 6. TRACKING. Rotate function switch and read meter. Patented tracking test makes the tracking comparison automatically and gives results in Good-Bad indication on meter.

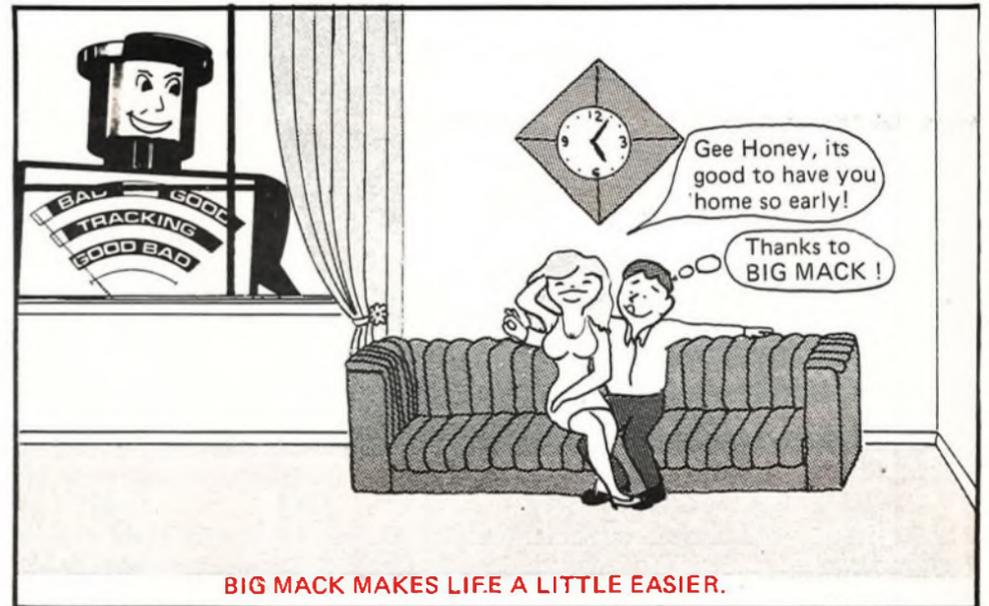
That's all there is to it. If someone can turn the function control and read the meter, you can have them make the test to prove that the tube is bad. No more arguments with "Mr. Know-it-all" or any wasted time trying to convince your customer that they need a new tube. Big Mack is your picture tube salesman on every call while you sit back and let him do the job.



## Big Mack Shortens Your Day - Makes Your Wife or Girlfriend Love You

Days can sure get long when you're busy, especially during the spring and summer when you can picture yourself taking in that ball game, or going out to the lake and drowning some worms for a few hours. When you've got work stacked up at the shop, however, those evening and Saturday hours just turn out to be additional working hours. Are they always necessary? How about that day you had to run two calls in the evening because you just couldn't get to them during the normal day. Maybe it was because you had to spend too much time trying to find the problem in Mrs. Phelps color set. . . you remember, the one you didn't have the socket adapter to check the color picture tube. Or you could have saved a lot of time if you could have shown Mrs. Smith her picture tube had bad tracking rather than trying to explain what tracking was and why the picture tube was causing the problem. What about that chassis you pulled to the shop because of the background color shift. When you connected it to your test jig, everything was okay. If you could have checked the color tube for tracking while you were in the home, you would have saved that hour it took go to out to the house again and pick up the cabinet and picture tube for a final check. How well your equipment helps you during your calls can make a big difference in the time it takes you to do your work.

Big Mack can save you time every day, so you have the leisure time to go to that ball game, go fishing, or just spend a relaxing evening with the family. Big Mack will test every tube for you, so you don't have to spend unnecessary time trying to pin down the problem. Big Mack has loads of customer convincing features to help you point out the problem to your customer and convince them that their CRT is bad - without long, time-wasting explanations. Big Mack, with his patented automatic tracking test, will find those tubes giving you the color tracking problem, saving you the time and embarrassment of making that second trip out to the house. Big Mack saves you time by



**BIG MACK MAKES LIFE A LITTLE EASIER.**

giving you a fast, simplified test of any picture tube, adapter sockets at your fingertips, and a quick reference set-up book with tabbed indexing to get you to the tube you need fast.

Big Mack may even help get your wife off your back, as well as your customers, by helping you get home for supper on time. Big Mack is your friend, too.



## Big Mack puts Dollars in Your Pocket for Pennies a Day

There are many ways of making a sale in the servicing business as in any other business. The most successful operations are those that take advantage of every opportunity to provide service to their customers and improve the level of customer confidence in their business.

Many times you will not find it possible to make the CRT sale on the spot. The financial situation that the customer is in will have a large effect on whether they are able to handle the cost of a new color tube. Alternatives are available to you to tie up the sale of that tube, even though it may be some time in the future. Here are a couple of common situations you may have encountered.

Your customer has a relatively new set with the picture tube just out of tracking range, causing screen color changes. They are unable to afford a new tube at this time, even if you offer to write it on a contract. What action can you take to save the sale?

Another situation involves an older picture tube that has low emission on all guns. The tracking is good between the guns but the picture is very dark and somewhat out of focus. Again, the finances won't permit the customer to make a change at this time. Another typical situation that you can walk away from and lose the sale.

Big Mack will come to your rescue again and help you save that sale. Big Mack will give you the alternatives you need to tie up that sale and hold the customer until they are able to purchase a new tube. Here is how he can help you so you don't pass up these sales.

In the first situation, Big Mack will come to your aid by providing safe timed RC rejuvenation to bring the weak gun up to the level of the others to restore good tracking. When the customer says they can't afford a new tube, offer to use Big Mack to attempt to restore the weak gun. Explain that the rejuvenation is generally very effective in a situation of this type and the results may be good for several months.

Tell them that you will be happy to try to restore the tube for them for a nominal charge, let's say \$10.00 for an example. Explain as well that the SENCORE NEWS

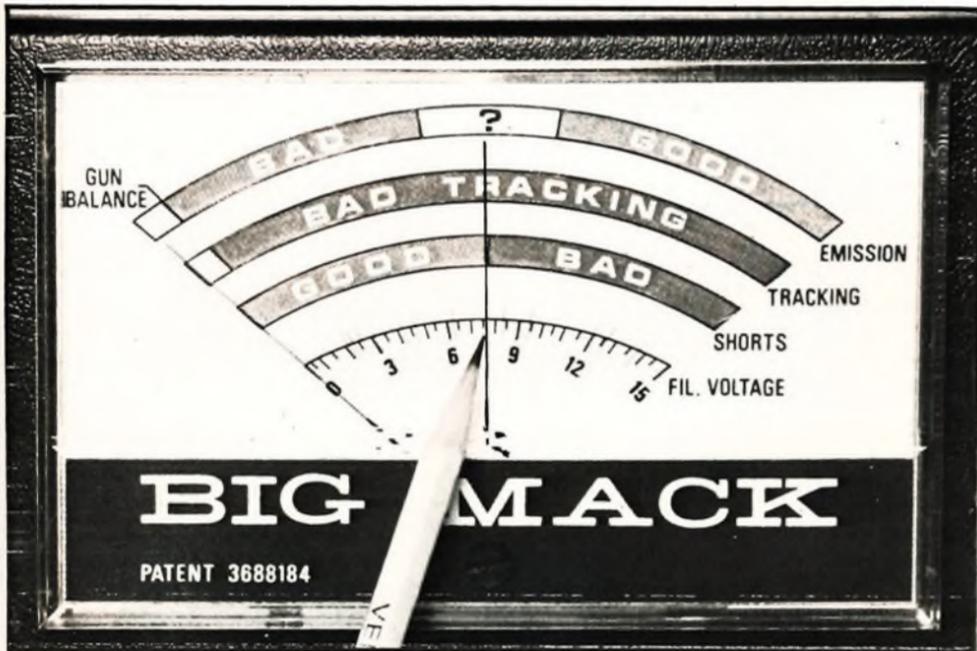


\$10.00 for the rejuvenation will apply on the purchase of the new tube in the future. Get their okay and proceed to rejuvenate the weak gun. The results of the rejuvenation can be checked in seconds to make sure you have accomplished what you intended. Just recheck the emission of each gun (which recharges the automatic tracking memory circuits) and then check the tracking.

When the tracking returns to normal, you have a happy customer, an additional \$10.00 from the call, and a customer that will be tied to you for the purchase of the new tube. That \$10.00 discount they have coming on the

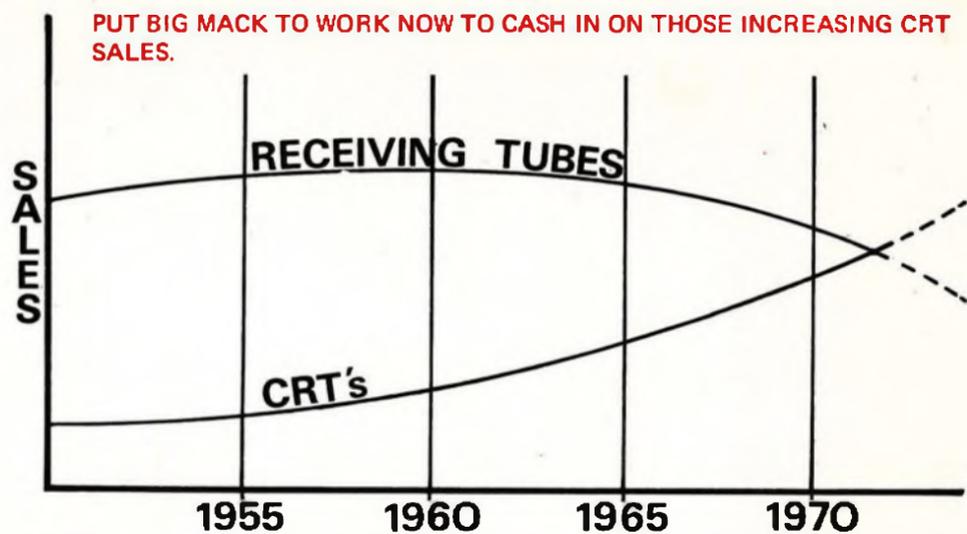
new tube will bring them right back to you when they decide to make the change. Big Mack's RC timed rejuvenation is safe and effective, and can help you add dollars to your business.

For the second example, Big Mack can also wrap up the sale for you. A tube which has low emission on all guns is a candidate for a brightener, rather than rejuvenation of all guns. This is especially so when the tracking is good. How do you find out if a brightener will solve your customers problems? Simple just increase the filament voltage by 10%, and recheck the tube. If a brightener will correct the problem, the tube should check in an acceptable range



**METERED FILAMENT ADJUSTMENT TAKES THE GUESS WORK OUT OF INSTALLING A BRIGHTNER.**

when tested at the increased filament setting. Increasing the filament voltage for such a check is easy to do with Big Mack, too. The calibrated filament voltage scale assures you of precise setting to make the check valid and accurate. Now how do you hold the customer? Easy. Point out to them that the picture can be restored to a viewable level with the installation of a brightener. Advise them of the cost of the brightener and bring up the fact that the price of the brightener can be applied to the purchase of a new tube at a later date. You have again made your customer happy, increased the income from the call, and most important, made it almost certain that the customer will buy the new tube from you.



Big Mack can be a real profit builder for you. Latest industry figures show that receiving tubes have relinquished first place as the largest profit dollar item in servicing to the replacement CRT. Receiving tube sales have been increasing at a slower rate for the past few years, primarily because of the advent of hybrid and solid state receivers. Even though the sets have gone solid state, there is one part that is still tube, and subject to all the problems associated with tubes. This item is the picture tube.

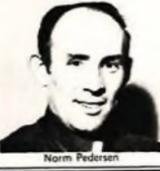
More and more television receivers are being sold every year, with over 60% of the households in the U.S. owning color television receivers today. Millions of picture tubes are going out of warranty and failing every year. It would seem to make good sense to have a picture tube salesman working for you to cash in on these big profit sales. Big Mack is your picture tube salesman by being your customer convincer. You can add him to your staff for only pennies a day to start realizing those big picture tube sales and beat your competition to the easy profit dollars.

Big Mack can help you make CRT sales in many ways, and at a very reasonable cost. One additional CRT sale will pay for any additional investment you make in Big Mack compared to other CRT testers. You can add Big Mack to your staff to increase your CRT sales for only 20 cents a day. That's probably a lot less than you spend for coffee during a day! How do we figure this? If you buy Big Mack for \$195 and write the instrument off for tax purposes over a four year period, your actual cost is only \$48.75 a year. Your cost is less than a dollar a week, or under 20 cents a day! And just a couple extra color CRT sales will pay for Big Mack in a short time. Big Mack is a big profit maker for you.



Bob Baum



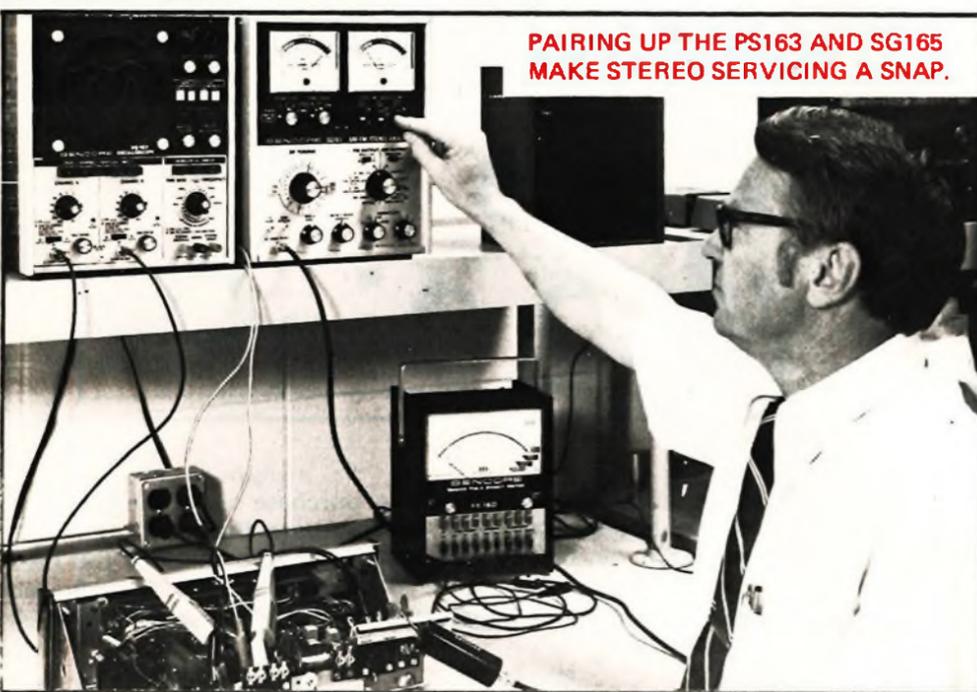


Norm Pedersen

# BOB AND NORM'S SHOP

- SERVICE TIPS
- SHORT CUTS

"Norm, I'm having a terrible time trying to get the separation I think I should get on this FM Stereo receiver. It's only about 20db. How about showing me that new alignment method you boys in Field Engineering worked out for FM Stereo Tuners?"



**PAIRING UP THE PS163 AND SG165 MAKE STEREO SERVICING A SNAP.**

"Sure, Bob, be glad to. First of all you need an SG165 AM-FM Stereo Analyzer and a PS163 Dual Trace Oscilloscope."

"I have those set up and ready for you."

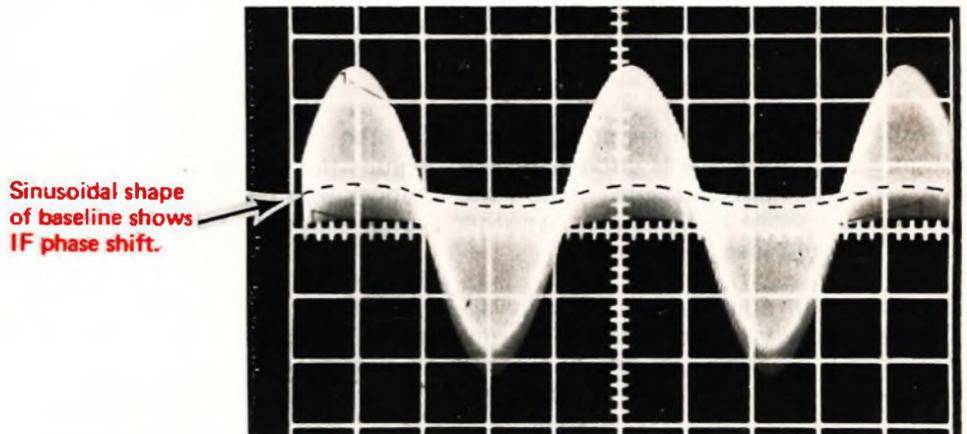
"OK. First you peak the IF's in a normal manner using the 10.7MHz CW signal from the SG165, using the output meters of the SG165 as the monitor."

"That much I have done. What do we do next?"

"Now you switch to FM RF output and inject the signal from the SG165 into the antenna terminals. Set the SG165 for one channel of 400Hz modulation on, and pilot off. Use the PS163 and pick up the signal at the FM Detector Test point."

"Fine. I have that done. Now what?"

"Look closely at the baseline of the signal on the PS163. Is it flat or does it have curvature present?"

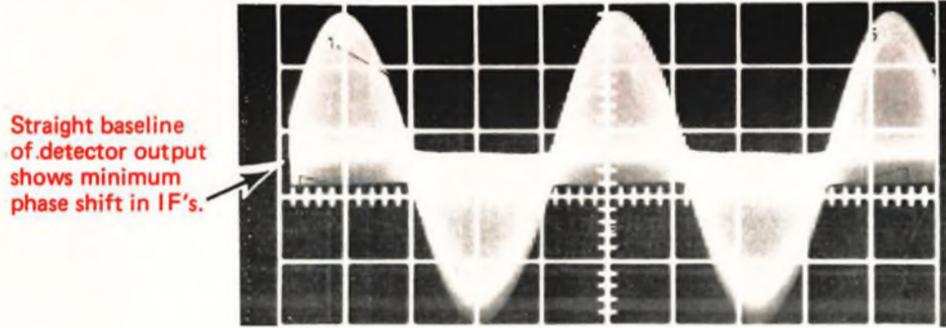


"The curvature of the baseline shows the phase shifting that is taking place in the IF's. What we want to do is align for minimum phase shift. The less phase shift we have in the IF's the better the stereo separation."

"That makes sense since the decoding is dependent on proper phasing for best separation. Show me how you align for least phase shift."

"Real easy, Bob. Just adjust each of the IF slugs slightly until you have a flat baseline on your scope display. The flat baseline shows minimum phase shift."

"Hey, this is easier than the method they give in the manual with the receiver. Does it really work that well?"

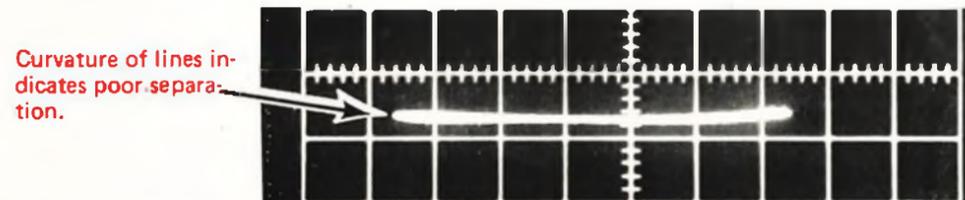


"We'll see in a couple of minutes. Now that you have the IF's set up, you can use the Vector scope function of the PS163 to really peak up the separation in the decoder. Just connect one channel of the PS163 to each output of the amplifier and push the vector button. Set the SG165 for FM RF output, both channels modulated and 10% pilot."

"Okay, I've done that. All I get is a diagonal line on the scope. What is that supposed to tell me?"

"That indicates the vector additive result of the two output signals, one on the vertical channel the other on the horizontal. If the stereo outputs are matched and balanced, it should be at 45 degrees. This, however, is not the important part of the separation set-up as far as the vector scope is concerned. Switch one channel modulation off as you would for a normal separation test using the Output Meters of the SG165."

"Say, the SG165 Separation meters show just under 30db separation. That IF touchup sure must have done some good. The Vectorscope shows a horizontal line. What am I supposed to do with that?"



"The horizontal line represents the left channel as you have the scope connected. The trace you have is not perfectly horizontal and also has a bend in it. This shows that the phase between 19 and 38KHz signals is off slightly. Adjust the 19 and 38KHz coils for the straightest line and get it as close to true horizontal as you can."

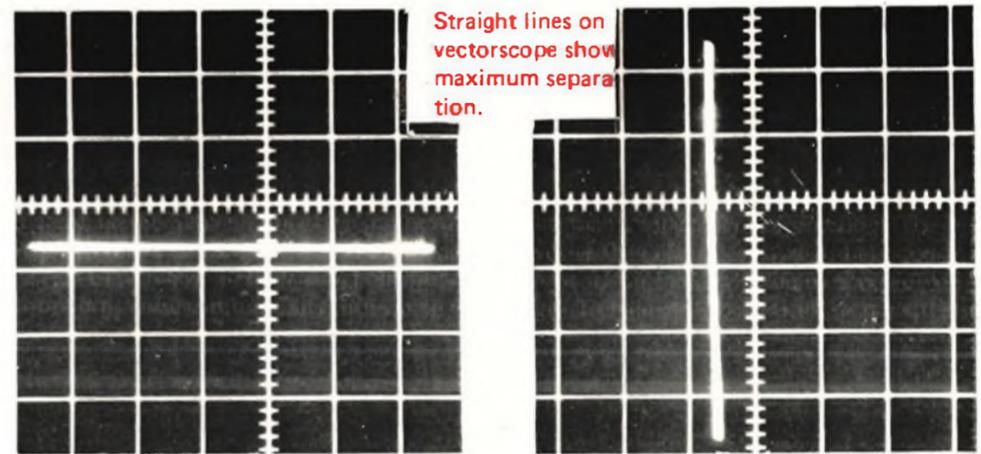
"No sooner said than done! You can sure see the effects of those adjustments when you look at them this way. There, that's as good as it wants to get. Not bad, huh?"

## TEST YOUR TEST EQUIPMENT KNOWLEDGE

Like to find out how well you know your test equipment? Here are a few questions that are covered in this issue of the News. Why not run through them now. Grade: 90-100, you certainly recognize the importance of good equipment, and are sold on Big Mack. Better get one the next time you stop at your distributor and start cashing in on those big CRT sales. 80-90, sounds like you would like to try a Big Mack and prove to yourself what a money maker it can be. Just fill out the Trial Coupon on page 15 and mail it in. 70-80, recheck the sections you missed and compare the Big Mack with any tester you may have or be considering. The greater your knowledge of test equipment and its applications, the greater your income. Below 70. Come on now, you just skimmed through the News. Let's take a closer look and see what you might be missing.

By the way, these are the Buck Questions that the Sencore Tech Rep will be asking at the Tech-A-Rama, in your area. Be prepared and win yourself a buck or two at the next Sencore Tech-A-Rama!

- The Big Mack is a real money-maker for you because it:
  - Checks all tubes with a simple procedure for emission, shorts, cutoff, and color tracking - without calculation or confusion.
  - Has safe, effective RC rejuvenation to tie down those future sales and help your customer when their dollars are tight.
  - Provides metered filament adjustment to help you determine if a brightener will solve the problem.
  - All of the above.
- The need for multiple meters, or calculations during test, are eliminated by:
  - Solid state design.
  - Sencore's patented automatic tracking test.
  - Pushbutton gun selector switches.
  - Using a large meter.
- The automatic tracking test used on the Big Mack is so important because:
  - Emission tests alone will not give a color tube a complete performance test.
  - It takes the place of the normal emission test.
  - It is the only way you can check a single gun color tube.
  - You can really impress your customer.
- The cumbersome, easily broken socket harness used on other CRT testers has been eliminated on the Big Mack:
  - By using a single socket for all CRT's.
  - By incorporating easy to use, low cost individual sockets.



"Looks pretty good. Now reverse the modulated channel on the SG165. You should get a vertical line on the PS163. It, too, should be straight and at true vertical. If it is very far off, retouch the decoder adjustments for the best compromise between channels. The closer the lines are to true vertical and horizontal, the less crosstalk between channels and the better the separation."

"Say, this is easy. That Vectorscope function of the PS163 tied in with the SG165 makes stereo look easier already. Let's look at the separation meters to see what they have to say."

"There's your proof, Bob. You now show over 30db separation between channels. Most of the improvement came as a result of the IF phasing, but you did pick up some additional with the Vectorscope adjustment of the decoder. If the other fellows that are doing FM Stereo work would team up the SG165 and PS163, they would find alignment and separation adjustments a lot faster and a lot easier, not to mention all the other capabilities they would have with these two great instruments."

"You're right, Norm. For example, stereo amplifier troubleshooting, especially the DC coupled jobs, goes a lot faster when you have the Dual Trace PS163 to check one channel against the other. The DC coupling of the input also has just about eliminated the need for my meter. It's much faster, too, because I don't have to find the leads for the meter. I've already got the scope probe in my hand. Just set the input switch on the PS163 to ground position, set my reference, flip to DC and I have my measurement. You can also work the same comparison between channels on DC that you can on AC. It really tells you quick what is going on in that amplifier. But, you can only do it if you have a sensitive, DC coupled, Dual Trace Oscilloscope like the Sencore PS163."

"Enough school for today, Bob. How about both of us getting back to work and see about making some money?"

- Because sockets are no longer necessary for CRT testing.
  - It takes too many different harnesses to test the newer tubes.
- New sockets for up-dating Big Mack when new tubes come out:
    - Are not needed because no more new tubes will be introduced.
    - Are optional at extra cost, just like other test equipment manufacturers.
    - Are supplied in groups of three on a socket harness.
    - Are supplied free by sending in free socket certificates as new adapters are announced.
  - Rejuvenation with Big Mack is safe and effective because:
    - You can time the rejuvenation cycle simply by holding the button for the time you want.
    - It used voltage directly from the power supply.
    - Of the automatically timed RC discharge system of rejuvenation.
    - Because filament voltage is raised 100%.
  - Every test is shown on an easy to read, Big color keyed meter to:
    - Make it possible to send non-technical people on service calls.
    - Make it easier for you to convince your customer their tube is bad.
    - Make the tester more impressive.
    - Make it easier to read from a distance.
  - The operation of Big Mack is simplified, compared to other testers, because:
    - There is just one test procedure for any tube.
    - All tests are read on just one meter.
    - There are fewer controls and meter scales to confuse you and your customer.
    - All of the above are correct.
  - Accurate tests, regardless of line voltage, are assured with Big Mack:
    - Because of regulated bias voltages.
    - Because of variable metered filament adjustment for exact test voltages.
    - Because of individual, variable G2 (Gun Balance) adjustments.
    - All of the above.
  - The all important color tracking test is accomplished:
    - By observing the deflection of the meter during emission tests.
    - If the gun balance adjustment can be made.
    - By a patented computer type FET memory circuit and comparator diodes without calculations.
    - By calculating the emission ratio read on meter for each gun.

ANSWERS:

1-D; 2-B; 3-A; 4-B; 5-D; 6-C; 7-B; 8-A; 9-D; 10-C.

# "The Substitutor"

**PUT A FULL RANGE OF SUBSTITUTION PARTS AT YOUR FINGERTIPS!!**

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**\$90.00**

- **EXCLUSIVE SENCORE SURGE PROTECTOR** - prevents arcing and heating of electrolytics when substituting.
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**SAVE TIME AND YOUR LEGS WITH "The Substitutor"**

# AM-FM STEREO ANALYZER

**THE ONLY INSTRUMENT THAT PROVIDES ALL 12 SIGNALS NEEDED FOR STEREO SERVICING!**

# SG165

- **IT'S A COMPLETE RF GENERATOR.** Covers the full range of both AM and FM RF frequencies for front-end troubleshooting and alignment. Calibrated for alignment accuracy.
- **IT'S A COMPLETE IF GENERATOR.** All needed IF signals; crystal controlled 10.7MHz for alignment, modulated 10.7MHz for FM troubleshooting, and both 455KHz and 262KHz for AM servicing. New IF Rocker, too, for the new fixed tuned sets. The SG165 covers them all.
- **IT'S AN FM IF SWEEP AND MARKER GENERATOR.** Crystal controlled markers are post injected for sharp, crisp display. Just two cables to do the complete job.
- **IT'S A STEREO GENERATOR.** MPX output available on both RF and IF, plus composite output without carrier. Full, front panel control over 19KHz pilot, right and left channel signals. High level IHF output, too, for those important Institute of High Fidelity checks.
- **IT'S AN AUDIO GENERATOR.** 400Hz sine and square wave outputs make short work of amplifier servicing. You can do the entire job with just one instrument.
- **IT'S A SPEAKER SUBSTITUTE AND SEPARATION READOUT.** Dummy loads provided so you can operate the stereo for servicing without that annoying howl in the shop. Separation meters tell you at a glance the performance of the MPX decoder for alignment and troubleshooting.
- **IT'S A POWER OUTPUT MONITOR TO VERIFY AMPLIFIER PERFORMANCE.** You can always be sure your customer is getting the performance he paid for.
- **IT'S A COMPLETE AM-FM STEREO ANALYZER TO WALK TROUBLES OUT OF ANY AM-FM STEREO RECEIVER IN MINUTES.** Expands your business into the very profitable audio field.



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