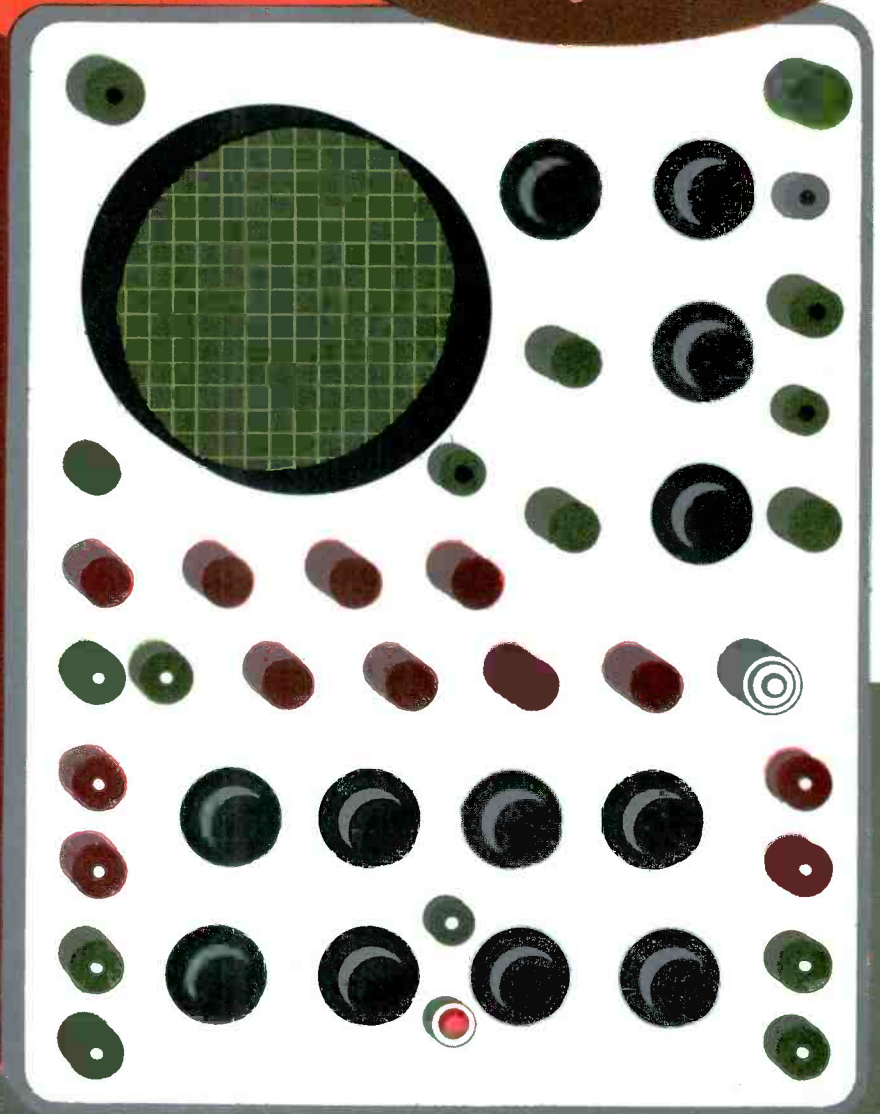


ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

A J-DIGLIO
94 SLEEPING GIANT DR
HAMDEN 18 CONN
TT-59NX AI 7E458



**Comparison of
SERVICE & LABORATORY
'SCOPES**

50¢
February • 1959



the case of the stereo

HUM M M M MING BIRD

or MAGNETIC vs CERAMIC

You may have been reading many controversial advertisements as to the merits of various stereo cartridges... namely, the magnetic version vs. the ceramic version. Qualified claims are made by their manufacturers... and most are accurate. But how a specific cartridge *sounds* in your stereo system is really the criterion. Let's consider the real facts:

.....: Audio Engineers agree that magnetic
 : **IT'S A FACT!** : stereo cartridges are excellent, costly
: but burdened with *hum*. Tests prove that the new
 Electro-Voice Magneramic cartridge is completely hum-
 free. No motor or line hum can possibly be introduced to
 mar soft record passages, because the Magneramic is *non-*
inductive.

.....: The simpler the
 : **IT'S AN ENGINEERING AXIOM!** : design of a pre-
 cision product, the less chance there is of manufacturing
 defect. Magnetic stereo cartridges are far more compli-
 cated than the comparable Electro-Voice Magneramic
 stereo cartridge. With E-V, you are assured years of
 trouble-free, high fidelity stereo performance.

.....: When the Electro-Voice corps of
 : **IT'S POSITIVE!** : 60 engineers began intensive sci-
 entific stereo studies, they had the choice of either design-
 ing a magnetic or a ceramic cartridge. Knowing that two
 of the most vital factors for true audio reproduction were
 lack-of-hum and trouble-free performance, they took the
 positive approach and produced a stereo cartridge incor-
 porating simple elements permitting positive, stable control
 for uniform output.

And so, with the advent of stereo, Electro-Voice intro-
 duced an entirely new concept in ceramic cartridges... a
 true high-fidelity series...

21 MD with 0.7 Mil Diamond Stylus, net \$19.50; 26 MDST Turnunder with 0.7 Mil Diamond Stylus, and 3-Mil Sapphire Stylus for 78 R.P.M.'s, net \$22.50; 21 MS with 0.7 Mil Sapphire Stylus, net \$9.90; 26 MST Turnunder with 0.7 Mil Sapphire Stylus, and 3-Mil Sapphire Stylus for 78 R.P.M.'s, net \$12.90.

GOOD STEREO DEPENDS ON THESE VITAL FEATURES: FREQUENCY RESPONSE, 20-16,000 cps-flat (Westrex 1A); ELEMENTS, 2 PZT Ceramic; OUTPUT VOLTS, 20 mv. Nominal; COMPLIANCE, 2×10^{-6} cm/dyne; WEIGHT, 3.4 Grams; TRACKING FORCE, 4-6 Grams; CHANNEL SEPARATION, 25 db at 1 KC; MOUNTING, EIA (RETMA) Standard 1/2"-7/16" Center; STYLUS, .7 Mil (Diamond or Sapphire); OUTPUT TERMINALS, Standard .050 Connectors; IMPEDANCE OR LOAD, 22,000 ohm or higher magnetic input.

THE E-V MAGNERAMIC



which will consistently outperform the best magnetics and do away with the "hummingbird" in your stereo system.

Choose the Magneramic... a new improved E-V stereo cartridge which plugs directly into magnetic inputs. See why it's the choice of so many FM stations for critical stereo broadcasts:

- ✓ NO HUM
- ✓ BEST CHANNEL SEPARATION
Over 25 db isolation between channels
- ✓ HIGHEST COMPLIANCE
Horizontal and vertical compliance equal to or surpasses the best magnetic cartridges
- ✓ WIDEST RANGE FREQUENCY RESPONSE
Far in excess of any monaural (monophonic) or stereo record
- ✓ FLATTEST RESPONSE TO WESTREX 1A VELOCITY CURVE
From 20 cps to beyond audibility
- ✓ HIGH 20 MILLIVOLTS OUTPUT
All the voltage you need... and then some
- ✓ PROVEN SUPERIOR
for conventional monophonic records as well as stereo records
- ✓ SOLD ON MONEY-BACK GUARANTEE
We invite you to try an E-V Magneramic, with E-V's unqualified guarantee backed by over 30 years as a manufacturer.

Give the Magneramic a thorough listening test. If for any reason you aren't completely convinced of its superiority, your FRANCHISED Electro-Voice dealer is authorized to give you a full refund.

Step up to the excitement of stereo... step up to Electro-Voice Stereo... the industry's standard. Over a half-million in use, more than the total of all other stereo cartridges combined, attest to its acceptance as stereo's standard. Choose either the E-V Magneramic for magnetic inputs or the E-V Standard Stereo Cartridge for non-magnetic inputs.

See your High Fidelity Specialist or write Dept. ET-2

Electro-Voice

INC., BUCHANAN, MICHIGAN

Over 1/2 Million in Use...
 MORE THAN ALL OTHERS COMBINED



ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

World's Largest Electronic Trade Circulation

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February, 1959

FRONT COVER The oscilloscope is a wonderfully effective tool for electronic troubleshooting. Both the lower-priced service type and higher priced lab scope may have a place in maintenance operations . . . depending on the kind of work you are doing. For a pro-and-con comparison of both types, see article starting on page 34.

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CIRCUIT DIGESTS

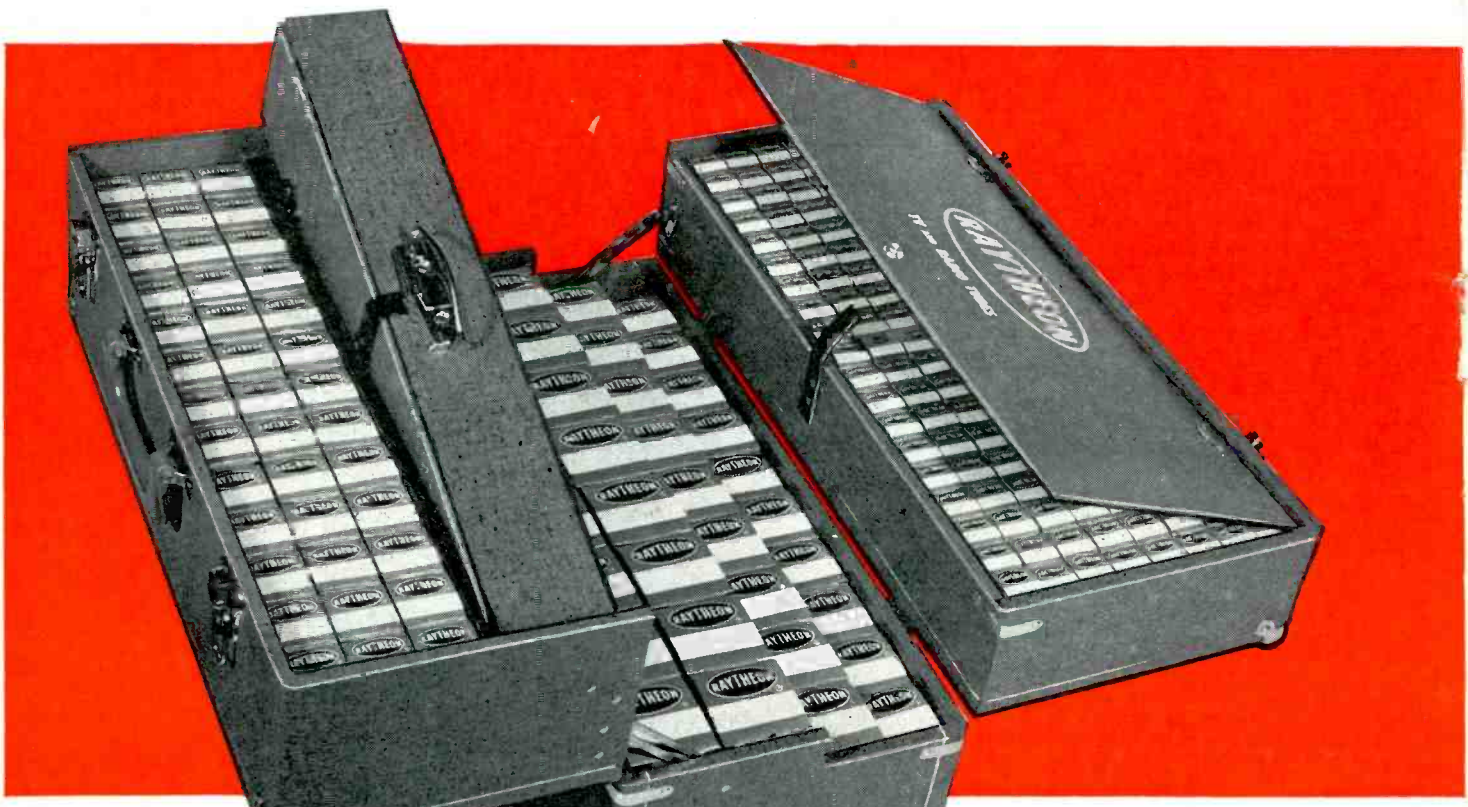
ALIGNMENT

1. Turn tuner channel as
2. Connect sweep genera shortest and most dir
3. Apply -3 volts bias to
4. Connect a detector an
5. Adjust mixer plate coi
6. Remove detector and
7. Connect oscilloscope i
8. Adjust remaining thr

PARTS LIST

- C-184 - 170 ohm 2000 V, 1/2 watt
- C-185 - 470 ohm 2000 V, 1/2 watt
- C-186 - 1000 ohm 500 V, 1/2 watt
- C-187 - 1000 ohm 500 V, 1/2 watt
- C-188 - 1000 ohm 500 V, 1/2 watt
- C-189 - 1000 ohm 500 V, 1/2 watt
- C-190 - 1000 ohm 500 V, 1/2 watt
- C-191 - 40 ohm, part of C-184

Independent TV-Radio Service Dealers:



Here are a few of the reasons why the Raytheon Senior Tube Case is tops:

- 226 Tube Capacity — Perfect for Everyday Servicing
- Removable Tool Box Unit
- All Tubes in Full View when Case Is Open
- Cover for Miniature Tube Section
- Solid Wood, Locked Corner Construction
- Brass Finished Hardware
- Reinforced Stress Points
- Modern Airplane-Luggage Styling

RAYTHEON MANUFACTURING COMPANY
TUBOR PRODUCTS DIVISION
DEALER PRODUCTS DEPARTMENT

ass., 55 Chapel Street • Chicago, Ill., 9501 Grand Ave. (Franklin Park)
 202 Zonolite Rd. N.E. • Los Angeles 16, Calif., 5057 W. Washington Blvd.



Special Offer for you

RAYTHEON TUBE CASE COMBINATIONS!

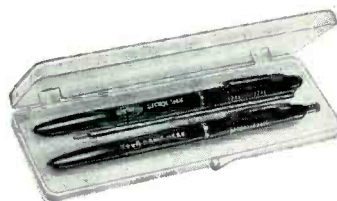
Your choice of any two of the Raytheon home servicing items shown, *plus a genuine Raytheon Senior Tube Case (SP-Q-7645)* — that's the special home servicing combination offered to you by your Raytheon Tube Distributor. And he's making it very easy for you to obtain these useful kits.

Take advantage of this excellent opportunity to equip your technicians and improve your home servicing efficiency: Call your Raytheon Tube Distributor and make arrangements to outfit every man in your shop. There'll never be a better time than now.



TRUCK DECAL (SP-Q-7587)

A heavy duty, outdoor type decal ideal for trucks, doors or panels.



BALL POINT PEN AND PENCIL SET (SP-Q-7634)

A slim-line-styled pen with new push-top retractable action and a matching mechanical pencil.



TV SCREEN POLISHING CLOTH (SP-Q-7617)

Chemically treated to clean dust and dirt with a quick swipe over face of TV screen.



TV CUSHION (SP-Q-7639)

A foam plastic cushion faced with flexible Vinyl for longer life. Won't slip, ideal safeguard against marring TV case, floor, furniture.



DROP CLOTH (SP-Q-7542)

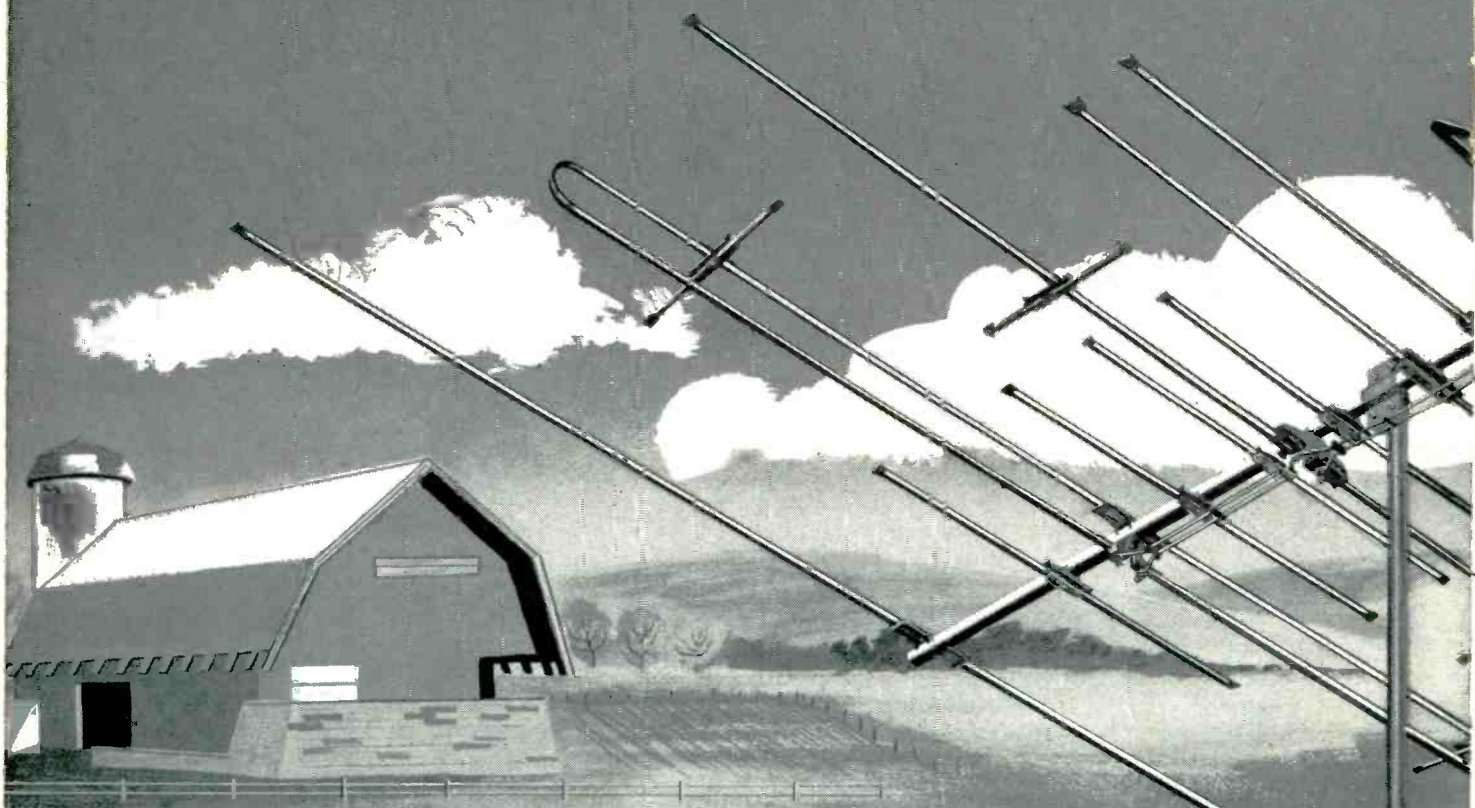
Protect your customers' floors and furniture when repairing TV sets in their homes.



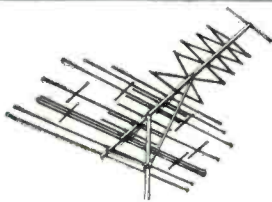
SCREW DRIVER SET (SP-Q-7518)

Four-in-one Screw Driver Set. 4 blades — two sizes of standard heads, 1 Phillips head and 1 Punch. Interchangeable in quick adjusting, firm grasping chuck.

THE NEW ANTENNA

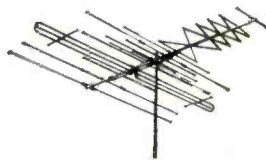


now... fabulous high-powered Satellite Sleeve Dipole achieves 25% greater gain.



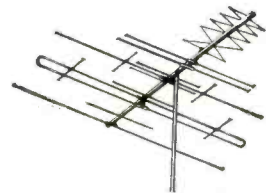
VX1111 regular

SATELLITE-HELIX



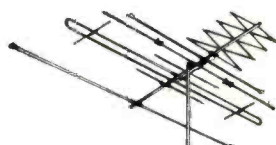
PX911 regular
AX911 anodized

POWER-HELIX



SX711 regular
AX711 anodized

STAR-HELIX



RX511 regular
AX511 anodized

SUPER-HELIX



JX311 regular
AX311 anodized

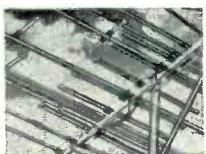
JUNIOR-HELIX

Pioneers in Electronics since 1929
JFD ELECTRONICS CORP.
 6101 Sixteenth Avenue Brooklyn 4, New York
JFD CANADA LTD. JFD INTERNATIONAL
 51 McCormack Street Toronto, Ontario, Canada
 15 Moore Street New York, N.Y.

LINE FOR '59



MEET THE GREAT NEW JFD HI-FI STAR-HELIX COLORTENNA WITH NEW DESIGN! NEW FEATURES! NEW PERFORMANCE!



• New Satellite sleeve dipole design ups gain 25% —shrinks the miles, flattens mountains for needle-sharp hi-fi pictures.



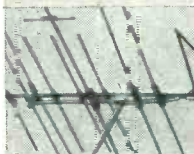
• Highly directive microwave helical probe (based on satellite telemetering antenna principles) pinpoints stations—sidesteps ghosts.



• Double U-bolt mast assembly freezes antenna on target for rock-steady reception.



• 1/2 inch seamless elements All elements over 30 inches reinforced with 15 inch aluminum dowels.



• Non-corrosive aluminum harness network made of rigidized busbar. Aluminum screw and nut take-offs insure permanent maximum signal transfer.



• Available in regular or gleaming diamond-hard Gold Anodized aluminum.

• Spearheaded by spectacular national JFD advertising for a record service-dealer Harvest of Profit.

presenting the

All New



HI-FI STAR-HELIX

COLORTENNA

Fabulous Satellite Sleeve Dipole design—the antenna concept that's bringing high fidelity reception to far-flung fringes—is the *new* heart of *every* JFD HI-FI Helix Colortenna! Five area-engineered models to choose from, assure picture-perfect matching of any location requirements. Make it *the* year for you with *the* antenna line for '59—JFD Hi Fi Colortennas. Now at all JFD distributors.

NEW

REVISED

EXPANDED



Still Only
\$25⁰⁰ net

ELECTRON TUBES

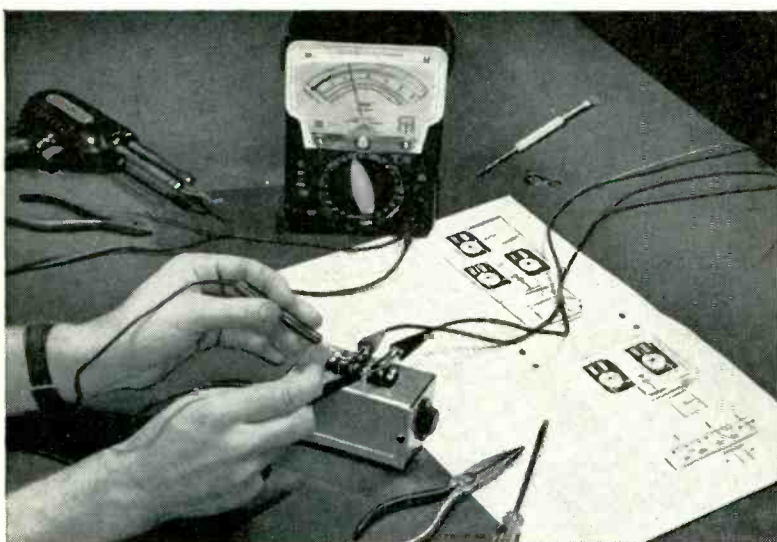


SEMICONDUCTORS

transistor course

**Learn about transistors
by using them**

Advancement opportunities await service-dealers, engineers and technicians who know about basic transistor fundamentals. The newly revised and expanded edition of this popular and economical Transistor Course can help you too. A CBS-Hytron first, it was especially written and illustrated by A. C. W. Saunders, well-known educator and author, to make it easy for you to learn about transistors by *using* them. What you learn you can be sure you will remember . . . by making for yourself the practical transistor devices described. Check the expanded features. Read how easy it is to start your fast, fascinating Transistor Course.



Transistor Course Includes:

- Ten intensive lessons (with 3-ring binder) . . . up-to-date, complete
- Simplified basic theory . . . how transistors work
- Practical experiments and servicing techniques for:
 - Amplifiers** . . . applications in all fundamental circuits
 - Oscillators** . . . a-f, r-f, relaxation, multivibrator, special TV
 - Rectifiers** . . . diode and transistor rectifiers and detectors
 - TV deflection circuits** . . . and Eccles-Jordan Trigger circuits
 - Practical commercial applications** . . . immediate and future

HOW TO GET IT

Call your CBS-Hytron distributor. He'll tell you how to get the CBS-Hytron Home-Study Transistor Course, PA-275. See him or write us . . . today!

CBS-HYTRON, Danvers, Mass.

A Division of Columbia Broadcasting System, Inc.

Editor's Memo



What an age of facts and figures. Recently I was examining some human mortality tables, and was interested to learn what the odds are to live to a certain age. For example, if you are between 25 and 45, chances are approximately 2 out of 3 that you'll live to about 65; 1 out of 2 that you'll reach 70; 1 out of 3 that you'll hit 75; 1 out of 10 for age 84; and a long-shot 1 out of 100 that you'll live to a ripe old 92.

Naturally, these are average odds. Many individuals will never make the average, while others will live far beyond them. Furthermore, the older you are now, chances are you'll live to an older age. Businesses are like that too; infancy is the hazardous time.

So the next time your blood pressure rises, when you feel like blowing your top at the tough dog on your bench—or the tough dog customer, for that matter—count to ten and take it easy. Every emotional upset gives you worse odds on the mortality tables.

Besides, you can accomplish more with co-workers and customers by exercising a little patience. I think the technicians I've met are considerably more patient than most people . . . and more generous too. The spiteful variety is the exception, providing meat for slightly humorous recounting.

The story is told of two technicians, partners in a service business. They had been good friends for many years, but when one of them lost patience it was not unusual for him to cut off his proverbial nose to spite his face. One day the two got into an argument.

"Charlie," said the more hot tempered one, "I hope that one day you will be flat broke. Then you should come to me for money . . . and I should be so poor that I wouldn't have any to give you."

Fortunately, most partners work well together, striving to build a business that means something. And one good business is worth a lot more than several piddling ventures, though diversification can be an important part of building a strong operation.

So far as quantity and quality are concerned, the story is told of a meeting of animals. The dog boasted that she'd had 10 youngsters in the past year. The rabbit claimed to have given birth to 30 offspring. The hen proudly proclaimed 150 chicks as the record. The lion looked at all of them and announced that she had only one cub, but (r-o-a-r) it was a LION!

Al Forman

Plus Profits for You . . . now at your

PHILCO DISTRIBUTOR

Add to your volume and profit . . . with Philco's line of universal products for the Hi-Fi, Stereo and Tape Recorder enthusiast



NEEDLES

- DIAMOND
- SAPPHIRE
- OSMIUM

ANTI-STATIC SPRAY

Minimizes surface noise and insures needle glide.



RECORD BRUSHES

Eliminate harmful dust from precious records.



45 RPM INSERTS

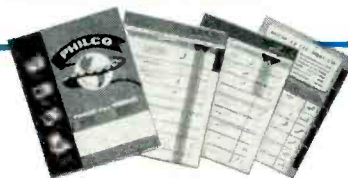
Custom-built for long wear.



FULL-FIDELITY TAPE

Extra strength and extra length.

Further evidence of Philco's PROGRAM OF COMPLETENESS to America's Service Dealers.

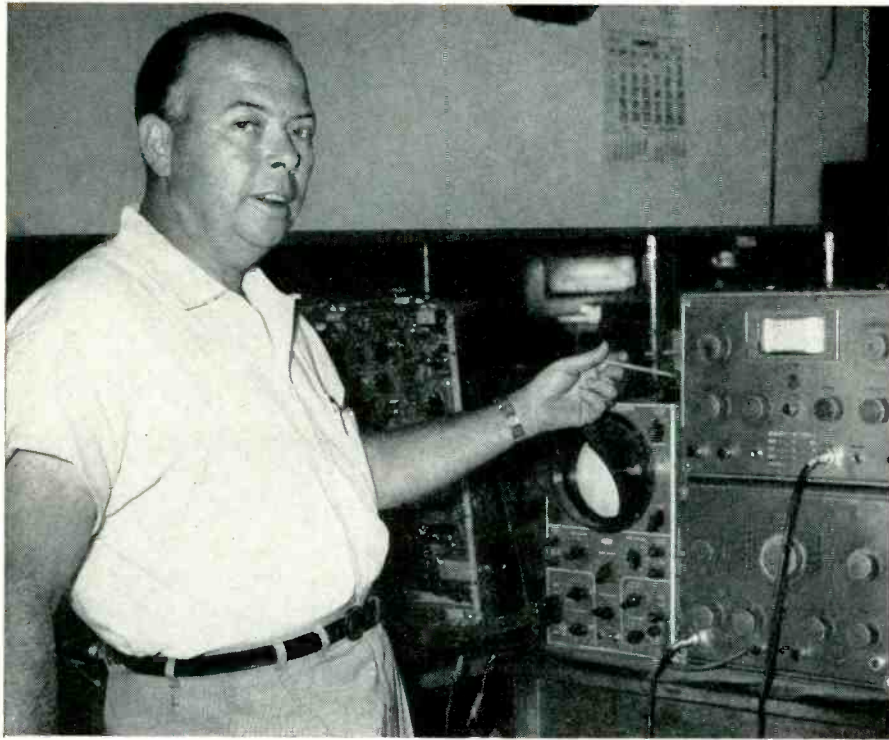


COMPLETE PHILCO NEEDLE CATALOG
Cross references are complete . . . Illustrations are big . . . Makes selling easy.

PHILCO
Accessory Division

WORLD WIDE DISTRIBUTION: Service Parts • Power Packed Batteries • Universal Components • Long-Life Tubes • Heavy Duty Rotors • Star-Bright 20/20 Picture Tubes • Long-Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories.

PHILCO® Famous for Quality the World Over



"Most of our service business comes from our Yellow Pages ads!"

says JAMES P. FULFORD, Proprietor
Fulford's-Colony Radio & Television, Washington, D. C.

"Yellow Pages advertising really produces for us! Since half our business is service, we'd be lost without the directory. For 85% of our repair work is done in the home — and people rely on the Yellow Pages to find us whenever they need radio or TV repair. So we rely on the Yellow Pages, too.

"Another thing. Because folks are so brand conscious today, I find it's good business to be listed under the trade-marks of all the major brands I service. That way, people find me when they're looking for a factory-authorized dealer to service the brand they have."

Yes, Yellow Pages advertising is good business. Why not have the Yellow Pages man show you how it can help you? Call your local Bell telephone business office today.

THIS 1/4-PAGE AD (shown reduced) brings Fulford's-Colony one servicing job after another...is greatly responsible for building the Company into one of Washington's foremost radio-TV service businesses.

TRADE-MARK LISTINGS. Ever mindful of the pulling power of an established trade-mark, Fulford ties in with manufacturers' trade-marks (such as Westinghouse, G. E., R. C. A.). These, plus listings under 8 headings, are continually boosting sales and service figures.

LETTERS

To the Editor

"Service" Subscription

Editor, ELECTRONIC TECHNICIAN:

My subscription to *Service* magazine expires Jan. 1961, but I have not received any copies since Oct. 1958. Kindly check this. Thank you.

RAYMOND L. YANZ

Lafayette Hill, Pa.

• All former *Service* subscribers started to receive *Electronic Technician* in Jan. 1959 after a two month gap to give us time to cross-check, and will continue to do so for a period equal to the dollar value of the unexpired portions of their subscriptions. *ET's* cost is twice as great as *Service's* because it is twice as large, so one issue of *ET* will be served for every two of *Service* still due. For example, from Oct. 1958 to your Jan. 1961 *Service* expiration covers 27 issues; divide this by 2, giving yourself the benefit of fractions, and you have 14 issues of *ET* still to come starting Jan. 1959. Your new *ET* expiration date is Feb. 1960. Subscribers to both magazines are having their *ET* subscriptions extended on the same basis. To be sure of a continuous flow of all issues from here on out, be sure to fill in the renewal notice you receive from our circulation dept.—Ed.

Cost Estimates

Editor, ELECTRONIC TECHNICIAN:

I agree 100% with what you said in your December Editor's Memo. In most cases it is impossible to give any estimate of how much a repair will cost. The Attorney General is supposed to help smoke out servicemen who do unfair dealing, not make it more difficult for the honest one. In 99% of our service calls which resulted in a bench job, we could not tell what was wrong in the customer's home. That is the reason you usually take the chassis to the shop. In the home we explain our rates for shop work, but do not give an estimate on bench jobs. We do promise to telephone the customer as soon as we could give him a reasonably accurate estimate.

BRIAN CHIN

Electron Radio-TV Service
New York, N. Y.

Self-Service Testers

Editor, ELECTRONIC TECHNICIAN:

I find you first again coming to the rescue of the service business with a hard-hitting item on captive service

(Continued on page 12)

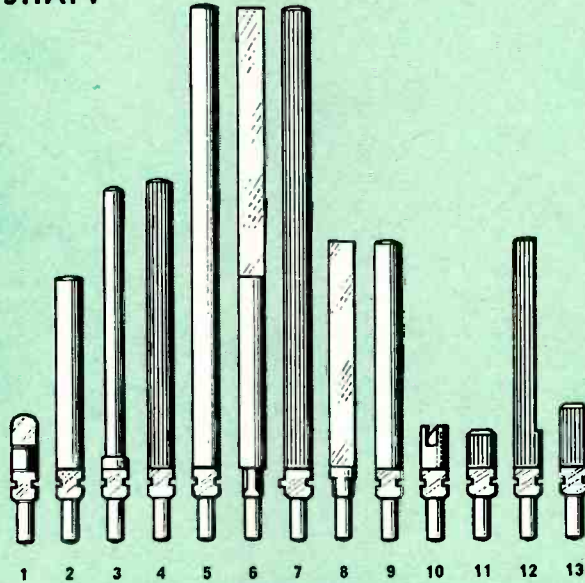
Quick as a Wink!



THE RIGHT CARBON CONTROL COMBINATION

There's no fuss, no muss, when it comes to getting the exact carbon control you want—when you ask for Clarostat. You get your choice of shaft—13 types to select from—and with just a light tap, the shaft is permanently attached. Also, pick your switch, and in a moment you have the exact combination you need. Ask your Clarostat distributor for the new, bigger, 1959 Catalog.

SHAFT

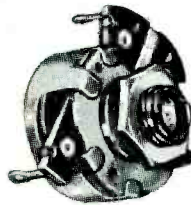


- 1 $\frac{3}{8}$ " long male for female fitting.
- 2 2" round shaft.
- 3 3" round shaft, $\frac{3}{16}$ " dia.
- 4 3" knurled split shaft.
- 5 5" round shaft.
- 6 5" flatted shaft.
- 7 5" knurled split shaft.
- 8 3" flatted shaft.
- 9 3" round shaft.
- 10 $\frac{1}{2}$ " double-flatted Philco-type shaft.
- 11 $\frac{1}{4}$ " fine knurled shaft.
- 12 3" knurled flatted shaft.
- 13 $\frac{1}{2}$ " fine knurled flatted shaft.

CONTROLS



Series A 47: $\frac{1}{2}$ -watt, $\frac{1}{16}$ " diameter controls. 500 ohms to 10 megohms.



Series A 47F: $\frac{1}{2}$ -watt, $\frac{1}{16}$ " diameter controls, with taps located at 30%, 50% or 70% of rotation, depending upon resistance value. 50K to 3 megohms.



Series AD 47: $\frac{1}{2}$ -watt, $\frac{1}{16}$ " diameter dual controls for audio, radio, TV and industrial uses. Various taps available. 50K to 5 megohms.

SWITCH



Choice of five switch types including SPST and DPST, for various power ratings. UL approved.

CLAROSTAT MFG. CO., INC.

Headquarters for **RESISTORS, CONTROLS, and RESISTANCE DEVICES**

DOVER, NEW HAMPSHIRE, U.S.A.

In Canada: CANADIAN MARCONI CO., LTD., Toronto 17, Ont.

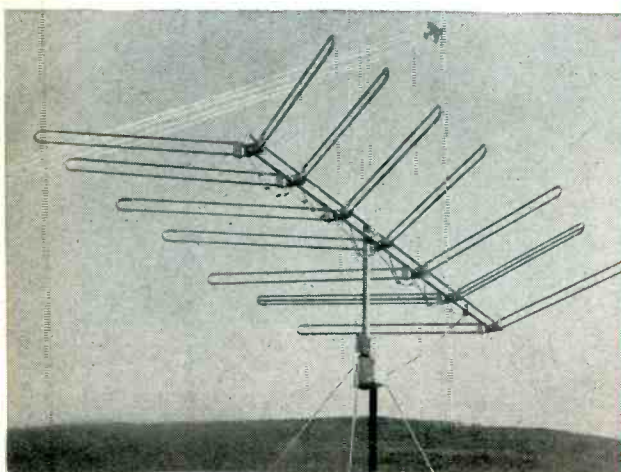


CHANNEL MASTER TRANSISTOR RADIOS

CHANNEL MASTER TV ANTENNAS

Dealers sell more T-W's than any other fringe-area antenna—by far. The powerful T-W delivers the highest gains and front-to-back ratios of any all-channel VHF antenna. Its rugged construction provides more years of peak performance. And it's nationally advertised on network TV and in leading magazines. Recommend a T-W for your next installation—and help your business grow.

CHANNEL MASTER **T-W** The World's Most Powerful TV Antenna



Personal Portable Radio

6 transistors, plus 1 diode and
1 thermistor. 5¾" x 3" x 1¾"

Model No. 6506 \$49⁹⁵ list
including accessories



Pocket Portable Radio

6 transistors, plus 1 diode.
4⅝" x 2¾" x 1¼"

Model No. 6501 \$34⁹⁵ list



Never before have any radios made such an instant hit with the American public. And no wonder! These electronic gems are unmatched in sensitivity — even by larger, much more expensive radios. Their smart, modern design... rich tone... and low price make Channel Master transistor radios America's #1 value.

CHANNEL MASTER

works wonders in
Sight and Sound

New! CHANNEL MASTER HIGH FIDELITY COMPONENTS

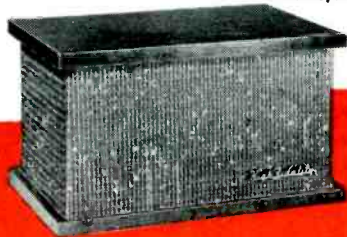
New components with a new idea: the "Practical Approach!" Channel Master's new hi-fi line is designed to eliminate confusion by directing the customer's attention to the 5 basic, practical considerations which apply to the selection of any high fidelity system: Performance, Ease of Operation, Versatility, Styling, and Cost.

The Channel Master line eminently satisfies each of these requirements. These are instruments of superb quality and striking appearance, offered at moderate prices. They reproduce with astonishing accuracy the entire audible spectrum with an absolute minimum of manual controls. The result is a true high fidelity system which satisfies the most discriminating audiophile... and yet can be used and enjoyed by virtually everyone.

Tiny Minstrel Speaker System brings concert hall realism to the home

Now, for the first time, full dynamic realism is achieved in a miniature enclosure only 9" x 9" x 16". Through the patented new "Acoustic Transformer" principle the entire air chamber becomes a phase matching air transformer which produces clear, undistorted sound from 50 to 15,000 cycles. The big sound and small size of Channel Master Minstrels make them ideal for flexible, space-saving, low-cost stereo installations.

audiophile net \$29⁹⁵



Monaural Amplifier Model No. 6620

audiophile net \$79⁹⁵ without cabinet

This superb 20 watt (40 watt peak) amplifier faithfully reproduces every sound audible to the human ear. Modern feed-back circuitry assures minimum distortion and full-frequency range. Special adapter jacks make conversion to a stereo system simple and economical. Solid brass face panel.



Stereophonic Amplifier

Model No. 6600

audiophile net \$119⁹⁵ without cabinet

The Channel Master 6600 stereophonic amplifier is an instrument of flawless electronic craftsmanship, embodying every advanced technical feature for full-range stereophonic sound reproduction. 16 watts on each channel (32 watt peak). Solid brass face panel.

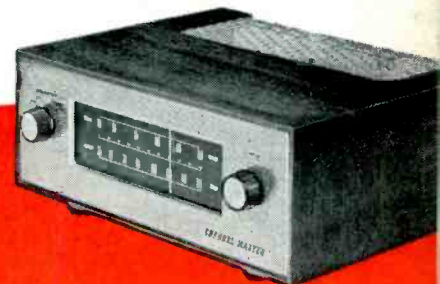
Cabinets available
in wood or metal.



AM/FM Tuner Model No. 6100

audiophile net \$84⁹⁵ without cabinet

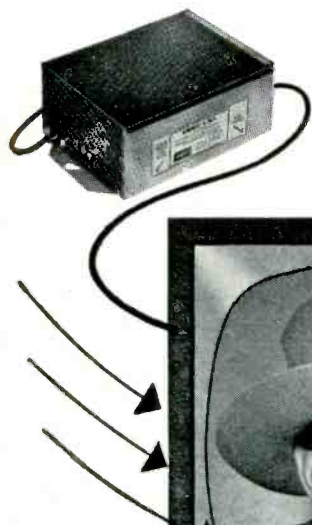
This outstanding tuner provides fine performance, pinpoint station selectivity and effortless flywheel tuning. Automatic Gain and Volume Controls on FM and AM prevent overloading by strong signals and maintain constant sound levels. Special multiplex output permits tuner to be adapted for stereophonic FM broadcasting. Solid brass face panel.



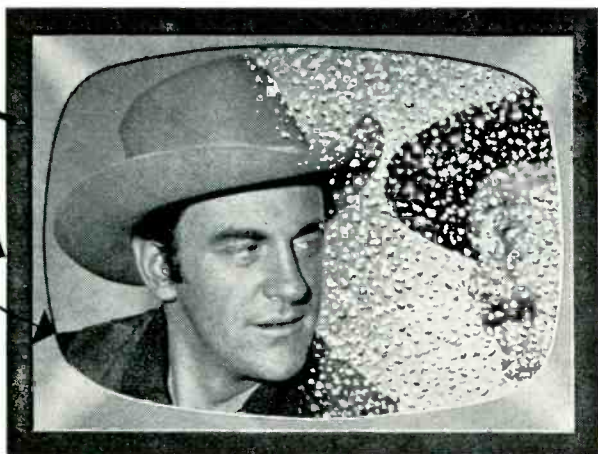
for product literature contact your CM Distributor or write to

CHANNEL MASTER CORP.

ELLENVILLE, NEW YORK



**SNOW, SNOW,
go away—**



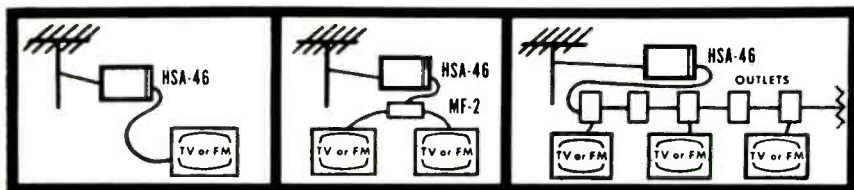
JERROLD makes clear pictures pay

with **NEW HSA-46 Home Amplifier!**

Jerrold's HSA-46 is a VHF Pre-amplifier that incorporates 2 two-stage neutralized triode amplifiers designed specifically for low noise figure (ability to work with small signals) and flat response (to avoid picture degradation, especially on color) over the entire TV and FM range.

Features 15 db gain; 300 ohm input and output; max. input signal 30,000 uv per ch. on 7 chs.; 24 hr. continuous operation; 110 V. AC., 18 watt power consumption.

EXTREMELY LOW NOISE FIGURE DELIVERS SUPERIOR RECEPTION TO ONE OR MANY TV AND/OR FM SETS!



Delivers high signal strength (6 times antenna signal) to single receiver.

Used with Jerrold's MF-2 Coupler delivers 3 times antenna signal to each of two receivers.

Used with Jerrold's new Home System outlets provides excellent reception at any number of plug-in outlets throughout a home.

DEMONSTRATE IT—YOU'LL SELL IT!

Write today for special applications literature.



ELECTRONICS CORPORATION

Dept. PD 137, The Jerrold Building, Philadelphia 32, Pa.
Jerrold Electronics (Canada) Ltd.
Export Representative, CBS International, New York 22, N. Y.

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

(Letters, Continued from page 8)

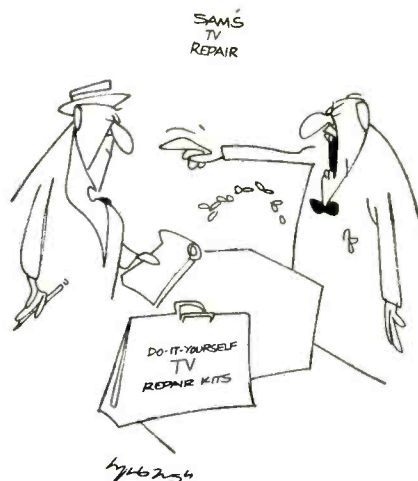
(Nov. 1958). However, I am amazed at your stand on tube vending machines. I realize it would not be your intention to promote anything detrimental to the trade, but I wonder if all perspectives of the operation and its consequences have been studied thoroughly. This large business has been exploited in large by those who desire to make a fast buck. The patrons of these machines are out on a limb and do not realize it. Many tubes are bought needlessly before it is discovered that an under-chassis component is the cause of faulty operation. Many times it simply amounts to spending dollars in order to save pennies. I understand that California will investigate tube vending machines in the near future. Only through periodic inspection by qualified service personnel can these tube testing machines operate in the proper manner.

FLOYD N. STRONG

Strong's TV & Radio
Chardon, Ohio

• We agree with reader Strong that tube testing and trouble analysis by a technician is preferable to self-service tube testing. However, the fact is that millions of replacement tube sales have slipped away from service dealers and been grabbed by promoters, chain stores and other tube vending operators. We believe that for his own protection, to keep tube sales within the service industry, and to give the public recourse to capable technicians, it is in the service dealer's interest to set up his own self-service tester route.—Ed.

For more information on new products described in this issue, fill in coupon on page 60.



"Sure I'll give you a big order, . . .
Get outa here!!"

Mr. Service Dealer—Look!

PHILCO
brings you a

**COMPLETE LINE
OF UNIVERSAL
SERVICE PARTS**

**A PROGRAM OF
COMPLETENESS**

...all year 'round

Your Philco Distributor has available a full line of Philco Universal Parts that fit every television and radio make and model. All Philco Universal Parts are precision engineered to insure superior performance, greater dependability and longer life. Eliminate your inventory problems and stock the one line of completeness . . . Philco. Don't settle for less!

PHILCO UNIVERSAL SERVICE PARTS • R.F., I.F., Oscillator, Sound Detector and Horizontal Oscillator Coils • Capacitors • Vibrators • Rectifiers • Horizontal Output Transformers • Deflection Yokes • Width and Linearity Coils • Vertical Output Transformers • Vertical Blocking Transformers • Audio Output Transformers • Power Transformers.

PHILCO
Accessory Division

WORLD-WIDE DISTRIBUTION

Service Parts • Power Packed Batteries • Universal Components • Long-Life Tubes • Heavy Duty Rotors • Star Bright 20/20 Picture Tubes • Long Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories.

PHILCO . . . FAMOUS FOR QUALITY THE WORLD OVER



COMPLETE NEW ELECTRONICS PARTS CATALOG—

Now available in five sections. Complete, up-to-date information designed to save you time and effort.

**See Your Philco
Distributor Today**

PHILCO CORPORATION ACCESSORY DIVISION

ATTN: Carl Areschoug
P. O. Box 3635
Philadelphia 25, Pa.

If you service television and radio receivers and would like to receive valuable promotional mailings from Philco, attach this coupon to your Company letterhead and forward to above address.

NAME _____

ADDRESS _____

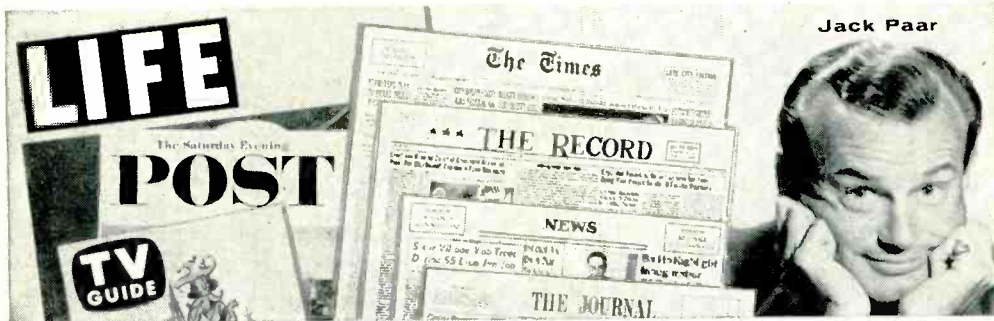
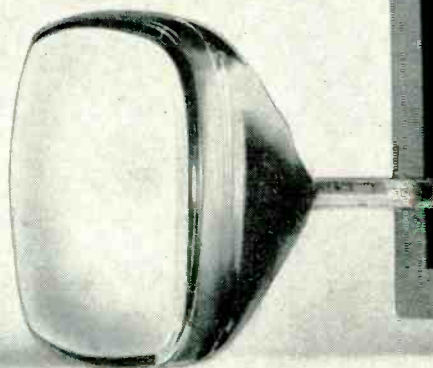
CITY _____ ZONE _____ STATE _____

NOW FROM RCA...TWO

ALL-NEW

RCA Silverama®

SILVERAMA is RCA's premium tube—and that means tops in the industry! Manufactured with all-new glass and parts, it's the finest picture tube made—for the customer who prefers top-quality. RCA SILVERAMA—a premium tube that merits a premium price—and commands premium profits for you!

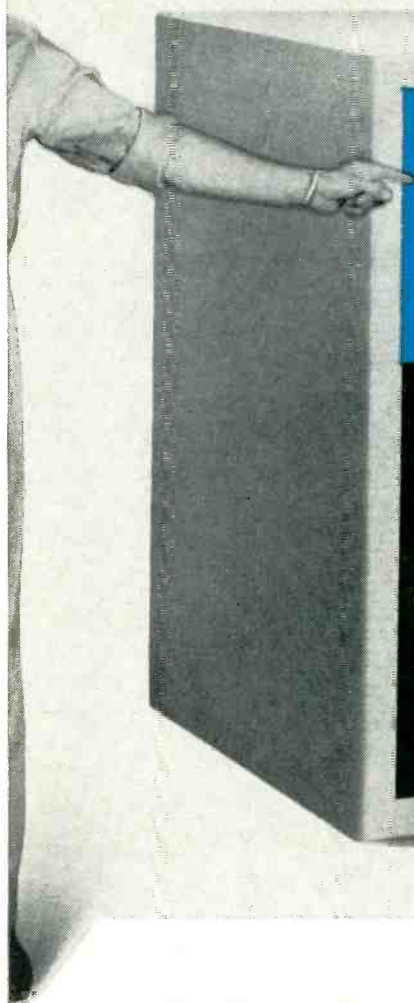


RCA is telling every TV owner the facts about RCA's BIG 21 IN PICTURE TUBES in the most informative and hard-hitting advertising campaign ever undertaken in the tube industry—directing all sales to you, the independent TV service technician.

GET THE PRICE AND PROFIT STORY

LINES OF PICTURE TUBES

FACTORY-REBUILT



RCA Monogram

RCA MONOGRAM is the finest rebuilt picture tube made. Factory-rebuilt by RCA to high quality standards, this tube assures dependable performance and fewer call-backs. It is backed by a brand name *you sell with confidence—a brand name they buy with confidence.* RCA MONOGRAM is economy-priced for the economy-minded buyer.

NOW you will be able to offer your customers a choice between an ALL-NEW, PREMIUM RCA SILVERAMA TUBE, the finest tube in the business, and an RCA MONOGRAM, the best REBUILT made. Yes, RCA manufactures both—and *warrants both for a full year.* Satisfy the needs of every customer with the right tube for virtually every set on the market.

Now, *you* call the signals. Now, *you* supply the very best tube in both price ranges—all-new or factory-rebuilt! Both lines of tubes now available from your RCA Distributor.

FROM YOUR RCA DISTRIBUTOR TODAY



RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.

BRAND NEW! READY FOR YOU NOW!

Neatest Package Yet... Greatest Convenience Ever

FOR CARBON COMPOSITION RESISTORS



HANDY-PAK *

Just the kind of package you have been asking for! New IRC Handy-Paks were designed with the up-to-date Serviceman in mind. Here is the neatest, most compact resistor package available in the whole electronics industry. And it is exclusive from IRC. Fussing and fuming over stocking small parts is all over as far as carbon composition resistors are concerned. IRC Handy-Paks are easier to buy, easier to stock, and easier to use. Ready for you now . . . added convenience for the world's finest resistors.

3

TYPES

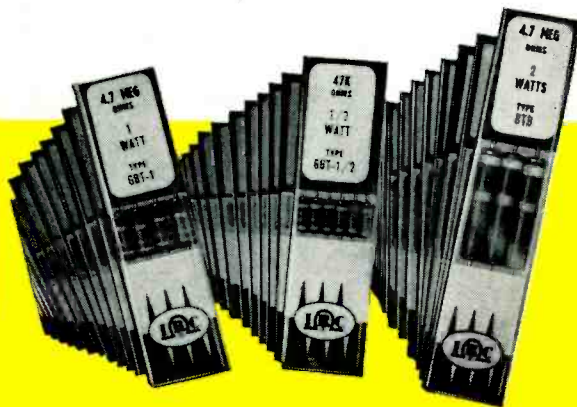
**½ watt, 1 watt
and 2 watts**

★

All Handy-Paks

72¢
ea.

DEALER NET



Each IRC Handy-Pak contains several carbon composition resistors of one type and resistance value . . . to save you unnecessary shopping. Three types include: 6 ½-watt resistors; 4 1-watt resistors; and 3 2-watt resistors.

EASIER TO IDENTIFY!

In clear, large letters the type, resistance value and power rating are printed on every Handy-Pak. Correct identification is fast and certain with Handy-Paks.

QUICKER TO FIND!

In any stocking arrangement, Handy-Paks can be quickly indexed by power rating and resistance. Your resistor stock remains orderly from the time you buy it until you use it.

HANDIER TO USE!

IRC Handy-Paks open at both ends. The package slides out of the slimline plastic sleeve. Simply withdraw one or more resistors and slide the package back into the protective shield. Leads are kept straight, and resistors are always factory-clean.

EASIER TO CHECK INVENTORY!

The actual resistors are clearly visible. You always know what you have. Identification tab tears off conveniently for reordering reminder.

*Patent Pending

And here's the perfect trio for keeping them at your fingertips!

IRC RESIST-O-PEDIA

Resistor Assortments in Handy Book Form

Here's unique convenience for stocking carbon composition resistors. Attractive blue and yellow hardback binder measures 9x8 $\frac{1}{4}$ x2 $\frac{7}{8}$ ". 3-ring "fingered" inserts hold resistor Handy-Paks. Indexed stock saves searching . . . speeds servicing. Complete resistor identification always visible. Choose from 3 popular assortments—

- #44 462 1/2-watt resistors, 77 values **\$5544**
 - #48 308 1-watt resistors, 77 values **\$5544**
 - #51 195 2-watt resistors, 65 values **\$4680**
- Dealer Net Price



RESIST-O-PEDIA included FREE with Nos. 44, 48 and 51 Handy-Pak Stock Assortments

IRC RESIST-O-CHEST

All-Metal File in 6 Assortments

End "cigar box confusion." Select from 6 popular carbon composition resistor stocks, all in sturdy metal chests. Hinged lid and metal separators keep resistor Handy-Paks in order . . . right at your fingertips. Compact 5 $\frac{5}{8}$ x3 $\frac{3}{8}$ x6 $\frac{1}{4}$ " size takes little bench space. Identification data clearly visible. Select from 6 fast-moving assortments—

- #42 204 1/2-watt resistors, 34 values **\$2448**
 - #43 462 1/2-watt resistors, 77 values **\$5544**
 - #46 136 1-watt resistors, 34 values **\$2448**
 - #47 308 1-watt resistors, 77 values **\$5544**
 - #49 102 2-watt resistors, 34 values **\$2448**
 - #50 195 2-watt resistors, 65 values **\$4680**
- Dealer Net Price



RESIST-O-CHEST included FREE with Nos. 42, 43, 46, 47, 49 & 50 Assortments

IRC RESIST-O-CADDY

Resistor Companion For Tube Caddys

Ideal for in-home servicing. Pliable plastic pouch folds to 6 $\frac{3}{4}$ x3 $\frac{7}{8}$ x1 $\frac{1}{2}$ " . . . fits easily in tube caddy or tool chest. Individual pockets hold resistor Handy-Paks secure and orderly. Accurate inventory always visible. RESIST-O-CADDY included FREE with either of these "best-seller" assortments—

- #41 120 1/2-watt resistors, 20 values **\$1440**
 - #45 80 1-watt resistors, 20 values **\$1440**
- Dealer Net Price

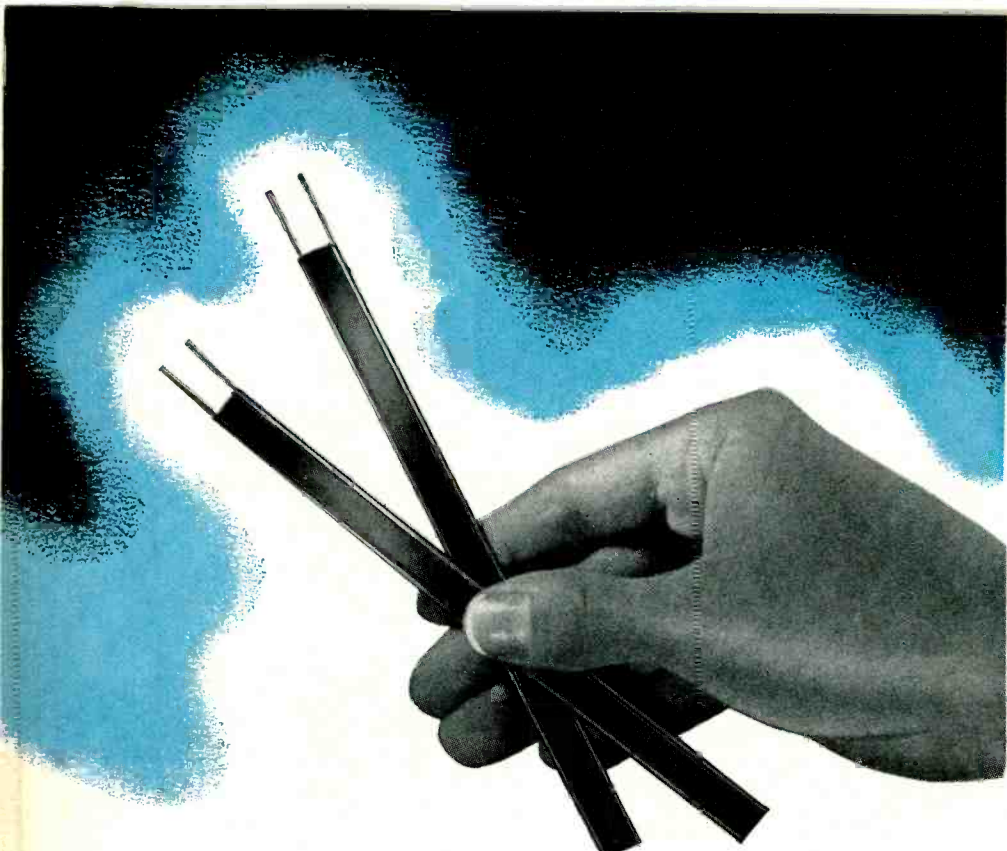


CHOOSE THE HANDY-PAK DEAL THAT SUITS YOU BEST
And Order Today From Your IRC Distributor!

Wherever the Circuit Says

INTERNATIONAL RESISTANCE CO.
 Dept. 902, 401 N. Broad St., Philadelphia 8, Pa.
 In Canada: International Resistance Co., Ltd., Toronto, Licensee





—what is the DIFFERENCE?

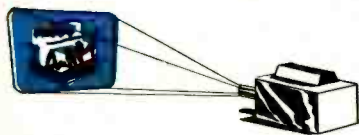
At a glance, all twin leads look alike. Why then should they sell at such widely different prices? What is the difference between Quality and "Price" twin leads?

To answer this question, AMPHENOL has prepared an informative slide film. It compares "Price" versus Quality twin lead in nine important ways:

<i>Quality Twin Lead</i>	<i>vs</i>	<i>"Price" Twin Lead</i>
1. Virgin Polyethylene		1. Reclaimed, reground Polyethylene
2. Pure Polyethylene		2. Wax extenders
3. Exact mil thickness		3. Up to 10% less than marked
4. Strong copper conductors		4. Small strands, less copper
5. Properly annealed wire		5. Brittle, rejected wire
6. 3/4" "lay" of wire		6. 1 1/2" "lay"—less copper, less strength
7. Proper conductor spacing		7. Conductors close—wrong impedance
8. Full lengths on spools		8. Undership as much as 50 ft.
9. Quality manufacturing		9. Extrusion speedup, no inspection

Because of these differences, it's a gamble every time "Price" twin lead is used—a gamble that "saves" about 26¢ on a 50 foot installation! It's a gamble that the installer always loses.

USE QUALITY—USE AMPHENOL TWIN LEAD!



Arrange with your Authorized AMPHENOL Distributor to see "What is the Difference?" get the facts on "Price" twin lead.

Write for a copy of "What is the Difference?"—a useful booklet which summarizes the main points of the slide film.



distributor division

AMPHENOL-BORG ELECTRONICS CORPORATION
chicago 50, illinois

News of the Industry

CBS-HYTRON announces the appointment of LEO G. RAPPOLI as Controller of semiconductor operations.

CALVIDEO TUBE CORP. has moved into their newly constructed plant at Santa Fe & Artesia, in Los Angeles' newly developed industrial tract.

ZENITH RADIO CORP. reports that consolidated sales for the first quarter of 1959 will be approximately \$53,000,000, a 25% increase over 1958's record breaking first quarter of \$42,173,732.

MICROTRAN CO. INC. announces the opening of its West Coast warehouse, at 1485 Bayshore Blvd., San Francisco, Calif., where the full transformer line will be stocked.

HOFFMAN ELECTRONICS CORP. announces the appointment of GEORGE W. DESOUSA as Vice Pres. in charge of marketing for the semiconductor division.

PHILCO CORP. Consumer Products Division, has named JOHN A. RISHEL, Jr. General Manager of Merchandising, replacing JAMES J. SHALLOW who resigned.

KESTER SOLDER CO. will, this month, complete its 60th year in business. It started in 1899, as the first manufacturer of fluxcore solder for the infant electrical industry. Also reported is the death of EDNYFED H. WILLIAMS at the age of 76 years. He had long been associated with the Company in the capacity of Vice Pres. and Corp. Counsel.

ALLEN B. DU MONT LABS. announces the appointment of BERNARD MENKES as field applications engineer, for industrial tubes, in the southern New York State area including Metropolitan New York and Long Island.

RAYTHEON MFG. CO. announces the creation of two new commercial product divisions from the former Commercial Equipment Division. JOHN H. BEEDLE, manager of the former division, will head the new Equipment & Systems Division. J. PENN RUTHERFOORD, assistant manager of the former division, has been appointed Manager of the new Industrial Apparatus Division. Another appointment is that of RICHARD E. SEIFERT as sales planning manager for the semiconductor division.

(Continued on page 24)

FASTEST

Now, in New Triplett Model 3414 you will recognize another answer to a long standing need—a FASTER, more versatile tube tester.

- * All switch settings can be made before the tube warms up; you are ready to test as soon as the filaments reach proper temperature.
- * Rejects burned-out tubes instantly without waiting for the filament to heat.
- * Complete flexibility for new tube setups; plus the non-obsolence factor.
- * A few simple switch settings give the complete and accurate story of tube capabilities.
- * Modified plate conductance circuit—for closer correlation to tube characteristics.

Neon Indicator shorts test—NEW, fast and accurate. Slightest inter-element shorts show while the cathodes are hot.
 New variable leakage test from 0.3 megohms to over 3 megohms.
 Checks all today's and tomorrow's tubes (including new series filament tubes). With BV adapter TV picture tubes can be tested in the set.



\$79.50
NET



Two other Triplett testers—



To the left for the ultimate in laboratory quality testing Model 3423 a \$199.50 Mutual Conductance Tube Tester.

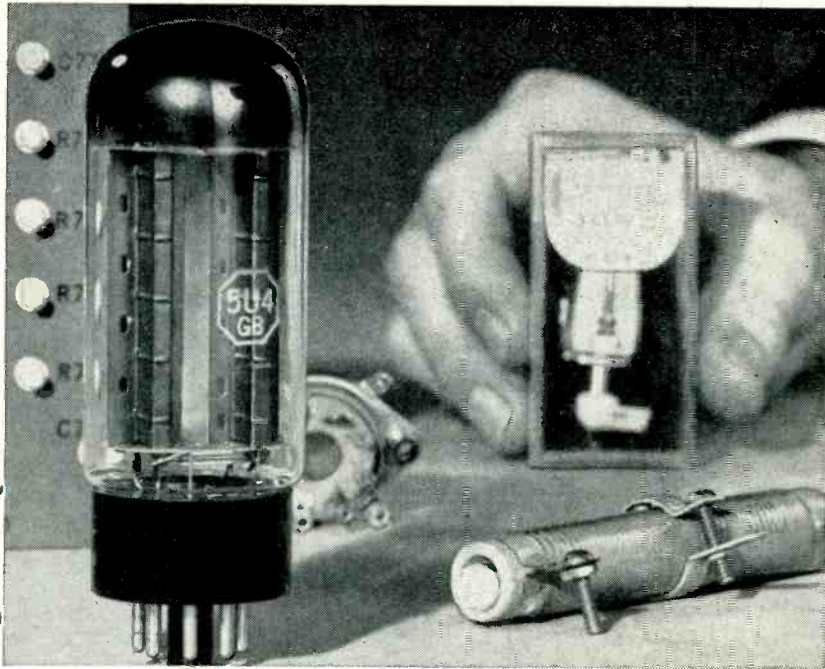
For full information see your Triplett distributor or write

New Model 69B-A Transistor Tester Leakage and Gain test for all low and medium power PNP and NPN type transistors—\$29.50 net.



Burton Broene Advertising

TRIPLETT ELECTRICAL INSTRUMENT COMPANY · BLUFFTON, OHIO



*Now you can
be sure he'll
get his tuner
sooner...*



IT'S THERE IN HOURS... AND COSTS YOU LESS!

Your packages go anywhere Greyhound goes... and Greyhound goes over a million miles a day! That means faster, more direct service to more areas, including many, many places not reached by other public transportation.

What's more, Greyhound Package Express offers this service seven days a week... twenty-four hours a day... even on week-ends and holidays! Packages get the same care and consideration as Greyhound passengers... riding on dependable Greyhound buses on their regular runs. And you can send C.O.D., Collect, Prepaid—or open a Charge Account.

So remember — anything from tubes to transformers can be sent Greyhound Package Express. Call your nearest Greyhound bus station or write to Greyhound, Dept. H-2, 5600 Jarvis Ave., Chicago, Ill.



You get

DEPENDABILITY

when you use

ZENITH[®]
QUALITY
PICTURE TUBES

and you get more
customer satisfaction



You get extra dependability and extra satisfaction, too, when you sell ZENITH Quality TV Picture Tubes! The Zenith Cinébeam Aluminized Picture Tube gives the ultimate in performance...the ultimate in picture clarity.

Zenith Pioneered in the development of TV picture tubes... Cinébeam Picture Tubes, Rectangular Tubes. Zenith was *first* with Lo-Voltage Electrostatic Tubes and the Black Tube. Zenith's list of first in picture tubes is just one more example of Zenith's leadership in creative engineering and advancements.

Replace with the best...replace with Zenith Quality Picture Tubes

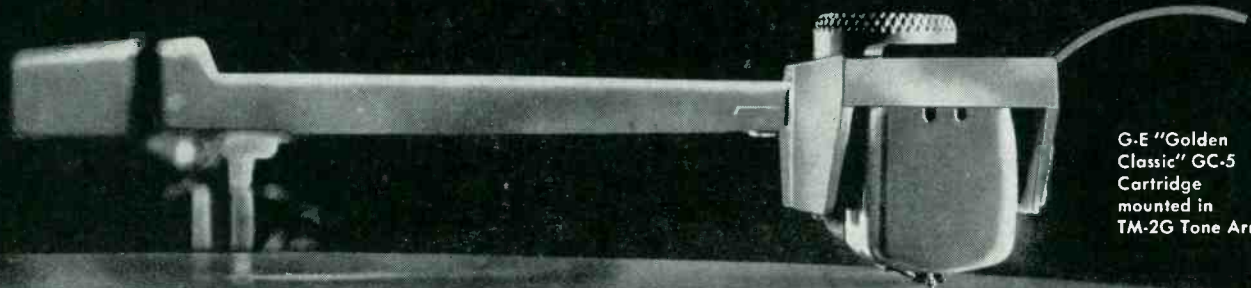
You can safely guarantee Zenith repairs when you use dependable Zenith components. **Buy picture tubes by Zenith**... backed by 40 years of leadership in radionics exclusively. The quality goes in before the Zenith name goes on.

SEE YOUR ZENITH DISTRIBUTOR



ZENITH RADIO CORPORATION
PARTS AND ACCESSORIES DIVISION
6001 W. Dickens • Chicago 39, Illinois

Stereo profits start here!



G-E "Golden Classic" GC-5 Cartridge mounted in TM-2G Tone Arm

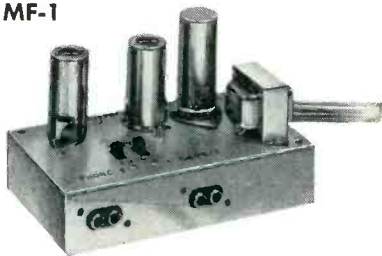
SPECIFICATIONS

- Compatible with both stereo and monaural records
- Full frequency response, 20 through 20,000 cycles
- "Floating armature" design increases compliance, reduces record wear
- Effective mass of stylus about 2 mg
- Output 8 mv
- Recommended tracking force with professional-type tone arm 2 to 4 grams
- Consistently high separation between channel signals (Specifications for GC-5)

Model GC-5 (shown) with .5 mil diamond stylus, **\$26.95**. Model GC-7 with .7 mil diamond stylus, **\$23.95**. Model CL-7 with .7 mil synthetic sapphire stylus, **\$16.95** (Manufacturer's suggested resale prices).

New Dual Stereo Preamp

Model MF-1



Easy, inexpensive way to convert stereo systems from ceramic to magnetic cartridges where necessary preamplification is not present. Dual inputs—stereo phono or tape. High sensitivity, low hum and noise, individual switching for each channel. **\$24.95** (Manufacturer's suggested resale price).

General Electric cartridges are easier to sell...offer better frequency response...greater compliance...less record wear...sensible prices!

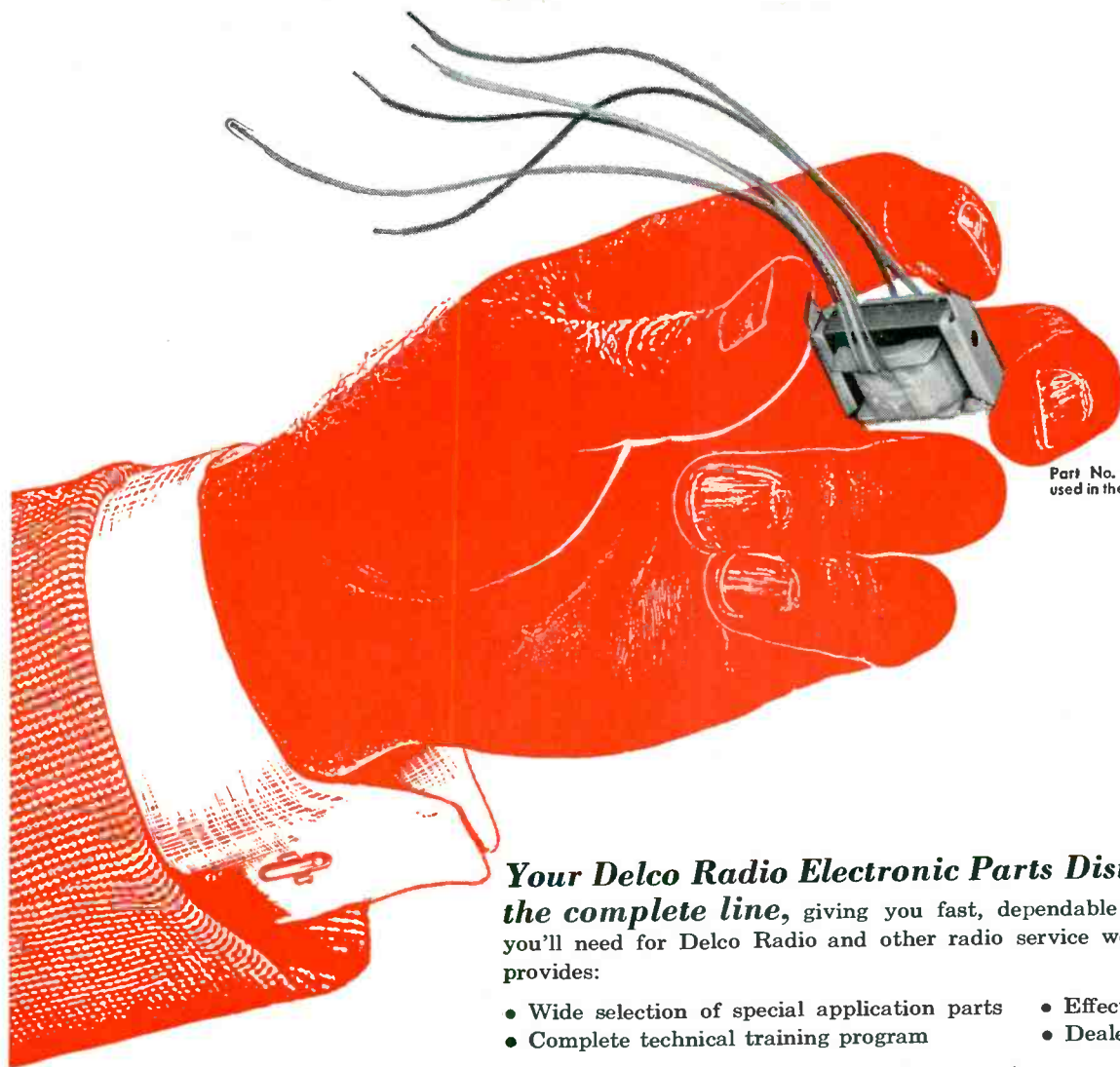
Start your customers on stereo *the right way*—with General Electric's new "Golden Classic" stereo-magnetic cartridges. They provide the high compliance, low distortion and excellent channel separation required by the new stereo discs. Just as important, General Electric is the name *all* your customers know and trust.

Only one moving part: General Electric "Golden Classic" cartridges have only one moving part—the stylus—which "floats" freely in special-formula damping cushions. This means lower mass, higher compliance, reduced wear on records and stylus. It also means your customers are getting the finest possible stereo performance when you sell them a G-E "Golden Classic!"

FREE! 16-Page Booklet — "Application Considerations in the Use Of Stereo Phono Cartridges." Tells how to convert different record changers and turntables to stereo. Write today! General Electric Company, Specialty Electronic Components Dept., W. Genesee Street, Auburn, N. Y.

GENERAL  **ELECTRIC**

Use Delco Radio Service Parts!



Part No. 7270804—output transformer used in the new Delco Portable Car Radio.

Your Delco Radio Electronic Parts Distributor carries the complete line, giving you fast, dependable service on the items you'll need for Delco Radio and other radio service work. Delco Radio also provides:

- Wide selection of special application parts
- Complete technical training program
- Effective warranty program
- Dealer identification signs


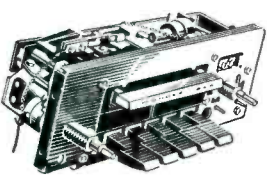



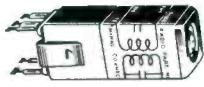




Get the facts today on this truly profitable dealer setup, and grow with General Motors!

Available everywhere through Electronic Distributors associated with...



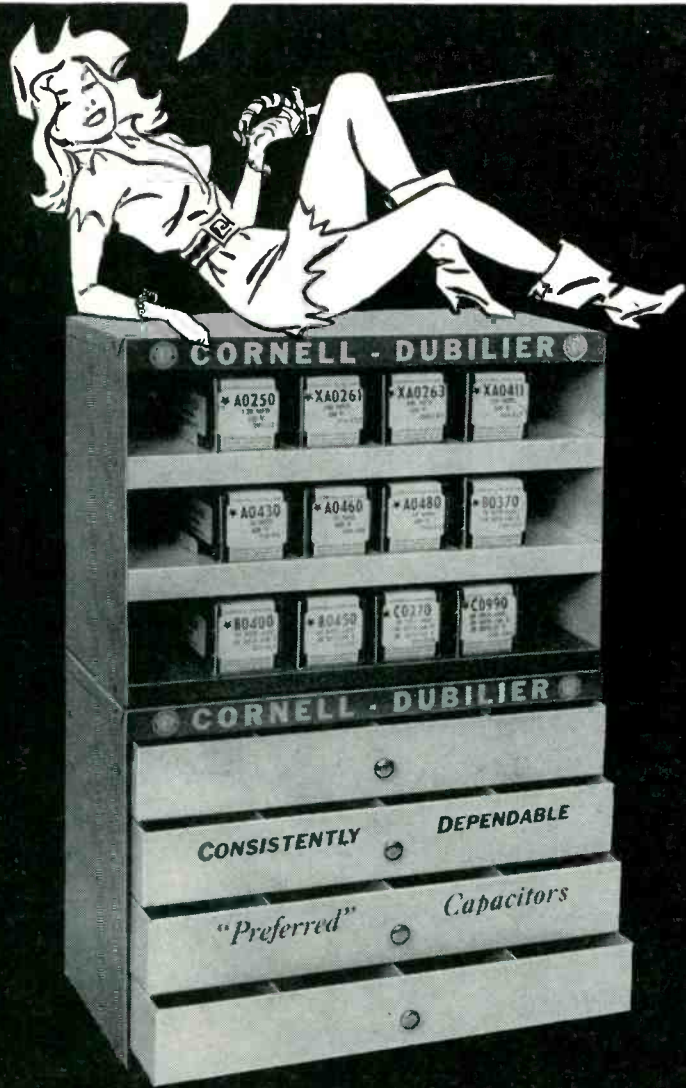
DELCO RADIO

DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA

 <p>SPEAKERS</p>	 <p>TUNER PARTS</p>	 <p>TUBES</p>	 <p>IRON CORES</p>
	 <p>TRANSISTORS</p>	 <p>COILS</p>	 <p>RESISTORS</p>
		 <p>VIBRATORS</p>	 <p>CAPACITORS</p>
			 <p>CONTROLS</p>

THE TREASURE CHEST THAT'S NEVER EMPTY

Brings more dollars to C-D distributors



FILLED WITH "GOOD-AS-GOLD" C-D CAPACITORS.

Here's the smart, modern way to keep your working capacitor stock shipshape. Each chest comes with a fast-moving assortment of C-D "Preferred" type twist-prongs, "Blue Beavers," and Mylar Tubulars—buy them and you get the chests FREE. Speed up your work...establish customer confidence with Consistently Dependable C-D capacitors from your own Treasure Chests. See them at your distributor or write for Bulletin to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.



Consistently Dependable
CORNELL-DUBILIER
SERVICE CAPACITORS

News of the Industry

(Continued from page 18)

ALPHA WIRE CORP. reports that custom cable facilities and highly specialized equipment have been added. There is now an inventory of 4,000 basic wire constructions.

MOTOROLA INC. has appointed **DON C. LIVINGSTON** as Manager of Two-Way Radio Sales in the area bounded by New Mexico, Okla., Ark., Tenn., and Ga., with headquarters at 7138 Envoy Court, Dallas, Texas.

ASTRON CORP. announces the purchase of **MINITRONICS CORP.**, and the appointment of **MATTHEW KATZ**, formerly Vice Pres. and Chief Engineer of **MINITRONICS CORP.**, to head their new tantalum operation.

GENERAL ELECTRIC CO. Receiving Tube Dept. has a new, 10-minute, color slide film, available for electronic parts distributors. The film highlights significant points in the "Service Designed" program.

CHANNEL MASTER CORP. states that 1958 is the seventh year the firm has made a maximum contribution to its employees' Profit Sharing Retirement Plan of \$468,842.57, which equals 15% of each participant's earnings. Employees make no contribution to the Fund.

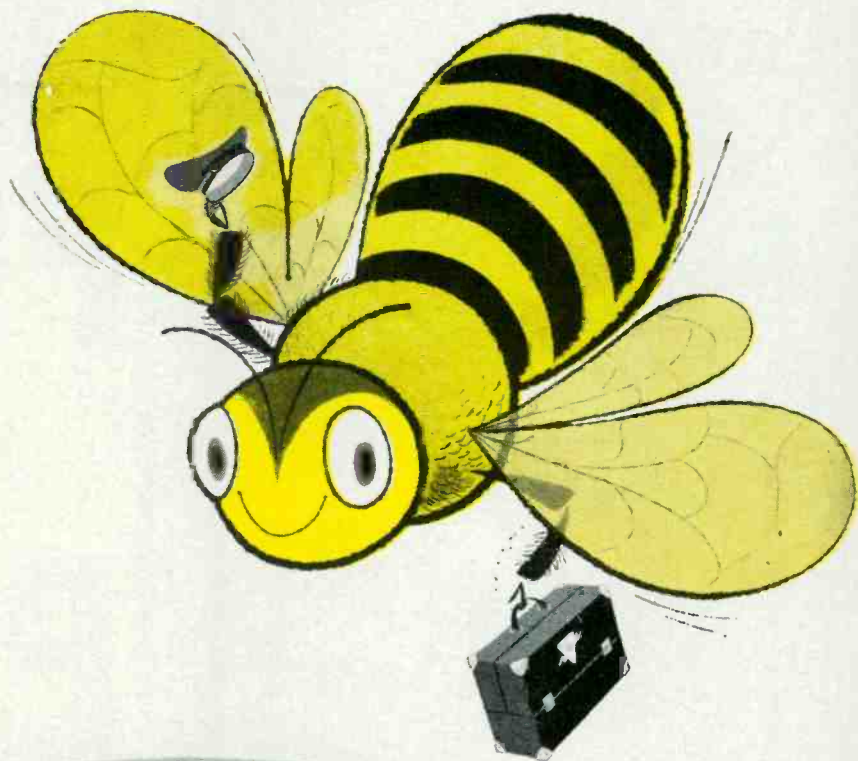
BELDEN MFG. CO. reports that legal action, to prevent **REGO MFG. CO.** from manufacturing and selling transmission line which infringed **BELDEN's** patents, has been settled in the issuance of a consent decree in preliminary action in a federal court. **REGO** will continue to manufacture foam polyethylene transmission line but under a license agreement with **BELDEN**.

RADIO CORP. OF AMERICA has awarded 63 undergraduate scholarships to college and university students. Thirty of the **RCA** Scholarships, valued at \$800 each, were made to students in the fields related directly to the electronics and broadcasting industries, and the Nation's security. Three other \$800 **RCA** Scholarships went to honor graduates of **RCA** Institutes. The remaining thirty, designated as **RCA** Science Teacher Scholarships, went to students preparing for careers as teachers.

PYRAMID ELECTRIC CO. reports that the sale of their new "Gold Standard" Mylar Capacitor has reached 3½ million units since it was launched last Sept. Also reported is the sale of their North Bergen, N. J. plant for \$610,000. Leased space, in the same general vicinity, will be occupied by the jobber division. Manufacturing activities will be conducted at Gastonia, N. C., and at Darlington, S. C. Executive offices will be at the latter location.

(Continued on page 27)

Make a bee line
for your
**AUTHORIZED
SYLVANIA
DISTRIBUTOR**



—where “first line” dealers
are buzzing about

LOWEST COSTS IN
“Silver Screen 85”
HISTORY!

**Authorized
SYLVANIA
Distributor**

Here's good news, extra profit news, for “first line” dealers who sell up to Silver Screen 85. During the current promotion new low costs make America's most popular picture tube your most profitable first-quality replacement.

Call your Sylvania Distributor right away! Ask him for details about his plan. Then sell up to extra profits on every Silver Screen 85 you install.

SILVER SCREEN 85 PICTURE TUBES
RECEIVING TUBES
INDUSTRIAL PRODUCTS



SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station “O” Montreal 9

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • CHEMISTRY-METALLURGY

ELECTRONIC TECHNICIAN • February, 1959

25

MORE POWER PER POUND

in the
ALL-NEW

UTAH

**dual-diameter
speakers**

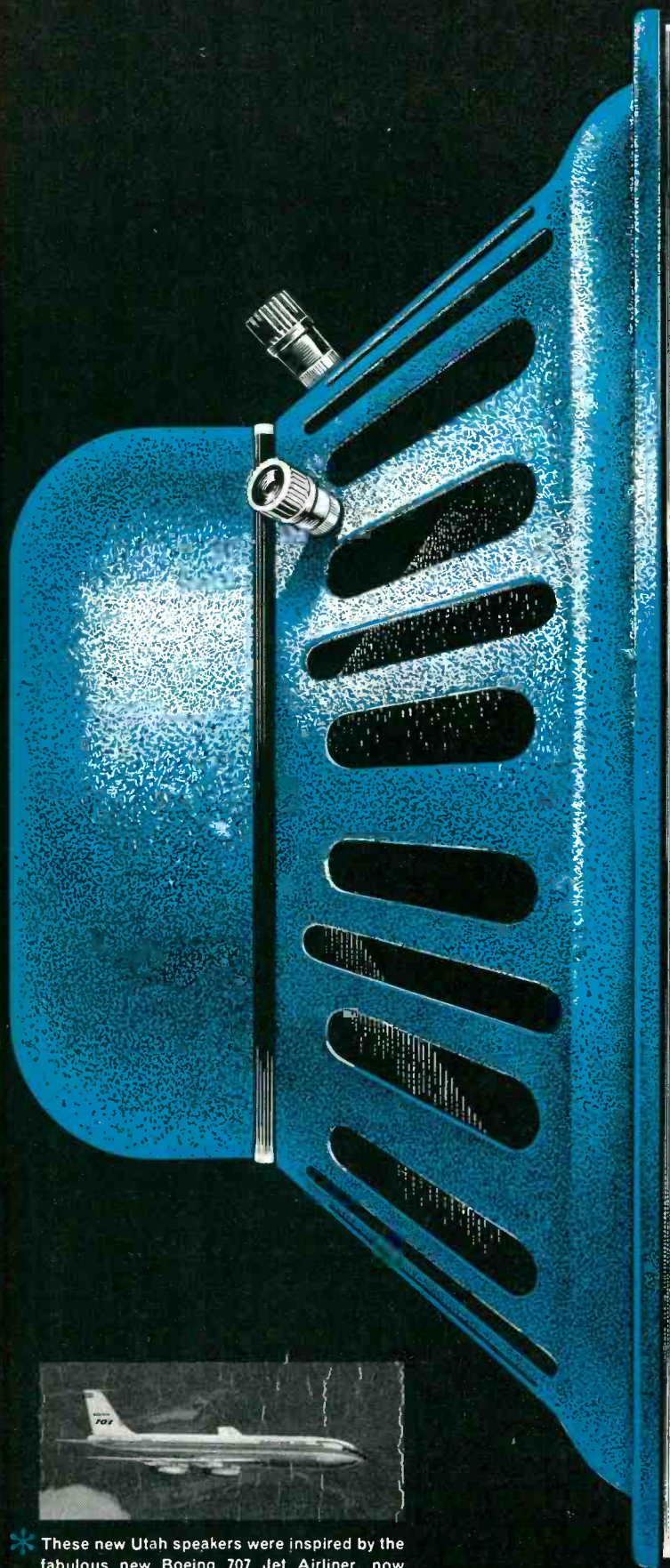
Never before such *concentrated power!* The secret is in Utah's brand new dual-diameter magnetic circuitry and dynamic Uni-coils. By ingeniously combining two magnetic material structures into one, Utah has produced the greatest power per pound in a loud-speaker since the advent of Alnico V. See the all new Utah speakers now—8" full range model D8LA and 12" full range model D12LA—they're as "hot" as a Jet Airliner!

Utah

SPEAKERS



Utah Radio & Electronic Corp., Huntington, Inc.



* These new Utah speakers were inspired by the fabulous new Boeing 707 Jet Airliner, now streaking coast to coast in just 4½ hours! Utah speakers, too, pack more power per pound, feature Jet Airliner slim-line design to meet modern demands for more compact Stereo and High Fidelity applications.

News of the Industry

(Continued from page 24)

PRECISION APPARATUS CO. announces the following appointments: SOL SPARER, sales manager of the distributor division; HARRY BRASSEN, comptroller; ALAN D. MENTZER, production manager of the PACO division.

STROMBERG-CARLSON has opened a new sales office, at 6589 Main St., Buffalo, N. Y., to handle direct factory-to-user sales of intercommunication equipment. WILLARD C. KOEF, newly appointed District Sales Manager, is in charge.

SYLVANIA ELECTRIC PRODUCTS, INC. announces that ROBERT E. LEWIS, formerly a Director and Senior Vice President, has been elected President. Reported also is the upcoming eighth annual Television Award presentations to be made for the Outstanding Telecasts and Actors of the Year.

RADIO CORP. OF AMERICA Industrial Electronic Products Div. announces the following appointments: CHARLES H. COLLEDGE, Gen'l Mgr., Broadcast & Television Equipment Div.; and JOHN J. GRAHAM, Gen'l Mgr., Communications & Industrial Electronic Products Operations Div.

TEXAS INSTRUMENTS INC. reports that CHARLES K. FENNEL has joined the company as Manager of Marketing Techniques. Also that a new district sales office of the semiconductor components division has been opened at 600 Old Country Rd., Garden City, L. I., N. Y. J. F. HEGARTY, District Manager, is head.

WESTINGHOUSE ELECTRIC CORP. reports that a free lecture program on the latest advances in television is now being offered to service associations, and to trade and vocational schools. The program of three lectures, all of which can be presented at a single 3-hour session, include technical discussions on printed circuitry, transformerless supplies, automatic fine tuning, customer relations, etc. Scheduling arrangements are being handled through the television-radio division at Metuchen, N. J., and the electronic tube division at Elmira, N. Y.



"Nobody's perfect!"

Wizard Set Couplers make this possible



Mr. J. A. Morris, Owner, de Ville Motel, 1128 W. 7th St., Los Angeles, California
...A fine place to stay in downtown L.A.

“we operate 31 TV sets from one antenna without amplification...and reception is excellent!”

WIZARD
300*
Electro-Magnetic
SET
COUPLER



For
Brilliant
Reception
On Any
Combination
of Black &
White, Color
or FM

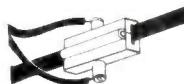
EASY TO INSTALL



THE WIZARD SLIDES APART

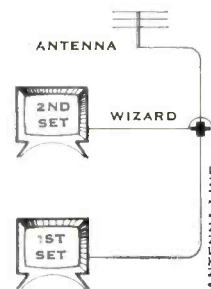


PLACE TWO HALVES ON LINE AND SLIDE TOGETHER



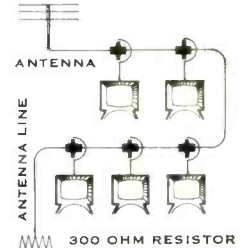
CONNECT TO SET

TO COUPLE 2 SETS



Install the Wizard anywhere on the line and connect to set.

TO COUPLE 3 OR MORE SETS



Extend antenna line through area of operation and terminate with 300 ohm resistor. Install Wizards and connect.

List Price \$1.95 • Contact Your Distributor or Write Dept. ET29

*PAT. PEND.

CHARLES ENGINEERING, INC.
6053 Melrose Avenue • Los Angeles, California

FIRST TIME . . . a versatile

DUAL

HEAT SOLDERING GUN

FOR ONLY
\$7.95
LIST
Model 8200K



...and best of all,
it's a new

Weller®

Here from Weller, long time leader in the soldering field, is the newest and finest soldering gun value on the market.

WELLER DUAL HEAT FEATURE saves time, gives greater convenience and greatly increases tip life. A touch of your finger on the Triggermatic control switches heat to high (125 watts) or low (90 watts) as your job requires. It adapts instantly to varying needs, and you use high heat only when necessary.

HIGH EFFICIENCY WELLERTIP utilizes copper for superior heat transfer and soldering efficiency, plus iron plating for durability. Flat cross-section design gives added strength and rigidity.

NEWEST DESIGN with sturdy plastic housing that resists hard knocks. Compact "feel" and comfortable balance aid precision soldering. Like all other Weller guns, this new model features instant heat, and a spotlight illuminates your work.



KIT INCLUDED

In addition to the Dual Heat Soldering Gun you get:

- Wire Bristle Cleaning Brush
- Soldering Aid for opening old joints, twisting wires
- All-purpose Solder

On sale now at your
Electronic Parts Distributor

WELLER ELECTRIC CORP. • 601 Stone's Crossing Rd., Easton, Pa.

Reps & Distributors

RADIO SHACK STORES has named **MYRON S. FRIEDMAN** manager of all stores.

F. A. DAUGHERTY CO., Cleveland rep firm, has moved to 6025 Mayfield Rd.

UNGAR ELECTRIC TOOLS, INC. has named **R. G. BOWEN CO.**, Denver, Colo., as area rep.

ORRADIO INDUSTRIES INC.'s first prize in the **IRISH** sweepstake rep sales contest was awarded to **PEYSER & CO.**, Colorado Springs, Colo.

CBS-HYTRON announces a controlled inventory service available to the firm's franchised distributors of receiving tubes.

SERVICE INSTRUMENTS CORP.'s 1959 promotion program was outlined at a recent meeting of reps. It is reported that promotion will be twice as large as previously.

PEERLESS PRODUCTS INDUSTRIES announces that **CHARLES SCHEFFLER CO.**, Indianapolis, has been appointed as the firm's rep in Ky. and parts of Ind.

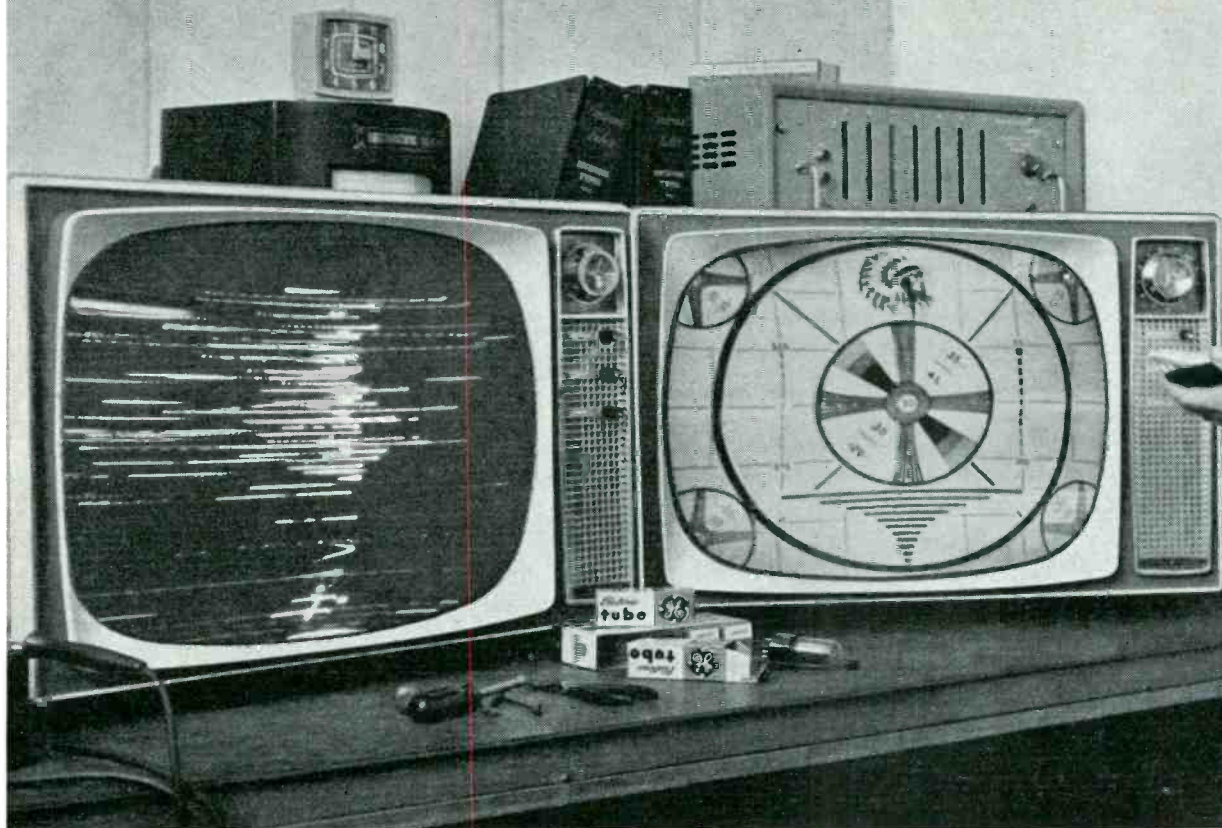
ZENITH RADIO CORP. has appointed **LEE WHOLESALE CO.**, Kansas City, Mo., as distributor of TV, radio, phonograph and stereophonic hi-fi products.

CORNELL-DUBILIER ELECTRIC CORP., Newport Antenna Div. reports that reps have already been appointed for almost the entire country to handle this new division.

ART CERF & CO., rep firm of Newark, N. J., has appointed **WILLIAM J. CROFUT**, Fayetteville, N. Y., and **PETER A. MESSINA**, Kenmore, N.Y. to cover eastern and western up-state New York respectively.

D. R. BITTAN, N. Y. Rep., has added three men to his sales staff, which now numbers ten salesmen. **ALAN BORKEN** and **R. B. CAINE** to call on OEM accounts in northern New Jersey, and in Queens and Long Island respectively; and **IRA DORNSTEIN** for distributor sales and merchandising.

ALLEN B. DU MONT LABS. reports that **DUTREX INDUSTRIES, INC.**, 250 4th Ave., New York, N. Y., has been granted sole and exclusive U. S. Sales rights to the firm's radio receiving type tubes. This new national sales agency will sell to distributors throughout the U.S. and for export.



CUT DAMPER-TUBE ARCING!

Have steady, dependable pictures with the new Service-Designed General Electric 6AX4-GTA (right)!

Side-by-side receiver tests show how prototype horizontal-damper tube occasionally will arc, cathode-to-plate (screen at left), whereas the new General Electric 6AX4-GTA continues to do its job reliably. The reason: a new, 15% larger cathode, with more emission area, consequently a lower operating temperature requirement.

New 6AX4-GTA also has faster warm-up, tapered pins, other improvements. Install this advanced tube to promote customer satisfaction, reduce callbacks. Service-Designed quality through and through! See your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC



2-111-202

another "first"... from
 the first name in high
 fidelity turntables—a
RONDINE turntable with
hysteresis motor* at



\$ **49** ⁹⁵
 net

REK-O-KUT RONDINE K33H
KIT

Rondine K-33H Specifications; powered by Rek-O-Kut Hysteresis synchronous motor. Single-speed (33 $\frac{1}{3}$ rpm) with Crown-Spindle belt drive; includes built-in strobe disc and on-off switch. Assembly: 30 minutes or less with ordinary tools. Complete instructions in each kit. Price: \$49.95 net, K-33H Turntable Kit only.

For ease of installation, handsome Rek-O-Kut bases and pre-drilled motor boards are available. Bases from \$10.95; Mounting Boards from \$4.95. Rek-O-Kut Tonearms from \$27.95. *Hysteresis motors are essential for the professional quality required by broadcast and recording studios.

REK-O-KUT

HIGH FIDELITY TURNTABLES
 TURNTABLE ARMS

Export: Morhan Exporting Corp., 458 Broadway, New York 13, N. Y.
 Canada: Atlas Radio, 50 Wingold Ave., Toronto 10, Ontario

Rek-O-Kut Co., Inc.
 Dept. ET-2
 38-19 108th St., Corona 68, N.Y.

Please send complete information on the new Rondine K33H Kit with hysteresis motor.

Name _____ Title _____

Company Name _____

Address _____

City _____ Zone _____ State _____

RK-40

Rondine—the Hysteresis Line... Engineered for the Studio... designed for the home!

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

Needed: A Professional Business Approach

Too many electronic technicians are notoriously unprofessional in the business end of their operations. Give them a technical troubleshooting job and they tackle it efficiently. But business troubleshooting? They're babes in the woods.

If you think we're exaggerating, consider these shortcomings:

Most service dealers do not have a detailed accounting analysis of their operations (turnover, cost per operating function, overhead per call, etc.).

Most service dealers do not belong to associations.

Most service dealers do not carry adequate inventory, wasting time on too many small shopping trips.

Most service dealers do not charge enough for their work.

Most service dealers do not take advantage of easily handled and profitable equipment sales opportunities.

Most service dealers do not have group insurance, health or pension plans now available to many small businesses.

Most service dealers do not have a continuing promotion program for procuring new business.

Most service dealers do not have an effective series of late collection letters.

We could go on, but we've made our point. Service technicians must stop short-changing themselves. Cut out the lax attitude toward your operations. Apply to business more of the same no-nonsense objective approach you rightfully lavish on technical activities, and you'll act and feel professional. Run your business; don't let it run you.

Professionals reap the profits.

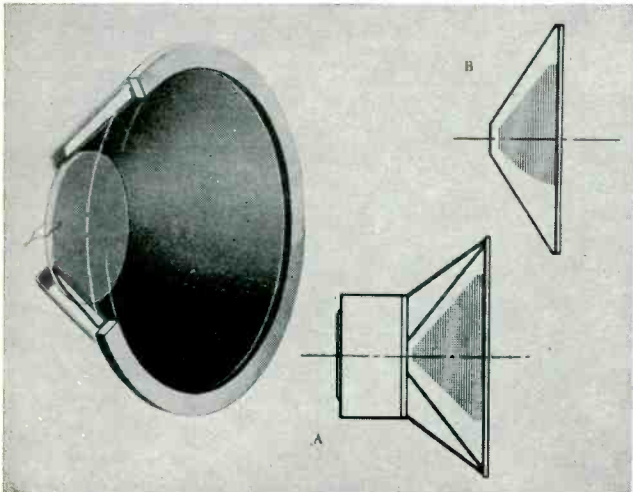
Tuning In the

TV SET DESIGN TRENDS: Zenith is adding a power transformer to each of the company's portable sets in the '59 line with no price increase. The transformers are of the fin-cooled type. Packard-Bell is introducing the "Control Master" complete color TV remote control. All four of the primary picture controls are continuously variable.

FEDERAL TRADE COMMISSION is continuing to take action against misleading "bargain" tube sales, based on the results of an investigation conducted by Electronic Technician. ET found that receiving tubes promoted as "top quality" were in fact used, reprocessed, rejects or totally defective. Since most electronic publications neglect to name names when the FTC takes action against deceptive practices, here is a summary of the three latest FTC actions: Electron Tube Corp. of America and Sky-View Electronics Co., New York City, have signed a stipulation of the facts and agree to "cease and desist from representing directly or by implication that said tubes are first quality tubes, when such is not the case"; Concord Radio Corp. and Fay-Bill Distributing Co., New York City, similarly ordered to desist; B & C Distributors Co., Paterson, N.J. also ordered to stop selling used tubes without clearly disclosing their true nature.

LEGISLATION to limit pay-TV has been introduced by Rep. Oren Harris. It would permit technical tests of one system in one market, but neither the wired or aired variety would be allowed until and unless Congress specifically says so.

MAGNET-LESS SPEAKER



Lightweight speaker uses ceramic driving element (left & B) in place of magnet and coils (A). Electrostrictive ceramic (barium titanate) discs a few thousandths of an inch thick are bonded to a larger titanium disc. Fluctuation of 200-volt supply, as in push-pull plate circuit, provides signal which causes disc to "cup," causing cone to move. Developed by Mullenbach.



"No. . . . 76.50 is the part number, . . . 17034632 is the price. . . ."

POLICIES which will govern future product service have been presented by General Electric. Its distributors are urged to supplement existing distributor and dealer service facilities by appointing independent service organizations as authorized GE repair outlets. TV service manager S. R. Mihalic notes: "Our customers will continue to depend upon the independent service dealer for the vast majority of service rendered on GE TV receivers." He states that GE has an obligation to service its products to the extent required to obtain customer satisfaction. Its service operations must be self-sufficient, and an unimpeded flow of parts and service data must be assured.

POLARITY METHOD of grounding TV sets to reduce a serious shock hazard has been described as preferable to the three-conductor approach, according to engineers of GE and Underwriters' Labs. The polarity method, which connects the chassis to the ground side of the ac line, calls for a floating or non-grounded cabinet. Two failures would be required to produce a hazardous condition—polarity reversal and insulation or spacer failures. They note that at some future date when the three-blade receptacle comes into common usage, this method may be preferred over the two-blade polarity method.

NARDA, the National Appliance & Radio-TV Dealers Association, is demanding that manufacturers stop their extended warranty competition, and that warranties be reduced to something that makes economic sense for dealers, distributors and manufacturers alike. Set producers should start orienting the public to recognize that their merchandise represents a splendid value, but that a reasonable amount of service expense is to be expected.

Picture



NATIONAL TELEVISION TECHNICIAN'S WEEK, March 23 to 28, celebrates its fifth anniversary this year. It is designed to honor and gain greater recognition for the nation's service dealers and technicians. Sponsor **RCA** is promoting the week with national advertising, making available a statuette in tribute to technicians, as well as dealer display material. A handy bank is available as a free consumer give-away. Details of the promotion program are available from **RCA** tube distributors.

FULL YEAR WARRANTY by **Motorola** on all tubes has proved good economics as well as good marketing, says **Executive Vice President Edward Taylor**. He reports that TV warranty parts costs have dropped during the program. Regarding labor warranty, Taylor says that contracts are offered through distributors as a matter of convenience at the option of both the distributor and retailer.

ATTORNEY GENERAL of New York has moved to dissolve 13 companies in the New York City area who are alleged to have sold defective tubes or forged new identification code by rebranding to receive improper warranty credit from tube manufacturers. They are:

Cavalier Electronics Corp., 1775 Broadway; Concord Radio Corp., 45 Warren Street; Credda, Inc., 3 West Sixty-first Street; Edward L. Mayer Corp., 16 Court Street, Brooklyn; Liberty Electronics, Inc., 119 Prince Street; National Radio Distributors Corp., 1165 Southern Boulevard, Bronx.
Also: National Radio Distributors-Manhattan, Inc., 1779 First Avenue; North American Electronics Corp., 129 Fifth Avenue, New York; S. & R. Electronics, Inc., 297 Central Avenue, Bethpage, L. I.; State Labs, Inc., 649 Broadway; Teleparts Distributing Corp., 2504 Amsterdam Avenue, New York; Television Maintenance Corp., 2090 Crotona Parkway, and Wescon Electronics, Inc., 580 East Fordham Road, Bronx.

CALENDAR OF COMING EVENTS

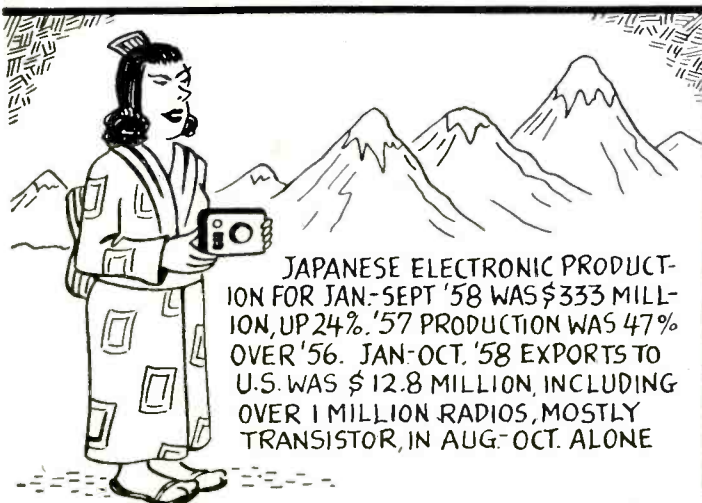
- Mar. 3-5: Western Joint Computer Conference, Fairmont Hotel, San Francisco, Calif.
- Mar. 23-26: IRE National Convention, Coliseum & Waldorf-Astoria Hotel, New York, N. Y.
- May 6-7: 7th Regional Technical Conference & Trade Show, University of New Mexico, Albuquerque, N. Mex.
- May 6-8: Electronic Components Conference, Ben Franklin Hotel, Philadelphia, Pa.
- May 11-13: Joint Conference on Automatic Techniques, Pick-Congress Hotel, Chicago, Ill.
- May 18-20: 1959 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- Aug. 18-21: Western Electronic Show & Convention (WESCON), San Francisco, Calif.

HI-FI SHOWS

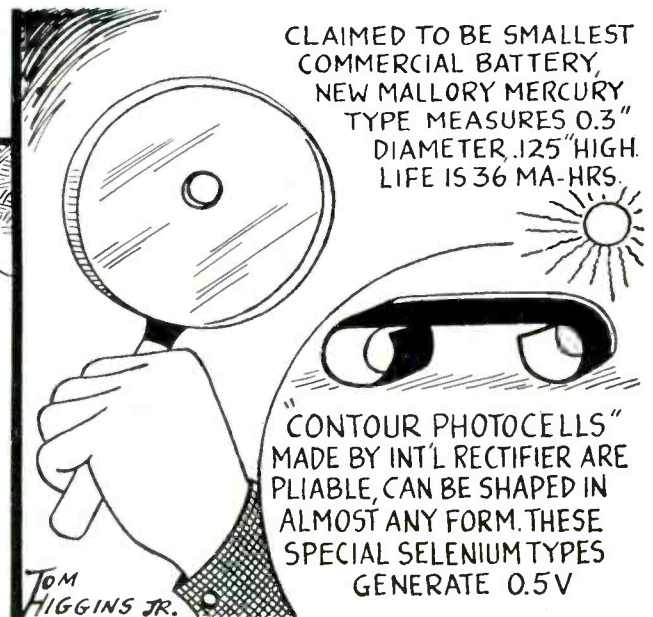
- Feb. 7-10: Cow Palace, San Francisco, Calif.
- Feb. 16-23: Biltmore Hotel, Los Angeles, Calif.

FACTORY REBUILT TV picture tube line is being offered by **RCA**, in addition to its all-new "Silverama" line. **RCA** is the first major producer to merchandise such a dual line on a national basis. The rebuilds, marketed under the "Monogram" name, have optional list prices approximately 35% under the new tubes, and are based upon the return of an acceptable old picture tube. A new electron gun and any other required new parts will be used with the rebuilds. Both "Silverama" and "Monogram" lines contain aluminized and non-aluminized versions, and a one-year warranty card is provided with each new or rebuilt tube.

RANDOM NOISE

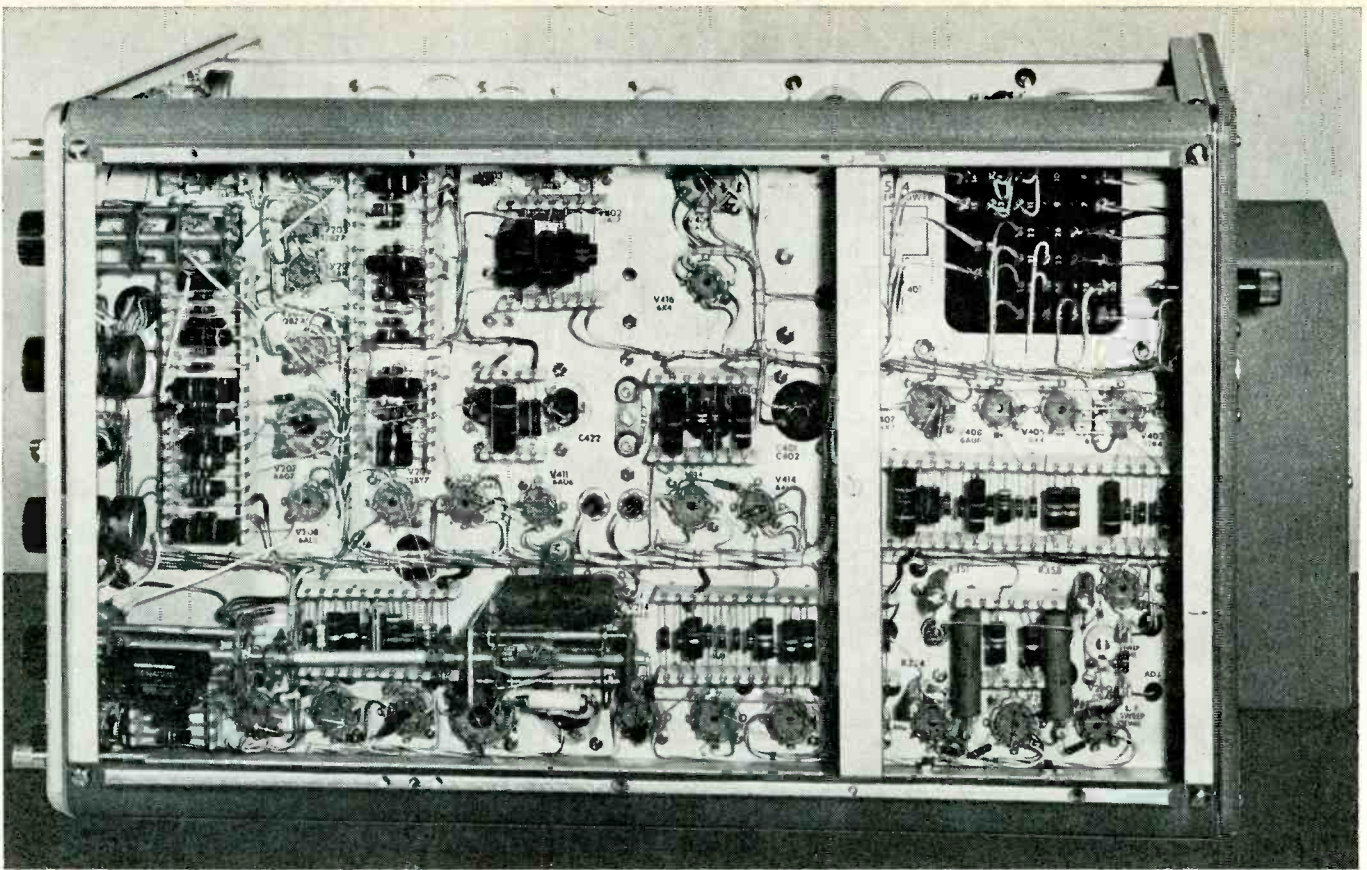


JAPANESE ELECTRONIC PRODUCTION FOR JAN.-SEPT '58 WAS \$333 MILLION, UP 24%. '57 PRODUCTION WAS 47% OVER '56. JAN.-OCT. '58 EXPORTS TO U.S. WAS \$12.8 MILLION, INCLUDING OVER 1 MILLION RADIOS, MOSTLY TRANSISTOR, IN AUG.-OCT. ALONE



CLAIMED TO BE SMALLEST COMMERCIAL BATTERY, NEW MALLORY MERCURY TYPE MEASURES 0.3" DIAMETER, .125" HIGH. LIFE IS 36 MA-HRS.

"CONTOUR PHOTOCELLS" MADE BY INT'L RECTIFIER ARE PLIABLE, CAN BE SHAPED IN ALMOST ANY FORM. THESE SPECIAL SELENIUM TYPES GENERATE 0.5V



In addition to many special circuits and functions, lab scopes are usually precision wired, air cooled, and of durable construction.

Service & Lab Oscilloscopes

Features, Advantages, And Price Are Considered, But Too Often A Basis For Comparison And Evaluation Is Not Available

CHARACTERISTICS

Bandwidth
Frequency Response

Brightness
Focus

Sensitivity

Linearity

Sweep
Triggered
Calibrated
Magnified

ROBERT G. MIDDLETON

• Service technicians at one time or another inquire about the difference in laboratory and service type scopes. Those that have never used both types really have no basis for

comparison. But it is well to be aware of the difference when using or purchasing a scope. Conscientious thought and proper shop instruments can make routine work of tough jobs. There are many differences in functions and characteristics as well as price. Bandwidth, frequency response, brightness, focus, triggered sweep, calibrated sweep, magnified sweep, sensitivity, and linearity are just a few of the test equipment designer's considerations affected by the intended application of a particular scope. Prices range from about \$100 to \$300 for the service scope. Most of them hover around the \$200 mark. Generally, lab scopes range from about \$450 to over \$1,500.

Many lab scopes have a bandwidth of 10 mc or more, as compared to a 4 or 5 mc bandwidth for a wide-band service scope. Increased bandwidth permits viewing narrow pulses and waveform detail which may be lost

in a narrow-band instrument. Because TV receiver circuits usually do not exceed a bandwidth of 4 mc, a lab scope would offer little advantage in this regard. Many lab scopes have less bandwidth than modern service scopes. Narrow-band lab scopes are often used in industrial electronics and audio applications. Though they have less bandwidth, they do have other features not usually found in service scopes. Narrow-band scopes are particularly not suitable for color TV servicing.

Service scopes usually employ peaking coils to obtain flat frequency response out to 4 or 5 mc. On the other hand, wide-band lab scopes generally have elaborate distributed amplifiers. A distributed amplifier, shown in Fig. 1, consists of an artificial line, with tubes provided at frequent and regular intervals along the line to boost the signal. The advantage of a distributed amplifier is

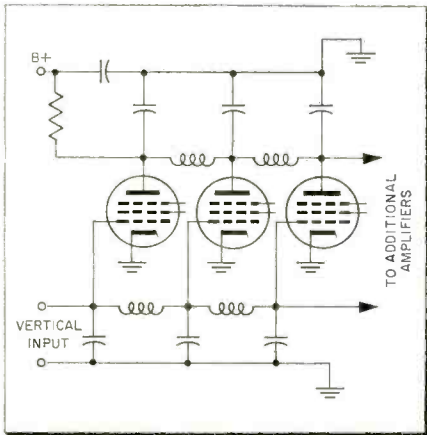
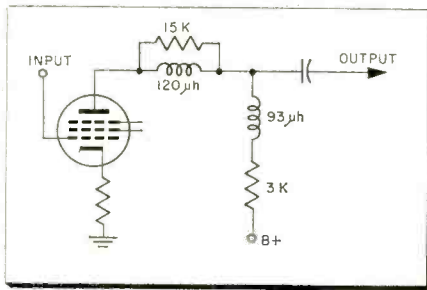


Fig. 1 Top—Peaking coils increase frequency response in service scopes. Bottom—distributed amplifiers are used in lab scopes.

that a square or pulse waveform with a fast rise time will not ring or overshoot. However, considering that TV receiver waveforms have relatively slow rise times that do not ring an amplifier equipped with peaking coils, the distributed amplifier is a luxury for service work.

Brightness & Focus

The CRT in a lab scope is operated with a much higher accelerating voltage than the CRT in the service

scope, in order to obtain sharper focus. The higher voltage also reduces scope sensitivity. Added input and sweep amplification is then required to regain this sensitivity. Comparison of sharpness-of-focus is shown in Fig. 2. Again, it may be concluded that the increased sharpness is not too essential for service work. It may be a bit of a surprise to learn that many lab scopes are usually about 1/10 as sensitive as the familiar service scopes. Sensitivity is often required in practical service work, particularly for front-end alignment. Sensitivities of from 10 to 20 mv RMS per inch are not uncommon in service instruments.

Linearity

Sometimes vertical linearity is not good when a pattern is displayed at full-screen deflection in both types of scopes. Many lab scopes provide very good linearity up to about 2/3 or 3/4 full-screen deflection. Linear amplifiers capable of providing linear sweep over the entire face of the CRT could be used, but many of the less expensive CRTs used in service scopes have a face which is somewhat curved at the edge. Under this circumstance inaccurate full-screen peak-to-peak voltage measurements would be obtained even if perfectly linear amplifiers were provided.

Triggered Sweep

Some service scopes have triggered sweeps, but the majority do not. Some have sweep magnifiers, which are capable of doing some of the jobs accomplished by triggered

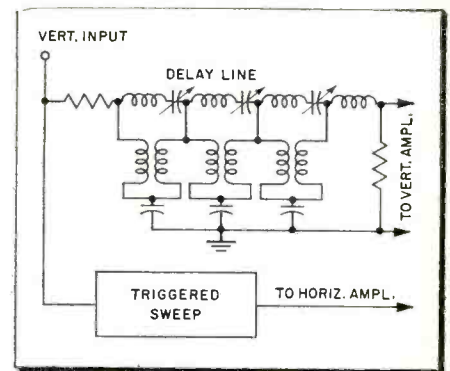


Fig. 4.—As many as 24 sections are used to delay the signal to the vertical amplifier to prevent losing the leading edge of some very fast traces.

sweeps. Most lab scopes do have triggered sweeps. Triggered sweep makes it possible to expand a portion of a waveform for close-up inspection. Fig. 3 shows just the tip of a horizontal sync pulse expanded to occupy almost full screen width. If triggered sweep were not used to expand the sync tip, the pattern would overlap and appear confused. High CRT voltage is required, otherwise the rapidly moving beam, needed to expand the pattern, would become dim or invisible. While many service scopes do not have the necessary high voltage, expanding waveforms in most service work serves no useful purpose. Because the leading edge is used to trigger the sweep, and because it takes a fraction of time for the sweep to get started, part or all of the leading edge would be lost if a delay line were not used. The delay line is connected in series with the vertical amplifier, but not in series with the
(Continued on page 78)

Fig. 2—Focus on a service scope, top, as compared with a lab type, bottom.

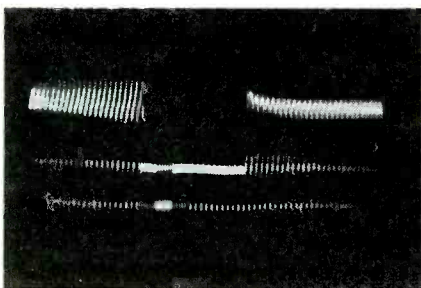
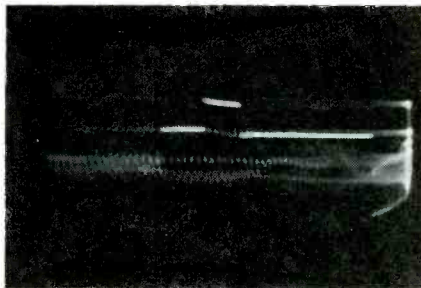


Fig. 3 Bottom—Tip of sync pulse expanded on a lab scope. Top—Normal view.

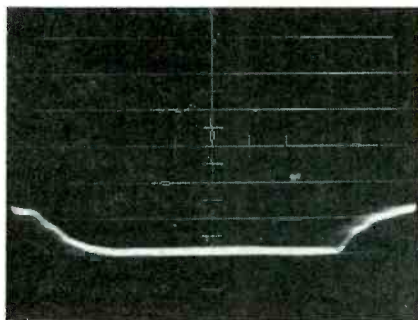
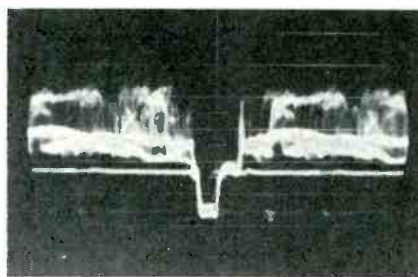
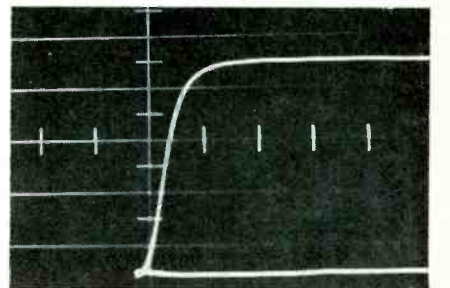
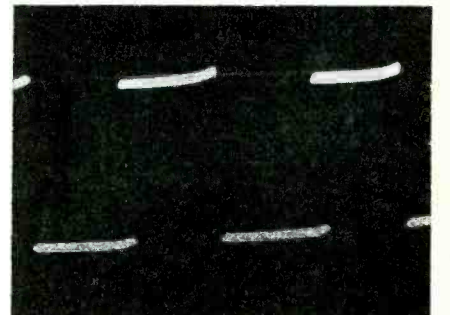


Fig. 5. Bottom—Lab scope with calibrated horizontal sweep. Top—View of the leading edge lost on a service scope.



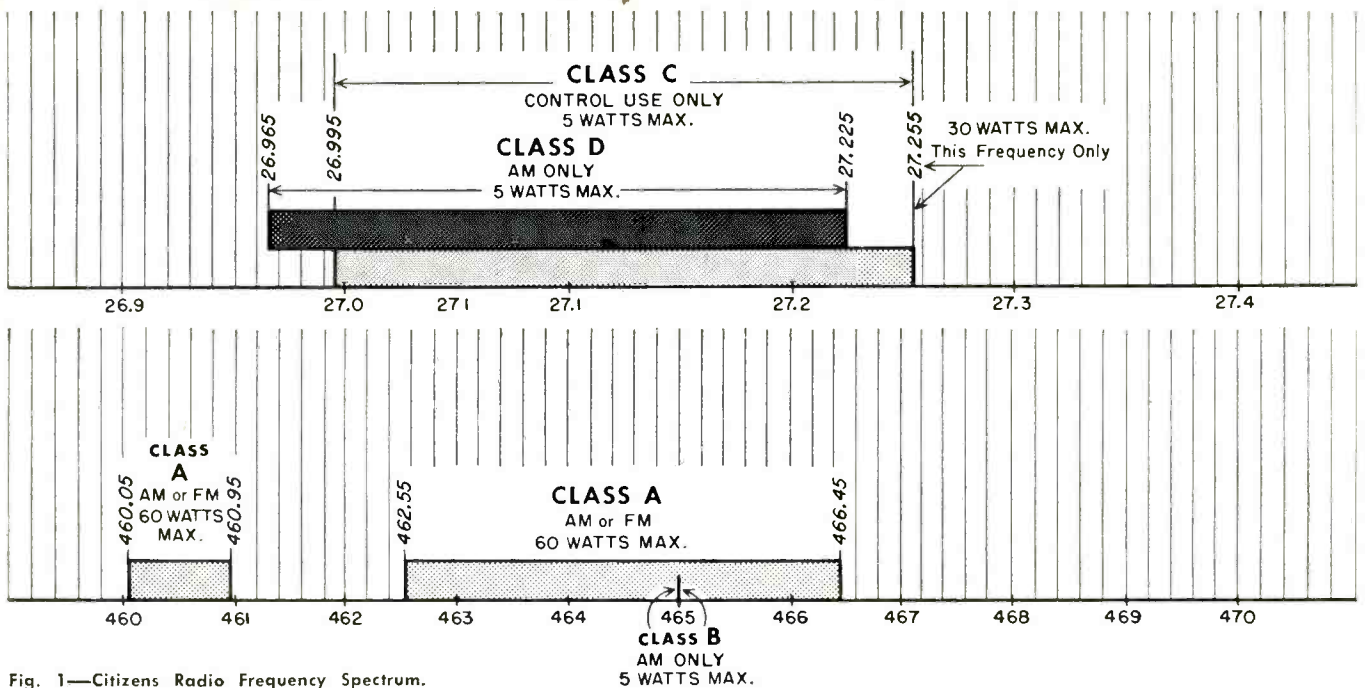


Fig. 1—Citizens Radio Frequency Spectrum.

Citizens Radio Service

New Opportunities For Sales And Service In 2-Way Radio

LEO SANDS

• Citizens Radio Service is intended for personal or business, short-distance radio communication, signalling, and radio control of objects and devices such as model airplanes, and boats. Any citizen of the United States who is 18 years of age or older may obtain a station license in this service if his application meets the requirements of the revised Part 19 of the FCC Rules governing the Citizens Radio Service. Applicants for a Class C station may be 12 years of age or older.

Frequencies available to stations in this service are shared among licensees. During periods of normal operation no protection can be afforded to the communications of any station in this service from inter-

ference which may be caused by the proper operation of other authorized Citizens Radio stations, or from stations in other radio services properly operating on frequencies shared with the Citizens Radio Service, even when involving the safety of life or property.

Citizens Radio stations may not be used for any purpose contrary to any law or for broadcasting to the public in any way. They likewise may not be used as links in the physical circuits of other radio services, but they may be used for the mechanical con-

trol or turning on or off of stations in other services. No charge may be made for messages carried over Citizens Radio stations, or for the use of licensed equipment by persons other than the licensee. The licensee is responsible at all times for the operation of stations licensed to him.

In order to avoid interference by shifting frequencies, Class A stations must apply for a new authorization.

Fig. 2—Class B, 2-way radio operates at 456 mc, range varies from a few hundred yards to as much as 10 miles over land.



Fig. 3—Roof-top antenna for cars if properly selected and installed increases signal.

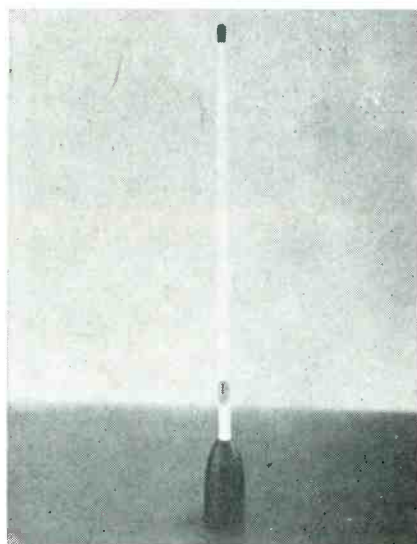
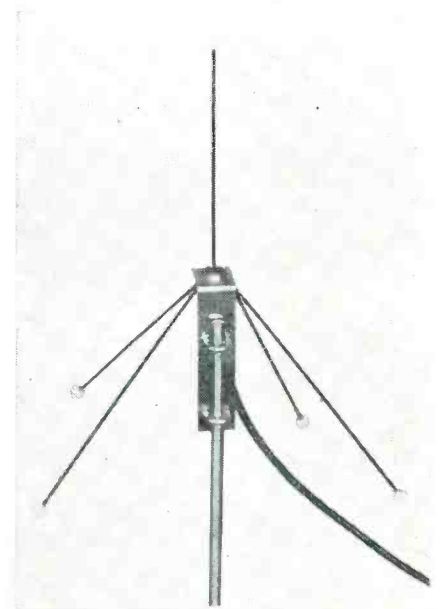


Fig. 4—High-gain ground-plane antenna for locations capable of supporting a mast.



CITIZENS RADIO

Classes of Stations

Emission
Frequency
Power

License Required

Age Limitations
Citizenship

Interference

Antenna Structures
Servicing
Class B Transceivers

Class B, C, and D stations may shift to any of the frequencies available to stations in their respective classes without further authorization.

A station license must be obtained direct from the FCC at Washington 25, D. C., for operation of a Citizens Radio station. Field offices no longer issue any class of Citizens Radio license. A commercial radio operator's license of the proper grade is also required for manually operated telegraphy and for any adjustments to the transmitter during installation, testing, or servicing which may cause the transmitter to operate off-frequency, or otherwise in a manner which would violate the rules. FCC Form 505 is used to apply for a new or modified license, change of address, change in the number of transmitters, etc. The station license, or a photocopy of it, must be in the personal possession of the operator, or attached to the transmitter, or kept at the control position when using remote control. Forms may be obtained without charge from any of the Commission's Field Offices. Renewals should be filed at least 30 days prior to the expiration of an old license.

New FCC rule changes for the Citizens Radio Service are now in



Tug boat maintaining communications with barges and shore points via Citizens Radio.

effect. These changes created a new 27-mc citizens band, and took away 6.06 mc of the former 10 mc band between 460 and 470 mc leaving 460.05 to 460.95 mc and 462.55 to 466.45 mc. The frequency spectrum chart in Fig. 1 shows the distribution of the different classes of operation in the citizens bands.

Antenna structures for Class A stations are not limited to height unless they are hazardous to air navigation. However, to avoid unnecessary interference antennas should be kept as low as possible.

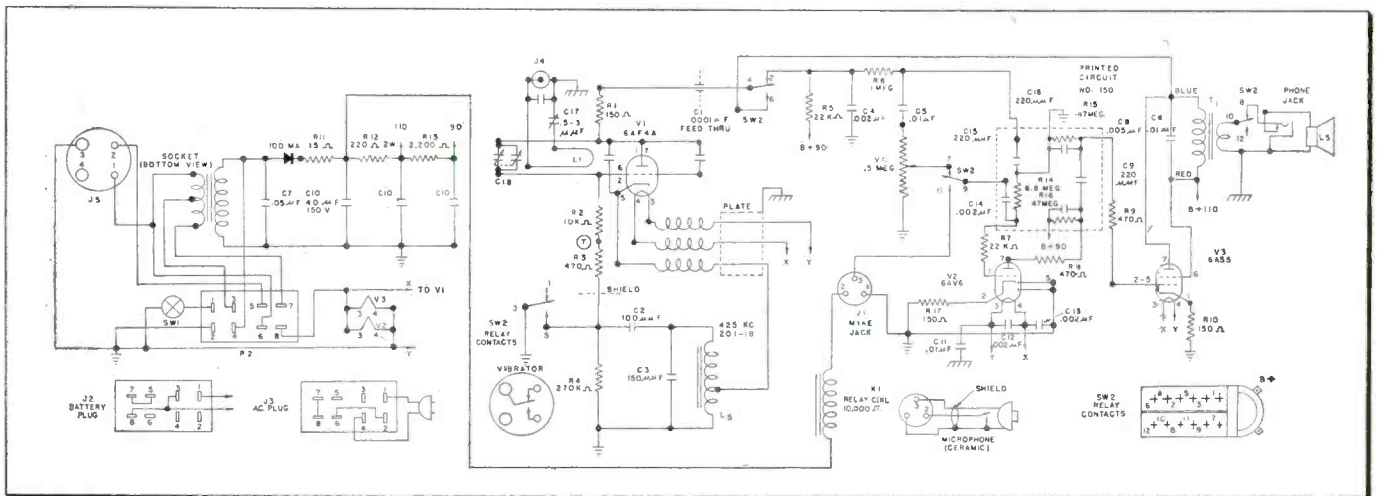
Antennas for Class B, C, and D stations may not extend more than 20 feet above the building roof, or ground, depending on which the antenna supporting structure is mounted.

The approach to Citizens Radio, as in any communication systems planning procedure depends upon local conditions, communication requirements and budget.

Most Class A mobile equipment operates on FM, some on AM. Both transmitter and receiver are crystal

(Continued on page 79)

Fig. 5—Schematic of Class B transceiver shown in Fig. 2 has only 3 tubes. The 6AF4 serves as a super-regenerative detector when receiving, and as an AM power oscillator when transmitting. The 6AV6 and 6AS5 double as an audio amplifier and modulator.



Diagnosing And Trouble-

Symptomatic Approach Isolates Defects. Above-The-Chassis

SUMMARY

Sync circuitry is usually not tricky. In most instances a fault can be traced to a breakdown of one tube or one component, but with new sophisticated engineering developments, interaction and side effects do create misleading symptoms.

AL DIAMOND

• Loss of sync does not necessarily mean trouble in the sync circuits. If, for example, the horizontal oscillator is functioning too far off frequency, and even if the sync pulses were present and normal in every respect the picture would still be quite mixed up. The same conditions could also prevail with the vertical oscillator section. While these symptoms seem to be about the same as those encountered when the sync pulse is absent or abnormal, it should be obvious in this case, that the trouble lies with the particular oscillator, and not the sync circuits.

Above-The-Chassis Approach

How then can the technician diagnose the symptoms, pin down the trouble, and not waste time? Several techniques are available, however, most of them by themselves are not conclusive. If the picture is out-of-sync both horizontally and vertically, the chances are that there is a sync problem. On the other hand, if by coincidence both of the

oscillator circuits are harboring defects, and there is nothing wrong with the sync circuits, the conclusion would be wrong again. Still another misleading situation presents itself when there is a defect in the AGC system. If the sync pulses are clipped, compressed or missing the picture is most likely to be out of sync in both directions. Any time spent in troubleshooting the sync circuits would have to be chalked up to experience, and not as time spent in finding the trouble. Even if it is determined that sync compression is at the root of the complaint, it does not necessarily mean that there is something wrong with the AGC circuit, because AGC voltages depend upon signal conditions in the receiver. A defect in the front end, i-f amplifiers, or video detector can upset the AGC voltages. A poor signal due to a defective antenna can often lead to a complaint of loss of sync, particularly loss of vertical sync. Another unique situation which may upset AGC and sync pulse is a defect in the horizontal output circuit or pulse feedback loop when keyed AGC is used. This could be quite misleading if the defect causes an upset in the vertical section only.

As a general rule horizontal hold will stay locked in over a wider range of operating conditions, and it is possible for an overall sync problem to be reported only as a loss of vertical hold. Under these circumstances it may be noticed that the horizontal hold is a little critical. It is well to acknowledge

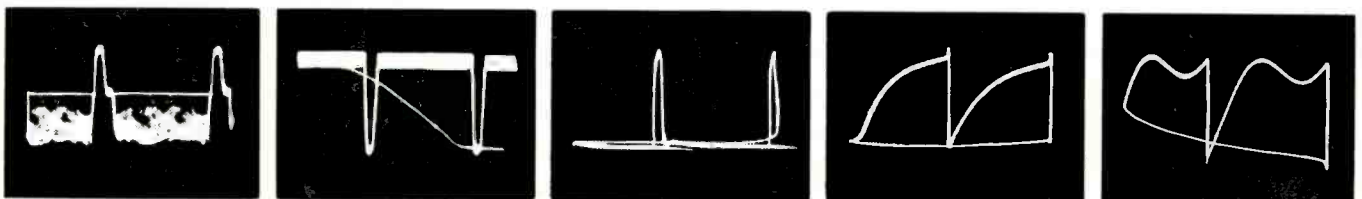
that it isn't always possible to predict AGC defects by just observing the picture. Depending upon the severity and nature of the AGC upset, indications in the picture may show up as varying amounts of distortion, pulling or bending, negative picture, and sometimes without any noticeable defects.

There are several quick ways to predict the general area of trouble, and in a few cases, isolate the cause without using any test instruments. If the defect in the sync circuits does not affect the horizontal or vertical oscillators by making them run too fast, or too slow, or not at all, the oscillators can usually be exonerated if it is possible to make them run faster, slower and almost normal by varying the hold controls.

Assuming that it is possible to momentarily bring the picture into full view, it is then possible to observe the vertical blanking bar for presence of sync pulse by turning up the brightness a bit, turning down the contrast a little and adjusting the vertical hold control so that the vertical blanking bar is brought into view. If the sync pulse is present as evidenced by a "blacker-than-black" bar, as shown in Fig. 2, it is then possible to assume that all is well from the antenna through the video detector to the CRT, including the AGC circuit. If the vertical sync pulse region is gray and not much darker than the black elements in the picture, the chances are that the sync pulse is clipped and not getting through the receiver.

Assuming that the sync pulse can

Fig. 1—Sync pulse, center photo, after separation from the composite video signal, left. Some video information is still present in second trace. Fourth and fifth photos show normal properly synced vertical and horizontal oscillator waveforms respectively.



shooting Sync Circuits

Techniques Speed Servicing. Beware Of Sophisticated Side Effects.

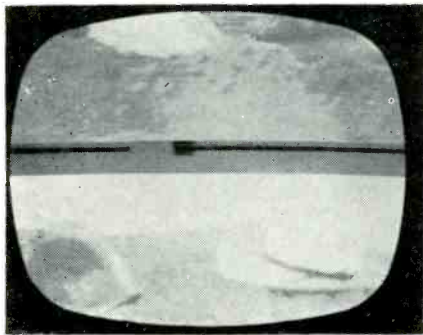


Fig. 2—Blacker-than-black region in vertical blanking area generally indicates presence of sync pulse at sync take-off point.

be observed on the CRT, it then becomes a fairly simple matter to further isolate the cause of the sync problem. If both horizontal and vertical sync is lost, the odds are that the trouble lies somewhere between the sync take off point, and the place where horizontal and vertical sync pulses are separated. If loss of sync is experienced in only the vertical direction, then it is possible to concentrate on the section between the vertical oscillator and vertical sync separation point. The same logic also applies to loss of horizontal sync only, in this case, the area of interest lies between the horizontal oscillator and the sync separation point.

Modern TV circuitry takes advantage of several different types of sophisticated circuits, and when trouble sets in, logical and time-proven troubleshooting procedures may in some cases seem to be of no value. Absence of or defective sync pulses in some circuits may cause an AGC problem and complete loss of video and sound. In other circuits it may cause loss of raster due to very little or no high voltage. An awareness of these side effects can save many hours on the bench, and even prevent a trip to the shop.

The basic sync circuits, starting from the sync take-off point, may consist of a sync amplifier, which often also serves as a separation or

limiting device to clip off the video information and leave only the sync pulses; additional amplifiers may be further employed to amplify shape, or phase invert the sync pulses before passing them on to the vertical and horizontal oscillators.

A block diagram of a typical TV receiver is shown in Fig. 3. While many sets have a sync take-off point just past the detector, this particular receiver takes advantage of an extra stage of amplification, by moving the take-off point just beyond the video amplifier. The typical waveforms shown are representative of the action which takes place in most receivers. The composite video signal present at the sync take-off point is amplified and trimmed of most of the video information. The center photo, Fig. 1, shows almost complete sync separation from the video signal. The fourth and fifth photos show normal, properly synced vertical and

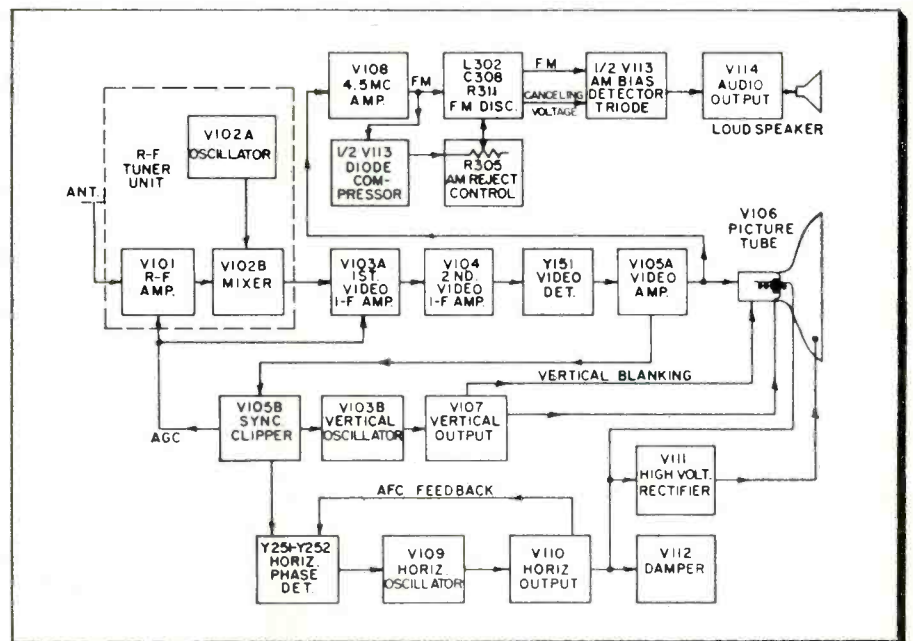
horizontal oscillator waveforms respectively.

In order to avoid line pairing and maintain proper sync action it is important to avoid interaction between the horizontal and vertical sync pulses. Essentially the differentiator and integrator network respond only to proper pulses or portions of the pulse, shape them, and pass them on to the horizontal and vertical oscillators respectively. An additional automatic frequency control circuit is almost universally used between the horizontal oscillator and incoming sync pulse to improve stability and noise immunity.

Troubles in the sync amplifier and separator stages may range from the absence of sync pulse, to permitting some of the video information being passed through with the pulse. Hum voltages which may exist in these or prior stages will play havoc

(Continued on page 65)

Fig. 3—Defective sync-clipper can upset AGC as well as horizontal and vertical hold. Sync take-off beyond the video amplifier provides a larger sync pulse.



Overcoming Pitfalls In

How To Recognize Harmonic Content, Interpret Audio Waveform

SUMMARY

How to avoid misleading interpretation of harmonic distortion measurements due to hum, phase changes within the equipment under test, instability and clipping distortion. Technique makes fractional percentage readings possible without the use of filters, even when the distortion in the signal source is higher than the expected readings. For basic arrangement of equipment and test procedure see page 32 in the January 1959 issue of Electronic Technician.

NORMAN H. CROWHURST

• A fact not often appreciated is that some forms of harmonic distortion can reach relatively high percentage figures and not be audible, while other forms of distortion can be audible even when the meter reads

Fig. 1—Bouncing waveform, top, is hum. R-F oscillation may appear as a form of modulation, bottom.

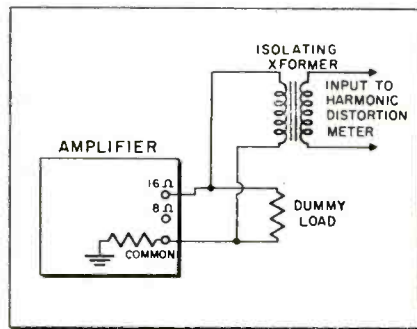
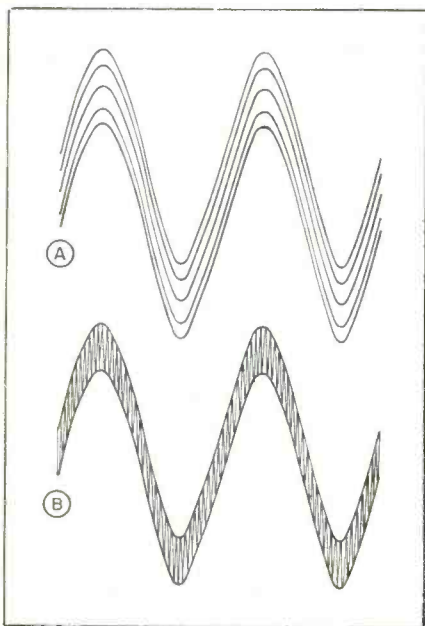
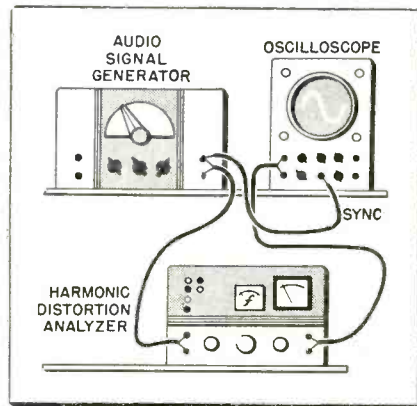


Fig. 2—Isolation transformer may be required to eliminate parasitic oscillation.

only 0.1%. An unqualified statement of distortion content means virtually nothing. Of course, if there is 50% of any kind of distortion, it is a lot in any language. But when it comes to a fraction of 1% or even a few percent, the answer to the question, "Is it audible?" unfortunately, is not simple.

There are times when an oscilloscope display will show a nice looking waveform, relatively free of distortion, while the harmonic distortion meter reads as much as 10%. This could be quite puzzling because it is doubtful that there is 10% of any kind of distortion that would not be seen on a scope trace. A beginner may have difficulty seeing 3% of some kinds of distortion, but 10% would certainly be obvious. What

Fig. 3—Set scope on external sync and hook up to signal generator to compare phase of amplifier's input and output waveforms

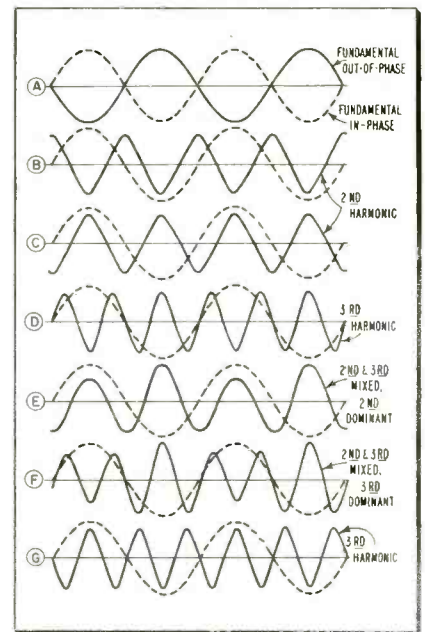


then is the cause of such a high reading?

This can be due to hum, or r-f oscillation, or a combination of both. Hum may appear on the scope as a multiple image, the trace may seem to be jumping, as shown in Fig. 1A. On the other hand, r-f oscillation as shown in Fig. 1B may escape being noticed. The amplifier may be oscillating quite gently at a megacycle or more; and if the scope is only intended for low frequency work, the high frequency component may be severely attenuated. The result might appear as an almost imperceptible thickening of the trace which could be mistakenly attributed to poor focus.

The foregoing is based on the assumption that the scope and distortion meter are simultaneously connected to the amplifier. It is desirable to leave the scope connected when hooking up the distortion meter. The scope connections may be trans-

Fig. 4—Fundamental input waveform, dotted line, is shown for reference purposes. It may be temporarily marked on the CRT with a crayon. See text for explanation



Audio Measurements

Phasing Characteristics, And Obtain Meaningful Meter Readings

ferred from the input to the output terminals of the distortion meter, as needed. Sometimes the quantity measured was not there before the meter was connected. The distortion meter contains a high-gain amplifier and other circuits which could, under certain circumstances, create instability or hum which is not normally present.

The first thing to find out is what is happening, then try to stop it. If the scope is connected to the output of the meter it is possible to see what the meter is reading. If a fault were to develop in the harmonic distortion meter's amplifier or switching circuit which permitted the fundamental to leak through, even when the bridge is balanced, it would be seen on the scope. It is the same signal, or a portion of the signal seen when the meter's set level adjustment is made. But, more often the scope will show evidence of either hum or r-f oscillation as the cause of the abnormal reading. To check the effect of connecting the harmonic

	Fundamental	Harmonic	Distortion Readings
1	In-phase	In-phase	Subtract
2	Out-of-phase	Out-of-phase	Subtract
3	In-phase	Out-of-phase	Add
4	Out-of-phase	In-phase	Add

Table 1—In the presence of 2nd harmonic distortion, the phase of the amplifier's output signal should be determined and compared to the phase of the generator's signal, to determine if the distortion meter readings of the generator and amplifier should be added or subtracted.

meter, leave the scope connected across the output of the amplifier under test and watch what happens when the meter is connected and then disconnected. If connecting the meter causes hum or r-f oscillation to appear at the amplifier output, it will be necessary to modify the hookup and clean up the signals before any valid measurements can be made.

A good electrical ground is essential. Even though all the grounds on the equipment are tied together—with all the gain associated with the measurements—a floating ground can cause trouble. Anchoring the

ground to a good electrical return to terra firma may be necessary. High-frequency oscillation can sometimes be induced through the supply transformers and the com-
(Continued on page 70)

Fig. 5—Test equipment setup. Note sync take-off point is before the attenuator. A decade type of calibrated attenuator is optional equipment, but is highly desirable.

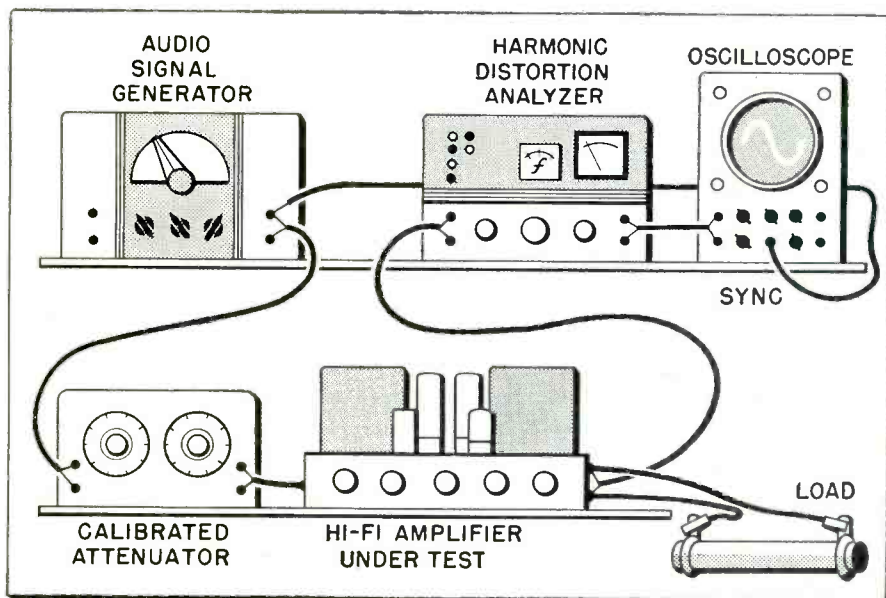
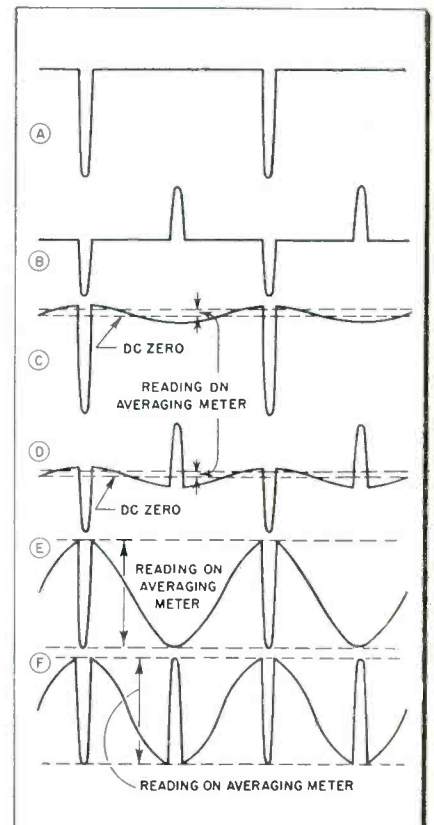
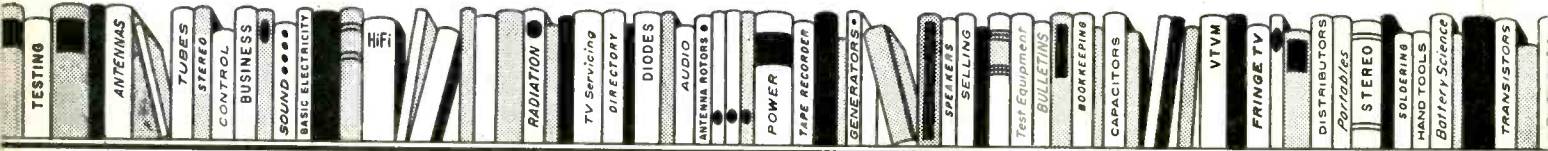


Fig. 6—More significant readings of distortion at clipping levels are obtained by readjusting the analyzer's balance control until the waveform looks like Curves E or F.



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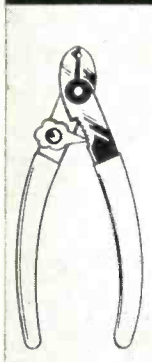
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Take care of all your phono drive replacements with the WALSCO line... largest and most complete line on the market.



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WALSCO
STRIP-ER-
CLIP

Strips and clips all wire from 14 to 26 gauge. No accidental nicks or cuts.

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WALSCO
STICKLEBACK
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Drill, saw, file and rout faster and easier with these remarkable tools made from tough alloy steel. Choice of 6 drill routers, 4 drillsaws, rasp and combination.



WALSCO
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PROTECTORS

Prevent excess wear and tear on tube checker sockets and other equipment.

No. 1946—7-pin mini List \$3.25
1947—8-pin octal 3.25
1948—9-pin mini 3.25



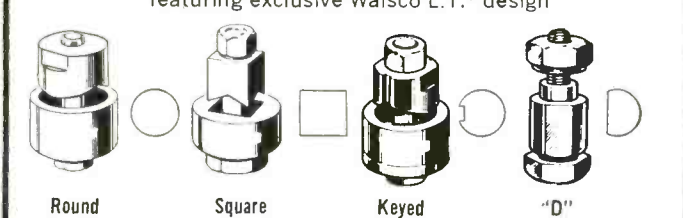
NEW WALSCO
"AUDIOTESTER"
TEST RECORD

High fidelity LP record for checking playback equipment from needle to speaker. Mono bands on one side, stereo on reverse.

No. 300 Audiophile Net \$3.98

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featuring exclusive Walsco L.T.* design



Round Square Keyed "D"

*"Low-Torque" Electro-Coating requires 50% less punching effort.

FREE! Send for your copy of the new Color TV Tool Manual and Walsco Catalog 59. Send postcard today!

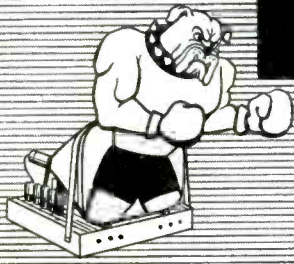


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Western Plant: Los Angeles 18, Calif.
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YOU CAN GET WHAT YOU WANT FROM WALSCO!



"Tough Dog" TV

Corner



Difficult Service Jobs Described by Readers

Low Volume & Noise

All my trouble began when I finished servicing the TV section of a Zenith combination and the lady of the house said, "Would you look at the phonograph, it will only take a few minutes? I think the sound isn't loud enough." It had a 10H20Z radio chassis. When the volume control was fully turned on, only a little sound plus a crackling noise was heard in the background. A finger-touch of the connections to the phono pickup crystal failed to send out the anticipated audio buzz. Both AM and FM radio had plenty of volume. The tube line up was checked, but did not help isolate the trouble. The radio chassis and push-button tone network was taken to the shop. The schematic showed that the phono signal passed through the 6BA6 first i-f amplifier stage. All the tubes were checked and substituted, but without improvement. The fact that noise was coming through on phono position only and not on AM or FM was very puzzling.

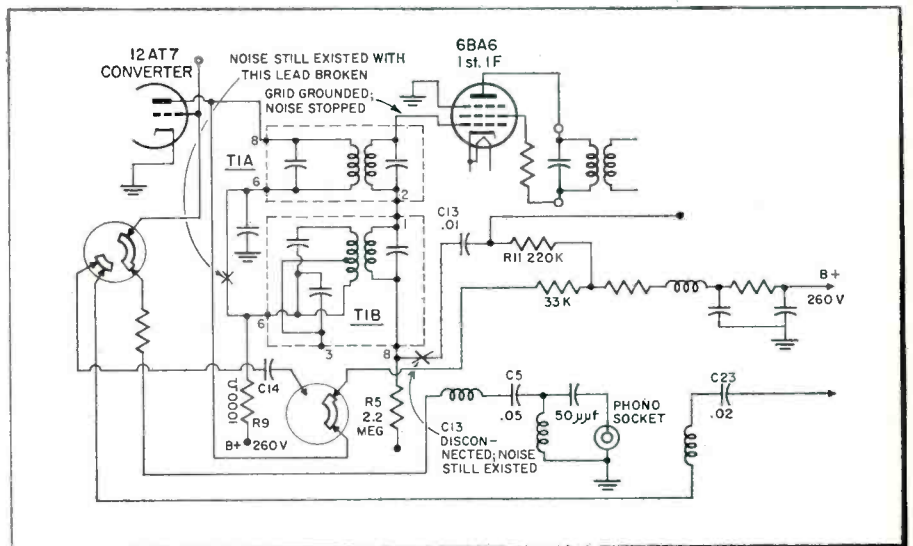
The noise stopped when the first i-f amplifier tube was pulled out. Next the 12AT7 converter was pulled, but the noise was still there. Now I knew the noise had to be originating somewhere between the phono input and the 6BA6. I checked the capacitors not common

to the radio. Capacitors C5 and C14 showed leakage so they were replaced but still no improvement. The chassis was set aside for a break, and a fresh start. The next day I again started to trace down the noise by disconnecting capacitor C13. The noise was still present. Grounding the grid of the 6BA6, first i-f tube, caused the noise to stop. This localized the trouble to the first i-f transformers but if they were noisy why didn't it show up on AM or FM radio? The next step was disconnecting resistor R9 from Pin #6 of transformer T1B which removed B+ from both transformers. The set was turned on and no noise was heard. A quick check of the phono function with the crystal applied to a record, produced music without noise, and plenty of volume, with only a quarter turn of the volume control. I still had to find out which transformer was defective.

Resistor R9 was soldered back in place and the lead from Pin #6 of transformer T1B to Pin #6 of T1A was disconnected; this removed B+ from transformer T1A.

The set was turned on. The same weak sound and noise were present. I knew it had to be transformer T1B. When it was checked a 5 to 8 megohm leakage path was found between windings with my capacitor tester. An ohm meter check showed no leakage. The transformer was replaced and everything worked fine. Why wasn't this defective transformer causing trouble on radio? Well, the only difference measured was a voltage of 260 volts on Pin #6 of transformer T1B when the selector was in phono position. On radio positions this voltage was 225 volts. The higher voltage on phono position was probably enough to cause the transformer to act up.—
Elmer T. Roming, Philadelphia, Pa.

Low volume and noise in phono position only, caused by defective I-F transformer, cured by process of elimination.



TOUGH DOGS WANTED!

\$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned. Send your entries to "Tough Dogs" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

SHOP HINTS



Tips for Home and Bench Service

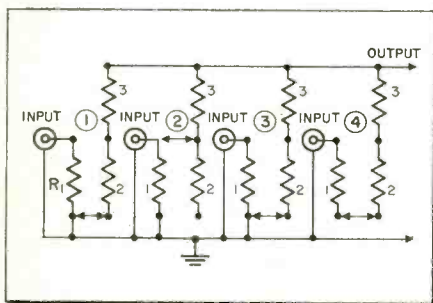
Power Transformer Damper Winding Breakdown

Breakdown of insulation in the damper heater winding in a TV set's power transformer causes frequent shorts to chassis and sometimes to other windings, particularly when 6W4 tubes are used. For many years I have modified sets to eliminate this trouble. The 6AX4 is the key to these modifications. For example on the RCA KCS47 receiver, remove the jumper between pin 3 and pin 7 on the 6W4 socket. Disconnect damper heater leads from the defective transformer winding, tube pins 7 and 8, connect one side to ground and the other to the nearest 6.3 volt heater. Connect a cathode by-pass capacitor on the order of 80 to 100 μf at 6,000 volts. Replace the 6W4 with a 6AX4.—*Frank M. Dickinson, Stony Point, N. Y.*

Fader-Mixer

Not really a high fidelity set up, but it is a simple and handy circuit for multi-switching and mixing several program sources without the use of tubes, compensated controls, and capacitors. Varying load effects are reduced, and the bass response is not compromised as in a single potentiometer arrangement. I used this device recently with phonos, a tape recorder, and a radio for a public affair. The usual switching arrangement was inconvenient. Clicks and sudden application of the following

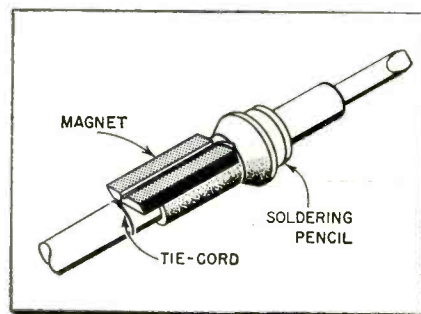
Use of dual pots for fading and mixing programs offers compensations for varying loads. Additional resistors enhance isolation between channels.



program was annoying. In the diagram, only Channel 2 is shown in the circuit, the 1 megohm stacked controls tend to maintain the same isolation between the input signal, and the stray capacitance of the output cable and amplifier input circuit. As the control is lowered, some loss of high notes may be experienced depending upon the amount of this stray capacitance. The addition of a 47,000 ohm resistor is desirable to improve isolation between channels being mixed. The loss in signal due to these resistors is negligible.—*J. J. Rouleau, Senneterre, Quebec, Canada.*

Magnetic Soldering Iron

We use a number of pencil type soldering irons in our shop. To keep them handy when needed, and yet out of the way, I have attached a small magnet to each handle. The iron sticks to the metal chassis. This makes it especially handy on cabi-



Magnets holds soldering iron to chassis, metal cabinet, etc., for safety and convenience.

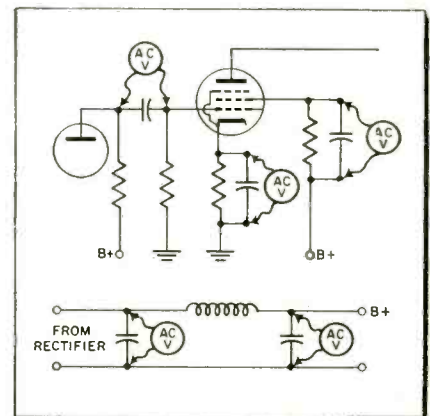
net and rack equipment. The magnets were taken from magnetic door catches and held in place by #16 copper wire.—*Paul R. Foster, Ogden, Utah.*

Since most of these pencil type soldering irons can accommodate a 6 or 7 watt intermediate base light bulb in place of the iron tip this ar-

angement is also convenient on home service calls to light up the inside of a TV cabinet.—*Ed.*

Capacitor In-Circuit Test

Most applications, of bypass, coupling and filter capacitors, for practical purposes, present a short circuit, or very low impedance path to ac. Therefore, the voltage drop across them should be zero or very



Measuring A-C voltage drop across capacitor to predict condition, while in circuit.

low. Measuring the a-c voltage drop across the capacitors will usually indicate whether or not they are open or have decreased in value appreciably. There is one notable exception—a low a-c voltage reading of about 10 to 15 volts is normal across the input-filter capacitor in a B+ capacitor input filter circuit. Most filters of this type have a high ripple content at this point.—*Louis C. Maly, Iron Mountain, Mich.*

SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

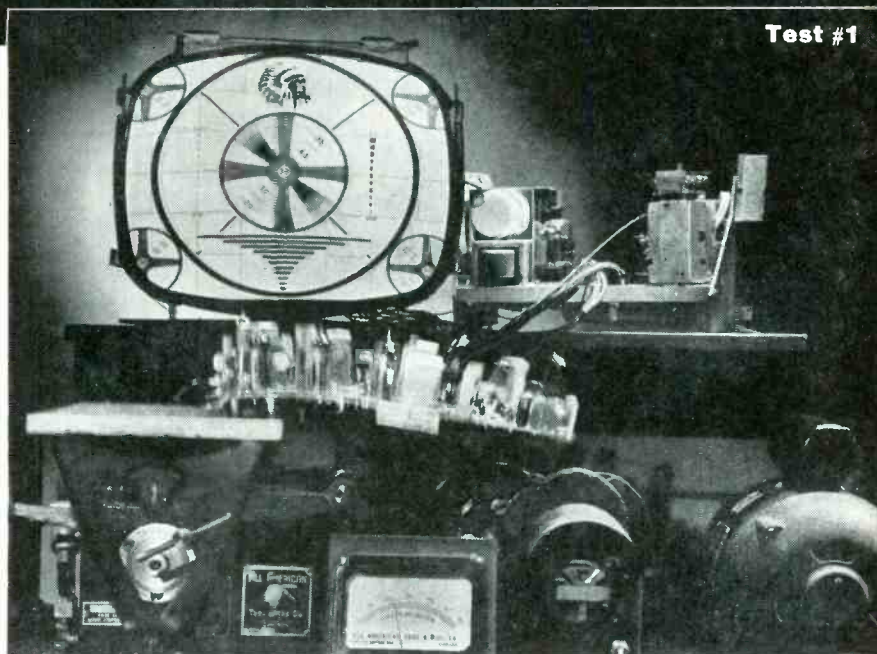
The greatest engineering advance in TV!



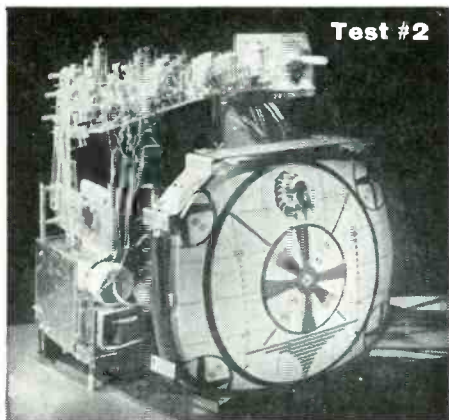
The new **SYLVANIA**
"LIFETIME ENGRAVED CIRCUIT"

**Torture Tested for
 Lifetime Reliability**

This chassis (right) is being literally tortured on a vibration table. One end is fastened to the table, the other free and unsupported. In spite of being whipped up and down at speeds from 10 to 60 cycles per second, the picture continued to be clear and steady. Here's proof positive of the durability and dependability of the Sylvania "Lifetime Engraved Circuit."



Test #1



Test #2

Unretouched photographs of the toughest tests ever given an operating TV chassis—Note clear picture.

Bent back and forth over 3 inches 15,000 times per day!

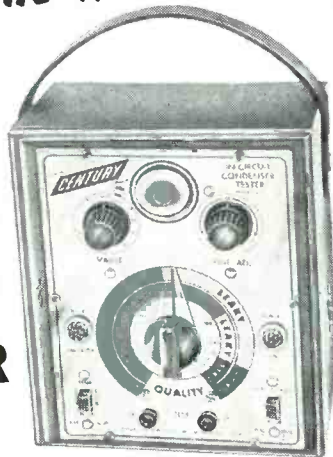
The amazing "LIFETIME ENGRAVED CIRCUIT" keeps a clear, bright picture on the screen while one end is bent continually a distance of over 3 inches! There were *no* instances of loose connections, breakage, or failure of any kind!

**The exclusive "Lifetime Engraved Circuit"
 ...in every SYLVANIA TV set.**

SHIPPED ON APPROVAL

an IN-CIRCUIT CONDENSER TESTER THAT DOES THE WHOLE JOB!

The CT-1 actually steps in and takes over where all other in-circuit condenser testers fail. The ingenious application of a dual bridge principle gives the CT-1 a tremendous range of operation . . . and makes it an absolute 'must' for every serviceman.



IN-CIRCUIT CONDENSER TESTER Model CT-1

Model CT-1—housed in sturdy hammertone finish steel case complete with test leads . . . only **\$34.50** Net

in-circuit checks:

- ✓ Quality of over 80% of all condensers even with circuit shunt resistance present . . . (leakage, shorts, opens, intermittents)
- ✓ Value of all condensers from 200 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ Transformer, socket and wiring leakage capacity

out-of-circuit checks:

- ✓ Quality of 100% of all condensers . . . (leakage, shorts, opens and intermittents)
- ✓ Value of all condensers from 50 mmfd. to .5 mfd.
- ✓ Quality of all electrolytic condensers (the ability to hold a charge)
- ✓ High resistance leakage up to 300 megohms
- ✓ New or unknown condensers . . . transformer, socket, component and wiring leakage capacity

OUTSTANDING FEATURES

- Ultra-sensitive 2 tube drift-free circuitry
- Multi-color direct scale precision readings for both quality and value . . . (in-circuit or out of circuit)
- Simultaneous readings of circuit capacity and circuit resistance
- Built-in hi-leakage indicator sensitive to over 300 megohms
- Cannot damage circuit components
- Electronic eye balance indicator for even greater accuracy
- Isolated power line

Check all power rectifiers in-circuit

whether SELENIUM,
GERMANIUM,
SILICON, etc.

with the IN-CIRCUIT RECTIFIER TESTER Model SRT-1



Model SRT-1—housed in sturdy hammertone finish steel case complete with test leads . . . only **\$29.50** Net

With the growing trend towards compactness, portability and low price, TV manufacturers are resorting more and more to producing series-string TV sets employing selenium, germanium or silicon power rectifiers. Now the need for an in-circuit rectifier tester is greater than ever.

THE SRT-1 CHECKS ALL POWER RECTIFIERS IN-CIRCUIT AND OUT-OF-CIRCUIT WITH 100% EFFECTIVENESS FOR:

- ✓ Quality ✓ Fading ✓ Shorts ✓ Opens ✓ Arcing ✓ Life Expectancy

OUTSTANDING FEATURES

- Checks all types of power rectifiers rated from 10 ma. to 500 ma. (selenium, germanium, silicon, etc.) both in-circuit or out-of-circuit.
- Will not blow fuses even when connected to a dead short.
- Large 3" highly accurate multi-color meter . . . sensitive yet rugged.
- Separate meter scales for in-circuit and out-of-circuit tests.
- Cannot damage or over heat rectifier being tested.

SIMPLE TO OPERATE

Just clip SRT-1 test leads across rectifier under test right in the circuit without disconnecting rectifier from circuit. Press test switch and get an instant indication on the easy-to-read three-color meter scales . . .

ALL CENTURY INSTRUMENTS ARE GUARANTEED FOR ONE FULL YEAR

The extremely low prices are made possible because you are buying direct from the manufacturer.

TRANSISTOR TESTER Model TT-2

Every day more and more manufacturers are using transistors in home portable and car radios . . . in hearing aids, intercoms, amplifiers, industrial devices, etc. Since transistors go bad the need for TRANSISTOR TESTER is great. They can

develop excessive leakage, poor gain, shorts or opens. The TT-2 is an inexpensive quality instrument designed for accurate and dependable tests of all transistors and diodes — quickly and accurately.

OUTSTANDING FEATURES

- Checks all transistors, including car radio, power output, triode, tetrode and unijunction types for current gain, leakage, opens, shorts, cut-off current
- Checks all diodes for forward to reverse current gain
- All tests can be made even if manufacturers' rated gain is not available
- Less than half a minute required for tests of either transistors or diodes
- Large 3" meter is extremely sensitive yet rugged . . . with multi-color scales designed for quick easy readings
- Power is supplied by an easy to replace 6-volt battery — current drain so small, service life almost equal to shelf life. Battery cannot be drained due to accidental shorting of test leads
- Cannot burn-out its own meter or damage transistor or diode under test
- Long test leads and insulated test clips enable tests without entirely removing transistor from circuit
- Test leads are identified by E.I.A. color code so that connection to the correct terminal is assured
- Comes complete with replaceable transistor set-up chart that fits into a special rear compartment.

IMPORTANT FEATURE: The TT-2 cannot become obsolete as the circuitry is engineered to enable you to check all new type transistors as they are introduced. New listings will be furnished at no cost.

Model TT-2 — housed in sturdy hammertone finish steel case complete with test leads . . . only **\$24.50** Net



EASY TO BUY IF SATISFIED 
see order form on facing page

FOR 10 DAY FREE TRIAL

try them for 10 days before you buy . . . only then, when satisfied, pay in easy-to-buy monthly installments — without any financing or carrying charges added.

STILL THE BEST SELLING TUBE TESTER IN THE FIELD FAST-CHECK TUBE TESTER

Model FC-2



The greatest testimonial ever paid an instrument . . . over 20,000 sold in a little more than a year—and still selling as fast as we can produce them. See for yourself at no risk why so many servicemen choose the FAST-CHECK above all other tube testers—regardless of price.

Model FC-2 — housed in hand-rubbed oak carrying case complete with CRT adapter . . . only

\$69.50
Net

SIZE: W: 14 5/8" H: 11 1/4" D: 4 3/8"

Just 2 settings on the FAST-CHECK TUBE TESTER tests over 700 tube types completely, accurately — AND IN SECONDS!

PICTURE TUBE TEST ADAPTER INCLUDED WITH FAST-CHECK

Enables you to check all picture tubes (including the new short-neck 110 degree type) for cathode emission, shorts and life expectancy . . . also to rejuvenate weak picture tubes.

No other tube tester made at any price can match the value of the FAST-CHECK.

RANGE OF OPERATION

- ✓ Checks quality of over 700 tube types, employing the time proven dynamic cathode emission test. This covers more than 99% of all tubes in use today, including the newest series-string TV tubes, auto 12 plate-volt tubes, OZ4s, magic eye tubes, gas regulators, special purpose hi-fi tubes and even foreign tubes.
- ✓ Checks for inter-element shorts and leakage.
- ✓ Checks for gas content.
- ✓ Checks for life-expectancy.

IMPORTANT FEATURES

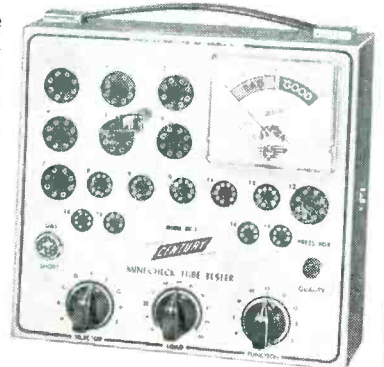
- No time consuming multiple switching . . . only two settings are required instead of banks of switches on conventional testers
- No annoying roll chart checking . . . tube chart listing over 700 tube types is located inside cover. New listings are added without costly roll chart replacement
- Checks each tube will read "Bad" on the meter scale one section is defective beryllium tube sockets never need replacement
- 41 phosphor bronze beryllium tube sockets mounted on panel
- Large 4 1/2" D'Arsonval type meter — most accurate type available . . . its greater sensitivity means more accuracy . . . its jewel bearing sockets means longer life
- 17 long lasting phosphor bronze tube sockets
- Combination gas and short jewel indicator
- 9 filament positions
- Handy tube chart contained in special back compartment
- New tube listings furnished periodically at no cost
- Detachable line cord

NOTE: The Fast-Check positively cannot become obsolete . . . circuitry is engineered to accommodate all future tube types as they come out. New tube listings are furnished periodically at no cost.

NEW . . . For those looking for a real ECONOMY MULTIPLE SOCKET TUBE TESTER without sacrificing ACCURACY, SPEED and VERSATILITY MINI-CHECK TUBE TESTER

Model MC-1

Here is a multiple socket tube tester designed to meet limited budgets. Although low in price it boasts a unique circuitry that enables you to check over 600 tube types — and has a range of operation that far exceeds others in its price class.



Model MC-1 — housed in sturdy wrinkle finish steel case . . . only

\$39.50
Net

SIZE: W: 9" H: 8 1/2" D: 2 3/4"

OUTSTANDING FEATURES

- Checks emission, inter-element shorts and leakage of over 600 tube types. This covers OZ4s, series-string TV tubes, gas regulators, auto 12 plate volt, hi-fi and foreign tubes
- 3 settings enable a test of any tube in less than 10 seconds
- Employs dynamic cathode emission test principle
- 3 1/2" D'Arsonval type meter — most accurate type available . . . its greater sensitivity means more accuracy . . . its jewel bearing sockets means longer life
- 17 long lasting phosphor bronze tube sockets
- Combination gas and short jewel indicator
- 9 filament positions
- Handy tube chart contained in special back compartment
- New tube listings furnished periodically at no cost
- Detachable line cord

plus these BONUS FEATURES . . . found in no other low price tube tester

- ✓ Checks for cathode to heater shorts
- ✓ Checks for gas content
- ✓ Checks all sections of multiple purpose tubes . . . will pickup tubes with one "Bad" section
- ✓ Line isolated — no shock hazard
- ✓ Variable load control enables you to get accurate results on all tubes
- ✓ Positively cannot become obsolete as new tube types are introduced.

CONVENIENT TIME PAYMENT PLAN — NO INTEREST OR FINANCING CHARGES

CENTURY ELECTRONICS CO., INC.

CHECK INSTRUMENTS DESIRED

- | | | |
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| <input type="checkbox"/> | Model MC-1 Mini-Check Tube Tester | \$39.50 |
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Prices Net F.O.B. Mineola, N. Y.

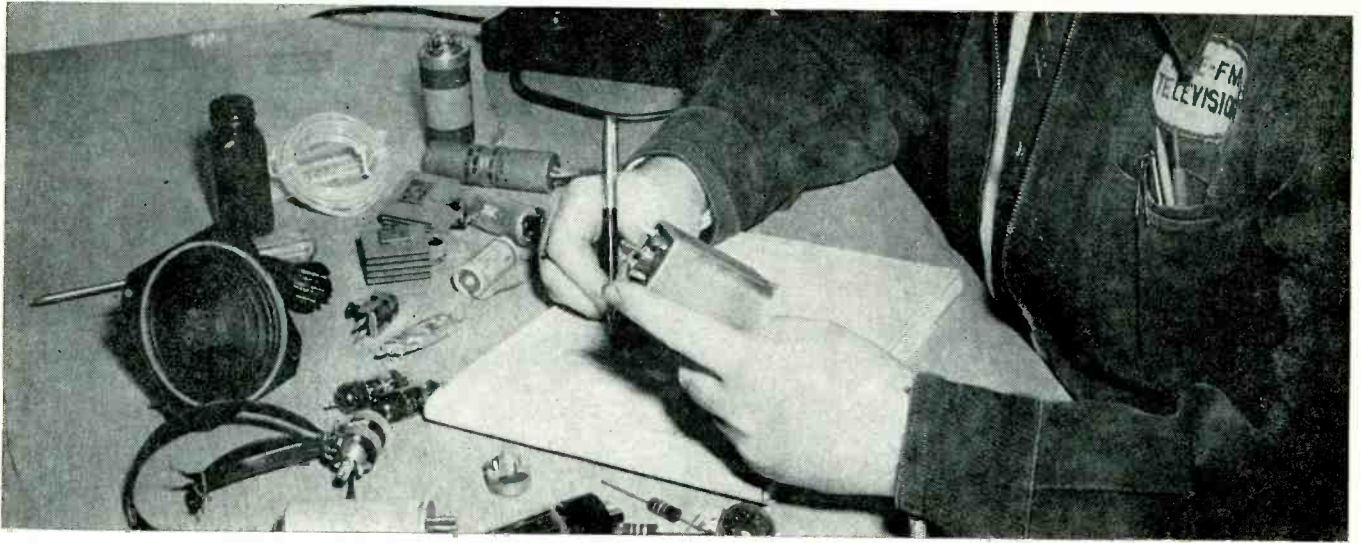
111 Roosevelt Avenue, Dept. 502, Mineola, New York

Please rush the instruments checked for a 10 day free trial. If satisfied I agree to pay the down payment within 10 days and the monthly installments as shown. If not completely satisfied I will return the instruments within 10 days and there is no further obligation. It is understood there will be NO INTEREST or FINANCING charges added.

Name _____ Please print clearly

Address _____

City _____ State _____



Parts Procurement Problems

*Electronically Controlled Equipment May Grind To A Halt
Because Of Some Manufacturers' Servicing Policies*

JACK DARR

• The technician who attempts to diversify by going into industrial electronic maintenance work often finds himself confronted with a very serious problem. How to obtain special and other custom-built parts for the equipment? Purely electronic parts present no great difficulty. Tubes, resistors and capacitors may be obtained from any radio-TV parts supply house. Perhaps not exactly of the same physical size and shape, but surely of the required electrical values. Minor physical differences can be easily handled.

When it comes to other, more highly specialized parts, such as relays, timing motors, gears, and special mechanical parts of the assembly, procurement troubles begin to mount for the independent technician, especially for those located in small towns, remote from major sources of supplies. The largest headache is the complete refusal of some manufacturers to sell them parts. Letters inquiring about parts are answered by a curt note advising the technician to return the unit to the nearest factory-service depot

where it will be repaired by factory-trained mechanics.

The basic reasoning behind this attitude is sometimes hard to determine. With the presence of electronic gear in practically every field of endeavor in the American scene, even in the smaller towns, this ceases to be a minor annoyance and assumes serious proportions. Delays, troubles, and financial losses result from this short-sighted maintenance policy. It could conceivably be that the manufacturers wish to retain the service business for themselves. One manufacturer's authorized service station charged \$68.00 just for replacing a relay; \$24.00 for parts and \$44.00 for labor. Is it any wonder that some of them refuse to sell parts?

Here is an actual experience. A control unit in a gas-fired boiler, in the local hospital broke down. Water overflowed into the unit and caused a relay to short and burn out. It was used in the plate circuit of a 12SN7 tube, and closed whenever a photocell saw fire in the firebox. An exact replacement was desired. An urgent telegram was dispatched to the manufacturer giving part numbers, and requesting that the replacement be shipped air express. In the meantime, the hospital was getting along the best it could on only one boiler.

They happened to have two, one of which could carry the load alone. Even so, it was forced to run continuously because of the cold weather.

A week went by and pressure mounted on the technician. No reply. Another week passed. Finally a brief note from the company, by mail! This billet-doux advised that the unit be sent to the nearest factory branch, some 400 miles away, since the company did not make it a practice to sell repair parts to anyone and everyone, and the factory-trained mechanics were the only ones capable of repairing and adjusting the delicate circuits and complicated equipment. The unit in question comprised a timer motor, which drove a cam-shaft, with about 8 contacts, and a two-stage amplifier, for the photocell, which closed the relay. This, of course, is extremely complicated! They should see some of the sync-separator or tuner circuitry in an ordinary TV set. Adding fuel to the technician's rage was the fact that he had made five or six overhauls of the complete unit, and had been in complete charge of the equipment ever since its installation over five years ago. He wondered if the manufacturer

(Continued on page 74)

more test equipment per dollar!

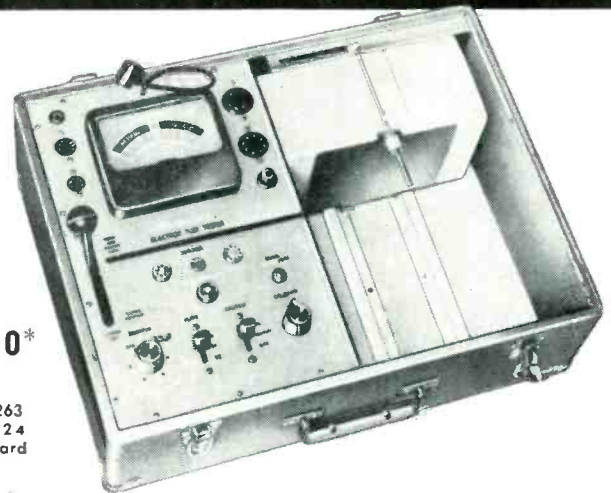
RCA WT-110A AUTOMATIC ELECTRON TUBE TESTER

Speed...Accuracy...Dependability

The WT-110A automatic punched-card tester is virtually obsolescence-proof! Designed especially for use in TV and general electron tube service testing, the RCA WT-110A provides *expandability* to cover new tube types as they are released, *versatility* to speed-test diodes, triodes and other multi-electrode tubes as well as double- and triple-unit tubes having dissimilar units, and *economy* that will pay for itself in time saved, new business and prestige! Try it yourself at your local RCA Test Equipment Distributor!

ONLY
\$199⁵⁰*

(Complete with 263 punch cards, 24 blank cards, and card punch.)



- Fully automatic! Sets up all socket connections and all operating voltages for heater, control grid, plate, screen grid, and bias.
- Checks for shorts and leakage between each element and all others consecutively—plate, screen, control grid, cathode. Multiunit tube sections checked individually.
- Checks amplifier tubes for transconductance—green scale indicates normal range of tube's transconductance
- Normal and special high-sensitivity tests for gas and leakage
- Automatically selects correct test conditions from 220 different heater voltages (from 0.1 volt to 120 volts) at currents up to 4 amps., 10 bias voltages, and 11 values of cathode resistance.
- Rectifier-type tubes tested for emission under heavy load currents (up to 140 ma per plate).
- 12-volt plate-and-screen supply for testing new auto-radio tubes.

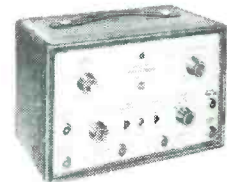
more dollars per service call!



WR-69A TV/FM SWEEP GENERATOR—top visual aligning and trouble-shooting equipment for color-TV and FM! Especially suited for aligning color-TV (if/video output frequency has continuous tuning from 50 Kc to 5 Mc)—essential for aligning color-TV video and chrominance stages. \$295.00*



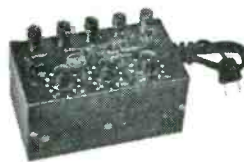
WR-99A CRYSTAL CALIBRATED MARKER GENERATOR—supplies fundamental-frequency rf carriers of crystal accuracy for use in aligning and trouble-shooting color and monochrome TV, FM, and other electronic equipment operating in the 19 to 260 Mc range. \$242.50*



WR-70A RF/IF/VF MARKER ADDER—provides a choice of four markers for rf, lf, and video sweep alignment of color and black-and-white TV receivers. Designed for use with a variety of conventional marker and sweep generators. \$74.50



WG-295B VIDEO MULTIMETER—provides seven simultaneous absorption-type markers at accurately preset frequencies for marking video response curves in color receivers. \$32.50*



WG-307A TV BIAS SUPPLY—for use in aligning black-and-white and color-TV—has three fully adjustable 0 to 15-volt outputs, plus a negative 100 volts output for biasing the burst keyer. \$22.50



WG-309A-TV MICROSCOPE—especially designed for the direct observation of the phosphor dot pattern, the WG-309A is a valuable service aid for convergence and purity adjustments in color-TV receivers. \$24.95*

Individual technical bulletins covering features and specifications of each of the above instruments are available from your nearest RCA Test Equipment Distributor, or write RCA Commercial Engineering, Section B-46-W, Harrison, N.J.



ALL—at your local RCA TEST EQUIPMENT DISTRIBUTOR!

RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.

*User Price (Optional)

Cold Cathode Vacuum Tube

Discovery Eliminates Conventional Hot Filament And Cathode

• A radically new cool-running radio tube, considered a major breakthrough in basic tube design has been unveiled.

The new device glows blue instead of red and uses less than one-tenth the power of a standard tube. Developed jointly by the U. S. Army Signal Corps and Tung-Sol Electric Inc., it could have as great an impact on electronics as the discovery of the transistor.

The new "cold cathode" vacuum (not gas) tube operates on an entirely new principle discovered by Dr. Dietrich Dobischek of the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J. It could be the forerunner of a new line of general-purpose tubes for broad military and civilian use.

Early reliability tests indicate the tube may well outlast any equipment in which it is used. This means it is possible future radios and TV sets equipped with cold cathode tubes may rarely require tube replacement. Time will tell.

This experimental tube is not a direct replacement for current types. Tube replacement will be with us for a long time.

The cold cathode principle is believed adaptable to almost all types of electron tubes, including TV screens, giant radar and transmitting

tubes, as well as nearly all general-purpose radio tubes. Miniature and subminiature tubes, which could rival the transistor in size, are also feasible.

It could also create a revolution in tube design by making possible the first reliable "secondary emission multiplier"—potentially the world's highest gain amplifier tube. The device would allow design of simplified miniature circuits, more efficient than today's bulkier units. Until now, though, this type of tube has always failed because the hot cathode contaminated other elements in the glass envelope. By eliminating the hot cathode, the new tube solves this problem.

Ordinary tubes, ever since their invention, have required a hot cathode element to generate needed electrons. But this heating takes a large percent of the power and forces the use of more complicated circuits or extra batteries. In the new tube, the hot element is replaced by a cold cathode—a tiny nickel cylinder specially coated with porous magnesium oxide (MgO, chemically identical to dried milk of magnesia). Instead of heat, high voltage field causes the electron flow, which in turn produces the tube's characteristic phosphorescent blue glow.

This reaction requires a barely

perceptible amount of electricity. A cold cathode tube can idle on 5 millionths of a watt, a tremendous saving over standard tubes. And future designs should be even more efficient.

The new tube also springs to life almost as soon as it is turned on, while an ordinary tube requires several seconds for warm-up, or 18 to 20 times as long.

Like the discovery of vulcanization and the Xray, the new tube principle was uncovered by accident. While experimenting on field-enhanced secondary emission, Dr. Dobischek noticed that one of his experimental tubes kept running even though he turned off the primary current. After years of research at the Army Signal Corps Laboratory's Techniques Branch, he perfected a surface that would continue to emit electrons indefinitely.

Cold cathodes require only 0.75 watt cathode power, compared to 7.56 watts for a similar power output tube. It is not necessary to have a separate filament transformer or battery to run the cold cathode. It can run on a small portion of the dc used for total tube operation. This applies also to the filament used momentarily for starting emission.

Since most of the cold cathode tube parts are the same as for hot cathode types, price will eventually be about the same. At the present stage of development, there are some limitations. For example, the cold cathode vacuum type requires about 300 volts on the plate, considerably higher than present hot types.

Cathode Function

The MgO cold cathode is based upon a unique electron emission phenomenon discovered in the course of a study of the field-enhanced secondary emission from MgO. In these experiments, thin MgO layers were deposited on a nickel base and bombarded with electrons possessing sufficient energy to produce secondary electron emission from the MgO. The secondary electrons were collected at a nearby collector elec-

(Continued on page 54)

Dr. A. Melvin Skellet, Dir. of Research, Tung-Sol Electric Inc. (left), and Dr. Dietrich Dobischek, scientist, U. S. Army Signal R & D Lab., who discovered the cold cathode principle, discuss fast-starting feature of the new tube.



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- 2 CAPACITY RANGES:
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- 5 D.C. CURRENT RANGES
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+ 34 db to + 58 db

NOTE: The line cord is used only for capacity measurements. Resistance ranges operate on self-contained batteries.

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• A built-in Isolation Transformer automatically isolates the Model 80 from the power line when capacity service is in use.

• Selected, 1% zero temperature coefficient metalized resistors are used as multipliers to assure unchanging accurate readings on all ranges.

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AS A DC VOLTMETER: The Model 77 is indispensable in Hi-Fi Amplifier servicing and a must for Black and White and color TV Receiver servicing where circuit loading cannot be tolerated.

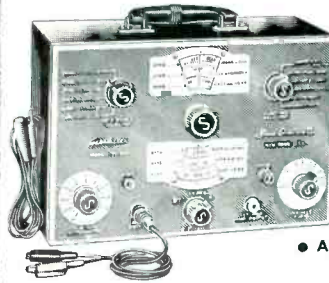
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- SPECIFICATIONS**
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 - AC VOLTS (Peak to Peak) — 0 to 8/40/200/400/800/2,000 volts.
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 - DECIBELS — 10 db to + 18 db, + 10 db to + 38 db, + 30 db to + 58 db. All based on 0 db = .006 watts (5 mw) into a 500 ohm line (1.73v).
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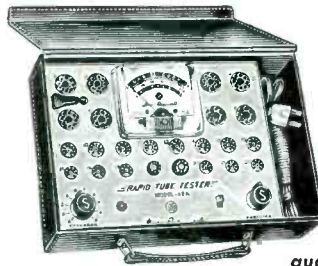
BAR GENERATOR: Pattern consists of 4 to 16 horizontal bars or 7 to 20 vertical bars.

DOT PATTERN GENERATOR (FOR COLOR TV): The Dot Pattern projected on any color TV Receiver tube by the Model TV-50A will enable you to adjust for proper color convergence.

CROSS HATCH GENERATOR: The pattern consists of non-shifting horizontal and vertical lines interlaced to provide a stable cross-hatch effect.

The Model TV-50A comes complete with shielded leads and operating instructions. Only **\$47⁵⁰**

TUBE TESTER Multi-Socket Type TEST ANY TUBE IN 10 SECONDS FLAT!



- 1 Turn the filament selector switch to position specified.
- 2 Insert tube into a numbered socket as designated on our chart (over 600 types included).
- 3 Press down the quality button—

THAT'S ALL! Read emission quality direct on bad-good meter scale.

SPECIFICATIONS

- Tests over 600 tube types
- Tests OZ4 and other gas-filled tubes
- Employs new 4" meter with sealed air-damping chamber resulting in accurate vibrationless readings
- Use of 22 sockets permits testing all popular tube types and prevents possible obsolescence
- Dual Scale meter permits testing of low current tubes
- 7 and 9 pin straighteners mounted on panel
- All sections of multi-element tubes tested simultaneously
- Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms

Model 82A comes housed in handsome, portable Saddle-Stitched Texon case. Only **\$36⁵⁰** (Picture Tube Adapter available for \$5.50 additional)

Production of this Model was delayed a full year pending careful study by Superior's engineering staff of this new method of testing tubes. **Don't let the low price mislead you!** We claim Model 82A will outperform similar looking units which sell for much more — and as proof, we offer to ship it on our examine before you buy policy.

To test any tube, you simply insert it into a numbered socket as designated, turn the filament switch and press down the quality switch — **THAT'S ALL!** Read quality on meter. Inter-element leakage if any indicates automatically.

SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C.O.D.

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Include Model 82A Picture Tube Adapter at \$5.50

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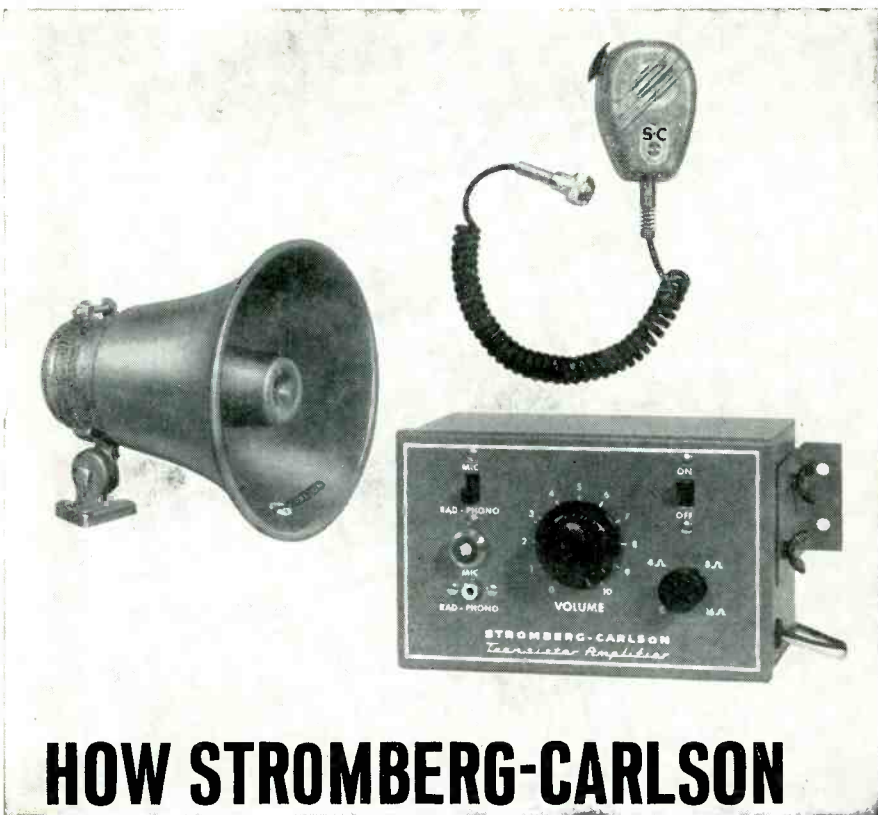
Cold Tube

(Continued from page 52)

trode, as commonly practiced in secondary emission studies. Once when the primary electron beam bombarding the MgO surface was turned off with the voltage still applied to the collector electrode, the surprising observation was made that the MgO layer continued to emit electrons without any external stimulus. Neither heat, as required for the operation of a standard thermionic cathode, nor external light, as required for the functioning of a photocathode, was necessary to keep alive the emission current from the MgO. By varying the voltage at the collector electrode, this self-sustained current could be controlled easily for many hours from a few microamps to several tens of milliamperes. It was natural that the discovery of this novel and interesting electron emission effect stimulated further exploration of the phenomenon for both theoretical and practical reasons.

Preparation

It was soon discovered that the ability of the MgO to render self-sustained electron emission was extremely dependent upon the methods of preparing the MgO layers. Therefore, the prime effort was directed towards the development of suitable preparation techniques. The early methods, using vacuum techniques primarily, yielded highly emissive MgO coatings, thus strengthening the desire for practical use of these coatings as useful cathodes. However, the methods were inconvenient for large-scale production of the cathodes. Furthermore, the reproducibility of the results was unsatisfactory. Yet, during this phase of the work, much was learned about the basic requirements for obtaining layers with good emission qualities. For instance, it was recognized that a certain type of porous structure of the cathode coatings was very important for obtaining maximum emission yields. Heat treatment of the MgO coatings in O₂ was found to be an essential factor for the development of the self-sustained emission phenomenon. The damaging effects of moisture were detected, and many other pieces of helpful information were



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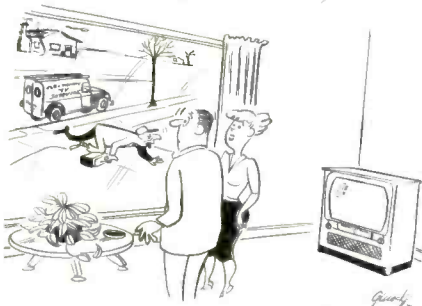
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gradually accumulated. With all this knowledge attained, a simple technique was finally developed which was suitable for large scale production of efficient and reproducible MgO cathodes.

From experiments done thus far, it is known that when the emission is started from a MgO cold cathode, a positive charge is developed at the surface of the MgO layer. Since the cathode coatings are very thin, a high electrical field is created across the coatings. It is assumed that under the influence of this high electrical field, electrons liberated within the MgO are multiplied by an avalanche process, and gain sufficient energy to leave the MgO and enter the vacuum. The liberation of the electrons which initiates the avalanche, is tentatively assumed to be the result of a photoelectric effect in which photons are ejected during the recombination of positive ions with electrons. This concept of the self-sustained emission can be considered at present only as a first approximation in explaining the self-sustained emission phenomenon. Further proof of the validity of the basic theory is needed, and many details have to be clarified in future work. Experiments in this direction are under way, and it is felt quite strongly that the further exploration of the more fundamental problems will be rewarding in many respects. Not only will each piece of information on the mechanism of the self-sustained emission greatly aid in making the best use of the MgO cold cathode, but a better insight into the fundamentals might also lead the way to materials even more suitable for displaying the self-sustained emission effect than MgO. •

NEWS NOTE: As we go to press, unofficial reports state that RCA will bring out its version of a cold cathode vacuum tube, and will display it at the IRE Show in New York City in March 1959.



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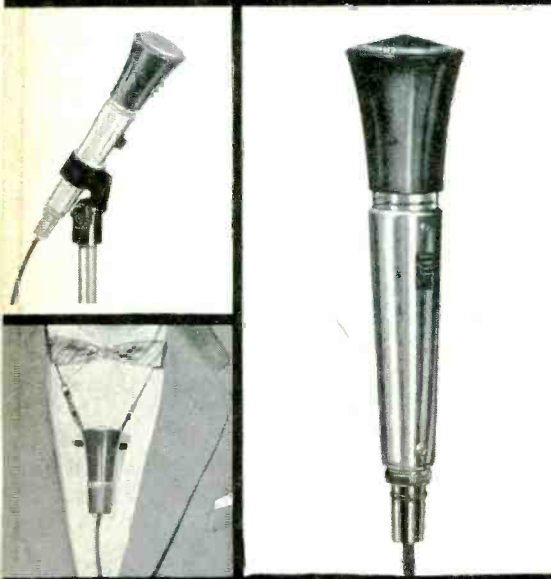
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The Commando is sturdy and rugged. Of patented controlled magnetic construction, it is unaffected by extremes of temperature and humidity; and it can be depended on to maintain its high level of quality through tough, sustained usage, year after year.

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New Medical Electronic Tool

The "Ultrascope"

Microscope Electronic "Eye" Converts Ultraviolet

A new electron tube, called the "ultrascope," which is expected to be a substantial help in medical and industrial research was demonstrated by RCA.

The tube is the "eye" of a new simple attachment for a microscope, which reportedly for the first time allows direct visual focusing of an image under ultraviolet light. It converts invisible ultraviolet images of specimens into visible pictures that can be interpreted quickly by medical research workers. The accessory replaces the regular eyepiece of a microscope adapted for ultraviolet viewing.

A commercial model of the ultraviolet image-converter unit, equipped for direct viewing and photography, will be made available in the near future by Bausch & Lomb Optical Co.

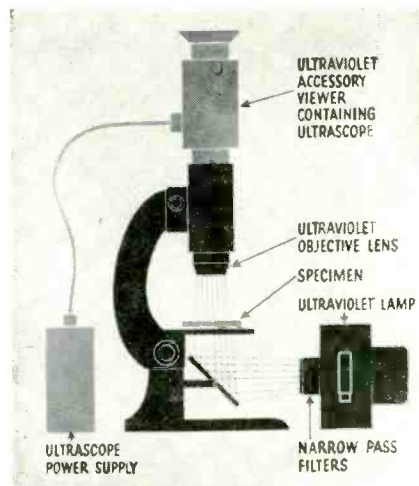
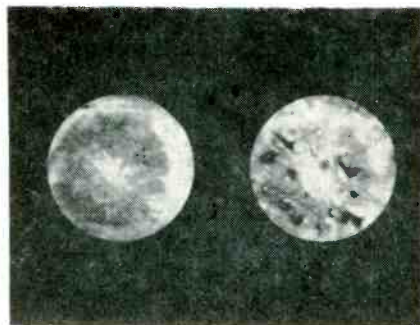
Cylindrical in shape, the new tube, No. 7404, is 2 1/4 inches long and 1 3/8 inches in diameter.

All methods of ultraviolet microscopy take advantage of the fact that specimens absorb ultraviolet rays in various degrees depending on the ultraviolet wavelength.

Evaluation tests of a prototype of this accessory at the National Institutes of Health reveal that this new device has a very satisfactory degree of resolution—the ability to reproduce detail in small areas of a specimen.

Image-converter tubes, sensitive

Photomicrograph of human brain at left, as seen in visible white light, shows no cell structure. Identical specimen at right viewed in ultraviolet converted to visible light by "ultrascope" shows nerve cells as black spots.



Ultraviolet accessory viewer as used in microscopy includes 12 kv power supply.

to infrared rays, were used in the famous "Sniperscope" of World War II and the Korean War. Mounted on gun sights, this device enabled soldiers to see enemy troops and vehicles in total darkness. Until recently, the development and production of image-converter tubes by RCA had been confined to military purposes.

The ultraviolet accessory viewer consists of two units. One unit, which fits onto the barrel of a microscope, contains the ultrascope and an eyepiece; the other unit is a compact (Continued on page 86)

"Ultrascope" tube, priced initially in \$200 range to manufacturers, is heart of the system.



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all the tubes in the TV set with

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YOU CAN INCREASE YOUR INCOME

FAST AND ACCURATE

- Tests complete set in minutes
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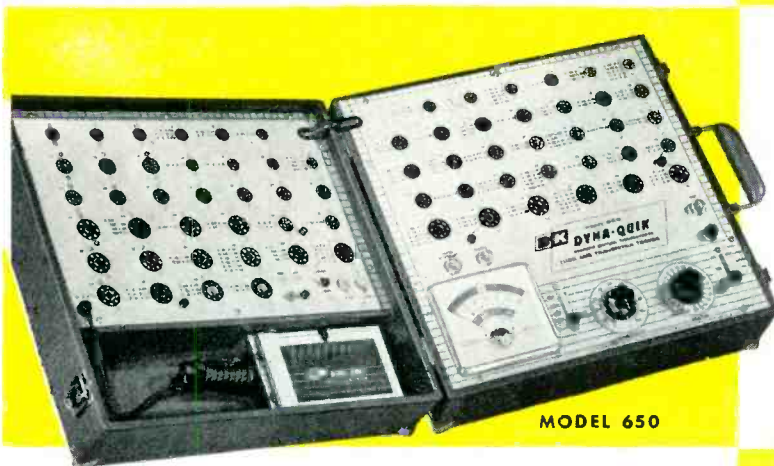


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Net, **\$169⁹⁵**



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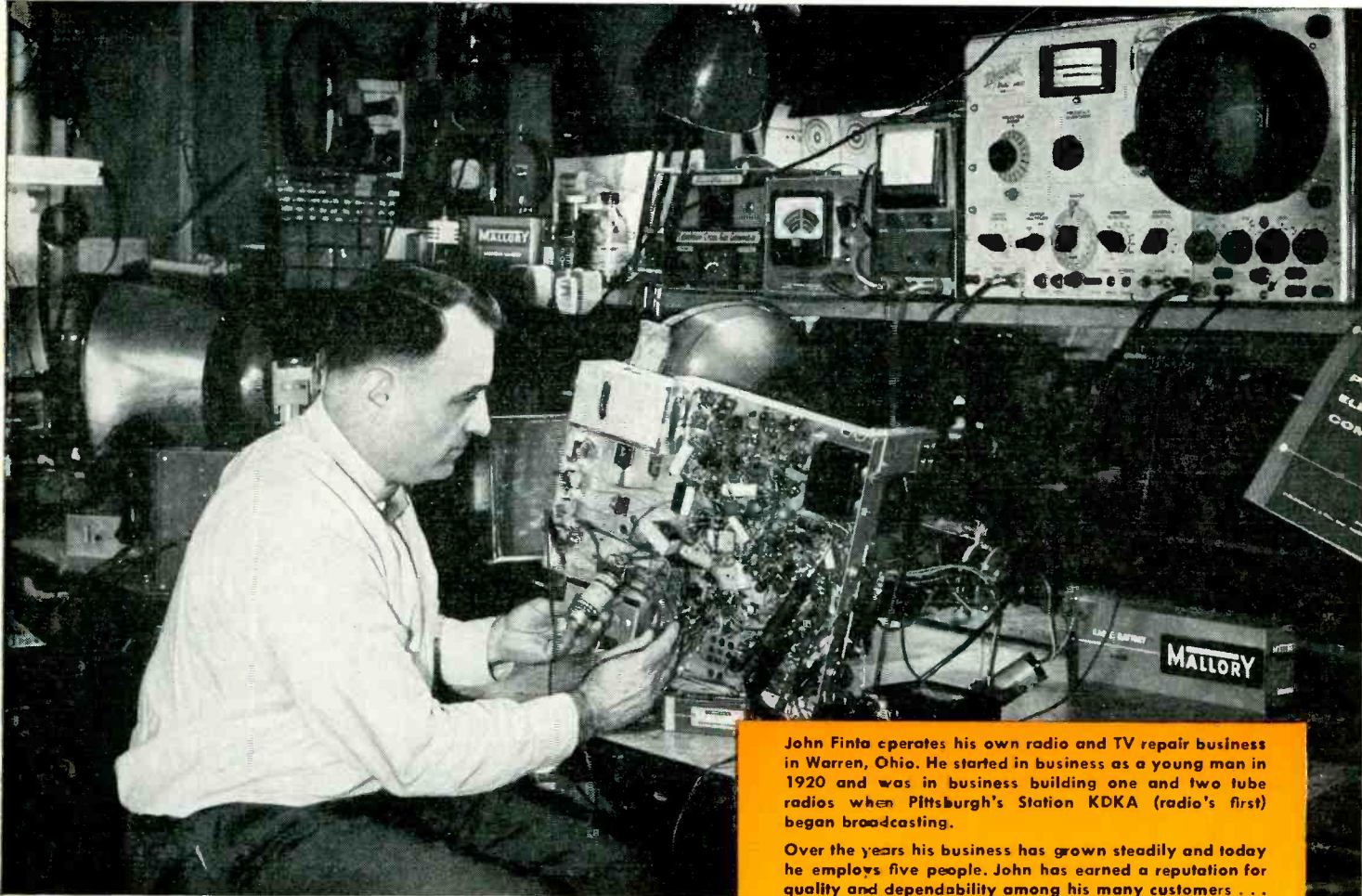


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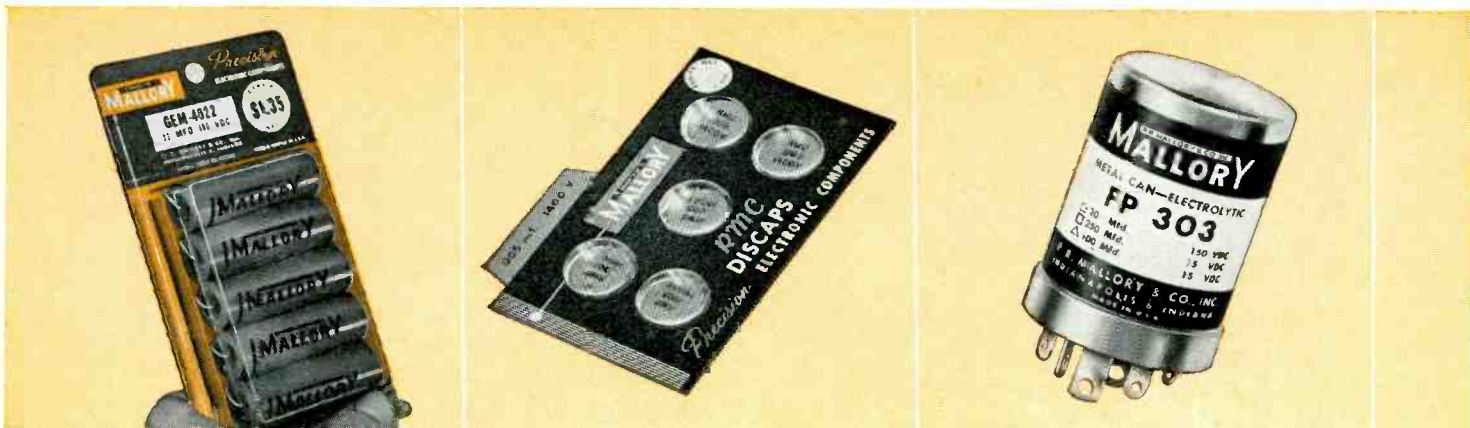
Service Technician John Finta Says...



John Finta operates his own radio and TV repair business in Warren, Ohio. He started in business as a young man in 1920 and was in business building one and two tube radios when Pittsburgh's Station KDKA (radio's first) began broadcasting.

Over the years his business has grown steadily and today he employs five people. John has earned a reputation for quality and dependability among his many customers... a reputation that is bringing him new customers as well as making fast friends of the old.

Cut Call-Backs with These Quality Mallory



Gems—5 rugged, moistureproof, Mallory "Gem" tubular capacitors in an easy-to-use dispenser that keeps your stock fresh and clean—easy to find—no more kinks in lead wires. They're your best bet for outstanding service in buffer, bypass or coupling applications.

RMCDiscaps®—are a product of the world's largest producer of ceramic disc capacitors. Long the original equipment standard, Mallory RMC Discaps are now available for replacement. They come in a handy 3" x 5" file card package... easy to stock, simple to use.

FP Electrolytics—The Mallory FP—the original 85°C capacitor—now has improved shock-resistant construction and leakproof seal. Its etched cathode construction—standard in all FP's—assures hum-free performance. High ripple current ratings fit the toughest filter circuits.

...“Mallory Components Make Every Job a ‘Sure Thing’”

“Nothing gets under your skin more—or eats into your profits deeper—than time consuming, expensive call-backs. But, there’s one sure way to stop them: use only quality replacements.

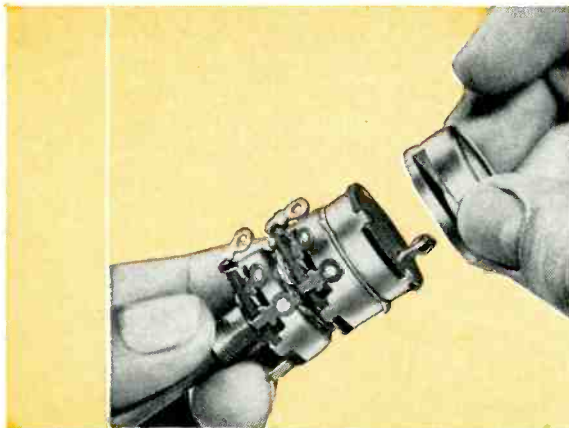
“You know you’re getting the best when you ask for Mallory . . . and you don’t pay premium prices, either. You see, Mallory components are service-

engineered to give long, trouble-free life. They’ve been thoroughly tested and ‘punished’ in the Mallory lab, far beyond any beating they’ll ever get in actual service.

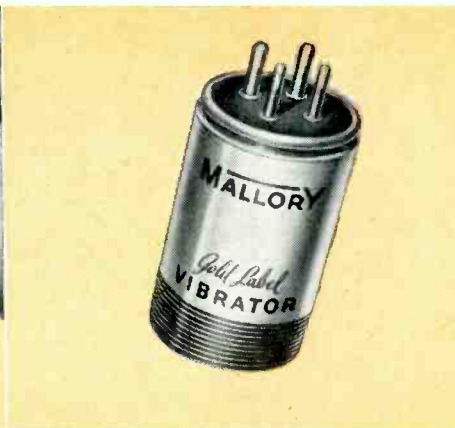
“This is the kind of quality you get across the entire line of Mallory components . . . capacitors, controls, resistors, vibrators, rectifiers and batteries.”



Products...

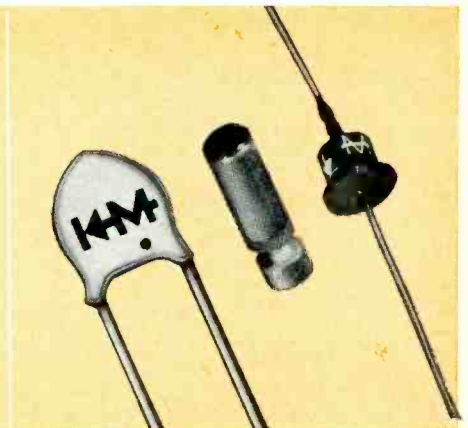


Sta-Loc* Controls—New Sta-Loc design enables your distributor to custom build, in just 30 seconds, over 38,000 combinations—eliminates waiting for out-of-stock controls. You can replace the line switch by itself, without unsoldering control connections.



Gold Label* Vibrators—On critical auto radio servicing, use the Mallory Gold Label Vibrator. It gives longer, trouble-free service life. Mallory Gold Label Vibrators feature Mallory exclusive buttonless contact design.

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FREE LITERATURE

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1 Transformers: Bulletin No. 551 describes 3 new flybacks for exact replacements in the following TV sets: Coronado, Firestone, GE, Hallicrafters, Hotpoint, and Trutone. (1B2: Chicago Standard Transformer Corp.)

2 Power Supply: A 4-page folder covers model PS-2 dual purpose filtered DC power supply for transistor circuits, hybrid sets, and auto radios. Tabulated information on percentage of ripple, continuous maximum current rating, and special features are covered. (2B2: Electro Products Labs.)

3 Hi-Fi Components: Specification sheets on 6 new stereo hi-fi components cover tuners, stereo cartridges, stereo amplifiers, speakers, stereo preamplifiers, and stereo remote controls. (3B2: General Electric Co.)

4 Tube Testers: Literature describes model 800 dynamic mutual conductance portable tube tester. This new unit incorporates a transistor and diode checker. Price: \$159.50. (4B2: Hickok Electrical Instrument Co.)

5 Hi-Fi Speakers: Announced is the new "Mardi Gras" line of hi-fi speaker systems. Using the "acoustically loaded cone" principle permits 50 to 15,000 rated response, 10 to 15 watts continuous power capacity. Available in 2 models, priced at \$30 and \$45 respectively. (5B2: JFD Electronics Corp.)

6 Batteries: Information is available covering the new M13 leakproof steel-jacketed battery. It is a size D dry cell designed for flashlights, radios, games and general use. (6B2: P. R. Mallory & Co. Inc.)

7 Receivers: Two new crystal controlled mobile FM receivers, for continuous positive monitoring of any single frequency in the 30-50 or 152-174 mc bands, are covered in descriptive literature. (7B2: Monitoradio Div., I.D.E.A., Inc.)

8 Capacitors: Circular M-757 lists a new line of upright mounting electrolytics for printed wiring boards. Designed as replacements in transistor circuits in auto, personal, and portable radios. (8B2: Sprague Products Co.)

9 Rectifiers: Data sheet No. 31 describes new midget sized type F. silicon rectifiers. Included are electrical ratings, characteristics, dimensions, output voltages, etc. (9B2: Sarkes Tarzian, Inc.)

10 Tube Testers: Model 3414 is a fast tester for such tubes as receiving, gaseous rectifiers, series filament, resistor and ballast, etc. Has maximum flexibility and a non-obsolescence design. (10B2: Triplett Electrical Instrument Co.)

11 Rectifiers: A new catalog sheet gives mechanical data, ratings, and electrical specifications for diffused silicon rectifiers. (11B2: Texas Instruments, Inc.)

12 Antennas: Literature is available covering a new complete line of car radio antennas. The new line will include fifteen standard and deluxe models for initial or replacement use with the firm's car radios. There is a model to fit and complement almost every foreign and domestic car, truck, boat or tractor. (12B2: Motorola Inc.)

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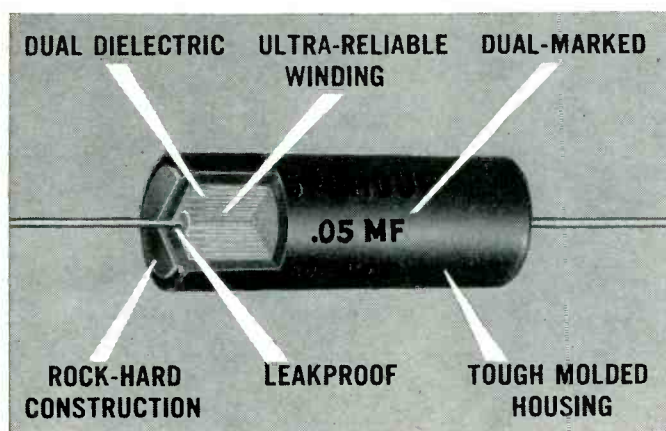
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NEW DIFILM[®] BLACK BEAUTY[®] MOLDED CAPACITORS

BEAT THE HEAT AND HUMIDITY!

Now Sprague's new DIFILM BLACK BEAUTY MOLDED CAPACITORS have taken the steam out of heat and humidity problems. These capacitors are so good you can *boil 'em* for 24 hours without affecting their performance.

Unlike straight polyester film tubulars, these capacitors operate in a 105°C environment *without derating*.



Look for the RED markings on the black case.

And the heart of these new DIFILM capacitors can't be beat. It's a dual dielectric which *combines the best advantages of both Mylar* polyester film and the highest grade of paper dielectric*. A rock-hard solid impregnant fills voids and pinholes in the film.

Talk about *reliability!* . . . these capacitors have it. DIFILM capacitors are actually low cost versions of the Sprague capacitors now being used in every modern military missile. The basic reliability and outstanding performance of missile-type Sprague capacitors are all yours in this outstanding new development. Why take chances when you can get the best—DIFILM BLACK BEAUTY MOLDED TUBULARS . . . at regular prices.

For the complete DIFILM BLACK BEAUTY story, write for Bulletin M-759 to Sprague Products Company, 65 Marshall St., North Adams, Mass.

*DuPont trademark

The major capacitor improvements
come from

SPRAGUE[®]

world's largest capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

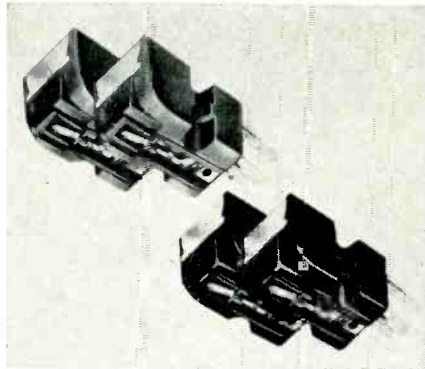
New Audio Products



For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon on page 60.

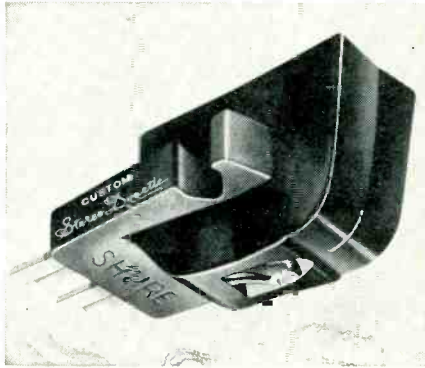
Columbia CARTRIDGE →

Four versions of the Constant Displacement (CD) stereo cartridge include the basic twin-ceramic with either a diamond or sapphire stylus, and in either "in-phase" or "out-of-phase" connection. In-phase cartridges provide conventional phasing. Certain stereo amplifiers—notably the unit designed by CBS Labs.—require opposite or out-of-phase polarity at the cartridge terminals. In-phase cartridges are: diamond, SC-1D; sapphire, SC-1S; out-of-phase are: diamond, SC-2D; sapphire, SC-2S. CBS-Hytron, Danvers, Mass. (ELECTRONIC TECHNICIAN 2-6)



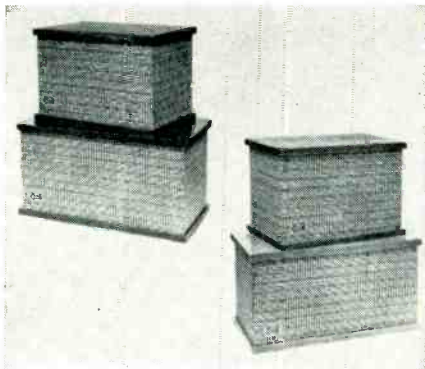
Shure STEREO CARTRIDGE →

A magnetic stereo phonograph cartridge selling for \$24 audiophile net, including 0.7 diamond stylus, is the M7D Custom Stereo Dynetic. It utilizes the principle of a moving magnet in a stationary coil. The M7D has the following specifications: Channel separation, more than 20 db; frequency response, 20 to 15,000 cps; output voltage, 5 mv per channel; vertical and lateral compliance, 3.5×10^{-6} cm/dyne. Tracking force is 4 to 7 grams. There are four terminals. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. (ELECTRONIC TECHNICIAN 2-4)



JFD SPEAKER SYSTEMS →

A new line of high fidelity speaker systems is called the Mardi Gras. It will be sold on a 2-step sales plan to service dealers. Response is from 50 to 15,000 cps. Enclosure is 18" wide, 10" deep and 10" high. A single driver is used. Power handling capacity is 10 to 15 watts continuous. Includes 4, 8 and 16 ohm impedance taps. Model ALC1, is \$45 audiophile net; model ALC2, measuring 14" x 10" x 10", is \$30.00. JFD Electronics Corp., 6101 Sixteenth Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 2-3)



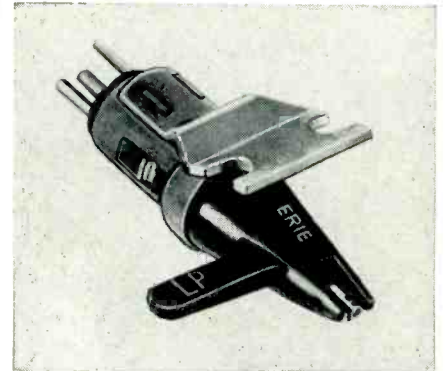
Pilot STEREO PREAMP →

Model 216 is a two channel stereo preamp featuring two illuminated VU meters. In one position, a lever switch measures tape output level as adjusted by the recording level controls; in the other, audio output as adjusted by balance and volume controls. It features 12 inputs. Frequency response is ± 1 db from 20 to 20,000 cycles. Harmonic distortion for 1 volt output is 0.2%. Hum and noise is 80 db below 1 volt. \$189.50 Pilot Radio Corp., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 2-5)



Erie STEREO CARTRIDGE

Model 1304 ST-ERIE-O cartridge @ \$24.50 list has a 0.7 mil diamond and 3 mil sapphire stylii, and the Model 1303 @ \$14.50 has dual sapphires. These models are supplied with cable and hardware for conversion. A single ceramic element develops signals for both channels. It offers separation of



20 db. Response is 20 to 16,000 cps with output voltage 0.5 at 1 kc each channel. Compliance is 3×10^{-6} cm/dyne, vertical and lateral. Recommended load is 2 megohms, tracking 5 to 6 grams, Erie Resistor Corp., 644 W. 12 St., Erie, Penna. (ELECTRONIC TECHNICIAN 2-1)

American Microphone DISPLAY

A new counter display for the self-service selling of tape recorder microphones contains six different styles of dynamic, crystal and ceramic mikes. The full-color display is part of a package that can bring the audio dealer as much as 65% in selling these popular replacement items. The microphones in



this deal 3926 are designed for all types of recorders, P. A. systems, intercoms, and the like. It includes the \$10.00 display rack free of charge, and carries a list price of \$99.65. American Microphone Mfg. Co. (div. of G-C Textron Inc.), 412 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 2-2)



DID YOU SAY \$11.95 PUTS ME IN BUSINESS?

Yes, \$11.95 Puts You in the BOOMING EXACT REPLACEMENT PORTABLE ANTENNA BUSINESS!

You bet. Only \$11.95 earns you a king-sized share of today's 4 million dollar portable TV antenna replacement market. That's the amazingly low price for the new JFD Exact Replacement Portable TV Antenna Merchandising Kit that sets you up overnight in this thriving new business.

Look at what you get:

5 top-selling Exact Replacement antennas that cover 85% of portable TV's in use... the 1959 JFD edition listing every portable TV set by make, model, and antenna... a traffic-stopping window streamer... and a comprehensive portable antenna business building plan.

As a Portable TV Antenna Service Specialist, you can forget about competition with drug stores, auto accessory stores and the like, too. *You* make a handy profit on every sale.

Makes sense, doesn't it, to stop at your JFD distributor today for your Exact Replacement Portable TV Antenna Merchandising Kit?



JFD Exact Replacement Portable TV Antenna Merchandising Kit

No. PA500 Contents: **\$11.95 Dealers Net**

No.	JFD Antenna Model	Exact Replacements for	List
1	TA154	Admiral-Westinghouse	\$10.95
1	TA155	Zenith-Admiral	11.50
1	TA359	RCA, Motorola, Magnavox	12.95
1	TA360	GE, Hotpoint, Westinghouse	11.75
1	TA442	Emerson, GE, Olympic	10.95
			Total List \$58.10

- 1 1959 catalog of all Portable TV Sets by brand, model and JFD Exact Replacement Indoor Antenna.
- 1 "Exact Replacement Portable TV Antenna Headquarters" streamer.
- 1 Outline of complete dealer sales promotion plan.

Pioneers in Electronics since 1929

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Toronto, Ontario, Canada

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Silicon Rectifier... **1N2078**

NEW Tung-Sol 1N2078 designed and made for simple, speedy TV replacement!

Tung-Sol's new 1N2078 diffused junction silicon rectifier possesses distinct advantages the service industry will welcome. Optimum physical and electrical characteristics combine to make 1N2078 convenient to handle and install, and assure your TV and radio service customers the high-grade performance they want and appreciate.

Small size, easy to install. Tung-Sol's 1N2078 is smaller than most semiconductor devices, at no sacrifice in efficiency. Long

flexible leads can be quickly soldered to existing connections with no additional hardware. This is especially suited to printed circuitry.

Long life. Negligible voltage drop that remains stable over lengthy operation promotes long life. 1N2078 virtually unaffected by high current surges . . . maintains high B+ over full-length operation.

Special Insulated case. Special case insulates against chassis shorts to further ease replacement. Also, 1N2078 dissipates its own heat . . . needs no heat sink . . . yet never requires derating. Only leads get hot.

You can replace any other device and, in some cases, rectifier tubes, with the new, high-quality Tung-Sol 1N2078. For complete information . . . to stock up, contact your distributor or: Tung-Sol Electric Inc., Newark 4, New Jersey.

1N2078 Maximum ratings (100°C) capacitive load:

(Similar types available with Peak Inverse Voltages ranging from 50 up to 500)

Peak Inverse Voltage	400 Volts
Continuous D. C. Reverse Working Voltage	400 Volts
Average D. C. Output Current	500 mA dc
Peak Recurrent Forward Current	5 Amps.
½ Cycle Surge Current	30 Amps.
Full Load Voltage Drop @ 25°C	1.1 Volts
RMS Input Voltage	130 Volts
Minimum Series Resistance (for capacitive filter)	5 ohms, 10 watt



Sync Circuits

(Continued from page 39)

with the picture. They could cause horizontal pulling and false vertical sync, a condition wherein the picture will lock half or part way up or down on the screen, exposing the vertical blanking bar.

Bench Procedure

It is possible to signal trace the sync pulse using a capacitor in series with a lead connected to the top of volume control and listening for a 60 cycle buzz. It is also possible to use the output function of a VOM to trace the pulse, but the best instrument is the scope. Not only will it enable the servicing technician to trace the signal, but it shows the shape and amplitude. The presence of hum, video, or other undesirable noise pulses can be spotted at a glance. When looking for sync pulses at the input of some oscillator circuits it may be desirable to disconnect the lead going to the oscillator to avoid reading the oscillator signal and mistaking it for the sync pulse. Many horizontal oscillator tubes operate at or near zero grid voltage, with respect to ground. If a defective AFC circuit or other sync problem should cause the oscillator tube to become inoperative, merely shorting the grid-to-ground will usually cause the oscillator to come to life, thus giving the oscillator a clean bill-of-health. Picture bending, pulling, piecrust, and other defects can be isolated by opening up the sync lead to the oscillator. When the circuits are separated in this manner, it is possible to predict if the trouble exists before or after the point of separation.

The capacitor probe and shorting technique are perhaps more suitable as a quick check when on a service call, but it does work in many cases. There is no substitute for the scope. Once the trouble has been more or less localized, it should be a fairly simple matter to use the VOM or VTVM to measure voltage, resistance, and spot defective capacitors. Servicing sync circuits is usually not difficult. However, there are times when it could be a challenge even to the best of the old timers. Remember when feedback loops and queer interactions are taking place, the secret to success lies in isolating the defective circuit. •

CAPACITORS

you can
depend
upon!

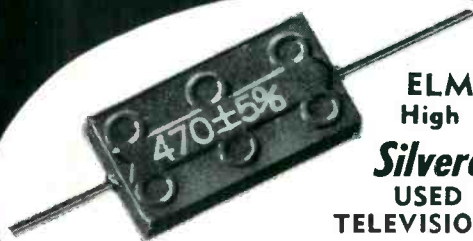
PRECISION DESIGNED
for Long Life and Trouble-Free Service!



ELMENCO Miniaturized TUBULARS

- High Temperature Operation
- Superior Moisture Resistance
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- All Values $\pm 10\%$ Tolerance
- Printed Circuit Application

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ELMENCO High Voltage Silvered Mica USED IN ALL TELEVISION CIRCUITS

CAPACITY, TOLERANCE AND
VOLTAGE IMPRINTED ON EACH UNIT
Standard Tolerance $\pm 5\%$

ARCOlytic

HIGH QUALITY ELECTROLYTICS
UNCONDITIONALLY GUARANTEED FOR ONE YEAR



Available at every REPUTABLE
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64 White Street
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DALLAS • LOS ANGELES

So Smooth & Clean-

is the response of the Atlas WT-6 that we demonstrate it in our high-fidelity Audio-Torium," says Anton J. Schmitt, Harvey Radio Co., Inc., New York, N. Y.



New ATLAS
COAX-PROJECTOR WT-6

WT-6 NET \$34.50
support stand only,
SS-4 NET \$12.60

ALL-WEATHER— install it, forget it! —
HIGH-EFFICIENCY . . . COMPACT . . .

True **HIGH FIDELITY TWO-WAY** system — not just a "compromise" of two horns coupled to a single diaphragm. The WT-6 comprises a weather-proof cone type driver (with 6-inch throat) coupled to its individual woofer horn; a separate pressure-type driver loaded to its separate tweeter horn. The built-in crossover electronic filter supplements the electro-mechanical frequency-limiting characteristics of the 2 individual reproducers — providing for smooth frequency division as each speaker functions within its engineered range of frequencies.

Universally adjustable "U"-type rugged steel mounting . . . finished in high temperature baked modern beige enamel.

Power Rating	15 watts continuous
Freq. Resp.	140-15,000 cps
Impedance	8 ohms
Dispersion	120°
Dimensions	Bell opening 15", overall depth 12"

See the WT-6 at your local distributor.
Send for complete catalog ET-2.



Association News

ANNUAL ASSOCIATION ROSTER

ELECTRONIC TECHNICIAN's annual Service Association Roster, published every May, is being prepared.

A questionnaire has been sent to every association on last year's list. To be included in the 1959 Roster, be sure to complete the form and return it promptly.

Association officials not receiving the questionnaire are urged to write on association letterhead to the Association Editor, **ELECTRONIC TECHNICIAN**, 480 Lexington Ave., New York 17, N.Y. Please give address and names of president and secretary.

California

Radio TV Association, Santa Clara Valley, reports the four-year RTASCV-sponsored apprentice training curriculum has been approved, in cooperation with school officials.

Connecticut

Television Service Association takes NATESA to task for the latter's opposition to IDEA. TELSAs questions whether it wouldn't have been better for NATESA's Frank Moch to go along with the IDEA program, instead of attacking it.

Florida

Radio-TV Technicians Guild, Miami, states that the enemies of independent service are opposing licensing. RTTG maintains that there is no other solution to protect ethical businesses and the public, that the licensing cost per technician will be less than 8¢ per call, and that it has been working well in Madison, Wis., St. Paul, Minn., and Detroit.

Illinois

National Alliance of Television & Electronic Service Associations questions the value of IDEA, stating the latter group is not attempting to do anything NATESA has not been doing for years. NATESA has also come out in favor of three or more regional electronic parts shows each year, as proposed by the Electronic Representatives Association.

TESA-Chicagoland Chairman Frank Moch has asked to be re-

lieved of this post due to the press of work as NATESA executive director. New officers elected Jan. 14 are: Chairman John Cahill, Pres. Sam Maksimuk, VP William Franz, VP William Hamada, VP Marshall Ruehrdanz, Sec. Angelo Chrysogelos, Treas. Joseph Issak, Sgt. at Arms Frank Spearman, NATESA Director Joseph Blink.

Independent Dealers Electronic Activities Committee meeting Jan. 11 was attended by technicians from 13 states, representing 84 associations speaking for 3240 shop owners. Various set manufacturers explained their service policies. IDEA officers elected are: Pres. Karl Heinzman, VP Al Neihaus, Sec. John Perez, Treas. Don Wilson.

Indiana

Indianapolis Television Technicians Association reports the findings of its survey of charges. Averages are: TV service call, \$4.21; minor labor for TV set brought to shop, \$2.70; major labor for set brought to shop, \$8.97; labor for table radio brought to shop, \$2.29; service car radio brought to shop, \$2.99; charge to pull and reinstall car radio, \$3.18; labor to repair and adjust 3-speed record changer, \$4.29.

Michigan

TSA, Detroit, backs IDEA, stating that big business is attempting to eliminate small business. The solution can be attained, says editor Harold Chase, by straight talk with set manufacturers, legislative action and public relations.

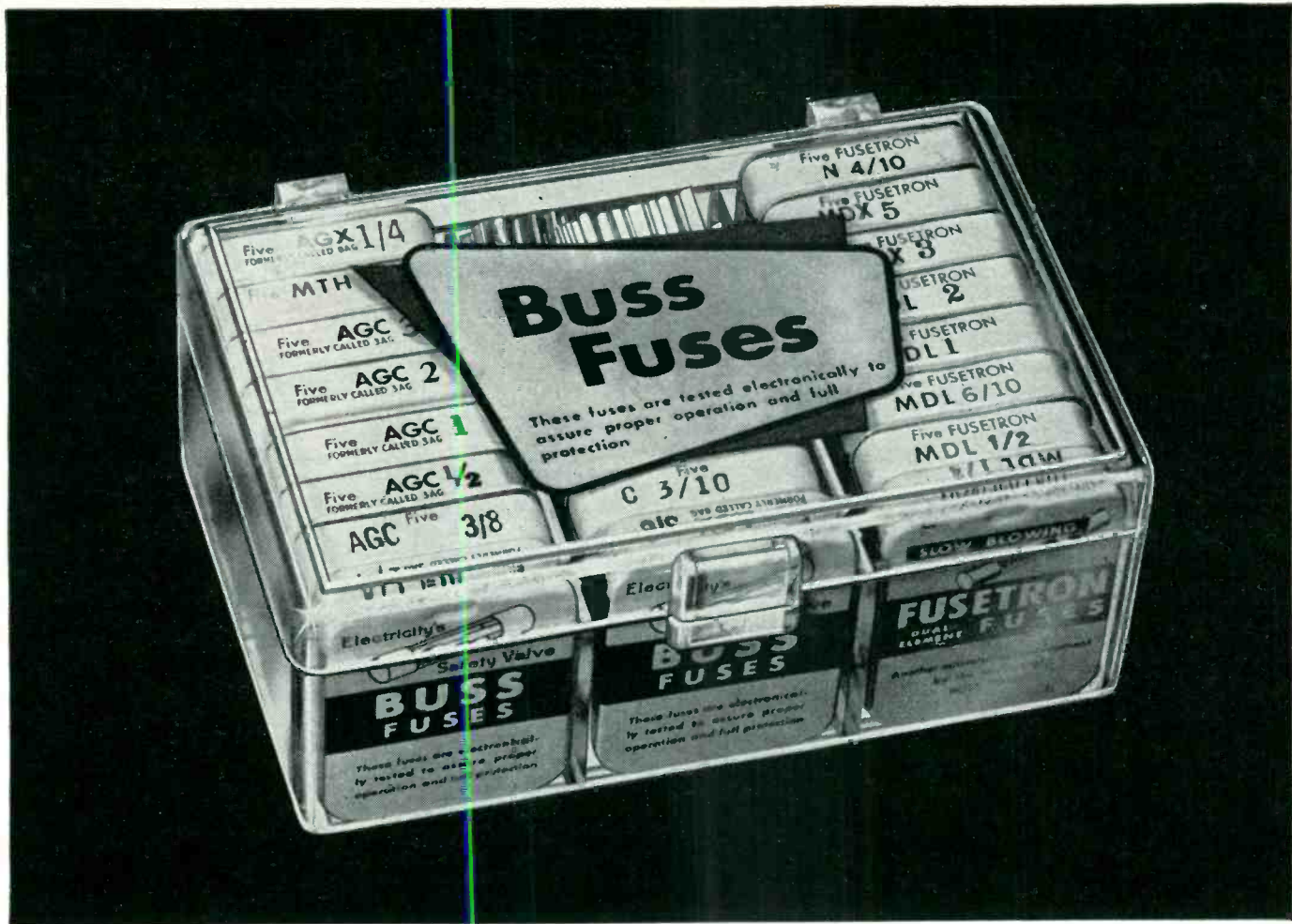
Missouri

Electronic Service Council of the Ozarks calls NATESA a working champion of independent service, and takes anti-NATESA people to task for their opposition.

Ohio

Associated Radio-Television Service Dealers, Columbus, celebrates its 15th birthday. It calls on members to use the power of their public opinions to influence set manufacturers to stay out of retail service.

Electronic Technicians Association, Toledo, urges members to continue to honor standard 90-day parts warranties only. Customers will think twice about a brand when they find out independents do not recognize extended warranties.



A CONVENIENT WAY TO HAVE THE RIGHT FUSE WHEN YOU NEED IT

BUSS fuse TV service kit assortment

Call-backs because you lacked the right fuse are costly — so why not carry an assortment of fuses that will supply the fuse you need.

Fuses are selected for the BUSS Fuse Kit on the basis of popular demand, which practically assures you of having the right fuse for any job.

The fuse boxes will not spill, scatter or be lost, as the kit keeps the boxes neatly arranged.

Your inventory problems are simplified too. One order takes care of your fuse requirements for some time. The clear plastic box enables you to tell at a glance what sizes need to be reordered.

Order the BUSS Fuse TV Service Kit from your distributor today.

BUSS fuses have ready customer acceptance

Over the past 43 years, millions upon millions of BUSS fuses have provided dependable electrical protection in homes, industries and on farms. Using BUSS, the Known brand of fuses, saves you time and helps you build your reputation for service and reliability.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders, write for bulletin SFB.

BUSSMANN MFG. DIVISION, McGraw-Edison Co.

University at Jefferson, St. Louis 7, Mo.



259

BUSS makes a complete line of fuses for electronic, commercial, industrial, automotive, farm and home use.

TV SERVICING

RECEIVING TUBE SUBSTITUTION GUIDEBOOK By H. A. Milton, #135.....\$3.00
First Supplement, #139.....\$.99
Second Supplement, #139-2.....\$.99
Third Supplement, #139-3.....\$1.35

REPAIRING TELEVISION RECEIVERS By Cyrus Glickstein, #191.....\$4.40
HOW TO LOCATE AND ELIMINATE RADIO & TV INTERFERENCE by Fred D. Rowe, #158.....\$1.80

PICTURE BOOK OF TV TROUBLES

By Rider Lab Staff

Fabulous series of definitive, practical books that teach recognition of faults in TV receivers.

VOL. 1: HORIZONTAL AFC-OSCILLATOR CIRCUITS, #168, 80pp.....\$1.35

VOL. 2: VERTICAL SWEEP-DEFLECTION CIRCUITS, #168-2, 96pp.....\$1.80

VOL. 3: VIDEO I-F & VIDEO AMPLIFIER CIRCUITS, #168-3, 96pp.....\$1.80

VOL. 4: AUTOMATIC GAIN CONTROL CIRCUITS, #168-4, 96pp.....\$1.80

VOL. 5: HORIZONTAL OUTPUT & H-V CIRCUITS, #168-5, 108pp.....\$1.80

VOL. 6: HORIZONTAL & VERTICAL SYNC CIRCUITS, #168-6, 120pp.....\$1.80

VOL. 7: SOUND CIRCUITS & L-V POWER SUPPLIES, #168-7, 64pp.....\$1.50

TV PICTURE TUBE-CHASSIS GUIDE By Rider Lab Staff, #204.....\$1.35

TV TROUBLESHOOTING & REPAIR GUIDEBOOK By R. G. Middleton

VOL. 1: For the serviceman requiring practical down-to-earth servicing information on TV receivers. #140.....\$3.90

VOL. 2: A gold mine of information on troubleshooting. #140-2.....\$3.30

TV REPAIR QUESTIONS & ANSWERS

By Sidney Platt

Practical and useful series of question and answer books on TV troubles and their repair.

VOL. 1: FRONT ENDS, #173, 128pp.....\$2.10

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VOL. 4: DEFLECTION & H-V CIRCUITS, #173-4, 128pp.....\$2.10

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TECHNICIAN'S GUIDE TO TV PICTURE TUBES By Ira Remer, #163.....\$2.40

TV TUBE LOCATION & TROUBLE GUIDE (RCA) By Rider Lab Staff, #194.....\$1.25

TV SWEEP ALIGNMENT TECHNIQUES By Art Liebscher, #145.....\$2.10

HOW TO TROUBLESHOOT A TV RECEIVER By J. Richard Johnson (2nd edition), #152.....\$2.50

SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS By Harry Thomas, #150.....\$2.40

SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS By Harry Thomas, #150.....\$2.40

HANDBOOK OF 630-TYPE TV RECEIVERS By Miller & Bierman, #174.....\$3.50

HOW TO INSTALL TV ANTENNAS By Samuel L. Marshall, #172.....\$2.50

ADVANCED TELEVISION SERVICING TECHNIQUES By Zbar & Schildkraut

MAIN TEXT, #161.....\$3.60

LABORATORY WORKBOOK, #161-2.....\$9.95

Catalogs & Bulletins

RECTIFIERS: Bulletin DL-S 1006 gives tentative specifications for three new diffused silicon rectifiers. Texas Instruments Inc., Semiconductor-Components Div., P. O. Box 312, Dallas, Texas. (ELECTRONIC TECHNICIAN B2-7)

TRANSFORMERS: A 24-page catalog on pulse transformers contains tables, charts, schematics, measurements, specifications, applications and other data. PCA Electronics, Inc., 16799 Schoenborn St., Sepulveda, Calif. (ELECTRONIC TECHNICIAN B2-4)

PLUG SYSTEMS: An 8-page, two-color, illustrated catalog covers custom harnessed connector assemblies. Information on factors, facilities and testing is included. Cannon Electric Co., 3208 Humboldt St., Los Angeles 31, Calif. (ELECTRONIC TECHNICIAN B2-1)

TUBES: A 16-page consumer booklet of cartoons, with text, tells the TV technician's story and explains tube manufacturing procedures. Space is provided for the technician's imprint. Westinghouse Electric Corp., Electronic Tube Div., P. O. Box 284, Elmira, N. Y. (ELECTRONIC TECHNICIAN B2-8)

ANTENNAS, ETC.: New, redesigned, catalog sheets are available which introduce 1959 lines of: auto and indoor TV antennas; extensions; hand trucks; etc. The multi-colored sheets are die cut for filing. Snyder Mfg. Co., 22nd & Ontario Sts., Philadelphia 40, Pa. (ELECTRONIC TECHNICIAN B2-6)

VOLTMETERS: Data Sheet 19-27 provides two pages of information on model 501 digital voltmeter, which measures voltages in four automatic ranges. Kin Tel Div., Cohu Electronics, 5725 Kearny Villa Rd., San Diego 12, Calif. (ELECTRONIC TECHNICIAN B2-3)

BATTERIES: A new line of button cell, hermetically sealed, rechargeable batteries is described in a 4-page brochure, No. VO-110. These batteries are available in more than 50 sizes and voltages. Alkaline Battery Div., Gulston Industries, Inc., Metuchen, N. J. (ELECTRONIC TECHNICIAN B2-2)

LAMPS: Flashlight, neon glow, automotive and multi-purpose lamps are listed in a 24-page booklet. Bulb type, base, volts, amps and bead color are included. Arranged numerically and by name of manufacturer. Has illustrations with physical dimensions. Available free from the firm's distributors, or for 10¢ direct from The Radio-Electronic Master, 60 Madison Ave., Hemstead, L. I. N. Y.

WHICH OF THESE RIDER BOOKS WILL INCREASE YOUR SERVICE PROFITS IN 1959?

COLOR TELEVISION

INTRODUCTION TO COLOR TV (2nd edition) By Kaufman & Thomas, #156.....\$2.70

HIGHLIGHTS OF COLOR TELEVISION By John R. Locke, Jr., #157.....\$.99

COLOR TELEVISION RECEIVER PRACTICES By Hazeltine Corp. Lab. Staff, #162.....\$4.50

#162-H Cloth Bound.....\$6.00

COLOR TV DICTIONARY By J. Richard Johnson, #164.....\$1.25

AUDIO & HIGH-FIDELITY SERVICING

RIDER'S SPECIALIZED HI-FI AM-FM TUNER MANUAL, #7001.....\$3.50

HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS By Jack Darr, #189.....\$3.00

HOW TO SERVICE TAPE RECORDERS By C. A. Tutthill, #167.....\$2.90

REPAIRING HI-FI SYSTEMS By David Fidelman, #205.....\$3.90

RIDER'S SPECIALIZED TAPE RECORDER MANUAL, VOL. 1, #6001.....\$4.50

TEST EQUIPMENT

HOW TO USE METERS By John F. Rider #144.....\$2.40

HOW TO USE TEST PROBES By A. Ghirardi & R. Middleton, #165.....\$2.90

OBTAINING INTERPRETING TEST SCOPE TRACES By John F. Rider, #146.....\$2.40

HOW TO USE SIGNAL & SWEEP GENERATORS By J. Richard Johnson, #147.....\$2.10

RADIO SERVICING

RADIO RECEIVER LABORATORY MANUAL By Alex W. Levey, #178.....\$2.00

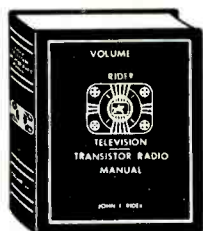
RADIO TROUBLESHOOTING GUIDEBOOK, VOL. 1 By Rider & Johnson, #149.....\$2.40

HOW TO INSTALL AND SERVICE AUTO RADIOS by Jack Darr, #159.....\$1.80

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New Books

Books marked with an asterisk (*) may be obtained prepaid from Electronic Technician

***GUIDE TO MOBILE RADIO.** By Leo G. Sands. Published by Gernsback Library, Inc. 160 pages. Soft cover. \$2.85.

The growing number of electronic technicians getting into communications maintenance should welcome this basic, yet practical, book on mobile radio. It discusses the base station, receivers, transmitters, power supplies, antennas, remote controls, portable equipment, selective calling, licensing and field survey. A brief section on maintenance indicates useful test instruments, though troubleshooting techniques are not given in detail. The text is suitably illustrated and quite informative.

UNDERSTANDING HIGH FIDELITY, 4th Ed. Prepared and published by Bogen-Presto, Box 500, Paramus, N.J. 64 pages. Soft cover. 25¢.

This is the stereo edition, recently revised and brought up to date, of a popular little book which sold 250,000 copies in earlier editions. Though essentially intended for the hi-fi enthusiast, there is a great deal of useful data for service dealers who sell, recommend or install hi-fi equipment. Topics include records, players, recorders, tuners, amplifiers, speakers, enclosures and listening tests. A good number of equipment photos, curves and a glossary round out an interesting text.

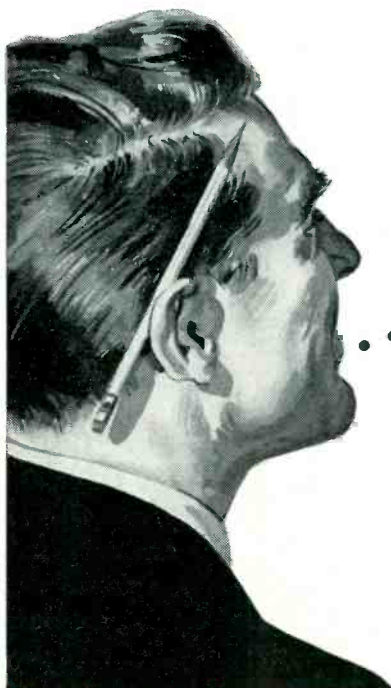
1959 RADIO-ELECTRONIC MASTER, 23rd Ed. Prepared and published by United Catalog Publishers, 60 Madison Ave., Hempstead, N.Y. 1356 pages. Hard cover. From U.S. parts distributors, \$3.50; Canada, \$4.50.

This catalog bible of the industry gives descriptions, specs and prices of over 150,000 standard stock jobber items. More than 11,500 illustrations are shown. It is divided into 18 product sections. Almost any component or piece of equipment you could think of for the servicing field is shown, manufacturer by manufacturer. The Master is a must for your bookshelf.

PRACTICAL DICTIONARY OF ELECTRICITY AND ELECTRONICS. By R. L. Oldfield. Published by American Technical Society, 848 E. 58 St., Chicago 37, Ill. 216 pages. Hard cover. \$5.95.

Sometimes it's handy to have a technical dictionary around, particularly if you become curious about electronic terms. This interesting reference includes both common words and the unusual (e.g., the daraf, a measure of elastance, reciprocal of farad). A 38-page section on symbols, tables and circuits is included.

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Electronic Applications Division, Dept. CT-29

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In Canada, contact Atlas Radio Corp., Ltd., Toronto

Leading makers of fine ceramic cartridges, speakers, microphones, tape heads, electron tubes.

Audio Measurements

(Continued from page 41)

mon a-c power line. This can be stopped by isolating either the signal generator or harmonic meter from r-f coupling to the line, either with a simple line-interference filter or a shielded-isolating transformer. Sometimes this type of trouble can be due to the fact that the low side of the amplifier's output is not at true ground because it has a small resistance provided for current feedback in the variable damping circuit. In this case the remedy is to use an audio isolating transformer, which should be able to handle the output voltage without distortion, between the output load and the distortion meter input, as shown in Fig. 2.

Once the bugs in the equipment setup are removed, the real problem of measuring very small amounts of distortion can be tackled. This difficulty arises because the oscillator may have more, or not much less distortion in its output than the amplifier under test. Of course, filters could be used to clean up the generator's output, but after spending a lot of time and money getting some very good filters, the readings may not be appreciably more satisfactory. The following technique will provide more significant interpretation. While an explanation may sound complex, it is really quite simple. It is based on finding the exact relationship between the harmonics at the input and those at the output.

Time Base

Establish a time reference on the scope by connecting the meter and scope's sync input to the signal generator's output, as shown in Fig. 3. The scope's input is connected to the distortion meter in the conventional manner. Adjust the sync and horizontal controls for the particular test frequency to obtain a steady display of two cycles. The trace should be stable enough not to jump or drift if the oscillator level is varied a little. The signal generator's output waveform is shown as a dashed line superimposed on all the traces in Fig. 4. These do not actually appear on the screen, but are shown here to illustrate relative phase and to aid identification. An electronic switch could be used to display both waveforms at one time, but is not essential. A grease pencil sketch of the fundamental waveform on the

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scope's graph will facilitate phase comparison.

When the harmonic meter is set to read distortion and the bridge is balanced, waveforms similar to curves B, C, and D in Fig. 4 may be seen. If the amplifier has a single ended output stage, the second harmonic either in or out of phase, curve B or C, is more likely to dominate. If the amplifier output stage is of the push-pull type, it is more likely that the third harmonic, curve D, will be dominant. A combination of 2nd and 3rd harmonics, if present, would look like curve E if the 2nd harmonic dominates, or curve F if the 3rd harmonic dominates.

Now transfer the harmonic meter to the output of the amplifier under test as in Fig. 5. The phase of the fundamental at the amplifier output is an important consideration in the presence of the second harmonic but of no consequence in the presence

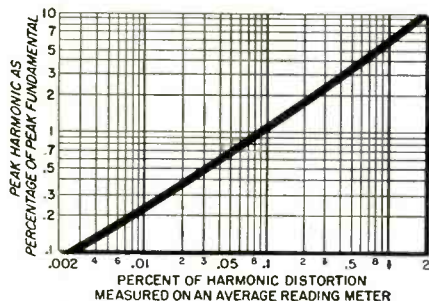


Fig. 7—Relationship of readings on a distortion meter adjusted for minimum, and re-adjusted to indicate average value of peaks.

of the third. If the second harmonic is dominant the distortion readings of the generator should be added to or subtracted from the distortion readings of the amplifier. There are four phase conditions, two of them require adding the distortion readings, and the other two indicate that the actual distortion present is the difference between the readings.

It is possible for both the fundamental and the harmonic signal or either one alone to change phase while passing through the amplifier. The four conditions are shown in Table 1. If both the fundamental and harmonic signals at the output are either in-phase, or out-of-phase, then the distortion meter readings should be subtracted. If, for example, the amplifier input reading is 0.5% and the output is 0.8%, the amplifier is producing the 0.3%. Even if the readings were the other way around, a lower reading on the output than on the input, the difference between the two would still indicate the amount of distortion in the amplifier. On the other hand, if either the fundamental or the harmonic,

(Continued on page 76)

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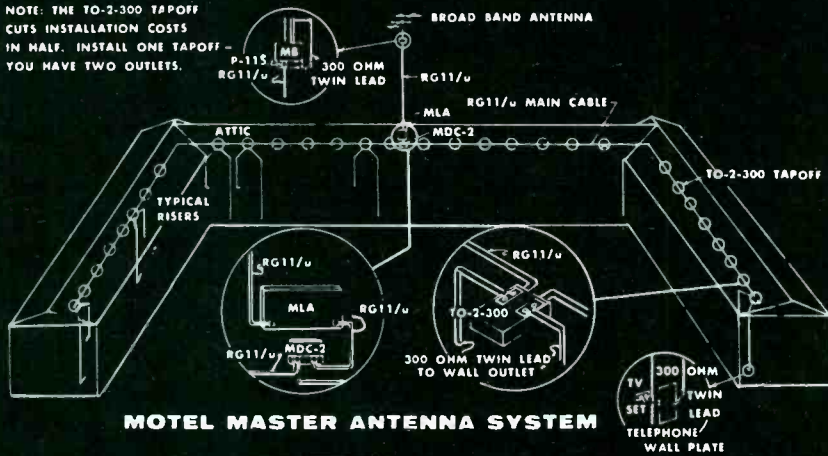
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- Better signal at set outlets** — fewer cascaded amplifiers for higher signal to noise ratio.

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- Howard Hammet Motel, *Leonardtown, Md.* • Holiday Inn, *Dallas, Texas* •
- Holiday Inn, *Jackson, Miss.* • Holiday Inn, *Greenwood Miss.* • Tyler Motor Hotel, *Radford, Va.*
- Shoreline View Motel, *Edgewater, Fla.* • Wright By The Sea, *Delray Beach, Fla.*
- All States Motel, *Clifton, Ill.* • Holiday Motel, *Anacortes, Wash.*
- Foothills Motel, *Somerville, N. J.* • Basile Motel, *Niagara Falls, N. Y.*
- Ashford Motel, *Stafford Springs, Conn.* • New Yorker Motel, *Rocky Mount, N. C.*
- Holiday Inn Motel, *Fayetteville, N. C.* • Jones Motel, *Waterville, Maine*
- Trinity Rock Motel, *Lake George, N. Y.* • Holiday Motel, *Hill City, Minn.*
- Clarksville Cabins, *Trenton, N. J.* • St. Francis Hotel Courts, *Montgomery, Ala.*
- Town House Motel, *Tuscaloosa, Ala.* • Sierra Motel, *Ft. Lauderdale, Fla.*
- Cavalier Motel, *San Francisco, Calif.* • Butler's Motel, *Owens, Va.* • Colonial Motel, *Weldon, N. C.* and hundreds of others.

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WEBSTER ELECTRIC acquires TELECOM, makers of Teletalk intercoms.

NEWCASTLE FABRICS announces the "Decorator Designs" line of grille cloth intended to appeal to the woman of the house.

QUAM NICHOLS names John D. Michael to the executive sales staff of the distributor division under manager Mel Krummy.

LOS ANGELES High Fidelity Music show, Feb. 18-22, Biltmore Hotel, has a "dealers only" preview set for Feb. 17, 6 to 10 PM.

CONTINENTAL MFG. introduces the MA-10 amplifier @ \$29.95. It is rated at 10 watts, has four tubes and two rectifiers.

MOHAWK announces the "Midgetape Professional 500" transistorized pocket tape recorder @ \$329.50. It weighs 3 lbs., features VU meter, 3-3/4 ips speed.

MASCO introduces the "Torulf" stereo amplifier, Model SA-202. It is rated at 2 watts/channel, 50 to 15,000 cps response ± 1 db, usable with ceramic cartridge or tuner. Price is \$29.95.

BOGEN-PRESTO acquires exclusive distribution rights to phono mechanisms made by Lenco A. G., Burgdorf, Switzerland. Four models to be marketed in the U. S. under the Bogen name are B-21, B-50, B-60 and B-61.

DE RO ELECTRONICS announces the "Grip-A-Lip" Model PPP-1 phono pin plug featuring an outward flange for easy insertion and removal. Displayed in transparent blister packs of 4 and 8 @ 69 cents and 99 cents.

MAGNECORD does not intend to standardize on a 4-track machine.

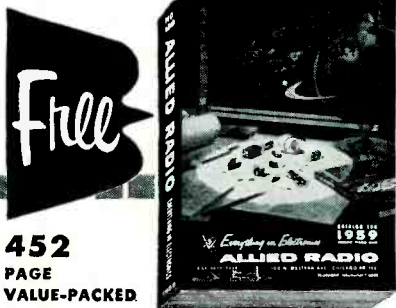
BRAND PRODUCTS names Stanley Neufeld, ex-Rockbar, as sales vice president.

MINNEAPOLIS SPEAKER is producing two 8" speakers; F-8-HF, 60-12,000 cps within 5 db @ \$10.77; F-8-HFD, 60-17,000 cps @ \$11.37.

BELL SOUND becomes a full division of Thompson Ramo Wooldridge, effective Jan. 1, 1959. The firm was acquired by Thompson Products in 1953.

ROBINS INDUSTRIES introduces the "Tape-Kare" kit TK-2 @ \$2. It contains a head cleaner and tape cleaning and lubricating cloth with silicone. Firm appoints Larry Post, ex-Tandberg, as sales promotion manager.

(Continued on page 75)



452

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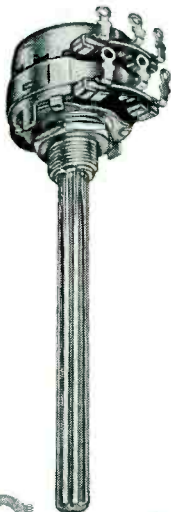
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CONTROLS • ROTARY SWITCHES • CERAMIC CAPACITORS
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

Parts Procurement

(Continued from page 50)

thought that this was the first time the thing had given any trouble since its installation.

The solution to this problem was quite simple; the technician selected an equivalent relay from stock at his parts distributor and modified the mountings to make it fit. The boiler was returned to service and it is still functioning quite well.

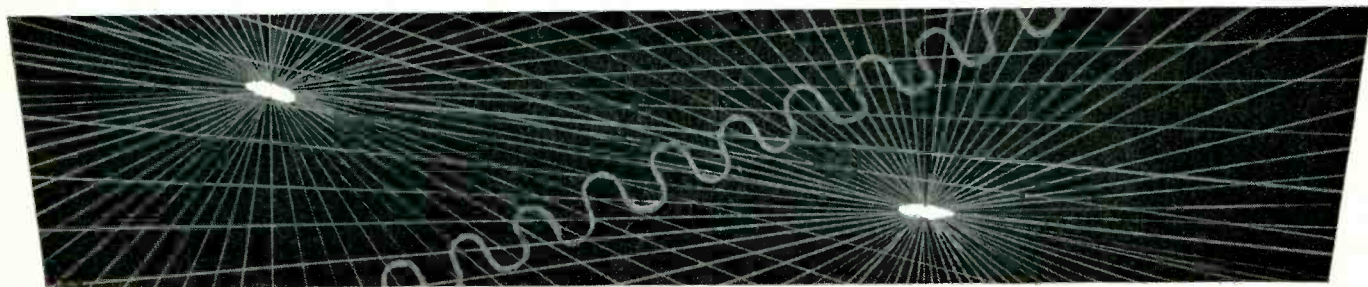
Dilemmas such as these are ever present. To avoid these difficulties it is well to get in touch with the manufacturer and obtain positive assurance that an adequate supply of specialized replacement parts will be available at all times, even before equipment is purchased. Incidentally, a lawyer assures us that any company, upon making a sale of equipment, automatically assumes an obligation to make available a supply of replacement parts, and that they cannot legally deny these to anyone. Their only recourse would be to void the warranty on such equipment. It wouldn't have

mattered in this case, because the warranty period had already expired. Also ask for service information and schematic diagrams. These are seldom shipped with the original equipment. If the maker proves to be uncooperative, and if there is no chance to select another manufacturer's product, steps should be taken to ensure an adequate supply of replacement parts from other sources. Check the units thoroughly, note which parts are out of the ordinary, and look up equivalent items in parts catalogs. As to schematic and other service information, the technician can do what we were forced to do with the control unit just mentioned. Diagrams sent with the equipment showed the electrical connections for overload switches and protective relays, blowers, etc., with several wires terminating in a rectangular space, perfectly blank, labelled "Electronic Circuit." During a periodic overhaul, this "extremely complicated" two-stage amplifier, with its power supply, was traced, a schematic was made and filed in the shop.

Parts may be adapted from other equipment which may be readily available. For instance, if a timing-motor has to be replaced, it can be obtained from an automatic wash-

ing-machine parts distributor and made to fit. In many instances this is a simple job.

It is sometimes possible to go over the head of the equipment manufacturer and go directly to his supplier. Many parts are interchangeable, with or without modification. Timer motors, escapements, switches, relays, gears, even complete electronic circuits may be available from the original source. As is the case with tuners in a TV set, most set makers buy them from one or more of the few companies in the tuner business. In many situations it is possible to repair a sub-assembly by taking similar parts from another unit which may be the same internally, but externally it just won't fit. Most subassemblies made by other than the manufacturer who assembled the final complete equipment are marked with the EIA source-code number. The Electronic Industries Association at 1721 De Sales St. N. W., Washington 6, D. C., maintains a complete listing of all its members, and many firms who are not members. A mixture of ingenuity and experience can make the few uncooperative manufacturers change their attitude toward independent service. •



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DIVISION OF BENDIX AVIATION CORP.
Owings Mills, Maryland

(Continued from page 73)

CBS is expanding phono operations. The Columbia Phonograph Dept. is being shifted from Columbia Records to CBS-Hytron.

CALBEST ELECTRONICS announces the development of a new stereo transmission system, fully compatible, using narrow band FM multiplex.

PRICE TRENDS, courtesy Audio-File div., United File-O-Matic:

PILOT (correction) P1060 amplifier continued, with magnetic, not ceramic cartridge input.

CONNOISSEUR turntable C-100 increased to \$119.50.

GE mono amplifier PA-20 discontinued.

V-M phono 625 & changer 1250 discontinued.

TANDBERG stereo console 10 decreased to \$1,295.

INTERESTING SALES TREND noted by Ken Tibbetts, National Credit Office VP, is that jobber sales volume is increasing at the fastest rate in certain low population areas. This underscores our contention that hi-fi manufacturers have much to gain by stronger sales efforts in non-metropolitan markets. Some 70% of the nation's population is in towns of under 100,000.

MAGNETIC RECORDING TAPE sales are doing nicely, and continued strong growth is expected. Five U. S. manufacturers account for almost all tape sold here: Audio Devices, Ferrodynamics, Minnesota Mining, ORRadio and Reeves Soundcraft. An estimate by ORRadio president J. Herbert Orr is: 1958 sales, \$21,000,000; 1959, \$35,000,000; 1963, \$115,000,000. He points to 3,500,000 present recorder owners, anticipated 1959 sales of 725,000 units, 490,000 of them new owners. Tape footage sales for 1959 and 1960 are forecast at 17 billion and 23 billion, respectively.

best buys in custom hi-fi... **EICO**

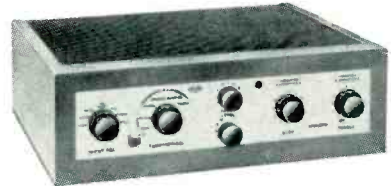
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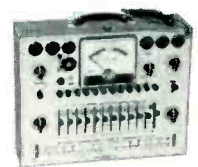
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Audio Measurements

(Continued from page 71)

but not both at the same time, undergoes a phase change in the amplifier, the amplifier's distortion reading should be added to the generator's distortion reading. Using the same readings, the amplifier distortion would now be 1.3%. Quite a difference! Keep in mind that if the input harmonic is dominantly 2nd and the output is dominantly 3rd, or vice versa, the input reading will not materially affect the output reading.

However, 3rd harmonics can add or cancel each other, the same as 2nds can, but the phase of the fundamental is not a factor in this case. The most usual kind of 3rd is that shown in Fig. 4D. A phase shift of the 3rd could appear as in Fig. 4G. If the waveforms at the input and output of the amplifier are of the same phase, subtract the readings. If they are opposite, add the readings. Note that the phase comparisons of the above signals are between the fundamental at the input, and the fundamental at the output, and the harmonics at the input with the harmonics at the output, and not between the fundamental and the harmonics.

Maximum Rated Output

All these waveforms are associated with measuring the harmonic distortion of an amplifier below maximum rated output. When maximum output is reached, clipping commences and possibly some other forms of distortion may set in. The problem now is not one of ascertaining output-to-input phase relationship because this kind of distortion does not exist in the input, but rather one of interpreting the significance of the distortion read on the meter.

A good amplifier will show simple clipping at the overload point. Other forms of distortion should be corrected. One thing that may happen is that the frequency and balance controls on the distortion meter may need readjusting to obtain a null, although the input frequency has not been changed. This may have been encountered to a lesser degree with earlier measurements, but it can be quite noticeable when measuring distortion that includes clipping. Once again, the scope will help to explain why this is, and also to help interpret the significance of the dis-

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SENCORE Handy "36"

R C-Substitution Unit

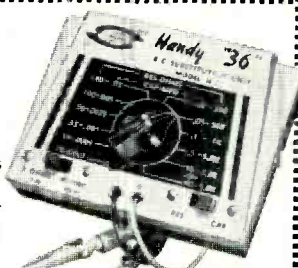
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- ★ 10—600 volt capacitors from 100-mfd. to .5 mfd.
- ★ 1—10 mfd., 450V Electrolytic ★ 1—40 mfd., 450V Electrolytic
- ★ For Shop, Lab, or outside service

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\$1295
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tortion. If the input signal level is increased to produce clipping, without readjusting the harmonic distortion meter balance, the trace will look like Fig. 6A or B, according to whether or not the clipping is symmetrical. Most likely it will be necessary to turn down the scope sensitivity controls, or use a higher distortion meter range because the spikes on the waveform will be quite large. Adjusting the balance controls on the distortion meter until a minimum reading is obtained, will change the scope trace changes to that of Fig. 6C or D. Actually what has happened is the deliberate introduction of a small amount of fundamental; the average deviation over the whole cycle is now slightly smaller. This is the reading usually obtained when plotting the distortion vs. output curve for an amplifier, and merely indicates if the amplifier meets spec.

Significant Readings

Is this really an indication of the significance of the reading on the audible effect of the distortion? The spikes are still very much bigger than the meter reading would indicate. The dotted lines in Fig. 6C and D represent the average value read by the meter. The audible effects are nearer to the actual magnitude of the "clip" than to its average value. A comparatively simple method to obtain a closer approximation of a reading related to the peaks without any special equipment, is to readjust the meter balance controls until all the ups and downs of the waveform are aligned between two parallel lines on the scope, as shown in Fig. 6E and F. In this manner the average readings more nearly indicate the true relationship between the waveform peaks in the distortion and the peaks in the fundamental. Although the measurements are still not peak indications, they are in proportion.

This adjustment will raise the reading from 5 to 10 times or more. In fact, Fig. 7 shows a plot of the relationship in a theoretical amplifier where the clipping is infinitely sharp. In actual amplifiers there is always a little rounding at the corners of the clip, but it does not make a great deal of difference to the relationship, if the rounding is small, as it is in amplifiers with a lot of feedback. Clipping distortion that would normally read 1% has a practical value of 6%. Even if the reading is as low as 0.1%, its practical value is more than 1%, and can be quite audible, as well as visible on the scope. •



CRT 400 PROVES REAL MONEY-MAKER

Thousands of servicemen today make money and keep customer good-will by checking and correcting b&w picture tube troubles with the famous B&K CRT 400, right in the home without removing tube from set. Restores emission and brightness. Repairs inter-element shorts and open circuits. Checks leakage. Indicates picture quality customer can expect. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new picture tube replacement sales easier! Model 400 (without adapter) Net, **\$59⁹⁵**

NEW MODEL C40 ADAPTER DOUBLES VALUE OF B&K CRT

Designed for use with all B&K Models 400 and 350 CRT's. Makes it easy to test and rejuvenate TV color picture tubes and 110° picture tubes. Isolates and detects difficult color troubles. Tests and rejuvenates each gun of the color picture tube separately the same way as a black & white tube. Model C40 Adapter Net, **\$9⁹⁵**

See your B&K distributor, or write for Bulletin AP12-T

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NEW

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High-Speed TUBE TESTER and TRANSISTOR CHECKER



Model 6000

- ☆ Constant Indication of Line Voltage
- ☆ New, Roll Chart Grouping of Popular Tubes
- ☆ New, Transistor and Diode Check

NEW SOCKET DESIGN—With a 10-socket snap-in master panel that easily removes to expose the new type 11-pin socket that will accommodate other adapters for checking foreign or older tubes.

SCALE READINGS IN MICROMHOS—Tube quality evaluations are read directly on the 3-range micromho scales. (0 to 3000, 6000, 15000.)

RESERVE CATHODE CAPACITY TEST—By merely turning a selector control on the panel, the reserve capacity of the tube under test can be determined to weed-out those tubes which very possibly could cause trouble in the future.

NEW HIGH-SPEED, EXTRA SENSITIVE SHORTS TEST—(12 Times More Sensitive)—Five neon lights automatically indicate shorts or leakage between elements.

NEW GRID CURRENT (Gas) TEST—The gas content (grid current) is measured very accurately on the meter in terms of actual microamps.

FILAMENT CONTINUITY TEST—As soon as the tube is plugged into the test socket, user may depress the Filament Continuity button to immediately determine whether filament is "open" or not.

FILAMENT VOLTAGE—From 0.6 to 117 volts in 18 steps.

The 6000 will pay for itself in a short time... and give you many years of accurate, dependable service.

\$189²⁵ NET

Now is the time to...
TRADE UP TO A HICKOK

Ask for a demonstration of the new 6000
from your Authorized Hickok Distributor.

THE HICKOK ELECTRICAL INSTRUMENT CO.
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Oscilloscopes

(Continued from page 35)

triggered sweep circuits, as shown in Fig. 4. This gives the sweep ample time to get started before the waveform voltage arrives at the CRT vertical deflecting plates. Carefully designed networks are used to set up a delay of about 0.25 microseconds. Fig. 4 also shows a typical filter network. Repeated sections are used and it is common to use as many as 24 sections. Good frequency and phase characteristics are essential to prevent ring and overshoot on waveforms having very fast rise times. Each section must be carefully tuned.

Calibrated Sweep

Lab scopes often have accurately calibrated horizontal sweep facility to permit marking off time intervals along the base line. This calibration feature is usually combined with the triggered function. A typical application is shown in Fig. 5. The leading edge of a square wave has been expanded on a calibrated, triggered sweep function of the scope having a rate of 1.0 microsecond per horizontal division. The rise time of the square wave is plainly evident. This is a great advantage in certain types of research work, and pulse waveform studies, but the service technician may find this to be of little use in actual servicing procedures. Another feature present in the lab scope can be demonstrated here. Note that the leading edge is practically invisible in the service-scope display. On the other hand, the leading edge is clearly visible in the lab-scope. This is the result of higher CRT voltage and a beam-intensifier

function. Beam intensities which would normally burn the screen are gated-on during the time of fast beam travel, to bring up the visibility of leading edges.

While many of the quality features contained in the higher class test instrument are desirable, and many applications require their use, it is better to obtain any scope rather than have none at all. Still the wisest move is to obtain the best available instrument consistent with the budget and the type of work engaged in. •

WORKMAN TV INC., IS THE ONLY MANUFACTURER OF "SUPER BRIGHTENERS." MODELS FOR ALL CRT'S INCLUDING 110". GUARANTEED 9 VOLT OUTPUT. AVAILABLE AT YOUR FAVORITE PARTS JOBBER.

TRUE UNIVERSAL FUSED RESISTOR

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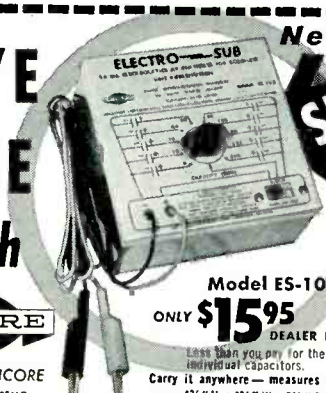
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Check all ELECTROLYTIC CAPACITORS in Seconds!

Merely select the electrolytic and substitute it. 10 big electrolytics from 4 to 350 Mfd. to safely substitute in any circuit from 2 to 450 volts.

- ... COMPLETELY SAFE—no arc or spark when connecting or disconnecting.
- ... AUTOMATIC CAPACITOR DISCHARGE—within seconds after releasing test switch by, unique surge protector circuit.
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Model ES-102

ONLY **\$15⁹⁵** DEALER NET

Less than you pay for the original capacitors.
Carry it anywhere—measures only 4 3/4" H x 4 3/4" W x 2 1/4" D

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Citizens Radio

(Continued from page 37)

controlled. Maximum power rating of the final r-f amplifier is 60 watts, which is more than adequate for most applications. Prices range from \$500 to \$900 for a mobile rig.

Class B equipment is limited to 5 watts, can operate only at 465 mc, is used for voice and control, and is priced from about \$75.00 and up. A hotly contested provision in the new FCC rules that stipulated that the center of the radiating portion of the antenna and the transmitter must not be separated by more than 25 feet has been rescinded. The purpose of this limitation was to reduce the communicating range, allow more stations on the same frequency, and reduce interference between them.

Class C stations are also limited to 5 watts, except on 27.255 mc where 30 watts of power may be used. Crystal controlled coded tone signals may be transmitted for control purposes in this class.

Antennas

Class D stations are AM-voice operated similar to Class A stations, except that transmitter power is limited to 5 watts, 20-foot antenna-height limitations apply, and equipment is less costly. Where small size and price are of primary consideration, Class B operation may be an answer. It is simple, and when used intelligently, it is effective. Communicating range between a pair of Class B units, similar to that shown in Fig. 2, can vary from a few hundred yards to as much as 10 miles over land, 50 miles over water and 75 miles from air-to-ground. For short range or portable work, a 6-inch plug-in whip antenna is used. In an automobile, a 6-inch roof-top whip, or a double gain-type antenna which can increase the effective radiated power, may be installed. This larger antenna is shown in Fig. 3. At fixed locations, or on vehicles, or on boats where suitable mast supports can be provided, a ground plane antenna, such as the one shown in Fig. 4, may be employed. For point-to-point operation, a corner-reflector type of antenna can multiply effective radiated power as much as ten times.

A schematic of the Class B transceiver, shown in Fig. 2, is shown in Fig. 5. Only three tubes are used.

(Continued on page 80)

INSPIRATION IN RADIO ELECTRONICS

Think big has always been the order of the day in radio electronics. Galvani, Marconi and you either have changed or can change the world with a thought or an idea unheard of before. Seeing all that's new at the 1959 IRE Show can spark your new idea—can be your inspiration.

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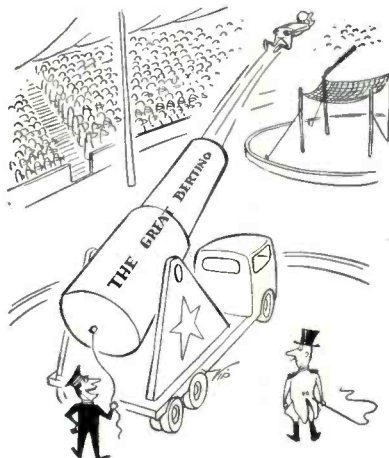
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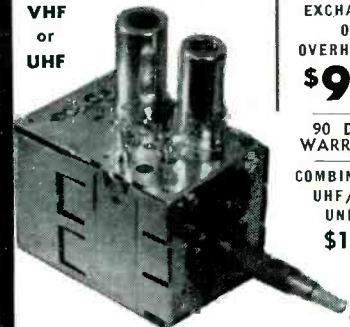


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Price includes worn parts only; defective tubes and damaged major parts are charged extra at net prices.

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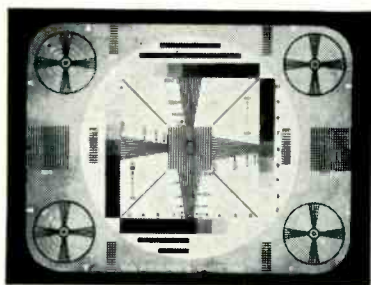
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(Continued from page 79)



TV TIPS FROM TRIAD

NO. 1 IN A SERIES

A Professional Television Man we know had a nasty problem. One of his customers owned a 21" metal tube receiver — which shall be nameless — that was a service repeater. When it worked, it worked very well indeed, but when it was bad it was awful. Which was often. Every three or four months a new 6CD6 was needed, and every couple of 6CD6's, a new flyback was called for.

This PTM was typically conscientious. He installed highest quality tubes — and got failure. He tried "exact" replacement flyback. Again, failure. He tried "original" replacement flyback. Still the wax heated up and oozed all over. Results: one very peeved customer, one very perplexed PTM.

About the time it dawned that the original set circuit was something less than perfect, a parts salesman handed him the brochure "Taking the Heat off Flybacks."

"Heat comes from high B plus, defective linearity coils, bad screen resistors — and as many as twelve other causes," he read first off. Immediately our PTM, who reads too fast, said he'd take a B plus dropping resistor, screen resistor, new flyback and linearity coil.

The parts man interrupted — which was just as well. "If this is for that direct drive receiver with the 21" metal kine, we have a complete kit of all these parts. The Triad people call it their D-153. When you install, which is almost as easily done as said, good things happen. Your plate current drops from 150 to about 100 milliamps, and you can expect normal life from tubes and flybacks."

When our PTM installed the parts according to instructions, he had a cool running job with good high voltage and width, and a happy customer.

"Why," he said, "I could have spent \$100 worth of time just working this circuitry out myself." That night he told his wife, and the next day she spent most of the \$100 on new clothes.

MORAL: Never tell women anything. Also, just installing an "exact" or "original" flyback in this set is not enough. You need engineered parts and tested instructions to rewire and solve the problem permanently. Ask your distributor for Triad kit D-153. Like other products designed to make life happier, it is made by the **Triad Transformer Corporation**, a division of Litton Industries. Triad also publishes a series of service aids for Professional Television Men. These make fascinating reading. Are you on the mailing list? Our address is 4055 Redwood Avenue, Venice, California.

The 6AF4 functions as a super-regenerative detector when receiving and as a self-excited, amplitude-modulated, power oscillator when transmitting. The 6AV6 and 6AS5 serve as an audio amplifier in the receiver and as the speech amplifier-modulator in the transmitter. The output transformer also functions as a Heising modulation reactor. A dual power supply permits operation from 117 volts ac or 6 volts dc. A lecher wire assembly, terminated in C18 at one end, is the 465-mc resonant circuit. Tuning is accomplished by bending the slotted plate of capacitor C18.

While regular frequency checks are not required as in other mobile radio services, the FCC may require a class B licensee to make tests to determine whether or not the equipment is capable of meeting their standards. This, of course, is the job of a licensed FCC operator. Those engaged in mobile radio servicing ordinarily have a frequency meter available which can cover 465-mc. If not, an accurately calibrated signal generator can be used for checking the frequency. Frequency calibration must have an accuracy of 0.02% or better.

Servicing

Servicing is easy. If no background hiss is heard when the receiver is tuned on a new 6AF4A tube should be tried. If operation is not restored, the other two tubes, operating voltages and relay contacts should be checked, in that order.

When a new 6AF4A tube is installed, as well as at regular intervals in order to maintain optimum performance and to avoid possible off-frequency operation, the transmitter frequency should be checked. The FCC requires that the transmitted signal, including modulation sidebands, shall be confined within $\pm 0.5\%$ of 456 mc. This is a very generous tolerance and better results can be obtained by keeping all transmitters within a single system tuned as closely as possible to each other's frequency. When the transceiver is out of its case for frequency adjustments it should be set at 465.5 mc since replacement in its shielded container lowers the frequency approximately 0.5 mc. With the case in place, the frequency should be as close as possible to 465 mc.

A quick test to determine if the transmitter is functioning can be made by touching the plug-in antenna with the base contact of a No. 47 dial lamp. Hold the lamp by its

SAVE
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NOW —
Check Vibrators
in ANY
Tube Checker

2 Adaptors in 1

SENCORE

"VIBRA-DAPTOR"

Checks Both Three and Four Prong Vibrators

- Merely plug into any tube checker. Set for 6AX4 (or 6SN7) for 6 Volt Vibrators and 12AX4 (or 12SN7) for 12 Volt Vibrators. • Two lamps viewed through top of adaptor indicate whether or not Vibrator needs replacing. Rugged—Made of steel. • Replaceable but unbreakable #51 indicating Lamps. Operates easily with Sencore LC-3 Leakage Checkers. Complete instructions screened on front.

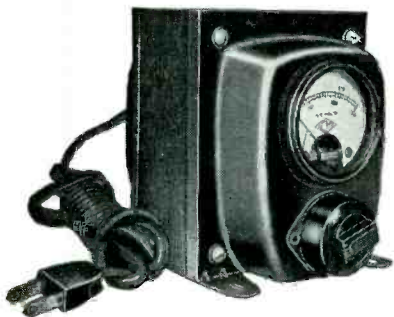
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MODEL VB-2
\$275
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**WHEN
PERFORMANCE
IS
AFFECTED BY
LOW VOLTAGE
CONDITIONS**



**SELL THIS
ACME ELECTRIC
VOLTAGE
ADJUSTOR**

TV sets are designed to operate best when voltage holds closely to 115-117 volts. Overloaded supply lines (the power industries greatest problem) may result in a voltage drop of 10 to 15% at certain times of day. Usually the TV set will function in a fashion under such low voltage conditions but with a great strain on its components. For example; narrowing of picture, output stage tube life shortened, frequent burn-out of filaments, fuzzy focus have been traced to lack of proper voltage.

These conditions can be corrected with an Acme Electric T-8394M Voltage Adjustor. Simply plug-in to convenient outlet. Plug-in television set cord into female receptacle built into adjustor. Voltmeter indicates output voltage. If voltage is incorrect turn regulating control until proper voltage is reached for best performance. Voltage range 95 to 125 volts. Tell your supply dealer you want the Acme Electric T-8394M. No other so compact, practical, inexpensive.

ACME ELECTRIC CORPORATION
882 WATER ST. CUBA, NEW YORK

glass bulb and move it so that the base contact runs up and down the antenna rod. There should be a point where the lamp will glow brightly. At this point, if the transmitter is left turned on for several seconds, the lamp should glow with constant brilliance. If it starts to dim, it indicates that transmitter power is fading. This is generally caused by a defective 6AF4A tube.

Modulation Test

Modulation can be checked roughly by noting the r-f power meter reading or brilliance of the test lamp which should increase when speaking loudly into the microphone. Failure to obtain normal performance for reasons other than too great a difference in frequency between the transmitter at one station and the receiver at another is generally due to a weak 6AF4A tube or inadequate input power. During a test it was found that the transmitter power as indicated on an r-f power meter, dropped about 50% when battery voltage was reduced from 6.3 volts to 4.2 volts. While the super-regenerative receiver has been known for a long time, its practical commercial application has not been often used. It is excellent for the Class B Citizens Radio units because of its simplicity, remarkable sensitivity and low cost. The use of a superheterodyne receiver at this frequency would increase cost. No receiver adjustments are required. When the transmitter tuning and antenna coupling adjustments are made these adjustments also affect receiver performance. Since the same tuned circuits function for both, there is no need for separate alignment of the receiver. Because of the small size of the sets, most servicing can be performed in the shop. Manufacturers service notes should be referred to, and observed. If spare sets are kept for use as loaners, customers won't have to do without radio communication while their units are being serviced. The beauty of the Class B service is that all sets are tuned to 465 mc and all use AM. Hence, one kind of set could serve as a loaner. •

Copies of the new Part 19, Citizens Radio Rules, effective September 11th 1958 may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. for 10 cents in coin. More articles on servicing other Classes of 2-way radio equipment are in the works.—Ed.

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Saves time . . . makes
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WRITE TODAY FOR COMPLETE
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107 TUBE TESTER—
Outstanding performance and accuracy—provides 3 important tests: amplifier types tested for gain by Dynamic Mutual Conductance method—power types tested for cathode current by Cathode Emission method—all types tested for shorts and grid error by Grid Circuit Test developed and patented by Seco. Dynamic Mutual Conductance Test pre-wired to eliminate elaborate set-up. Cathode Emission Test done by free point pin-selector method—will not be obsolete. Completely self-contained in portable carrying case. Furnished with handy flip chart for fast tube set-up data.



MODEL 107 \$139.50 NET

GCT-8 GRID CIRCUIT TUBE TESTER



—Perfect companion to any tester—checks critical "control grid" condition of vacuum tubes fast, accurately.

Electron eye tube indicates faults at a glance. As many as eleven simultaneous checks—automatically.

MODEL GCT-8—Kit \$19.95 NET

MODEL GCT-8—Wired & tested . . . \$29.95 NET

208 VTVM — "Foot-proof"—many new features! Easy - to - read 4½" 200 microamp meter mounted on sloping panel — 7 DC, 7 AC, 7 ordinary Ohm ranges, plus RETMA (EIA) Ohm scale to check standard color-coded resistance values and tolerance limits.



Specially designed "shift-lever" type function switch identifies and automatically connects proper probe. With stand, 40" leads, and common lead with clip.

MODEL 208 \$74.50 NET

Leather, felt-lined carrying case . . . \$9.95 NET



PS-2 BATTERY ELIMINATOR—Compact unit takes place of battery normally used to operate and service low-powered transistorized equipment. Supplies clean, filtered DC—can't be damaged

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FB-4 FLYBACK CIRCUIT AND INDUCTANCE ANALYZER—Quick "yes" or "no" answer on condition of flyback transformer and yoke—100% accuracy!

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NEW! HC-6 CURRENT CHECKER

Provides positive, on-the-spot method of checking TV horizontal output circuits—fast, accurate way to adjust horizontal drive and linearity. Easy to use—can be placed in circuit in seconds—compact size. Complete, ready to use.

MODEL HC-6 \$12.95 NET

Get the complete story on Seco's exciting line of test equipment. See your distributor—or write for complete information today!

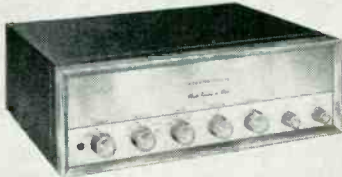
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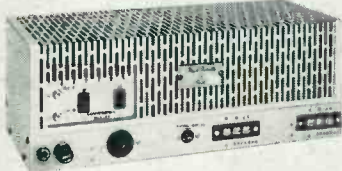
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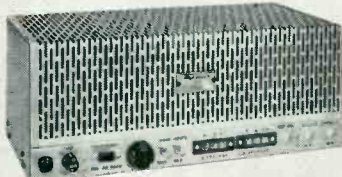
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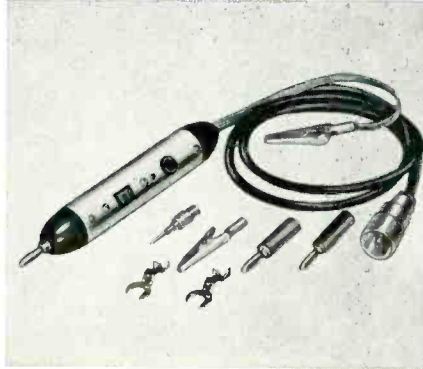
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Electronics manufacturer
for over 39 years.

Heath SCOPE PROBE

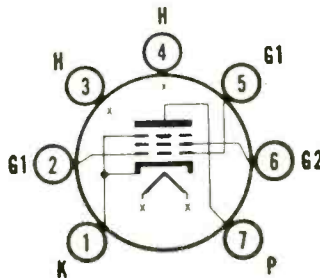
Model PK-1 oscilloscope probe kit is designed for use with scopes having calibrated vertical input. A switch on the probe selects direct or attenuated



operation. Universal connectors which adapt to most scopes are supplied with this X10 probe. Price \$4.95. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 2-23)

CBS PENTODE

The 6-, 12-, 25- and 50EH5 are four versions of a new beam power pentode for radio, TV and phonographs. A 7-pin miniature, it offers high sensitivity at low plate and screen supply voltages. For example, a peak a-f input voltage of three volts provides 1.4 watts output



with supply voltage of only 110-volts plate. Heater currents of the four types are 1.2 amperes, 600 ma, 300 ma, and 150 ma, respectively. The 600-ma version is heater warm-up controlled. Bulletin E-322. CBS-Hytron, Parker St., Newburyport, Mass. (ELECTRONIC TECHNICIAN 2-14)

Utah SPEAKERS

The "707 series" of speakers is inspired by the history-making new 600-miles-per-hour Boeing 707 jet airliner. The speakers are claimed to "produce more power per ounce than any other Alnico V speaker." Foundation for the claim is the redesigning into a slimmer profile speaker (30% less on the radial axis than the average of the industry) reportedly using the company's new dual diameter magnetic circuitry and dynamic Unicoids for increased concentration of power. Utah Radio and Electronic Corp., 1124 E. Franklin St., Huntington, Ind. (ELECTRONIC TECHNICIAN 2-20)

IF YOU MUST SPEND YOUR MONEY
Why not get something for it?
get **QUIETROLE**

IN BOTTLES 2, 4 & 8 oz. Dropper with 2 oz. SPRAY-PACK "CAN"

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None can equal its quality...
It's the answer to noisy controls and switches

QUIETROLE is the original product of its kind
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New! Improved! TRANSISTOR CHECKER
America's newest, most popular test instrument

Simple to Operate. Controls are accurately set for each transistor by referring to replaceable set-up chart on rear. Test leads or socket provides for fast hook-up.

NOW CHECKS:

- ★ Transistors for opens, shorts, leakage and current gain. Only tester that tests power transistors as used in car radio outputs.
- ★ Crystal Diodes checks forward to reverse current ratio on all diodes.
- ★ Selenium Rectifiers checks forward and reverse currents.

Service Instruments Corp. 121 Official Road, Addison, Ill.
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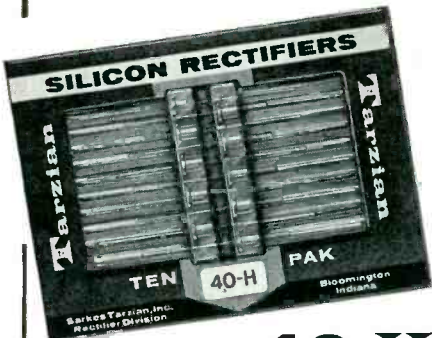
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Tarzian



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40-H

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EXPORT: AD AURIEMA, INC., NEW YORK CITY

NEW PRODUCTS

For more information, write in **ELECTRONIC TECHNICIAN's** new product code number on coupon on page 60.

Electro POWER SUPPLY

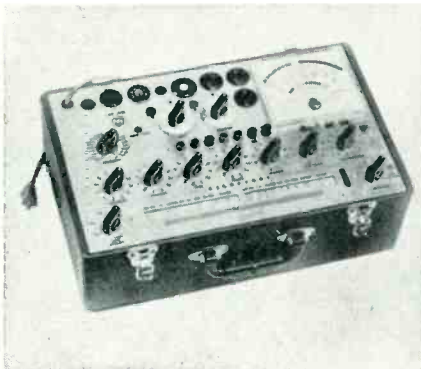
DC power supply PS-2 is designed for servicing all transistor and hybrid circuits, and 12/6-volt auto radio receivers. Transistor radio output range is 0 to 20 volts at 75 ma. Minute variations in current can be detected by the 0.75 ma meter. Auto radio output range is



) to 16 volts, with a continuous rating of 5 amperes up to 8 minutes. Filter holds ripple at 75 ma to 3 mv (0.15%). Can be used to service and operate phone circuits, relays, fans, etc. Also battery charging, electroplating. \$49.50. Electro Products Labs., 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 2-10)

Hickok TUBE TESTER

Dynamic mutual conductance portable tube tester 800 incorporates a transistor and diode check. Checks leakage between elements up to 10 megohms. Has a new filament continuity test. A push-button control reverses meter. Tube sockets for 4,5,6,7-pin, octal, loc-



tal, nobal and 7-pin miniature are provided. 5-inch meter. 0-3,000, 6,000, 15,000 micromhos are indicated on meter dial. A new grid current (gas) test is very sensitive. \$159.50. Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland 8, Ohio. (ELECTRONIC TECHNICIAN 2-11)

by
every
test



is BEST!



ATR AUTO RADIO VIBRATORS

Have Ceramic Stack Spacers

A COMPLETE LINE OF VIBRATORS

Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, featuring Ceramic Stack Spacers for Longer Lasting Life. Backed by more than 27 years of experience in Vibrator Design, Development, and Manufacturing.

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✓ NEW LITERATURE

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SAINT PAUL 1, MINNESOTA—U. S. A.



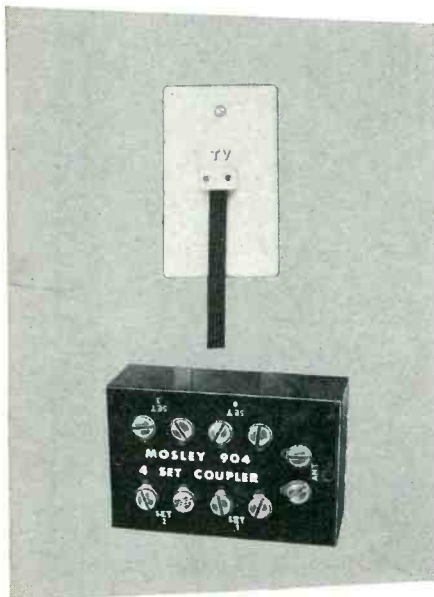
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You will appreciate the time-saving economy and flexibility of MOSLEY Premium Quality TV Accessories. Low loss MOSLEY accessories provide neat, efficient TV installations resulting in satisfied customers . . . fewer call backs!

PROFIT-WISE SERVICEMEN
USE **MOSLEY**
TV ACCESSORIES



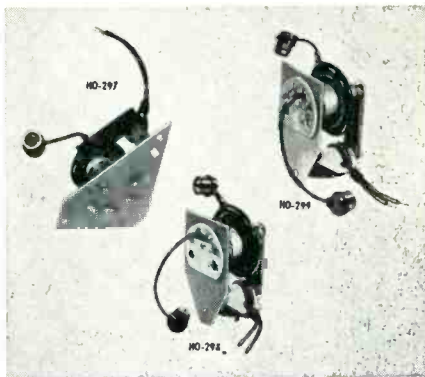
Install MOSLEY TV Accessories . . . your customers will appreciate it, too!

Mosley
Electronics, Inc.

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Stancor FLYBACKS

Two flybacks, Numbers HO-298 and HO-299, are now available as exact replacements for use in General Electric and Hotpoint TV sets. HO-298 replaces GE and Hotpoint parts RTO-207 in 3 models of the GE Q2 series chassis, and in 4 models of the Hotpoint Q2 series



chassis. HO-299 is used in 30 models of the M3 chassis. Also released was HO-297 for Hallicrafters, Coronado, Truettone and Firestone parts 55-301, 55-304, 55-307, 55C-301, 55C-304, 55C-307, 55A33, 055-300301. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 2-8)

Stromberg AUTO RADIOS

Initial line of auto radios covers the 1959 Ford, Plymouth and Chevrolet. Additional models for other makes of new cars will be supplied in the near future. They feature dual transistor-powered push-pull amplifiers. Transistors in the audio amplifier eliminate vibrator. The deluxe model has the "Signal Seeker," which tunes in stations automatically at two signal levels. This model has seven tubes plus two transistors. The standard model with push-button tuning has five tubes, plus two transistors. All sets come with 6" by 9" Alnico speaker. Stromberg-Carlson, Div. of General Dynamics Corp., Rochester 3, N. Y. (ELECTRONIC TECHNICIAN 2-17)

Sprague ELECTROLYTICS

"Littl-lytic" capacitors fill the need for medium-priced, subminiature replacement capacitors in transistorized and subminiature equipment. Hermetically-sealed, rated to 85°C. Terminal connections are welded. A sampling of their ultra-low leakage current is as follows: for a 2 μ f, 6 volt capacitor . . . only 1.0 μ a max.; for a 300 μ f, 6 volt capacitor . . . 3.5 μ a max. Comprehensive range of ratings (voltages from 1 to 150 WVDC). Circular M-753, shows complete ratings. Sprague Products Co., 65 Marshall St., N. Adams, Mass. (ELECTRONIC TECHNICIAN 2-18)

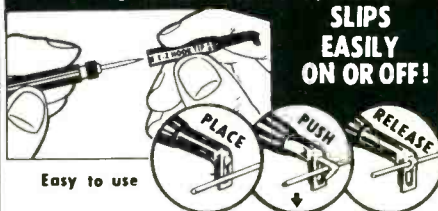
MAKE YOUR STANDARD TEST PRODS

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MORE EFFECTIVE IN SECONDS

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Here are the TEN E-Z-Hook Tip advantages:

1. Easy to attach — slips easily over test prod tip.
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3. Easy to connect or disconnect — patented design operates with light forward pressure.
4. Safer checks — hands stay clear of wiring.
5. Won't slip off — exclusive hook design clamps firmly around conductor.
6. Eliminates intermittents — spring pressure insures positive contact.
7. Eliminates adjacent shorts — insulated design gives maximum protection.
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9. Frees your hands — holds test prod for you.
10. Makes testing easier — saves time — eliminates aggravation.

No. 56-1 E-Z-HOOK TIP Only 89¢ ea.



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E-Z-HOOK TEST PRODUCTS
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Covington, Ky.

Canadian Rep.: Len Finkler & Co., Toronto, Ontario

Save Time with

SENCORE LEAKAGE CHECKER

Check these outstanding New Features

The LC3 provides all these new improved features in addition to those employed in earlier leakage or "grid circuit" testers. A must for any TV service technician.

★ Checks 156 different tube types—more than any other "grid circuit" type checker. Includes UHF and latest type tubes.

★ Checks picture tubes without removing tube from cabinet or chassis.

★ New Roll Chart prevents obsolescence—just dial the tube type and save time. Chart is easily replaced at no extra cost.

★ Provides instant filament checks on "Fil-Check" position—no need to carry a second filament checker. ★ Capacitor checks simplified.

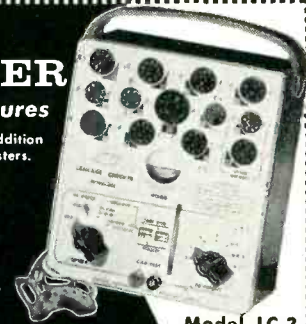
★ Two spare preheating sockets to cut down testing time.

In stock at your local parts distributor.

SENCORE

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Service Instruments Corp. 121 Official Road, Addison, Ill.



Model LC-3
\$2895

DEALER NET
Really Whips
Tough Dogs!

SAVE TIME
in removing printed
circuit components

Ungar®
DE-SOLDERING
KIT

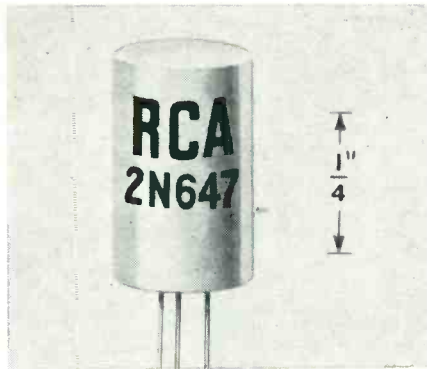
Don't ruin printed boards. Avoid de-lamination. Avoid contamination. Components are removed quickly, easily, safely with Ungar's new 8-pc. De-Soldering Kit. Order from your parts jobber. Ungar Electric Tools, Inc., 4101 Redwood Ave., Los Angeles 66



Ungar Electric Tools, Inc.

RCA TRANSISTORS

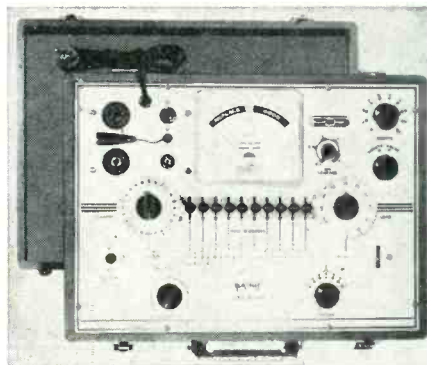
The 2N647 alloy-junction transistor of the germanium n-p-n type is intended for use along with its p-n-p counterpart, RCA-2N217, in class B Complementary-Symmetry power output stages of transformerless, battery-operated portable radios, phonographs and audio amplifiers. It may also be used in class B push-pull and class A. In typical class B complementary-symmetry circuit, a 2N647 and a 2N217



used together in the output stage and driven by a 2N217 class A driver are capable of providing 100 mw at a power gain of 54 db. Also, not shown, a new germanium n-p-n alloy-junction transistor (RCA-2N1010) for extremely small audio input signals, as in pre-amps. Noise factor is only 5 db. Small-signal current gain is 35; alpha-cutoff 2 mc. Radio Corp. of America, Semiconductor Div., Somerville, N. J. (ELECTRONIC TECHNICIAN 2-16)

Triplet TUBE TESTER

Model 3414 tube tester allows all switch settings to be made before tube warms up in order to speed testing. Burned out tubes are rejected instantly, without waiting for the filaments to heat. The neon indicator shorts test is new, fast and accurate. Tubes tested



include receiving types and gaseous rectifiers. Tests cover series filament, resistor and ballast tube continuity, etc. The continuity test circuit may be used to check electrical appliances. Triplet Electrical Instrument Co., Bluffton, Ohio. (ELECTRONIC TECHNICIAN 2-12)
ENICALY

SAVE TIME
in replacing printed
circuit components

Ungar®
SOLDERING
TOOLS

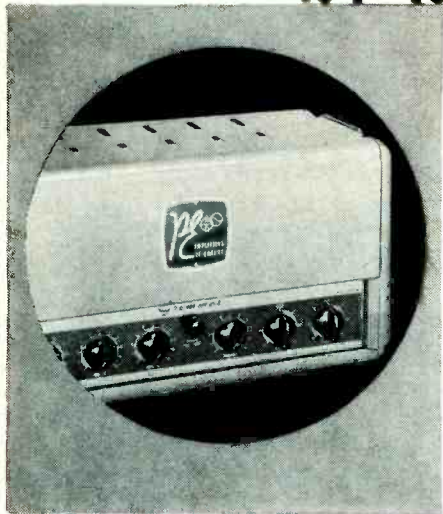
Interchangeable Ungar Tips and Tiplets make soldering easier, faster and more efficient in close, tight spots. Write for free catalog and new soldering booklet. Ungar Electric Tools, Inc., 4101 Redwood Ave., Los Angeles 66, California



Ungar Electric Tools, Inc.

high fidelity

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SOUND

P.A. sound, sparkling clear and natural . . . high fidelity which exceeds broadcast specifications. Created and engineered for the highest quality installations. This new sound amplifier series combines rugged durability, smooth versatile operation and true natural fidelity. Available in undistorted 20, 30 and 50 watt models. Ask your sound dealer for a Grommes Premiere Sound demonstration or for complete details, write . . .

GROMMES—Precision Electronics Inc.
Dept. T-2

9101 King St., Franklin Park, Ill.

Send details—Premiere Sound.

Name.....

Company.....

Street.....

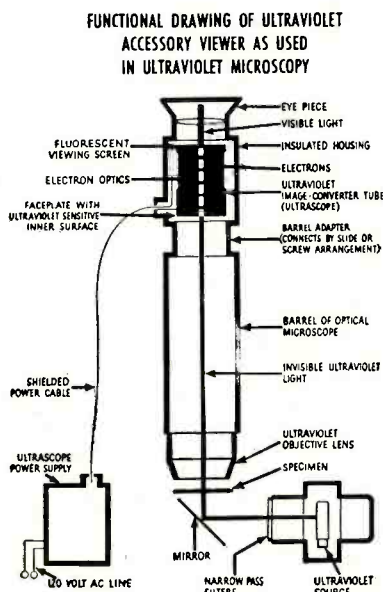
City..... State.....

"Ultrascope"

(Continued from page 56)

power supply. A cable connects the power supply to the ultrascope tube.

Invisible rays from an ultraviolet lamp are projected through the specimen under observation, and through an ultraviolet objective lens. An invisible ultraviolet image of the specimen is formed on the faceplate of the image-converter tube. The faceplate transmits ultraviolet rays



This is how "ultrascope" accessory fits on microscope. 35 mm camera may also be attached.

and has on its inner surface a photosensitive material which converts the ultraviolet image into a corresponding pattern of electrons. This electron pattern is, in turn, focused

on the fluorescent viewing screen at the opposite end of the tube.

A visible image of the specimen appears on the viewing screen in yellow-green light and is observed through a lens of the desired magnification. Because the human eye is most sensitive to yellow-green light, that color range provides comfortable viewing during prolonged observations.

The unit is also easily adapted to photomicrography and thus can provide film records of the specimen under study.



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SENCORE "Fuse Safe" CIRCUIT TESTER

Save Time with SENCORE

Save costly call backs by testing the circuit before replacing fuse, fuse resistor or circuit breaker.

Individual scale for each value fuse resistor—no interpretation, just read in red or green area.

★ Measures line current and up to 1100 watts of power at 115 volts using line cord and socket. ★ Two convenient current ranges—0 to 2 amps and 0 to 10 amps. Test leads clip in place of fuse or fuse resistor. ★ 5 ohm, 10 watt resistor prevents TV circuit damage, simulates operating conditions.

SENCORE

As Recommended by Leading Manufacturers
Service Instruments Corporation
121 Official Road, Addison, Illinois

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\$8.95 DEALER NET

AC-DC or both as needed for Fuse Resistor Circuits

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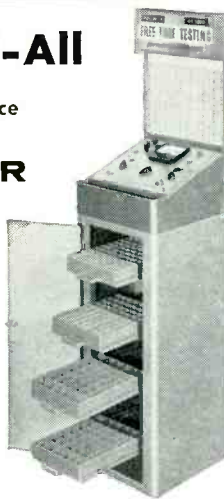
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FINEST TESTER-MERCHANDISER EVER DEVELOPED

Vis-U-All self service TUBE TESTER



Model V II

Counter model also available

Features only six tube sockets for simple operation, yet tests over 600 types of radio-TV tubes. Occupies minimum floor space, only 15" x 15". Most obsolescence-proof, has master-switch dial control to accommodate new tubes. Attractively designed, ruggedly built. Big tube storage capacity. And it's only \$199.95!

See your distributor or write for full details.

VIS-U-ALL products company
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HUSH

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

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Since 1949

VOLUME CONTROL AND CONTACT RESTORER

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

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0A2	.75	5Z3	1.00	6CF6	.90	12AY7	1.70
0A3/VR75	.80	5Z4	1.60	6CF7	.85	12AZ7	.95
0B2	.75	6A7	1.35	6CG8	1.25	12BA4	.90
0B3/VR-90	.80	6ARM	1.35	6CH8	1.25	12BA6	.70
0C3/VR-105	.80	6BGT	1.35	6CL6	1.30	12BA7	1.25
0Z4	.65	6B8	.75	6CM6	1.20	12B6	.70
0Z4B	.70	6B7	1.60	6CN7	.95	12BE6	.75
1A5E1	.90	6AD7	1.35	6CU5	.90	12B7A	1.05
1A7GT	1.00	6AG7	1.35	6CS6	.85	12B8	1.20
1A2	1.00	6AD7	1.85	6CS7	.95	12B86	1.10
1B3GT	1.00	6AF4	1.45	6CU5	.90	12B86GT8	1.55
1A5E2	.85	6AG6	1.20	6D6	1.20	12B7	1.50
1L6	1.05	6AG5	.80	6D6	1.20	12B7A	1.05
1L4A	1.00	6AG7	1.50	6D6C	.95	12B7A	1.05
1L4B	1.00	6AH4GT	1.05	6D6E	.85	12B7	1.05
1L84	1.25	6AM6	1.40	6D16	.85	12B7	.85
1L65	1.10	6AK4	1.50	6D6E	1.55	12CA5	.85
1L66	1.10	6AJ5	1.85	6E5	1.10	12C05	.85
1L05	1.10	6AN8	.90	6E6	1.10	12C05	1.55
1L13	1.10	6AK6	.95	6F6M	1.35	12D06	1.55
1L65	1.10	6AL5	.65	6F6G	1.00	12D7	.85
1A5E1	1.10	6ALGT	1.80	6G6	1.05	12K8	1.30
1LMS	1.10	6AM4	1.90	6I4	2.00	12K7GT	1.00
1R5	.85	6AMB	1.15	6I5GT	.85	12L6GT	.85
1A4	.80	6AN4	1.65	6I6	1.20	12SA7GT	1.05
1U5	.75	6AN8	1.20	6K6GT	.80	12S67	.95
1V	1.00	6AD5	.75	6K7	1.00	12SL7GT	.95
1W2	.60	6AG7	1.15	6L6	1.50	12SN7GT	.90
1X28	1.10	6AG7	1.15	6L6	1.50	12SN7GT	.85
2A3	2.00	6AR5	.75	6L6GA	1.50	12SR7	.90
2A4A	2.25	6AS6	2.25	6AR5	1.40	12S6GT	.75
2B4A	.90	6AS6	.85	6L7	1.40	12S6GT	1.00
2D21	1.10	6AS6	1.00	6M7	1.25	12K4	.60
2A2	1.10	6AS7G	3.00	6M7	1.25	1A47	1.00
3A3	1.10	6AS8	1.15	6AS8	1.10	1A47	1.05
3A4	.75	6AT6	.70	6S8GT	1.00	1A4F7	1.05
3A5	.75	6AT8	1.15	6SA7GT	1.05	1A4F7	1.05
3A6	.65	6AU6GT	1.15	6S67	1.05	1A47	.90
3AU6	.75	6AU5GT	1.50	6S75	.85	1A47	1.20
3AV6	.60	6AU6	.75	6S75	1.20	1A47	1.25
3BE8	.85	6AU7	1.00	6S75	1.20	1A47	1.25
3BC5	.85	6AU8	1.20	6S75	.85	1A47	1.25
3B6	1.00	6AV5GT	1.25	6S7M	.85	1A47	1.25
3B8	.85	6AV6	.60	6S7GT	.90	1A47	1.25
3B26	.85	6AX6	1.25	6S7GT	1.10	1A47	1.25
3C86	.85	6AX5GT	1.05	6S7GT	.85	1A47	1.25
3A4	1.25	6A28	1.45	6S75	1.05	1A47	1.25
3C56	.85	6A28	1.85	6S75	1.05	1A47	1.25
3D76	.80	6A28	1.70	6T8	1.15	25B8K5	1.25
3E4	.75	6B4	1.25	6U5	1.00	25B8K5	1.25
3E5	.75	6B5	1.15	6U8	1.15	25C06GA	2.00
3E5GT	1.15	6C7	1.15	6V3A	1.45	25C06	.60
3E4	.85	6B8	1.40	6V8	1.45	25C06GT	1.90
3V4	.80	6B8	1.40	6V8	1.45	25C06GT	1.90
4B8	1.20	6B6	.70	6W4GT	.85	25Z6GT	1.00
4B7	1.40	6B6E	.75	6W6GT	1.00	35A5	1.00
4B8	1.20	6B6	.75	6B75	.80	35A5	.90
4B7	1.20	6B6G	.65	6X5GT	.70	35C5	.75
5A6	2.10	6B6G	.95	6X8	1.10	35L6GT	.85
5A8	1.15	6B8	1.25	7A4	.75	35Y4	.80
5A8B	1.25	6B8	1.20	7A5	.90	35Z5	.65
5A85	.75	6B7	1.00	7A5	.90	41	.90
5A8B	1.20	6B8A	2.50	7C5	1.00	41	.90
5A78	1.15	6B8K5	1.10	7E6	.95	43	1.00
5A4	1.30	6B7A	1.15	7F8	1.30	50A5	1.10
5A4B	1.35	6B7GT	1.35	7H7	1.10	50B5	.90
5A41	1.25	6B8G	1.00	8AW8A	1.40	50C5	.75
5A24	.85	6B8GT	1.50	12A6E	.65	50L6GT	.85
5B47	1.20	6B8A	1.15	12AD6	.75	50M6GT	.90
5B8B	1.20	6B8B	1.45	12A85	.80	50M6GT	.75
5B07	1.40	6B8B	1.45	12A85	.80	50Y7GT	.75
5C8B	1.10	6B8B	1.00	12A87	1.25	70TGT	2.70
5C6	1.00	6B7GT	1.35	12A16	.75	80	.85
5B4V	1.50	6B75G	1.25	12A25	.75	80	.85
5T8	1.20	6B76	.80	12A26	.70	83	1.35
5U8B	.90	6B76	.90	12A27	1.10	83V	1.25
5U4B	.75	6B76	.80	12A27	1.10	117GT	2.70
5U8	1.15	6B77	1.40	12A27	.85	117GT	2.00
5U8	1.15	6B78/195	1.60	12A26	.60	117GT	2.00
5V6GT	.85	6C4	.60	12A27	1.10	117GT	.85
5WAGT	.90	6C5	.80	12A26	1.05	117GT	1.20
5K4G	.80	6C85	2.75	12A46	.95	117GT	1.20
5X8	1.15	6C85	2.75	12A46	.95	117GT	1.20
5Y3GT	.60	6C06G	2.25	12A27	.85	5654	1.40

Many other receiving tubes in stock. You may order them at same price level, or write for exact price and availability.

* HEAVY-DUTY TEST LEADS. Tests to 10 KV for TV, etc. Red & Black Leads. ICA #4317.
PRICE: \$1.25

* SIGNAL TRACER PROBE FOR VTVM, Etc. ICA #4310.
PRICE: \$1.75

* ICA 5 WAY BINDING POSTS (Black or Red)
PRICE: 22¢ Each

* BLK OR RED BANANA PLUGS FOR ABOVE, Etc. 3" Long. (Specify Color)
PRICE: 15¢ Each

* TEST LEADS. STD. SET OF RED OR BLK LEADS W/Banana Jacks & 5" Probs. ICA #312.
PRICE: 50¢ Each

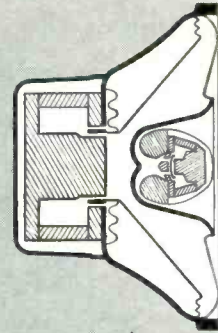
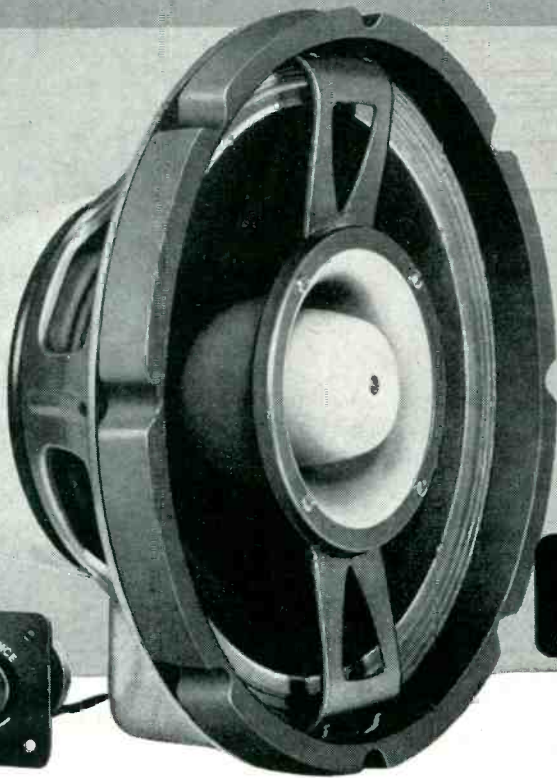
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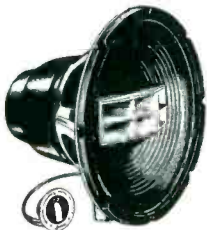
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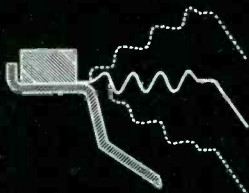
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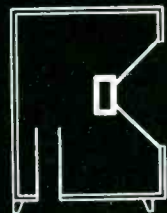
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