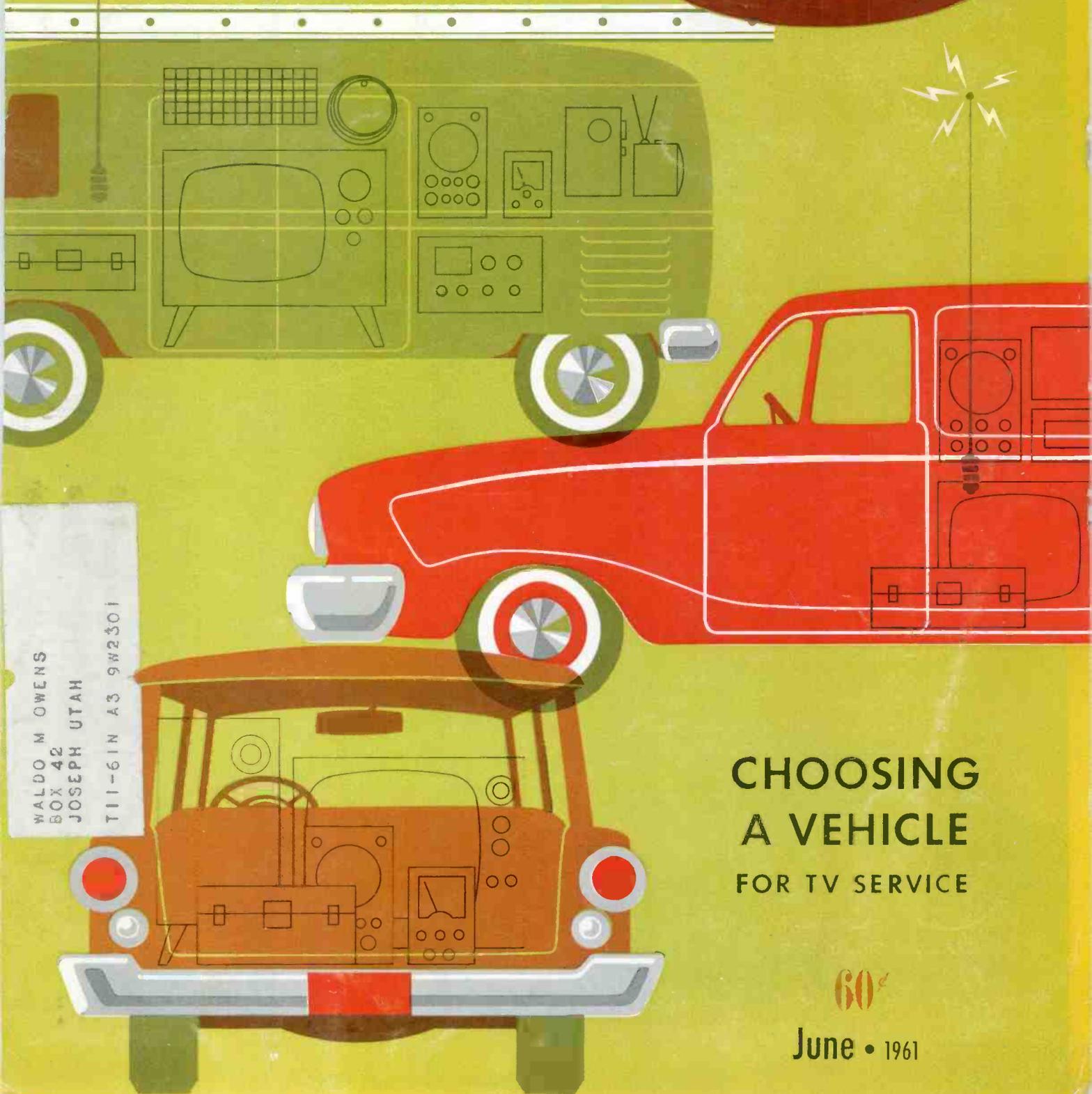


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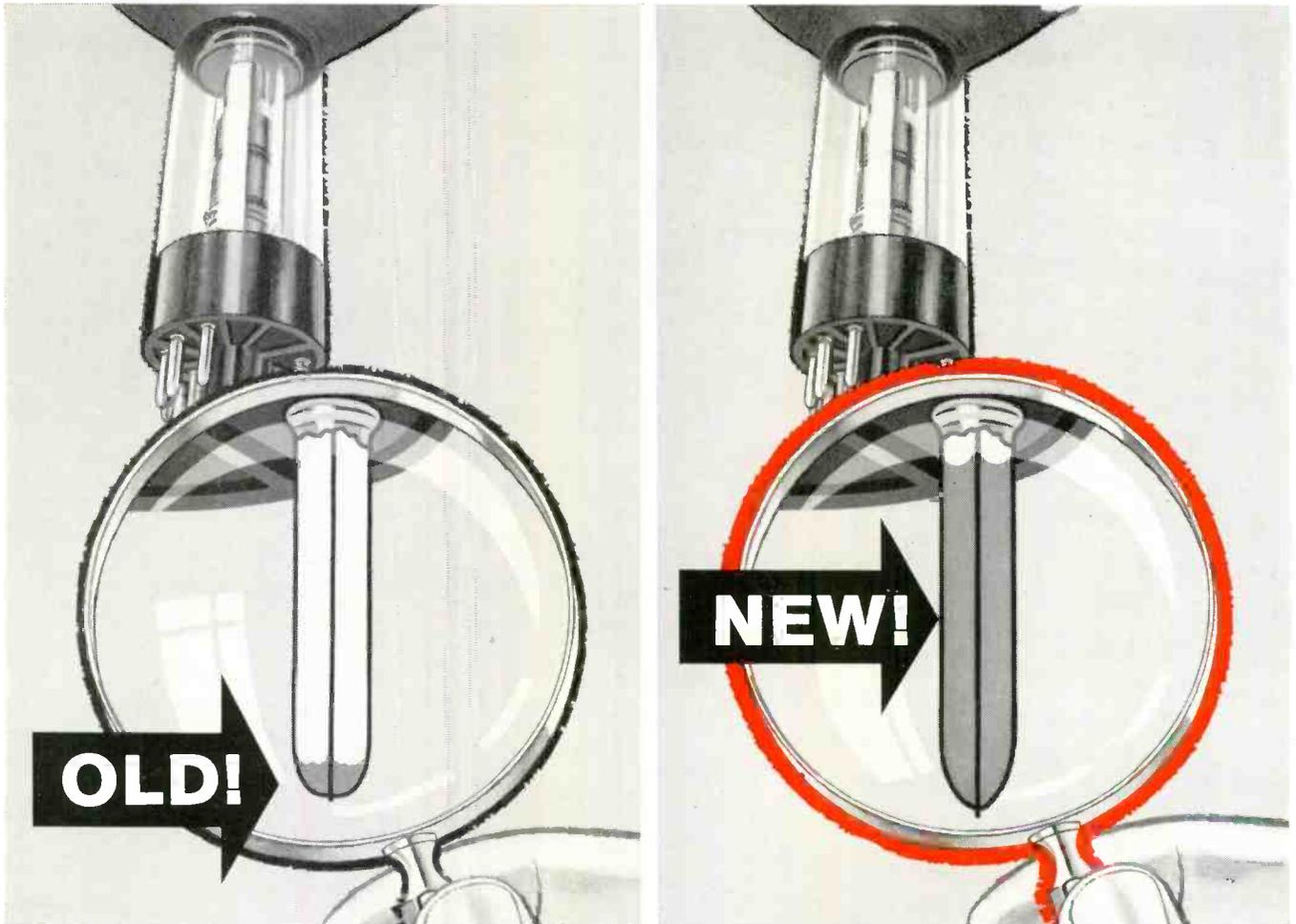
**CHOOSING  
A VEHICLE  
FOR TV SERVICE**

60¢

June • 1961

# New Sylvania Technique eliminates erratic pin soldering

*Picture tube callbacks due to "open-pin connections" dramatically reduced*

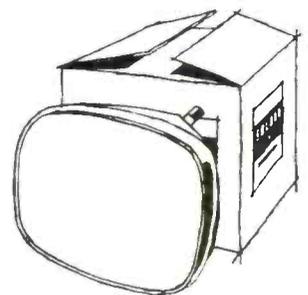


The "old" conventional pin soldering method relied upon contact between pin and wire only at their tips.

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# SYLVANIA

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June, 1961

**FRONT COVER** Your service vehicle may be a blessing or a millstone around your neck. If it's uneconomical to operate, for example, it can take a substantial slice out of your \$\$\$ profits. When next you decide to purchase another vehicle, many factors should be weighed to assure the "right" purchase. Remember, your choice will determine part of your overhead and work efficiency for the next few years. See vehicle buying guides in the article starting on page 38.



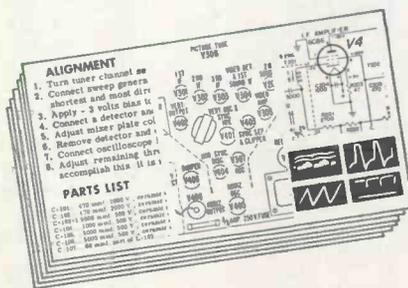
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**STERLING:** AM/FM/SW Radio, Phono Chassis 1/633 US-Stereo  
**TRAVLER:** TV Chassis 1051-90  
**TRUETONE:** TV Model 2D3246

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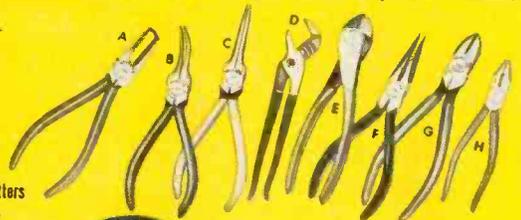
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For more data, circle 6-2-1 on coupon, p. 68

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# SERVICE TECHNICIANS

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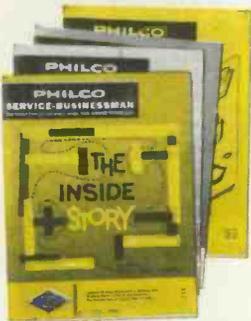
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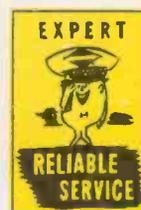
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# The "Big Picture"

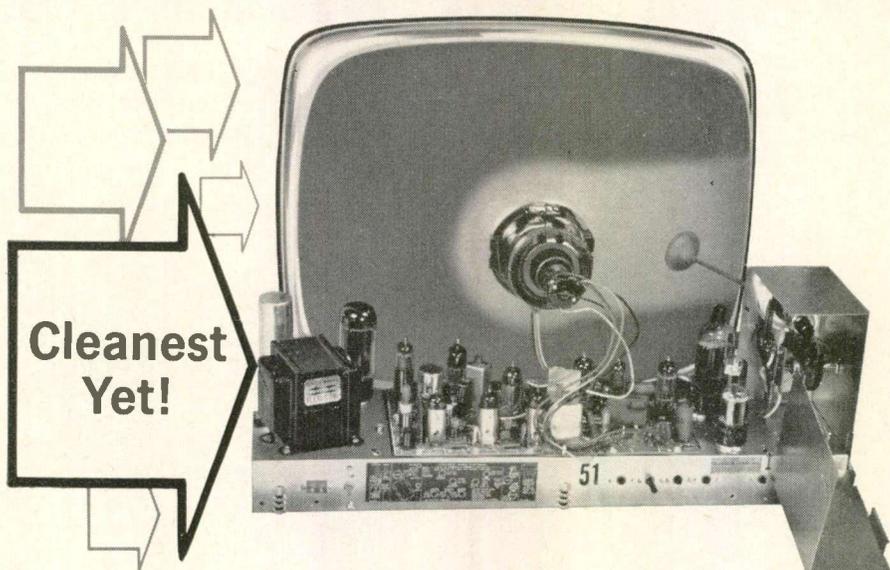
...informative shop talks

by AL MERRIAM, Sylvania Natl. Service Mgr.

## Editor's Memo



# New GT-555 chassis...



This new GT-555 chassis is the transformer-powered, modern version of the famous, performance-proved S-110 chassis. Just look at it . . . clean, modular, and service-designed with easy access to all components.

The new transformer that powers the GT-555 is a Sylvania exclusive and a modern marvel. It's called the Flexi-Core transformer, and it's up to 30% smaller and lighter than conventional types, and far more efficient in dissipating heat. The formed core strips are 100% interleaved and welded (rather than bolted) to eliminate lamination buzz and reduce core losses.

If you have to take the chassis to the shop, pulling the GT-555 is a breeze. You don't have any front screws to fight with — just chassis studs that push neatly into cabinet-mounted brackets, instead. Simply remove the three back screws, and slip the chassis completely free — the deflection yoke, tuner cluster, remote receiver and speaker are all plug-ins and quickly detachable.

You'll like this great, new one-two combination — the GT-555 chassis with Flexi-Core power. For more information on this and other big electronic advances, contact your local Sylvania TV distributor for dates and location of the Service Clinic in your area.

### SERVICE TIP OF THE MONTH

Don't throw away that broken portable TV antenna — repair it. Cut above the break with tubing cutter, making sure the inside rod section is fully extended while cutting. Remove the broken part from ball socket, then push antenna rod through ball and flare end with flaring tool or needle-nose pliers. Sylvania Home Electronics Corp., Batavia, N. Y.

# SYLVANIA

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## GENERAL TELEPHONE & ELECTRONICS



This spring has been a traveling period for me. Roving back and forth across the United States, and even taking a journey to Europe, has given me an opportunity to visit a goodly number of service shops and manufacturers.

There's the struggling one-man shop, and the five-store 21-man operation; there's the civic minded pillar of the community, and the shady operator; there's the bright fellow who is always eager to learn, and the know-it-all who knows too little.

Economically there are also great variations, not only from city to city, but between shops in the same area. One dramatic example was in a large city where two 2-man shops of almost the same size were across the street from one another. One fellow was crying the blues because business was down over 30%; the second servicer was almost even with last year. By a strange coincidence, the successful shop was neater and better stocked, and the owner subscribed to guess-what electronic service magazine. The other man didn't read any electronic magazines or books.

In foreign countries, some things are completely different. In Germany, for instance, there are practically no independent service shops. Service is obtained through factory authorized set dealers who have their own service department or use the factory-distributor service. And techs must go through a 3-year apprenticeship.

The difference in views between countries is highlighted in a story of four atomic scientists of different nationalities. After being exposed accidentally to radioactive plutonium, a doctor examined them. The physician told them they all would die in a week. Was there anything they wanted to do?

The German said: "I want to have a big party in the beergarden. I would like to sail down the Rhine and hear Wagner's music for the last time."

The Frenchman said: "I want to kiss Bardot and climb to the top of the Eiffel Tower. I wish to visit the Louvre once more."

The Englishman said: "I want to taste tea and scones once again. I will die content if I can hear Big Ben toll for the last time."

The American said: "I want to see another doctor!"

*Al Foman*

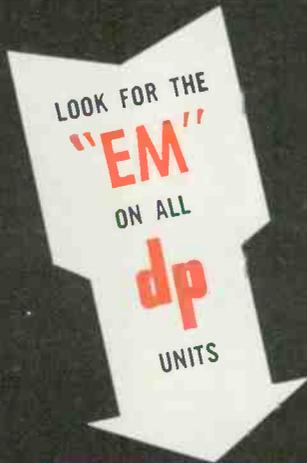
FIRST CHOICE WITH SERVICE TECHNICIANS . . . EVERYWHERE!

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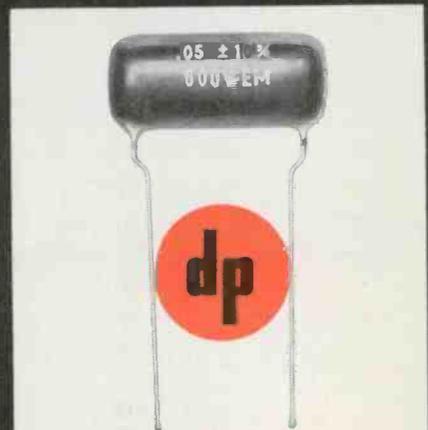
\* Dupont Reg. Trademark



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imitations!*

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*Electra*

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Low-drain house current Power supply @ 24 volts provides dependable, trouble-free performance.



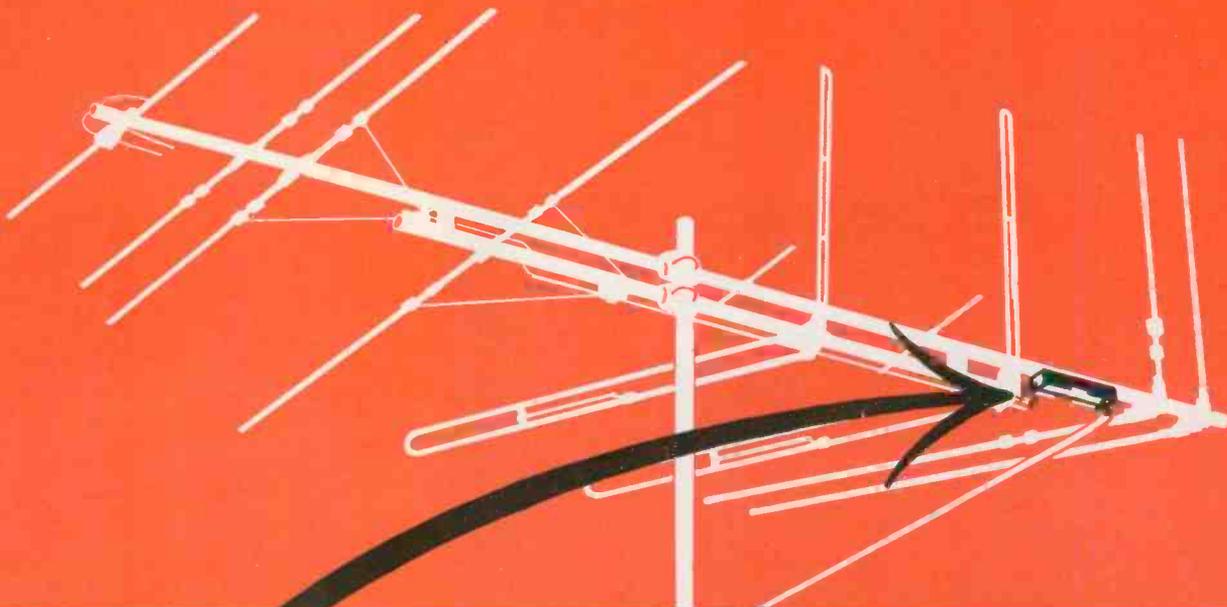
**NO COUPLER  
REQUIRED FOR  
TWO-SET OPERATION**

A TACO exclusive! Automatically feeds two sets or more without interaction or interference. Two outputs are built right in. A unique feature available only with the T-Bird ELECTRA.

Why sell less than the best? It costs no more than old-fashioned tube-type antenna-amplifier combinations yet gives you, and your customer so much more. You will make friends and build up your reputation as a TV expert when you install TACO T-Bird Electras. Old sets or new — in good or bad reception areas—the Electra gives picture strength and improvement your customer can see at a glance.

And if you're installing a color receiver right now, or expecting to install one — the all-new, exclusive TACO T-Bird Electra is the answer. Ten-fold gain pulls in the picture so desperately needed for good color reception — even in fringe areas!

*The first electronic  
antenna with  
power to spare!*

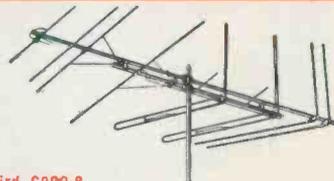


**100% POWER INCREASE!**  
*automatically drives*  
**1-2 or more sets!**

Streamlined—light weight unit—no burden for rotor operation. Built-in two set connection. And if you need to feed more—three, five, ten, or more sets can receive the finest pictures obtainable through use of standard distribution systems.

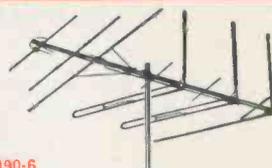
But let your **customer** convince you. Install an Electra in a poor location—and then receive the compliments. IT'S GOT TO WORK. The Electra has been tried, tested, checked and double-checked and never failed. If there's a picture to be gotten—the TACO T-Bird Electra will get it!

**TACO T-Bird Antennas — the only 100% rust-proofed antennas . . .**  
 Anodized gold with iridized hardware!



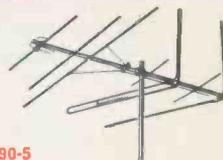
**T-Bird G990-8**

The ultimate for tough long distance reception areas. Can range up to 175 miles from TV transmitter and still pull in the picture! The finest antenna—at any price—in any location.



**T-Bird G990-6**

Pulls in distant signals without lines, snow or blur. Range up to 125 miles with maximum power gain on all channels from 2-13. Anodized and iridized for complete protection against rust and corrosion.



**T-Bird G990-5**

Ideal for near-fringe areas. Selected directivity pattern kills co-channel interference, minimizes snow and fade. Exceptionally flat frequency response produces superb black and white or color pictures.

**Get In On It Right Now**

Write or wire for complete money-making details TODAY.

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offer these advantages  
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less than 1 $\frac{3}{16}$ " deep from mounting surface, these units fit into any standard junction or switch box with room to spare... diameter is only 1 $\frac{1}{32}$ ".

**HIGH WATTAGE...**

conservatively rated at 20 watts audio, 5 watts D.C. yet they are no larger than units rated at 2 watts D.C. One size takes care of all your 2, 3, 4, and 5 watt requirements. Centralab's exclusive "thermo-pass" insulation combines fast heat transfer with a high dielectric constant to achieve this high rating.

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the "play" frequently found in dual controls is eliminated. The wiper contacts move in unison, assuring that there will be no alteration in frequency response due to variations in wiper position on the resistance tracks.

B-6124



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 PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS**

# LETTERS

## To the Editor

### Sweep Article Appreciated

Editor, ELECTRONIC TECHNICIAN:

May I express my appreciation for your April issue article "TV Sweep Circuit Test Analyzers." I feel that this type article is of real value to the service operators, especially the smaller shop owners. With so many new specialized instruments on the service market, we are often at a loss as to whether the investment in one more piece of equipment is to our advantage. This type of article helps considerably in its analysis of what the equipment of various manufacturers can and cannot do. I hope we may have more of this type of article in the future.

CARL G. SCHAUHM

Flushing, N. Y.

### Inauguration Loudspeakers

Editor, ELECTRONIC TECHNICIAN:

We would like to ask publication of at least a portion of this letter so there is no misunderstanding whatsoever about the University Loudspeaker ad appearing on page 4 of April 1961 ELECTRONIC TECHNICIAN. The headline is "University is chosen again for the Presidential Inauguration." This implies that University was selected for sound coverage of the inauguration. This is not true. While some University loudspeakers may have been employed as evidenced by the photograph labeled, "1961," we refer you to page 24 and 25 of March SOUND MERCHANDISING. The bulk of the loudspeakers were provided by Electro-Voice. All of the microphones were provided by Electro-Voice; the loudspeakers illustrated on page 25 are all by Electro-Voice. We are sure our competitors make good products just as we feel we do, and in some cases we feel we make better products. We do not feel it is necessary to resort to inaccuracies, either by implications or outright mis-statements concerning the use of our products. Where it is so patently obvious, as in this instance, we feel that we are entitled to proper recognition of the facts.

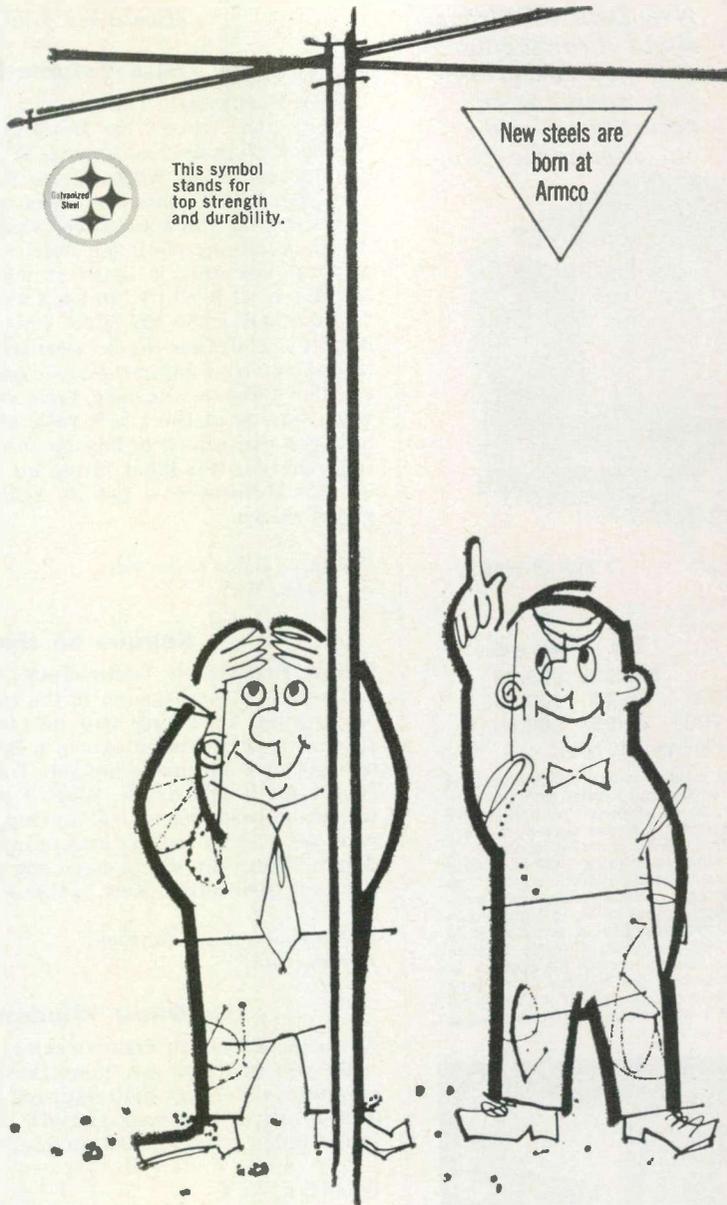
My objection to the University ad is the implication that their speakers were used exclusively at the inauguration, whereas in fact they were used in a very limited area.

LAWRENCE LEKASHMAN

Electro-Voice, Inc.  
 Buchanan, Mich.

• Mr. Charles Ray of University states the following in rebuttal: "The article referred to by Mr. LeKashman specifically notes that speakers were provided by both Electro-Voice and University Loudspeakers. Nowhere in our ad did we claim that the loudspeakers were all University."—Ed.

(Continued on page 10)



This symbol stands for top strength and durability.

New steels are born at Armco

## PLEASE YOUR CUSTOMERS ...SELL MORE

with TV Masts and Towers made of Armco ZINCGRIP Tubing  
Satisfied customers make your best salesmen. And they *stay* satisfied when TV masts and towers have the strength, rust-resistance and lasting good looks of Armco ZINCGRIP® Tubing. It's zinc-coated for protection against weather. Send coupon for names of manufacturers of TV masts and towers of this special Armco Tubing.

Armco Division, Armco Steel Corporation  
1621 Curtis Street, Middletown, Ohio  
Send me the names of manufacturers who make masts and towers of Armco ZINCGRIP Tubing.

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ZONE STATE \_\_\_\_\_



Armco Division

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WITH **EICO**®

*New Deluxe Citizens Band Transceivers give you everything you need for fast, reliable, economical communication*



**770 Series**

	kit	wired
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Model 771: 117 VAC and 6 VDC*	79.95	109.95
Model 772: 117 VAC and 12 VDC*	79.95	109.95

\*Including Posi-Lock® Mounting Bracket (Pat. Pend.)

Front panel selection of one of 3 transmit crystals with continuous receiver tuning over all 23 CB channels, or a fourth transmit crystal with appropriate receiving crystal. Press-to-talk button on microphone; transmit-receive switching accomplished by high-quality relay with minimum capacity between contacts to prevent current leakage at RF frequencies. Superhet receiver with RF stage for high sensitivity & proper signal-to-noise ratio. 1750 KC IF strip for unequalled image rejection & freedom from oscillator "pulling" on strong signals. IF strip prealigned so that only "touchup" alignment without instruments is needed. Current metering jack in series in cathode circuit allows checking of input power to transmitter final & adjusting it to FCC limit. 13-tube performance (4 dual function tubes, 4 single function tubes, plus germanium diode). Adjustable squelch control (in addition to automatic noise limiter). Optimum adjustment to any popular CB antenna assured through use of variable pi network in output. AVC. 3" x 5" oval PM speaker. Supplied complete with 8 tubes & 1 transmit crystal (extra crystals \$3.95 each).

The entire transmitter oscillator circuit and RF final in every EICO transceiver kit is premounted, prewired, pretuned, and sealed at the factory (about 3 hours of skilled labor, precision adjustments and testing), complying with FCC regulations (section 19.71, part d), and permitting you to build the kit and put it on the air without the supervision of a commercial radiotelephone licensee.

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**Standard 760 Series  
of CB Transceivers**  
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NEW FM-AM Stereo Tuner ST96  
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(Continued from page 8)

## Those Volume Discounts

Editor, ELECTRONIC TECHNICIAN:

The letter titled "No Discount to Hobbyists," in your March 1961 issue, had appeal. It is my opinion wholesalers should not sell at wholesale to the ultimate consumer. On the other hand, manufacturers ought to get together and put a stop to a new practice, which came out very recently. To illustrate my point, an item, which is supposed to retail at \$1.25 per unit, is listed at wholesale under this setup: Net Each—1-9, \$1.01; 10-24, \$.98; 25-49, \$.59; 50-99, \$.46; 100-249, \$.36; 250-499, \$.29. This kind of a price structure merely encourages the serviceman in smaller towns to turn to German and Japanese-made goods. Just why should the smaller town servicemen have to operate on less profit, when buying at the 1 to 9 rate, above quoted, than the fellow who can afford to buy on the 250-499 price rate? It is true, there is less labor filling an order at the 250-499 rate, but the difference is not as much as is indicated by the prices shown.

WALTER J. WILLIAMS

Williams Sales & Service  
St. Clair, Mich.

## Repairs on the Phone

Editor, ELECTRONIC TECHNICIAN:

There is a small group in the trade that want whole hog or nothing. Licensing will not take the gyps out of the trade. I was making a call in a San Diego suburb not long ago. After I had made my call, I stopped at their shopping center for a cold drink. When I returned to my car there was an advertisement left stating that they would help fix your set just by calling and telling them what the set was doing. Then they would come out and fix it if owners could not fix it themselves. Now, is that not unethical practice?

O. R. HAYS

Hay's Radio & TV Service  
Poway, Calif.

## No-Ghost Window Antenna

Editor, ELECTRONIC TECHNICIAN:

Do you know of any manufacturer who makes window antennas which can help improve TV reception with reference to ghost and weak signal? I have tried the standard type window antennas but no improvement is noticed.

LOUIS LERNER

Brooklyn, N. Y.

• High gain, directive antennas with end nulls and high front-to-back ratio are needed for weak signals and ghost elimination. But so far as we know, such antennas are bulky affairs unsuited for window mounting.—Ed.

## Fighting Drug Store Testers

Editor, ELECTRONIC TECHNICIAN:

One thing has had very little mention and should be brought up more often if the serviceman expects to make his business a profitable one. This is the drug store and supermarket gravy train tube testers. My big question is why? It's a money maker of course. So is the meat business a good profitable field. How many TV service shops are there in this country where you can buy a pound of bologna? If servicemen do not take heed of this now and fight fire with fire, they will be as extinct as ice delivery men. Every drug store and every supermarket with a tube tester is a potential TV service shop and is competitive to our business. The only way to combat this is to educate the people.

(1) Explain that these tube testers are a money making proposition, and they are throwing their money away on tubes they don't need, since the tubes operate differently under load than in the testers. (2) Explain that you replace only tubes that will help the set, and that a good technician will know what tubes to change. (3) Explain that there is no way to predict the life of a tube, which most people think a tube tester will do. (4) If you run into a drug store tester addict who has bought \$15 worth of tubes, replace

(Continued on page 26)



**CHANNEL MASTER**  
has everything  
under the  
sun...

to keep your Summer Sales Simmering!

Summertime is "easy living" time. People have more leisure hours in which to enjoy radio and television. That's why they'll want radios and TV sets that are in top operating condition...and Channel Master has everything you need to do the job better.

Replace winter-worn antennas with one of the powerful Super T-W's. Convert old-fashioned manual rotators to fully automatic operation with the new Channel Master Automatic Rotator Control Consoles. Perk up TV set performance by replacing weak or worn out tubes. Show your customers how their leisure hours can be more enjoyable when they own Channel Master portable radios.

There aren't any summer sales doldrums when you sell the Channel Master line because Channel Master has everything you need to keep summer sales simmering.

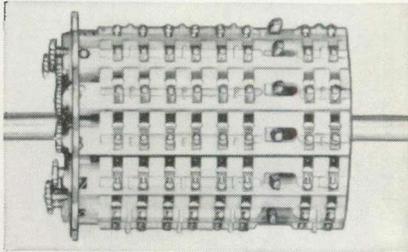
**CHANNEL MASTER** works wonders in sight and sound

ELLENVILLE, NEW YORK

For more data, circle 6-11-1 on coupon, p. 68



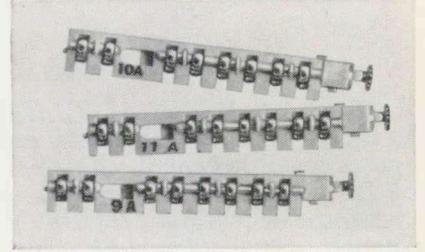
10 great Zenith features now eliminate troublesome tuner problems—simplify service, deliver stronger pictures in any signal area, assure better performance for the lifetime of the set.



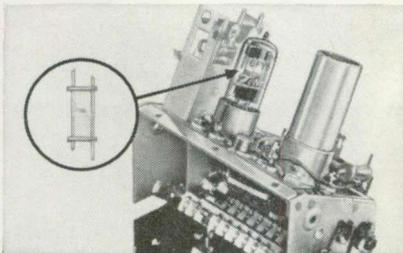
**1.** New 16-k. gold contact points can't oxidize or wear out. Gold-filled, not just plated. Can't lose signal like corrodible silver points, rarely need cleaning—won't wear out like gold plating.



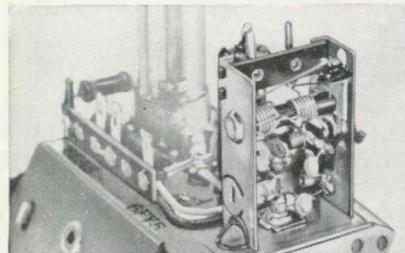
**2.** New out-front Perma-Set control custom-tunes each channel. Zenith eliminates fine-tuning circuits and drift. Single control makes *all* tuning adjustments—*assures maximum frequency stability.*



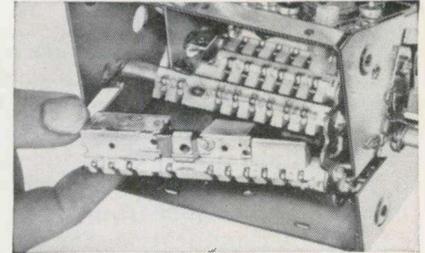
**3.** New channel strips 10 times more resistant to moisture. Remarkable new glasskyd insulation material virtually ends moisture-caused drift—ends one of the major causes of lost picture quality.



**4.** New frame-grid type tube provides TV's best signal-to-noise ratio. Zenith-pioneered micro-precision tube gives unsurpassed fringe-area or prime-area reception.



**5.** New filter cuts police and ham radio interference. Exclusive Zenith high-pass filter improves rejection efficiency—gives purer signal for still finer picture.



**6.** Tuner designed for quick, easy UHF conversion on the spot. You can convert tuner to take up to 4 UHF stations, *switch strips without disassembling tuner or drum.*

**7.** Handcrafted construction—no printed circuits anywhere. Famous Zenith handcrafted quality means more dependable operation, longer life, quicker servicing.

**9.** New gold contact points are triple-lifetime-tested. Actual laboratory tests proved new Zenith points stayed corrosion free, performed like new after 150,000 complete cycles—3 times the standard industry life-endurance test run!

**8.** Compact design plus complete accessibility. Zenith-developed, Zenith-built—this tuner is trim and compact for cleaner receiver layout. Yet can be serviced *without disassembly.*

**10.** Zenith premium quality components throughout. No production short-cuts—Zenith uses premium rated components all the way!

Zenith sets the new standard of tuner performance for the industry! The inside story of Zenith's all-new Gold Video Guard Tuner®—successor to the world-famous Bull's Eye Turret Tuner®—is another example of the product leadership that makes Zenith first in TV performance—serviceability—and customer satisfaction.

# ZENITH

The quality goes in  
before the name goes on



ZENITH RADIO CORPORATION, CHICAGO 39, ILLINOIS IN CANADA: ZENITH RADIO CORPORATION OF CANADA LTD., TORONTO, ONTARIO. The Royalty of television, stereophonic high fidelity instruments, phonographs, radios and hearing aids. 43 years of leadership in radionics exclusively.

# Tuning In the

**NATIONAL MEDICAL CLEARING HOUSE** to be linked electronically with every major hospital and medical school in the country, was proposed by RCA Chairman, Brig. Gen. David Sarnoff. Addressing the National Health Council Forum, Gen. Sarnoff stated, "Through a blend of electric computation and communication techniques, it would be possible to establish . . . a central repository for all the latest medical information." Further uses for television, particularly color TV, through a Medical School of the Air and for radio through a Medical Journal of the Air, were emphasized as well as making electronically conveyed medical knowledge available to the developing nations of the world.

**PORTABLE TV RENTALS** are setting the pace for Hertz Rent-All Corp.'s home goods rental business. Charges for renting 19" portable TV sets are: \$5 per week or \$15 per month. Other popular home rental items include dinnerware, linens, and chairs. The Chicago company, which is not affiliated with the car rental organization bearing the Hertz name, is reviewing franchise applications for its expansion program.

## ELECTRONIC "TRACK COACH"



An electronic pacing device is being used to train Japan's Olympic trackmen. The "Coach" runs on a rail laid along the inside of the track. Speed can be set in advance and controlled by magnetic tape or changed during the run by remote control. It is equipped with a radio receiver and loudspeaker which broadcasts instructions from a human coach supplied with a portable transmitter.



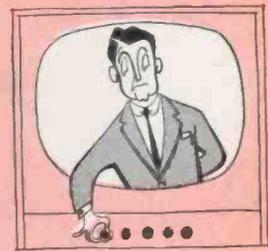
"That fluctuating pattern has almost a hypnotic effect, hasn't it, Mrs. Frimly? . . . Mrs. Frimly? . . . Mrs. Frimly? . . ."

**EDUCATIONAL TELEVISION'S** growth is described in a free-68-page pictorial report by the Ford Foundation. Today there are fifty-four non-commercial, educational TV stations in operation (the FCC has set aside 267 channels for non-commercial ETV use). The first station, KUHT, Houston, Texas, went on the air in 1953. At least 3,000,000 students in 7,500 elementary and secondary schools are presently receiving part of their regular daily instruction by TV. About 250 colleges and universities give credit courses on TV to about 250,000 students.

**ELECTRONIC COMPONENT PACKAGES** are built in reverse sequence at MIT's Lincoln Lab. The usual arrangement is to connect a few transistors, resistors, capacitors and what-have-you, and then encase them in a protective plastic block. But at Lincoln the components are first encapsulated with leads sticking through the surface. Milling the sides of the plastic block, copper plating the unit entirely, and then etching leaves the desired circuit for a subminiature communication or control system. No soldering is involved.

**TV REPAIR BY PHONE** is being instituted by General Electric to permit TV service technicians to consult with their local factory-trained color TV service experts. The color TV service plan, called "D-O-T" (Diagnosis Over Telephone), is available to all TV service personnel, independents and G-E affiliated companies alike.

# Picture .....



**PARTS-LABOR WARRANTIES EXTENDED** to five years for Sylvania Transistor radios and one year for tube radios. The new warranties, effective May 1, 1961, cover all current 1961 line radios, with few exceptions. Previous warranties were valid for only 90 days. To obtain warranty service, the customer or dealer must deliver or send the radio prepaid to the nearest Authorized Sylvania Repair Station (Sylvania has approximately 150 repair stations throughout the country). Radios will be returned to the customer with transportation prepaid.

*FIRST COMMERCIAL THERMOELECTRIC product manufactured for the American market has been introduced by the Norge Div. of Borg-Warner Corp. The new thermoelectric refrigerator-freezer combinations will be used in 500 rooms of the new Sheraton-Chicago Hotel. Production increases will make the product available for hotels, hospitals, doctors' offices and similar establishments.*

**FACTORY SALES OF TRANSISTORS** advanced again during 1960, following the yearly growth pattern characterizing the industry since beginning of production, according to the Marketing Data Dept. of EIA. A total of 127,928,586 transistors valued at \$301,432,285 were sold at the factory during the past year. The year before, 82,294,120 units were sold and revenue accrued totaled \$222,009,722.

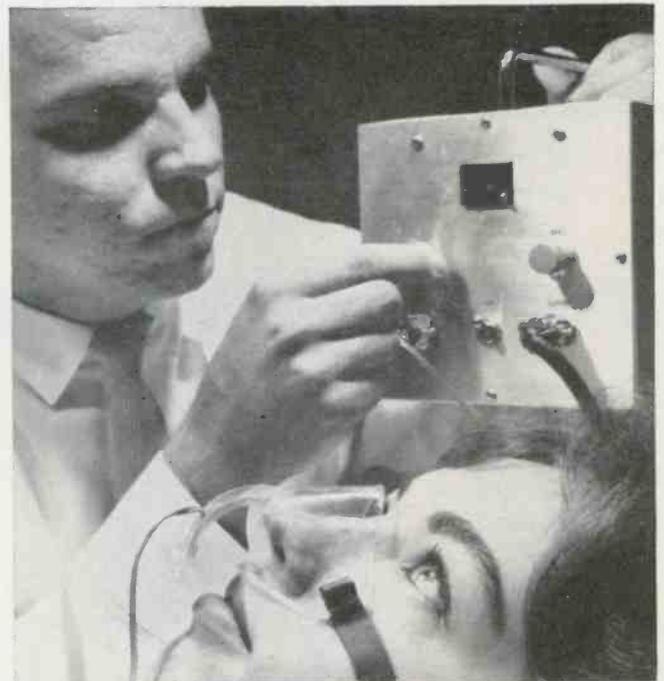
*CLOSED-CIRCUIT TV is being installed in elevators of the Ansonia Hotel, N.Y.C. to protect riders from robbery and attack. A remote-controlled, 10 pound camera is mounted on top of the elevator, with the TV lens looking through a hole in the ceiling of the car. Three monitors are within sight of the desk clerk. The device was developed by Ling Closed-Circuit Television System and installed by Space Communications Corp.*

**AIRBORNE TV INSTRUCTION**, an \$8 million dollar educational experiment for a six state mid-west area, provides for telecasts on video tape four days a week. Reports indicate that a test pattern, telecast 23,000 feet over Maryland, was clearly received 150 miles away in Philadelphia. Transmission pickup was made by engineers of Jerrold Electronics Corp. from FCC-assigned UHF channels 72 and 76. Besides participating in technical check-outs, Jerrold is also installing master antenna systems in schools.

## CALENDAR OF COMING EVENTS

- June 19-20: Second National Conference on Broadcast Television Receivers (IRE & PGBTR), O'Hare's Inn, Des Plaines, Iowa.
- June 30-July 3: "Telerama 61," Sponsored by Tri State Council of TV Service Association, Hotel Shelburne, Atlantic City, N. J.
- Aug. 22-25: Western Electronics Show & Conference (WESCON), Cow Palace, San Francisco, Calif.
- Aug. 22-Sept. 2: British National Radio & Television Show, Earls Court, London, England.
- Sept. 13-17: 1961 New York High Fidelity Music Show, New York Trade Show Building, New York, N. Y.
- Oct. 2-4: IRE Canadian Electronics Conference, Automotive Bldg., Exhibition Park, Toronto, Canada.
- Oct. 9-11: National Electronics Conference, (IRE, AIEE), International Amphitheatre, Chicago, Ill.
- Nov. 14-16: Northeast Research & Engineering Meeting (NEREM), Somerset Hotel, Boston, Mass.

## BREATH RECORDING SYSTEM



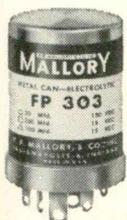
Attractive subject undergoes "breath-taking" experience in a test of an electronic medical device to be used in recovery rooms of hospitals. The instrumentation system will make it possible to automatically monitor and record patient pulse rate, blood pressure, respiration and temperature. It is being developed by Minneapolis-Honeywell's Heiland Division.

# NEW MALLORY SILICON

For top performance *every time*, use Mallory silicon rectifiers. From 50 to 600 PRV, you'll get all of the rating you pay for. You can stake your reputation on the quality of these rectifiers. They meet the standards required for military types, yet you don't have to pay premium prices. You'll get 750 ma up to +50°C and 500 ma at +85°C. Quality is

so high you won't even need equalizing resistors in most cases.

Available in parallel lead "T" type and axial lead "A" type from your nearest Mallory distributor, five to a pack, in a reuseable jewel box, on a handy file card.



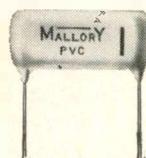
#### ELECTROLYTIC CAPACITORS

Famous FP-WP metal can types, reliable TC tubulars, and tiny TT tubulars.



#### VIBRATORS

Sure-start Gold Label® and every other type for auto or mobile communications.



#### PVC CAPACITORS

Premium quality Mylar\* Capacitors in handy zip-lip package.

\*Reg. Trademark E. I. du Pont de Nemours, Inc.



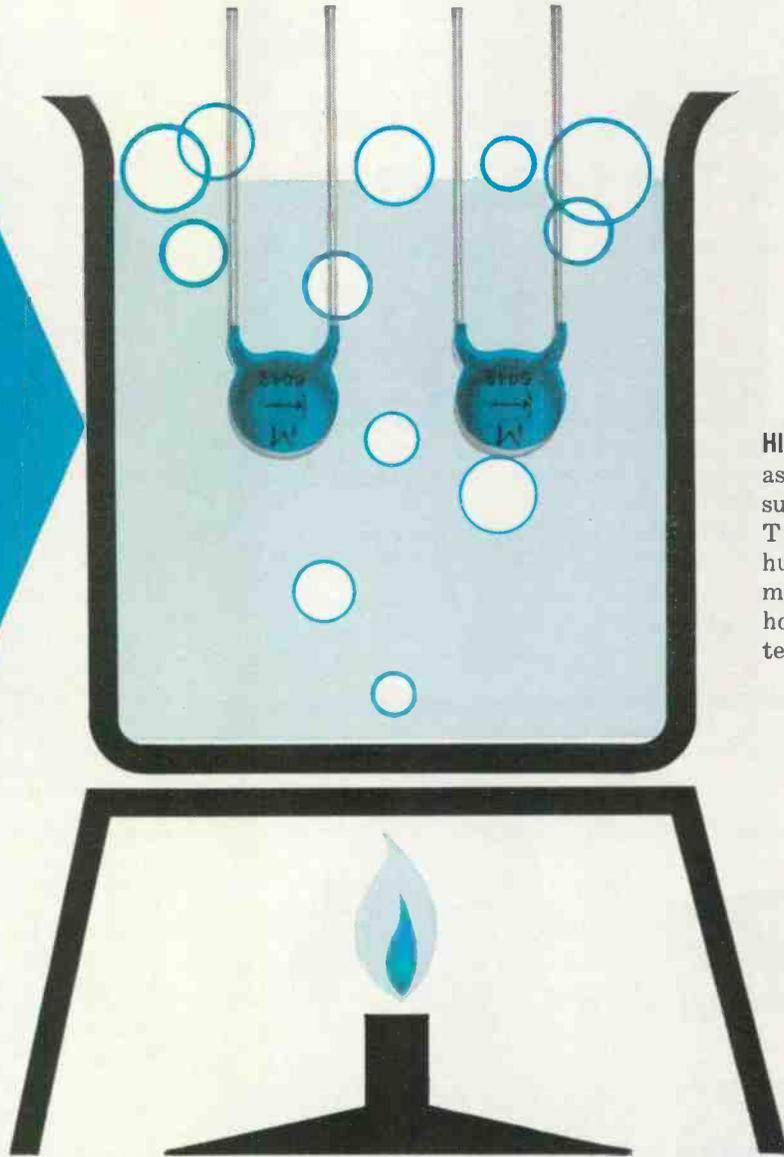
#### STA-LOC® CONTROLS\*\*

30 second delivery on every imaginable control.

\*\*U.S. Patent 2,958,838

# RECTIFIERS STOP CALL-BACKS

## ... premium quality at no extra cost



**HIGH HUMIDITY PROTECTION** is assured by the unique encapsulating material. The Type T withstands four times the humidity cycling required by military tests . . . takes 500-hour boiling water immersion test without failure.



### DISCAPS®

The standard of the ceramic capacitor field.

®Trademark Radio Materials Company, a Mallory Division



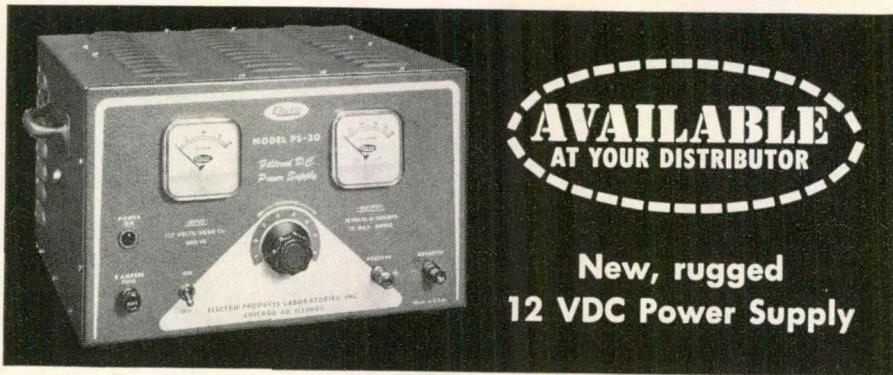
### MERCURY BATTERIES

Get the details on the New Mallory Battery Program today.

Distributor Division, Indianapolis 6, Indiana



In Canada: A. C. Simmonds & Sons, Ltd., Toronto 7, Ontario



**AVAILABLE  
AT YOUR DISTRIBUTOR**

**New, rugged  
12 VDC Power Supply**

## 30 A. OUTPUT at 1% AC RIPPLE

... up to 50 Amps. for short periods

Though low in cost, the Electro "PS-30" offers many advantages found only in higher priced power supplies.

**HEAVY DUTY SERVICE** . . . special circuitry and rugged components assure continuous, 24-hour-a-day performance at the rated 30 amperes and enable it to withstand periodic overloads up to 50 amperes. Patented EPL conduction cooling provides a bonus margin of safety and longer life.

**VARIABLE VOLTAGE** . . . although nominally rated at 12 VDC, an 8-position selector switch permits voltage adjustment over a broad range. 0-20 V. voltmeter and 0-50 A. ammeter show output at all times.

**DESIGNED FOR:** communication equipment servicing... base station operation... laboratory applications... production testing... manufacturing uses.



Write for New Catalog PS-561 giving all advantages

**ELECTRO PRODUCTS LABORATORIES**  
4501-V Ravenswood, Chicago 40, Ill., Longbeach 1-1707  
Canada: Atlas Radio Ltd., Toronto 1239

For more data, circle 6-18-1 on coupon, p. 68

Cat. No. 52

**NEW!**

**Built To  
Stay Up!**

## STRAP-LESS Chimney Mount

- Installs In Seconds
- No Chimney Too Large
- Can't Rust Away
- Up To 1,500 lbs Clamping Pressure

DEALER NET PRICE \$1.25 Write for literature. Ask for bulletin T-6

**R-Columbia Products Co., Inc.**  
2008 St. Johns Ave. Highland Park, Illinois

## News of the Industry

**WALDOM ELECTRONICS, INC.**, names HARRIS PRINCE as Vice President, Sales.

**STANCOR ELECTRONICS INC.** is the new name for CHICAGO STANDARD TRANSFORMER CORP.

**AMERICAN TELEVISION & RADIO CO.** has changed its corporate name to ATR ELECTRONICS, INC.

**MERIT COIL & TRANSFORMER** is showing how turnabout is fair play. The company just completed the largest single export order in its history, destined for the Far East.

**CHANNEL MASTER CORP.** is conducting a Coast-to-Coast series of clinics to help dealers provide servicing of the firm's imported transistor radios.

**LUXO LAMP** appointments: ROBERT RUBIN, Manager of the Western Division; and SAM F. BLAKE, Jr., Vice President, Eastern Sales.

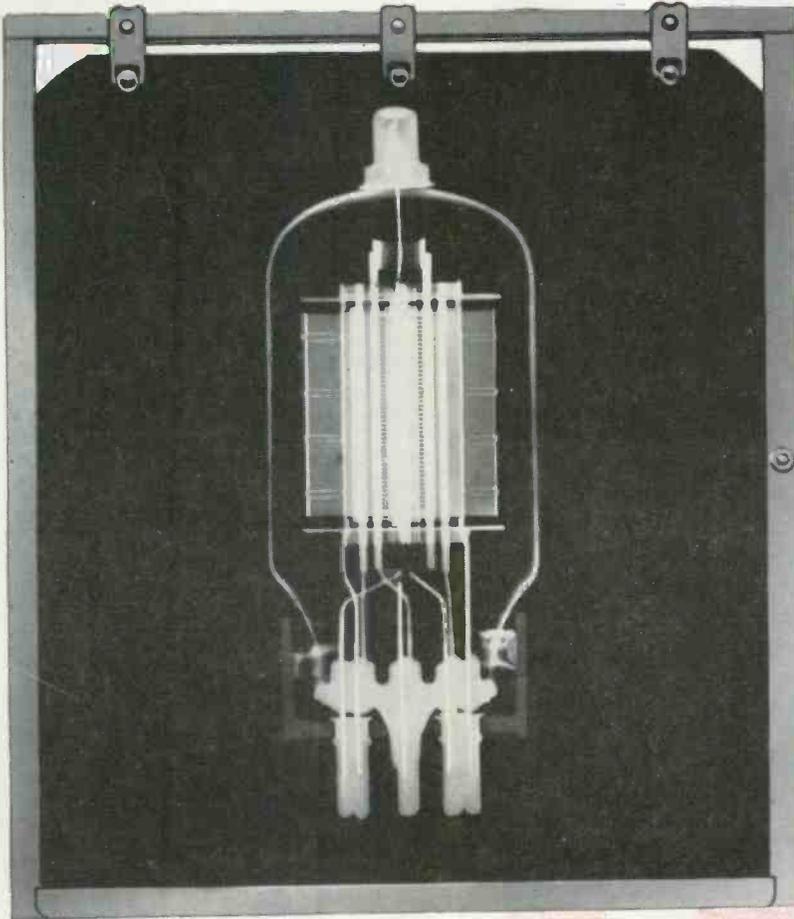
**SYLVANIA ELECTRIC PRODUCTS, INC.** has begun sampling television receiver manufacturers with 19-inch and 23-inch television picture tubes using a new "Velvetone" anti-reflection safety glass bonded to the tube faceplate.

**WESTINGHOUSE ELECTRIC CORP.** appointments: PAUL SCHRIEBER, New Orleans District Sales Manager, radios and phonographs; ROBERT E. BARNES, Pittsburgh Area District Sales Representative, electronic tubes; and JOHN F. LEAHY, added to midwest regional sales staff, electronic tube division in Detroit.

(Continued on page 20)



"I think I'll like working here. One other thing, what about night calls?"



## HORIZONTAL DEFLECTION TUBE PROGNOSIS INDICATES STABLE EMISSION OVER LONG LIFE SPAN

Prolonged observation of Tung-Sol horizontal deflection tubes indicates a consistent behavior pattern: virtual immunity to chronic deflection tube illnesses. They exhibit a remarkable ability to withstand the high temperatures and high pulse voltages encountered in TV deflection service, which too frequently have a fatal effect on tubes of less hardy ancestry. Diagnosis shows unusual physical fortitude. The plate design, with special large area cooling fins plus high conductivity core aluminum-clad steel material, is a combination of ingredients that safeguards against "hot-spotitis".

Tung-Sol "circuit design"\* approach has eliminated Barkhausen oscillations and snivets. Qualified specialists agree that continued use of Tung-Sol deflection tubes is certain to result in an epidemic of successful service work of very pleasing proportions.

### PRESCRIPTION FOR PROFIT

When diagnosis of your customer's TV set reveals an ailing horizontal deflection tube, it's best to prescribe Tung-Sol. Customer satisfaction with the results is certain to be contagious. These are some of the more popular Tung-Sol horizontal deflection tubes:

*\*Designed by Tung-Sol to fit circuits already in use in the market.*

6/12/17/25 BQ6GTB	6/12/17 DQ6B
6/12/17/25 CU6	6/25 DN6
6/12/25 BQ6GA	6CD6GA
25CD6GB	



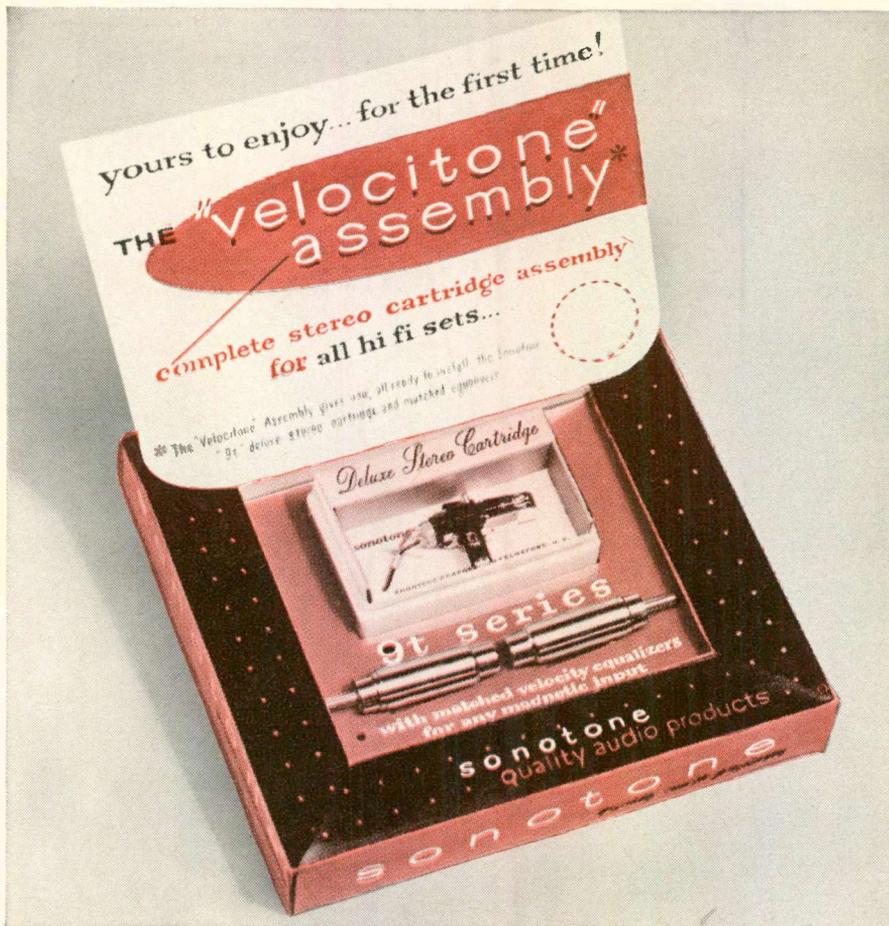
the first name to ask for when ordering



# TUNG-SOL®

## DEFLECTION TUBES

TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.



## No stereo cartridge in the world outperforms the *Sonotone Ceramic "Velocitone"*

*Listen!...* with any magnetic you sell today—at any price. Then replace it directly in any component system with Sonotone's new "VELOCITONE" STEREO CERAMIC CARTRIDGE ASSEMBLY. Listen again! We challenge you to tell the difference. Experts have tried... in dozens of A-B listening tests. And, in every single one, Sonotone's "VELOCITONE" performed as well as or better than the world's best magnetic.

*Listen!...* perfectly flat response in the extreme highs and lows (better than many of the largest-selling magnetics).

*Listen!...* excellent channel separation—sharp, crisp definition.

*Listen!...* highest compliance—considerably superior tracking ability.

*Listen!...* absolutely no magnetic hum—quick, easy, direct attachment to any magnetic inputs.

*Listen!...* remarkable performance characteristics unexcelled anywhere. (Write Sonotone Corporation for specifications.)

Now listen to the price. Only \$23.50... about one-half the price of a good stereo magnetic cartridge. Stock and sell Sonotone's "VELOCITONE"... the stereo ceramic cartridge system that can't be outperformed by any magnetic, regardless of price.

# Sonotone<sup>®</sup>

ELECTRONIC APPLICATIONS DIVISION, ELMSFORD, N. Y., DEPT. C9-61  
IN CANADA, CONTACT ATLAS RADIO CORP., LTD., TORONTO

LEADING MAKERS OF CARTRIDGES • SPEAKERS • TAPE HEADS • MIKES • ELECTRONIC TUBES • BATTERIES

(Continued from page 18)

INTERNATIONAL RESISTANCE CO. names J. PENN RUTHERFOORD as Executive Vice President.

ELCO ELECTRONICS, INC., Indiana phonograph manufacturer, has been acquired by TELEX, INC. of St. Paul, Minn.

EMPIRE STATE ELECTRONICS, INC., 139-40 Hillside Ave., Jamaica, N. Y., has been appointed authorized service agency for the NATIONAL RADIO CO., E. F. JOHNSON CO., and ACRO ELECTRONIC PRODUCTS CO.

SENCORE, INC. reports that more than 500 service clinics have been conducted in the U. S. and Canada during the past two years. Latest two clinics: one, in cooperation with MELVIN ELECTRONICS, Oak Park, Ill.; and one, in cooperation with SLATE & CO., Mount Vernon, N. Y.

SECO ELECTRONICS, INC. reports that replacement panels, listing the newest 1961 domestic tubes, have been issued for the GCT-8 Grid Circuit Tube Tester. Separate list of industrial and foreign tube types with test settings for use with both the GCT-8 and GCT-5 Tester, also available. Newly appointed: RICHARD O. AHLFORS, as national field sales representative.

RAYTHEON announces a new consumer folder to help "rocket" tube sales. It describes a 16-piece toy missile base that fires missiles from two launching sides and also informs customers of the high reliability built into the firm's tubes, which are used in 23 U.S. missiles. Also newly appointed: JAMES W. PROCTOR, Jr., as California District Manager, Distributor Products Division.

## Reps & Distributors

RADIO SPECIALTIES DISTRIBUTING CO. played host to Detroit area servicemen recently at a SENCORE Service Clinic.

STANDARD RECTIFIER CORP. announces the appointment of two additional sales representatives: ALEX CORBETT, JR., ST. PETERSBURG, FLA.; and ENGINEERING SERVICES CO., St. Louis, Mo.

ERA (Electronic Representatives Association) is scheduling three Business Management Institutes for members in 1961: June 11-16, University of Illinois, Champaign, Ill.; June 25-30, American University, Washington, D. C.; and, tentatively, Sept. 12-16, Stanford University, Palo Alto, Calif.

(Continued on page 22)

# TUBES



# ARRIVE

# SAME DAY! DAY!



Shipping parts or entire sound units? Remember, speedy shipment of delicate goods is a specialty of Greyhound Package Express. Shipments going hundreds of miles can arrive *the same day they're sent!*

Whatever the destination of your shipment, chances are, a Greyhound is going there anyway... *right to the center of town.* Greyhound travels *over a million miles a day!* No other public transportation goes to so many places—so often.

You can ship anytime. Your packages go on regular Greyhound passenger buses. Greyhound Package Express operates twenty-four hours a day... *seven days a week...including weekends and holidays.* What's more, you can send C.O.D., Collect, Prepaid...or open a charge account.

**CALL YOUR LOCAL GREYHOUND  
BUS TERMINAL TODAY...OR MAIL  
THIS CONVENIENT COUPON TO:**

**GREYHOUND PACKAGE EXPRESS**  
Dept. F-17, 140 S. Dearborn St., Chicago 3, Illinois

Gentlemen: Please send us complete information on Greyhound Package Express service...including rates and routes. We understand that our company assumes no cost or obligation.

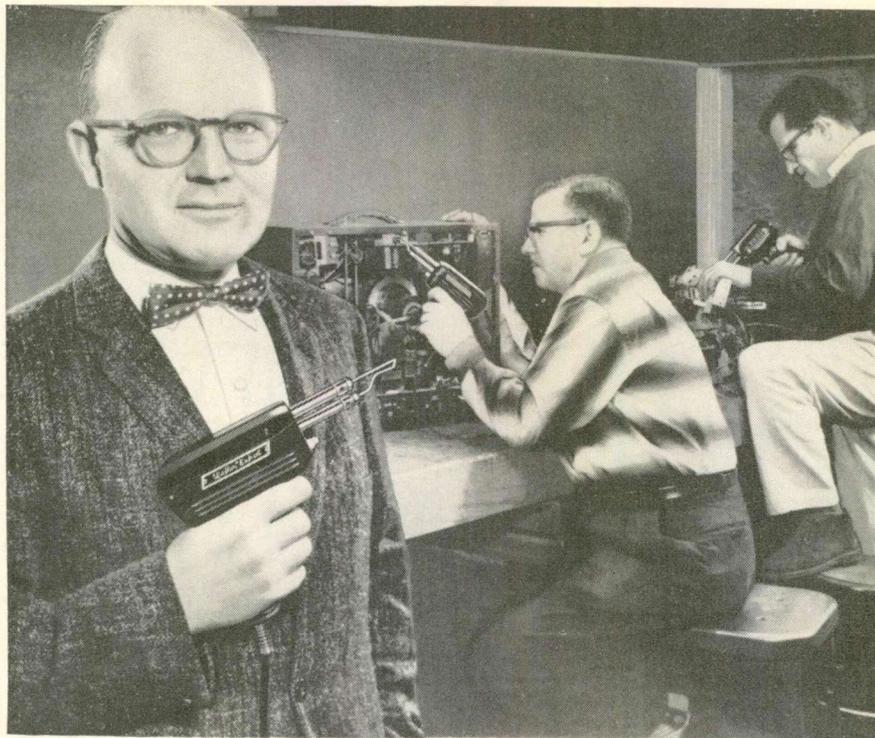
NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_ PHONE \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

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



MR. RAY ROUGHTON, TECHNICAL SUPERVISOR OF UNIVERSAL TELEVISION CO., SAYS:

**“Universal TV does 200 service jobs a day  
... faster and more efficiently with**

# Weller® DUAL HEAT SOLDERING GUNS”

Universal Television Company of Los Angeles is one of the nation's largest contract service organizations. They have 25 servicemen—each with his own Weller Dual Heat Soldering Gun. Why *Weller Dual Heat*? For *speed and flexibility!* Although fast heat is the most important benefit, Dual Heat runs a close second, according to Mr. Roughton. The 2 trigger positions permit their servicemen to switch instantly to the low heat required for printed circuit soldering—and the high heat needed for conventional soldering. Result? Faster servicing and more reliable soldered connections. Don't settle for less! Buy Weller—the original Soldering Gun.



Model 8200K  
Dual Heat Gun  
90/125 Watts  
**\$795**  
list



Model D440  
Dual Heat Gun  
100/150 Watts  
**\$1295**  
list



Model D550  
Dual Heat Gun  
200/275 Watts  
**\$1625**  
list

Available at Electronic Parts Distributors

**WELLER ELECTRIC CORP. EASTON, PA.**

(Continued from page 20)

D. R. BITTAN CO. announces the appointment of DAN LEIB as Sales Engineer to cover the Northern New Jersey territory, working out of Hackensack, N. J.

MILO ELECTRONICS CORP. has opened a sales office at 5770 N. Rosemeade Blvd., Temple City, Calif., under the supervision of IVAN NEUFELD.

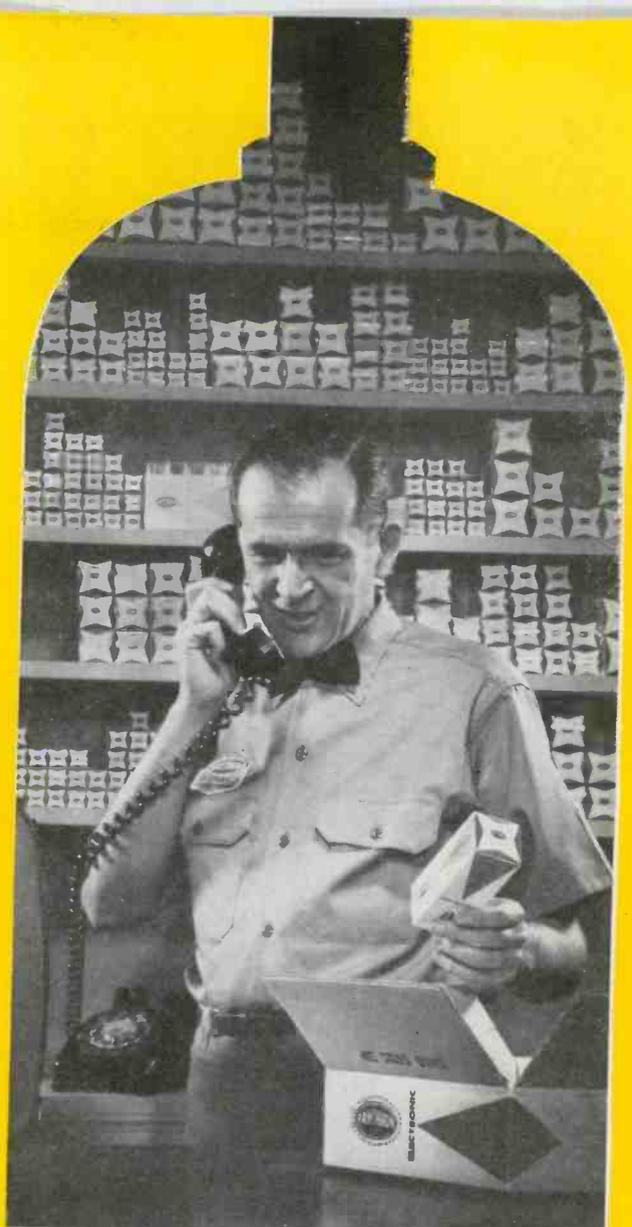
ASTREX, INC. reports the acquisition of RADIO ELECTRIC SERVICE CO. OF DELAWARE, Wilmington, Dela.; RADIO ELECTRIC SERVICE CO. OF YORK, York, Pa.; and RESCO INTERNATIONAL CORP., Philadelphia, Pa.

SYLVANIA ELECTRIC PRODUCTS INC. reports the following distributor appointments: THOMPSON & HAMILTON, INC., Columbus, Ohio, for radio and stereo hi-fi phonographs; and MIDWEST SALES & SERVICE, INC., South Bend, Ind., for TV, radio and phonographs.

ARCO ELECTRONICS, INC. announces the appointment of the following distributors to handle the DRESSER ELECTRONICS HST transformer line: KANN-ELLERT, Baltimore, Md.; LAFAYETTE RADIO, Boston, Mass.; FEDERATED PURCHASER, Mountainside, N. J.; ARROW ELECTRONICS, Mineola, L. I., N. Y.; HARVEY RADIO, New York, N. Y.; LAFAYETTE RADIO, New York, N. Y.; TERMINAL-HUDSON, New York, N. Y.; D&H DISTRIBUTING, Harrisburg, Pa.; Also, ELECTRO SONIC SUPPLY, Toronto, Ontario, Canada.

### Sylvania TUBES

Five new receiving tubes for TV receiver applications are: Type 4GS8/4BU8, 9-pin miniature dual pentode used as a sync separator, sync clipper and age in series string TV receivers. 6DT6A, 7-pin miniature pentode used as an AM-FM detector, limiter or amplifier. 6HJ8, 9-pin miniature diode pentode used as an i-f amplifier and video detector. 6HS8, 9-pin miniature twin pentode used as a combined sync-age tube. 6EW7, double triode used as a vertical deflection oscillator and amplifier. Also 12FQ8, 9-pin miniature twin double plate triode used as a harmonic generator in electronic organs; and 14GT8, 9-pin miniature duplex diode triode used as an FM detector and a-f voltage amplifier in home radios. Sylvania Electric Products, Inc., 730 Third Ave., New York 17, N. Y.



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For more data, circle 6-23-1 on coupon, p. 68

# RCA MARK VII RADIO-PHONE



**"TOP-OF-THE-LINE"  
CITIZENS' BAND  
2-WAY RADIO  
EQUIPMENT—  
GIVES YOU  
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ADDITIONAL SALES OUTLETS are now being considered. Sell the Citizens' Band favorite! Write for further details now!



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA

For more data, circle 6-24-1 on coupon, p. 68



MARANTZ appoints Robert Strome as Sales Manager.

BELL SOUND reports the resignation of Earl V. Sala, Jr. as General Sales Manager.

DUOTONE announces a new record dust brush-groove selector device that fastens to the tone arm. Lists at 98¢.

EICO announces a luggage-type case for their Model RP-100 4-track tape deck; priced at \$29.95.

BEN WOLFE RADIO & ELECTRONICS reports they are now distributing nationally the British-made BSR automatic record changers.

SWITCHCRAFT issues free Reference Guide to select proper Switchcraft connectors for all types of tape recorders. Available as 8½ x 11 reference page or wall chart.

DYNACO distributes the TA-16 professional tone arm and cartridge manufactured by Bang & Olufsen of Denmark. Features flat response from 30-15,000 cps within 2 db.

ELECTRO-VOICE announces creative merchandising award program for E-V hi-fi dealers. Merchandising ideas that have paid off, however, are not limited to E-V products.

GENERAL DYNAMICS/ELECTRONICS introduces the "Young America" series of Stromberg-Carlson stereo consoles from approximately \$200-500, augmenting the existing "Integrity" series.

BENJAMIN ELECTRONIC SOUND announces the Miracord Studio-H, fully automatic turntable with hysteresis motor, operating at all four speeds. Studio-H is priced at \$99.50, Studio model @ \$79.95.

PICKERING announces that owners of the Stanton Stereo Fluxvalve can get a free Model S3827 2.7 mil V-Guard Stylus Assembly to play 78 rpm records in the new V-Guard Playmates stylus pack.

LOWELL MFG. introduces Model RJA loudspeaker baffle to accommodate any of three speaker sizes—RJA6 for 6", RJA7 for 7", and RJA8 for 8". Also reported is Model MT8 baffle designed for an 8" speaker. All are for commercial applications.

NORTH AMERICAN PHILIPS releases the Norelco "Continental" 200 (Model EL3541) tape recorder operating at 7½ ips. It features frequency response of 50-14,000 cycles, separate four track heads (.0001 inch gap). Unit records and plays back on each track; stereo playback through external hi-fi.

ROBINS INDUSTRIES publishes 4-page illustrated brochure describing their line of record and tape-care accessories.

AMPLIFIER CORP. publishes specs and prices for 20 models of endless-loop Magnematic Bookshelf Recorders.



### TVL TWIST-LOK® CAPACITORS

These 'lytics take on the toughest TV and radio duty, give maximum trouble-free service, *without HUMMM!* They are dependable at extremely high and low temperatures. Cathodes are etched to meet the needs of high ripple currents, high surge voltages.



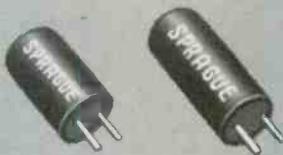
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These single-ended molded tubulars are the ideal replacement for units of this type found on printed wiring boards. Keyed terminals assure fast manual mounting and correct polarity. Resin end fill protects against drying of electrolyte or entrance of external moisture.



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The printed circuit version of the Twist-Lok. Universal base replaces any of the printed circuit 'lytics in use today. No makeshift mounting adapters to damage capacitor or add extra height... no possibility of high resistance contacts.

## EVERY 'LYTIC YOU NEED...

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Shown here are the more popular of Sprague's big family of Electrolytic Capacitors, the broadest in the industry. Other types include Metal-encased Screwbase; Plastic-encased High-MF; Metal-encased Octal-base; Ultra-low leakage Photoflash. All are listed and described in Sprague's NEW Catalog C-614. Get your copy from any Sprague distributor, or write Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

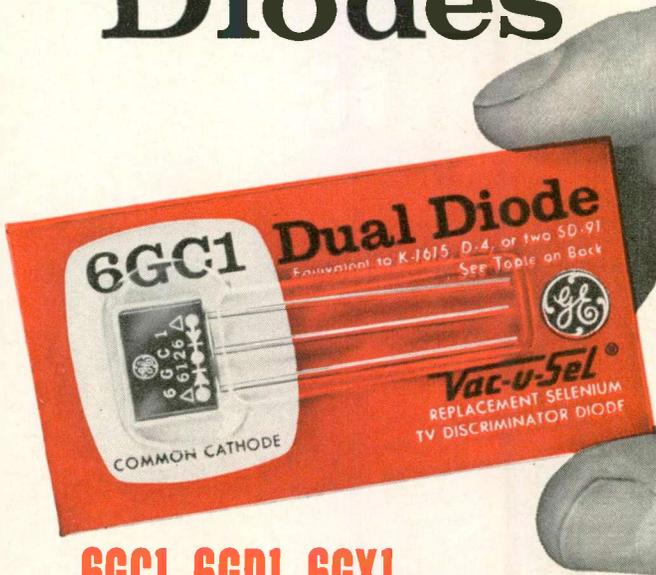
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*Progress Is Our Most Important Product*

# GENERAL ELECTRIC

For more data, circle 6-24-1 on coupon, p. 68

(Continued from page 10)

these new ones with the old ones, or as many as you can without making any difference in the picture or sound, so he can see what he has accomplished. (This usually cures him.) (5) Stress importance of set adjustment he gets with service call and that otherwise he might have to be satisfied with an incorrectly adjusted set. (6) Above all, make sure the controls, tuner, and glass have been cleaned, if need be, before you leave. This will usually give him a good taste in his mouth as far as TV servicemen are concerned. The object of all this is to discourage drug store tube testing by explaining to the layman so he can understand it and stick to TV service shops for repairs. Remember, sooner or later all do-it-yourselfers get stuck. Strike when you have the advantage or you may never have it again.

RICHARD NOWAK

Monte's TV  
Maumee, Ohio

### Photography Computer

Editor, ELECTRONIC TECHNICIAN:

In your March article, "Electronics in Photography," the author mentions an electronic computer used to control enlarger exposure. Who made this computer?

OREN KING

Minneapolis, Minn.

• *Electronic photographer Jacques Saphier informs us that the computer was designed and manufactured by Anton Martin Feller, Box 563, R.D. #4, New Brunswick, N.J.—Ed.*

### Industry Problems

Editor, ELECTRONIC TECHNICIAN

May I add my thanks to the many you have already received for your efforts in seeking a solution to the problem confronting all legitimate service dealers and distributors. As a service dealer for the past 12 years, I find my position getting worse and worse. I have become guilty of cutting my inventory to the minimum simply because in order for me to be able to sell a receiving tube to a consumer, I must discount it so low that it does not pay me to carry any tubes that may not move off the shelves fast enough. Because of this lack of store tube sales, I have found it necessary to increase my service charges and my shop labor charges in order to still stay in business. This makes the service customer pay for the do-it-yourselfer which is unfair, but there is no other alternative.

I have spoken to distributors who sell to anyone and their reasons seem to be that the non-service dealer customer pays cash. They claim that the service dealer continues to purchase parts on credit and when he is told his credit is being stopped until he makes his payments, he goes to another distributor. It is unfortunate for the distributors that they do not work together so that such abuses can be stopped. I have never been able to figure out how a dealer that charges as much as \$20.00 for a repair that may have used a 20¢ condenser does not have enough money left to pay his bills.

I believe the solution to this problem could be worked out in the following manner: distributors shall form a credit clearing house in their area and sell only on a cash basis to any firm that has not paid their bills on time, sell only to established business firms, refer all retail trade to a service dealer in their area. Service dealers shall purchase parts only from distributors who do not sell retail, and pay their bills promptly.

JACK UNTERWEISER

Empire Electronics  
Massapequa, N. Y.

Correspondence from readers is always welcome. Name and address, which must accompany letters selected by the editor for publication, will be withheld on request. Anonymous letters go right into the wastepaper basket.

# 72



## GENERAL CEMENT

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for a limited time your distributor will have **GC SUPER FREEZE MIST No. 8568**

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Bonds almost all surfaces. No. 43-2 2 oz. NET \$0.53



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Prevents corona shorts with a puff. No. 50-12 16 oz. NET \$2.18



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For transistor heat transfer. No. 8101 1 oz. NET \$2.10



**GC MAG-NETIK RECORDING HEAD CLEANER**

Removes oxide from tape heads. No. 53-2 2 oz. NET \$0.97



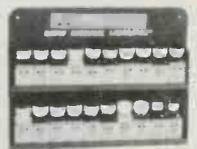
**GC SPRA-KLEEN**

Stop radio and TV control noises. No. 8666 6 oz. NET \$1.00



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New miracle adhesive bonds anything. No. 346 3 oz. NET \$1.95



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**GC DE-OX-ID SPRAY**

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**GC CREME-O-WAX POLISH**

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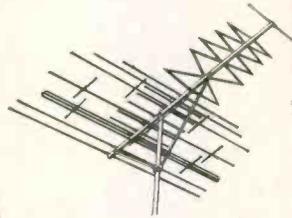
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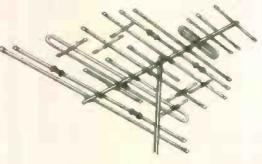
HI-FI HELIXES			
Silver Aluminum	Gold Anodized		
MX211	SX711	AX211	AX711
JX311	SX711S	AX311	AX911
RX511	PX911	AX511	AX1111
	VX1111		

HI-FI FIREBALLS			
Silver Aluminum	Gold Anodized		
FB490	FB510	AB490	AB510
FB500	FB520	AB500	AB520

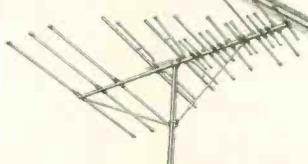
HI-FI BANSHEES			
Silver Aluminum	Gold Anodized		
<b>HEAVY DUTY DIPOLES</b>			
B300	BS300	AN300	ANS300
B400	BS400	AN400	ANS400
<b>PREASSEMBLED DIPOLES</b>			
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You win *both* ways when you buy a JFD Hi-Fi Helix, Fireball or Banshee. You get the TV antenna replacement that insures satisfaction—plus *free* aluminum furniture for your happier relaxation.

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\*Expires July 15, 1961

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## *Distribution Practices and Legal Woes*

We've observed for some time that the TV dealer-distributor hassle over retail parts sales was bound to end in a nasty legal fight. Now it's happened.

The Television Service Association of Delaware Valley, which covers the Philadelphia area, has been supporting a campaign against the practice of distributor sales to the public. TSADV members have been urging service dealers to patronize only parts distributors who sell exclusively wholesale to the trade. An agreement was reached between TSADV representatives and certain distributors whereby the latter would stop retail sales and promotion.

Then the Federal Trade Commission set up an investigation to determine whether an illegal boycott was in effect, and if a cease and desist order should be issued. Possibly the investigation was caused by the complaints of unhappy distributors.

In any case, the FTC panel will also hear charges of unfair business practices leveled at the distributors. No doubt various records will be subpoenaed and industry people will have to testify.

From the distributor's viewpoint, a businessman has a right to sell everyone coming into his store. He believes that a concerted effort to boycott him is illegal.

From the service dealer's viewpoint, there is no reason to patronize a supplier who undercuts him by selling directly to the public. Since the distributor buys and sells at a lower price, the service dealer views him as a retailer who gets an illegal preferential discount.

To carry the battle still further, TSADV has complained to the State Tax Office that distributors who sell to people without sales tax numbers are cheating the state out of tax revenue. Consequently, state tax auditors are reported to be checking the books of several distributors.

What a mess!

With the electronic service industry trying to cope with a load of problems—capitalization, imports, fast changing technology, and many others—it's a shame to see both sides wasting their energies on a family fight.

We can not help but sympathize with the service dealers' position. We know how violently distributors react when manufacturers do anything which even smacks of bypassing them. Dealers can't be expected to take cut-throat distribution lying down either.

TV service is truly small business. Shop owners frequently work long hours, evenings and weekends. We hope that the FTC will recognize that service dealers are not fighting for just another few dollars. Their survival is at stake.

We hope that more distributors will cooperate with dealers. Those who don't should not expect patronage from the very dealers they are deliberately bypassing.

## *Readers Become Authors*

The Shop Hints and Tough Dogs we publish every month are, for the most part, conceived and authored by practicing service technicians. As a matter of fact, some of the very best major technical articles are prepared not by professional writers, but by people who make their living maintaining electronic equipment.

Perhaps you are interested in earning extra money and professional recognition by writing. The editors work very closely with reader-authors, and take care of polishing the article. From the author, we want informative facts and practical data based on actual experience.

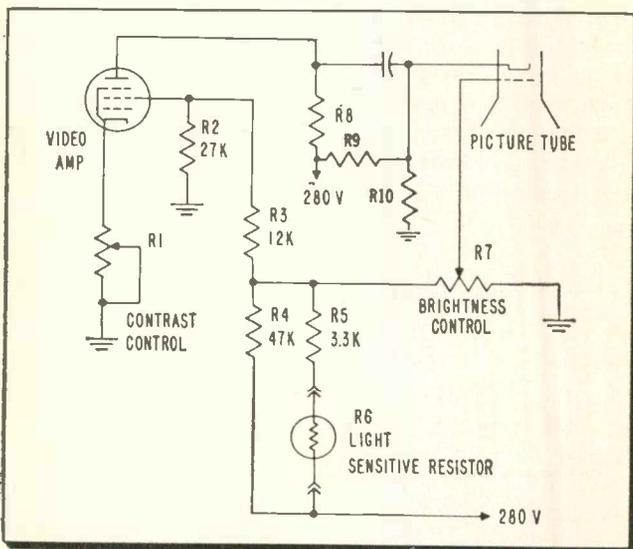
If you are interested, prepare an outline on what you want to write about and send it to us. We will send you our Author's Guide and let you know what the prospects are for publishing your suggested article.

# TV MANUFACTURERS

## MAGNAVOX

### TV Chassis 30, 33 & 35 Series— Automatic Brightness-Contrast Control

An automatic brightness and contrast control is being used in the 30 and 33 Series chassis, and will shortly be introduced in the 35 Series. The circuit employs a photoconductive cell for automatically maintaining a relative brightness and contrast ratio when light level changes occur in the viewing room.



Schematic of automatic brightness-contrast control of Magnavox TV chassis 30, 33 & 35, shows photo conductive cell used.

The cadmium sulfide control cell, called a light dependent resistor (LDR), may vary in resistance from 1000 ohms under bright light to as much as several megohms under low light conditions. The circuit employs the cell's characteristic to simultaneously adjust the video amplifier's screen grid voltage and the CRT bias, thus obtaining both contrast and brightness variation. The LDR is attached to a cabinet mounted bracket behind a small window in the lower front portion of the cabinet.

When installing one of these sets the technician should adjust brightness and contrast controls under lighting conditions specified by the customer as "nor-

mal." Little trouble is expected with the LDR. If it should open, manual adjustment of brightness and contrast is still possible.

## MOTOROLA

### Chassis TS-432—Production Changes

(See ET Circuit Digest #558, 9/60)

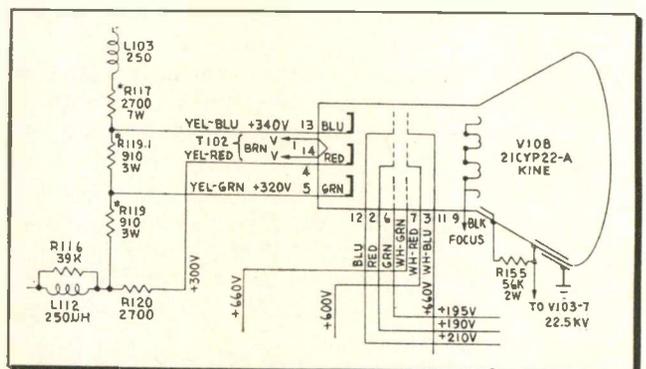
. . . code C-05 and above eliminate delayed agc action (when switching from suburban to fringe) by soldering terminal #9 of the horizontal output transformer to B + +.

. . . code C-07 has the 4.7K resistor in the agc gate circuit removed and a jumper wire is found in its place. The resistor in the emitter circuit of TR-49 (R116) has been changed from 4.7K to 6.8K.

## PACKARD BELL

### TV Chassis 98CC-3 & 98CC-4—New Color CRT

A new color picture tube, type 21FBP22, may be used in place of the 21CYP22A when tube replacement is necessary. When replacing the old tube with the newer type, the following changes must be made: Remove the 56K, 2 watt resistor and spring from the HV anode lead. Connect the green and blue cathode



Packard Bell's 21CYP22A color picture tube can be replaced with a new type by making circuit changes described here.

leads (color coded yellow and green and yellow and blue respectively), together with the red cathode lead (color coded yellow and red). Replace the 2700 ohms 1/2 watt resistor (R-120) from the red cathode circuit and replace with a jumper wire. Reset the screen and background controls for proper tracking, using normal procedures. The new tube will give more brightness and greater color gain.

# TECHNICAL DIGEST

## PHILCO

### Chassis 11H25—Run 4 Production Change (See ET Circuit Digest #613 1/61)

To provide increased height range the following production change was made: resistor R35, 2.2 meg, which is in series with the height control, was replaced by a 1.8 meg resistor. This change will be identified by a yellow dot on the deflection panel. Run 3 can be interchanged with Run 4. The chassis wiring assembly in either case will be identified as Run 3.

## RCA

### Remote Control TV—Insensitivity

When a transducer is replaced in a remote control instrument it is important that it be installed exactly as it was originally.

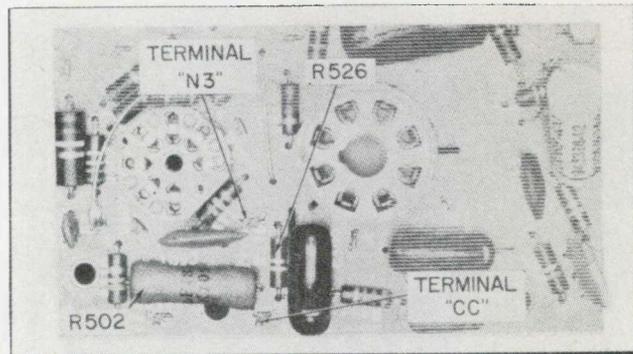
In investigating reports of insensitivity of remote controls after a transducer had been replaced, it was found in several instances that the fiber disc covering the back of the transducer was missing and/or that the soft rubber washer inside of the metal cover and/or the rubber pad on the outside were not in their proper places.

All mounting parts for a transducer have a particular function to perform and should be reassembled in their proper places to insure correct operation.

### KCS-132 Chassis—Kinescope Arc-Over

If a momentary arc-over occurs in the CRT, a high voltage pulse can create an arc-over between R526 (terminal CC) and R502 (terminal N3). This arc-over introduces a carbonized path on the printed board between these two connecting points. If the carbonized path is not cleared, future arc-overs may result in CRT burnout.

To prevent arc-over the following steps should be taken: Remove R502 and relocate it between terminals N3 and Z. (Do not remove jumper, long end of R502, between terminals Z and FF). Then, remove approximately  $\frac{1}{2}$ " of the copper strip (N3) adjacent to terminal CC, to which one end of R502 is connected. Do not remove the connection for R526. Bend terminal CC down toward the metal chassis to form a gap of 0.030" between the terminal lug and chassis ground.



Carbonized arc-over path on printed board between terminals CC and N3 can result in burned out CRT if not eliminated.

Bend terminal lug 4 of R149 (tiepoint on focus control for R148 and the lead from pin 6 of the CRT 23AWP4), toward the focus control case to form a 0.020" gap between the terminal lug and ground (control case). This change has been incorporated in production.

## WEBCOR

### Models 2001, 2005 thru 9, 2103, 2107, 2150— Tape Pressure Pad Change

Pressure pads on late production versions of these tape recorders have been replaced with a hard chrome surface to prevent tape squeal. Pressure arms with this improved surface are available for early production tape recorders. The part numbers of the affected parts are as follows:

Early Models		
Ref #	Part #	Description
1	11x2265	Pressure Pad and Arm Assembly
1A	23P014	Pressure Pad
Late Models		
1	45P2838	Pressure Arm
1A	Pressure Pad	OBSOLETE

When installing the new pressure arm on the models listed, place an additional vibration damping pad (23P129) on the top plate, directly over the erase head assembly. Note that the pressure pad is now obsolete so that the entire arm should be replaced to insure future reliability.

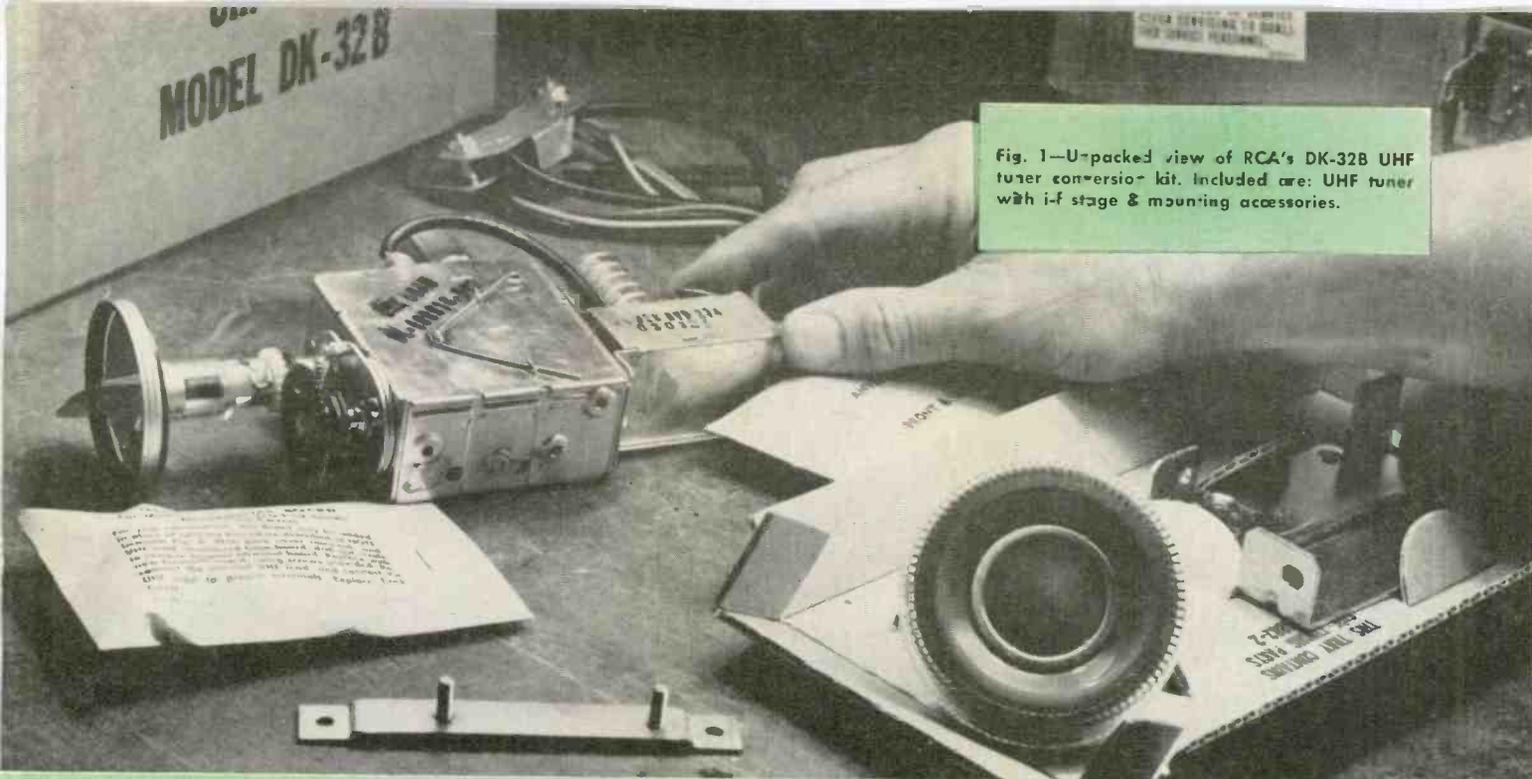


Fig. 1—Unpacked view of RCA's DK-32B UHF tuner conversion kit. Included are: UHF tuner with i-f stage & mounting accessories.

# UHF-TV Tuner Installation?

HOMER L. DAVIDSON

• UHF TV bands provide a major portion of television reception in many areas. Viewers in these areas invariably purchase a TV receiver with a VHF-UHF tuner. VHF-area viewers, however, will usually purchase TV sets with VHF tuners, since there is frequently insufficient UHF broadcasts to warrant the extra expense. But new UHF bands sometimes open in VHF areas. Accordingly, "VHF only" set owners are unprepared for the added entertainment made available on these channels. This is where the TV technician can offer customers the benefit of his knowledge and experience.

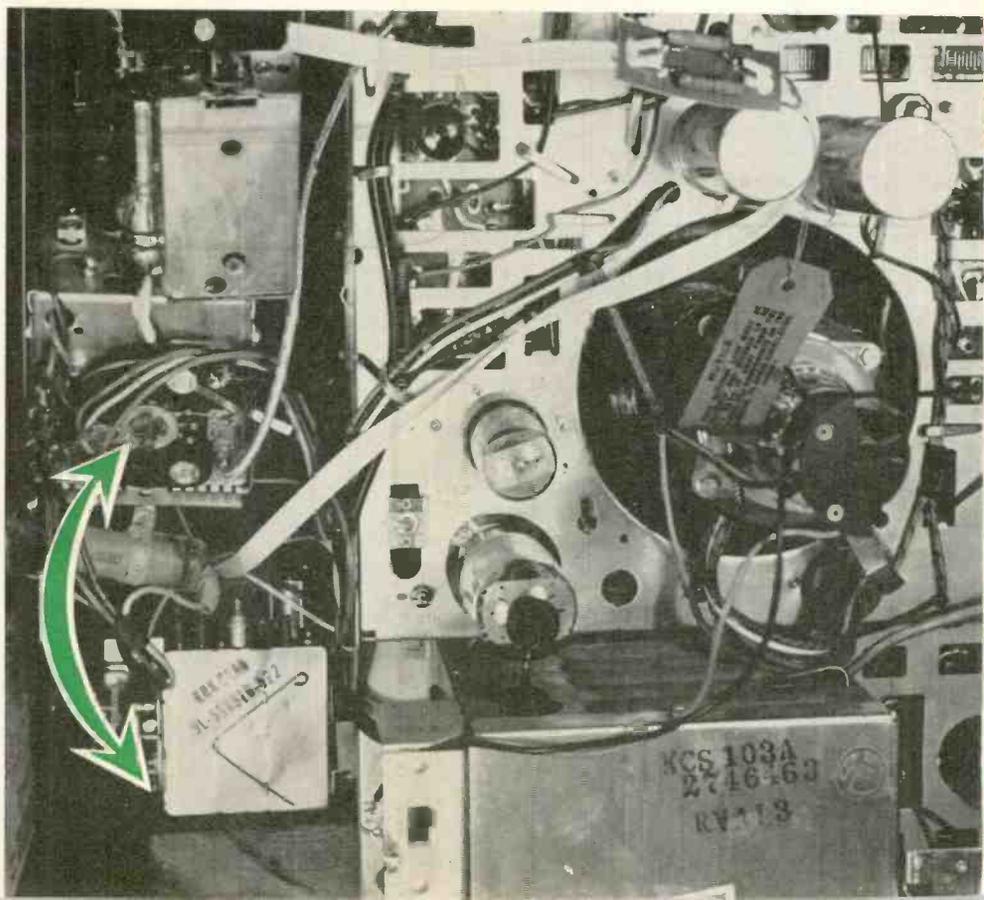
Most of these sets can be converted to receive UHF stations. Standard Coil barrel tuners permit substitution of UHF channel strips, as an example. UHF kits can be employed to convert a VHF receiver to receive UHF, also.

I've been successful in convert-

ing 40 mc i-f TV sets by using RCA's DK-32 series UHF kits. Four kits are available, namely DK-32, 32A, 32B and 32C. Kit DK-32C supersedes the previously listed three, and may be used in their places.

The tuner package (Fig. 1) includes a UHF tuner and i-f amplifier assembly with a pre-wired wafer switch, front and side mounting brackets, hardware, knobs, a four terminal antenna board, and other necessary parts. A booklet of

Fig. 2—RCA 1956 TV set with completed UHF installation. Switching assembly (upper arrow) controls signal input to VHF tuner or UHF tuner (lower arrow). Entire mounting is secured to the chassis, as shown.



instructions is included which illustrates various mounting methods and installation procedures. A completed installation is shown in Fig. 2.

The UHF tuner employs a 6AF4 oscillator, a crystal mixer, and 6DE6 i-f amplifier, as shown in Fig. 3. This kit can be mounted on the side or front of a TV receiver, depending upon available room.

### Installation Procedure

UHF kit installation is a simple matter if the technician follows an outline. As an example, let us install an RCA UHF tuner kit model DK-32B in an RCA KCS 103A TV receiver. This model was manufac-

tured in 1956 and the set did not incorporate a UHF tuner.

Kit installation requires a hole to be cut in the cabinet to permit the UHF tuner shaft to protrude, enabling the customer to rotate the UHF knob. Since this receiver has the tuner mounted on the side of the cabinet, a hole was cut below the VHF tuner, and the UHF tuner was mounted in the following manner: The proper type mounting bracket (side mounting in this case) was selected and the UHF tuner was secured to the bracket, shown in Fig. 4, using the lock washers and screws provided in the kit. After this had been accomplished, the entire assembly was then mounted to the VHF tuner

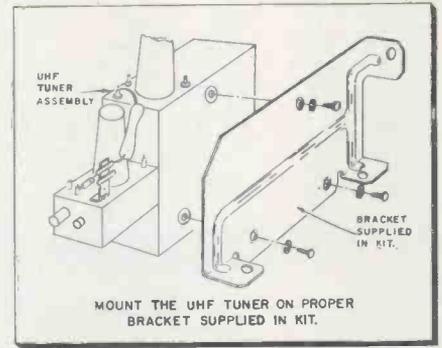


Fig. 4—The UHF tuner is secured to a mounting bracket supplied with the kit.

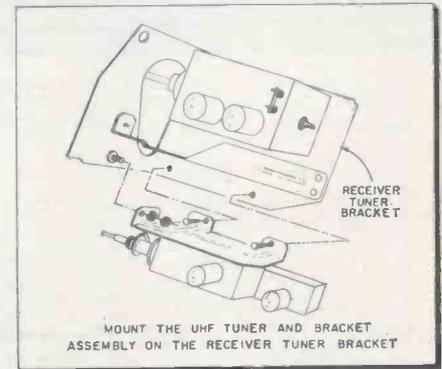


Fig. 5—Entire UHF tuner assembly is secured to the VHF tuner mounting bracket.

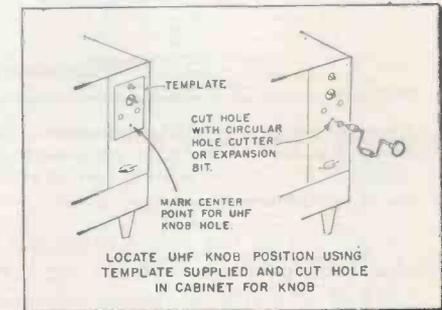
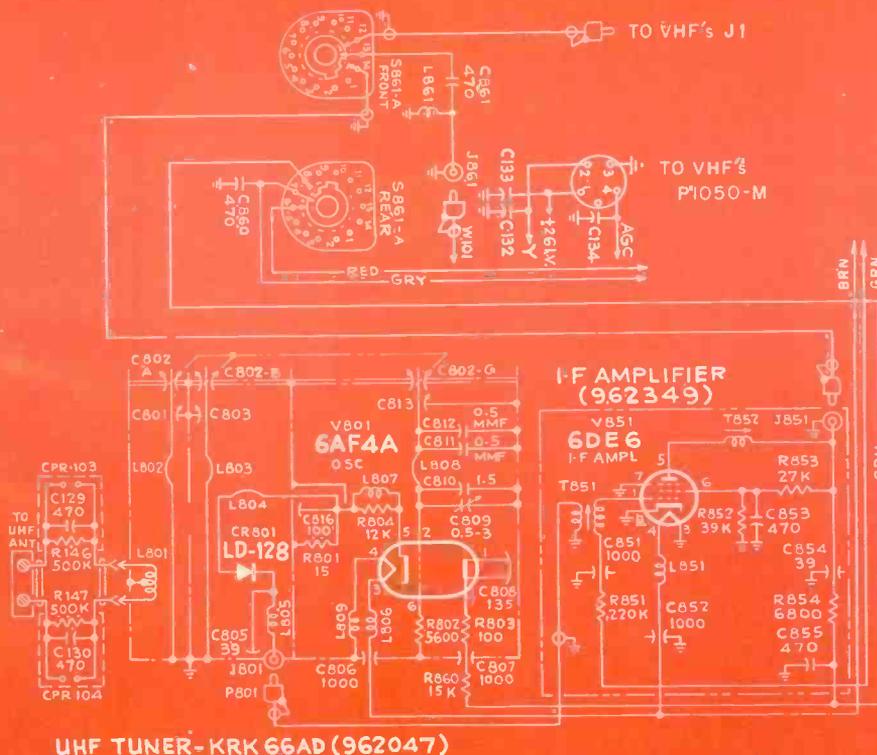


Fig. 6—Front mounting template is marked to establish center point for UHF tuner knob. Hole is then enlarged, as shown.

# ...It's a Snap!

## Step-By-Step Instructions For Mounting RCA's DK-32 UHF Tuner Kit In 40 Mc I-F Receivers



mounting plate as shown in Fig. 5. The UHF tuner is secured in three places to the VHF tuner's plate. In the front by using a small slotted bolt, lock washer and nut, and on the sides by two self-tapping screws. Thus, the UHF tuner is positioned in the cabinet, firmly attached to the existing VHF tuner.

An example of front mounting is shown in Fig. 6, illustrating the hole can be cut with a hand brace and circular hole cutter or expansion bit (as shown). Power equipment is not recommended. If the intended mounting area is a plas-

Fig. 3—Schematic drawing of a UHF tuner. The UHF signal is transferred to the TV circuit by pin Jack J<sub>1</sub>. Voltage is supplied to the added tuner via plug P1050-M.

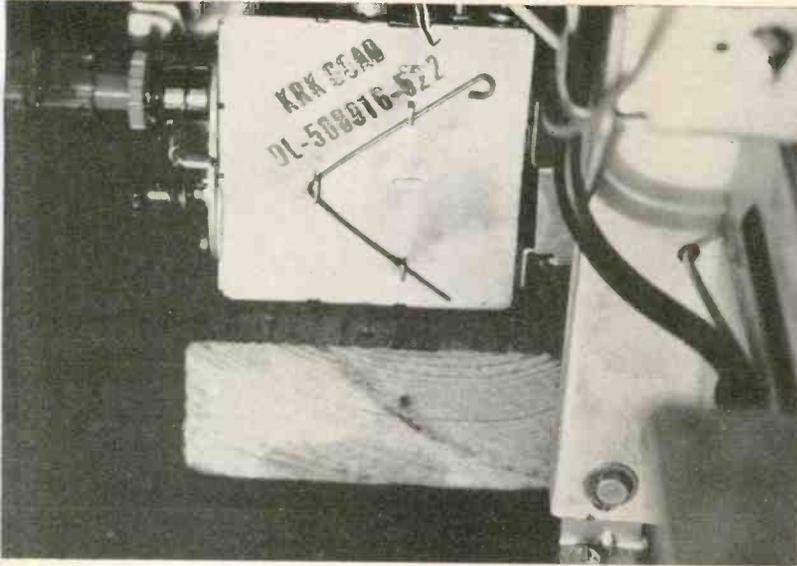


Fig. 7—Close-up of an installed UHF tuner shows a wood block under it. This block is secured to the chassis or snug-fitted between the tuner and the set's cabinet shelving to provide support.

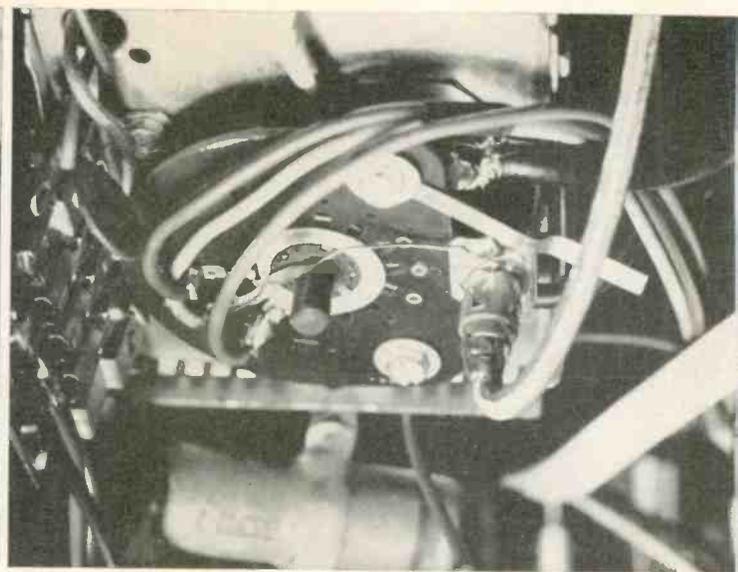


Fig. 8—Switch assembly is fastened to the rear of the VHF tuner by self-tapping screws. The VHF tuner's i-f link cable is removed and inserted into the wafer switch jack, as shown.

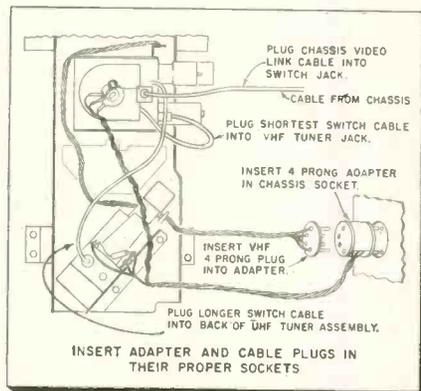


Fig. 9—Cable assembly connections are changed in 1960-61 RCA's, as indicated here. Be sure to dress power cable to prevent shorting to the chassis.

tic cabinet or the tuner area has a plastic covering, then another method of drilling should be used. Here, the technician should drill a series of  $\frac{1}{8}$  inch holes (with slow speed hand drill) in a circle, the circumference of the tuner shaft. A sharp instrument should then be used to cut away the plastic between the holes. The ragged edges should then be smoothed with a rat-tail file into a smooth circle. This plastic drilling method, although consuming more time, does offer a reasonable margin of safety.

If a speaker is mounted beneath the area to be cut, make sure to place a cloth or dust catcher over the speaker so that wood, plastic or metal particles do not fall into the speaker's cone.

Front and side templates are furnished with the kit to facilitate installation in RCA receivers. But, when the receiver in question is not an RCA, an additional step is needed in installation procedure.

After a place has been found for mounting the tuner, a very small pilot hole for the hole cutter is drilled through the cabinet. This hole marks the center point of your tuner shaft.

If the mounting brackets need bracing, utilize wood blocks (as shown in Fig. 7), angle brackets or metal strapping. After mounting a few tuners the technician will automatically establish which is easier to use in each given situation. Having mounted the tuner the next step involves the wafer switch assembly.

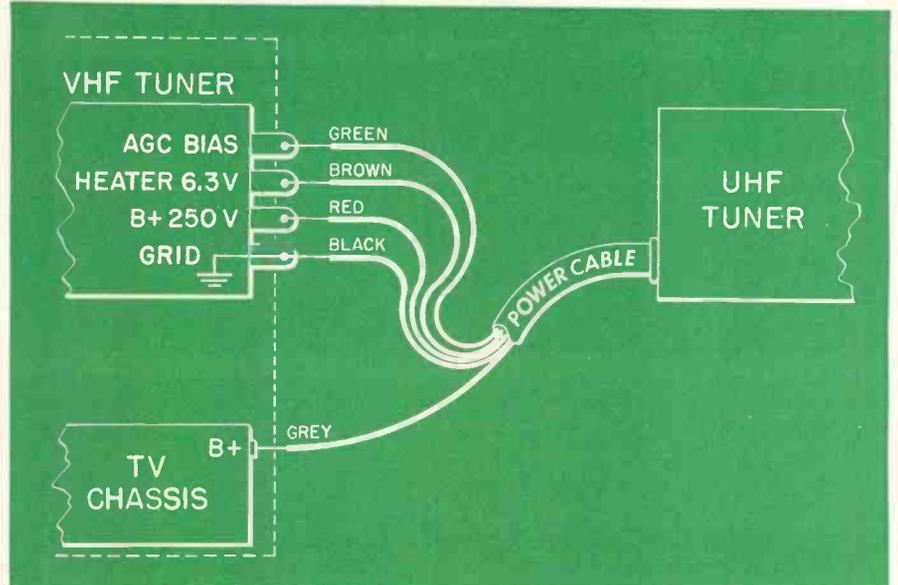
Installing the wafer switch on some sets requires only sinking two self tapping screws. These sets have been designed so that UHF

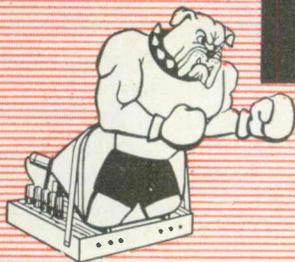
conversion is easy. An example is the RCA KCS 103's tuner, providing two holes for easily attaching (see Fig. 8). Notice that the tuner and switch are snug, with the VHF tuner's retainers removed.

RCA TV models older than 1960, will require two holes to be drilled in the VHF tuner rear for mounting the switch with self tapping screws. Should some other set have only a short shaft protruding, a shaft extension will have to be installed. This is accomplished by utilizing a shaft coupling and a plastic shaft extension.

The wafer switch serves two purposes. The unit switches the VHF or UHF tuner output into  
(Continued on page 71)

Fig. 10—The UHF kit may also be used to convert a TV set that is not an RCA make. Simply remove the kit-provided plug and splice leads as shown.





# "Tough Dog"

## Corner



### Difficult Service Jobs Described by Readers

#### Poor Ground—No High Channels

A customer brought in a Sentinel TV Model 420B complaining about intermittent sound and pix on high channels and insufficient width. He told me all the tubes were good as he had tested them himself. I informed the customer his set would have to remain at the shop for further inspection.

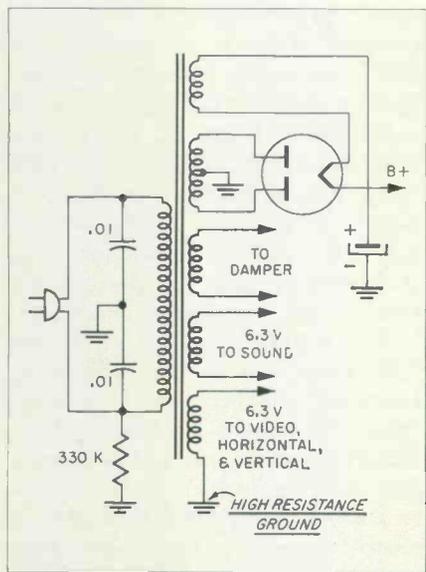


Fig. 1—A cold solder joint on a 6.3 volt filament winding's ground side caused a Sentinel TV 420B to exhibit poor width and intermittent upper channel reception.

On the bench, I started with the width problem since this was a constant symptom. The two screen resistors of the 6BG6 output tube had greatly increased in value from their original 15,000 and 100 ohms. Replacing these parts restored width, but with little to spare.

The fading picture on high channels was not continuous, and this trouble required constant observance of the CRT screen. Feeling this trouble originated in the tuner oscillator, I turned the set over on

its side and started to check the tuner.

While checking the oscillator section's connections for cold solder joints, I noticed the picture would go off every time my solder gun's trigger was pressed. Recalling similar situations in radio servicing where low B+ or low filament supply voltage caused the same situation, I turned my attention to the TV set's low voltage supply. All voltages were close to the manufacturer's reading. Returning to the tuner, I then checked the filament voltage of the oscillator tube and found it read 5.7 volts instead of 6.3 as required. Tracing this wiring back to the low voltage transformer tap (shown in Fig. 1) revealed a poor ground connection on the winding supplying voltage to the tuner. Resoldering this contact restored normal set operation.—*John D. Dabour, Jr., Richmond Hill, N. Y.*

#### Erratic Auto Radio Traced to Battery

A customer complained that his auto radio would start and stop playing. His car was parked nearby. Walking outside with the customer, I grimaced when I saw his car. It was a foreign car; a Peugeot automobile. Frequently, foreign cars have foreign radios, which presents a parts procurement problem, or, at the very least, an unusually "tight" installation. I was right on both counts here. The auto radio was a Blaupunkt, and the installation was unusually snug. This was a two chassis radio; the vibrator supply was easily accessible but the main chassis required a contortionist to remove it. The fuse checked good and the B+ supply lead read 6 volts, which sounded fine since the auto radio's vibrator supply clearly indicated on a label that it was a 6 volts radio.

The vibrator didn't buzz and the pilot light wasn't lighting (customer said that the light wasn't working for some time.) I suspected a faulty switch and suggested that I "pull" the radio. The customer agreed.

Connecting the shop's battery eliminator (in the six volt position) to the radio, the set began playing, and it continued to play even though I jarred it continually.

When the customer returned the next day, I told him that the radio didn't stop playing and installed it into the auto. Turning on the switch, the radio played superbly. Collecting an installation and shop check fee, the customer happily drove away.

About one hour later he returned. The radio wasn't playing. I checked the fuse; it was good. I checked battery voltage; it was six-volts on the head. I checked the battery supply with the set turned on . . . the VOM indicated six-volts and slowly moved to about one-volt, like a capacitor discharge. Making the same test a second time, the VOM once again indicated a discharge-like reading.

"Let me look at this guy's battery," I thought. Lifting the hood, I was astonished to find a 12-volt battery. And right in the middle of the battery was the radio's battery supply lead, soldered to a six-volt tap. The connection was loose. Cleaning the terminal and pressing it down tightly, the radio commenced playing. I quickly obtained a short screw which I sank into the terminal. Wrapping the supply lead around the screw's head, I tightened the screw down and haven't seen the customer since.—*J. Behrens & R. Teitelbaum, Jackson Heights, N. Y.*

• *Inexpensive dropping resistors are commercially available to permit using a six-volt radio with a 12-volt supply.—Ed.*

# Here's The New FM Stereo System!

## At A Glance

Whose system adopted:	GE/Zenith
FCC-approved broadcasting:	June 1, 1961
Are adapters available:	Yes
What is the cost:	Est. \$25 to \$100

## FCC-Approved FM Multiplex System Should Spark Hi-Fi Sales & Service



Fig. 1—H. H. Scott's model 335 multiplex adapter is self-powered @ \$99.95.

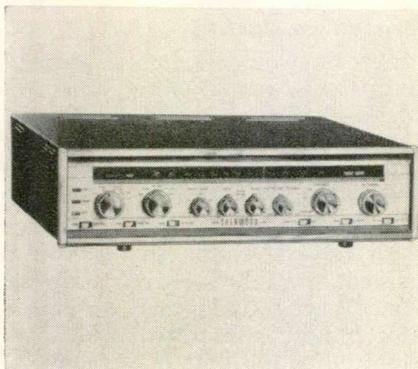


Fig. 2—Sherwood's model S-8000 FM-multiplex stereo 64-watt receiver.

• Stereo broadcasting is here! And FM's got it!

The FCC has adopted standards for FM multiplex broadcasts that are based on G-E and Zenith proposals. Other systems proposed to the FCC and National Stereophonic Radio Committee were eliminated one by one until the choice of a national FM stereo system was between G-E/Zenith (both systems are essentially the same) and the Crosby system.

One of the major reasons offered for adopting the basic G-E/Zenith proposals was their ability to offer better monophonic reception while broadcasting stereo. Consequently, present owners of FM sets will not experience deteriorated mono sound. Another interesting advantage is, it does not interfere with subsidiary services such as subscription background music.

### The Sales-Service Picture

What does FM stereo mean to the sales-service dealer and his customers? Many manufacturers feel that authorized FM stereo broadcasting will stimulate sales in the entire stereo industry. The premise here is that FM multiplex will make more people familiar with stereo sound. Thus, they will become interested in stereo records and tapes. If equipment sales increase, so will repair and installation services.

The initial effect of authorized FM stereo will probably be in the multiplex adapter area. For many years FM tuners have been manufactured with multiplex output jacks. These jacks will be utilized to convert existing FM tuners to receive stereo broadcasts with units such as shown in Fig. 1.

At this writing, a large number of tuner manufacturers have already announced availability of FM multiplex adapters. Estimated prices vary from \$25 to \$100. The Institute of High Fidelity Manufacturers suggests that only an adapter recommended by the tuner manufacturers be used because overall requirements are more stringent than for mono reception.

Complete FM stereo tuners are available too, as shown in Fig. 2. Whether their introduction will hurt monophonic FM tuner and receiver sales remains to be seen.

Service technicians may find FM

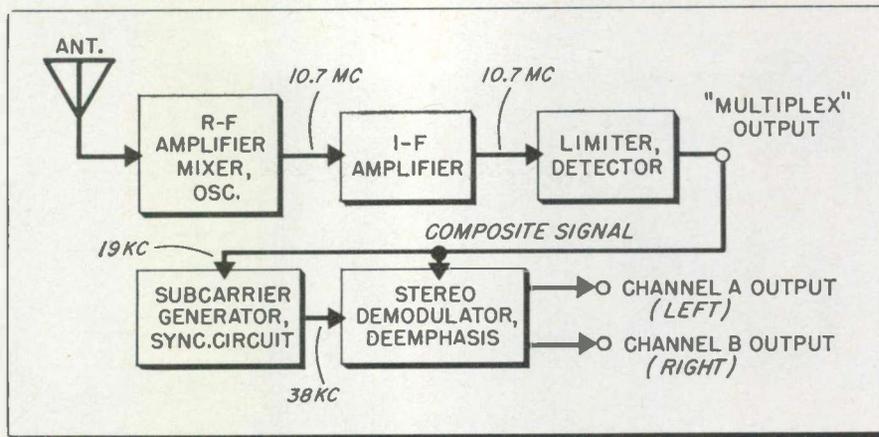


Fig. 3—Block diagram of a typical FM multiplex stereo tuner.

tuner conversion a fine income source. One industry spokesman says that once multiplex is installed, the FM set will have to be realigned and an FM antenna installed. If such is the case, service dealers can use their technical facilities as an inducement for consumers to purchase adapters from them.

#### How FM Stereo Works

Fundamentally, multiplex is a system whereby two or more separate signals can be transmitted simultaneously by a single transmitter and received and separated by a single receiver with a single tuning operation.

The FCC-approved multiplex stereo system is a compatible system. For example, if an existing tuner is tuned to a stereo station it will receive combined stereo channels as a monophonic signal. When a multiplex tuner or a mono tuner with the proper multiplex adapter is tuned to the station, two separate stereo channels will be received. These separate channels can be reproduced by a stereo amplifier and two separate speaker systems just as with stereo records or tape.

A block diagram of a stereo tuner is shown in Fig. 3. Here, the stereo signal is picked up by the antenna, passed through the front end, and amplified at an i-f frequency of 10.7 Mc. It is then detected, as in regular monophonic FM tuners. At

the output of the FM detector the composite stereo signal is split into two paths. One path, containing a 19 Kc "pilot" or synchronizing carrier, is fed into a circuit that produces a subcarrier of 38 Kc, which is the second harmonic of the carrier. The 38 Kc subcarrier is fed into the stereo demodulator, which also receives the composite signal. Left and right channel de-emphasis is accomplished here. Then the signals are fed to audio amplifiers.

It's interesting to note that the 38 Kc subcarrier signal is *amplitude* modulated. However, the entire composite signal is transmitted frequency modulated. It's only after passing through the FM tuner's detector does the signal become the main carrier and the amplitude modulated subcarrier. The frequency response of the subchannel (which contains the stereo information) and the main channel (which contains the sum of left and right signals) are identical to within 0.3 db over the whole frequency range.

#### Multiplex Reception Problems

All is not gravy, however. The stereo multiplex system is subject to a greater degree of interference than the monophonic main channel. Ignition noises may sound louder; stray radiation from TV sets, and other transmitters may cause whistle tones; and tube hiss in the FM tuner's first stage degrades the

signal-to-noise ratio. Also, increased distortion may be noted due to improper tuning control adjustment of the set or reflection of the station's transmitted signal from nearby buildings.

It's very desirable, therefore, to have a directional outdoor antenna to provide an increased amount of signal for the tuner. To correct interference, it may be necessary to reorient the antenna or, perhaps, reverse the antenna leads.

If using a multiplex adapter, it should be matched to the particular tuner, as indicated previously. Aside from this, if a tape recorder is contemplated being used to record stereo, be sure the particular adapter or stereo tuner being considered doesn't produce interference. This point is emphasized because the usual tape recorder employs a bias frequency of 35 to 100 Kc. The multiplex subcarrier is in the same range. Therefore, if any of the subcarrier or its harmonics is present at the output terminals of the multiplex adapter or tuner and the unit is connected to a tape recorder, severe interference may result between the bias frequency and the subcarrier frequency. The result would be undesirable whistles or birdies. •

*Information and illustration credit: Mr. D. R. von Recklinghausen, H. H. Scott, Inc., Maynard, Mass.*



Dealer uses International Harvester's four-cylinder engine "Metro-Mite" to deliver television, stereophonic and hi-fi equipment.



Service-installation-sales dealer uses a Volkswagen panel vehicle to obtain efficient transportation. Loading space is 170 cubic feet.

# How To Choose A Vehicle For TV Servicing

*TV Service Dealer Must Evaluate  
Many Features To Assure The  
Best Transportation For His Business*

ERNEST W. FAIR

• Purchasing a service vehicle or vehicles is an important financial step for any TV service dealer. Aside from the initial cost, however, other considerations will determine the usefulness and cost of the vehicle over a period of years. Some time-proven considerations offered here will help guide you in selecting a vehicle that will serve *your* business best.

*Is carrying capacity adequate for present and anticipated near-future work?* It would be foolish to purchase an under-capacity vehicle, when a wide choice of spacious vehicles are available. A limited carrying capacity, for your business, would result in repeated returns to the shop if the technician must "pull" a few sets. If you're also a sales dealer, console delivery may be limited by your choice unless carrying capacity in relation to your work load is seriously considered. However, don't go overboard with a costly vehicle that can handle larger loads than you could possibly carry.

*Are loading facilities adequate?* If you're a service-sales dealer, four-door sedans are obviously inadequate vehicles for delivery of console TV sets. Some station wagons are also inadequate carriers since their inside height or vehicle entrance may be too short to accommodate sets with ease. Additionally, height to lift load may be too high. Van type wagons with double side doors are especially useful to trans-

port console TV or hi-fi sets due to their wide entrance areas.

*Is the prospective vehicle mechanically sound and reliable?* Some vehicles acquire well-earned reputations for reliability. And a TV service dealer desperately needs dependable transportation for his everyday business. Be wary of radical new innovations, such as a spanking new engine or transmission. First year designs may have an affinity for mechanical "bugs," so consider those vehicle types that have had at least one year in the field. Your business depends upon day in and day out transportation. It doesn't pay to gamble.

*Are replacement parts difficult to obtain?* Every vehicle eventually needs the services of a qualified auto mechanic. It is especially important that a vehicle being repaired is not garaged in an auto mechanic's shop for an unreasonable length of time due to difficulty in obtaining a replacement part. Also, qualified auto mechanics, and this doesn't refer to gasoline-lubrication jockeys, should be located within a reasonable distance from your place of business.

All major automobile manufacturers have wide, complete service and parts distribution. Some of the less prominent manufacturers, however, have poor service-parts setups in many areas. Before you purchase a minor manufacturer's vehicle, it seems judicious to inspect their service and parts facilities in your particular area. As far as imported automobiles are concerned, with the exception of Volkswagen (who has an admirable policy of maintaining sufficient parts and trained service mechanics before opening dealerships), few manufacturers offer the type of service needed to promptly and expertly repair a vehicle under all circumstances.

*What is the operating costs of the vehicle?* Operating costs, from a gas consumption viewpoint, can strongly influence overhead when a vehicle is driven eight hours a day. This doesn't apply to a difference of a mile or two per gallon, but does apply to much greater differences.

Other contributing factors affecting operating costs are oil and lubrication requirements. How much oil and how often oil change and lubrication must be performed should be considered by the prospective buyer of a business vehicle.



Rambler's American wagon combines business with pleasure. Cargo space is 64 cu. ft.

What do typical repairs cost? Select some key repairs, such as brakes, carburetor, clutch or transmission, battery, tires, and compare service and parts costs between various vehicles being considered.

How about insurance rates? Check rates of vans, station wagons, pickups with your agent. Garaging or parking problems can differ due to size of the vehicle. Many garages cannot accommodate larger vehicles or charge additional rates, if they do.

*Will the new vehicle make and type be a business prestige builder?* We should always remember that a service shop's vehicle is seen by hundreds of people every day of the week. If it makes a highly favorable impression as it goes about its busi-



Ford's Econoline Van has a modified version of Falcon's up-front 85-hp engine.

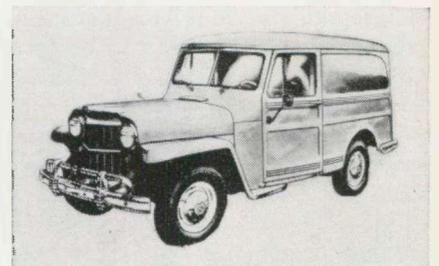
Corvair Van has an air-cooled rear engine, which means no anti-freeze expenses.



ness it builds goodwill that is reflected in a constant flow of new business to the shop. A vehicle that lends itself to prominent display of shop name and phone number is a definite asset, too.

Carrying capacity here is important, also. For example, the vehicle should be able to carry TV antenna masts, if this is a prime business of yours, in an orderly fashion. Strapping masts to a vehicle in a haphazard manner is not helpful in this respect.

*Does the vehicle offer the equipment options you want?* Depending on the vehicle being considered, you may want power steering to help ease parking problems. Or, automatic transmission may be considered a "must" if the vehicle is being used for both business and pleasure. Perhaps you're in a hilly area and require a vehicle that can take hills with ease; or in an area that has heavy snows or unusually bad roads. Obviously, many factors peculiar to each shop owner's individual business or the area in which he is operating should be considered when purchasing a vehicle. Adding these factors to the foregoing points will help the shop owner compare one vehicle with another to intelligently determine the best selection for his business. •



Rugged Jeep panel truck features four-wheel drive for snow and rough terrain driving.

Powers' "Service-Master" bodies convert pickup bodies to service bodies.



# Choosing A Transistor Test Instrument

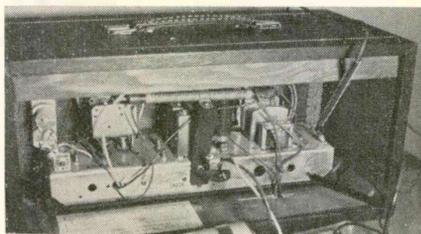
*Various Instrument Circuits Are Analyzed To Determine Their Different Test Capabilities*

MANNIE HOROWITZ  
Electronic Instrument Co.

- Second only to the number of different types of transistors made, is the variety of transistor checkers. Each one performs its advertised functions to different degrees of accuracy and validity. Some excellent instruments are relatively expensive laboratory types. Others are inadequate units with very low price being their only desirable feature. Between these extremes, lie the reliable units worth the serviceman's serious consideration.

One important factor to be considered when purchasing a transistor checker is the speed and convenience offered for testing transistors. For example, one good inexpensive checker may permit a wired-in transistor to be tested without removing it from the equipment. This type unit places the transistor into an oscillator circuit. If the transistor oscillates, it is considered acceptable.

This is a quick, workable and convenient check. However, it does not tell the whole story. Transistors may oscillate even if the beta or current gain has fallen below specifications. Excessively high leakage currents ( $I_{CE0}$  and  $I_{CBO}$ ) will probably not stop oscillation, but will prevent peak transistor performance in a radio, TV set or audio amplifier—especially with an increase in ambient temperature. Finally, there will be no oscillation



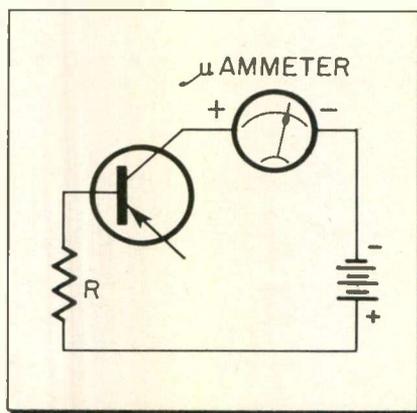
if the transistor's circuit impedance is below a certain value.

Although this method serves adequately as a rapid preliminary test, it is not sufficient to guide the troubleshooter. More accurate methods can be used.

Several transistor characteristics are important to the technician. Because most transistors are used in the grounded or common emitter mode of operation, beta current gain is important.

Next, the  $I_{CBO}$ , the collector to

Fig. 1—Test set-up for checking collector to base leakage current in reverse biased transistors using  $\mu$ ammeter.



base leakage current of reverse biased transistors will determine how well a transistor behaves in a circuit. The importance of this characteristic increases with temperature rise.

A third factor is the  $I_{CE0}$ , the collector to emitter leakage current. For this test, a voltage is applied to these elements in the proper polarity to reverse bias the collector-base junction. Although seldom found on testers, it is an important test when used in conjunction with  $I_{CBO}$ .

It should be noted that  $I_{CE0}$  is considerably greater than  $I_{CBO}$  in a good transistor. No matter what the other tests show, if this condition is not satisfied, the transistor is definitely defective. The formula:

$$\frac{I_{CE0}}{I_{CBO}} = \text{Beta} + 1$$

holds for all transistors. This relationship can be used as an approximate test for transistor beta, but its accuracy is limited by temperature and the point of measurement.

## $I_{CBO}$ Measurements

The test setup used to measure  $I_{CBO}$  is shown in Fig. 1. Only the base-collector junction is involved. The emitter-base junction is not connected, and the base-collector junction is biased in the reverse direction. The leakage current between these elements is read on the microammeter.

In the circuit, the battery is used

to bias the transistor to required polarity. The resistor R limits the current, protecting the sensitive meter. R and the voltage values are not critical since  $I_{CBO}$  is constant over a wide range of voltage conditions.

One factor separating the good from the "fair" testers is meter movement sensitivity. The leakage current can go as low as 1 or 2 microamps. Accordingly, fairly accurate leakage current reading is necessary to be certain that the transistor will operate properly.

Some instruments use 1 ma or 500  $\mu$ a movements. Although they do read  $I_{CBO}$ , it is obvious meter sensitivity is insufficient to provide a meaningful reading. At best, they might indicate if the leakage is very far out of line. To obtain a significant leakage reading, a meter movement sensitivity of 50  $\mu$ a or better should be used.

#### $I_{CBO}$ Measuring

The circuit arrangement in Fig. 2 is used to measure  $I_{CBO}$ . Current is read on the microammeter and resistor R protects the meter movement. For this measurement, a 500  $\mu$ a movement is satisfactory. Since this measurement is extremely temperature-sensitive, the transistor's temperature should match that of its environment before a reading is made.

#### Beta Measurements

Beta is probably the most controversial of all transistor measurements. Beta is defined as the short circuit current gain when the collector circuit is shorted. Mathematically:

$$\text{Beta} = \frac{\Delta I_C}{\Delta I_B}$$

( $\Delta$  sign indicates amount of change in value)

A test circuit for checking beta is shown in Fig. 3.

Small signal transistors are measured under standard bias conditions. 5 volts is applied between the base and collector at a collector current of 1 ma. The short circuit conditions are satisfied by making the meter and internal battery resistances as small as possible.

In Fig. 3A, the collector current is adjusted to 1 ma with the bias

control in the base circuit. The meter is then switched into the base circuit, resulting in the circuit shown in Fig. 3B. The base current is read on the microammeter. Considering formula 2, beta is assumed to be the ratio of these two readings,  $I_C/I_B$ . Meter dials are usually calibrated to enable this reading to be made directly.

This ratio is not truly beta, for

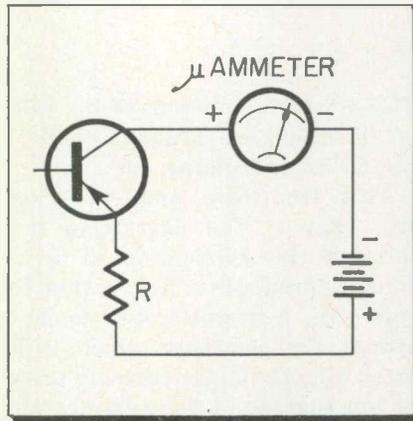
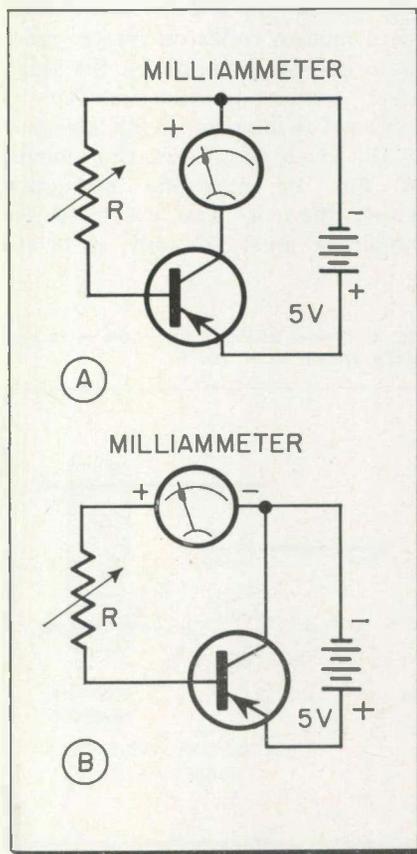


Fig. 2—Set-up for checking collector to emitter leakage current.

Fig. 3 (A)—Test circuit for adjusting collector current to 1 ma with resistor in base circuit. (B)—Meter is switched into the base circuit to read current. Beta is then found by employing formula 2.



**Coming Next Month!**  
ET editors examine and rate available transistor test instruments.

beta is the ratio of  $\Delta I_C/\Delta I_B$ , the change of collector current to the change of base current. However, the ratio  $I_C/I_B$  is considered the d-c beta. It approaches the actual a-c beta, but not too reliably, for  $I_C$  is dependent on the collector resistance of the transistor itself. Taken for what it's worth, it is a very useful and rapid beta indication.

Expensive laboratory instruments set up the d-c conditions as shown in Fig. 3A. A known a-c current is fed into the base. A-c current output is read on a meter in the collector circuit. The ratio of these two currents is the actual ac beta. Because the a-c input base current is a known constant, the a-c meter in the output can be calibrated directly in terms of a-c beta.

Servicing frequently requires a-c beta measurements. In push-pull audio amplifiers, two transistors can be matched only by use of a-c beta measurements, as well as  $I_{CBO}$  matching. D-c Beta is a poor approach. However, few technicians are willing or should be required to pay the price of an a-c instrument.

In a tester designed by the writer, this problem was solved. Results very nearly as accurate as those obtainable by the a-c method were obtained. The circuit shown in Fig. 3 was used.

The procedure for finding a-c beta is simple. The beta set control in Fig. 3A is adjusted to get 1.25 ma in the collector. The circuit in Fig. 3B is then used to obtain the base current reading. Call this  $I_{B1}$ . Next switch back to the beta set position, and adjust the control to obtain a collector current of 750  $\mu$ a. Switching back to the circuit of Fig. 3B will yield the base current reading for this second amount of collector current. Call this  $I_{B2}$ .

The ratio of the difference of the two collector currents (1250  $\mu$ a - 750  $\mu$ a = 500  $\mu$ a) to the difference of the two base currents,  $I_{B1} - I_{B2}$ , is the a-c beta. You now have the ratio of the difference of the two currents, satisfying  $\Delta I_C$  and

(Continued on page 69)

# Using Relays In Industry

## Operation, Application & Maintenance Of Electro-Mechanical Relays In Equipment Control

HENRY A. SCHWARTZ

• Electronic technicians are called upon to service not only the electronic components of control loop systems but also electro-mechanical and mechanical components such as electrical relays.

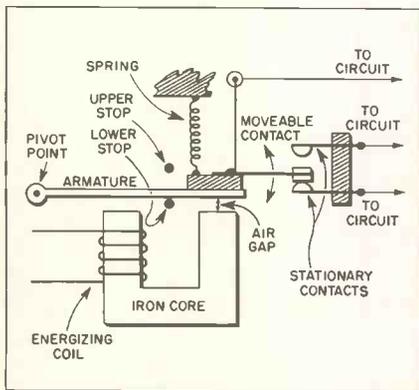


Fig. 1—Principal parts of the electro-mechanical relay.

The electrical relay has been used extensively in industry in the past and will be used extensively in the future. It is essentially an electro-mechanical device which has found wide applications in many types of switching functions, and conversion of rotary motion to linear motion. Relays are integrated into many electronic circuits and are commonly found in great quantities in many industrial plants.

### Relay Operation

Basic understanding of relays and their operations is essential to the service technician who is called upon to repair a defective control system. A simplified drawing of a typical relay is shown in Fig. 1.

The energizing portion of the relay is an iron core around which is wound an energizing coil.

This iron core may take several shapes. The energizing coil, through the application of a d-c voltage, produces a flux within the iron core. A magnetic field tends to attract the armature which is located directly above the pole pieces or top surface of the relay core.

The armature is pivoted at one end and when it is attracted to the iron core it moves downward. It remains down for the duration of time a relay core is energized. There are two stops, one above and below the armature.

The lower stop limits armature downward motion while the upper stop limits upward motion. Downward motion relies on electro-magnetic energy supplied by the relay core, while upward motion is achieved through a spring attached to the armature. Thus, the amount of flux or magnetic attraction which the core can exert on the armature must not only move the

mass of the armature, but also overcome the tension of the armature spring.

Relays are designed by manufacturers with these variable factors in mind i.e., the spring tension, the armature mass, and the amount of magnetic attraction between the core and the armature.

Attached to the armature, as indicated in Fig. 1, is a movable contact. This contact moves upward or downward, with the movement of the armature. It is insulated from the armature itself by means of a high-resistance insulating material. One end of the movable contact. This contact moves upward or mechanical means, usually a finely stranded flexible wire, to a terminal. This terminal provides the "common" terminal of the relay. The contact point located at one

Fig. 2—Typical trouble spots in the relay generally appear at A and B.

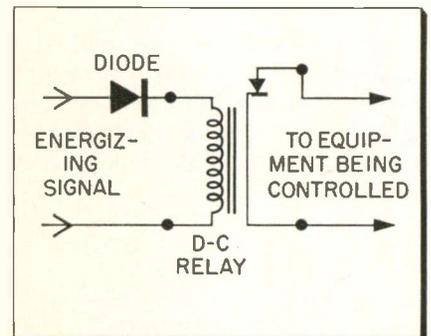
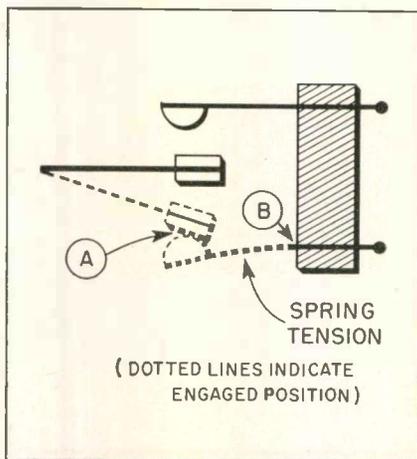


Fig. 3—Employing a diode in series with one leg of the relay's energizing coil, current flows only in one direction—allowing a single direction control.

end of the movable contact moves between the two stationary contacts.

Arrangement of the stationary contacts are such that movement of the armature downward causes a physical juncture with the lower

stationary point, while movement of the armature and contact point upward causes a juncture with the upper stationary contact.

These contacts are insulated from each other and from the frame of the relay housing. Each contact is connected to an associated terminal which provides the switching terminal for the relay.

Design of movable and stationary contacts and selection of material from which they are made, is very critical. In proper relay design it is essential that movable and stationary contacts close prior to the termination of full downward or upward movement.

The stationary contact arm is usually made of spring material. (See Fig. 2). As pressure is applied to the stationary contact by the movement of the movable contact, the stationary contact will move downward, resisting its natural spring tension (B), while making contact at (A). In this way positive electrical connection is maintained at all times between the movable and stationary contacts.

Points (A) and (B) are typical trouble points for relay operation. Spring tension loss in the stationary contact is one of the major problems in relay field service. Another major problem in relay field service is stationary contact adjustment by unauthorized personnel. It is important to note that a stationary contact must be adjusted so that contact is made and maintained as the movable contact moves downward or upward. It is interesting to note also that personnel not familiar with relay maintenance have a tendency to use a file on the surfaces of the contacts. A contact burnisher should be used.

There are several different types of relays manufactured which essentially use this principal of construction. Other relay types have multiple movable and stationary contact arrangements. Switching functions from either the simple on and off to complex double throw double pole and interlocking operations are provided.

### Polarized Relays

Some relays must be polarized, as shown in Fig. 3. Polarization is accomplished by placing a diode of sufficient rating in one arm of the

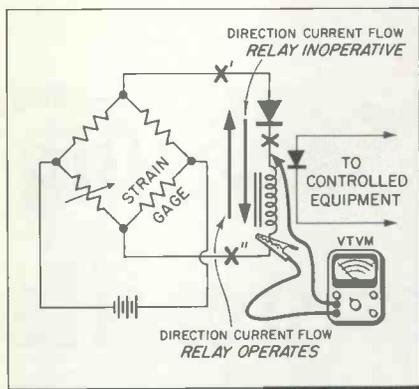


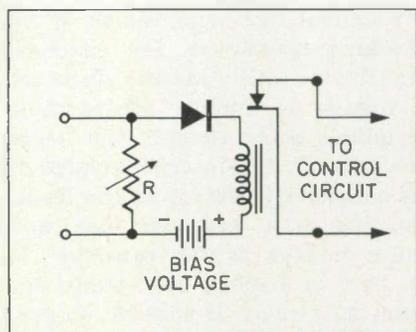
Fig. 4—Strain gage bridge circuit for single direction control with relay.

relay coil. The diode allows current to flow in one direction while providing an open circuit to current flow in the other direction.

Without the diode the d-c relay coil will produce a magnetic flux in the core as described previously, regardless of which direction the current is flowing in the coil. By placing the diode in one leg of the coil, the relay now becomes sensitive to direction of current flow. In other words, the relay will only be energized when current is flowing through the coil in a direction which is not opposed by the diode.

A polarized relay in a typical bridge circuit is shown in Fig. 4. The relay is connected across the bridge terminals which are normally connected to an indicating instrument, such as a galvanometer. The variable leg of the bridge in this case is a strain gage and the circuit is designed so that control action occurs when there is an excessive strain on the material under test. A typical application would be within a magnetic tape driving mechanism in which excessive strain is not tolerable upon the tape itself.

Fig. 5—Method of biasing relay to provide increased sensitivity or adjustable energizing range.



The bridge is normally set up so that under normal operating conditions current will not flow within the bridge galvanometer circuit. When the tape is too loose, the strain gage will produce an electronic flow in the direction indicated by the arrow in Fig. 4. This is not detrimental to the operation of the tape mechanism, therefore no corrective action is required.

On the other hand, when the tape is too tight, the strain gage produces an electron flow in the opposite direction as shown. In this case only, the current is passed by the diode and the relay coil is energized to operate a switch or alarm signal.

Relays may be externally polarized with the diode mounted to the external casing of the relay, or may be internally polarized and manufactured as one complete unit.

Relay sensitivity is dependent upon a number of factors which include the tension of the return spring, the distance of the movable contacts as related to the stationary contacts; and the amount of energizing flux that is produced in the relay. There are many instances where the design function of the relay is too critical to provide the sensitivity required for the application. In this case a relay may be biased much the same way that a tube is biased. A typical voltage biased circuit is shown in Fig. 5. An additional d-c voltage is inserted in series with the coil. This provides for an adjustable current

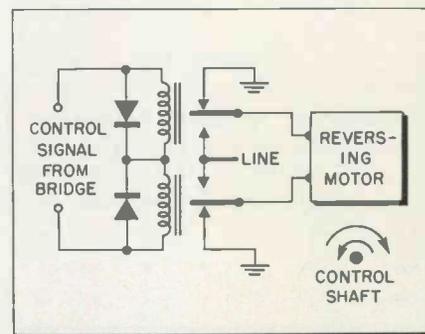


Fig. 6—Three position controller relay with normally-off position allows motor control in both directions.

flowing through the resistor and through the coil at all times.

The current is adjusted by means of resistor R to provide flux within  
(Continued on page 76)

# Servicing Transistor Radios

## Service Techniques & Precautions

### For Profitable Repair

BARRON KEMP

• The season is here when TV repair volume decreases once again and cranky transistor portable radios, with battery sales, take up some of the business slack.

Many technicians still hesitate when asked to repair one of these little "monsters." This is unfortunate because test procedures used with transistor radios are essentially the same as those used in repairing vacuum tube radios. But some special test and repair techniques are required for transistor radio work.

#### Troubleshooting

If the radio does not come alive after batteries are replaced, it goes

CHART I

Transistor Terminal Polarities						
	EMITTER		BASE		COLLECTOR	
	NPN	PNP	NPN	PNP	NPN	PNP
Emitter	0	0	-	+	-	+
Base	+	-	0	0	-	+
Collector	+	-	+	-	0	0

to the test bench. Troubleshooting procedures used are generally established by the radio's symptom or symptoms.

For example, if a transistor is suspect, a simple, though not infallible, approach is to feel the transistor. If the transistor is not in a power stage, it should be run-

ning perfectly cool. If hot, it is either defective or is drawing too much current because of a circuit fault. Be sure to touch each transistor lightly because a defective or overloaded transistor can become very hot and may burn the finger. Power transistors normally run hot and cannot be checked in this way.

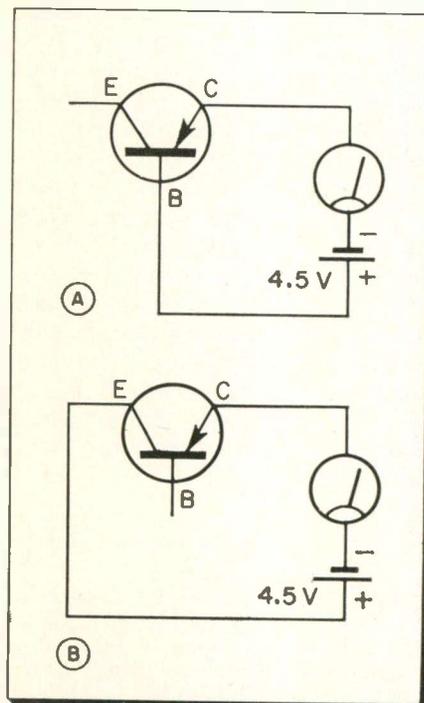
If shorted transistors, capacitors, or other components are suspected (as may be suggested when a customer complains of batteries running down quickly), a total current drain check on the radio is an ideal initial test. Look up the manufacturer's specifications for total drain at normal volume, set the VOM on a high ma scale, and insert the probes in series with the battery lead or across the radio's on/off switch in the "off" position. Depending upon the amount of current being drawn, the VOM may then be switched to a lower scale to obtain an exact reading.

The multimeter is a valuable troubleshooting tool, but it should be used with special care when checking voltage and resistances throughout transistor radios. When checking resistance, for example, transistors will conduct whenever a voltage is applied across their terminals even though the main power is off. The internal voltage of an ohmmeter, present at the leads, can act as a reversed bias and cause damage to the transistor. It is best to remove the transistor from the circuit, if possible, to prevent damage and likewise obtain

accurate readings when measuring resistances.

Another effect will also be noted when attempting to measure resistance with transistors in the circuit. When VOM test leads are reversed, or ohmage scales changed, indicated resistance may vary over a range of 300 to 50,000 ohms, depending upon the probe's polarity and meter range used.

Fig. 1 (A)—Circuit used to measure PNP transistor's reverse saturation current by employing a VOM's microammeter scale and a 4½ volt battery. Reverse battery polarity when checking a NPN transistor. (B)—Hook-up for checking current gain of PNP transistor. Battery polarity is reversed to make same measurement on NPN transistor.



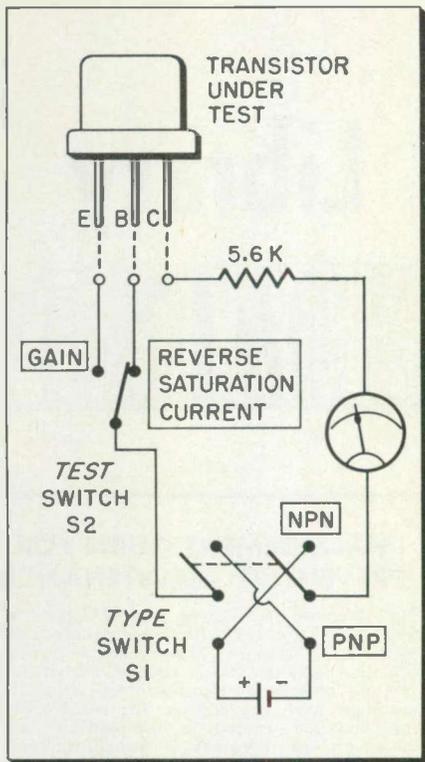


Fig. 2—A convenient circuit employing two switches for checking reverse saturation and current gain of PNP & NPN transistors with a VOM's  $\mu\text{a}/\text{ma}$  scales.

Because of the miniaturized nature of transistor radios, accidental short-circuits are difficult to avoid. Test probes should be carefully handled. A momentary short-circuit caused by a slipping test probe can cause serious damage to transistors. Probe tips should be completely taped or covered with insulated tubing down to the very ends—leaving only a small point exposed.

The "screw-driver" method employed by many technicians to quickly isolate trouble by shorting or grounding grid circuit sections of a tube radio cannot, of course, be employed in transistor radios.

Signal substitution and tracing may be used in transistor radios for isolating defective stages and areas. However, here again, a number of precautions must be observed. Level of the injected signal must be very low. In most cases the signal should be injected by induction—not directly with the signal generator probes. This can be done with a few turns of wire attached to the probes, with the coil brought near the set to obtain sufficient signal. Additionally, all test equipment being used, including the radio's chassis, should be bonded to-

gether in a common-ground network.

If there is any doubt regarding a transistor's condition it should be tested on a commercial-type transistor checker. Substituting a known-good transistor is also a good way to isolate trouble—but first make sure abnormal current is not being drawn by that stage before placing a good transistor in the circuit. It may be ruined. Battery polarities should also be checked.

If a commercial transistor checker is not available, a fairly accurate indication of the transistor's condition can be obtained by checking two of its characteristics: Approximate current gain, and reverse saturation current of the base-collector circuit.

Both characteristics of a PNP transistor are easily checked in a simple circuit using a VOM's  $\mu\text{a}/\text{ma}$  scales, as shown in Fig. 1. Reverse saturation current and gain of an NPN transistor is measured by reversing the battery leads. Both NPN and PNP transistors may be tested in a single circuit by employing the arrangement shown in Fig. 2.

Set the "type" switch S-1 to the proper position (NPN or PNP). Adjust the meter to the 2.5 ma scale, and set the "test" switch S-2 on the reverse-saturation current position. Insert the transistor in the socket or connect it to the proper points as shown. If the meter reads above 0.25 ma (except for power transistors), the transistor is defective.

If the meter reading is less than 0.25 ma, set the meter to the highest microampere scale. If no indication, go to the next lowest scale, etc., until a reading is obtained. Low-powered transistors (50 milliwatts) generally used in r-f, i-f, oscillator and 1st audio stages, should read between 1 and 5 microamperes. Medium-power types (100 to 150 milliwatts) usually employed in audio output stages, should read between 2 and 10 microamperes. Power transistors (2 watts) may show as much as 300 microamperes reverse saturation current. The  $4\frac{1}{2}$  volt battery used for testing will not damage a transistor even if the polarity is reversed.

To determine if a transistor is type PNP or NPN, move the

"type" switch S-1 to each of its two positions. The position showing the lowest reading will indicate the type of transistor being tested.

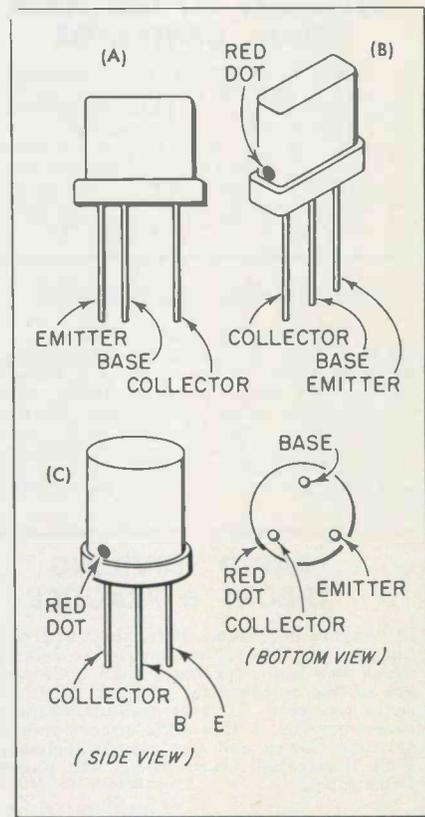
### VOM Tests

Partial indication of a transistor's condition can be obtained with a VOM. While this test will not indicate a transistor's gain or current handling ability, it will usually show if the transistor is defective. Use the VOM's high resistance scale to begin.

When applying this test to a PNP transistor, connect the VOM's positive lead to the transistor's base terminal, and the common meter lead to the emitter terminal. Because of the polarity of the small ohmmeter voltage applied, the emitter-base junction is biased in the reverse direction so that the meter reading should be approximately 0.5 megohm or greater. Remove the common meter lead and connect it to the transistor's collector. The ohmmeter voltage biases the base-collector junction in the reverse direction and the reading should also be 0.5 megohm or greater.

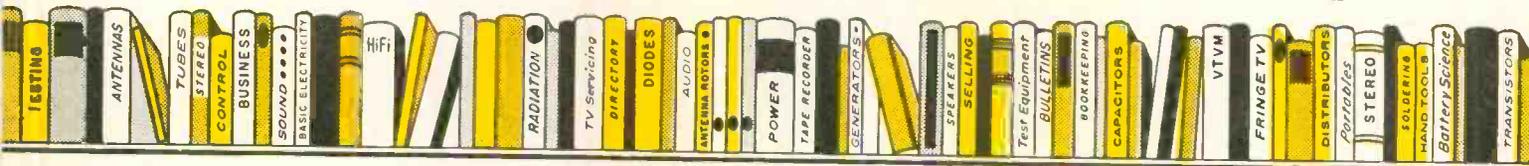
(Continued on page 62)

Fig. 3—Elements of various transistors can be identified by lead spacings and markings on transistor's body.



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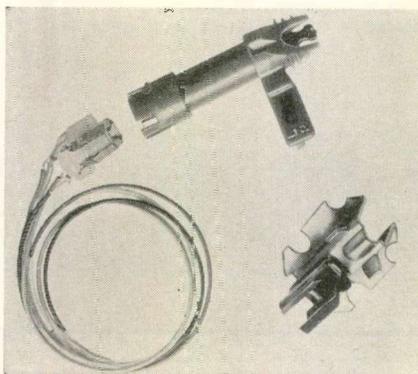
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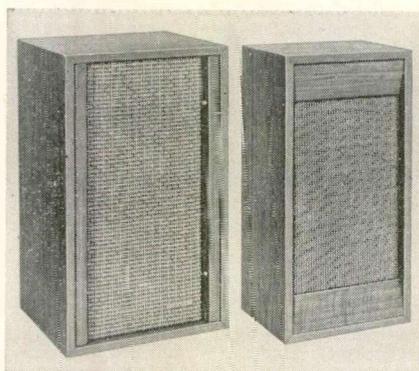
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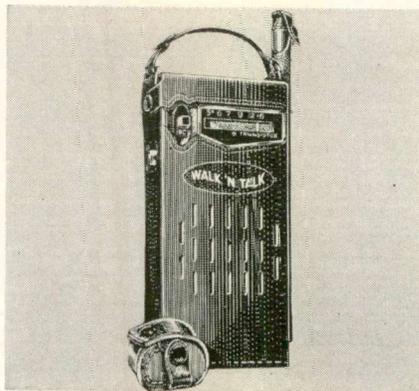
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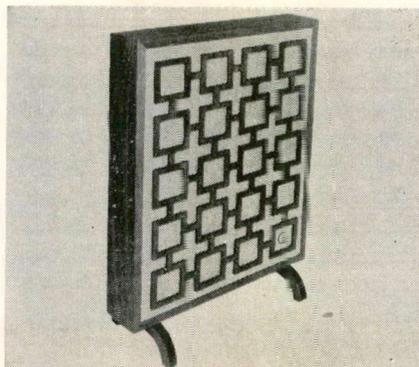
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## Audax LOUDSPEAKER SYSTEMS

Announced as a new concept in speaker design, employing an advanced idea in styling, shape and sound quality, the "Sonoteer" Series employ five speakers, measures only 4" thick by 21" by 25", and is reported to radiate smooth natural sound in all directions. May be placed on the floor, in a corner, against or away from a wall, or suspended from the center of a ceiling for auditorium or studio use. Weight 18 lbs. Model CA-70, shown, \$79.95. Rek-O-Kut Co., 38-19 108th St., Corona, N. Y.

For more data, circle 6-48-4 on coupon, p. 68



## Fisher

### STEREO MULTIPLEX ADAPTOR

Designed specifically for the FCC-approved multiplex system, model MPX-100 stereo multiplex adaptor can be used with all tuners and receivers employing FM wide-band design and multiplex output facilities. Completely self-contained and self-powered. Has simple plug-in connections for easy



installation. Features include: the "Stereo Beacon," an exclusive circuit which automatically indicates whether or not a tuned-in station is broadcasting in stereo; front panel stereo balance control; special selector switch with feed-through facilities; and extra a-c power outlet. \$89.50. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.

For more data, circle 6-48-5 on coupon, p. 68

## G-E RADIOS

Seven new transistor portable radios are: model P870, "The General," personal size, features include tuned r-f circuit, class B audio output, built-in ferrite rod antenna and adjustable whip antenna, \$59.95; model P8511, size of a pack of king-size cigarettes, weight with battery, 10 1/2 oz., can be carried or hung up by ring secured in top, features include class B push-pull audio output, and vernier tuning, \$39.95; model P825, vest-pocket size, weight with battery, 7 1/2 oz., has 6 transistors plus 1 diode, and 2" speaker, \$29.95; model P820, shirt-pocket size, weight with batteries, 10 1/2 oz., has 6 transistors plus diode, and 2 5/8" magnetic speaker, \$24.95; model P835, full size, has 6 transistors plus 1 diode, 4 i-f transformers, 4" dynamic speaker, \$39.95; model P840 has tuned r-f circuit with 3-gang tuning condenser, 4 i-f transformers, printed circuit chassis, 4" dynamic speaker, \$49.95; and model P809, all purpose 5 transistor portable, weight with batteries, 30 oz., big easy-to-read dial, thumbwheel tuning, class A audio output, 3 1/2" heavy-magnet speaker, \$19.95. General Electric Radio & Television Division, Syracuse, N. Y.

For more data, circle 6-48-6 on coupon, p. 68

**TESTS**  
All TV and Radio  
Tubes—Old and New

**TESTS**  
the Nuvistors

**TESTS**  
the New 12-Pin  
Compactrons

**TESTS**  
the New 10-Pin Tubes

**TESTS**  
European Hi-Fi Tubes,  
Voltage Regulators, and  
Most Industrial Types

**TESTS**  
for True Dynamic  
Mutual Conductance (Gm)

**OBSOLESCENCE  
PROOF**  
Designed for Maximum  
Use Today and  
Tomorrow

**NEWEST  
FINEST  
MONEY-MAKER**

*for Professional  
Servicemen*



# Multiple-Socket Speed with Gm Accuracy **PLUS** OBSOLESCENCE PROTECTION

## Model 700 DYNA-QUIK

*Fastest, Most Complete  
Most Up-to-Date*

**DYNAMIC  
MUTUAL CONDUCTANCE  
TUBE TESTER**

*See your B&K Distributor,  
or Write for Catalog AP18-T*

**TESTS BOTH OLD AND NEW TUBE TYPES—SELLS MORE TUBES PER CALL**

*Again you benefit from proved B&K techniques! This up-to-date, obsolescence-proof, professional instrument is designed for maximum use today and tomorrow. Provides multiple-socket section to quick-check most of the TV and radio tube types the true dynamic mutual conductance way—plus simplified switch section to check new tube types in Dyna-Quik emission circuit. Also includes provision for future new sockets.*

Makes test under set-operating conditions. Checks each section of multi-section tubes separately. Checks for all shorts, grid emission, leakage and gas. Makes quick "life" test. Exclusive adjustable grid emission test provides sensitivity to over 100 megohms.

Makes complete tube test in seconds. Checks average set in a few minutes. Discovers weak tubes that need replacement. *Satisfies more customers. Sells more tubes. Saves call-backs. Insures your reputation.*

Patented automatic compensation for line voltage variation. Large 4½" plastic meter with easy-to-read "Replace-Good" scale. Lists most commonly used tube types with settings directly on socket panel for fastest operation. Complete listing in reference chart in cover. Phosphor-bronze contacts for long life. 7, 9, and 10-pin straighteners on panel. Operates on 117 volts 50-60 cycle a.c. Handsome leatherette-covered carrying case.  
Size: 16½" x 15¼" x 5⅞" deep. Net wt: 15½ lbs. **Net, \$169<sup>95</sup>**

### NEW TUBE INFORMATION SERVICE

Available every 3 months, on subscription,  
for all B&K Dyna-Quik Tube Testers



### B&K MANUFACTURING CO.

1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

# SHOP HINTS



## Magnetic Iron Holder

When soldering radio and TV chassis it is nice to have your small iron handy. Attaching a magnet to the solder iron's handle will enable technicians to magnetically secure the tool to a chassis, as shown in Fig. 1.

A solder tool can be converted as follows: Simply take a PM magnet

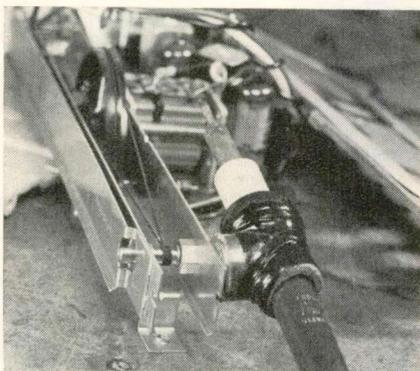


Fig. 1—Taping a speaker's PM magnet to a solder iron permits it to be magnetically clamped to a chassis or serve as a "solder stand" when not being used.

out of an old PM speaker. Cut a hole in the cork handle and glue the magnet into place. Take a few turns of plastic tape and wrap it around the magnet and handle. The magnet will also serve as a soldering iron stand when the iron is placed on the work bench.—Homer L. Davidson, Ft. Dodge, Iowa.

## Lamp Reveals PC Breaks

Transistor or other small-type radios use printed or etched boards with circuits which do not always respond to normal tests—some of which may not be safe to use.

For breaks in circuits of such boards, try placing an inspection lamp behind sections of the board, for visual spotting of breaks. The lamp and holder shown in Fig. 2 is about 5 inches overall in length and uses a 6 to 8 volt dial lamp with a resistance cord for 120 volt service.—H. Leeper, Canton, Ohio.

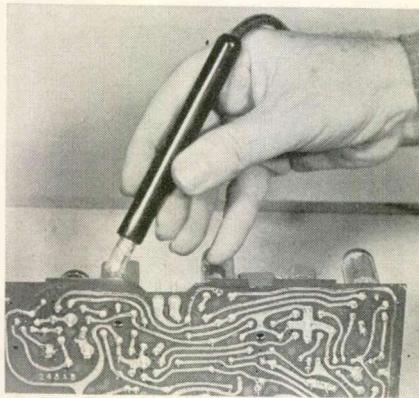


Fig. 2—Printed or etched boards can be inspected for minute breaks using a lamp, holder and resistance cord.

## Pliers Converted to Third Hand

Ordinary slip joint pliers serve as a third hand, as shown in Fig. 3, when fitted with a strong rubber

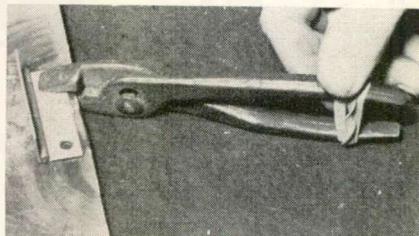


Fig. 3—A pair of slip-joint pliers with a rubber band looped around its handles becomes a technician's "third hand."

band. The rubber band is looped around the plier handles several times to increase its tension, and the tool becomes a quickly adjustable clamp or extra hand to hold small components without strain.

This improvised clamp is especially useful in soldering work. It can be shifted from one position to another without the necessity for screw adjustments.—Glen F. Stillwell, Manhattan Beach, Calif.

## CRT Tester Conversion

Here is an idea for modernizing a CRT tester. For example, if a technician has a B & K model 400 tester, with a C40 adaptor, and

wishes to convert it for testing the new 2.5 filament tubes. Only five simple steps are required, as shown in Fig. 4:

1. Remove life test switch, ream out hole for a single pole double throw toggle switch.
2. Connect single brown wire from life test switch to the toggle switch center pole.

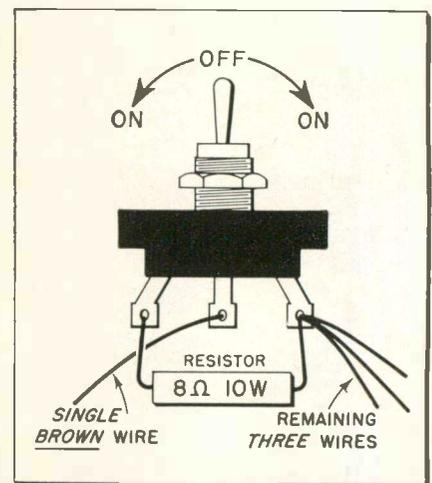


Fig. 4—CRT tester is updated for testing 2.5 volt tubes by removing life test switch and replacing it with a s.p.d.t. switch.

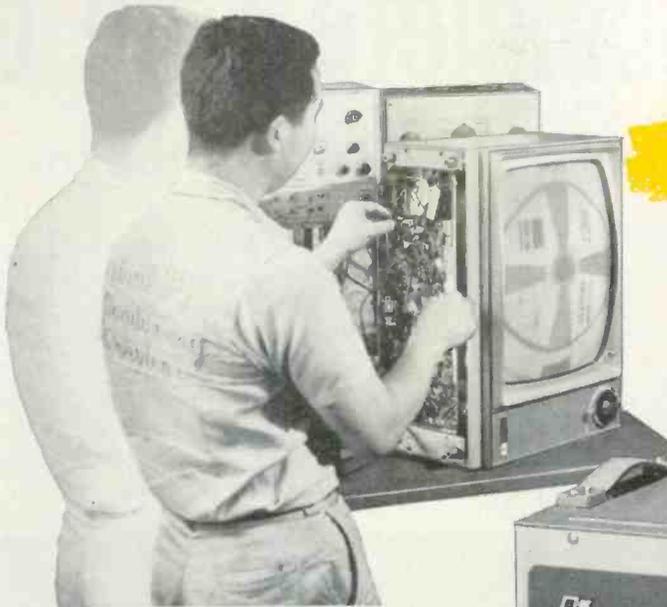
3. Connect the remaining three wires to one side of toggle switch.
4. Place an 8 ohm, 10 watt wire-wound resistor across the two outer toggle switch poles.
5. Mount toggle switch in the enlarged hole.

The life test is made with the switch in its center "off" position.—N. C. Cumberlin, Cedar Rapids, Iowa.

## 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 if accompanied by a stamped envelope. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

# DOUBLES YOUR EFFECTIVE MANPOWER



Fix "Tough Dogs" Fast!

Save Half Your Time!

Step Up Your Profit!

**B&K** NEW  
MODEL 1076

## TELEVISION ANALYST

for Black & White and Color



Check all circuits—Pinpoint any TV trouble...in minutes

**By Easy Point-to-Point Signal Injection,  
You See the Trouble on the TV Screen and  
Correct it—Twice as Fast and Easy!**

There's no longer any need to "lose your shirt" (and customers)—and worry about the lost hours you never recover—on "tough dogs" or even intermittents. The remarkable B&K Analyst enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. Makes it quick and easy to isolate, pinpoint, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—including intermittents. Makes external scope or wave-form interpretation unnecessary. Most useful instrument in TV servicing! Its basic technique has been proved by thousands of successful servicemen the world over.

The Analyst enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, and make more money.

Model 1076. Net, \$29995

Available on Budget Terms. As low as \$30.00 down.

See Your B&K Distributor or Write for Bulletin AP17-T

Combines all the features of both  
the Model 1075 and Model A107

- |  |                                      |
|--|--------------------------------------|
| COMPLETE R.F. and I.F.                       | HI-VOLT INDICATOR                    |
| VIDEO TEST PATTERN                           | YOKE and HI-VOLTAGE TRANSFORMER TEST |
| COMPOSITE SYNC                               | <b>Also Now Provides:</b>            |
| FM MODULATED AUDIO                           | SWITCH-TYPE TUNER                    |
| COLOR PATTERNS                               | NEGATIVE BIAS SUPPLY                 |
| HORIZONTAL and VERTICAL PLATE and GRID DRIVE | AGC KEYING PULSE                     |
| B+ BOOST INDICATOR                           | PICTURE TUBE MODULATION              |



**B&K MANUFACTURING CO.**

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Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

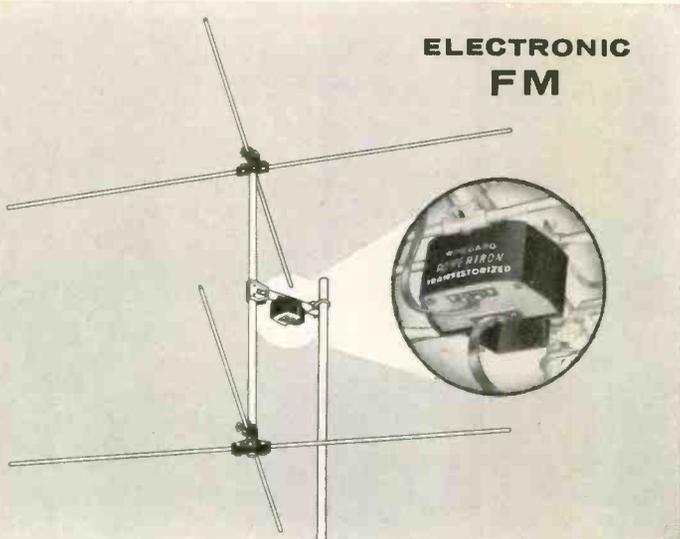
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

# NOW...A Complete Line of

Built-in Amplifier clears up snow, improves

In addition to three all-channel (VHF) Powertron antennas, Winegard now offers you 14 cut-channel and broad band Powertron yagis and two FM Powertrons. Each of these high gain antennas has the following important features:

1. Electronic amplifier for unprecedented antenna gain.
2. Amplifier connected *directly* to the yagi "Tapered-T" driven elements for best possible signal-to-noise ratio.
3. Linear frequency response for crisp, clear black and white and brilliant, true color reception.

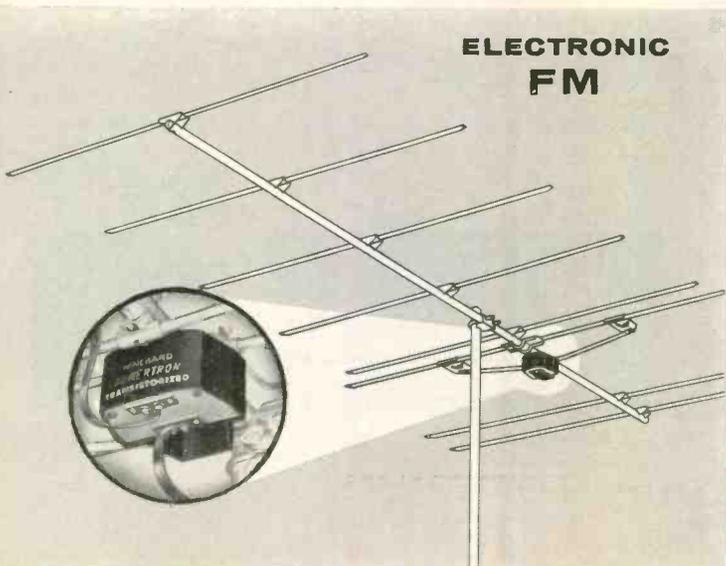
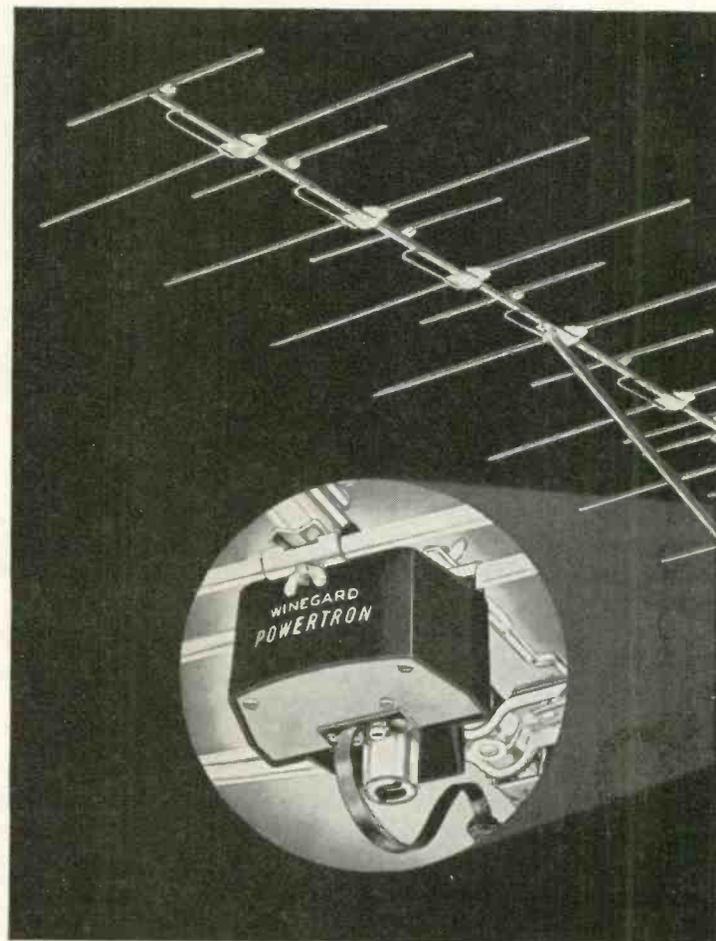


**MODEL PF-T FM POWERTRON TURNSTILE** Non-directional FM antenna with 16 DB gain in all directions over a folded dipole. Has unique offset mount and comes complete with built-in transistorized amplifier and TV-FM coupler.

## NEW, POWERFUL TRANSISTORIZED FM POWERTRONS WITH FM-TV COUPLERS

For the first time, FM antennas with built-in transistorized amplifiers are available for long range FM reception. Winegard offers two models — FM Powertron Turnstile (omni-directional) and the FM Powertron Yagi (directional). Both models have two 300 ohm terminals on the amplifier: one for down-lead connection to the set and one for connection to a TV Powertron antenna.

**MODEL PF-B FM POWERTRON YAGI** This is the world's most powerful FM antenna. Makes weak signals come in like "locals". Has 25 DB gain over folded dipole. Eight elements with exclusive Winegard "tapered T" driven element. Built-in TV-FM coupler allows you to couple into TV Powertron with only one power supply. Complete with built-in transistorized amplifier.



## ELECTRONIC ALL-CHANNEL YAGIS

... will greatly improve every channel. Weak, faded pictures become crisp and clear. "Good" channels will be even better. In many areas you'll watch channels you couldn't possibly see before. Because Powertrons are powerful enough to drive up to 10 TV sets, you can have plug-in outlets in every room ... and in many locations you can install a Powertron lower than other antennas.



# Winegard Electronic Antennas

contrast... gives you greater reception distance!

4. Gold Anodized finish for permanent corrosion protection and fine appearance.

5. Deluxe quality materials and workmanship.

Try a Powertron and see for yourself. Take a field strength meter reading with your present antenna and then take a Powertron reading. When you see the meter jump 5 to 10 times . . . and see the sharp, contrasty reception you get, you'll be convinced . . . and so will your customers.

**"Amplifies the Signal  
at the point  
of Interception"**

**MODEL SP-44X**

**"By FAR world's most powerful all-channel antenna"**

## ELECTRONIC Cut-Channel TV

Each channel  
amplified  
individually.  
No antenna couplers  
needed!

## NEW, TRANSISTORIZED CUT-CHANNEL YAGI POWERTRONS FOR THE FINEST INSTALLATIONS

Here are the highest gain (28 db) TV antennas ever made! Each is powered by a *built-in transistorized* amplifier. Because TV signals are amplified right at the point of interception, you get the best possible signal-to-noise ratio . . . resulting in the ultimate in reception!

Each Powertron yagi amplifier has two 75 ohm coaxial connectors: one for the down-lead to the power supply and one from the built-in coupler for connection to another Powertron yagi.

Because of the built-in mixing coupler, they can be connected directly to each other without interaction. The negligible power consumption of these transistorized antennas (.05 watt each) means you can tie as many as 8 Powertron yagis together and run them all from one power supply on one down-lead.

There are six (8-element) cut-channel and broad low band models — eight (12-element) cut-channel and broad high band models. Ideal for hotels, motels, apartment buildings or wherever the finest installation is needed.

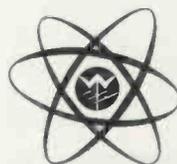
THE  
"SIX-SET"



**WINEGARD "SIX-SET"  
TV COUPLER**

With the Powertron, hook up 3, 4, 5, or 6 sets by adding a Winegard "Six-Set". Here's the only 6 tap coupler on the market. Six no-strip terminals give you instantaneous taps with complete electronic isolation. Model LS-63.

©1961



# Winegard

**ANTENNA SYSTEMS**

Winegard Co., 3019-6 Kirkwood St., Burlington, Iowa

Write today for technical bulletin on Winegard's complete line of Powertron antennas. Ask your distributor for details.

# ASSOCIATION NEWS



## California

CSEA, Fresno, reports 3 directors from the general Bay area have been elected to the State Association for a 2-year term. They are: Claire Lanama, Alameda County; Russell Hamm, Santa Clara/Santa Cruz, and Wesley C. Keys representing the Diablo Valley group.

TSDA, San Mateo County, reports new officers are: Pres., Lloyd Willams; 1st V.P., Ed Feio; 2nd V.P., Gordon Cole; Sec'y, Francis McCarthy; Treas., Kenneth Deedler.

TSA, San Francisco, announced election of officers as follows: Pres., Albert Blanchard; V.P., William Flannerty; Treas., Mrs. Gibson Bories; Sec'y, Earl Crocker.

## Canada

### Canadians for Licensing

RETA, British Columbia, reports it has been very active for some time trying to establish serv-

ice standards meeting both public and trade approval. After considerable work a Trades Advisory Committee was set up. Members of the Labour Board headed this Committee, to which RETA sent delegates. A standard examination was designed for Domestic radio and TV equipment. All those passing this test receive a Government Certificate of Proficiency. Apprenticeships are now available in the Electronics field and apprentices receive all facilities and privileges provided through the Labour Board. The Vancouver chapter of RETA has submitted a brief to the City Council on licensing, but nothing has materialized thus far.

## Illinois

NATESA, Chicago, reported 38 State Representatives have introduced HB 209 in the house. This bill is an exact duplicate of HB 1083 introduced two years ago by five Representatives. To carry the bill, 61 more votes are needed. The organization also reported that its Directors presented "Friends of Service" plaques to Raytheon, Sprague, Sylvania, Tung-Sol, and to ELECTRONIC TECHNICIAN Magazine at their conference in Albuquerque, New Mexico, April 8. It was announced that recent affiliates to the National organization were: TESA, Muscatine County, Iowa; TESA, Quint Cities, Illinois; SCIOTA, Portsmouth, Ohio; and TESA, Yamhill County, Oregon.

## Iowa

Muscatine County reports the following officers were elected: Pres., T. Wesley Hunter; V.P., Harold McElroy; Sec'y-Treas., Steve Crow.

## Michigan

TSDA, Grand Rapids, reports the following officers elected: Pres., Lyle Cook; V.P., Chet Brown; Sec'y, William Katsma; Treas., Al Heilman.

SOCTA, Royal Oak, has elected the following officers: Pres., Edward Kotlarek; V.P., Harold In-galls; Sec'y, Jean Lash; Treas., John Werbinski.

TSA, Detroit, reports the election of the following officers: Pres., J. Russell Goode; V.P., Michael R. Dallen; Sec'y, Thomas J. Goode; Treas., Lawrence F. Nelson.

## Missouri

TESA, St. Louis, reports the Wellston Journal has joined the growing ranks of advertising me-  
(Continued on page 56)

# BUY A DOZEN VU-BRITES



... get the Tool Kit

# FREE!

Eight American-made wrenches—to give you every wrench needed to service all volume controls and all TV knobs with set screws—yours free with the purchase of 12 Vu-Brites!

## WHAT A DEAL!

For a limited time, Perma-Power is offering you this wonderful gift absolutely free with the purchase of 12 Vu-Brites at the regular price. Vu-Brites are the brighteners that really do a job—on series or parallel sets (Model C401 for parallel; Model C402 for series). They come colorfully packaged in individual boxes . . . and are priced at \$9.95 the dozen, net.

Hurry—this special gift offer will end when current stocks are gone. Call your distributor today.

# Perma-Power<sup>®</sup> COMPANY

3104 N. ELSTON AVENUE • CHICAGO 18, ILLINOIS

# BEST

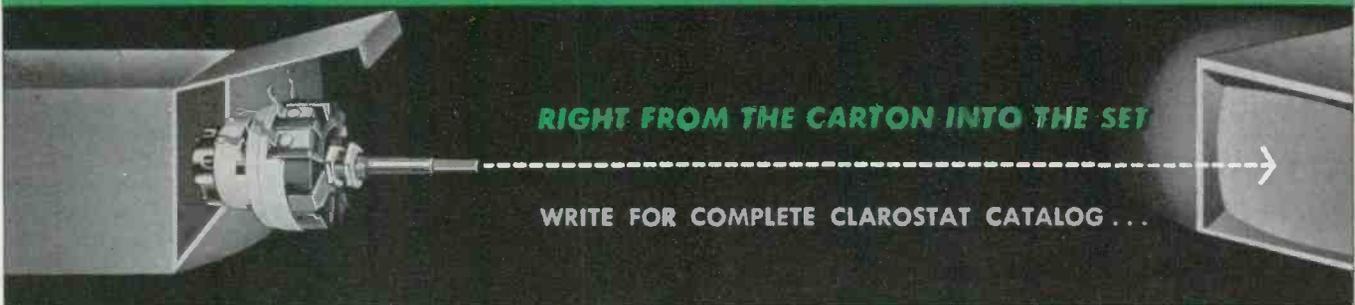
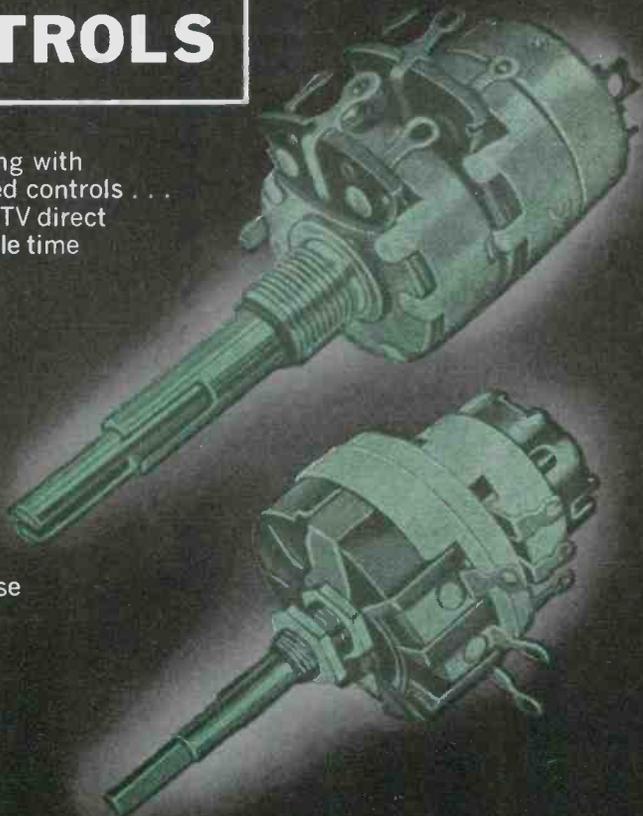
## FOR FAST PROFITABLE SERVICING

### RTV CONTROLS

Eliminate that fuss and muss that goes along with time-consuming, troublesome field-assembled controls . . . Don't accept substitutes—specify Clarostat RTV direct replacement controls. Why spend your valuable time putting together a control when Clarostat can do it for you—correctly.

Clarostat RTV controls offer you ready-to-install controls for virtually all popular TV sets. All you do is open the carton and install the control. That's all! And then watch your profits soar as you do more jobs per hour, per day, per week. Furthermore, you save time and money associated with call-backs. Clarostat RTV controls are factory-assembled under the same precise quality control as original equipment units.

For FAST PROFITABLE SERVICING—always ask for Clarostat RTV controls . . . There are more than 1500 Clarostat Distributors to guarantee local service.



RIGHT FROM THE CARTON INTO THE SET

WRITE FOR COMPLETE CLAROSTAT CATALOG . . .



# CLAROSTAT

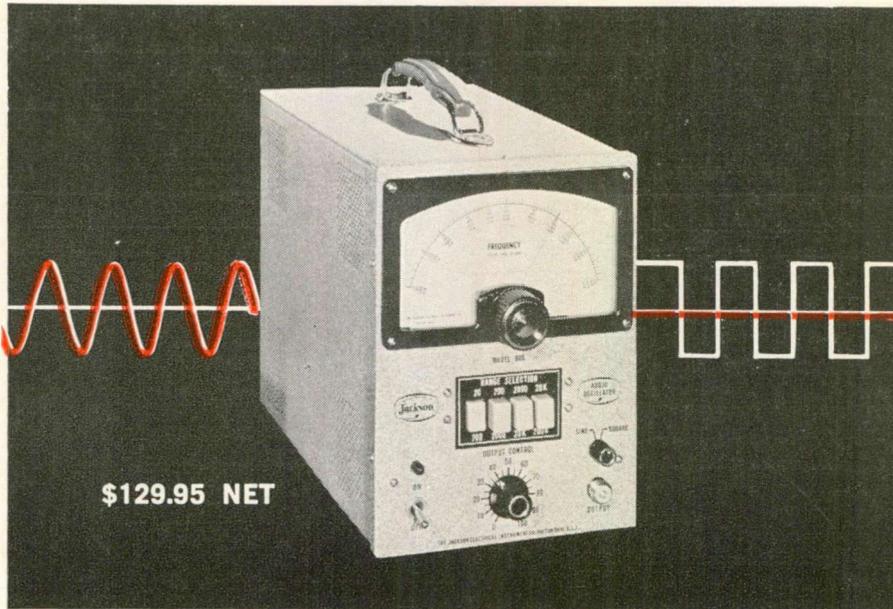
CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE

# NEW

## Jackson 605

for accurate Amplifier Circuit Checks



### Sine/Square Wave Oscillator

This new, precision generator provides both sine and square wave output for checking distortions, voltage, gain and frequency response of amplifier circuits. The "service-engineered" Jackson 605 is very versatile... ideal for hi-fi, video and stereo testing and equally useful in the laboratory for industrial applications.

Range is wide... 20 to 200,000 cycles, in four push-button selected ranges. Output is continuously variable.

Square wave is not a clipped sine wave. It's generated by a Schmitt circuit triggered by the sine wave. You'll like the professional quality of this new instrument. Ask your distributor to show it to you... or write for literature.

#### SPECIFICATIONS

- Output Voltage:** Sine wave 0 to 5.0 RMS volts  
Square Wave: 20 mv to 7.0 P-P volts
- Accuracy:** 3% or 1 cycle whichever is greater
- Sine Waveform:** Less than 1% distortion
- Square Wave Rise Time:** Less than 0.2  $\mu$  sec
- Square Wave Tilt:** 5% at 60 cycles, less than 1% above 200 cycles
- Output Level:**  $\pm$  1 db over full range



ELECTRICAL INSTRUMENT COMPANY

124 McDonough St., Dayton, Ohio

In Canada: The Canadian Marconi Co.

(Continued from page 54)

dia in this area who are supporting the TV service industry's advertising code-of-ethics. A letter confirming this decision was received from the Journal.

TESA, Ozarks, reports the following officers have been elected: Pres., William Shiner; V.P., Rue Johnson; Sec'y-Treas., Tom Leftwich; Sgt-at-Arms, Mark White.

#### Judge Suspends License Law

TESA, Kansas City, says that Judge Ben Terte has issued a temporary injunction against the City, Members of the Examining Board, the Mayor and Police Chief from enforcing the existing Kansas City, Missouri TV Service License law. The injunction sought also to have existing Licenses suspended which the Judge did not grant. This status is to remain until revoked by the Courts or until they show cause for hearing to certify the validity of the ordinance. Firms or individuals now possessing TV Service Licenses may advertise such and display same. More than 400 service dealers and technicians had previously passed the license examination.

#### Ohio

##### License Bill to Senate

TESA, Cincinnati, reports the Commerce Committee approved the State License Bill, No. 253, by a vote of 6 to 2. The bill was sent to the Senate with recommendations for passage. The Association is urging all members to write State Senators requesting them to vote for the bill.

ARTSD, Columbus, reports HB 57, regulating picture tube markings, was passed by the Ohio House of Representatives and would be sent to the Senate soon. This bill not only requires the manufacturer to mark the tube's quality on the carton, but the retailer must also indicate tube quality on customer's invoice.

TESA, Cleveland, announced the following officers were elected: Pres., Edward Maro; V.P., Ray Kacprzak; Rec.-Sec'y, Gus Mirsalis; Corr.-Sec'y, Gene Kotrba; Treas., Harry Bertack; Sgt.-at-Arms, Levi Mosley.

#### Wyoming

RTASA, Casper, reports election of the following: Pres., J. W. Posker; V.P., Frank Lamont; Sec'y-Treas., Jack Holmes.



**"25% of our service calls come in through the Yellow Pages!"** says W. J. Holland, manager, Bailey's Television Inc., Savannah, Ga. "We get up to 85 calls for service every week, and can trace 25% of them to our Yellow Pages advertising. The Yellow Pages and word-of-mouth recommendations are our only advertising—and that's all we need. The Yellow Pages is especially valuable in introducing us to new armed forces personnel in the area."



Display this emblem. It builds your business!

Display ad (shown reduced) runs under TELEVISION SERVICING. Call the Yellow Pages man at your Bell Telephone Business Office to plan your program.

## Catalogs & Bulletins

**CRYSTALS & EQUIPMENT:** Two-color, illustrated, 32-page 1961 Catalog covers: commercial, amateur and citizens band crystals; accessories; and equipment such as auto radio converters, oscillators, frequency alignment equipment, etc. Provides diagrams of typical circuits. Also price list, compiled by item and catalog number. International Crystal Mfg. Co., 18 North Lee, Oklahoma City, Okla.

For more data, circle 6-58-2 on coupon, p. 68

**RESISTORS:** New 350°C hot spot—125°C ambient Thermacoat miniature precision power resistors are described in 2-page color bulletin, P-8. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

For more data, circle 6-58-3 on coupon, p. 68

**DIODES:** "The Zener Diode," bulletin PA-502, latest in the TECH TIPS series provides 4 pages on zener diode theory, characteristics and applications. Includes typical circuits, and advice on use of zener diodes in series and also in parallel. CBS Electronics, Danvers, Mass.

For more data, circle 6-58-4 on coupon, p. 68

**CAPACITORS:** Colorful 28-page catalog covers the firm's line. Engineering specifications and electrical characteristics included. Well illustrated. Chicago Condenser Corp., 3255 W. Armitage Ave., Chicago 47, Ill.

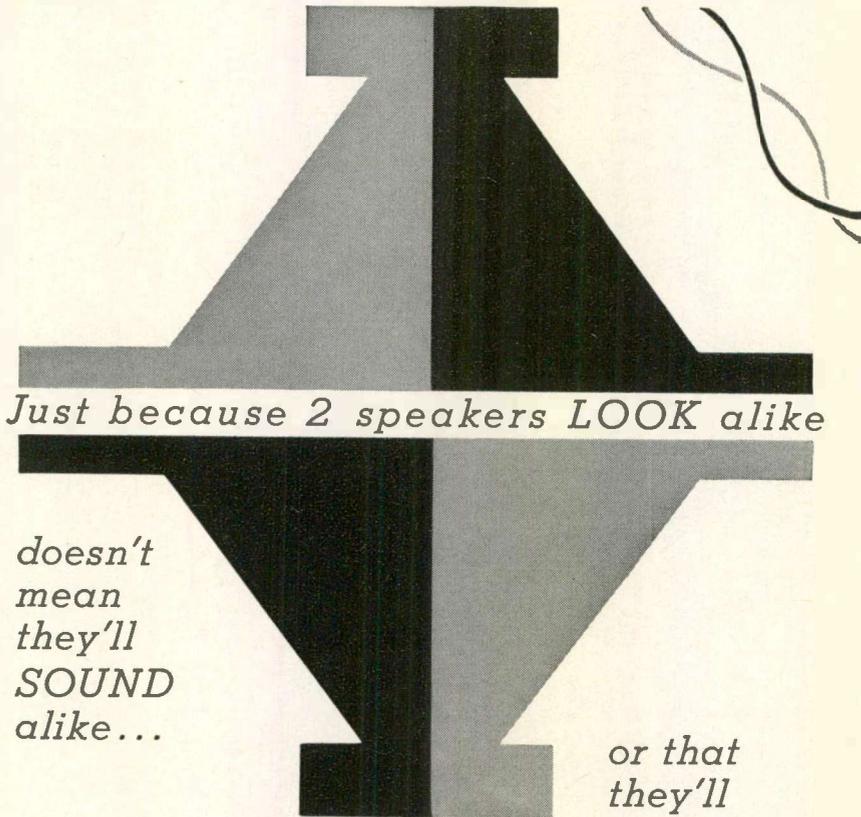
For more data, circle 6-58-5 on coupon, p. 68

**COMPONENTS, TUBES, EQUIPMENT:** A wide range of stock items are covered in the firm's illustrated, 48 page, Spring-Summer 1961 Catalog No. 22. Includes prices. Pay-Bill Distributing Co., 79 White St., New York 13, N. Y.

For more data, circle 6-58-6 on coupon, p. 68

**SOLDERING TIPS:** Catalog sheet covers Hexclad, Xtradur, and Durotherm soldering tips. Listings are by diameter size. Style of tip point and dimensions of point and length are given. Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J.

For more data, circle 6-58-7 on coupon, p. 68



Just because 2 speakers LOOK alike

doesn't  
mean  
they'll  
SOUND  
alike...

or that  
they'll  
give the  
same  
trouble-free  
performance.

ask for

# QUAM

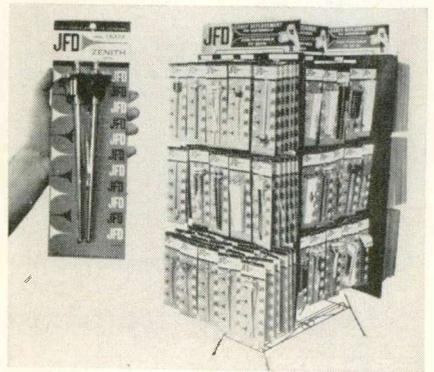
The NO CALL-BACK speaker with the exclusive Adjust-a-Cone Suspension  
Completely manufactured in the United States of America

## QUAM-NICHOLS COMPANY

226 East Marquette Road • Chicago 37, Illinois

### JFD ANTENNAS

Three preassembled display racks are the basis of a new merchandising program, for exact replacement antennas for portable and tote-able TV receivers. They are shipped free with the purchase of a back-up inventory of the firm's antennas, which are available in a new 3-color skin-packed card and boxed in standard folding cartons that allow a choice to fit local needs. Distributor display unit DMP1200, shown, consists of a 3-section, pre-assembled, self-supporting wire rack



that includes 177 antennas (3 each of 59 different types). Compactly made to require just 3 ft. x 2 ft. of floor area. Has 2 side panels, 9" deep, for wall-mounting. Distributor branch stores are offered the DMP400 display carrying one each of the 59 models. For dealers: the DMP530 rack, free with an order of 30 antennas (2 each of 15 basic types), self-supporting but can be hung on wall or pole; also the PA515 counter rack, includes one each of the 13 models most in demand. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y.

For more data, circle 6-58-8 on coupon, p. 68

# NEW! RCA High-fidelity tube gives to RCA VICTOR COLOR TV the truest, sharpest picture ever- with up to 50% more brightness



The new RCA High-Fidelity tube is by far the biggest improvement in Color TV since RCA introduced the first 3-gun color tube years ago!

It's the result of unending research and development at RCA, the only manufacturer in the U.S. now commercially producing color television picture tubes.

**How does it differ from previous color TV tubes?** This new RCA tube features a phosphor-dot screen utilizing a new sulphide group of color phosphors. This outstanding new phosphor group is more efficient, producing color pictures up to 50% *brighter!* It has medium short persistence to provide *sharper pictures* on rapid-action scenes and produces white light with nearly equal current from each of the three electron guns. As used in the new receivers, this adds up to more beautiful color pictures . . . remarkably clear black-and-white pictures!

Furthermore, it incorporates all of the previously announced RCA improvements in color picture tubes such as graded-hole shadow mask, simplified color-field set-up, and an all-glass envelope.

This important Color TV development will stimulate interest *and sales* . . . and will encourage even more manufacturers to enter the color field. For further information about the new RCA High-Fidelity Color Tube, contact your RCA Victor Distributor.

TMK(s)®



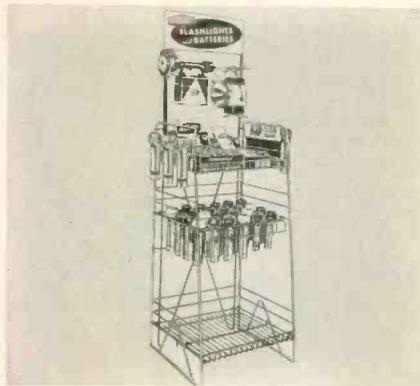
The Most Trusted Name  
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## Eveready BATTERY DISPLAY

A new inexpensive display fixture assortment, designed to turn unused floor space into profits, the new "Ever-ready" store fixture No. 5 forms a complete department in approximately two square feet of floor space and contains over five square feet of shelf space. Ideal for any location, the easily assembled new steel and chrome displayer builds impulse sales of flashlights, lanterns and batteries, and holds a balanced assortment of fastest selling types. \$63.51. Union Carbide Consumer Products Co., 270 Park Ave., New York 17, N. Y.

For more data, circle 6-60-2 on coupon, p. 68



## Jerrold CC TV SYSTEM

The "J-Jacks" closed circuit TV system is reported to offer unlimited communications flexibility over a single cable system. It is designed to overcome one of the major limitations of closed circuit TV, the immobility of TV camera locations. Since TV signals can be fed into existing systems only at a fixed number of pre-engineered points, few new applications can be added after installation. The J-Jacks system permits insertion of both a TV camera and a TV receiver at any point in the system and is reported to be the only system engineered for this flexibility with functions combining a master antenna system, an r-f distribution system and a video distribution system. Jerrold Electronics Corp. 15th and Lehigh Ave., Philadelphia 32, Pa.

For more data, circle 6-60-3 on coupon, p. 68

**Pinpoint in Seconds...**  
**HORIZONTAL & VERTICAL SWEEP TROUBLES**

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**SENCORE**  
Time Saver

*The missing link in TV service . . .*

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**IT'S A . . . UNIVERSAL HORIZONTAL OSCILLATOR.** For direct substitution. No wires to disconnect in most cases. Traces trouble right down to the defective component. Variable output from 0-200 volts, peak-to-peak. Oscillator will sync to TV sync signal giving check on sync circuits.

**HORIZONTAL OUTPUT CATHODE CURRENT CHECKER.** A proven method that quickly checks the condition of the horizontal output tube and associated components. Adaptor socket prevents breaking wires. Easily replaceable Roll Chart gives all necessary pin, current and voltage data. New Roll Charts are Free.

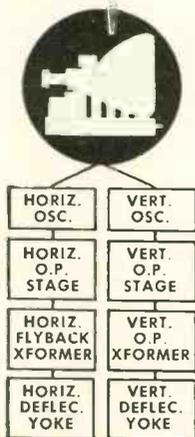
**UNIVERSAL DEFLECTION YOKE.** A new, simple way to determine yoke failure accurately—without removing yoke from picture tube. Merely disconnect one yoke lead and substitute. If high voltage (also bright vertical line) is restored, TV yoke is defective.

**DYNAMIC FLYBACK TRANSFORMER CHECKER.** Merely flip switch to "Flyback Check" and meter will indicate condition of flyback transformer, in degrees of horizontal deflection. Extremely sensitive and accurate; even shows up one shorted turn on flyback.

**VOLTMETER.** For testing bootstrap, screen and other voltages. Direct-reading voltmeter, 0-1000 volts.

**UNIVERSAL VERTICAL OSCILLATOR.** Checks oscillator, output transformer and yoke. Merely touch lead to component and check picture on screen.

**SS105 is completely self-contained, nothing else is needed. New Improved Circuit . . . DEALER NET 42<sup>95</sup>**



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## Colman PUTTY

High Voltage Putty, a new compound developed to repair and rebuild tires on flyback transformers, can also be used to stop arcing in yokes, high voltage cages and many similar places. Application is made by simply molding the flexible material into and around the area to be insulated. It is reported that, because of its unique properties, it will not crack or shrink with age but will continue to protect against corona and arcing. Colman Electronic Products, 1017 N. E. Third Ave., Amarillo, Texas.

For more data, circle 6-74-2 on coupon, p. 68

## Mullard TUBES

An expanded line of laboratory-balanced matched pair tubes, designed to permit optimum performance of quality high fidelity equipment, avail-



able in new dual-tube cartons, are: EL34/6CA7, EL37, EL84/6BQ5, EL86/6CW5, EL90/6AQ5, EL95/6DL5, ECL82; 6BM8, UL84/45B5, and 7189. International Electronics Corp., 81 Spring St., New York 12, N. Y.

For more data, circle 6-60-5 on coupon, p. 68



## CBS 6SN7GTB FREE! with New CBS "Preferred Line" Profit Pack

Introductory "P-L" tube offer gives you these 15 fast-sellers:  
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MLC ideal for moderate-size areas. Front loaded folded horn. 12 $\frac{3}{4}$ " x 9 $\frac{1}{2}$ " x 10 $\frac{3}{8}$ " deep. \$34.50

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## Transistor Radios

(Continued from page 45)

Now connect the common meter lead to the base terminal, and alternately connect the positive lead, first to the emitter, then to the collector. Both junctions will be biased in the forward direction so that each reading should be less than 500 ohms. The transistor is assumed to be good under these conditions.

When testing an NPN transistor, reverse the VOM leads in each of the foregoing tests. The high resistance readings will be obtained with the meter's common lead to the collector terminal; the low readings with the positive lead connected to the base terminal.

When removing transistors from the circuit for testing or replacing, remember it is easy to re-insert some transistors incorrectly. For this reason socket terminals and the transistor's leads should be identified before removing the transistor from the socket or from the circuit.

A convenient way to do this is by marking the transistor's collector terminal, and its socket terminal or tie point, with colored crayon or with a small piece of adhesive tape. It is then easy to replace the transistor correctly.

### Source & Bias Voltage Polarity

Depending upon the type or types of transistors being used in the radio, source and bias voltage polarities must be carefully observed (see Chart I). Reversed polarity can completely destroy a transistor. Always check the polarity of the bias voltages applied to a defective transistor before substituting a new one.

When checking the bias voltage on a transistor, leads should first be identified and likewise if the transistor is PNP or NPN type. If the leads cannot be identified from labeling, examine lead spacing at a point where they enter the transistor. If unequally spaced, as shown in Fig. 3A, the two closely spaced leads represent the emitter and base, with the base on the inside. The third lead, widely spaced from the other two, is the collector. If

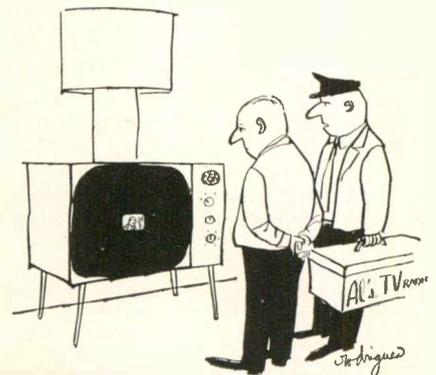
the leads are equally spaced, look carefully for a red dot on the transistor's edge (see Fig. 3B). The lead nearest the dot is the collector, and the base and emitter follow in this order. If the transistor is cylindrical in shape, look for a red dot on the side at the lower edge. The pin adjacent to this dot is the collector. The base and emitter follow in a clockwise direction when viewed from the transistor's bottom, as shown in Fig. 3-C.

### Other Precautions

By now most technicians already know that transistors can be damaged if subjected to excessive heat. This means low wattage irons should be used, long transistor leads, and leads should be grasped with pliers to absorb the heat while soldering. Also, the iron should never be allowed to come into contact with the transistor body. If a soldering gun is used, it should not be brought near the transistor body. A heavy magnetic field is generated by soldering guns and this may damage the transistor.

If a transistor radio requires realignment after parts replacement, manufacturers' instructions should be carefully followed. The practice of peaking individual stages is generally avoided. If one-stage alignment is required, all stages should be realigned according to the procedure outlined for a particular radio.

Transistors have very low impedance input circuits and their input and output circuits are not isolated. Adjusting one stage, therefore, not only affects the loading and tuning of the previous stage, but also the tuning of all following stages. •



"What you need is some new wiring in this house."

*there's a gold mine in the sky with the...*

# NEW TRANSISTOR MAST-MOUNTED TV/FM 4-SET BOOSTER

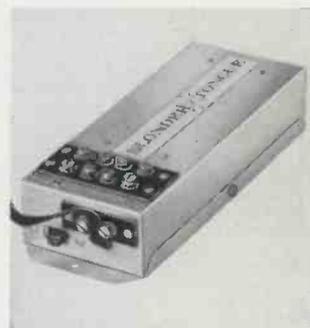
*Blonder-Tongue Signal Master, AB-4  
master system performance at  
a home booster price! \$29.95 list*

Thousands of TV antennas in your area can be converted into powerful, amplified 4-set home distribution systems with this remarkable new transistor booster. It is service-free, weather-proof and low-priced for volume. Check these engineering features:

- Transistor circuit provides lowest noise, maintenance free operation—no tubes to burn out or replace—no heat dissipation problems.
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- Converts existing antenna into a powerful amplifier-distribution system—no need to invest in a new antenna.
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- Provides improved FM reception (gain 12-15 db).
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- No separate balun needed—matches impedance of antennas and TV sets.

**ALL THIS PLUS . . .** 4 set coupler incorporated in remote power supply distributes full isolated amplified signals for brilliant reception on up to 4 TV or FM sets.

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<p>1 set gain: up to 19 db, channel 2 Up to 10.5 db, channel 13</p>	<p>2 sets gain: up to 14 db, channel 2 Up to 6 db, channel 13</p>	<p>3 sets gain: up to 13 db, channel 2 Up to 4 db, channel 13</p>	<p>4 sets gain: up to 10.5 db, channel 2 Up to 2 db, channel 13</p>
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## New Books

**INTERNATIONAL TRANSISTOR SUBSTITUTION GUIDEBOOK.** By Keats A. Pullen, Jr. Published by John F. Rider Publisher, Inc. 56 pages, soft cover. \$1.50.

Over 4500 direct substitution transistors for transistor radios, communications, industrial and computer types are listed in this text. Equipment of American, Japanese, British, Dutch, French, Italian, and German origin have direct replacement transistors listed. Listings contain the original component, its case number, the substitute and its case number. Drawings of various cases are shown. Substitute evaluations were conservatively rated to prevent damage to transistors and related equipment. Possible substitutes deemed "doubtful," that is, they work only in some cases, were omitted from the listing. Thus, the substitution guide is a safe guide, too. This manual is a *must* addition to the reference shelf of any technician repairing transistorized electronic equipment, especially those of foreign origin.

**1961 RADIO AMATEUR'S HANDBOOK.** Prepared and published by the American Radio Relay League, West Hartford 7, Connecticut. 724 pages, soft cover. \$3.50, in the U.S.

As always, this technical Bible of Amateur radio contains a wealth of data. There are more than 1300 illustrations, including some 500 tube-base diagrams, many construction articles and a most lucid explanation of electronic functions. The chapter on radio communications theory has been updated to keep abreast of the state of the art. Many new designs have been included in equipment construction material. Recommended as a radio construction manual, reference, and training text for class or home study.

**ELEMENTS OF ELECTRONICS.** By Henry V. Hickey and William W. Villines. Published by McGraw-Hill Book Co., Inc. 554 pages, hard cover. \$8.75.

This is a revised and up-dated edition of a basic text written and published in 1955. It begins with the fundamentals of matter and electricity, and quickly discusses mathematics' "powers of ten." After this introduction, basic electrical circuits, vacuum tube fundamentals, parallel and combined circuits are covered. Magnetism and electromagnetic circuits are likewise examined. Meters, a-c principles and the necessary introduction to trigonometry, vector and phase analysis, are followed by the laws and properties of inductance. Fundamentals and applications of LCR circuits completes the gradual transition to power gener-

ation, transformers, batteries, and various types of power supplies. Later chapters deal with practical descriptions of amplifiers and oscilloscopes, oscillators, transmitter tuning and keying, and modulation principles. Antennas and transmission lines, receivers, wave propagation and a final chapter on transistors completes this excellent coverage of the elements of electronics. The material is well organized. Review questions are included at each chapter ending and the text is adequately illustrated with photos, schematics, drawings, charts and graphs.

**CITIZENS BAND RADIO HANDBOOK.** By David E. Hicks. Published by Howard W. Sams & Co., Inc. 192 pages, soft cover. \$2.95.

This book can serve as a guide for those who now use or plan to use CB radio equipment. Some of the chapters contain information which can be used by the technician for CB installation, maintenance, and repair. The elements of Citizens Band radio is explained. License classes and how to obtain a license is reviewed. Types of equipment—kits and factory-built—are explored. Types of receivers and transmitters and their circuitry are outlined, together with antenna selection and installation. Final chapters contain information on fixed and mobile installation, maintenance, and operating procedures. The volume is well illustrated with photos, schematics and drawings.

**TV TROUBLE ANALYSIS.** By Harry Hileaf. Published by Gernsback Library, Inc. 244 pages, soft cover. \$3.20.

An unusual text approach to analyze TV defects is offered here. The author stresses component construction and failure in the first half of the book. How they fail and the effect of its breakdown is thoroughly analyzed. The second half of the text emphasizes circuit failure analysis: how a specific TV circuit section operates and is adversely affected by various component defects. Each circuit failure chapter, which includes tuner-if-video, audio-age, sync-vertical sweep, and horizontal sweep-high voltage, depends a great deal upon waveform analysis for explanations of what occurs, circuit-wise, when a component fails. (It should be mentioned here that the first chapter is devoted to analyzing waveforms in various sections of a TV receiver.) It's an excellent service approach, and one which many service technicians who are not too familiar with scope traces could well study. Many illustrations and a to-the-point writing style succeeds in making this effort a very commendable one and certainly recommended reading for TV service technicians who wish to improve their understanding of TV circuits and shorten repair time.

For more data, circle 6-64-1 on coupon, p. 68

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ELECTRONIC TECHNICIAN • June, 1961

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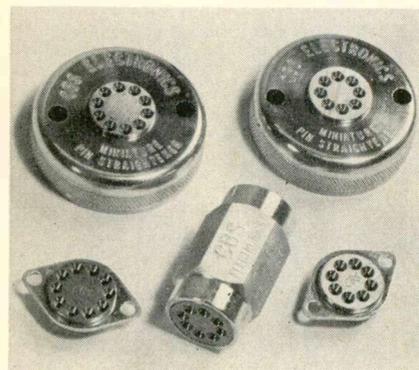
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### CBS TUBE PIN STRAIGHTENERS

The firm's miniature tube pin straighteners are now available in three models. Original bench-mounted models SH-17 and SH-19 are now supplemented by two additional designs. SH-79 hand tool combines a 7-pin

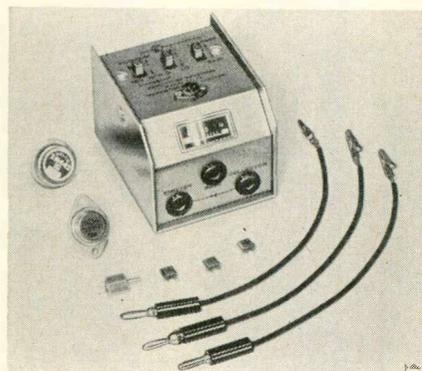


straightener on one end with a 9-pin straightener on the opposite end. SH-97P offers a separate pair of 7- and 9-pin straighteners, for mounting on a chassis in standard cut-outs for miniature tube sockets. CBS Electronics, Danvers, Mass.

For more data, circle 6-66-2 on coupon, p. 68

### Heath TRANSISTOR/DIODE CHECKER

Heathkit IT-10, for testing transistor radios, tests both low power and high power transistors for shorts, opens, leakage, current gain, as well as forward and reverse current of crystal diodes. A PNP/NPN forward/reverse switch identifies transistor



type and eliminates transferring test leads for diode testing. External removable test leads provided to check transistors that do not fit tester socket. Tester checks its own built-in battery power supply and doubles as a continuity tester. 3 3/4"D, 3 1/2"H, 3 1/2"W. \$6.95. Heath Co., Benton Harbor, Mich.

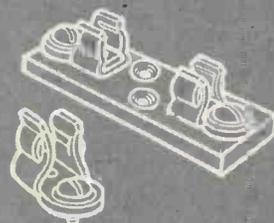
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# FREE LITERATURE

To receive the literature below without charge, simply circle the numbers on the coupon.

Cut out and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

**1** Picture Tube Test Equipment: Colorful circular on the "Anchor" line includes: check tube converters; reacto testers; test adapters, etc. Illustrated. Prices included. Antronic Corp.

For more data, circle 6-69-1 on coupon

**2** Cable: Antenna guy cable, non-inductive, non-conducting, non-absorbing, is described in literature. Tensile strength, with proper use, 2500 lbs. Glas-Line Co.

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**3** Towers: Literature covers a new line of 2-way communications towers, ranging in height from 10 to 500 feet. Motorola, Inc.

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**4** PA Loudspeakers: Covered in a brochure are: RL Series medium power speakers for paging, talk-back and speech reproduction; PT Series, weatherproof hi-fi patio and extension; and heavy duty types. Racon Electric Co.

For more data, circle 6-68-4 on coupon

**5** Microphones: New Elucidator press-to-talk microphone unit, covered in literature, operates on d-c

microphone currents ranging from 15 to 120 milliamperes. Raytheon Co.

For more data, circle 6-68-5 on coupon

**6** Multiplex Adaptor: Type 335, completely new wide-band FM multiplex stereo tuner is covered in 2-color illustrated circular. H. H. Scott, Inc.

For more data, circle 6-68-6 on coupon

**7** Semiconductors: Literature covers: American replacement line for Japanese radio transistors and diodes; replacement line for silicon power rectifiers, etc. Interchangeability charts included. Semitronics Corp.

For more data, circle 6-68-7 on coupon

**8** Tools: 16-page illustrated buyers guide lists 216 individual numbers of screwdrivers and nutdrivers, plus over 250 other tool items and display units. Vaco Products Co.

For more data, circle 6-68-8 on coupon

**9** Components: Literature covers complete line of i-f transformers and oscillator coils for miniature and sub-miniature transistor sets. Vidair Electronics.

For more data, circle 6-68-9 on coupon

**10** 2-Way Radios: Literature covers: "Volt-Air Twins" CB transceiver, described as a complete station; and "Volt-Air Sportsman" portable PA record playing system. Volt-Air Receiver & Transmitter Mfr.

For more data, circle 6-68-10 on coupon

**11** Intercom Systems: Data sheet covers Guardian "Inter-Compact," complete transistorized intercom system. Easily portable, and wireless. Webster Productomatic Corp.

For more data, circle 6-68-11 on coupon

**12** Chemicals & Components: 400-page catalog combines all previous separate catalogs of: GC, Telco, Walsco, Audiotex, and American Microphone. GC Electronics Co.

For more data, circle 6-27-1 on coupon

**13** Ceramic Cartridges: Data on cartridges which replace all ceramic stereo and many mono types. Fine performance includes 16-25,000 cps response, 1.5 gram tracking, 25 db separation, many other features. Euphonics Corp.

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6-9-1	6-28-1	6-58-4	6-66-3	6-72-3	6-77-3
6-10-1	6-48-1	6-58-5	6-67-1	6-72-4	6-78-1
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## Choosing Transistor Test Instrument

(Continued from page 41)

$\Delta I_b$  in formula 2. Note that the variation is around the 1 ma d-c current standard, thus maintaining standard test conditions.

This method may seem cumbersome at first, but after several trials the entire test will take seconds. This is especially simplified when you note that  $\Delta I_c$  is maintained at 500  $\mu$ a. Then all you do is divide the difference of the two readings into 500. The result of this calculation is the true a-c beta.

For those unwilling to go through these extra few seconds of test and calculation, a meter should still provide a d-c beta scale. If you are ever stuck for an a-c test, try this on your present tester. First, however, be certain that the collector circuit resistance is very low.

### Power Transistor Testing

No portable and few line powered testers can measure beta properly for power transistors. The standard collector conditions are usually 1 volt at 1, 3, 5 or 10 amps. No portable battery will supply these currents.

For these transistor types, you can just calculate the approximate beta. Measure the  $I_{CBO}$  and  $I_{CEO}$ . You will have to assume the ratio of these two values is the closest you can approach to a reliable beta measurement for power units.

A complete service instrument should consist at least of a transistor tester to measure  $I_{CBO}$ ,  $I_{CEO}$ , d-c beta and an indication of a-c Beta for small and power units. It is an advantage not to tie up other service instruments which can be used on high voltage equipment. Thus, in addition to checking transistor characteristic, a really useful instrument would include a voltmeter, ammeter and ohmmeter to test only transistorized equipment.

It is not unreasonable to include these additional functions on an all-around tester. The 50  $\mu$ a meter movement is the most expensive item in a good tester. Only added switching and a few precision resistors would turn this unit into a 20,000 ohm/volt VOM. In the serv-

iceshop, it is more economical to buy a complete transistor test instrument. If a meter movement less sensitive than 50  $\mu$ a is used, the additional functions cannot serve adequately because of circuit loading and inadequate resistance ranges.

### Troubleshooting

When the  $I_{CBO}$  measurement indicates an extremely high current, there is a breakdown in the base-collector junction. A breakdown in the emitter-base junction is char-

acterized by  $I_{CEO}$  being equal to  $I_{CBO}$ .

Punch-through, a short or near short of the complete transistor from emitter to collector, is evidenced by an extremely high reading of the  $I_{CEO}$  characteristic. It is wise to check the transistor circuit involved prior to replacing a defective unit with a good one.

Armed with the above characteristics obtainable with a good transistor tester, you can rapidly localize any defect in transistor equipment. •



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**"for-the-Serviceman" design converts your time to added profit!**

the NEW T-471 Reacto-Tester

Complete all-in-one unit tests, repairs all picture tubes including newest 110° types and color models. Locate trouble, make repairs fast!

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the NEW TC-438 Check Tube Converter

1 converter enables bench testing of any TV receiver using your present substitute TV tube! Whether your tube is large neck (90°) or small neck (110°), this one converter is all you need! One setting and you're ready to check!

- Supplies correct voltage and current for all 6 combinations:
 

2.35 V 600 MA	6.3 V 300 MA
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- Checks all 110° RCA & Sylvania; standard base, too

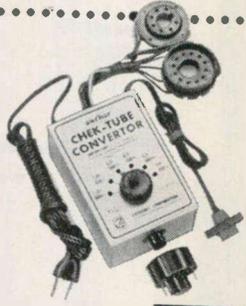
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the UT-450 Test-Adapt

Use your present test and repair instruments for servicing 110° picture tubes and color tubes. Up-date your TV picture tube tester!

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**NEW! RA-310 Adapter**

Converts picture tube tester from regular RCA base to 23 EP4 tube basing.

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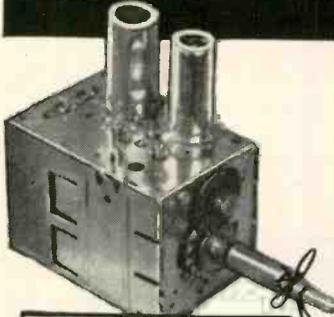
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Castle overhaul charge includes all labor and minor parts and written 90 day warranty. Tubes and major parts are extra at net prices. Tuner to be overhauled should be shipped complete; include tubes, shield cover and any damaged parts. Write down model number and state complaint. Pack well and insure.

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For more data, circle 6-70-1 on coupon, p. 68

## Stancor DEFLECTION YOKES

Model DY-43A, exact replacement for Motorola part numbers 24D733239 & 24K735873 used in 36 models and chassis, is a 90° yoke with a 24 MH horizontal inductance, and a 3.3 MH vertical inductance. Horizontal resistance is 31 ohms and vertical resistance is 3.0 ohms. DY-45A for Admiral part



numbers 94D147-1/-2/-3 used in 269 models and chassis, is supplied with a thermistor wired between the vertical coils. It is a 110° yoke with a 18.6 MH horizontal inductance, and a 14.8 MH vertical inductance. Horizontal resistance is 35 ohms, and vertical resistance is 13.8 ohms. Chicago Standard Transformer Corp., 3501 Addison St., Chicago, Ill.

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1A7GT	3CB6	5X8	6AV5GT	6BS5C	6DE6	6SJ7	7B6	12A05	12F5	25Z6GT
1B3GT	3Q4	5Y3	6AV6	6BZ6	6DF6	6SK7	7B7	12A76	12F8	27
1H5GT	3S4	6A6	6AW8	6BZ7	6E5	6SL7	7B8	12A77	12M5	35A5
1L4	3V4	6AB4	6AX4GT	6C4	6F6	6SQ7	7C4	12A07	12K7	35B5
1L6	4B07A	6AF4	6AX5GT	6CA8	6F5	6SR7	7C6	12A06	12R5	35C5
1N5GT	4B58	6AG5	6B8	6CB6	6H6	6SR7	7C6	12A07	12Q7	35W4
1R5	4BZ7	6AH4GT	6BA6	6CD6C	6J4	6T8	7E5	12AX4GT	12S7	35Z5
1S5	4C06	6AM6	6BC3	6CF6	6J5	6U8	7E7	12A77	12R5	36
1T4	5AM8	6AK5	6BC8	6CC7	6J6	6V6GT	7F7	12B4	12S7GT	38
1U4	5AN8	6ALS	6BD6	6CC8	6J7	6V6GT	7F7	12B4	12S7GT	39/44
1U5	5AT8	6AM8	6BE6	6CH8	6K6GT	6W6GT	7F8	12BA6	12S07	42
1V2	5AV8	6AN8	6BE6	6CL6	6M6	6X4	7G7	12B07	12V6GT	43
1X2	5AZ4	6AQ5	6BG6C	6CM6	6N7	6X5GT	7H7	12B06	12W6GT	50B5
2AF4	5BR8	6AQ6	6BH6	6CM7	6Q7	6X8	7H7	12B06	12X4	50A5
2BN4	5C68	6AQ7	6BQ6	6CN7	6Q7	6X8	7H7	12B06	14A7/12B	50C5
2CY5	5J6	6AR5	6BK5	6CQ8	6S7	7A4/XXL	7S7	12B07	14B6	50L6
3A5	5R4	6AS5	6BK7	6CR6	6S8GT	7A5	7X6	12B06	14Q7	56
3AL5	5T8	6AT6	6BL7GT	6CS6	6S7	7A6	7X7	12B07	19BG6G	84/6Z4
3AU6	5U4	6AU6	6BN6	6CS7	6SD7GT	7A7	7Y4	12B07	14B6	50L6
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## UHF-TV Tuners

(Continued from page 34)

the TV set's first i-f transformer. When the UHF tuner is switched into the circuit, it feeds directly into the first i-f transformer and not through the VHF tuner as in most VHF-UHF TV receivers. Likewise, when the VHF tuner is switched into the circuit, it is coupled directly to the first i-f transformer. The other side of the wafer switch connects the proper B+ voltage to each tuner.

### Cable Hookup

In 1960-61 RCA TV receivers the tuner cable assembly connections must be changed in the following manner: (1) Unplug the chassis i-f link cable from the jack atop the VHF tuner. (2) Insert the link cable into the jack on the wafer switch. (3) Plug the long cable from the wafer switch into the jack on the rear of the i-f amplifier. (4) Plug the short cable from the wafer switch into the VHF tuner jack. (See power cable connections in Fig. 9.) (5) Remove the VHF tuner power cable from the socket on the main chassis. (6) Insert an adapter plug into the chassis socket in place of the VHF tuner power cable. (7) The VHF cable plug is now inserted into the adapter top. This power cable should be dressed and properly fastened to prevent shorting to the chassis or antenna connections.

However, when wiring i-f link cable connections, in some other TV's, follow the diagram of Fig. 10. The VHF tuner's B+ voltage should be disconnected and then spliced to the grey lead of the power cable. The red lead from the power cable should be connected to the B+ connector on the VHF tuner. This is the point where the B+ lead was disconnected. Connect the green lead to the agc bias wire on the VHF tuner. The black lead of the power cable should go to ground on the VHF tuner. Take the brown lead and solder to the filament connection on the UHF tuner.

### Antenna Hookup

For later model RCA TV receivers, two snap type antenna terminals

are supplied to provide connection of the UHF terminal lead. Snap the terminal into position in the pre-cut slots in the cabinet block. The UHF antenna cable assembly plugs into the top of the tuner. Run the lead through the slot in the side of the cabinet body, and connect it to the two terminals previously installed in the back.

Should you have some other make TV receiver, a black antenna assembly strap is enclosed with separate UHF and VHF terminals to provide antenna connections. Remove the old VHF antenna terminal block and insert the new one in its place. Solder both sets of wires to the correctly lettered terminals. After checking all connections, turn the set on.

The i-f amplifier should be adjusted if the UHF signal is weak. With a UHF station tuned in, check the pre-set factory adjustments of the two i-f amplifier coils. The coil at the rear of the UHF amplifier should be adjusted first, then adjust the coil on top. Note that these two coils should not be adjusted unless UHF reception is weak.

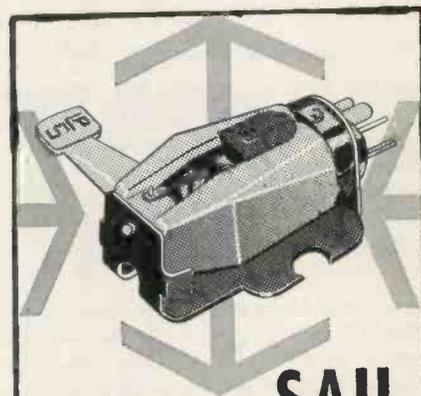
When the UHF tuner is front mounted, UHF stations will be indicated on the proper channel number. Of course when side tuning is used the channel numbers will be off and the dial must be varied.

Simply tune in a local UHF station, remove a flat "U" spring from the front of the tuner dial, and pull out on the dial knob. With the station still tuned in, push the knob back in, with it set on the correct channel number. A small lever must be pushed out so the gears will mesh. Now stick the "U" spring back into its original slot and the knob is set for tuning. A small brass brad, with a round head, can be driven into the cabinet for dial markings. This brad is also furnished with the DK-32 UHF tuner kit. •

*Information & Illustration Credit: RCA Service Co., Camden, N.J.*

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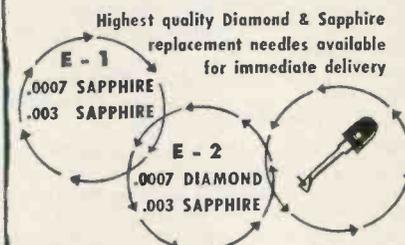
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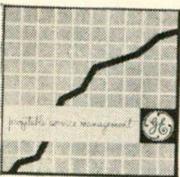
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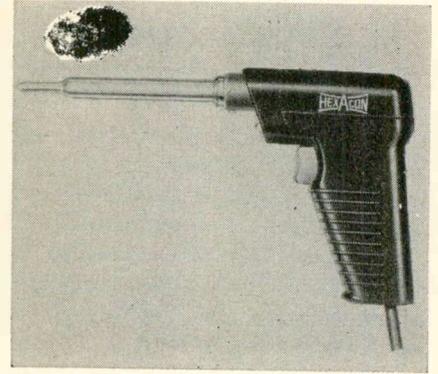
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**Hexacon SOLDER GUN**

A new solder gun is reported to be soldering-hot in a few seconds without the use of transformer or thermostats. Weight, 8 oz. Features include: 1/4" special alloy lifetime tip; trigger control for any degree of heat without danger of overheating; and long thin reach for getting into tight places. Rated at 150 watts and available for 120v. Operates on d-c as well as a-c, any cycle. Catalog #G14, \$7.95. Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J.

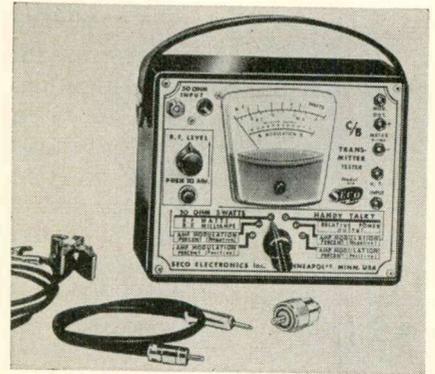
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**Seco TRANSMITTER TESTER**

Model 510 is designed for use with 2-way radio transmitters up to 160 mc at 5 watts, and for optional use (with attenuator) with transmitters rated up to 50 watts output. Permits amplitude modulation and r-f power output checks without removing transmitter chassis from cabinet. Direct reading scales, for both 0-5 watts r-f and 0-400 ma r-f scale. Also measures losses in transmission lines and tests coaxial insertion devices such as connectors, etc. Complete, with carrying case, cables and adapters, \$46.95. Seco Electronics, Inc., 5015 Penn Ave. S., Minneapolis 19, Minn.

For more data, circle 6-72-4 on coupon, p. 68



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12 Volts DC/115 Volts AC... 3.2 Amps full standby current  
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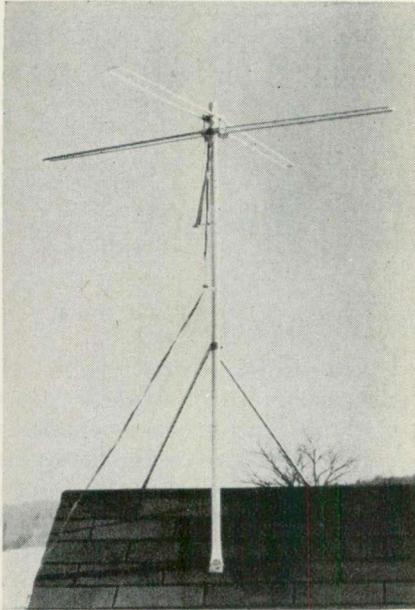
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## TACO BI-MOUNTS

Announced is a new Bi-Mount for both FM and TV antennas, designed for use with all types of antennas and can be installed on any roof, flat or pitched on one side or straddling the peak. Available in two models, "Regu-



lar" for short masts and "Super" for 10' masts. No guy wires are required. Available in two packages: one as a single unit which includes screws and other hardware items; the other a kit which also contains a 50' length of lead-in wire. Technical Appliance Corp., Sherburne, N. Y.

For more data, circle 6-73-3 on coupon, p. 68

## RCA TV PORTABLES

Three new 19" (overall diagonal) portable TV receivers, featuring the firm's "New Vista" tuner, are: Trimette, model 192-A-06-M, has power-pack Sportabout chassis, luggage handle, built-in telescoping antenna and top tuning; Travel-Mate, model 192-A-07-M, easy to carry and offers peak power (20,000v of picture power) and performance; and Urbanite, model 192-A-09-M, features two speakers, front control tuning, hi-level contrast control. Radio Corp. of America, Camden, N. J.

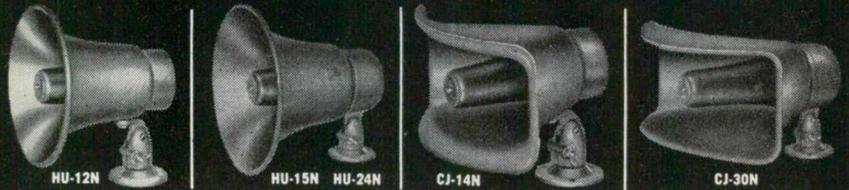
For more data, circle 6-73-4 on coupon, p. 68

## S-C STEREO HI-FI CONSOLES

A new six-console line, the compact "Young America" series of stereo high fidelity consoles, is priced from just under \$200 to about \$500 and will augment the "Integrity" series, currently priced up to \$1000. Components, found in the "Integrity" series, have been adapted for use in the "Young America" series. Solid hardwood veneer cabinets are featured in authentic period furniture styling. Stromberg-Carlson Co., 1400 N. Goodman St., Rochester, N. Y.

For more data, circle 6-73-5 on coupon, p. 68

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Model	HU-12N	HU-15N	HU-24N	CJ-14N	CJ-30N	CJ-44	TP-15N	TP-24N	DU-12	DC-5
POWER*	7.5 w	25 w	25 w	7.5 w	25 w	60 w	25 w	25 w	7.5 w	6 w
IMPEDANCE**	8 ohm	8 ohm	8 ohm	8 ohm	8 ohm	16 ohms	8 ohm	8 ohm	8 ohm	8 ohm
FREQUENCY	350-	250-	200-	400-	250-	150-	250-	200-	400-	120-
C.P.S.	10,000	10,000	10,000	10,000	10,000	9000	10,000	10,000	10,000	7000
LENGTH OVERALL	7 1/4 in.	8 3/4 in.	12 in.	8 in.	1 1/4 in.	23" x 13"	16 1/2 in.	23 in.	14 in.	14 in.
BELL DIAMETER	7 1/2 in.	9 3/4 in.	11 1/4 in.	9 1/2 in.	5 1/2 in.	14" x 6"	19 in.	9 3/4 in.	11 1/4 in.	7 in.
NET PRICE	\$16.20	\$20.10	\$22.35	\$18.00	\$24.60	\$43.50	\$31.20	\$34.50	\$19.80	\$13.20

\*Input range limited to frequencies above horn cutoff \*\*All models available in 45 ohms at slightly higher prices

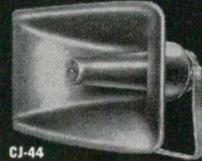


TP-15N TP-24N



DC-5

DU-12



CJ-44

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6207-PC	TV Ratio Detector	RTD-025 (WT56X37)
6208-PC	TV Ratio Detector	RTD-020
6209-GI	TV Ratio Detector	RTD-024 (WT56X36)

### PHILCO

6209-P1	TV Discriminator	32-4721
6209-P2	TV Discriminator	32-4689-1, 2
6209-P3	TV Discriminator	32-4735-1, 2

### RCA

1483 IF	Sound I.F. Transformer	76437
1484 RD	Sound Ratio Detector	102692
1485 RD	Sound Ratio Detector	102644
1486 RD	Sound Ratio Detector	102253
1487 RD	Sound Ratio Detector	100364
1488 RD	Sound Ratio Detector	79141
1489 RD	Sound Ratio Detector	101219

### WESTINGHOUSE

12-C14	Home Radio I.F.	235V025H-11, 2 (V157661)
68 Osc.	Home Radio Osc.	230V039H-01 (V15764-1)
6204-W3	TV I.F.	V12128-1, 2, 3

MILLER	ADMIRAL	MFG. #
1471-A	Sound Take-Off	728185-2
1472-A	Sound Take-Off	72C132-19

### BENDIX

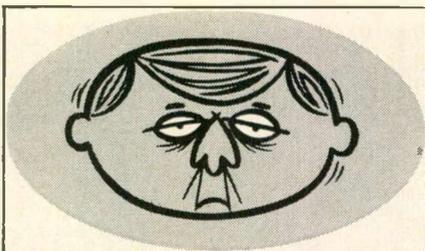
6501	Auto Radio I.F.	2090237-1
6502	Auto Radio I.F.	2090237-2
6503	Auto Radio I.F.	2090237-3
6504	Auto Radio I.F.	2090237-4
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# GHOST REJECTION

## Depends On The Channel

• The April 1961 issue of ET pre-  
sented the article, "When To Choose  
Fringe TV Antennas For Strong  
Signal Areas." It showed how high  
gain antennas with very directive  
patterns can be used to eliminate  
rear ghosts. The point was made  
that an antenna with a very small  
rear lobe on the polar response pat-  
tern would be the best selection in  
such ghost areas.

The question arises as to whether  
a good response pattern on one  
channel implies that the particular  
antenna is also better on the re-  
maining channels as well. The an-  
swer is no. In comparing two an-  
tenna types, we find that one is bet-  
ter on some channels, while the sec-  
ond antenna is better on other chan-  
nels.

As a case in point, note Fig. 1.  
The polar response patterns for  
channel 9 are the same as those  
published in April. Based on tests  
made by RCA Service Co., the pat-  
terns indicate that antenna type B

is to be preferred over type A (note  
the small rear lobe on pattern B) to  
eliminate rear ghosts on channel 9.

However, the case for these same  
two antennas is just the opposite on  
channel 6. Note that the relative  
strength of the A antenna 180°  
rear lobe is less than that of B.  
In other words, the A antenna has  
a greater front-to-back ratio on  
channel 6. Also, A has end nulls  
which cut ghost reception at this  
frequency from the antenna ends.  
Therefore antenna A is the better  
choice for ghost rejection on chan-  
nel 6.

Other factors such as directivity  
or beam width, gain, and side lobes  
affect suitability for ghost rejec-  
tion. However, the important point  
to keep in mind is that an antenna  
that is superior on one channel may  
be inferior on another channel.  
Technicians should make their an-  
tenna choice based on the particu-  
lar channel where ghosts are a  
problem. •

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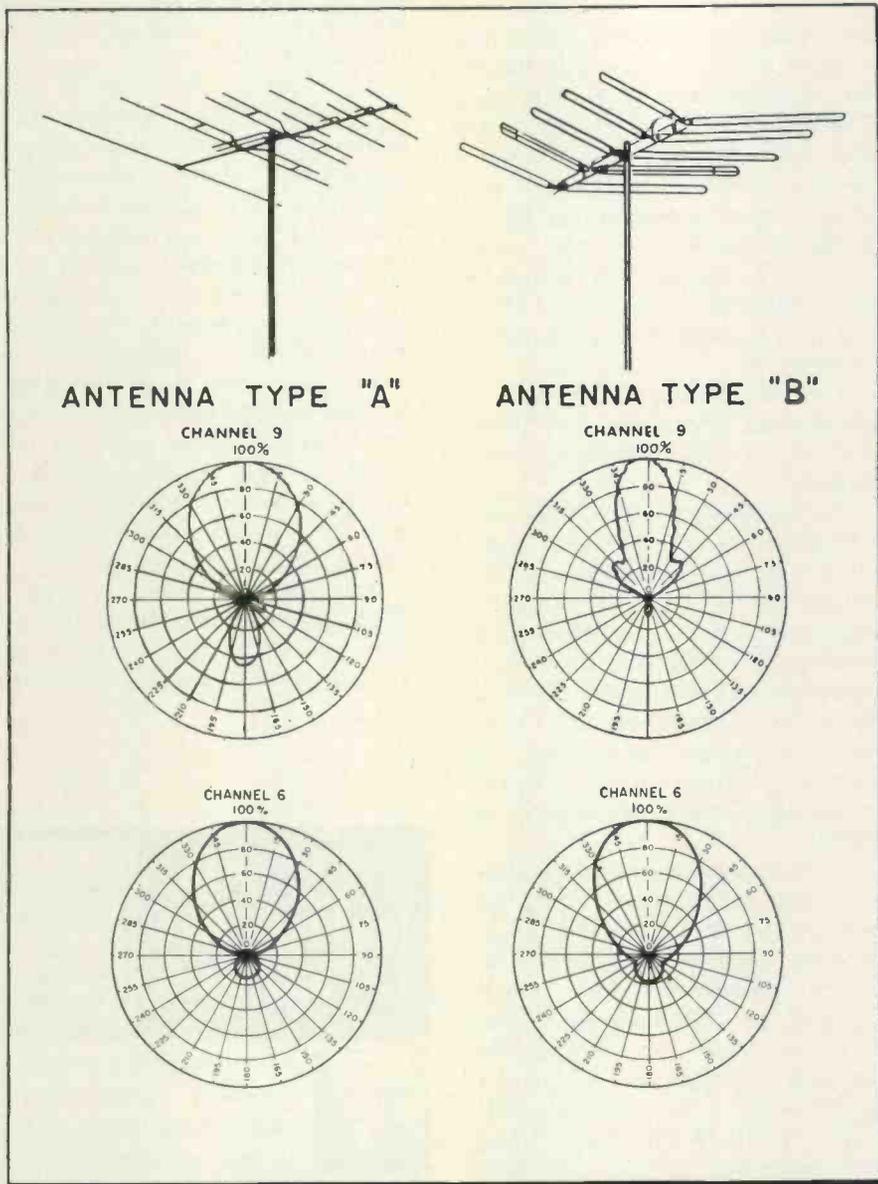
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Fig. 1—Comparing response patterns of two antennas, it is not surprising to find one antenna better on some channels, while the second antenna is better on other channels. For example, the patterns for channel 9 indicate that antenna "B" provides better rear ghost rejection than antenna "A." However, considering channel 6, the patterns indicate that antenna "A" offers better ghost rejection both from rear and sides than antenna "B." Consequently, a technician should make his antenna choice based upon the specific channel where ghosts are a problem.



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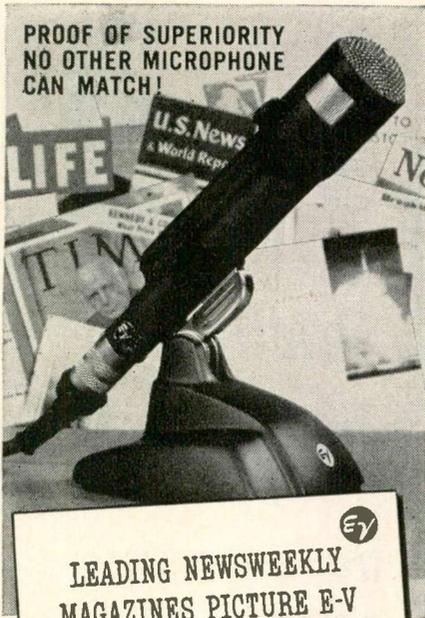
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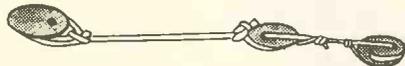
**Electro-Voice**

**ELECTRO-VOICE, INC.**  
Commercial Products  
Div., Dept. 611T  
Buchanan, Michigan

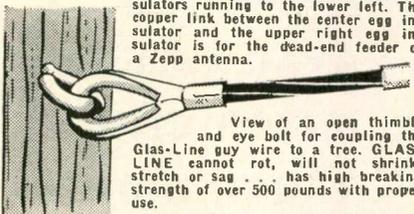
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## Relays

(Continued from page 43)

the relay core slightly below the amount required to energize the relay. A small additional flux, provided by the control signal, would then energize the relay. Without the biasing circuit on the relay this small control signal would be insufficient to operate the relay. Therefore, biasing has increased the sensitivity of the relay, allowing a very small control signal to energize it.

The polarization of a relay, and the biasing if required, can be utilized to provide a selective contact output.

An example of a polarized relay which may be attached to a bridge circuit, is shown in Fig. 6. This system can be used to energize a reversing motor (providing a corrective control signal), which could correct in either direction from the norm. In the tape recording mechanism described previously, we wished to correct in one direction only—when the tape became too tight.

In a temperature control system, we would wish to maintain the temperature at a norm and therefore we would have to correct for a lower temperature. This is indicated by the bridge current flowing in one direction, and a higher temperature indicated by bridge current flowing in the other direction.

The circuit in Fig. 6 is a 3-position controller, having a normally off-position. Here, the motor can be energized in either direction. This type of 3-position controller is used extensively in industry wherever a norm or center point in a process is required.

### Service

Straightforward service techniques can be applied to relay service. It is essential to ascertain that the control signal or energizing voltage is being supplied to the relay coil. To avoid possible confusing indications on this test, disconnect the relay circuit in question and substitute a known resistance value equal to the relay's coil resistance. A voltage check can then

be made across the known resistance to indicate existence or absence of a control signal. In the absence of a control signal, standard testing practices may be used to check-out the bridge circuit and connecting wires.

A VTVM is most commonly used in servicing relay systems. Volt-ohmmeter readings are essential to determine whether a relay coil is open or has a partial short. In general, all relays are marked with their d-c resistance—which is readable with an ohmmeter. In a polarized relay it is essential to measure the coil at the coil terminals, rather than across the polarizing diode. Typical service procedures used to check out a polarized relay are indicated in Fig. 4. The circuit is broken at X for checking the relay coil. It is broken at X' and X'' for signal input checking.

An ohmmeter may be used to check the d-c resistance of the coil. The polarity of the meter is not critical since a properly operating

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ELECTRONIC TECHNICIAN • June, 1961

relay coil will indicate the same d-c resistance measured from either end. The d-c reading of the meter should be compared with the d-c resistance as indicated on the relay coil. Any great variation of this value should indicate a partially shorted coil.

The diode may be checked by placing the meter leads directly across the diode. In this case, however, the polarity of the meter is important. The positive lead of the meter should be connected at X in Fig. 4 to measure the forward resistance of the diode. This measurement is usually from five to 50 ohms.

The meter probes should then be reversed across the diode. This will provide a reading of the reverse resistance of the diode which is usually 40,000 to 50,000 times greater than the measured forward resistance. A diode not having similar characteristics would tend to provide a leakage path or an open circuit path to the flow of control current. The relay would either be totally inoperative, or exhibit the same functions of a non-polarized relay. •

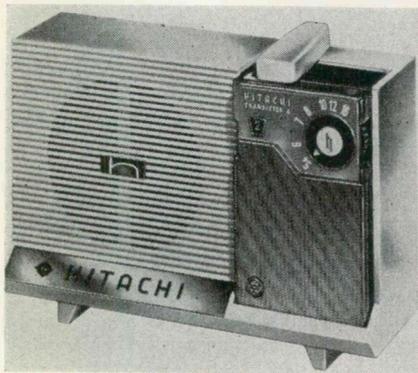
#### Vidaire ANTENNAS

Announced are two new flat ferrite loop antennas as replacements in the transistorized pocket type radio sets. LA-21, for use with 211  $\mu\mu\text{fd}$  variable condensers and the LA-36 for use with 365  $\mu\mu\text{fd}$  variable condensers are reported to replace approximately 80% of all flat loops used in imported and domestic transistor radio sets. The "Q" of each look is in the order of 300. Vidaire Electronics Mfg. Corp., 365 Babylon Turnpike, Roosevelt, N. Y.

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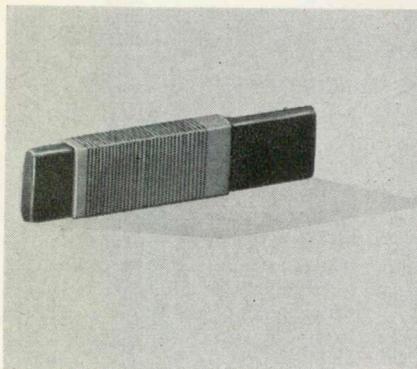
#### Hitachi RADIOS

Model TH666ES radio and speaker combination is announced. The radio, reported as the smallest full performance radio ever made, incorporates 6 transistors plus diode, plus thermistor and powerful dynamic speaker. Has watch maker's precision engineered throughout. Choice of col-



ors: red and gray; pearl and ivory and gold and black. With "convertible" speaker, becomes compact desk or table model ensemble for console-rich tone. Speaker plugs into earphone jack. Complete with leather carrying case, earphone and batteries, \$39.95. Sampson Co., 2244 S. Western Ave., Chicago 8, Ill.

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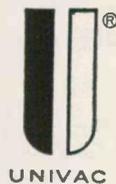
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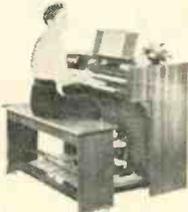
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## Anchor CHEK-TUBE CONVERTER

Model TC-438 compact converter is designed to adapt the standard substitute bench check tube for use with all the new TV receivers. These check tubes are made in either the large neck (90° tube) or the small neck (110° tube) . . . both types have only one heater rating, 6.3v, 600 milliamperes. With the Anchor Chek Tube Converter you can check all TV receivers with your present substitute tube check (8JP4/8YP4 and 8XPA or 5AXP4). Antronic Corp., 2114 W. Montrose Ave., Chicago 18, Ill.

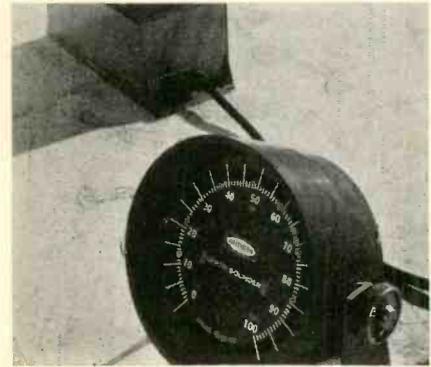
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## Raytheon DEPTH SOUNDER

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For more data, circle 6-78-4 on coupon, p. 68



## GC TUBE CHECKER

The Vis-U-All Auto Radio Vibrator and Tube Checker, catalog #36-550, features an illuminated sign and requires space of only 17" x 15" x 8". It has a storage section which holds replacement tubes and vibrators. Instructions are clear and simple. It operates on any 117v, 60 cycle a-c outlet. Weight, 23 lbs. \$89.50. A colorful baked enamel sidewalk sign, 20" x 26", \$5.00; with legs, \$7.50. GC Electronics Co., 400 S. Wyman St., Rockford, Ill.

For more data, circle 6-78-5 on coupon, p. 68



## Mallory BATTERIES

A new model seal, reported to withstand temperatures up to 200°F, designed to completely eliminate electrolyte leakage and crusting is now being applied to mercury batteries for hearing aids, transistor radios, etc. Because of its superior protection of the battery, the firm is now offering a guarantee against leakage on its mercury batteries when used in transistor radios. Color coding with the new seal identifies their cell chemical system. Mallory Battery Co., 60 Elm St., North Tarrytown, N. Y.

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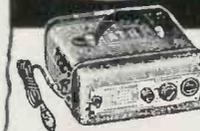
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While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

## PRODUCTS FOR MODERN LIVING



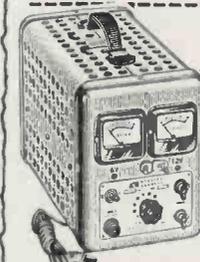


**ATR PLUG-IN TYPE PORTABLE INVERTERS\***

A.C. HOUSEHOLD ELECTRICITY Anywhere . . . in your own car!

Operates Standard A.C. • Record Players • Dictating Machines • Small Radios • Electric Shavers • Heating Pads, etc. In your own car or boat!

**MODELS**  
 6-RMF (6 volts) 60 to 80 watts. Shipping weight 12 lbs. **DEALER NET PRICE \$33.00**  
 12T-RME (12 volts) 90 to 125 watts. Shipping weight 12 lbs. **DEALER NET PRICE \$33.00**  
 \*Additional Models Available



**ATR "A" Battery ELIMINATOR**

For Demonstrating and Testing Auto Radios—TRANSISTOR or VIBRATOR OPERATED!

Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines—Equipped with Full-Wave Dry Disc-Type Rectifier, assuring noiseless, interference-free operation and extreme long life and reliability.

**MAY ALSO BE USED AS A BATTERY CHARGER**  
 MODEL 610C-ELIF . . . 6 volts at 10 amps. or 12 volts at 6 amps. Shipping weight 22 lbs. **DEALER NET PRICE \$49.95**  
 MODEL 620C-ELIT . . . 6 volts at 20 amps. or 12 volts at 10 amps. Shipping weight 33 lbs. **DEALER NET PRICE \$66.95**

---

**AUTO-RADIO VIBRATORS**

By every test ATR Auto-Radio Vibrators are best! . . . and feature Ceramic Stack Spacers, Instant Starting, Large Oversized Tungsten Contacts, Perforated Reed, plus Highest Precision Construction and Workmanship and Quiet Operation!

There is an ATR VIBRATOR for every make of car!

Ask your distributor for ATR's Low Priced type 1400, 6 volt 4-prong Vibrator; and 1843, 12 volt 3-prong; or 1840, 12 volt 4-prong Vibrator. THE WORLD'S FINEST!

There is a trim plate kit for YOUR CAR!



**ATR CUSTOMIZED KARADIO**

Vibrator-Operated with Tone Control

ATR KARADIO . . . is ideal for small import cars or compact American cars! Unit is completely self-contained—extremely compact! Powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. The ATR Customized Karadio comes complete with speaker and ready to install. Can be mounted in-dash or under-dash—wherever space permits! No polarity problem. Neutral Gray-Tan, baked enamel finish. Overall size, 7" deep, 4" high, and 6 1/2" wide. Shipping weight, radio set, 7 lbs. Model K-1279—12 for 12V Dealer Net Price . . . \$33.57 Model K-1279—6 for 6V Dealer Net Price . . . \$33.57

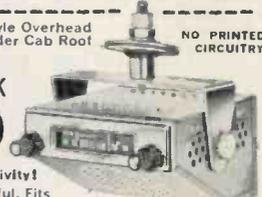
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**ATR TRUCK KARADIO**

Excellent Tone, Volume, and Sensitivity!

Compact, yet powerful. Fits all trucks, station wagons, most cars and boats. Just drill a 1/8 inch hole in roof and suspend the one-piece unit (aerial, chassis and speaker) in minutes. Watertight mounting assembly holds antenna upright. Yoke-type bracket lets you tilt radio to any angle.

Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls. 33-in. stainless steel antenna. Neutral gray-tan enameled metal cabinet, 7 x 6 1/2 x 4 in. high over-all. Shipping weight 10 1/2 lbs. Model TR-1279—12A for 12V Dealer Net Price \$41.96 Model TR-1279—6A for 6V Dealer Net Price \$41.96



Airplane Style Overhead Mounting under Cab Roof **NO PRINTED CIRCUITRY**

SEE YOUR ELECTRONIC PARTS DISTRIBUTOR  
WRITE FACTORY FOR FREE LITERATURE . . .

**ATR AMERICAN TELEVISION & RADIO CO.**  
Quality Products Since 1931  
SAINT PAUL 1, MINNESOTA—U. S. A.

IT'S EASY TO ORDER FROM RAD-TEL

UP TO **75% OFF** ON

RAD-TEL'S FIRST QUALITY

**BRAND NEW TUBES**

**ONE FULL YEAR  
GUARANTEE**

SERVICEMEN: Now speedy one-day service.

BUY DIRECT FROM RAD-TEL! YOU'LL SAVE PLENTY. YOUR ORDER SHIPPED WITHIN 24 HOURS AFTER RECEIVING AND PROCESSING. RAD-TEL SELLS ONLY BRAND NEW TUBES, NOT USED.

THE SIGN OF RAD-TEL'S RELIABILITY



**GUARANTEED** RAD-TEL TRANSISTORS  
**SET TESTED**

All Transistors Germanium PNP

**AF** ST\* AF Driver. Use as: Driver Low Power Output, Code Osc., DC Amp., Control, Test Instr., Pre-Amp., Timers, Organ, etc. **39c** ea.



**RF** ST\* as Converter in an American set. Use as: Converter Sq. Wave Gen., RF Osc., Amp. Regen. Det., etc. **49c** ea.



**IF** ST\* as 455kc IF in an Amer. set. Use as: IF Amp., Grid Dip Osc., Electronic Computer, RF Osc., Switch, Amp., etc. **49c** ea.



**AUTO OUTPUT** ST\*\* as Audio Power Output into Speaker. 90% of Auto Radios so Powered. Use as Power Amp., Mobile Power Supply, Voltage Regulator, Osc., DC to DC Converters. **79c** ea.



**HI POWER** ST\*\* as Hi Power AF Output. Ideal as DC to DC Converter, Multivibrator replaces Vibrator supply. **\$1.39** ea.



\*SET TESTED IN AMER. TRANSISTOR RADIO OF CURRENT MFR.

\*\*SET TESTED IN AMER. AUTO RADIO OF CURRENT MFR. AT 16 VOLT BATTERY SUPPLY.

Rad-Tel eliminates complicated characteristics and numbers with their "SET-TESTED" Transistors. Transistors Tested to Rad-Tel's specifications—available on request. 100% Satisfaction Guaranteed. Substitute or replace with Rad-Tel Transistors on the basis of similar operating characteristics . . . at Low, Low Prices.

NOT AFFILIATED WITH ANY OTHER MAIL ORDER TUBE COMPANY



SEND FOR FREE TROUBLE SHOOTER GUIDE AND NEW TUBE & PARTS CATALOG

**RAD-TEL TUBE CO.**

DEPT. ET-661 55 CHAMBERS STREET, NEWARK 5, N. J.

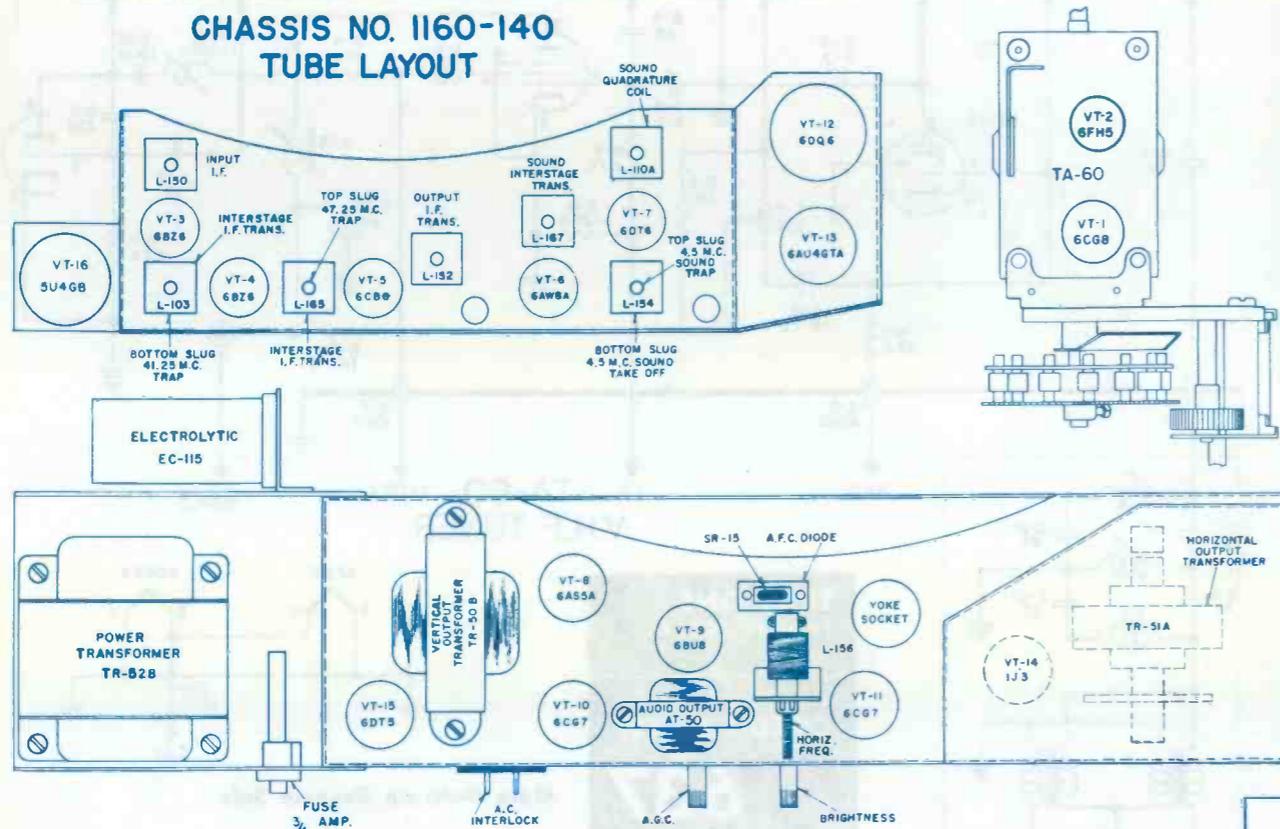
TERMS: 25% deposit must accompany all orders, balance COD. Orders under \$5: add \$1 handling charge plus postage. Orders over \$5: plus postage. Approx. 8 tubes per 1 lb. Subject to prior sale. Prices subject to change. No COD's outside continental USA.

EACH TUBE INDIVIDUALLY & ATTRACTIVELY BOXED

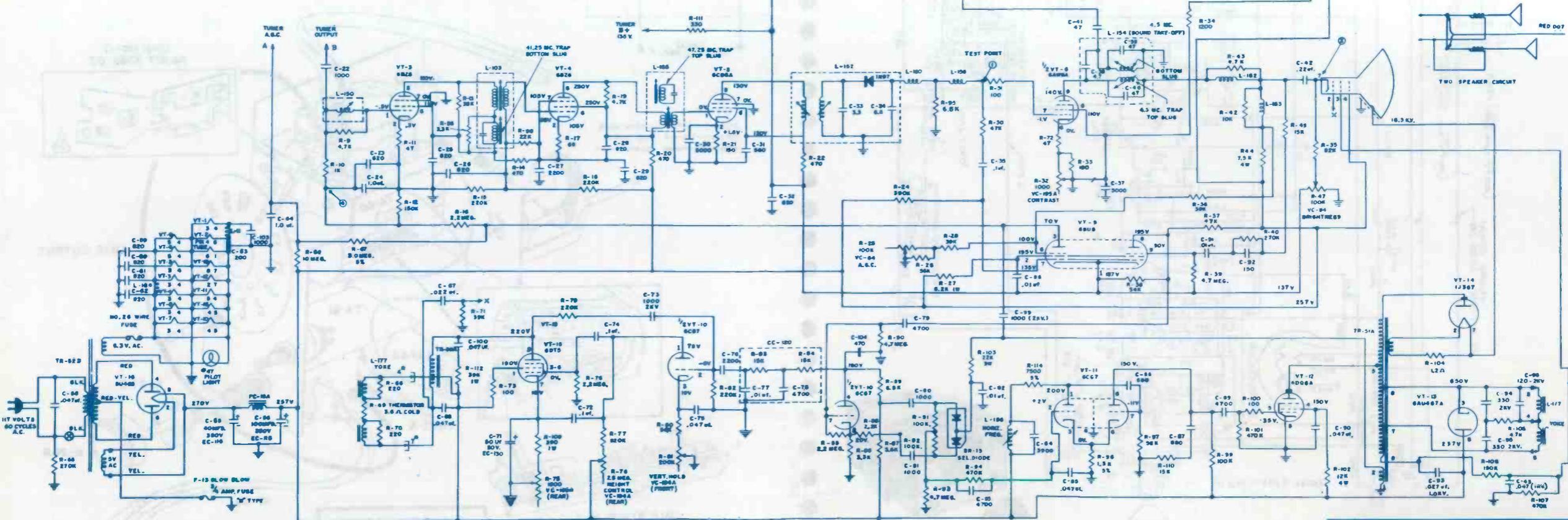
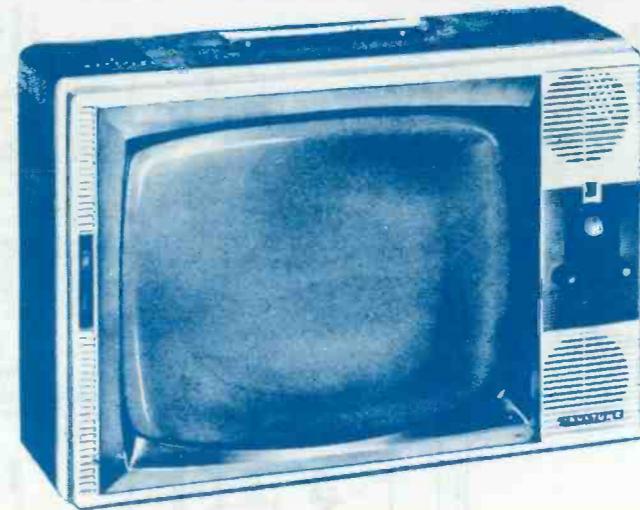
Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
	0Z4M	.79		6AX7	.64		12AF6	.49
	1AX2	.62		6BA6	.50		12AJ6	.46
	1B3GT	.79		6BC5	.61		12AL5	.45
	1DN5	.55		6BC7	.94		12AL8	.95
	1G3	.79		6BC8	.97		12AQ5	.52
	1J3	.79		6BD6	.51		12AT6	.43
	1K3	.79		6BE6	.55		12AT7	.76
	1LN5	.59		6BF6	.44		12AU6	.50
	1R5	.62		6BG6	1.66		12AU7	.61
	1S5	.51		6BH6	.65		12AV5	.97
	1T4	.58		6BH8	.87		12AV6	.41
	1U4	.57		6BJ6	.62		12AV7	.75
	1U5	.50		6BK7	.85		12AX4	.67
	1X2B	.82		6BL7	1.00		12AX7	.63
	2AF4	.96		6BN4	.57		12AZ7	.86
	3AL5	.42		6BN6	.74		12B4	.63
	3AUG	.51		6BQ5	.65		12BA6	.50
	3AV6	.41		6BQ6GT	1.05		12BD6	.50
	3BA6	.51		6BQ7	1.00		12BE6	.53
	3BC5	.54		6BR8	.78		12BF6	.44
	3BE6	.52		6BU8	.70		12BH7	.77
	3BN6	.76		6BY6	.54		12BL6	.56
	3BU8	.78		6BZ6	.55		12BQ6	1.06
	3BY6	.55		6BZ7	1.01		12BY7	.77
	3BZ6	.55		6C4	.43		12BZ7	.75
	3CB6	.54		6CB6	.55		12C5	.56
	3CF6	.60		6CD6	1.42		12CN5	.56
	3CS6	.52		6CF6	.64		12CR6	.54
	3DK6	.60		6CG7	.61		12CU5	.58
	3DT6	.50		6CG8	.77		12CU6	1.06
	3Q5	.80		6CM7	.66		12CX6	.54
	3S4	.61		6CN7	.65		12DB5	.69
	3V4	.58		6CR6	.51		12DE8	.75
	4BC8	.96		6CS6	.57		12DL8	.85
	4BN6	.75		6CU5	.58		12DM7	.67
	4BQ7	1.01		6CU6	1.08		12DQ6	1.04
	4BS8	.98		6CY7	.71		12DS7	.79
	4BU8	.71		6DA4	.68		12DZ6	.56
	4BZ6	.58		6DB5	.69		12EL6	.50
	4BZ7	.96		6DE6	.58		12EG6	.54
	4CS6	.61		6DG6	.59		12EZ6	.53
	4DE6	.62		6DQ6	1.10		12F8	.66
	4DK6	.60		6DT5	.76		12FM6	.45
	4DT6	.55		6DT6	.53		12K5	.65
	5AM8	.79		6E8	.79		12SA7M	.92
	5AN8	.86		6EA8	.79		12SK7GT	.74
	5AQ5	.52		6HG6T	.58		12SN7	.67
	5AT8	.80		6J5GT	.51		12SQ7M	.78
	5BK7A	.82		6J6	.67		12U7	.62
	5BQ7	.97		6K6	.63		12V6GT	.53
	5BR8	.79		6S4	.51		12W6	.69
	5CG8	.76		6SA7GT	.76		12X4	.38
	5CL8	.76		6SK7	.74		17AX4	.67
	5EA8	.80		6SL7	.80		17BQ6	1.09
	5EU8	.80		6SN7	.65		17C5	.58
	5J6	.68		6SQ7	.73		17CA5	.62
	5T8	.81		6T4	.99		17D4	.69
	5U4	.60		6U8	.83		17DQ6	1.06
	5U8	.81		6V6GT	.54		17L6	.58
	5V6	.56		6W4	.60		17W6	.70
	5X8	.78		6W6	.71		19AU4	.83
	5Y3	.46		6X4	.39		19BG6	1.39
	6AB4	.46		6X5GT	.53		19T8	.80
	6AC7	.96		6X8	.80		21EX6	1.49
	6AF3	.73		7AU7	.61		25BQ6	1.11
	6AF4	.97		7A8	.68		25C5	.53
	6AG5	.68		7B6	.69		25CA5	.59
	6AH6	.99		7Y4	.69		25CD6	1.44
	6AK5	.95		8A8	.83		25CU6	1.11
	6AL5	.47		8AW8	.93		25DN6	1.42
	6AM8	.78		8BQ5	.60		25EH5	.55
	6AQ5	.53		8CG7	.62		25L6	.57
	6AR5	.55		8CM7	.68		25W4	.68
	6AS5	.60		8CN7	.97		25Z6	.66
	6AT6	.43		8CX8	.93		35C5	.51
	6AT8	.79		8EB8	.94		35L6	.57
	6AU4	.82		11CY7	.75		35W4	.42
	6AU6	.52		12A4	.60		35Z5GT	.60
	6AU7	.61		12AB5	.55		50B5	.60
	6AU8	.87		12AC6	.49		50C5	.53
	6AV6	.41		12AD6	.57		50DC4	.37
	6AW8	.90		12AE6	.43		50EH5	.55
	6AX4	.66		12AF3	.73		50L6	.61
							117Z3	.61

June • 1961

### CHASSIS NO. 1160-140 TUBE LAYOUT

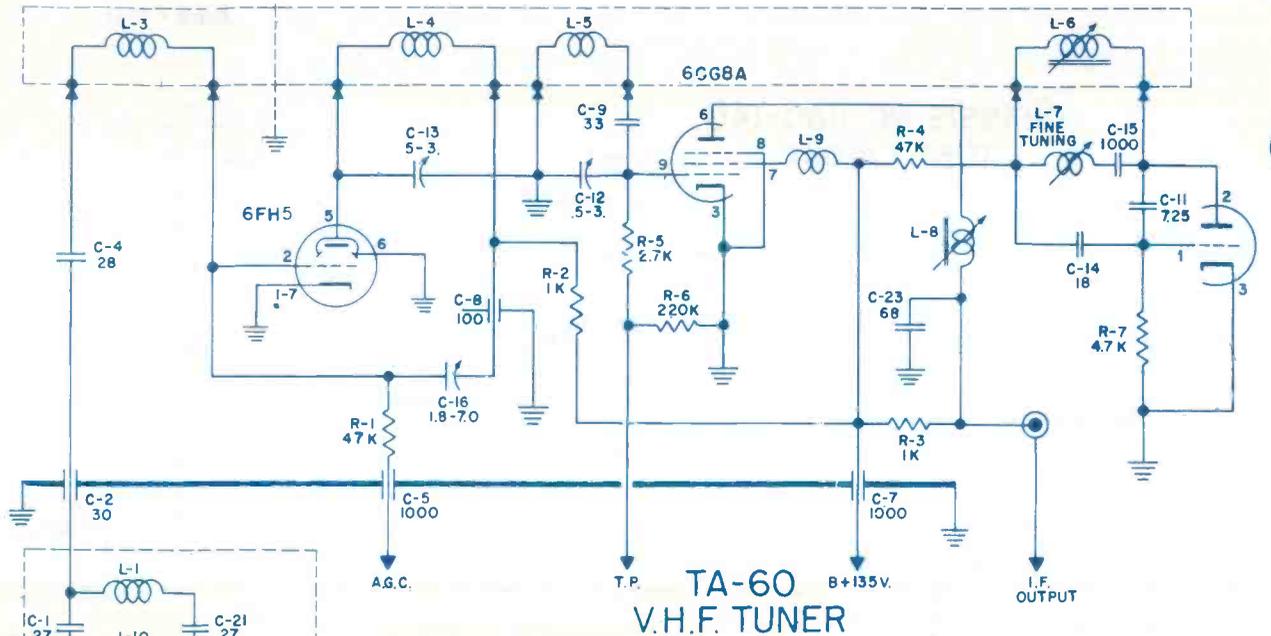
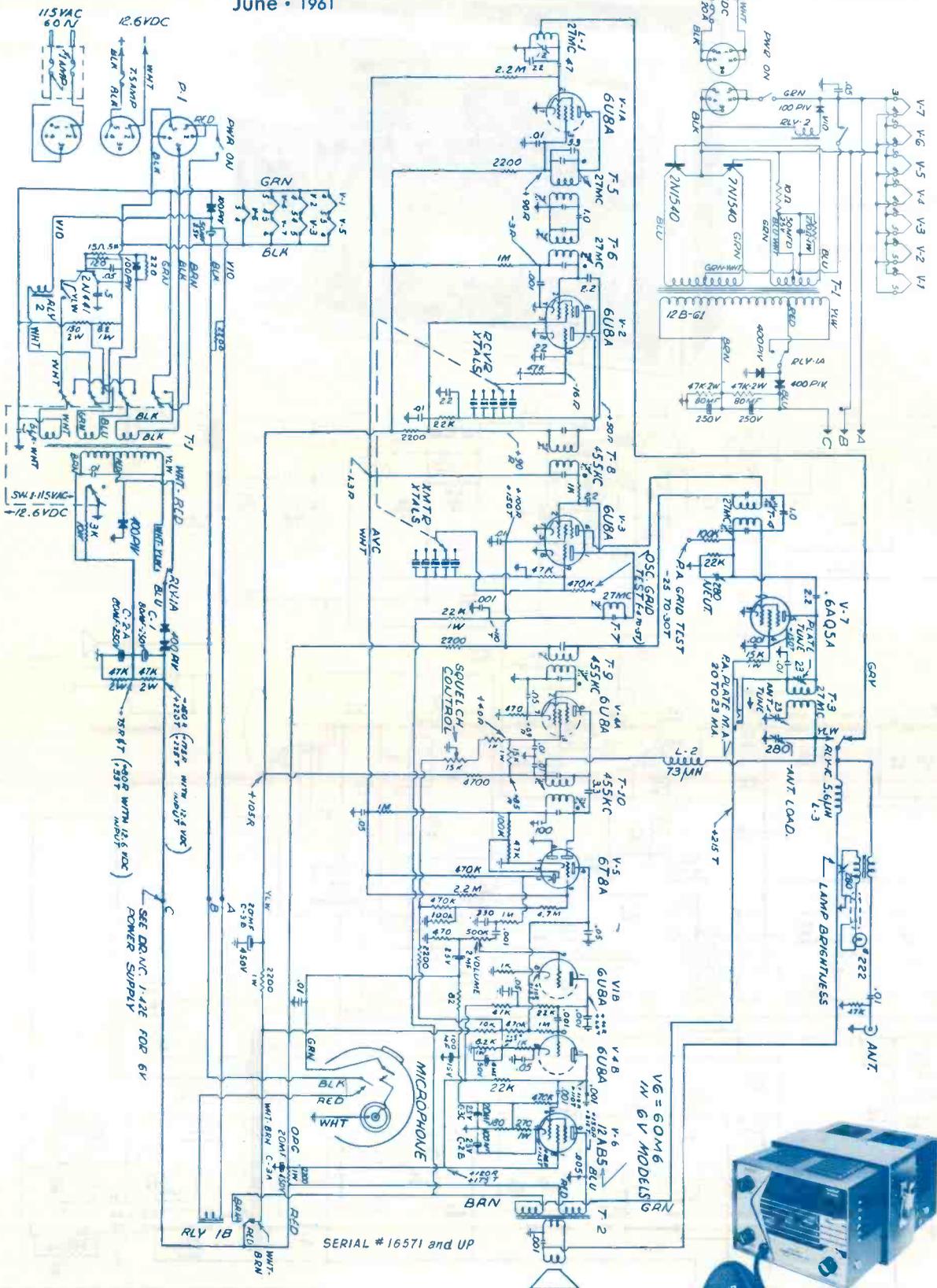


More Data  
on Reverse Side



NOTE: REFER TO YOKE PLUG AND SOCKET PIN NO'S.

June • 1961

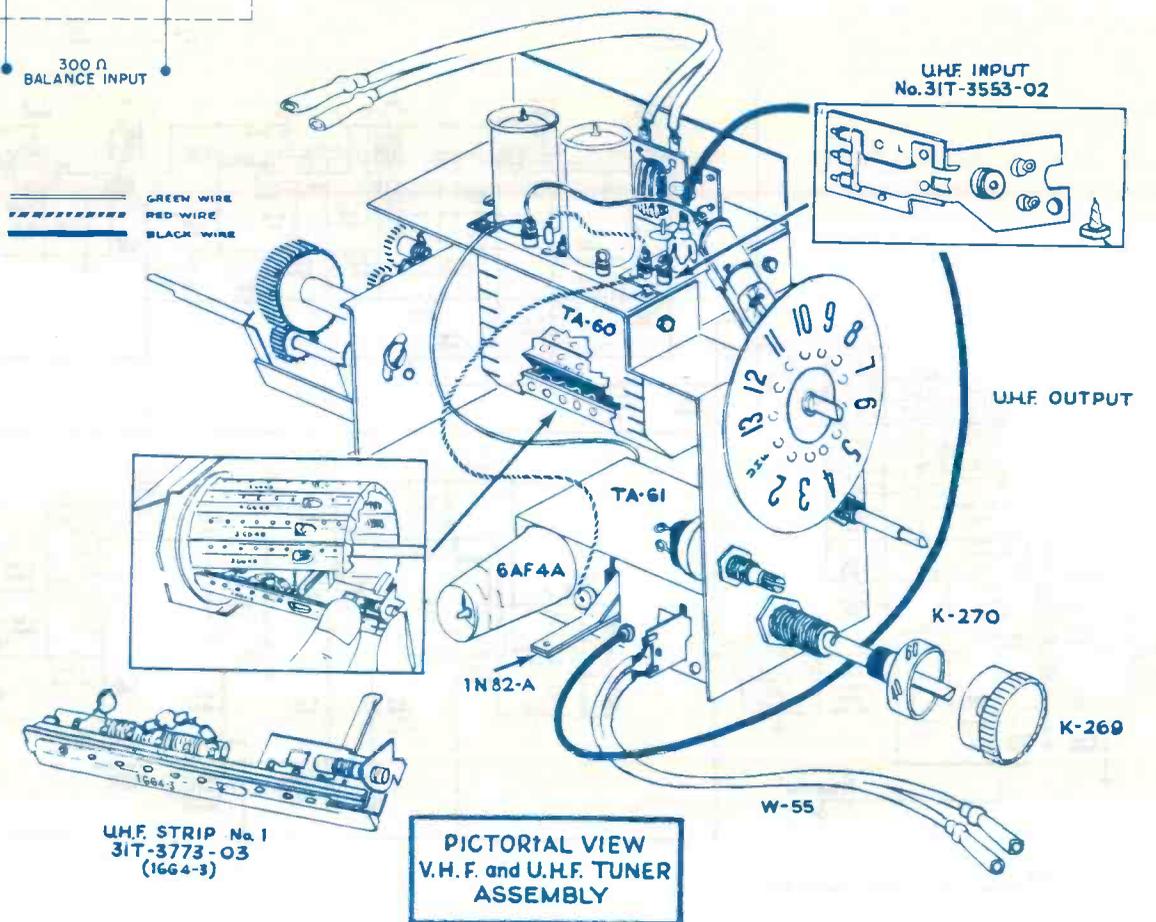


**TRUETONE**  
TV Model 2D3246

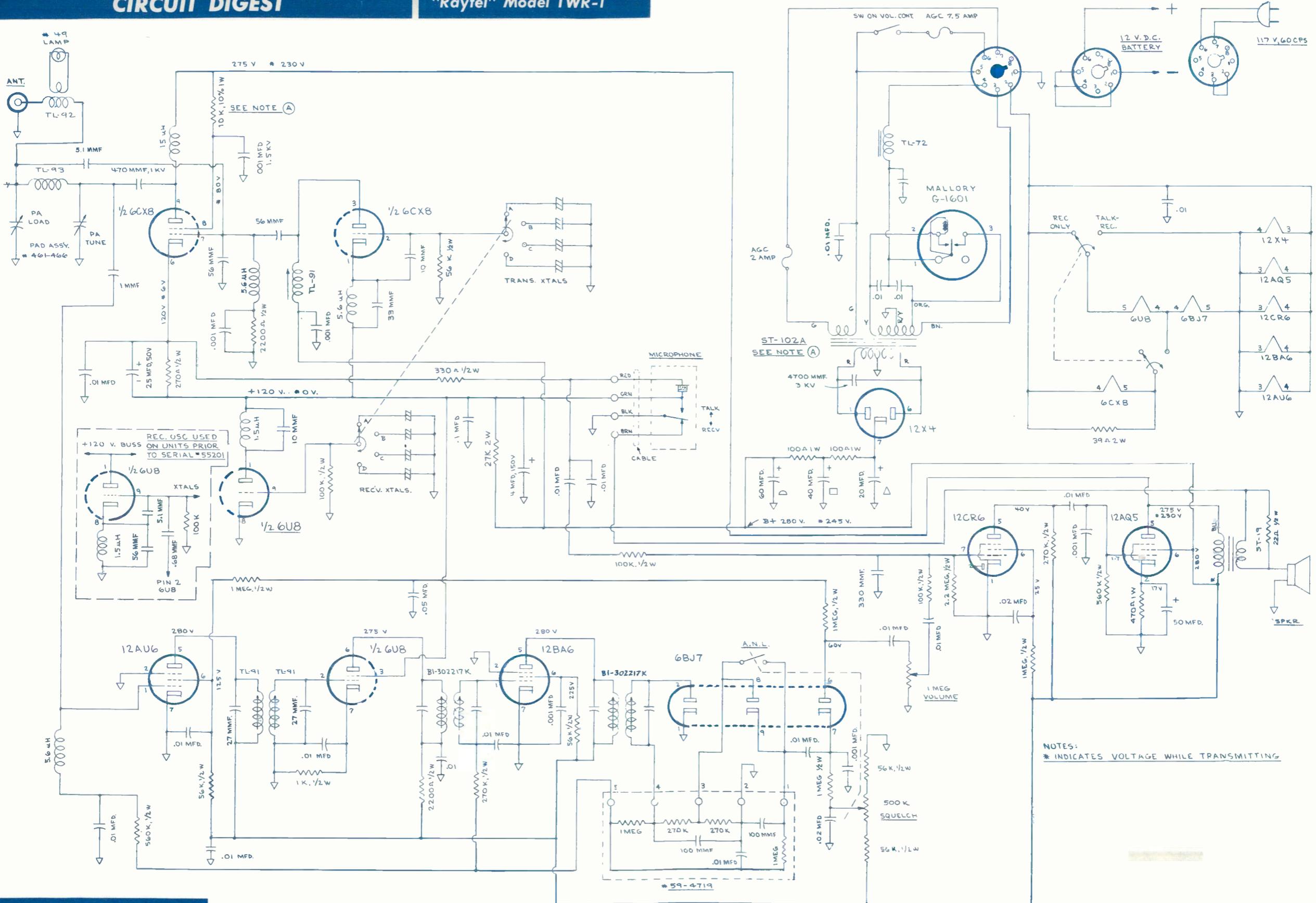
Electronic Technician  
**CIRCUIT DIGEST**

# 637

More Data on Reverse Side





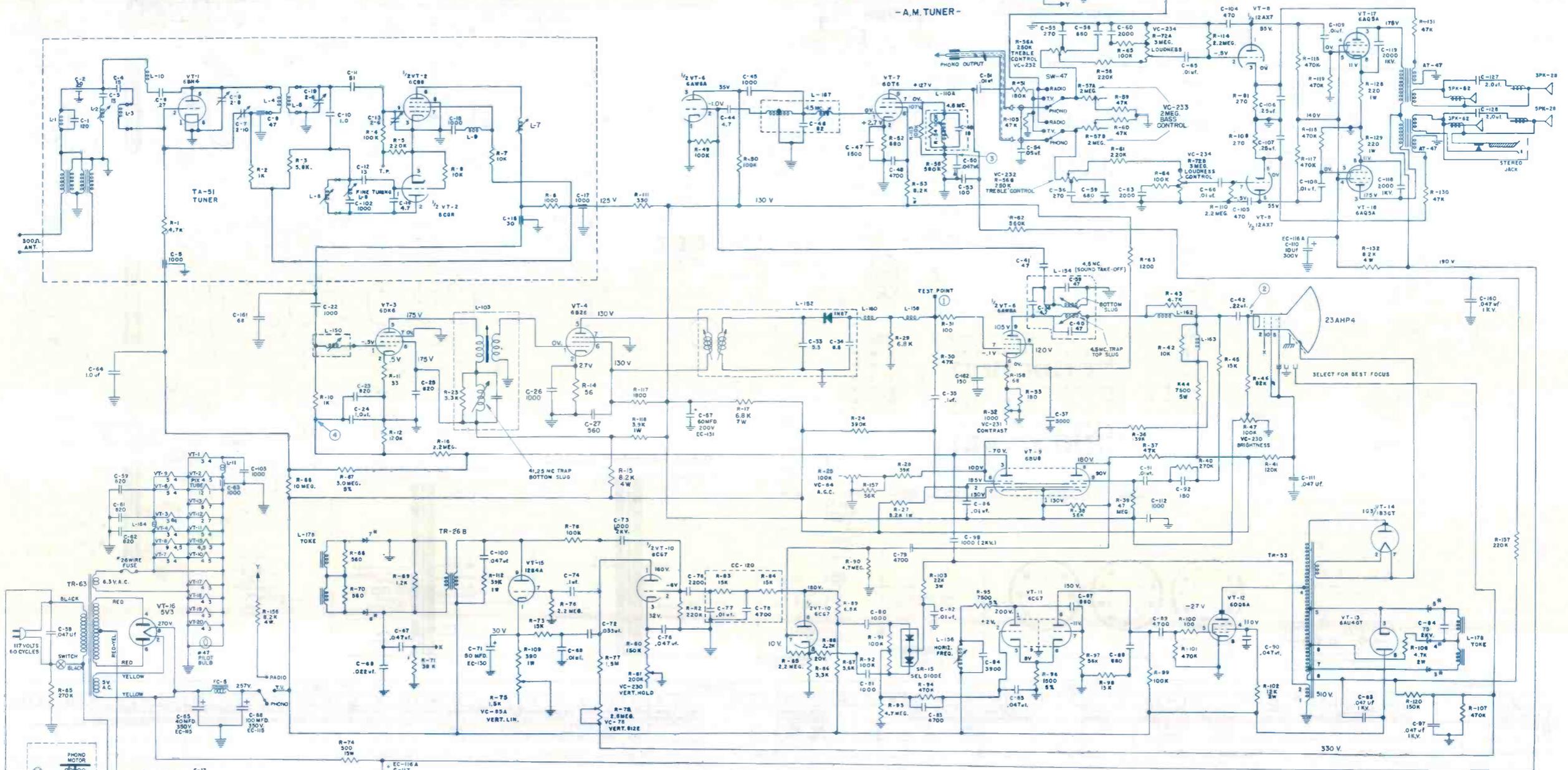


NOTES:  
\* INDICATES VOLTAGE WHILE TRANSMITTING

\* 59-4719

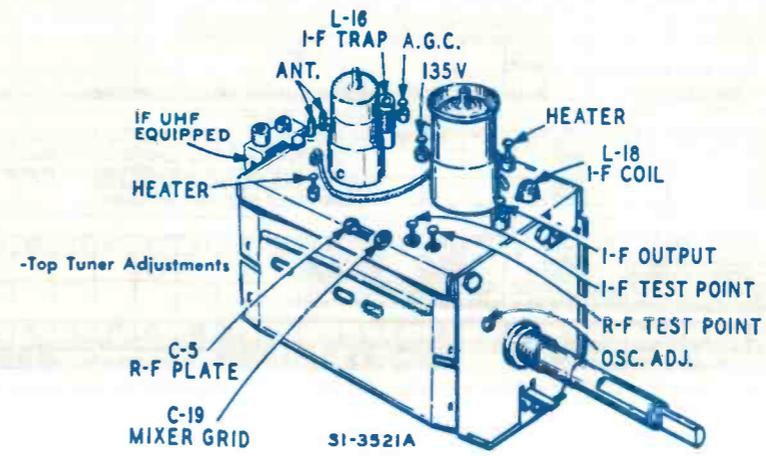
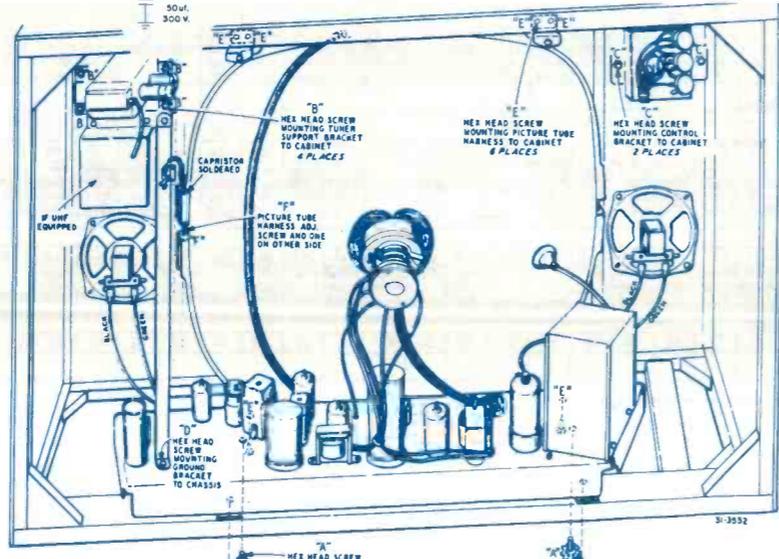


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\* REFER TO YOKE PLUG AND SOCKET PIN NUMBERS

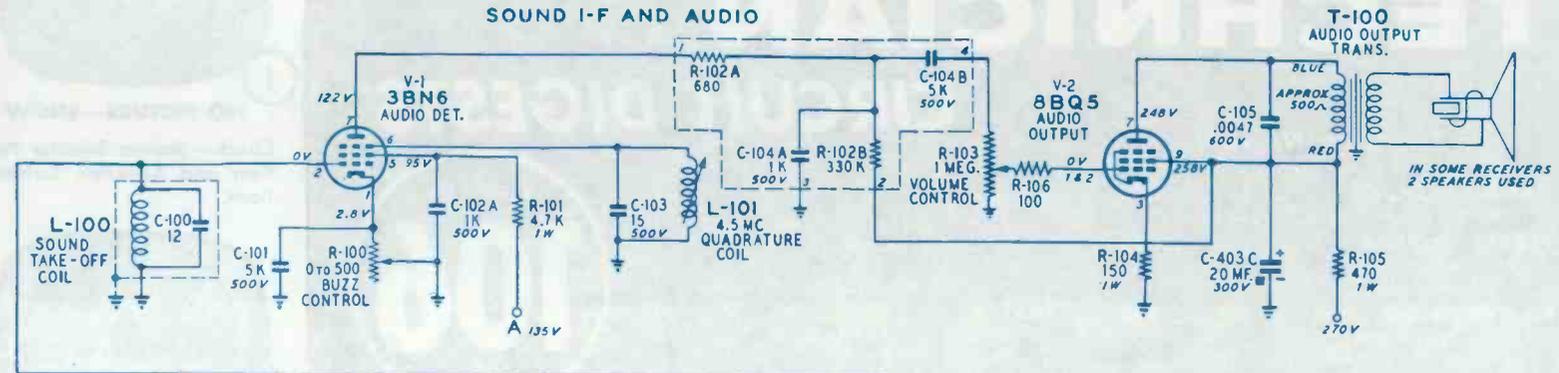
Picture Tube Removal



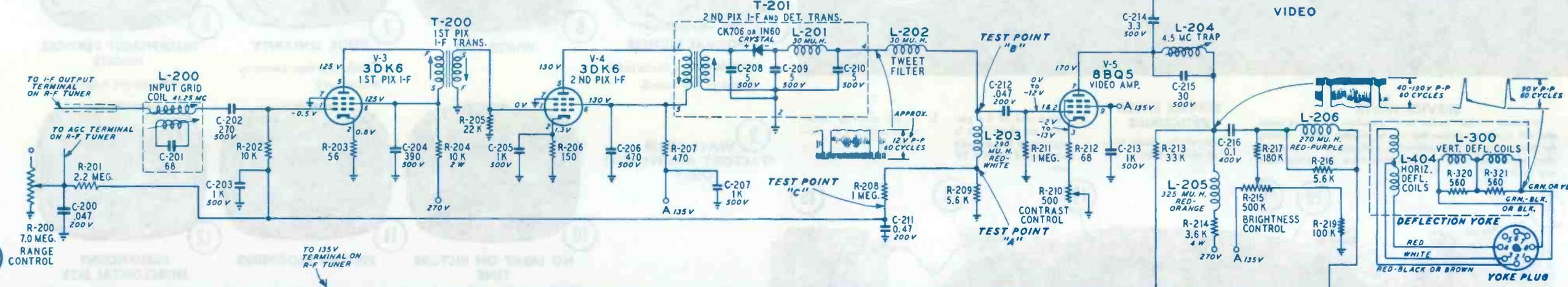


More Data on Reverse Side

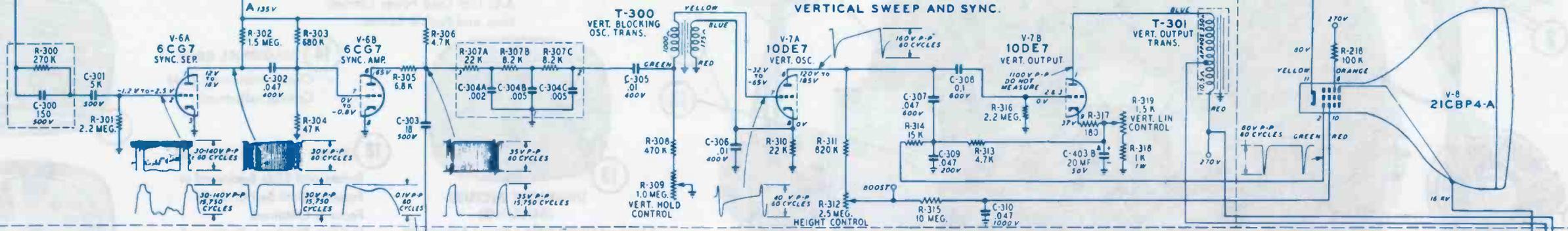
### SOUND I-F AND AUDIO



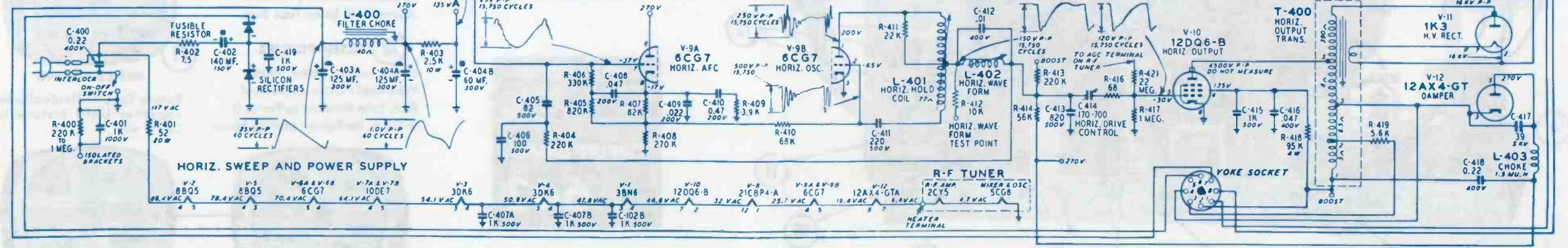
### VIDEO



### VERTICAL SWEEP AND SYNC.



### HORIZ. SWEEP AND POWER SUPPLY



NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes.

# ELECTRONIC TECHNICIAN

Trademark

## CIRCUIT DIGESTS

In This Issue (No. 106)

Circuit Digest Schematic No.

**GAMBLE-SKOGMO** . . . . . 643

TV Models 9590A, 9591A, 9592A

**PEARCE-SIMPSON** . . . . . 638

Citizens Band Radio  
Model CBD-5

**RAYTHEON CO.** . . . . . 640

Citizens Band Radio  
"Raytel" Model TWR-1

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TV Chassis, Model 159

**STERLING** . . . . . 641

AM/FM/SW Radio, Phono  
Chassis 1/633 US-Stereo  
Models Tannhauser US, Isabella US,  
Arabella US

**TRAVLER** . . . . . 642

TV Chassis 1051-90  
Model 23SP6095

**TRUETONE** . . . . . 637

TV Model 2D3246

GROUP

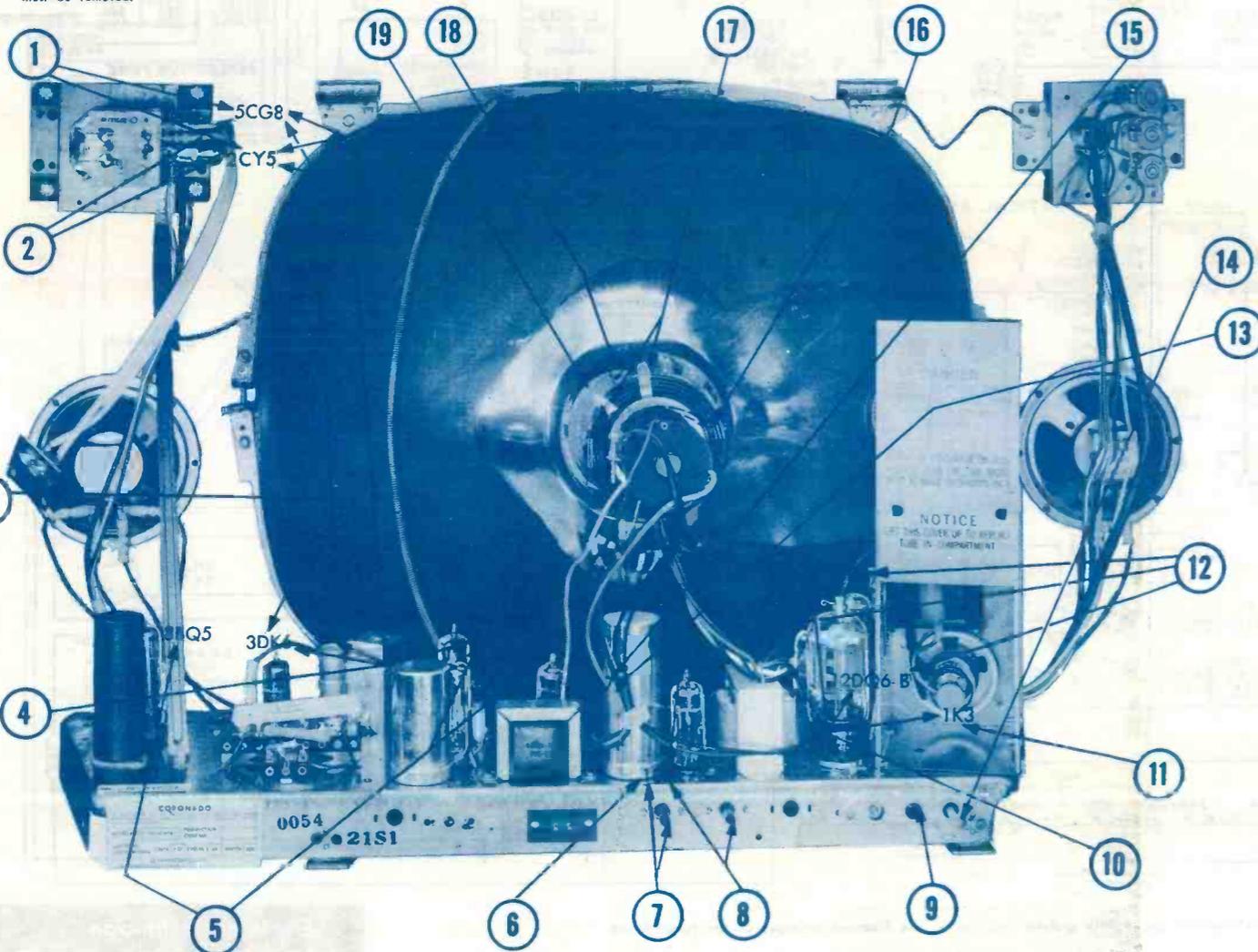
# 106

### SERVICE HINTS

To provide a simple "Service Saver" procedure, the controls associated with a service condition that can be adjusted without removing the cabinet back are listed adjacent to each picture. To accomplish other control adjustments or to substitute tubes, the cabinet back must be removed.

### SERVICE SAVER PROCEDURE

- Carefully study face of picture tube.
- Select one of the pictures on chart that is closest to the picture portrayed by the TV set.
- Adjust controls indicated adjacent to picture.



**1 NO PICTURE - SNOW**  
Check - Station Selector Position and Antenna Connections.

**2 WEAK PICTURE**  
Check - Antenna Connections and Adjustment of Range Control at Front of Receiver.

**3 NO PICTURE - NO SNOW**

**4 HUM BAR**

**5 NORMAL PICTURE**  
With Weak or Distorted Sound or No Sound.

**6 WHITE LINE**

**7 POOR LINEARITY**  
Check - Vertical Linearity Adjustment.

**8 INSUFFICIENT VERTICAL HEIGHT**  
Check - Height Adjustment.

**9 WAVE FORM "FACTORY ADJUSTMENT ONLY"**

**10 NO LIGHT ON PICTURE TUBE**  
Check - Brightness Control, A.C. Line Cord Power Connections and Fusible Resistor.

**11 PICTURE BLOOMING**

**12 INSUFFICIENT HORIZONTAL SIZE**

**13 UNSTABLE PICTURE (ROLLING)**  
Check - Vertical Hold Control Adjustment.

**14 DIAGONAL BARS**  
Check - Horizontal Hold Control Adjustment.

**15**

**16 BEAM ALIGNER (If Used)**  
Rotate and Slide Backward or Forward Until Best Overall Focus Is Obtained. In Some Receivers, Position of Aligner Will Be on Tube Base.

**17 MIS-CENTERING**  
Rotate Tabs Individually or Together Until Picture Is Centered.

**18 TILTED PICTURE**  
Loosen Locking Screw, Rotate Yoke Until Picture is Level and Push Yoke Forward as Far as it Will Go. Re-Tighten Locking Screw.

**19 SHADOW**

**GAMBLE-SKOGMO**  
TV Models 9590A,  
9591A, 9592A

Electronic Technician  
**CIRCUIT DIGEST**

# 643

More Data on Reverse Side



©1961 VOLKSWAGEN OF AMERICA, INC.

## Our dealers have had parts for our '62 model for years.

Yes. Our '62.

Next year's Volkswagen.

Doesn't it stand to reason?

We make only the one basic truck. We've been perfecting it for the past 12 years. Part by part.

Today practically every part is improved. Yet most fit any year VW you have.

The number of parts we take from

Volkswagen production as spares would seem excessive to some manufacturers.

But VW service is as much a part of the idea as the VW price or the VW gas consumption.

Our dealers carry spares they almost never get calls for. Axles. Wheels. Even dip sticks. As a rule, this makes VW repairs much faster than other makes.

(Other dealers simply can't afford the  
For more data, circle 6-C3-1 on coupon, p. 68

spares for every year and model that a VW dealer carries for just one truck.)

This has become very important to people with '51 and '52 VWs. They can still get a rear quarter panel, a gas pump or a cylinder head in no time.

We're still making them for those years.

(And those years look like our '62, too.)





## A SPACE-AGE BATH FOR ELECTRON GUNS

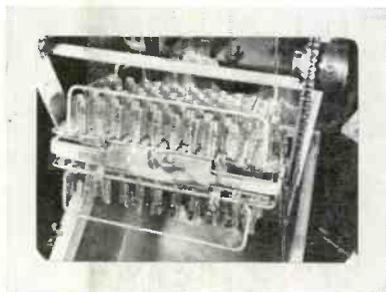
### Another RCA Precaution Against Picture Tube Callbacks

Superior TV picture tube quality depends largely on an electron gun that is precision-made and clinically clean. RCA assures the cleanest guns possible in *Silverama Picture Tubes* by employing the costly space-age technique of ultrasonic cleaning: scrubbing gun mounts with high-frequency vibrations in a super-wet detergent to remove even microscopic foreign particles.

In this and every respect, RCA Silverama Picture Tubes are built to the highest standards of the picture tube industry. They

contain an all-new electron gun, all-new parts and materials except for the envelope which is used.

These extra precautions help substantially to reduce troublesome "in-warranty failures" and costly callbacks. So give yourself the advantage of selling the best *name brand* picture tube: RCA Silverama. It's now merchandised in an attractive, distinctive new package and is competitively priced with other leading brands of picture tubes. See your Authorized RCA Distributor this week.



Guns emerging from ultrasonic cleaning tank. Still in the same tray, they are placed immediately in the radiant drying oven shown in the photograph at right.

Gun mounts are dried for one hour at 150°C (302°F.). Then, super-dry and super-clean, they are taken out for final processing in our dust-free "White Room".



RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA