

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Mcgazine

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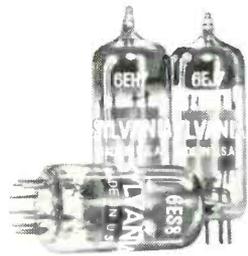
**MASTER  
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October • 1961 60¢

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...your 2 key words to profit protection



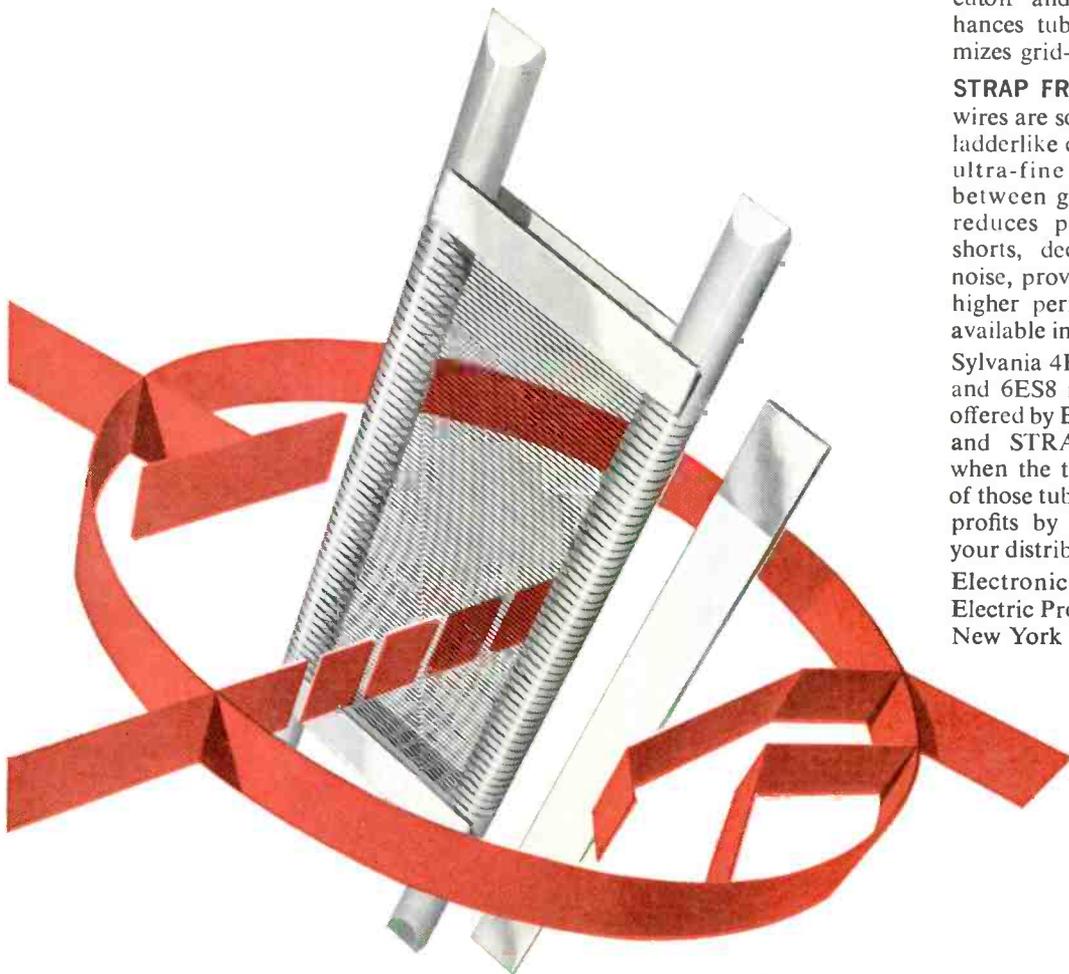
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Administrative, Editorial and Sales  
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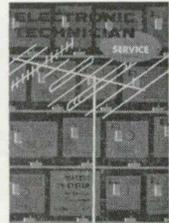
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October, 1961

**FRONT COVER** Many TV service dealers endure poor TV set reception in their shops and showrooms because they neglect to install a master antenna system. The upshot of this is often lost TV set sales and improper diagnoses of receivers' fault symptoms. For information concerning how to distribute TV antenna signals among a number of TV sets, see article starting on page 32.



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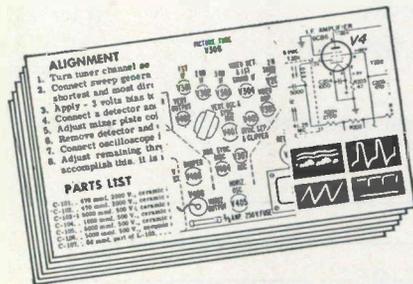
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Model MoPar 109  
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SONY: Transistor TV Model 8-301  
SYLVANIA: Transistor Radio Chassis  
682-1,-2,-3, Model 4P19 Series



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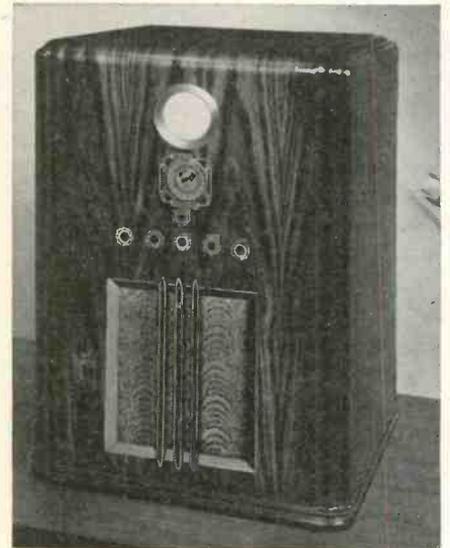
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## Editor's Memo



While rummaging through my photo file I couldn't help but think back on an old aunt. She used to save string in two boxes. One was labeled "string." The other was "string too short to use." It must run in the family, since I have plenty of pictures too old to use.



I came across the picture shown here—of a TV set that is no doubt too old to use. It shows one of the oldest commercially available TV receivers, the Model A35 made by American Television Corp., New York. The picture tube is a three inch and the walnut cabinet measures 10" x 26½" x 14". The photo was taken on June 20, 1938. The price was \$125.

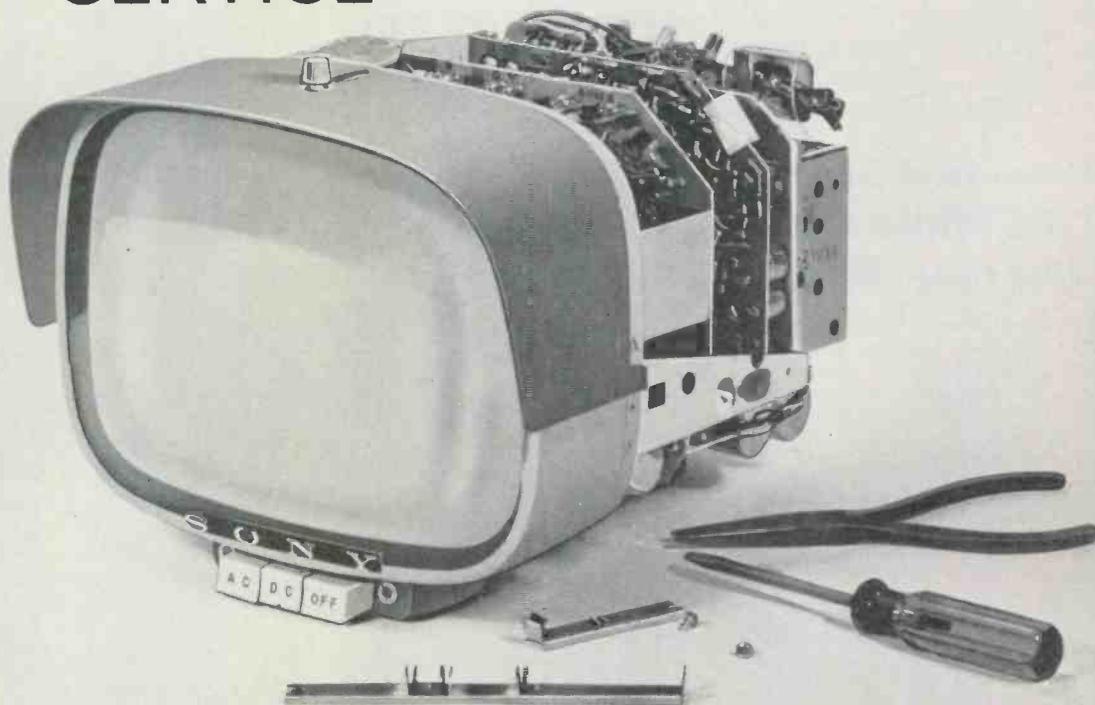
What an amazing industry we're in. For about the same price or a bit more, paid in inflated 1961 dollars or less, we can still buy a TV set. While houses, food, clothing, automobiles and practically everything else has gone up in price perhaps 400%, television remains at the level of 23 years ago.

While we may be proud of what electronics has accomplished, the next quarter century will bring (H-bomb permitting) more startling innovations in electronics than we can imagine.

But people won't change that much. Customers will still stop by the service shop and insist, as one reader recently reported, that the technician sell her a horizontal hold because the picture refused to hold still horizontally.

*Al Foman*

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# LETTERS

## To the Editor

### Auto Radio Batteries

Editor, ELECTRONIC TECHNICIAN:

The Tough Dog titled "Erratic Auto Radio Traced to Battery" in your June 1961 issue found our special interest. As follows, we would like to submit our comment on the matter:

All Blaupunkt car radios of the present production as well as since the year 1957 can be easily converted between 6 volt and 12 volt and, therefore, without problems adapted to the car to be installed. Due to the fact that exact model specifications were not given, we do not know whether the set in question was of the convertible type or an older model. We are, therefore, not in the position to submit information on this specific radio but we would like to say a few words about connecting a 6 volt car radio to a 12 volt battery in case the set is not convertible.

1. To tap a 12 volt battery in order to obtain 6 volt supply for a car radio is a very unsatisfactory, even dangerous solution. One half of the battery will be overcharged while the remaining half will be undercharged. In the long run this will positively damage the battery, especially at low temperatures, and the manufacturer would probably reject any warranty claim.

2. a) A tube radio can be used with a dropping resistor, but attention must be paid to correct resistance as well as sufficient wattage.

b) A transistor radio should never be operated through a dropping resistor, due to the fact that the current drain will change considerably during operation, mainly depending on the audio volume. The actual battery voltage applied on the set will, therefore, fluctuate and the power output and performance of the set will be unfavorably affected.

Many customer complaints and difficulties could be avoided if the car radio installer would always make sure that voltage and polarity of the set to be installed are correct. We are happy to be of assistance if service technicians have any questions regarding the Blaupunkt car radio line.

L. AMENDA  
Service Manager

Robert Bosch Corp.  
Blaupunkt Car Radio Division  
Long Island City 1, N. Y.

• As standard practice, reader Amenda is right about the risk of tapping 12 bolt batteries. The Tough Dog cited was more in the line of an emergency repair.—Ed.

### Polarity Error

Editor, ELECTRONIC TECHNICIAN:

In perusing your June 1961 issue of ELECTRONIC TECHNICIAN and reading the article on "Relays in Industry" I notice that Fig. 5 on page 43 seems to have what appears to be an error in the polarity of the battery or the rectifier. As it now stands the positive voltage is applied through the relay winding to the cathode of the rectifier, which, being an applied reverse voltage, would act as a delay voltage instead of a sensitizing voltage. To correct this it seems either the rectifier or the battery polarities would have to be reversed, but not both, of course. The article in general appears to be a good basic article on fundamentals and will no doubt be appreciated by many.

M. G. GOLDBERG

Beacon Radio & TV Service  
St. Paul 3, Minn.

(Continued on page 10)

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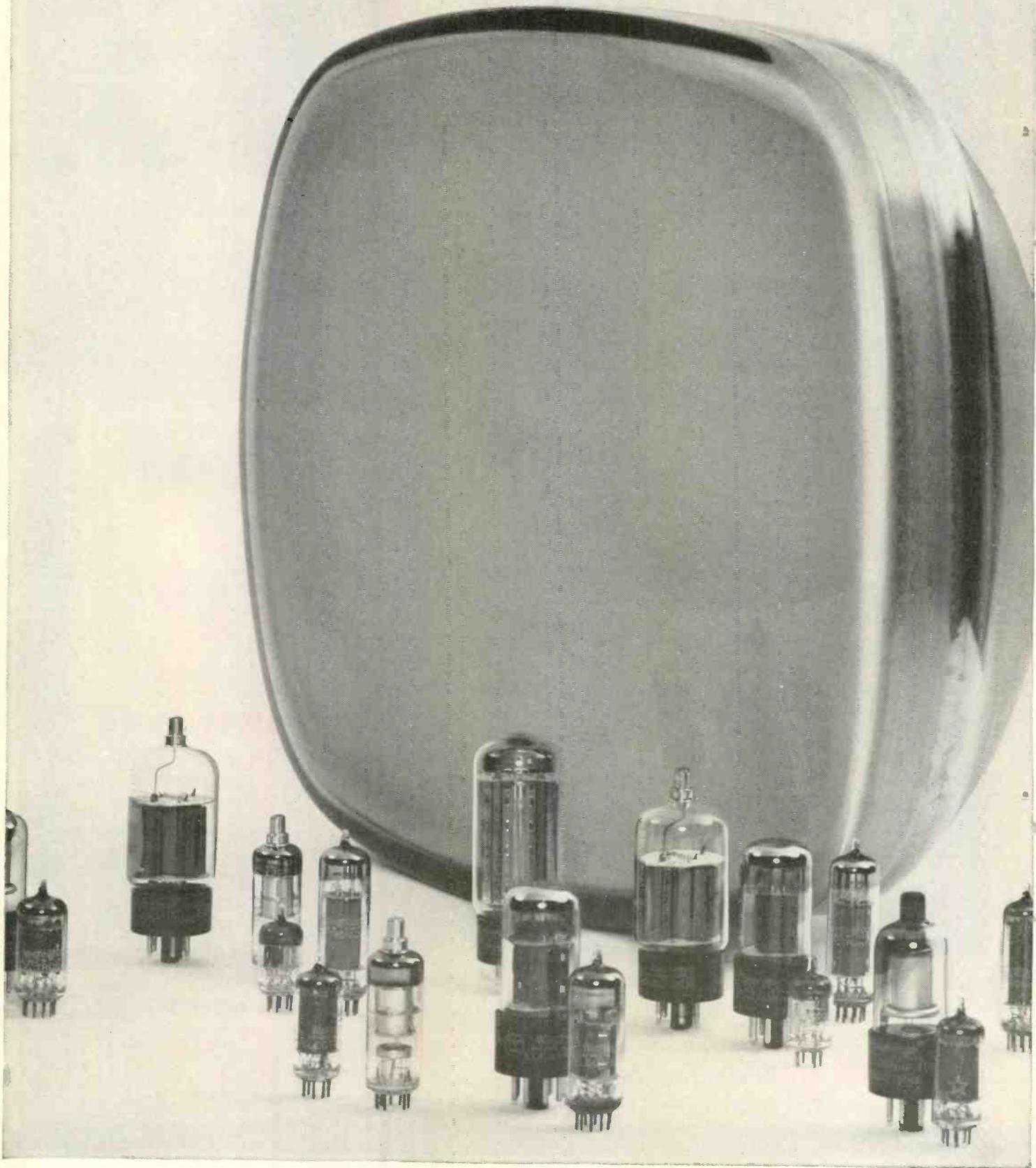
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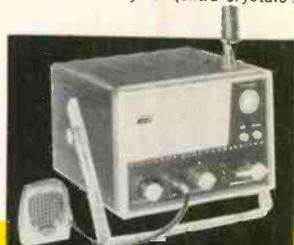
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(Continued from page 6)

### Mandatory UHF

Editor, ELECTRONIC TECHNICIAN:

Your July editorial "The Price of Mandatory UHF" was very interesting to read in the May, 1961 issue. The letter of Mr. R. Evans, I assume, makes justified statements.

It seems to me, there is a *sound compromise* in this controversy:

The TV channels 2 to 6 shall be cancelled and redistributed for other services. Reasons:

1. Channels 7 to 13 can be received by the oldest sets in use, therefore no sets will become obsolete.
2. The incentive for transmitting on UHF will be increased by diminishing the VHF channels from 12 to 7.
3. Channels 2 to 6 may be the most convenient for other, mostly low powered services.
4. Channels 2 to 6 are very often disturbed (in summer especially) in fringe areas by distant transmitters through reflection from the ionosphere.
5. The reception techniques for higher frequencies are very definitely improved against the time when the frequency allocation for TV channels was decided.

On these reasons, the proposed change will yield the most effective measure with the least amount of hardship.

F. ZAKARIAS

Beacon, N. Y.

### Licensing

Editor, ELECTRONIC TECHNICIAN:

The New York State TV Technician has been promised relief from all the ills besetting him if he will support the drive for any kind of a license that can be gotten on the books. Now this is a fallacious argument if there ever was one because a license law is for the direct benefit of the public, not the licensee. Under its terms he has merely proved his qualifications.

Now in New York, by political tradition if nothing else, and as a matter of practical politics, no legislature will consider a bill that, quote, "will put anyone out of business." So a grandfather clause is always a part of new legislation allowing business incumbents to automatically receive their license sans test. All the technician receives above and beyond a status quo is a yearly license fee and the knowledge that the marginal part timer who never registered his business will be frozen out. While this will be helpful our main woes will remain unsolved.

The various New York associations would do themselves and the technician better justice if they would firmly petition the legislature to forego such a grandfather clause, giving the business incumbent two years of grace to take the test that will be required at once of freshmen. Then, and then only, can we honestly assume the professional status we claim. But then, who will dare bell the cat?

ROBERT L. WEIL

Weil's Repair Service  
Albany 5, N. Y.

... At this time I am pleased to announce that the N. Y. license bill is going ahead! Our sponsors, Francis P. McCloskey, Assemblyman of Nassau County, John H. Cooke, Senator of Alden, N. Y. have again indicated support and will prefile the bill. The bill will again be known as the McCloskey-Cooke TV license bill.

We now need your support. We need prominent display of this appeal. The State group needs three things—desperately! One, money, the state treasury was seriously depleted last year. Please send this to Mr. Warren Baker, 514 Second St., Albany 6, N. Y. If enough men will help in or out of ESFETA, the passage of this bill will be virtually assured.

Secondly, private letters and phone calls to your own Assemblyman and Senator. The leaders of both Assembly and Senate are behind us this year! The Attorney-General, Louis J. Lefkowitz, is helping us this year. So let's get the letters, cards, and telegrams started.

DOUG COOK  
Pres.

ESFETA  
Buffalo, N. Y.

(Continued on page 18)

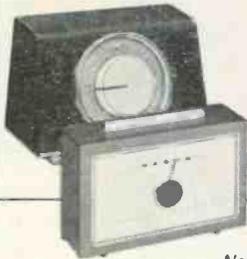
among  
consumers...  
dealers...  
servicemen...  
still the number one

Alliance  
Tenna-Rotor...  
number one in  
sales and in  
profits, because  
it's  
number  
one in  
advertising...  
in improved  
features...in  
consumer  
acceptance!

choice!



Look at the market for Tenna-Rotor—color TV... new station assignments . . . new homes . . . all these are creating a new wave of demand for the optimum reception Tenna-Rotor makes possible. Get your share of the sales!



**alliance**  
**TENNA · ROTOR**

*Newest automatic and manual Alliance models—in mahogany, ivory and forest green.*

**The Alliance Manufacturing Company, Inc.** (Subsidiary of Consolidated Electronics Industries Corp.) ALLIANCE, OHIO  
WORLD'S LARGEST PRODUCERS OF SUB-FRACTIONAL HP MOTORS • MFRS. OF ALLIANCE GENIE AUTOMATIC GARAGE DOOR OPENERS

Guaranteed against leakage...  
and full of **sound power**—



### Mallory Mercury Batteries



To protect your transistor radio against damage and to get more enjoyment from it, always use Mallory Mercury Batteries—the different batteries.

These rich, soft-taste battery gelatinated against leakage. They give you far more **sound power**; they're designed up to seven times as many operating hours as your usual ordinary battery. They stay in full strength all their long life—no fading, no power loss when idle.

Try Mallory Mercury Batteries often, and you'll never settle for less. In popular sizes of three, four and six.



For protection against your radio and regular protection, free of charge, Mallory Mercury Batteries should be used in all popular sizes of three, four and six. Mallory Mercury Batteries are available in all popular sizes of three, four and six.

Mallory Battery Company, South Tarrytown, N.Y.



The Complete Mallory Battery Company  
1000 Broadway, New York 10010  
1000 Broadway, New York 10010  
1000 Broadway, New York 10010

For more information, contact your local electronics distributor, or write to Mallory Battery Company, South Tarrytown, N.Y.

A leaky battery  
can ruin your  
transistor radio



### Mallory Mercury Batteries are guaranteed against leakage



Don't risk costly damage to your transistor radio by using ordinary batteries. Protect your radio right by using Mallory Mercury Batteries—the **only radio battery guaranteed against leakage.**

**Greater sound power.** A completely different kind of power cell, Mallory Mercury Batteries give you up to seven times more operating hours than ordinary batteries. They never fade, never lose power when idle. Try them in your radio. You'll be amazed at the difference they make. Stores near you have them in all popular sizes.

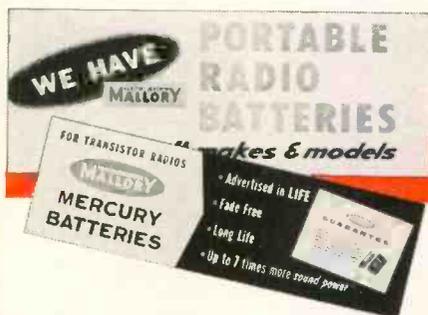
We guarantee to repair your radio and replace batteries, free of charge, if Mallory Mercury Batteries should ever fail. Mallory Mercury Batteries should be used in all popular sizes of three, four and six. Mallory Mercury Batteries are available in all popular sizes of three, four and six.

Mallory Battery Company, South Tarrytown, N.Y.



For more information, contact your local electronics distributor, or write to Mallory Battery Company, South Tarrytown, N.Y.

# Step up your battery profits



BRING PROSPECTS INSIDE...  
with these bold window streamers.



BRING 'EM TO THE POINT OF SALE...  
with store and window display material.



THEN SELL 'EM IN YOUR STORE...  
from this new counter-top dispenser. A balanced stock of Mallory Mercury Batteries for all popular transistor radios... in new re-usable plastic jewel boxes. Packs fed one at a time. Guarantee boldly featured.

ADVERTISED IN  
**LIFE**

**LIFE ADS REACHING  
34 MILLION PROSPECTS**

**Consistent Mallory advertising  
in LIFE—telling them... and  
selling them.**

Mallory Mercury Batteries... the *sound power\** battery... now come to you with a new *salespower program* to help you cash in on the booming transistor radio battery business. It's a big market... over 15 million transistor portables in use today, thousands more every month. And Mallory Mercury Batteries have the performance... the promotion... and the profitability... that lead the field.

New national advertising that pre-sells millions of customers this *different* battery.

New guarantee against leakage, unique in radio batteries... heavily promoted in national advertising.

New promotional materials—store banners, window displays, dealer ad mats, counter cards.

A new point-of-sale merchandiser—puts every dealer in the Mercury Battery business... balanced inventory... minimum investment... attractive display.

Plus... the unequalled performance of the most powerful batteries on the market. Up to seven times more sound power. Non-fading performance. Two years or more storage life.

And... *high profit per sale*... several times that of ordinary batteries.

See your Mallory distributor now. Get ready for the big battery selling season... with the fastest growing battery line!

\*T.M.

## with the Mallory '61 Program



Distributor Division  
Indianapolis 6, Indiana

P. R. MALLORY & CO. INC.  
**MALLORY**

AND SELL 'EM AT HOME, TOO...

from the Mallory Mercury Battery Service Kit. Only 2" x 5" x 7", it fits easily in a corner of tube or tool caddy. Stocked with fast-moving Mallory Mercury Battery assortment to fit most popular transistor sets.

NEW GUARANTEE AGAINST LEAKAGE...

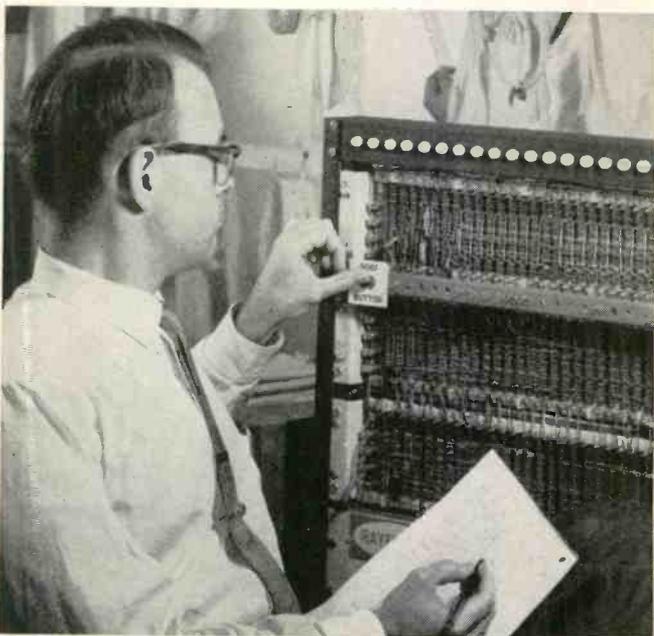
Display the Mallory guarantee that protects your customers. We guarantee to repair the radio and replace the batteries, free of charge, if Mallory Mercury Batteries should ever leak and damage a radio set.

# Tuning In the

**FIFTY-FIVE RUBLES** for a 10-minute repair job replacing a cord on a radio set (the cord lists at 1.94 rubles which is 20¢), sent an enraged Moscow citizen to the shop where the director admitted a slight error—the charge should have been 35.6 rubles. Even more enraged, he entered a complaint with “Trud” the journal of the Soviet trade unions. At the radio repair shop the reporter was shown a thick book of labor time, travel and other charges for radio repairs as approved by the Soviet Ministry of Communications in 1952. The bill was correct; the repairman had followed precisely the official rate schedules.

**MEN TALK LOUDER** on the telephone, but women make more social calls. Speech volumes of males average 2 db higher than those of females, but there is a wide variation in the average volume of male talk while the variation in the average speech volume of females is smaller, discloses Bell Telephone Labs. These disclosures resulted from a 10-city survey made by the company when speech volume measurements were made on more than 10,000 connections at 17 central offices.

## “GOOF BUTTON” PUNISHES MACHINE



A machine that learns, makes decisions, profits by its mistakes and tells how it solved problems has been developed by the Raytheon Company. It uses punched tape to obtain data and modifies what it has learned on a memory element. When the machine makes a mistake in learning, the teacher pushes a “goof button” to make it re-evaluate its answer.



“We’ll just move your set away from the window, . . . Whoops!”

**RADIO-TV INTERFERENCE** potential is part of an FCC educational program. The FCC cautions consumers about purchasing sets without a certification seal of compliance with the Commission’s radiation limits. The Commission notes that present seals are not uniform in size, wording, or location. A proposed rule amendment to correct this includes affixing a distinctive 1 x 3 inch seal to a set’s back panel.

**TRANS-OCEAN TV** via short wave instead of communications satellites was demonstrated at the Polytechnic Institute of Brooklyn. The system uses a much narrower bandwidth than conventional TV but the picture is “acceptable.” Dr. Deutsch, the scientist who developed this system, said that it could also be used for educational TV at far less expense than conventional TV.

**ELECTRONIC SNIFFER**, developed by Westinghouse, is called an electronegative gas detector (EGAD). It detects and exactly measures concentrations of gases as low as one part in 10 million parts of air. In contrast to the human sense mechanism, odor has nothing to do with its operation. It uses transistorized circuitry. The EGAD can detect a leak so small that the escaping gas, in an entire year, would fill only the space inside a pack of cigarettes.

**TV CRT SALES CLIMB.** Factory sales of TV picture tubes rose in June to end a downward slope started in April, according to EIA. Sales of receiving tubes increased in June over the previous month’s total. June sales numbered 806,852 CRT’s, valued at \$15,887,776, against 673,315 worth \$13,238,774 sold in May. Receiving tube sales totaled \$1,463,000 at \$25,989,000. In May, the total was 29,823,000 units sold with a value of \$25,308,000.

# Picture .....



TV TUBE LABELLING LAW has been enacted in two more states, Ohio and Pennsylvania, making essentially the same requirements as New York's law in effect for almost a year. The three states represent 21% of the total U. S. population and purchase 23% of all the replacement TV tubes in the nation. The laws' requirements are: No tube other than one using all new parts and new glass can be represented directly or indirectly as a "new" tube. The tube and its carton must be labelled to show the true quality or condition of the tube. The marking on the tube may only be removed by the purchaser after the tube has been purchased. TV servicemen must furnish a written statement to the customer stating the true quality or condition of the tube furnished to the customer, even though the tube is marked as required by law.

*FREE TV TUBE TEST AD of the Videon Television Service Co., refused by the Southwestern Bell Telephone Co., has resulted in drawn-out hearings before the State Commission. Videon appealed for allowance to use the phrase "you pay nothing" if no tubes need changing in their advertisement in the Yellow Pages of the telephone directory. The telephone company states they have decided to keep all TV repair companies from using that sort of advertising, as a safety measure.*

SYLVANIA HOME ELECTRONICS introduces first color TV receiver since 1956. Model 21LC7 deluxe console in Scandinavian styling with tambour doors, available in walnut only, \$825.00. It is equipped with a 21" three-gun shadow-mask color picture tube and a transformer powered chassis. Illuminated channel indicator and primary and secondary controls, located on front of cabinet. Two speakers, a 6 x 9-inch oval and a 4-inch round, are also front mounted.

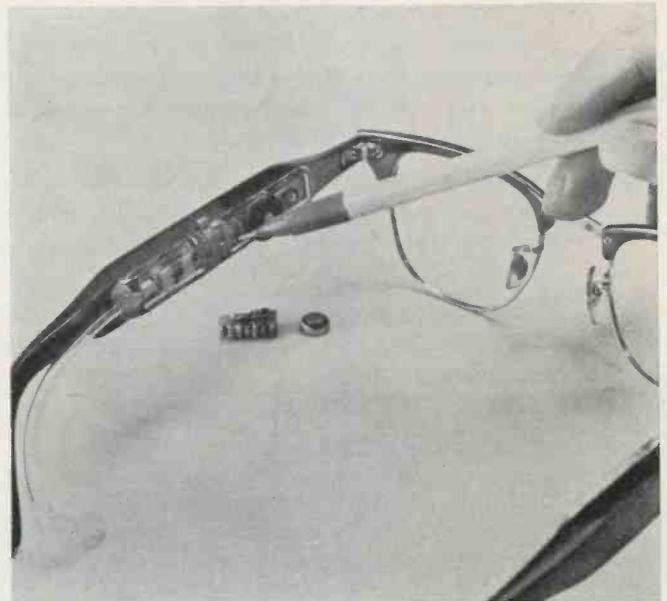
*OVARY RADIO PILL, implanted permanently in the body of a monkey, may shed some light on the little-known nature and timing function of a female's ovary. Up to now, according to scientists, no reliable method has been developed for determining just when ovulation is about to occur or has occurred. The tiny devices being used in the experiments are technically known as "endoradiosondes," and were developed by RCA. They consist of a speck of temperature-sensitive ceramic material, and an inductor unit made of a small piece of electromagnetic material wrapped in a coil of wire. The implanted unit is designed to transmit a signal whenever the inductor unit is triggered by an r-f signal sent into the body from the outside. The device requires no battery or other power source of its own.*

## CALENDAR OF COMING EVENTS

- Oct. 9-11: National Electronics Conference, (IRE, AIEE), International Amphitheatre, Chicago, Ill.
- Oct. 9-13: Fall Convention & Technical Exhibit, Audio Engineering Society, Hotel New Yorker, New York, N. Y.
- Oct. 13-15: 2nd Annual Denver Stereo & Hi-Fi Show. Norman J. Murfield & Associates, Ltd, Albany Hotel, Denver, Colo.
- Oct. 30-31: Radio Fall Meeting, (PGED, BTR, RQC, EIA), Hotel Syracuse, Syracuse, N. Y.
- Nov. 5-8: Dixie Electronic Representatives, Inc., Diplomat Hotel & Country Club, Hollywood, Fla.
- Nov. 14-16: Northeast Research & Engineering Meeting (NEREM), Somerset Hotel, Boston, Mass.
- Nov. 16-19: Northwest Hi-Fi, Music & Stereo Show, Audio Div. Paul Bunyan Chapter, ERA, Municipal Auditorium, Minneapolis, Minn.
- Nov. 30-Dec. 1: PGVC Conference, Professional Group on Vehicular Communications, Hotel Radison, Minneapolis, Minn.

*TOO MANY TV COILS and a hissing sound. Off to the back-country went a technician in response to a customer's call that his TV set was "blinking." While adjusting the set he heard a hissing sound from the inside of the cabinet and looked into the back of the set. There, coiled around the picture tube, was a four-foot black snake. When the harmless snake was removed, the TV set operated fine.*

## MICRO-MINIATURE HEARING AID



The snap-in hearing aid shown here, introduced by Acousticon International, a division of Dictograph Products, Inc., employs a transistorized micro-miniature amplifier that weighs less than 1/3 ounce. It has a frequency range of 380 to 4,000 cps and a gain of 33 decibels. The unit has a volume control and an off-switch.

# Meet...and beat...the fringe-area challenge with the new **CHANNEL MASTER**

*Channel Master's world-famous Antenna Development Laboratory has done it again! By using a brand new concept in antenna design...*

**PROPORTIONAL ENERGY ABSORPTION...**

*Channel Master meets the fringe area challenge with the most powerful TV antenna ever produced...the Crossfire!*

## Proportional Energy Absorption works like this!

Each Crossfire element has a predetermined impedance, at each frequency, which determines its degree of energy absorption. This impedance, governed by the taper and spacing of the dipoles, decreases with the distance from the feed point. Each successive element therefore absorbs a larger percentage of the available energy.

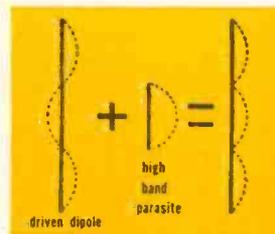
Since the amount of available energy decreases as it progresses along the length of the antenna, each element, by absorbing a *larger* percentage, absorbs approximately the *same amount* of energy as the other elements in the array.

This means that the Crossfire...unlike other antennas...has a large group of driven dipoles actively working to increase gain *on every channel*...on both low and high bands.

More working elements provide more picture power! This is the key to the remarkable performance of the Crossfire.

## Revolutionary New Dual Dipole System

Each parasite reverses phase of high band current on the adjacent low band dipole, so that it operates as three driven half-wave high band elements.



## ... And the Crossfire is Gold!

The Crossfire's performance is matched only by its beauty. Channel Master's exclusive E\*P\*C Process gives the antenna a lustrous golden coating that enriches its appearance and protects it for years against corrosion.

Channel Master's E\*P\*C Process is *not* anodizing! The disadvantage of anodizing is that the anodized film is an electrical insulator, and must be removed by *abrasion* wherever metal-to-metal contact is required. Therefore, anodized antennas have no surface protection on the very parts that need it most!

**THERE'S  
A CROSSFIRE TO MEET  
EVERY RECEPTION PROBLEM!**

model 3600  
28 elements

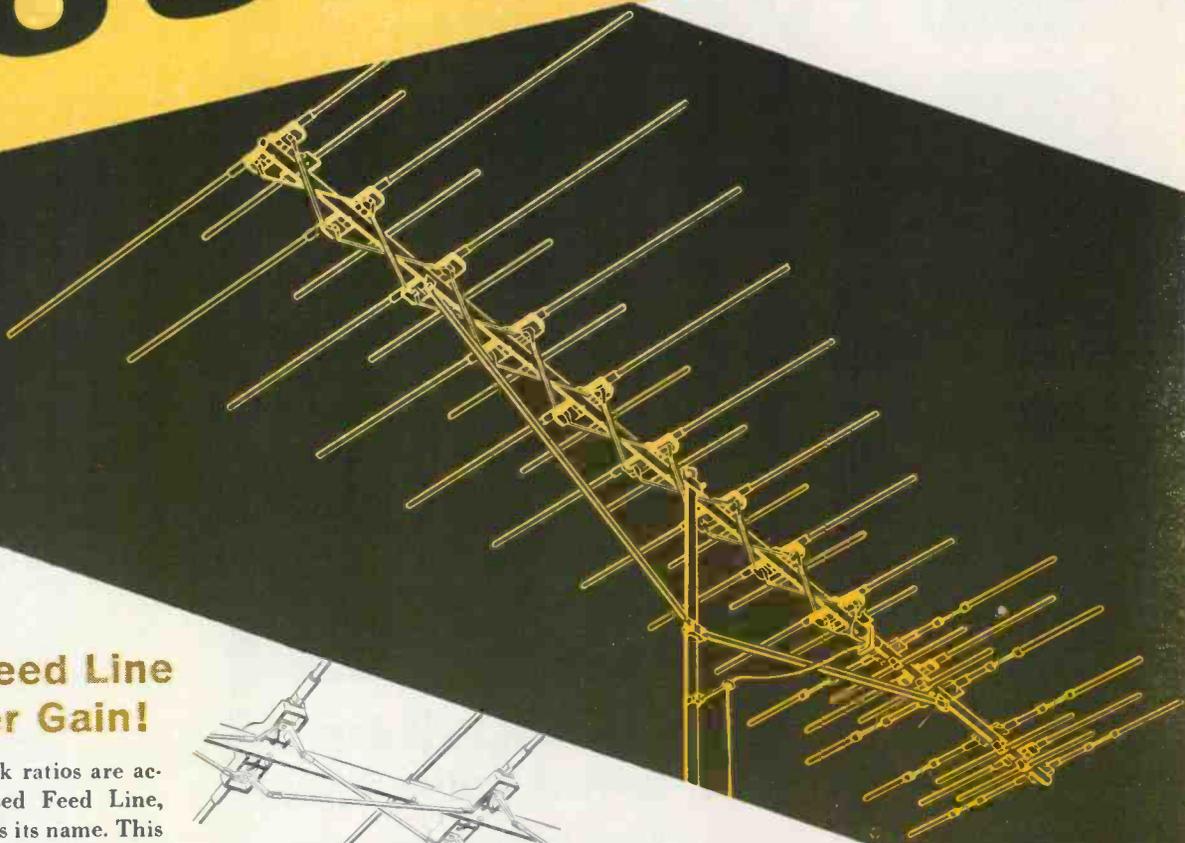
model 3601  
23 elements

model 3602  
19 elements

model 3603  
15 elements

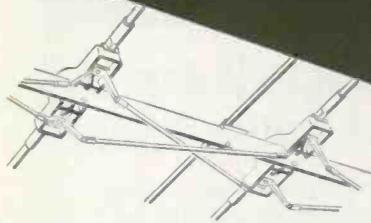
model 3604  
11 elements

# GOLDEN Crossfire

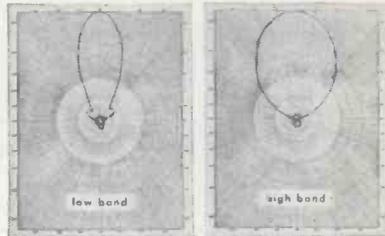


## Transposed Feed Line Means Cleaner Gain!

Extremely high front-to-back ratios are accomplished by a Transposed Feed Line, from which the Crossfire gets its name. This feed line is transposed between each successive pair of elements. As a result, the radiations from each pair of adjacent elements are self-cancelling because they are 180° out of phase. This carefully engineered system is so efficient that the Crossfire needs no parasitic reflector element.



Because of these high front-to-back ratios, the Crossfire provides *cleaner* gain than any other all-channel antenna. It pulls in the signal you want while rejecting unwanted interference of every type (auto ignition systems, electrical noise, other TV signals, etc.) from both side and rear. See untouched photo of actual horizontal polar pattern.



**The Crossfire is the only antenna you can sell with full confidence that it will outperform anything your customer is now using!**

For still more power... add the new

## CHANNEL MASTER JETRON

Antenna-mounted transistorized signal amplifier and set coupler  
*Most effective...most dependable...lowest noise figure!*



Power supply (with built-in 4-set coupler) is conveniently located in the home. Compact, only 5" x 3 3/4" x 1 3/4".

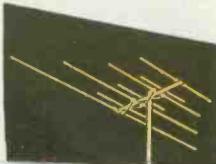
*model 0020*

For more data, circle 10-17-1 on coupon, p. 48

• Patent Pending

Copyright 1961 Channel Master Corp.

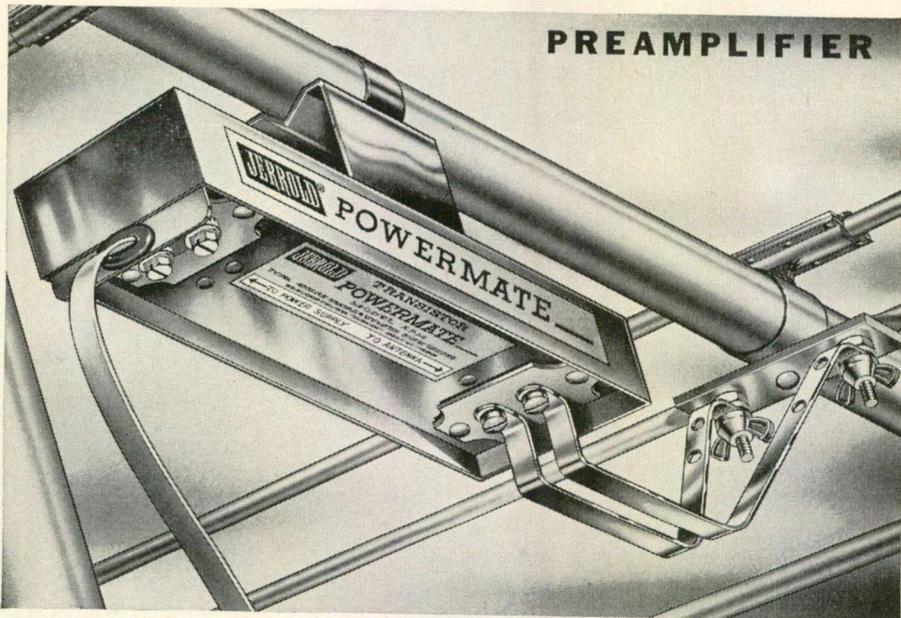
model 3605  
7 elements



Introducing the perfect mate for any TV/FM antenna

# NEW TRANSISTOR JERROLD® POWERMATE

PREAMPLIFIER



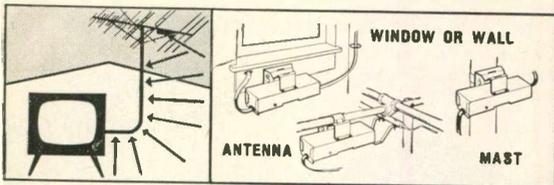
**mounts on boom, mast, wall, window...  
offers highest gain, lowest noise figure**

Here's the preamplifier for every TV antenna in your area, whether new or up for years! The exclusive universal bracket of the new JERROLD Transistor POWERMATE permits mounting directly on the antenna boom (for greatest boost before download losses) or at any other point—along the mast, on the wall or windowsill, behind the set—anywhere your best judgment dictates.

And look at this gain: An average of 13.9db at Channel 13 and 18.25db at Channel 2—by far the highest in the business! This remarkable gain gives any antenna system the lowest System Noise Figure obtainable—the key to better pictures.

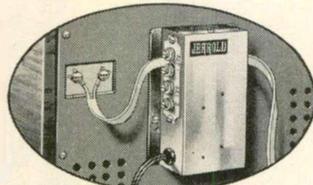
See your distributor today, or write for special bulletin describing System Noise Figure.

*Only \$39.95 list, complete with power supply*



## MOUNT IT AND FORGET IT

On the antenna or anywhere along the download, POWERMATE is up for good. Same 300-ohm lead that carries signal also carries 15 volts ac to POWERMATE. No tubes, no batteries to replace.



**REMOTE A-C POWER SUPPLY** installs on or near receiver, draws less current than an electric clock. No polarity nuisance when attaching to lead, no danger of damaging the transistor.

**JERROLD® ELECTRONICS CORPORATION**  
Distributor Sales Division, Dept. IDS-182  
The Jerrold Building, Philadelphia 32, Pa.

Jerrold Electronics (Canada) Ltd., Toronto, Ontario  
Export Representative: CBS International, New York 22, N.Y.

AMERICA'S LEADING MANUFACTURER OF TV-FM RECEPTION AIDS AND MASTER-ANTENNA-SYSTEM PRODUCTS

(Continued from page 10)

## Service Dealer Discounting

Editor, ELECTRONIC TECHNICIAN:

Re "Service Dealer Discounting On The Rise" (Aug. 1961), there are several fallacies in this philosophy:

1. Discount for more volume—true only when competitors (other service dealers—not over the counter sales) do not discount.

2. By buying from drugstores the customer cannot take advantage of the service dealers knowledge.

3. At 50% of list and \$5 per house call most dealers in this area would not break even.

4. 15% over cost? a grocery store needs 17%.

5. The article ignores the fact that when a customer calls a service dealer it is because he needs service, not that the parts needed are at a bargain price.

6. The article ignores the customer's confidence in the service dealer—confidence that the service man will find the trouble and return the equipment to good working order shortly.

7. With discount service, who pays for the 90 day warranty on all parts the service man replaces.

Should the auto mechanic charge less for parts simply because you can buy the parts cheaper via mail order—I would say not because you depend on him to do the replacement and stand behind his work.

ROLAND P. CRAWFORD

Rod Crawford TV  
Sarasota, Fla.

## Screens for TV

Editor, ELECTRONIC TECHNICIAN:

In your August issue 1961, on the upper left side of page 15 "Tuning In" I read an article on TV Scanning Lines.

This is to inform you that I hold Patent #2,943,964 which was issued to me on July 5th, 1960 which is known as an E-Z-Eye Television Viewing Screen. It is a thin plastic screen with vertical and horizontal opaque lines which superimposes lines over each second horizontal line and over the other darker lines. This causes the appearance of closely interlaced lines, with new skew distortions, 3-D depth effect, 52% reduction in glare, reduced reflections from lamps, mirrors, sunny windows, etc.

It's designed for simple attachment to the safety plate glass or face plate. The screen is transparent and contains a pattern of opaque thin black lines which operate by selective light absorption to alternate light and glare originating from external sources.

At normal viewing distance with the TV operating the line pattern is completely invisible giving the viewer a smoother, closer scanning lined picture with an apparent 3-D depth. These screens are almost ready for production and will retail at \$3.98.

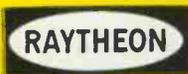
MAX GOLDENBERG

Evansville 14, Ind.

(Continued on page 20)



THE "FIRST IN QUALITY"  
CLEARLY PRINTED ON ALL  
RAYTHEON UNILINE TUBES  
GUARDS AGAINST CALL-  
BACK LOSS... ASSURES  
ALL YOUR CUSTOMERS OF  
HIGHEST QUALITY SERVICE

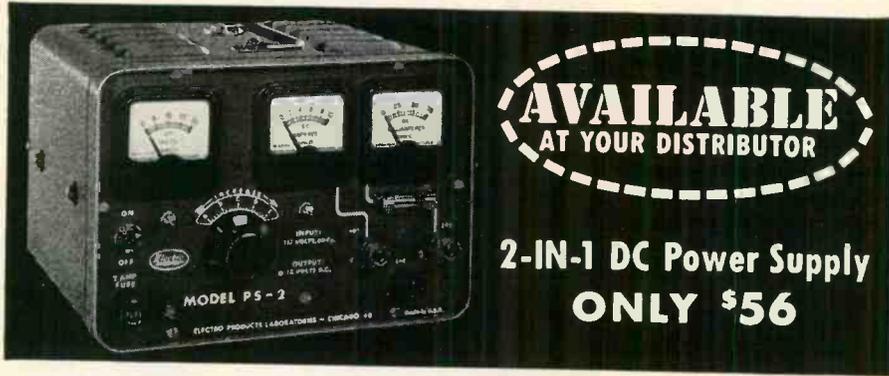


RAYTHEON  
COMPANY

DISTRIBUTOR PRODUCTS DIVISION

411 Providence Turnpike • Westwood, Mass.

For more data, circle 10-19-1 on coupon, p. 48



**AVAILABLE  
AT YOUR DISTRIBUTOR**

**2-IN-1 DC Power Supply  
ONLY \$56**

## BEST performance FOR LESS

- 1... use the PS-2 to operate ALL TYPES of auto radios  
(transistor, hybrid and tube)
  - 2... use the PS-2 to operate personal portable radios  
(transistor)
- ... also operates experimental transistor circuits, relays; use it for electroplating, laboratory work. Transistor protection with separately fused milliammeter. Longer life with EPL patented conduction cooling.

*Outperforms all others in its price class*

Also available in kit form through your Electronic Parts Distributor  
Model KPS-2 . . . . . \$44.95

VOLTAGE	CURRENT	RIPPLE
0-16 VDC	5 amps.	0.5%
0-20 VDC	75 ma.	0.15%



Write for literature giving all advantages

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

1238

For more data, circle 10-20-1 on coupon, p. 48

## ATLAS "Job Rated" P. A. SPEAKERS



**There is an Atlas Speaker Ideally Suited for Every Job**

All Atlas P. A. speakers are highly efficient, especially in the voice frequency range, providing the extra "punch" needed to override high level background noise. Most are 100% weatherproof; aluminum and diecast parts are treated with corrosion inhibitors, then finished in "stone hard" baked enamel. The CJ Cobra-Jector horns are constructed of nonresonant, indestructible fiberglass, and HU and TP speaker horns of aluminum, finished in gun-metal grey. The HU and TP speakers are particularly designed for efficient talkback operations. The peaked characteristics within the voice frequencies increase the sensitivity of these speakers as pickup devices.

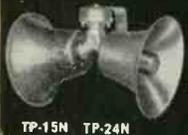
All HU and CJ speakers are equipped with versatile "Versalock" . . . This rugged, reliable mounting bracket, completely adjustable both horizontally and vertically, provides positive locking in any position.

The DU-12 and DC-5, Atlas' renowned DeCor projectors, are styled to harmonize with any decor, modern or traditional.

Send for free catalog to Dept. ET-10

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 C.P.S.	350-10,000	250-10,000	200-10,000	400-10,000	250-10,000	150-9000	250-10,000	200-10,000	400-10,000	120-7000
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" x 5 1/2"	14" x 6"	19 in.	9 3/4 in.	11 1/4 in.	7 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



**ATLAS  
SOUND CORP.**  
1449 39th Street  
Brooklyn 18, N. Y.  
In Canada:  
Atlas Radio Corp., Ltd.,  
Toronto, Ontario

(Continued from page 18)

### Old Radio Schematics

Editor, ELECTRONIC TECHNICIAN:

Perhaps you can tell your readers, that Supreme Publications supplies, at a nominal charge, diagrams and service material for individual radio and TV sets. Just yesterday, we helped a collector of old sets with a diagram of a 1923 Kennedy. Our material goes all the way back to the first radio sets when commercial broadcasting began.

If model and chassis number is available, this permits us to quickly locate the material wanted. However, in many instances a complete description, including the tubes used, will permit us to locate the material needed. The charge made varies from 50¢ to \$1.00 in most instances. Where an unusually large number of pages of material is available, the charge may be somewhat larger.

M. N. BEITMAN

Supreme Publications  
1760 Balsam Rd.,  
Highland Park, Ill.

### Woman's View

Editor, ELECTRONIC TECHNICIAN:

I am only a woman in a man's world but believe me I am happy to be one, when I see what my husband has to put up with in TV service.

It is surprising how little the general public knows about our problems.

My point in writing to you is to suggest and hope someone may think it is a good idea.

Wouldn't it be a wonderful thing to "Educate the Public" as to what a serviceman has to do to become a technician, how hard he works to earn his bread and butter, the instruments he has to buy and the guff he has to take from the public.

Wouldn't it be nice if some Big magazine would run some favorable articles.

Maybe it would help an honest TV man. It burns me up to see things printed about a dishonest one, but never any good.

MRS. MARSHALL

Marshall's TV  
Villas, N. J.

• Amen!—Ed.

### Free Literature 5 1/2 Years Later

Editor, ELECTRONIC TECHNICIAN:

We have a copy of your magazine for March 1956. In it you have a list of literature your readers could obtain at that time through your magazine.

We would like to know if there is some way of obtaining this literature now.

ROBERT E. SCOTT

Saginaw, Mich.

• Sorry, but it's much too late. Write in for current free literature listed in each issue. Or write direct to the manufacturer for back copies. See May directory for manufacturer addresses.—Ed.



The Sprague TCA-1 is specifically designed to safely test capacitors such as tantalum capacitors, low-leakage aluminum electrolytic miniatures, low voltage ceramics and low voltage paper and film capacitors used in transistor and other low voltage circuits. No industrial laboratory or modern electronic service shop can afford to be without one!

**MODEL TCA-1 TRANSFARAD 115 VAC/60 cy \$197.50 net**

**MODEL TCA-1RM FOR RACK MOUNTING**

Electrically identical with the standard instrument Model TCA-1RM has a standard 19" w. x 10½" h. panel so that it can be mounted in the conventional relay rack.

**MODEL TCA-1RM ..... \$207.50 net**

\*Trademark

**TCA-1 TRANSFARAD\***

**THE FIRST ANALYZER SPECIFICALLY DESIGNED TO SAFELY TEST TRANSISTOR CIRCUIT CAPACITORS**

- **CAPACITANCE BRIDGE** measures 1μF to 2000μF in five overlapping ranges. Only 0.5 volt is applied to the bridge from a continuously adjustable power supply. The voltage across the capacitor is less than this applied voltage, the amplitude depending on the capacitance being measured. No possibility of overheating or deforming any low voltage capacitor during measurements.
- **INSULATION RESISTANCE** directly read from 50 megohms to 20,000 megohms. Only 25v d-c is applied, permitting measurements on low voltage ceramic, mica, and film capacitors. IR of ceramics rated below 25v may be calculated from leakage current measurements at exact rated voltage.
- **LEAKAGE CURRENT** measured directly on meter at exact rated d-c voltage of capacitor. Sensitive circuit makes full scale measurements from 0.6 μa to 600μa in seven ranges.
- **POWER FACTOR** measured by Wien bridge from 0 to 50 per cent.
- **MAGIC EYE** null detector in high-gain amplifier has sensitivity control permitting accurate measurement of small capacitors.
- **SHORT-TIME STABILITY** is assured by dual regulation of the power supply. Specially processed etched circuits and complete encapsulation of the critical bridge-null amplifier insure long-time stability.
- **BINDING POSTS** are shielded against strays, assuring greater accuracy during low capacitance measurements.
- **FOR SAFETY** the capacitor under test is automatically discharged after testing. Three wire line cord grounds instrument case.
- **OPERATING PROCEDURES** are clearly shown on convenient pull-out slide.

**TO-5 TEL-OHMIKE® CAPACITOR ANALYZER**



The TO-5 TEL-OHMIKE capacitor analyzer is a must for checking all capacitors except special low voltage transistor types. The TO-5 is a moderately priced instrument with laboratory quality and accuracy—the highest accuracy of any instrument of its type available to the service trade!

**MODEL TO-5RM FOR RACK MOUNTING**

Electrically identical with the standard instrument, Model TO-5RM has a standard 19" wide x 10½" high panel so that it can be mounted in standard relay racks.

**Model TO-5RM.....\$102.50**

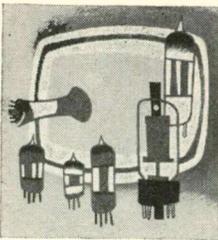


- **CAPACITANCE BRIDGE** measures up to 2000 mf in five overlapping ranges. The special 1 mmf to 100 mmf range is exclusive with the Tel-Ohmike.
- **INSULATION RESISTANCE** directly read on large meter up to 20,000 megohms for papers, ceramics, and micas. No guessing with neon lamps.
- **LEAKAGE CURRENT** of electrolytics measured directly on meter, with exact rated voltage up to 600v. applied from continuously adjustable power supply. Two ranges: 0-6-60 ma. No guessing on eye-width or counting lamp blinks!
- **POWER FACTOR** of electrolytics measured by Wien Bridge up to 55% in three ranges.
- **TURNS RATIO SCALE** to measure turns ratio of power and audio transformers.
- **MAGIC-EYE TUBE** simplifies bridge balancing for capacitance and power factor measurements.
- **PUSH-BUTTONS** for instant range selection, also discharge capacitors for safety upon release.
- **MODERN CASE** finished in two-tone gray; measures 8 7/8" high, 14 5/8" wide, 6 1/8" deep. Weight only 12 1/2 pounds.

**MODEL TO-5.....115 VAC/50-60 cy.....\$92.50 net**

**Model TO-5X.....115-230 V/25-60 cy..... 98.75 net**

**SEE THEM AT YOUR SPRAGUE DISTRIBUTOR**



# The "Big Picture"

...informative shop talk from  
Sylvania Field Service Headquarters

## New, Easy-Service Board



...beats the  
cracking problem

No need to handle this new chassis board with kid gloves! It's plenty tough—copper-bonded and double-sealed to withstand flexing, vibration and shock. Typical of the quality in the new '62 Sylvania TV sets.

No wiring "hangovers," either. Each and every new Sylvania chassis board is the spittin' image of the lab master—precision produced by automatic machinery designed and built by Sylvania specifically for the job. No more cold solder joints—the exact soldering temperature is automatically maintained. A new solder "resist" coating prevents solder from being applied except where it's supposed to go—on the connections only. They're clean connections, too—whiskers just automatically don't happen. Not with Sylvania TV.

New simplicity of service, too. Parallel circuitry makes testing faster and easier. Tube pin numbers, along with parts numbers and testing points, are clearly marked *on top* of the board, and the color-coded "road map" is a cinch to follow. Also, this horizontal chassis won't topple on your bench—and its clean design assures easy access.

You'll see, too, that this new board is sealed against humidity—as are the plastic encapsulated capacitors and the Mylar-insulated high voltage transformer and new Flexi-core power transformer. Just another example of the quality built into this service-designed chassis.

### SERVICE TIP OF THE MONTH

Have a good service tip you'd like to pass along? Send it to us in 50 words or less. If it's used in this column, you'll get \$10.00 and the credit. While you're at it, send us your comments on the new GT-555 chassis. Sylvania Field Service Headquarters, Sylvania Home Electronics Corp., Batavia, N. Y.

# SYLVANIA

SUBSIDIARY OF

## GENERAL TELEPHONE & ELECTRONICS



## News of the Industry

Sampson Co.—HAL W. MAZUR named western regional sales manager.

Reeves Soundcraft—WALTER R. HICKS appointed Vice Pres., charge of special projects.

Raytheon Co.—ROBERT R. PELGER joins the Distributor Products Division as St. Louis district manager.

Jerrold Electronics—elects SIDNEY HARMAN as President and chief executive officer.

General Electric Co.—GERALD L. PHILLIPPE elected President and CRAMER W. LAPIERRE, Executive Vice Pres.

International Resistance Co.—J. BURTON HENRY appointed Director of Sales, a new post. TERRY HALPERN named engineered products marketing specialist.

B&K Mfg.—first New York City showing of model 960 transistor radio analyst and model 375 vacuum tube voltmeter was made recently at a seminar, co-sponsored by SLATE ELECTRONICS INC.

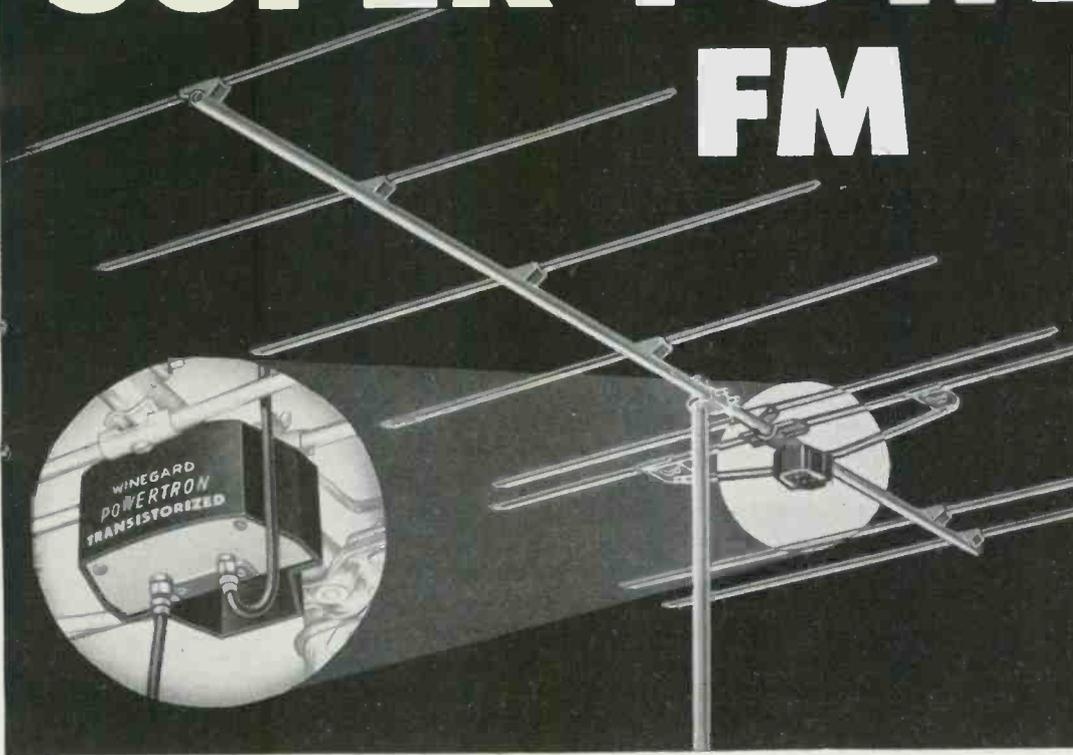
Mosley Electronics—ROBERT L. SEMMELROTH appointed advertising manager of the CARLOMA CORP., to handle all advertising for MOSLEY ELECTRONICS INC. and its affiliated companies.

Philco Corp.—FORD MOTOR CO. plans acquisition of the PHILCO CORP. Exchange of stock would involve about \$100 million. The transaction is subject to approval of PHILCO shareholders.

South River Metal Products—has purchased from the PENN TELEVISION PRODUCTS CO. the tooling to manufacture their product line. SOUTH RIVER will produce the mounting hardware formerly manufactured by PENN TELEVISION PRODUCTS CO., which recently liquidated their operations.

International Correspondence Schools—HERBERT W. EGGLESTON, employee of GENERAL ELECTRIC's Lamp Equipment Operation, Cleveland, is the school's 7 millionth student. EGGLESTON and his wife were flown to Washington, D. C. for special ceremonies at the Capitol. During this affair, full scholarships for ICS courses, were given to one male and one female worker living in an area officially designated as economically depressed.

# WORLD'S ONLY ELECTRONIC ANTENNAS FOR SUPER-POWERFUL FM



## MODEL PF-8 FM STEREO-TRON YAGI — GOLD ANODIZED

This is the world's most powerful FM antenna. Because Multiplex requires an antenna with greater sensitivity and gain to offset the power loss of the carrier and sub-carrier, Winegard's PF-8 is the best antenna you can install for Multiplex. When you hook up a PF-8, weak signals come in like "locals".

The PF-8 has a minimum gain of 26 DB over a folded dipole with a flat frequency response of  $\pm 1/4$  DB from 88 to 108 m.c. It features a built-in TV-FM coupler and has eight elements with EXCLUSIVE "TAPERED T" driven element engineered perfectly to match the powerful transistorized, direct coupled, built-in amplifier. It is available two ways — Model PF-8 for 300 ohm twin lead or Model PF-8C for 75 ohm coax.

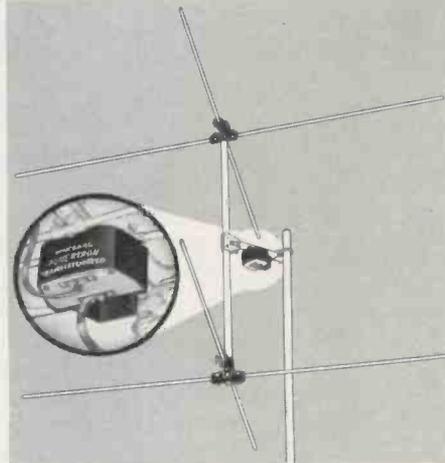
## 2 NEW TRANSISTORIZED WINEGARD ELECTRONIC FM ANTENNAS FOR LONG DISTANCE FM AND MULTIPLEX

Now WINEGARD brings you super-powerful FM antennas with *BUILT-IN* transistorized amplifiers for L-O-N-G range FM and multiplex reception. You can offer your customers the PF-8 FM STEREO-TRON Yagi (directional) or

the PF-4 FM ELECTRONIC Turnstile (omni-directional). Both models deliver unexcelled performance far beyond ordinary FM antennas—open a new field of opportunity in the fast growing FM and Multiplex market.

### Here Are Some Important Features of Winegard Electronic FM Antennas

1. Transistorized amplifier is designed as part of the "Tapered T" driven element (model PF-8) for unprecedented efficiency and signal-to-noise ratio.
2. Built-In FM-TV coupler allows you to use one power supply and down lead when used with a WINEGARD POWERTRON TV antenna.
3. Gold anodized finish—100% corrosion-proofed—all hardware irridized. This is the finest finish of any antenna—meets U.S. Navy specifications.
4. The quality of craftsmanship and materials in these antennas tell their own story—perfect mechanical balance—100 m.p.h. wind tested.



## MODEL PF-4 FM ELECTRONIC TURNSTILE — GOLD ANODIZED

Most powerful non-directional FM antenna with 16 DB gain in all directions over a folded dipole. Has Winegard offset mount and transistorized amplifier with TV-FM coupler. Model PF-4 has 300 ohm output.



**MODEL FM-8—Non-Electronic Yagi—Gold Anodized.** The FM-8 is the finest non-electronic FM antenna available. It features the same Winegard "Tapered T" driven element and construction as our super-powerful PF-8.



**MODEL FM-3T — Non-Electronic FM Turnstile — Gold Anodized.** Very popular WINEGARD omni-directional FM antenna. Has WINEGARD'S offset mount and is gold anodized. Easy to install — can be mounted on same mast as TV antenna.

WORLD'S MOST POWERFUL TV AND FM ELECTRONIC ANTENNAS, WINEGARD "TRON" SERIES,  
TELETRONS — POWERTRONS — COLORTRONS — STEREO-TRONS

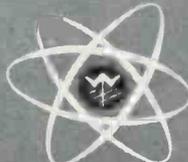
Watch Winegard go in '61 National Consumer Advertising this Fall in LIFE, LOOK, SUCCESSFUL FARMING, FIELD AND STREAM, SUNSET.



POWERTRON  
MODEL P-55  
14 Elements

POWERTRON  
MODEL P-55X  
21 Elements

SUPER POWERTRON  
MODEL 5P-55X  
30 Elements

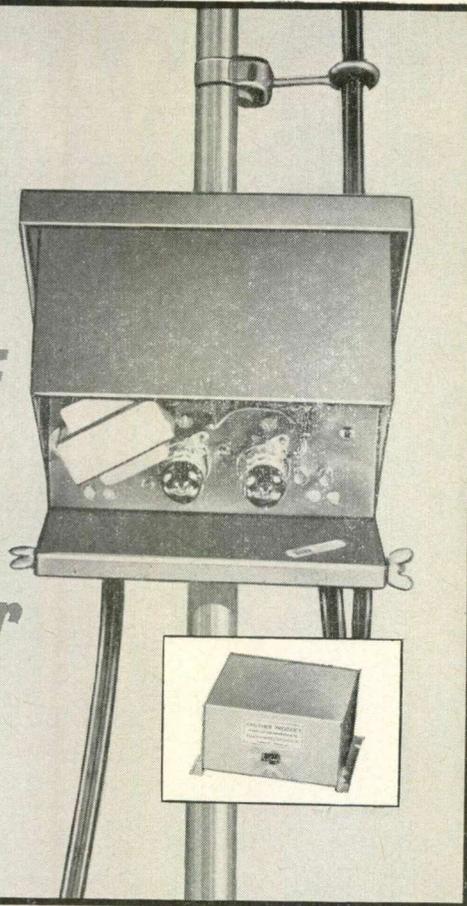


# Winegard

ANTENNA SYSTEMS

For more data, circle 10-23-1 on coupon, p. 48

**Now . . .  
Superb UHF  
Reception  
(Channels 70-83)  
Where Other  
Methods  
Fail**



## **BLONDER-TONGUE ULTRA BOOSTER** **Mast-Mounted UHF Booster** with remote power supply

The Ultra Booster has proved itself under fire in the MPATI\* area where it is being used in school TV systems to receive the Stratovision educational TV broadcasts. In case after case, where schools were unable to get usable pictures - the UB solved the problem and provided clear reception.

The UB is another product from the world's most experienced UHF product manufacturer, Blonder-Tongue. There's nothing like it on the market today. Mast mounted to take advantage of the maximum signal-to-noise ratio available at the antenna, it provides 14 db minimum gain for UHF channels 70 to 83. The UB uses two low-noise frame grid tubes. The remote power supply sends a 'safe' 24 volts of AC power to the mast mounted UB amplifier on the same downlead which carries the signal. The UB is enclosed in a weather-proof housing with a swing-down chassis for easy servicing.

The applications of the UB are unlimited - in master school systems in the MPATI area - for homes (on channel 70-83) where all other means of providing sharp, clear UHF reception have failed - and in translator areas to extend the range of UHF translator transmission where VHF signals are repeated by UHF translators. Model UB, list \$84.50.

If you are in a UHF area, contact the world's most experienced manufacturer of UHF products. Free 8-page catalog, write dept. ET-10

\*Midwest Program on Airborne Television Instruction.

engineered and manufactured by

**BLONDER-TONGUE**

9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc., Toronto, Ont. Export: Morhan Export Corp., N. Y. 13, N. Y.  
home TV accessories • UHF converters • master TV systems • closed circuit TV systems

Assn. of Electronic Parts & Equipment Mfrs.—announces two seminars. A workshop session, Oct. 17, McCormick Place, Chicago, Ill., and a 3-day business management seminar, April 1962, University of Illinois, Urbana, Ill.

Pentron—OSBORN ANDREAS elected Chairman of the Board and Chief Executive officer. Succeeds THEODORE ROSSMAN, resigned to become Senior Vice Pres.

Sansei Electronics, Tokyo, Japan—signs license agreement with CROSBY TELETRONICS covering the manufacture and sale of stereo FM receivers and multiplex stereo adapters under the CROSBY compatible FM stereo patent.

### **Reps & Distributors**

Audio Dynamics—McLOUD & RAYMOND, Denver, named as reps in the rocky mountain states.

C. L. Pugh Co., Columbus, Ohio—reports the association of W. H. WENNERBERG with their sales rep firm.

Goddard, Inc., West Palm Beach Fla. distr.—GEORGE LARKIN promoted to Vice Pres. and general manager of GODDARD-TAMPA, INC.

Westinghouse Electronic Tube Div.—announces the cancellation of more than 315 distributor franchises from coast to coast, in an effort to provide a more selective distribution base.

Assn. of Electronic Parts & Equipment Mfrs.—has prepared a checklist of points for consideration in the preparation of a formal agreement between manufacturers and sales reps. Obtainable by written request to the association's executive secretary, 11 S. LaSalle St., Chicago 3, Ill.

Electronic Representative Assn.—4th annual Mfr-Rep. Workshop is scheduled for Oct. 11, LaSalle Hotel, Chicago, Ill. A National Sales Training Program is expected to get underway early in 1962. Audio-Specialist Seminars to start this fall under the local sponsorship of ERA's southern Calif. chapter's audio division.

Olympic Radio & Television—appoints three new distributors: TELEVISION & RADIO SUPPLY CO., Portland, for state of Ore.; INTERSOUTH DISTRIBUTORS, Shreveport, for northern La., and parts of Ark. and Texas; and ROTH DISTRIBUTING CO., Milwaukee, for state of Wis. and northern peninsula of Mich.

**GE ELECTRONICS**

# ONE G-E 21FLP4 PICTURE TUBE REPLACES 13 TYPES

## FILLS 25% OF YOUR REPLACEMENT NEEDS

*The General Electric 21FLP4 just released. Here's the only picture tube you need for one out of every four replacements. It replaces 13 tube types. Thirteen replacement tubes you don't have to order—pick up—pay for—or carry in stock to meet your customers' requirements. It's almost like getting a 13-tube inventory in one picture tube! Quick availability for more of your replacement needs.*

The General Electric 21FLP4 is a low-voltage electrostatic focus tube which does not require an ion trap magnet. Saves time and work on service calls and in the shop. The General Electric high-resolution electron gun and deep-cushion phosphor screen help provide the long-lasting, brighter picture your customers want.

The General Electric 21FLP4 replaces these 13 tube types:

21ALP4	21BAP4	21CBP4B
21ALP4B	21BNP4	21CMP4
21ATP4	21BTP4	21CVP4
21ATP4A	21CBP4	21CWP4
	21CBP4A	

Get full details on this 21-inch 90-degree "universal" replacement picture tube from your General Electric tube distributor. General Electric Company, Distributor Sales, Electronic Components Division, Room 8238B, Owensboro, Kentucky.



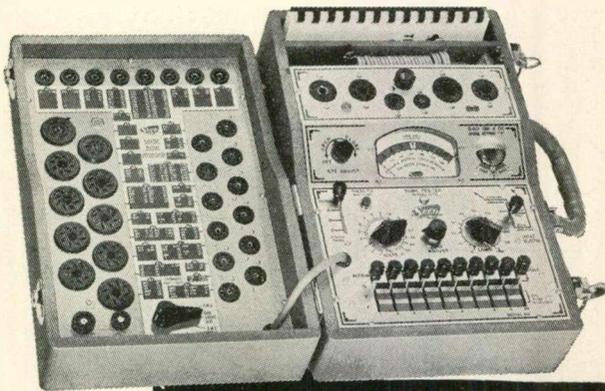
A FEW  
WILL DO

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

# NOW test all the latest tubes

THIS NEW DELUXE TUBE TESTER tests 9-pin NOVARS, 12-pin COMPACTRONS, new 10-pin tubes and Nu-Vistors plus all previous standard tube types. The Model 107A is the finest, fastest tester at a popular price—offers every important test you need! Dynamic Mutual Conductance Test on pre-wired chassis, Cathode Emission Test by free point selector system and the nationally accepted Grid Circuit Test patented by Seco—up to 11 simultaneous checks for leaks, shorts and grid emission. In handsome carrying case with handy chart for tube set-up data.



Meets specifications for Federal Stock Classification. Government Agencies use Part No. Tube Tester Type 107-FSN-6625-713-9075.

**NEW SECO MODEL 107A . . . . . \$149<sup>50</sup> NET**

**COMPACT, PORTABLE, LOW-COST TESTER.** Ten sockets offer complete modern TV tube coverage plus all heater-type radio tubes and hybrid types. Includes sockets for all latest types—Nu-VISTOR, 9-pin NOVAR, 10-pin tubes and 12-pin COMPACTRONS. Incorporates the patented Seco Grid Circuit Test plus reliable Cathode Emission Test . . . also checks filament continuity and provides open element test. One easy-to-read meter indicates results of all tests. With portable carrying case and flip chart for quick set-up data.



**NEW SECO MODEL 88 . . . . . \$69<sup>50</sup> NET**



**MODEL 100 DYNAMIC TRANSISTOR CHECKER**—checks transistors "in" or "out" of circuit. Permits matching of similar transistor types. No set-up necessary. **\$19<sup>95</sup> NET**

**MODEL GCT-9 GRID CIRCUIT TUBE TESTER**—tests for grid emission, leakage, shorts and gas in one operation! Two new exclusive tests—cathode continuity check and interelement short test with short identified to pin number. **\$32<sup>95</sup> NET**



## two-way radio test equipment



**TWO-WAY RADIO TESTER**  
Reduces servicing and installation time of crystal-controlled units. Combination Crystal Checker, RF Signal and Field Strength Meter. Model 500. . . . . **\$29.95 Net**



**TRANSMITTER TESTER**  
Designed especially for use with Citizens Band and other low transmitters up to 160 MC. Checks percentage of amplitude modulation as well as RF power output. Model 510. . . . . **\$46.95 Net**



**ANTENNA TESTER**  
A commercial quality in-line antenna efficiency tester and in-line RF power meter. Antenna testing is made easier and faster on wide range of transmitters employing 50 ohm transmission lines. Model 520. . . . . **\$42.95 Net**



**ATTENU-LOAD**  
A dual purpose unit in one compact package. 50 Ohm, 50 Watts Attenuator and Load Termination. Model 511A. . . . . **\$21.50 Net**

Send for your FREE copy of the Seco Full Line Folder. Complete details on all quality Seco Testing Equipment including:

- VACUUM TUBE VOLT METER**  
Model 208. . . . . **\$74.50 Net**
- BATTERY ELIMINATOR**  
Model PS-2. . . . . **\$13.95 Net**
- IN-CIRCUIT CURRENT CHECKER**  
Model HC-6. . . . . **\$12.95 Net**
- FLYBACK CIRCUIT AND INDUCTANCE ANALYZER**  
Model FB-4. . . . . **\$38.95 Net**

**SECO ELECTRONICS, INC.**  
5021 Penn Ave. So., Minneapolis 19, Minn.  
Please send information on MODELS . . .

Full Line  107A  88  500  510  520  511A  
 Folder  GCT-9  100  208  PS-2  HC-6  FB-4

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

## Catalogs & Bulletins

**AUDIO ACCESSORIES:** Catalog A-401, 12 pages, covers over 300 items for tape recorders, hi-fi, stereo, public address and amplifying systems. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.

For more data, circle 10-26-2 on coupon, p. 48

**SOLDERING IRONS:** New model B-2000 for microminiature soldering, described in literature, weighs 2-3/4 oz. Has 850-degree F tip temperature with large reserve energy. American Electrical Heater Co., 6110 Cass Ave., Detroit 2, Mich.

For more data, circle 10-26-3 on coupon, p. 48

**VOM's:** Literature describes model MT-200. Has diagonal meter scale to permit a large easy-to-read face in compact case measuring 3-1/4" x 4-1/2" x 1". One percent precision resistors are used throughout. Monarch Electronics International, Inc., 7035 Laurel Canyon Blvd., North Hollywood, Calif.

For more data, circle 10-26-4 on coupon, p. 48

**RECTIFIERS:** Brochure 180.50 covers new line of miniature Vac-U-Sel selenium rectifiers, price 15% lower than previous line. Cells are of .010" thin aluminum, fitted into new phenolic housing. Stack of the new cells in new housing reported about 50% the size of an ordinary stack of the same voltage rating. Rectifier Components Dept., General Electric Co., W. Genesee St., Auburn, N. Y.

For more data, circle 10-26-5 on coupon, p. 48

**SOLDERING POTS:** Literature covers #875 electric soldering pot for simultaneous stripping and tinning of plastic insulated wire and leads on small parts. Wattage, 150. Maximum temperature, 1000°. Solder capacity, 3/4 lbs. Electric Soldering Iron Co., Deep River, Conn.

For more data, circle 10-26-6 on coupon, p. 48

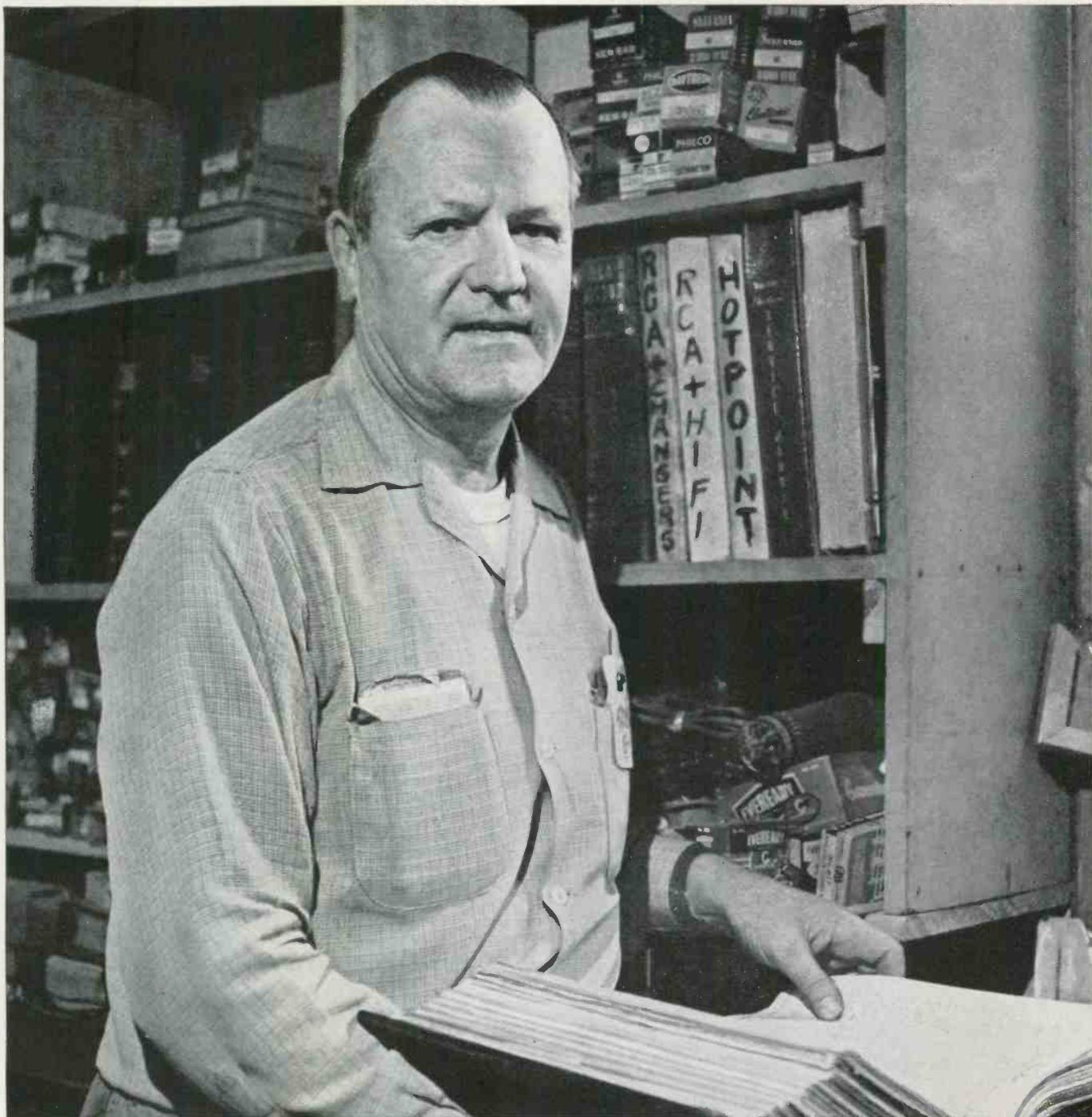
**COMMUNICATION RECEIVERS:** Literature covers model SX-115 triple-conversion short wave radio receiver. Features new front assembly which, by utilizing band-pass couplers, provides 4 tuned circuits and superior "out-of-band rejection." The Hallicrafters Co., 4401 W. Fifth Ave., Chicago 24, Ill.

For more data, circle 10-26-7 on coupon, p. 48

**ORGAN KITS:** Colorful, illustrated brochure on Artisan models enables selection of console type and number of manuals to be built. Self-addressed envelope, with the brochure, is used to obtain specifications and other data in free information packet. Electronic Organ Arts, Inc., 4949 York Blvd., Los Angeles 42, Calif.

For more data, circle 10-26-8 on coupon, p. 48

(Continued on page 50)



**"Over 25% of my TV service calls come in through the Yellow Pages!"** says L. Juergens, owner, Associated Radio & Television Service, Moorhead, Minn. "I get about twenty-eight calls for service every week, and I'd say eight of them come in through the Yellow Pages. Most of these are newcomers to the area who couldn't find me any other way. We make a practice of asking new customers how they came to select us, so we know that the Yellow Pages and word-of-mouth recommendations do the best job for us!"



Display this emblem. It builds your business!

**ASSOCIATED RADIO & TELEVISION SERVICE**

**TV SERVICE REPAIR**

*"Service Is Our Only Business"*

We Are Specialists on All Makes of TV - Radio - Hi-Fi & Stereo

SERVICE ON:

• RCA VICTOR	• ADMIRAL
• WESTINGHOUSE	• PHILCO
• HUNTZ	• ZENITH
	• SYLVANIA

**COLOR—BLACK & WHITE**

Pickup & Delivery or Home Service

**Dial CE 3-0969**

Ask for Larry

*We Also Invite Out of Town Calls—Ask About Rates*

712 MAIN MOORHEAD

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

# NEW

From a deluxe

# VTVM to a VOM with the flick of a switch!

Typical examples where a VTVM performs best . . .

- minimum circuit loading
- very high resistance measurement
- measuring peak to peak voltage
- alignment, AGC trouble shooting or ratio detector touch up
- reading 2nd anode voltage
- transistor radio voltage measurements

Typical examples where a portable VOM is best . . .

- instant action when you can't wait for warm up and stabilization. The VTVM can be warming up while you are using the VOM.
- working on a hot TV chassis
- checking anything remote where power isn't available such as antennas, auto, etc.
- reading DC current

And look at these specifications!

### Voltage

6 AC and DC ranges from 0 to 1000 volts on both VTVM and VOM  
 6 peak to peak ranges from 0 to 2800 volts peak to peak on VTVM  
 Zero center scale on VTVM

### Resistance

6 ranges from 0 to 1000 megohm on VTVM  
 2 ranges from 0 to 1 megohm on VOM

### Current

one easy reading scale from 0 to 1000 milliamp on VOM

### Batteries

one 1.5 volt "D" cell

### Accuracy

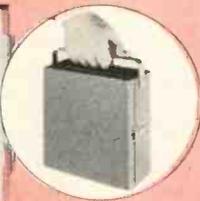
3 percent on DC volts; 5 percent AC volts with a 6 inch, 200 microamp, 2 per cent meter.

### Circuit Loading

10 megohms on VTVM, 15,000 ohms on VOM low range, 5 megohms on highest range.

### Special Servicing Features for the Man on the Go!

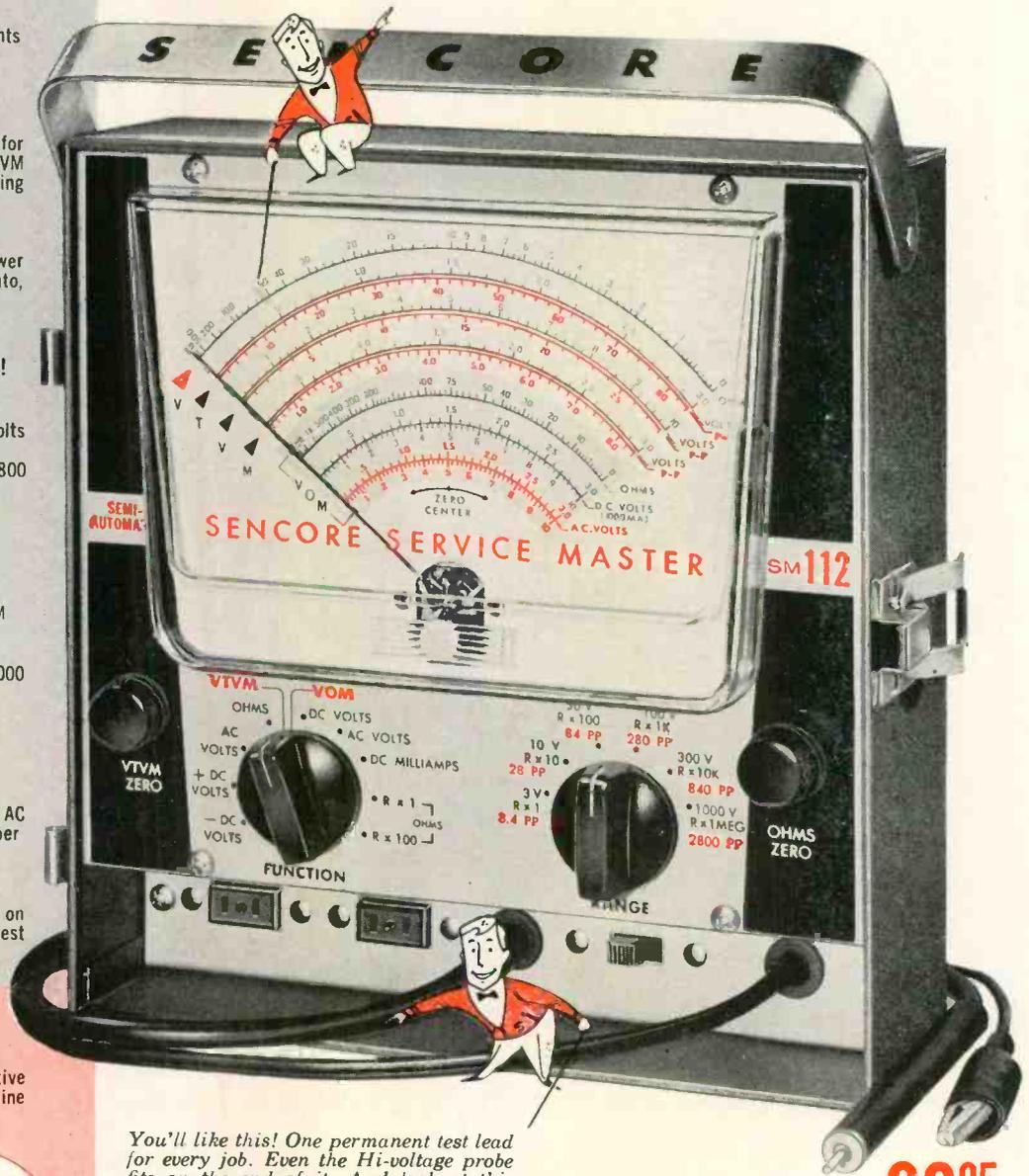
Unbreakable steel case and protective removable cover. No leads to drag or line cord to "hank".



Inside the cover is a real surprise: short cut technical data to make every job easier and faster . . . standard transformer lead color code, fuse resistor burn out voltage, transistor testing guide, etc.

For the First Time in Electronic History . . . a VTVM with laboratory accuracy for bench, lab, or anywhere 115 volt AC current is available . . . flick the function switch and it's a portable VOM that you can use anywhere, anytime.

Look! Another Sencore first . . . automatic scale indication. What a time saver! Rotate the controls and watch the indicating lights follow you. You can't go wrong!



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**SERVICE**  
Magazine

## ARE YOU PREPARED FOR THE ANTENNA BOOM?

Not too long ago, TV antenna sales and installations accounted for one of the greatest parts of service shop owners' incomes. The sands have since settled, as you know, and a few other major profit makers presently share the limelight with antennas.

Now, however, the antenna market promises alert dealers a return to the "Good Old Days." Antenna profits can be greater today than in the post-war 1940's era. Many factors account for this potential, among them: a population increase with attendant increased home construction, a strong second TV set market, a population exodus to suburbs, higher color TV set sales, many older antennas needing replacement, and new products such as Citizens Band radios.

Antenna manufacturers have responded to these challenges with new, improved antenna product lines that will improve customers' reception at a reasonable price. It's up to the electronic service dealer to call these new products to their customers' attention by explaining how they can provide better reception on a favored channel, correct ghosts, weak pictures, or other viewing and listening problems.

Some of the new TV antenna products that can please customers and bring extra dollars into a shop are: low-cost transistor master antenna systems, set signal boosters, antenna-mounted signal boosters, couplers, rotors, easy-to-assemble towers and portable TV antennas. Also, let's not overlook greatly improved antenna designs, with their higher front-to-back ratios, improved mechanical structure and other features that permit sets to receive cleaner B&W and color TV signals for a longer period of time.

In addition to the wonderful prospects for TV antenna sales-installations, other antenna types are ideally sold and installed by electronic service dealers: standard antennas for auto radios, whip antennas for mobile 2-way radio sets, FM home and auto radio antennas, and communications antennas for amateur communications sets.

As you can see, the antenna field is ripe for aggressive dealers. Perhaps a "One-Stop" antenna sales-installation service for consumers will help you cash in on it. It's not beyond financial reach of most TV service dealers and will serve customers better and bring in fresh repair business. This is a natural business venture for TV service companies. We urge you to consider it.

# TV MANUFACTURERS

## ADMIRAL

### TV Chassis 20B7, Run 12 & up—CRT & Horizontal Output Transformer Changes

(See ET Circuit Digest #644 7/61)

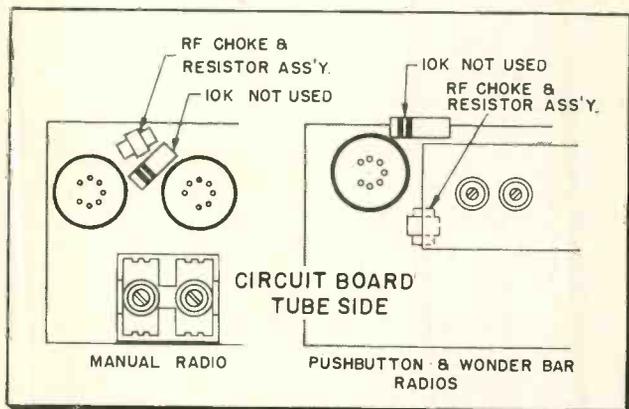
TV Chassis stamped Run 10 and 11 use a type 23CP4, 23GP4 or 23HP4 picture tube and horizontal output transformer part number 79E77-9. Chassis stamped Run 12 or higher use a type 23CP4A picture tube and horizontal output transformer part number 79E77-13.

Note that second anode voltage in Runs 10 and 11 is 18.5 KV, while Run 12 and higher sets use 20 KV. When making a replacement in Runs 10 and 11, use the same type picture tube and same horizontal output transformer originally used.

## DELCO

### 1961 Auto Radios — R-f Plate Choke Change

Late production push button, wonder bar and manual tuning auto radios will use an r-f plate choke that



Some late production Delco auto radios have replaced the r-f choke and 10K resistor (parts 7269684 and 1213252) with a choke-resistor combination (part 727916), as explained in text.

is wound around a 12K resistor. This assembly makes it possible to leave out the 10K r-f plate resistor that was mounted parallel with the old choke. The new choke-resistor assembly (part #7279416) is available and can be used as a service replacement for the present choke if the separate 10K resistor is clipped out.

Early 1961 production on push button radios used a short choke mounted between print board islands 35 and 9. The new choke assembly is longer and is

mounted between islands 33 and 9. Island 35 is no longer used on push button models. When checking continuity through the choke, meter leads should be placed between islands 33 and 9.

## GENERAL ELECTRIC

### LW Chassis—H.O.T. Connections Change

(See ET Circuit Digest #621 3/61)

Because of a pre-production schematic change in the horizontal output transformer, connections to the horizontal blanking winding of this transformer (T251) are the reverse of those shown in the preliminary LW chassis schematic.

In all production and replacement horizontal output transformers, terminal 7 connects to the CRT's first grid (pin 6), while terminal 8 connects to the junction of C209 and C210 on the sweep circuit board.

Incorrect wiring of the transformer winding will result in a loss of blanking because of reversed polarity.

## MAGNAVOX

### New Remote Receiver—Turns Set Completely Off

Remote control receiver #704105, which is to be incorporated in TV receivers MV350, MV407, etc., remotely turns off the complete TV set, including the remote receiver itself.

This is accomplished by adding an additional switch in conjunction with the remote receiver's TV on/off switch. This switch is part of the volume level switch

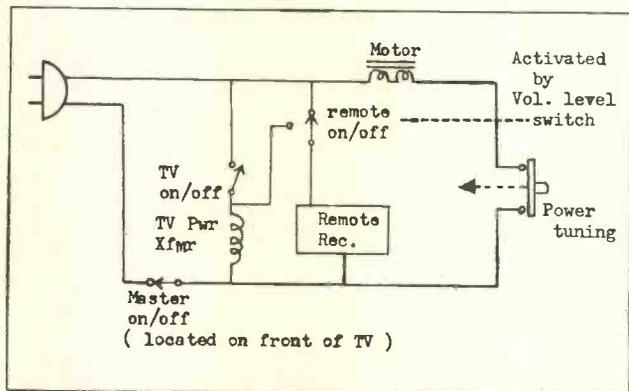


Diagram of a Magnavox TV set illustrates how the chassis and the remote receiver can be turned on or off by remote control.

# TECHNICAL DIGEST



and is activated when the volume level switch is moved to the mute position. This normally closed switch is usually in the a-c supply to the remote receiver.

When the volume is muted the switch will be moved to the open position and a-c will be removed from the remote receiver. This action depends upon the TV receiver's switch being in the open position. (The TV on/off switch will be in the open position if the tuner is between channel 13 and 2 position.)

Note that these two conditions must coincide to achieve complete turn-off of the receiver. If the TV tuner is not in the off position, a-c will still be fed to the remote. In addition, if the TV tuner is in the off position and volume is not muted, a-c will still be applied to the remote receiver. Therefore, make sure the two conditions prevail to insure remote turn-off of the entire TV receiver.

## PHILCO

### Model J-1826 —

#### Production Changes to Prevent Microphonics

In Run 51 the balance control was moved from the grids of the 6BQ5 output tubes and changed to the 12AX7 audio amplifier-phase inverter tubes.

In Run 52 a one megohm resistor was added to each center arm of the loudness control and returned to ground. A 2.2 megohm resistor was added between the red and white leads of the changer's pick-up arm. Both changes were made to prevent microphonics.

## RCA

### CTC 10 Chassis-Added Capacitor Improves Horizontal Phasing

Late production CTC 10 chassis have an added capacitor to improve horizontal phasing. The component is connected between terminal D of PW600 and terminal U of T102.

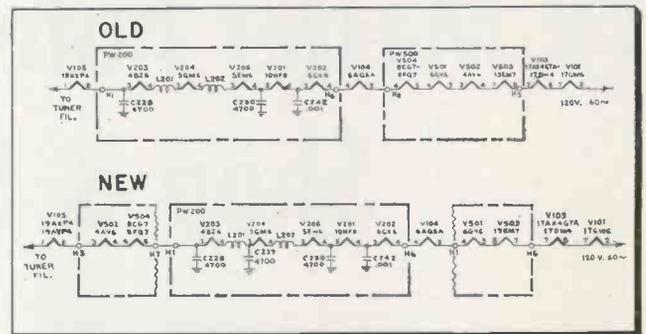
A 27  $\mu\text{f}$  coefficient N750, 500 volt capacitor is used and it has been designated part #C152. This addition will also improve picture width and linearity, and also reduce yoke ringing.

In addition, ringing on the left side of a picture (in a CTC10 chassis), can be corrected by changing coil L105 and L107 (in the damper tube circuit) from 12 mh to 5.6 mh.

## TV Chassis KCS 137 & 138 Series— Tube Filament Wiring Change

(See ET Circuit Digest #653, 8/61)

Late production models of this chassis have incor-



Late production RCA KCS & 138 Series TV sets have changed the filament wiring by repositioning the tuner tubes.

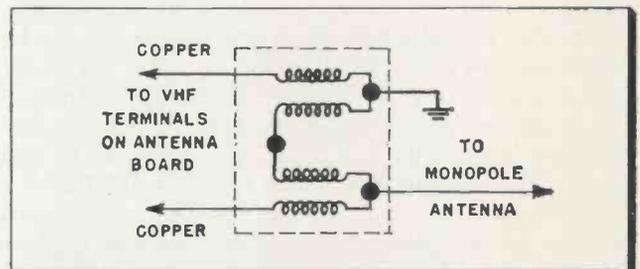
ported a rearrangement of the filament circuitry. Note that the tuner tubes have now been positioned after the CRT filament connections.

## SYLVANIA

### Chassis 546-1, -2 Code 05— Improve Antenna Operation

(See ET Circuit Digest #604 12/60)

To improve operation of a monopole antenna add a coil-balun to the antenna circuit. This balun is part number 129-0011. One section is grounded while the other section is soldered to the antenna. At the oppo-



Signal strength of a Sylvania monopole antenna can be improved by inserting a balun as shown.

site end the two leads are soldered to the VHF terminals on the antenna board.

### Model 55P19—Hum Reduction

To decrease hum in the model 55P19 stereo chassis, remove C38, a 100  $\mu\text{f}$  bypass capacitor across the 33 $\Omega$  cathode resistor of the push-pull output stage.



# TV Master Antenna Systems For Shop & Showroom

## *Selection & Installation of Head-End & TV Distribution Systems*

LON CANTOR

Blonder-Tongue Labs., Inc.

• Every professional TV service shop and dealer showroom can be made more effective by utilizing a master antenna system. The TV technician who works with an inadequate signal is handicapping himself.

Similarly, the salesman who tries to demonstrate a TV set that displays a less than perfect picture is at a disadvantage. In most cases, customers won't buy a TV set if they don't like the picture viewed in the showroom.

Once a set is repaired, it should leave a shop with the best picture possible. With a poor broadcast signal, however, you can't be sure a minor picture defect hasn't been overlooked.

To operate effectively in the shop and the showroom, a business should have enough TV antenna outlets for demonstration receivers and ample outlets for the shop. Ad-

ditionally, each outlet should provide a satisfactory signal input to the receiver. In many instances, a master TV antenna is needed to satisfy these requirements.

A master TV system consists of two basic elements: (1) A head-end (2) A distribution system.

The head-end picks up and amplifies the signal, and the distribution system brings it to the TV sets. If a signal is split up and sent to 12 TV sets, for example, without amplification, only a small portion of the signal arrives at each TV set. The amount of signal lost to any individual TV set is called the distribution system loss. The head-end must supply a signal strong enough to overcome the distribution system loss.

Included at the head-end is the antenna (or antennas), and (usually) an amplifier, to overcome the distribution loss. A minimum of 1000 microvolts per channel (across 75 ohms) is usually provided to each TV set in the system. Of course, a good picture can be ob-

tained with a lot less than 1000 microvolts, but this figure allows tolerance for changing conditions.

Another important consideration is the signal-to-noise ratio. Even if the signal supplied to the TV set is stronger than 1000 microvolts, it can still cause snow if it includes a lot of noise. A signal-to-noise ratio of 44db (signal voltage about 160 times voltage of noise) is considered excellent by TASO (Television Allocation Study Organization) standards. In fringe areas, you may have to settle for a signal-to-noise ratio of 28db (signal voltage 25 times noise voltage), which is considered barely passable by TASO.

Choosing a one-structure antenna for a master TV system head-end is no more difficult than choosing a one-set antenna. You probably know what antenna type is needed to provide channel coverage in your area.

However, choosing an amplifier or amplifiers may be more difficult for those unfamiliar with master TV systems. There are broadband amplifiers and single channel am-

plifiers; mast mounted amplifiers and indoor amplifiers. Amplifiers also vary as to gain, output capability and noise figure.

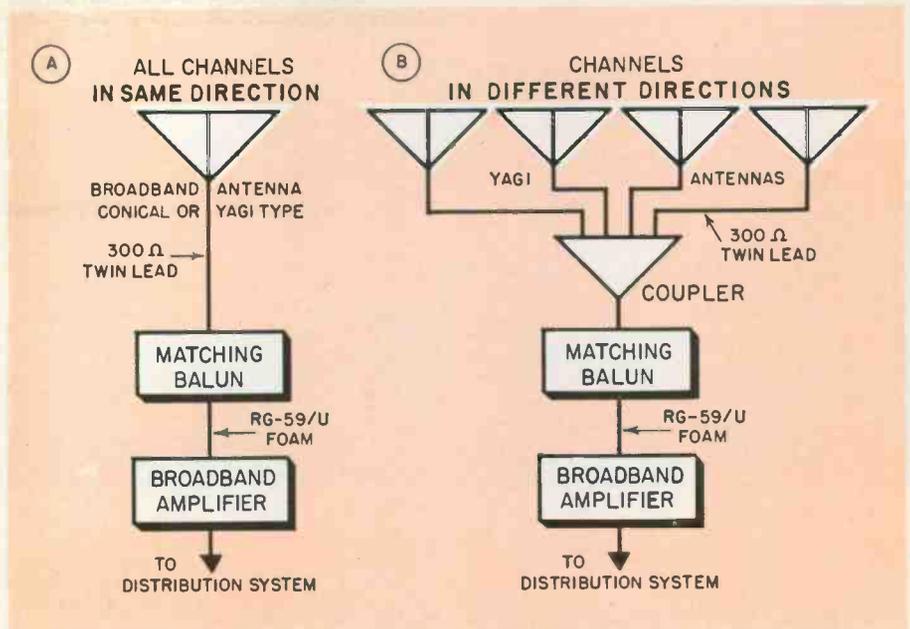
For economy, most TV service shops and dealer showrooms use broadband amplifiers. Single channel amplifiers are used in fringe areas where single channel antennas are required.

If an antenna on the roof can supply a good, snow-free picture to a single TV set in the shop, an indoor mounted broadband amplifier such as the Blonder-Tongue HAB, or the Jerrold ABD-1 will prove ample. In poor signal areas, where a roof antenna cannot supply good signals for a single TV set, a mast-mounted broadband amplifier such as the Blonder-Tongue AB-3 or the Jerrold DSA-132 is a necessity to provide adequate signals. After the antenna and amplifier type are selected the distribution system is chosen.

The distribution system consists of (1) Cable—to carry the signal throughout the system. Either 300 ohm twin lead or 75 ohm coaxial cable can be used. Coaxial cable is recommended, since it is shielded against interference. Also, in a strong signal area, twin lead can pick up signals directly, causing ghosts. For long line runs use RG 11/U coaxial cable. RG 59/U can be used in branch line runs under 200 feet. RG 59/U costs less than RG 11/U, but it has a higher signal loss. Be sure the type chosen is covered with non-contaminating poly-vinyl.

(2) Splitters—to separate the signals into branch lines. For two-way splitters, you can use the Blonder-Tongue TS-772, Benco 2SP-75 or Jerrold 1562. Four way splitters include the Blonder-Tongue TS-774, Benco 4SP75 and Jerrold 1514. A splitter is mounted close to the antenna pole. If your shop has two sections of TV receivers on display and you need two antenna lines for the shop, employ a four-way splitter. Otherwise, a two-way splitter may suffice.

(3) Tapoffs—for connecting the TV set to the system. The tapoff isolates the local oscillator of the TV set from the rest of the system. If coaxial cable is used, the tapoff may also match the impedance of the TV set (300 ohms) to the 75 ohm branch line. In very strong signal

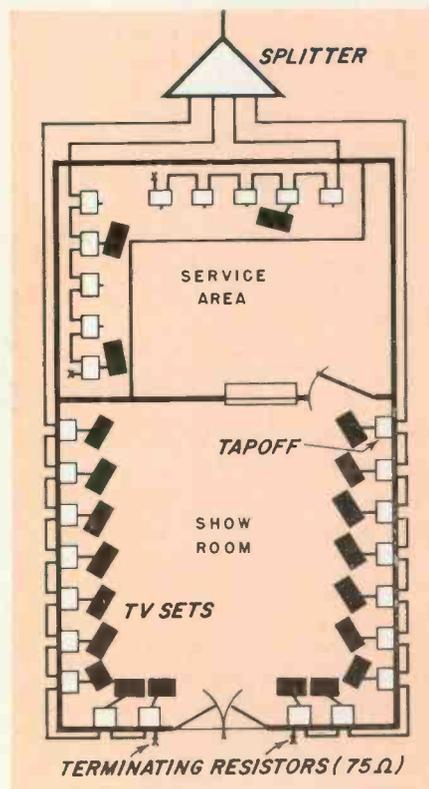


An all-channel broadband type antenna is used in a master system's head-end when all channels are received from the same direction. A balun matches the 300/72 ohm down leads. A broadband amplifier boosts signals to the required level. Separate yagi antennas are used with a coupler when channels originate from different directions.

areas, however, it may be necessary to use a separate matching transformer mounted right on the TV set, keeping the twin lead as short as possible to avoid ghosts.

There are a wide variety of tapoffs to choose from—both surface

Block diagram of antenna distribution system for service shop and show room.



mounted and flush mounted types. If you want a tapoff that also matches branch line impedance, use a Blonder-Tongue TS-731B or Jerrold's 1431.

With separate, set-mounted matching transformers, either a Blonder-Tongue TS-771B or Jerrold's LT-77 will do the job. All unused outlets on the splitter's branch line must be terminated using either a standard terminating plug or 75 ohm resistor.

Remember, pick the head-end that suits your area and the distri-

(Continued on page 45)

Signal tap-off mounted on wall base & 72 to 300 ohm matching transformer on TV.





## Squelch Circuits Automatically Cut-Off Audio When Signals Aren't Received

# How Citizens Band Radios

# SQUELCH NOISES

ALLAN LYTEL

• Citizens Band receivers minimize interference noises with noise limiter circuits. However, another type noise must be overcome, too. This is the disturbing sounds that occur when transmission ceases.

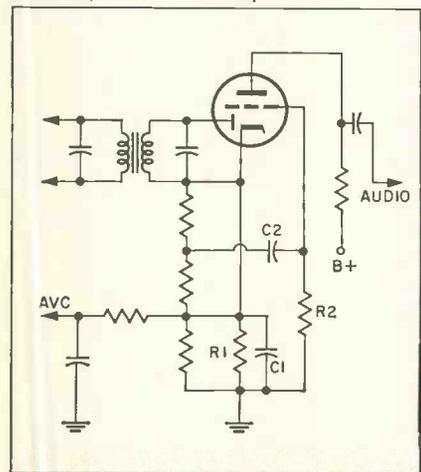
When a receiver isn't receiving a carrier signal (whether modulated or unmodulated) from the transmitter it produces crackling, buzzing, or rushing sounds. Whereas a radio or TV listener can silence this noise output when a station goes off the air by tuning to another station or shutting the set off, a Citizens Band

radio operator can't. He must keep his set on, tuned to a particular frequency, in the event someone tries to contact him again.

In view of a 2-way communication set's need to remain "on," designers have incorporated an electronic circuit in many CB sets to automatically cut-off audio output when it isn't receiving a carrier signal. Thus, objectionable noise doesn't disturb the operator when the set's in a standby condition. Additionally, this circuit, called a squelch circuit, automatically removes the cut-off when a carrier signal is again received.

Briefly, a squelch circuit operates in conjunction with the set's avc line to control bias of the first audio amplifier tube.

Fig. 1—Basic circuit using a triode-detector as the first audio tube. R-c cathode network is added squelch circuit components.



### Squelch Circuits

An example of a basic squelch circuit is shown in Fig. 1. This circuit typically uses a detector-triode as a first audio tube to detect the signal, amplify it, and develop avc voltage in an accompanying circuit. One difference is notable, however. The tube's bias (cathode bias is employed) is predetermined to maintain the audio tube at cut-off when a signal is not received. Thus, off-the-air noises cannot be transferred to the speaker output.

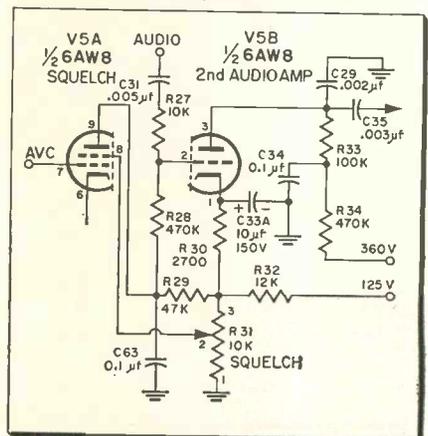
When a signal does come in, it over-rides the bias (if it's a strong signal), causing the audio tube to conduct again. In this event, the communication is reproduced in the speaker output.

One deficiency in this particular circuit is apparent. It cannot operate well if the transmitted signal is weak. Thus, if a vehicle or boat is in a bad pickup area, a weak signal may be cut-off unintentionally.

One type Citizens Band Radio squelch circuit is shown in Fig. 2. Here, avc is applied to the control grid of V-5A. Screen voltage is varied by means of the squelch control R-31 (from zero to 42 volts). V-5B is the second audio amplifier with audio to its grid through C-31 and R-27. With no incoming R-F signal, and low voltage of about 0.6 volts, V-5A conducts causing a voltage drop across R-29 which blocks V-5B. (This voltage is in opposition to that arriving at the grid.) Reception of a signal causes the negative avc voltage to increase. V-5A becomes cut off and the back bias across R-29 is gone. V-5B conducts. This allows audio to be amplified and sent to the audio output stage.

A noise-operated squelch is shown

Fig. 2—CB radio squelch circuit that is used in a Johnson Viking Messenger unit. 6AW8 is audio amplifier & squelch tube.



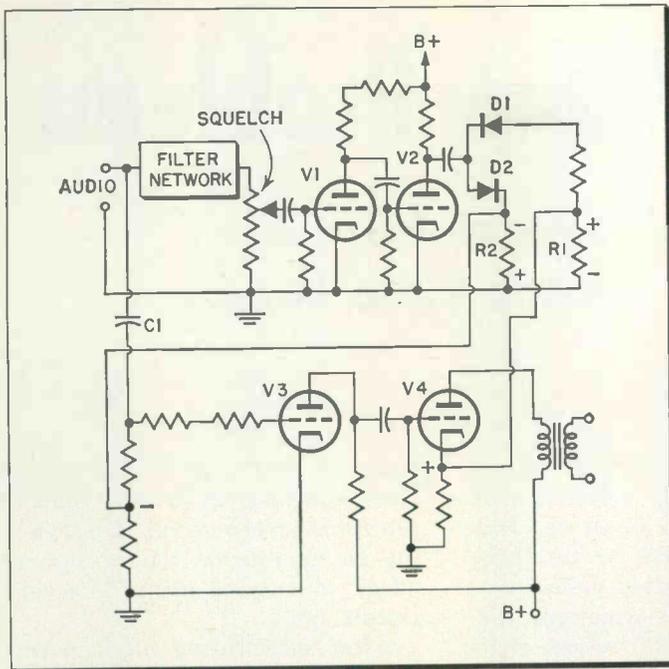


Fig. 3—RCA's super-regenerative CB receiver's squelch circuit.

in Fig. 3. Audio is normally fed to V-3, the first audio amplifier by C-1. V-4 is the audio output tube. Noise between transmissions, which is high in a super-regenerative set, goes through a high-pass filter to a two-stage noise amplifier, V-1 and V-2. D-1 rectifies the noise voltage which is applied as a positive cathode voltage for V-4. D-2 rectifies the noise voltage as a negative potential for V-3. Bias for both tubes increases. The audio amplifier is completely cut off when noise level is sufficiently high. Incoming signal

upsets this and voice is again heard in a speaker.

### Noise & Squelch Circuits

Many CB radios incorporate both noise limiters and squelch tubes as part of the detectors. The receiver in Fig. 4 uses a 12AL5 as a detector-noise limiter and a 12AU7 split as a carrier-operated squelch and audio amplifier. V-5B is a series noise limiter which may be shorted out by S-1 if desired. B+ voltage goes through a divider R-17 and R-38 to

ground making point A positive. An increase in avc voltage during reception cuts off both halves of the 12AU7. When no station is being received and avc voltage drops, V-6B conducts. This permits a bias to appear on V-6A and audio is amplified.

A noise limiter-squelch system is shown in Fig. 5. V-9A is a diode detector whose output is fed to the grid of V-7B, the first audio stage through a noise limiter. This is a series noise-limiter (V9C with its

(Continued on page 66)

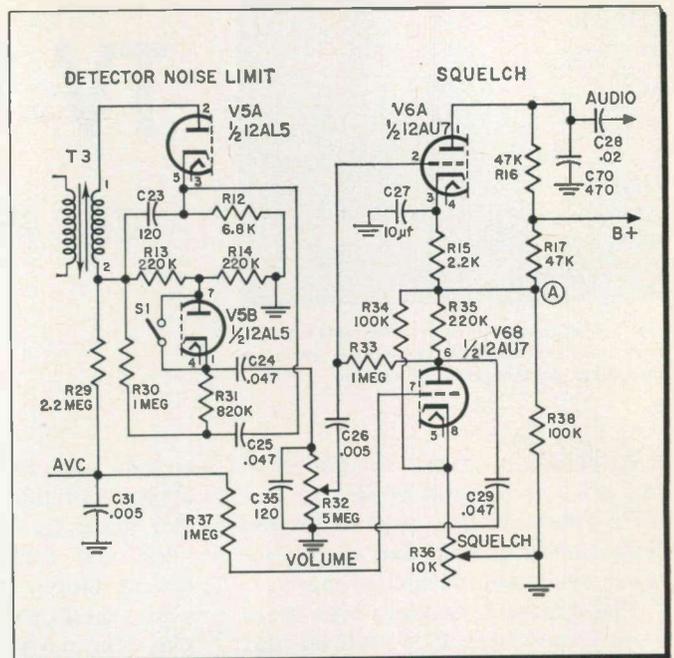


Fig. 4—Noise limiter-squelch system for Acton Labs. CB transceiver.

Fig. 5—Noise limiter-squelch circuitry employed by Kaar Engineering Corp. A noise rectifier holds squelch steady under noisy conditions.

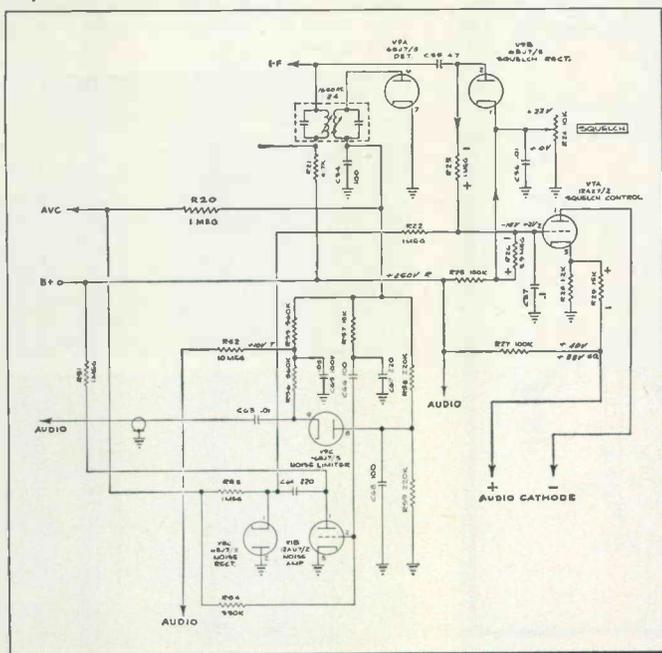
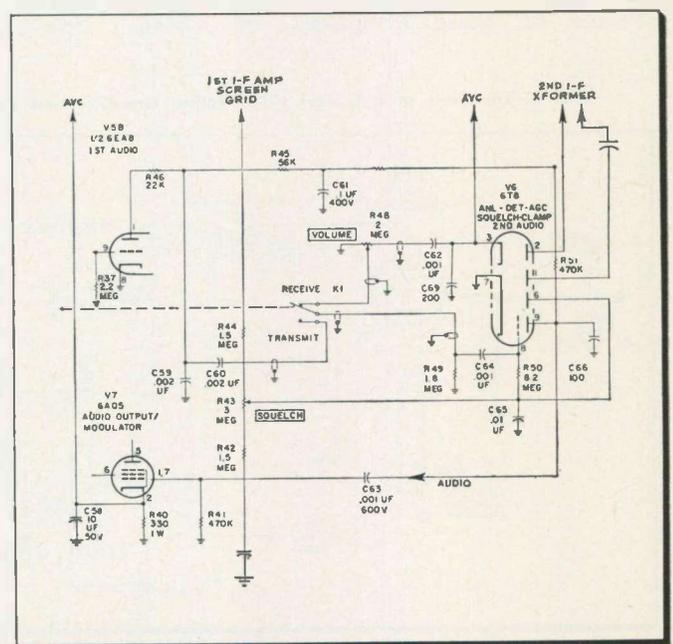


Fig. 6—Squelch-noise limiter system used in RCA's Mark VII CB radio. A 6T8 is employed as detector, squelch amplifier and 2nd audio.



# TV Video Problems

## CRT Fault Systems Help Isolate Video Defects

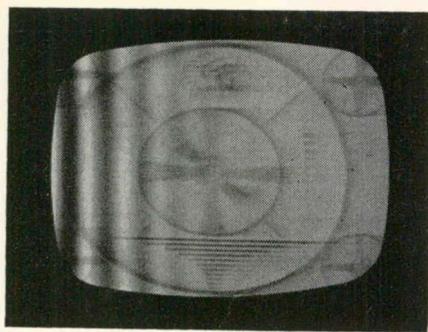


Fig. 1—An open capacitor in the video amplifier's coupling network caused this symptom to appear on the set's CRT screen.

• Although a rare "tough dog" can arise as a result of failure in a TV's video section, most video defects can be quickly and easily isolated when approached properly.

The approach assumes even more significance when it is realized that preliminary isolation and sectionalization of many video faults can be performed with reasonable accuracy by observing and analyzing fault symptoms appearing on the set's CRT screen.

### Trouble Symptoms

Aside from video and sound loss, overloaded i-f or video amplifiers, with symptoms of dark pictures, unstable sync, sound buzz, etc., are among the most common video problems.

After these more common symptoms will come hum bars, negative pictures, weak "washed out" pictures, picture smear and loss of detail; ringing, and a number of less frequent symptoms.

Some of these symptoms, of

course, can be caused by defects arising outside the video section. For example, from keyed age failures, and tuner r-f or oscillator circuit faults. In many cases, however, these trouble-symptoms display distinctive CRT screen characteristics which indicate unmistakably the fault is outside the video section.

Likewise, many easy to-confirm obvious video faults can cause an inexperienced technician (and some "hot-shots") to look elsewhere. For instance, observe the dampened alternately black and white vertical ringing bars in the left area of the CRT-screen shown in Fig. 1. A cursory inspection can cause many technicians to suspect a sweep problem. Perhaps a combination sweep and video problem. Doubt and indecision here, as in other comparable cases, can result in an unprofitable TV repair job.

A closer second look, however, will reveal some important information. A loss of picture detail is obvious. Picture information is

smear. The picture has insufficient contrast when the contrast control is turned up full. Disregarding an improbable believe-it-or-not "dog," everything points to a video circuit fault.

After substituting tubes, normal procedure here requires a quick scope check at the video detector's output. In this particular case the scope displayed an excellent composite video signal at the detector output—with proper p-to-p amplitude. Next step is a scope check at the video amplifier's plate. The signal is perfect. On to the CRT's cathode. At this point the scope shows a highly distorted video signal.

What defect lies between the CRT cathode and the video amplifier's plate? A brief check quickly

Fig. 2—Schematic of a typical video output amplifier and scope check-points.

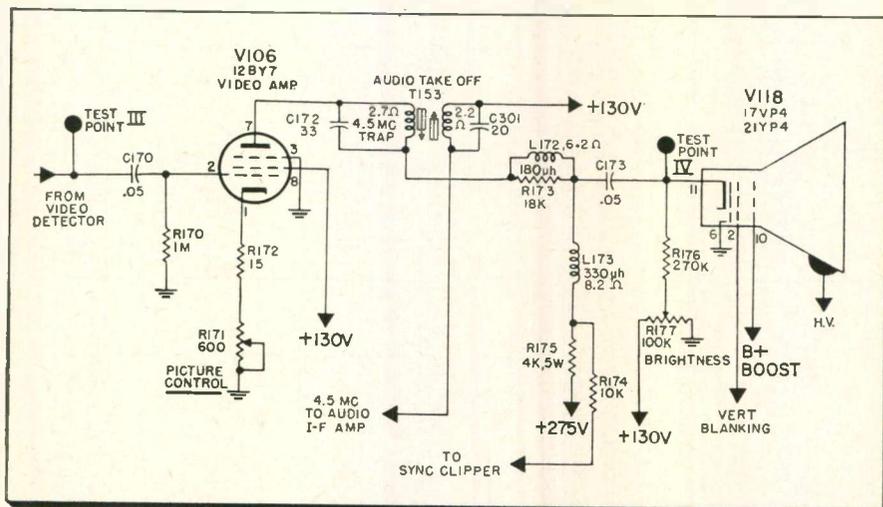
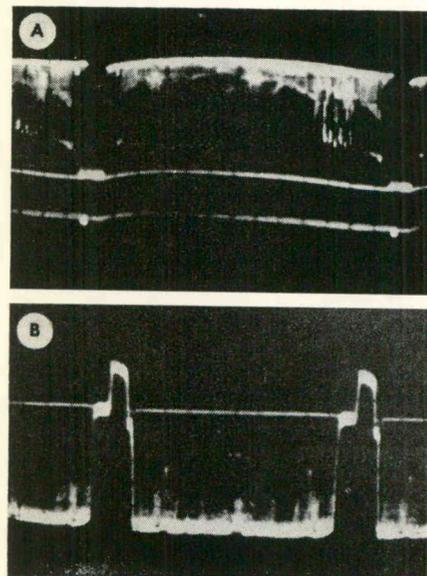


Fig. 3 (A)—Scope trace of an ideal composite video signal taken from a video detector output. Scope at 30 cycle sweep rate. (B)—Scope trace of composite video signal taken from same point but with scope's sweep rate at 7875 cycles.



turned up an open capacitor in an RC coupling network. This certainly could not qualify as a "tough dog" job.

### Troubleshooting

When it is recalled that a video i-f detector and output amplifier's ideal frequency response covers 30 cycles to nearly 4 mc, it is apparent that *major* failures are not necessary for problems to arise. An undetected minor defect can result in a dissatisfied customer or one or more costly call-backs. Reliable test instruments are important here.

Test instruments required to cover all video troubleshooting includes a reasonably wide-band oscilloscope with a demodulator probe (crystal detector probe) and a low capacitance probe; sweep generator covering i-f frequencies, and a marker signal generator for injecting marker pips. A VTVM or adequate VOM, plus a variable voltage bias supply, are also necessary.

Most skilled technicians begin video troubleshooting by "mentally" dividing the video section into two areas: from the first video i-f input to the video detector output, and from the video detector output to the CRT input (grid or cathode). This method facilitates isolation of the defective section.

For example, the case illustrated in Fig. 1, is a typical video amplifier problem. Naturally, the first logical step in isolating the fault is a scope check at the video detector output (Test Point III Fig. 2). Signals should appear as shown in Fig. 3A and 3B with the scope set at  $\frac{1}{2}$  the TV's vertical and horizontal pulse frequencies respectively.

There are other typical video amplifier problems. Some video amplifiers use a resistor in series with a grounded peaking coil in the grid input circuit. When this peaking coil or the resistor opens, the symptom will frequently appear smeared as shown in Fig. 4.

This symptom can also be misleading at first glance—the blacked out area on the left may cause some technicians to suspect damper circuit trouble. But, again, the badly smeared picture points unmistakably to video amplifier trouble. A scope observation of the composite video signal at the detector output

and the video amplifier's output will isolate the trouble to the amplifier's grid circuit. A VOM check can then locate the open resistor or peaking coil.

Various types of hum bars appearing on the CRT are common video section faults. Fig. 5A and B show some typical cases. They may be caused by grid-heater leakage of tube sockets, or by cathode heater leakage or shorts in tubes.

These problems are eliminated, of course, by replacing a defective tube socket, or by substituting i-f or output amplifier tubes.

The dim, washed-out picture, shown in Fig. 6, usually covered with vertical retrace lines even with the contrast control turned up full, can be caused by a number of i-f circuit faults. Almost any defect that lowers the i-f amplifier's normal gain can cause this symptom.

Shorted coupling capacitors, shorted i-f coils, grid-return resistors increased in value, i-f transformer shunt-resistors lowered in value, plate circuit and cathode resistors increased in value, are the usual causes of weak washed-out pictures. A scope check of the video signal at tube grids and plates, employing a demodulator probe, will quickly isolate the fault to a particular stage. VOM checks can then reveal the defective component.

A major cause of overloading is usually considered to be leaking, gassy, and shorted i-f and video amplifier tubes. Of course, overloading can also be caused by loss of agc bias, r-f or i-f misalignment, and by other component defects.

Component value changes in the video detector's circuit can cause negative pictures, insufficient picture contrast, over-contrasted pictures, and some other distinct symptoms. Faults can be quickly isolated to this section by scope observations at the detector's input and output.

Rare troubles include misadjusted i-f transformers, improperly adjusted adjacent-channel and fm rejection traps. Others include open peaking coil damping resistor shunts, and defective contrast controls. An open damping resistor usually results in ringing—with uniformly spaced dampened shadows, resembling ghosts, appearing on the picture's right.

And finally, we must not forget that leaking and shorted CRT elements can result in some hard-to-analyze symptoms, including complete loss of sync. •

*Illustration credit: John F. Rider Publisher, Inc., New York, N.Y.*

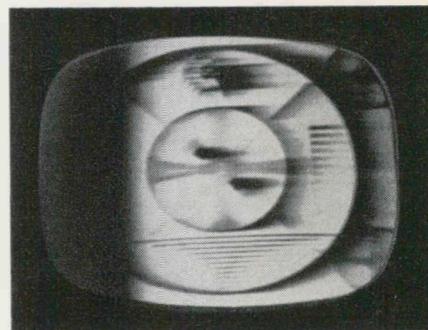


Fig. 4—Symptom caused by an open peaking coil in a video amplifier's grid circuit.

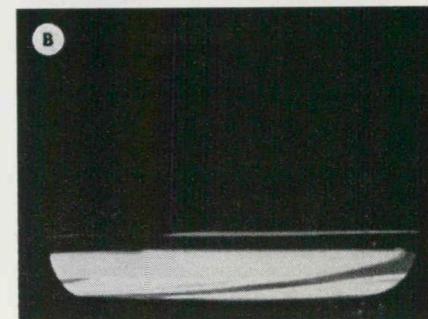
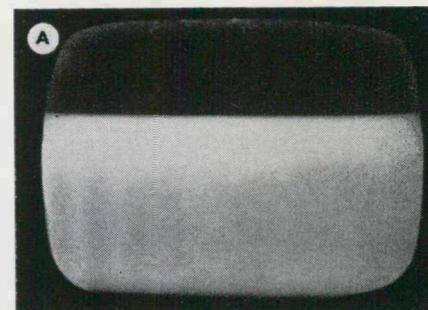
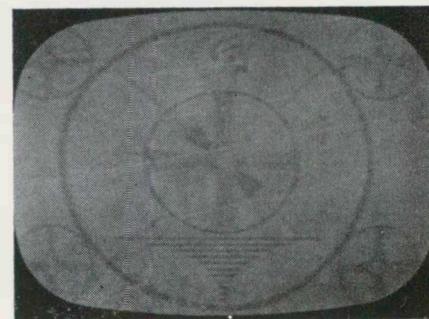


Fig. 5 (A)—CRT symptom caused by grid-heater leakage occurring in a defective video amplifier tube socket. (B) Heater-cathode short in a video output tube caused hum bar.

Fig. 6—This dim washed-out picture was caused by a shorted coupling capacitor in set's 1st video i-f amplifier.



# Troubleshooting Audio Power Amplifiers

## Circuit Analyses Simplify Locating Hum & Distortion Defects

MANNIE HOROWITZ

• Dividing a hi-fi audio amplifier system into its two major components—the preamplifier and the power amplifier—is an important step to simplify troubleshooting.

If you have any doubts about where a preamplifier ends and a power amplifier begins in an integrated unit, the block diagram in Fig. 1

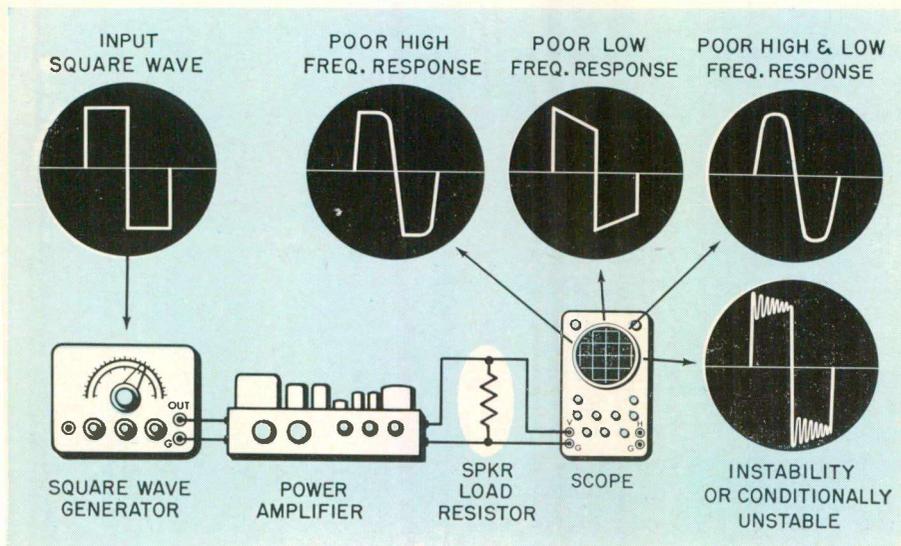
should dispel them. Every high quality audio amplifier incorporates at least one feedback loop (from the secondary of the output transformer to the first tube in the power amplifier section) to improve fidelity. The power amplifier begins with the first tube which is included in this feedback loop.

When troubleshooting a preamplifier unit, a defect should first

be localized to the preamplifier or power amplifier section. This isn't too difficult to do. For example, hum or noise problems, other than common power defects, can be localized by simply shorting the input grid of the power amplifier to ground. If the hum disappears, you can be certain that your problem is in the preamplifier. If it doesn't, the power amp is your problem.

If inadequate power output is the complaint, a technician can localize the defect to the preamp or power amplifier as follows: First, replace the speaker with an equivalent load resistor to match the transformer impedance; say 16 ohms. Place an oscilloscope and a-c voltmeter across the resistor, as shown in Fig. 2.

Next, set an audio oscillator to 1000 cycles. Feed the hot lead from the signal source to the input grid of the power amplifier. Turn the oscillator output up while you observe a sine wave on the scope. As soon as the wave just begins to distort, note the reading on the a-c voltmeter.



Test set-up for testing power amplifier frequency response using square wave input.

Fig. 1—Block diagram of an integrated preamplifier-power unit. Dividing line between preamp and power amp is the input of the negative feedback loop.

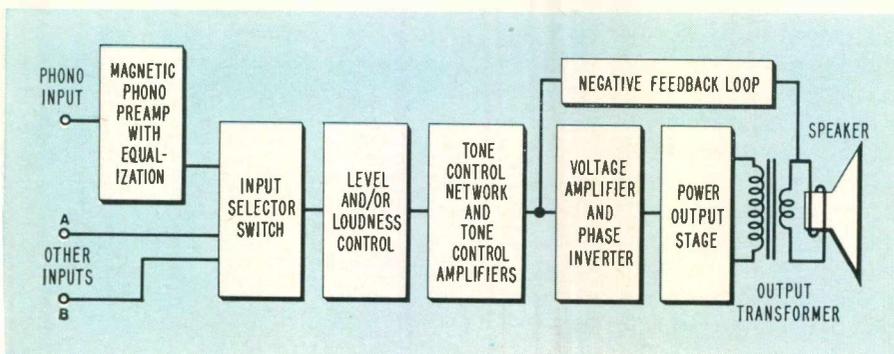
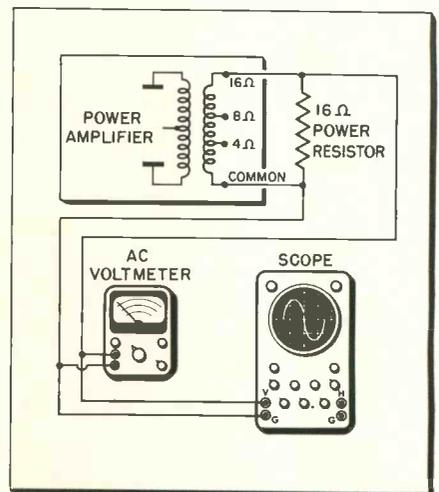


Fig. 2—Power amplifier output can be roughly determined with this setup.



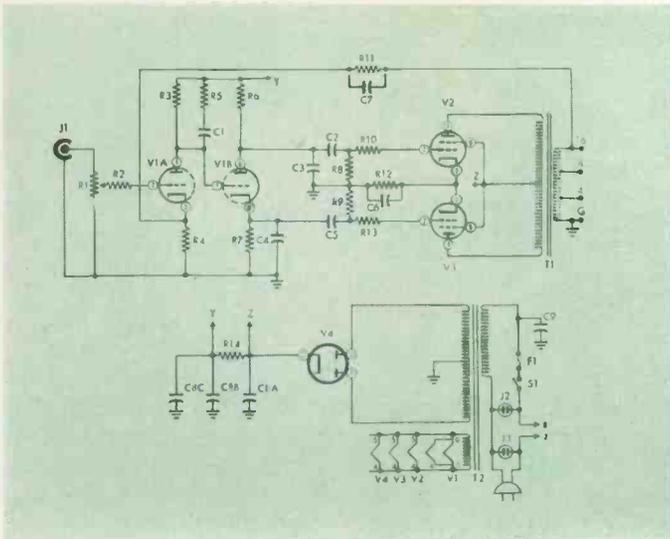


Fig. 3—Schematic drawing of a four tube power amplifier.

To calculate power output use the formula  $P = E^2/R$ . E is the a-c rms voltage read on the meter, while R is the load resistor (16 ohms in Fig. 2). If the calculated power is 75% or more of the rated power, you can be fairly certain that the power amplifier is passing the signal properly and your problem is in the preamplifier.

Assuming we've already localized whatever it is, to the power amplifier, what can possibly go wrong? Let's use the amplifier in Fig. 3 as our power amp example.

The circuit is simple. A level adjustment at the input controls the amount of signal to be fed to the first grid. R2 is a parasitic suppressor preventing undesirable sources of oscillation from originating at the grid of V1A. The signal is amplified by the first triode. V1A is direct coupled to the Williamson type of split load phase inverter, V1B.

R5-C1, C3 and C4 are all included to shape the response curve in the interest of amplifier stability.

The equal but out-of-phase signals are fed to the push-pull pentode power amplifier tubes V2 and V3. Similar to R2, R10 and R13 are parasitic suppressor resistors. The output power is developed across the secondary of transformer T1. The combination of R11-C7 completes the feedback path from the secondary of the output transformer to the cathode of the first tube in the voltage amplifier section of the power unit.

The power supply is conventional. The power transformer has two secondary windings. One winding supplies filament voltage; the second supplies B+ voltage. The high voltage is rectified by V4 and filtered by a pi network consisting of C8A as the input filter followed by resistor R14 for decoupling and the parallel

combination or C8B and C8C for further filtering and decoupling.

First, let's assume we have a hum complaint. The first logical check is for bad tubes. For example, heater-cathode leakage in V1 could produce some hum. Unequal plate currents in both V2 and V3 may also cause hum. A known pair of balanced tubes should be substituted for these tubes to determine if they're the source of hum. Some amplifiers have provisions for adjusting output balance. If half of V4, the low voltage rectifier is operating, it can cause hum, too. Here again, replacement should clear up the difficulty.

Other possible sources of hum are defective filter capacitors (C8A, B, or C), an open feedback loop, or a poor or accidental ground connection (ground loop) at any point throughout the unit.

(Continued on page 78)

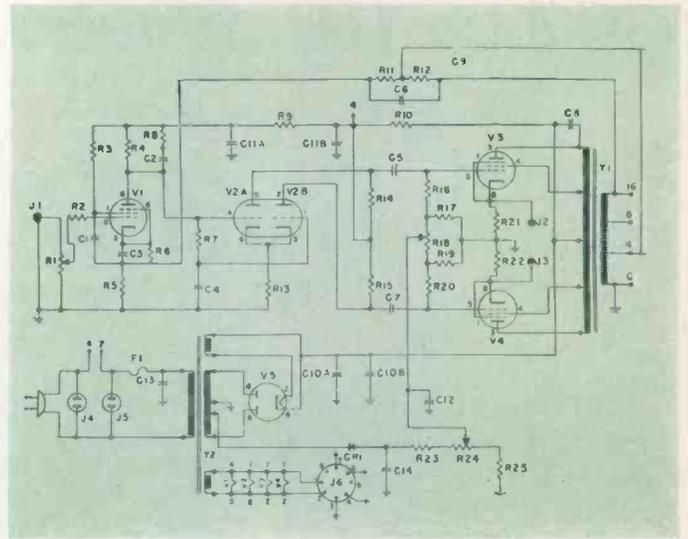


Fig. 4—High power amplifier with screen-tapped output stage.

Fig. 5—RC filters across the output dictates which frequencies will be attenuated.

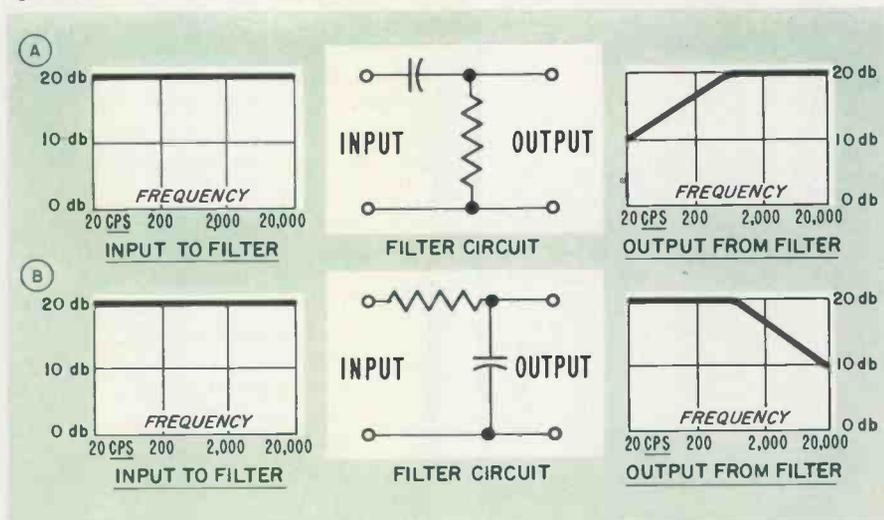
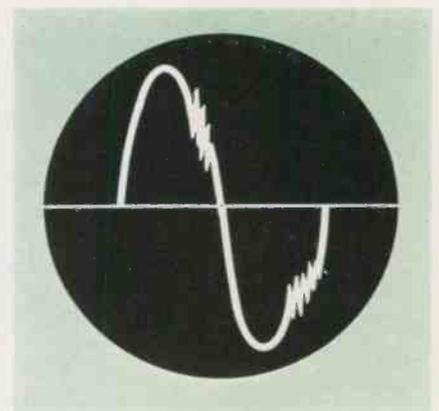


Fig. 6—Oscilloscope trace of this sine wave indicates oscillation pockets.



# Speed Up Tube Testing With A

## Filament Warmer

HOMER L. DAVIDSON

• There isn't much I can do about set owners walking into my shop with a bag full of tubes to be tested. But it *is* in my province to test their tubes as quickly as possible.

In this time-saving mood, I quickly observed that most of my tube testing time was due to waiting for tube filaments to heat up—one tube at a time. To speed up the tube testing procedure I built a

small unit to warm up a large group of tubes while they're "waiting their turn" at the tube tester.

In addition to eliminating filament warm up time, the warmer offers a filament continuity check. If a tube doesn't light in the warmer, it's rejected before it even reaches the tube tester.

### Construction

Building the tube filament warm-

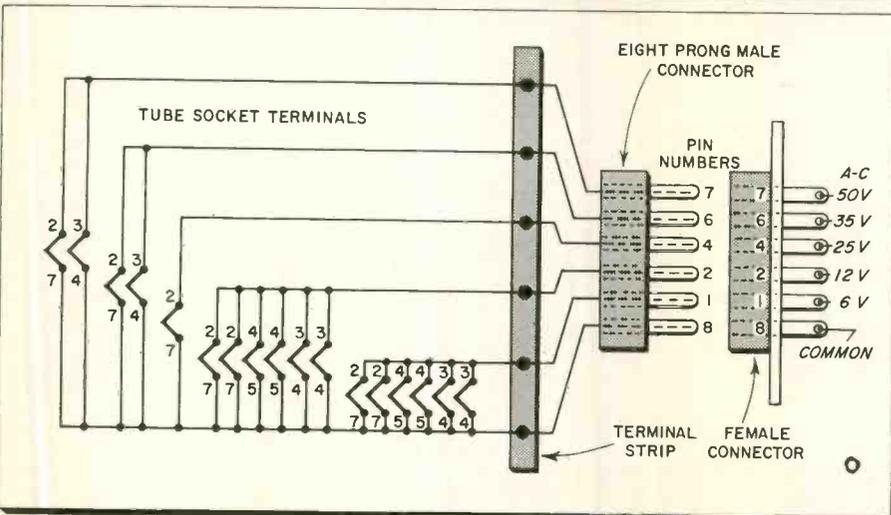
er was a simple job. Mine was made on an aluminum chassis that I punched out to accommodate various tube sockets. It has 17 sockets mounted: six 7-pin, seven 8-pin, and four 9-pin sockets. Voltages range from 6 volts to 50 volts.

Filament voltages to the sockets are obtained from my tube tester's transformer windings (tapped before the filament voltage selector switch). I bolted a female eight prong socket to the side of my tube tester and wired the transformer-tapped leads to individual prongs. In my case this was six prongs: five different filament voltages and a common ground. (*The number of tubes that can be "warmed" depends upon the current capacity of the tube tester's transformer. It may be necessary to use a separate transformer.—Ed.*)

These filament voltages are transferred to the filament warmer by an eight prong male socket that has flexible leads attached to the prongs (six leads to match the female socket's connections). The other ends of the leads are soldered to a six-point terminal strip on the underside of the filament warmer.

I fastened the aluminum chassis filament warmer to my tube tester's case. If I want to carry the tester to a customer's home the warmer can be separated from the tester by simply removing three mounting screws and detaching the flexible lead socket from the tester. •

(Top) Tube filament warmer fastened to a commercial tube tester. (Bottom) Wiring diagram of filament warmer illustrates how filament voltages are tapped from the tester.



### Parts List

- 6 7-pin sockets
- 7 8-pin sockets (octal)
- 4 9-pin sockets
- 1 ea. 8-pin receptacle & plug
- 1 6-point terminal strip
- 1 aluminum chassis
- misc. wire, nuts & bolts



Heinz Bahr (r) of German Philips Co. is interviewed in Hamburg by ET Editor Al Forman. Walter Mossner, an interpreter for Volkswagen, is at center.



TV service bench at Philips. These factory facilities are made available to retailers without their own service departments. Independent service dealers are rare in Germany.

## On-the-Spot Report:

# TV In Germany

Albert J. Forman, Editor  
ELECTRONIC TECHNICIAN

• German TV is similar to TV in the U.S. in some ways, vastly different in other ways.

Let's look at the West German TV industry. There are some 20 TV-radio manufacturers, 12 of which are major producers. In 1959, 1,900,000 TV sets were made; in 1960 it was 2,200,000, including 600,000 for export to other European countries.

There are practically no TV discount houses. Except for two large mail order houses which sell sets directly to the public at reduced prices, set producers sell to authorized dealers. About 70% of production goes through set distributors, usually factory owned, to dealers. 30% goes direct to dealers.

Just about every business activity in Germany is well organized. A TV manufacturer belongs to the Special Radio & TV Dept. of the Central Association of Electrotechnical Industries. Dealers have their own associations. Furthermore, price fixing similar to U.S. Fair Trade laws, and cartels are an established way of life. Manufacturers are allowed to sue dealers who cut prices, and dealers can do like-

wise if the manufacturer sells below the established price. This highly ordered arrangement has been in effect for years, but this year it broke down because the market was glutted with sets. The law of supply and demand took over and prices fell. One reason was that 23" sets cut the demand for 21".

Even more important, by agreement with other countries to prevent interference, Germany is limited to a single VHF channel. The government's promise to add a UHF channel was not carried out because of political reasons. Therefore, public anticipation turned to disappointment, and there were fewer sales than expected.

In radio, production climbed from 4,200,000 in 1959 to 4,670,000 in 1960. Portables are increasingly popular, accounting for one-third of all radios. Incidentally, half of these portables are both AM and FM. Competition from Japanese portables, sold by mail order, was reportedly kept in bounds by dropping prices on German radios.

### Receivers

Before the price drop, a typical 21" table model TV cost between 500 and 900 DM (a Deutsche mark is about 25¢). Though this price

range is almost comparable to the U.S., the average earnings of West Germans is well under U.S. income.

Table models account for 77% of TV sets. By picture tube size, in 1960 17" was down to 6% of sets made, 21" was 67%, and 23" came to 26%.

There is a tax on receivers, as there is in many countries. It comes to about 50¢ monthly per radio home, and \$1.25 monthly per TV set. Based on paying units, there are about 5,000,000 TV sets in use, and 15,000,000 homes with radio.

The TV programs are commercial, not unlike American programs. As a matter of fact, a great many U.S. programs are actually used.

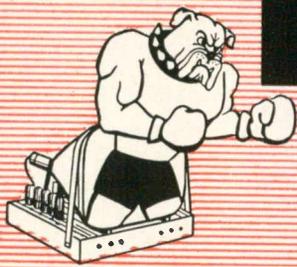
Technical specs are 625 lines, 50 fields, 25 frames per second. A 5.5 mc intercarrier is used between video and sound carriers. Sound is FM, i-f video is 4.5 mc wide.

In VHF, the maximum broadcast power is 100 kw erp (effective radiated power). With UHF, this may be in the 500-1000 kw range.

There is no color TV, except in certain schools and hospitals for closed circuit work.

Warranties are frequently for 6 months, covering both parts and labor.

(Continued on page 70)



# "Tough Dog"



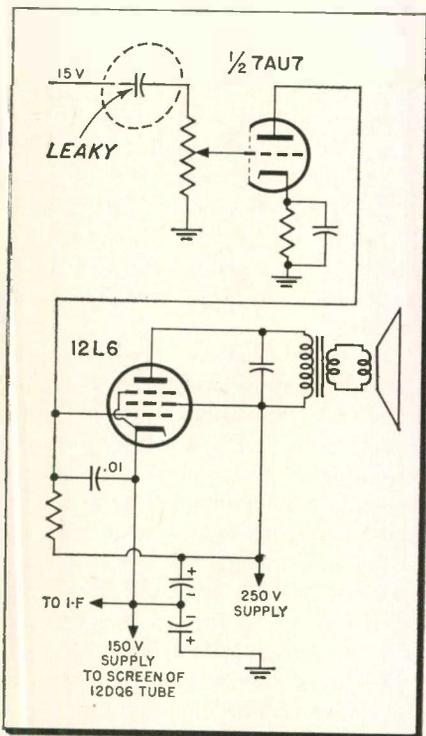
## Corner

### Increasing Volume Reduces Width

A customer called and complained that the picture would shrink and finally disappear on her Motorola TV, chassis TS 530, when the volume control was turned-up. At the customer's home I turned the set on and it played normally with low volume. However, when I turned the sound up the picture became smaller and then disappeared. Since this set uses a stacked B+

then checked the 7AU7 (1st audio amplifier) plate load resistor, cathode resistor, and cathode by-pass capacitor. All checked good.

However, with the volume control's high side disconnected the coupling capacitor showed-up leaky since I read voltage through it. This was a small ceramic type component in a low voltage circuit and replacing it returned the set to proper operation.—Paul H. Besler, Winnipeg, Manitoba, Canada.



Raising sound volume in a Motorola TV chassis reduced raster width. This defect was traced to a defective ceramic capacitor.

circuit (taking the screen voltage for the horizontal output tube from the audio output tube's cathode), I changed the audio and horizontal output tubes but the trouble remained. This was a shop job and I received the customer's permission to take the set to my shop.

The horizontal output tube's screen voltage checked normal, along with associated circuitry. I

### Filter Choke Improves Sync

A Silvertone TV model 6166 was brought to the shop after home servicing efforts failed to correct the set's loss of vertical sync and eliminate a strong sound hum.

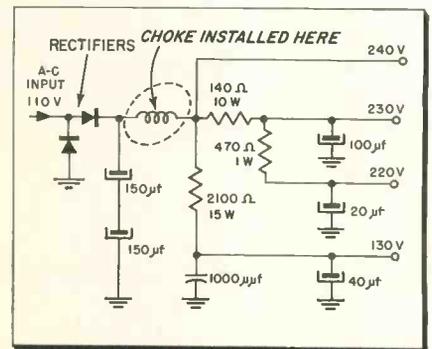
Using my signal generator and scope I could obtain good signals throughout the receiver, except at the tuner's output. I also noticed the set took about five minutes to start operating normally after being switched on.

Close inspection of the tuner revealed that the mixer tube's socket was a ten-pin type instead of the usual 9-pin. Thus, a tube could be inserted improperly. This was the case. With the tuner's cover removed, two burned resistors were revealed. After replacing the defective components, and making sure the tube was inserted correctly, the receiver was turned on.

The set operated normally, but it took about two to three minutes for the sync and the sound to settle down. I called the owner and he told me that this condition was present even when the set was new.

A close inspection of the chassis showed no filter choke in the power supply section. Also, the service manual indicated no filter choke is provided for any sets of this series.

I installed a 1.5 henry choke rated at 300 ma, 40 ohms, in the power supply filter network. When the set was switched on, sound and sync became normal almost immediately.



Installing a filter choke in a Silvertone TV model 6166 improved vertical sync and eliminated strong sound hum.

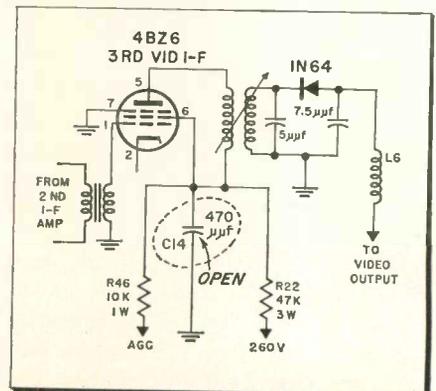
Shortly after returning this set another Silvertone (model 6164) was brought in for other repairs. After completing the repairs I noticed it also had poor sync. Installing a choke in the power supply section corrected the poor sync problem.—Lawrence R. Hale, Winslow, Ariz.

### Open Screen By-Pass Kills Video

A call was received from a customer who complained that picture and sound stopped after the set was on fifteen minutes. When this Zenith TV model B-1717-J was first turned on, it played normally. However, after a few minutes the set started to overload, the picture

(Continued on page 81)

An open 3rd video i-f by-pass capacitor in a Zenith TV set killed video and audio after the set played awhile.



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# SHOP HINTS

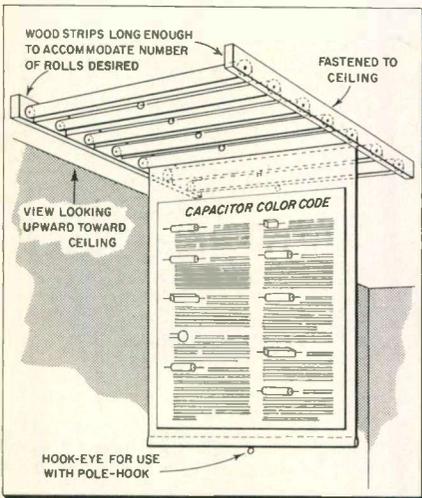


## "Stretch" Your Wall Space

Many small repair shops find a shortage of wall space for charts, price lists, etc. But most shops do have unused ceiling space.

Here is an idea I have used to "stretch" wall space.

A number of discarded window shades, with good springs, are mounted side-by-side on the ceiling. Many kinds of price charts, CRT specification lists, resistor and ca-



A number of old window shades mounted in the ceiling can solve the problem of wall space shortage in many small TV shops.

pacitor color code data, and other helpful information can be attached to shade surfaces with tape for easy replacement and up-dating. The material can be easily viewed by pulling down the proper shade. And, of course, it can be quickly stored out of the way by allowing the shade to roll back up automatically.—*Robert E. Diegoli, Plymouth, Mass.*

## Safety Pin Jumper

A regular safety pin, with both ends clipped off, makes a handy "jumper" in our shop. This little item can be used to complete the audio circuit for rear seat speaker auto radios, when the sets are taken

out for shop repair. It is also suitable for completing the filament circuit in combination radio-phono TV sets, such as Admirals, Olympics, etc.

The jumper is always inserted at the front side of the set's female receptacle. By doing this the wire is always visible and will surely be removed when the set is reassembled. A jumper serves better than the usual method of soldering or clipping a piece of covered wire between two points on the inside of the female receptacle. Frequently the soldered lead is not removed or solder may clog the pin area thus preventing plug reinsertion.—*Joseph Di Sabantonio, Jamestown, N.Y.*

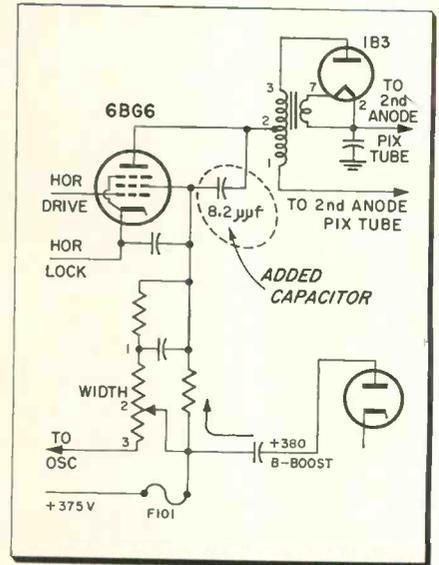
## Capacitor Prolongs Tube Life

After having two 6BG6's burn-out in a customer's TV set (RCA KCS-40) after only six months, I refused to put in a third one without investigating further. I monitored the cathode current of the overheating 6BG6 through fuse F-101 and found it to be over 80 milliamp, which a tube manual indicates is excessive.

Adjusting the horizontal linearity coil to resonance (minimum current reading) cooled off the tube, however, raster width decreased too much. I obviously needed a wider sweep with this minimum current.

To accomplish this in the KCS-40 set I was working on I added an 8.2  $\mu\text{f}$  capacitor from terminal 2 of the flyback to B+ boost. This modification spread the raster, yet maintained a safe current flow. Proof of this is: the TV set has been working fine for many months without an output tube burnout.

I've since modified an RCA KCS-47 TV set with the same tube burn-out problem by increasing the set's 4.7  $\mu\text{f}$  capacitor (in the same circuit as the KCS-40's modification) to an 8.2  $\mu\text{f}$  value capacitor. I've also found that it's advisable to check output tube cathode current when replacing a standard 5U4 low



A modification to prolong a 6BG6 tube's life in an RCA TV set was prompted by two tube burnouts in six months.

voltage rectifier with a 5U4GB tube. The latter tube increase B+ voltage, thus increasing output tube cathode current as well.—*R. R. Fitzmaurice, Dunedin, Fla.*

## Masking Tape Isolates A-C Cord

Ever have a TV's a-c line cord slip down under-foot while carrying a set? Do you put the set down again or try to kick the cord away while holding the set?

I've overcome this problem since I started using  $\frac{3}{4}$ " masking tape to secure a-c cords. When a set is picked up or is prepared for delivery, I either wind up the cord or roll it in a ring and secure it to the set's back with masking tape. This tape can also be used on air-conditioner cords or other appliances which the average shop may service.—*F. D. Gazzola, Greenwood, Ark.*

## 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.

## TV Master Antenna Systems

(Continued from page 33)

bution system that suits your shop. Put them together and you have a good master TV system design. Bear in mind that the mileages from the transmitters are approximate. If the station is blocked by hills and buildings, you might not be in a strong signal area even if you're only 15 miles or less from the station.

### Installing the System

Orient and install the antenna as you would for a single set installation. If a mast mounted amplifier is to be used, locate it as close to the antenna as possible. Be sure that the mast is installed firmly enough to support the increased weight and wind resistance of the mast mounted amplifier.

Ground the mast by connecting it directly to a ground rod or a cold water pipe. Also, according to standard electrical procedures, all electrical equipment should be grounded. Remember that hot water pipes, gas pipes, and vents are not good grounds. Cover all outdoor connections with a weather proofing compound, such as silicone grease.

In a strong signal area, it's a good idea to mount the amplifier right in your shop for easy service. Where interference is a problem, mount a matching balun close to the antenna and use RG-59/U foam as a download. Where there is no interference, twin lead can be used as a down lead. Many types of interference (including adjacent channel interference, ham interference, etc.) can be eliminated by traps.

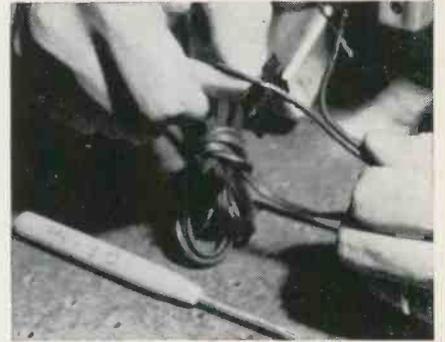
Cable can be run indoors or outdoors. Be sure to anchor it firmly in place. Don't run it over sharp edges. Coaxial cable should not be bent sharply. In other words, use the same technique you now employ on one or two set antenna lead-in wiring jobs.

Once a distribution system is installed, it should be checked for opens or shorts. The quickest way to do this is to measure the resistance of each branch line. Disconnect the branch line from the splitter and connect an ohmmeter between the shield and the inner conductor. You should read slightly over 75

ohms in each branch line. If your reading indicates a short or a high resistance contact, you can track it down with the ohmmeter. Shorts are the most common troubles, usually caused by a single strand of the shield. •

### G-E TOOLS

Two new tools make wire stripping and soldering easy. The wire stripper has four cutting edges for most-used wire sizes. The forked soldering tool is useful for removing and soldering wires in tight quarters. Both tools are

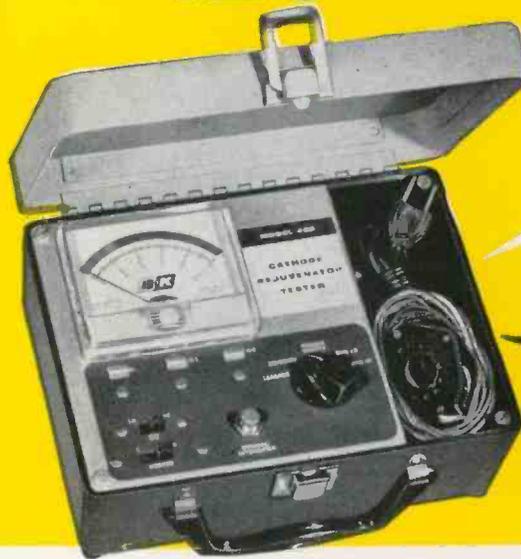


sealed in rugged plastic handles and will not pull out. General Electric Co., Owensboro, Ky.

For more data, circle 10-45-2 on coupon, p. 48

# NEW "COMPACT"

## Model 420 CATHODE REJUVENATOR TESTER



**TESTS AND REJUVENATES** picture tubes at correct filament voltage from 2.36 to 8.4 volts, including 110° tubes and the new 19" and 23" tubes

Spots the trouble and corrects it in a few minutes—right in the home, without removing tube from set

Another Money-Saver, Money-Maker!

It's even easier now for every serviceman to own a B&K CRT and profit from picture tube repairs. In addition to the famous deluxe Model 440, B&K presents the new "COMPACT" 420 CRT. And it is priced low enough to more than pay for itself in just a few weeks.

This unique "420" checks for leakage, shorts and emission. Removes inter-element shorts and leakage. Restores emission and brightness. Gives new useful life to weak or inoperative TV picture tubes. (Checks and repairs color tubes with accessory C40 Adapter.) *Keeps customers happy. Makes picture tube replacement sales easier for you. Builds more service profits.*

Has easy-to-read "Good-Bad" scale. Operates on 117 volts 50-60 cycle a.c. Handsome lightweight two-tone carry-case. Size: 8 $\frac{3}{8}$ " x 6 $\frac{3}{4}$ " x 3 $\frac{3}{8}$ " deep. Net wt: 5 $\frac{1}{2}$  lbs.

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# The Hi-Fi Role of Audio Accessories



Record cleaning materials, such as Duotone's cleaning kit, help hi-fi set owners remove dust and dirt from their records' grooves.



Items like Prestige Products' stylus alignment device can simplify adjustments of various hi-fi set components.

All phono needles wear out; even diamond ones. Thus, regular inspection with microscopes like the Robins one shown here can detect one before it damages records.



• Audio accessories are probably the most neglected sales items in electronic service dealers' stores. Either they're not stocked or they are improperly displayed.

Every person owning a phono or tape unit, stereo or mono, needs many accessories to make his listening time more pleasurable. Because of this obvious need, numerous accessory items sell themselves, usually through customer impulse purchases. Some of the items are like razor blade sales; they must be replenished after they're used up. This means repeat business for the dealer.

Record cleaning material, for example, are repeat sales items that sell very well when they're displayed. These include record cleaning cloths, sprays, and tone arm attachment brushes. Other big sellers for records include styli microscopes, protective plastic phono covers, tone arm weight measuring devices, and, of course, replacement needles.

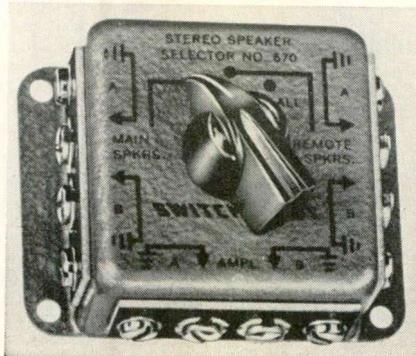
Tape recorder accessories are essential to tape equipment owners, too. Tape head cleaning fluid must

be continually used to maintain good record, play, and erase operation. Every tape instrument owner also needs a head demagnetizer and a tape splicer.

Hi-fi component system owners frequently require various cable assemblies to connect their components. Accessories to simplify operation of sets, such as: speaker phase switches, rumble filter, automatic set cut-off controls, stereo-mono reverse switch and other similar items, are often needed too.

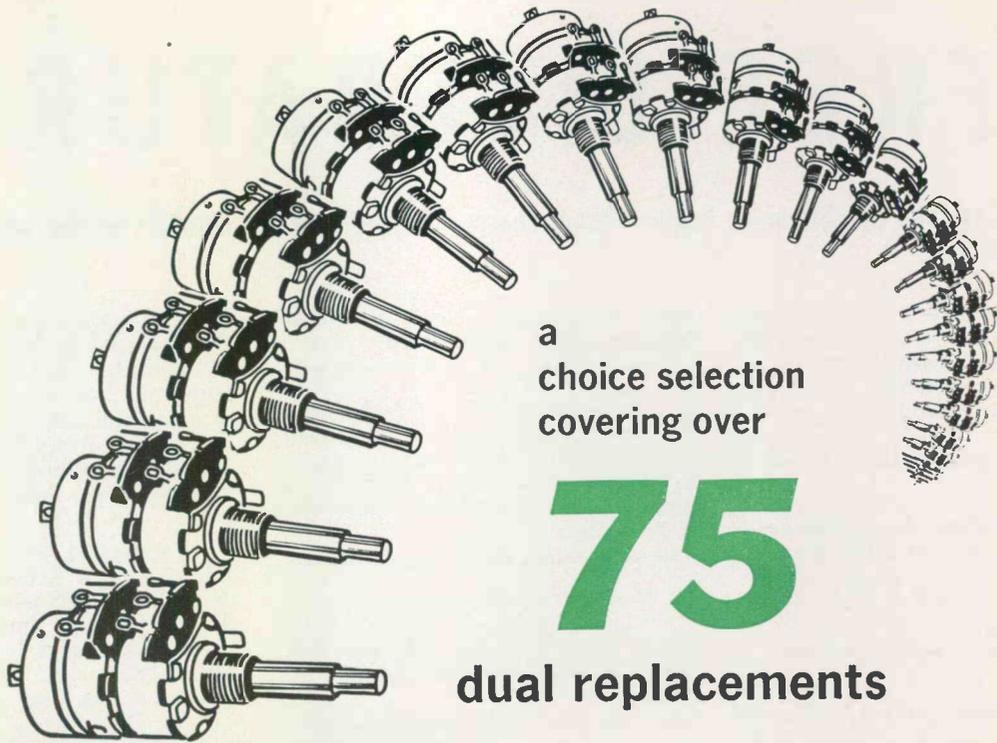
Are you making a profit selling these items or are your customers and potential customers spending their money in record album stores? There's no end to the type of accessories that customers buy. Selecting some key items and displaying them in a prominent place could supplement a service dealer's income without consuming much valuable time or requiring a large investment. If a customer trade is built up for these small items, a dealer could expand them with larger items that are outside the so-called accessory lines, like headphones and microphones. •

Added switch and control devices can make control and adjustment operations of a hi-fi set easy. For example, the Switchcraft speaker selector here is most helpful.



Plastic knobs can break, chip or warp. Exact replacement knobs are available to help give a hi-fi set that new look.





a  
choice selection  
covering over

# 75

dual replacements

right at your fingertips  
for only \$19.75

# NEW CLAROSTAT *Uni-TITE* SERVICE CENTER

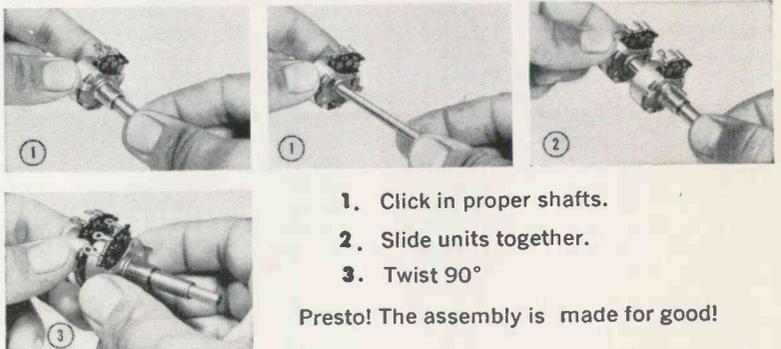
Right at your fingertips—ready for fast, easy, sure assembly in seconds—a choice of over 75 popular dual control replacements—in the new Clarostat Uni-Tite Service Center. Save those expensive trips for individual controls—have what you need on hand—finish the job and bill. That's the way to make money and you can do it with the Clarostat Uni-Tite Service Center. Ask your Clarostat distributor today!



## SPECIAL INTRODUCTORY OFFER

At no extra cost, get this handy steel cabinet FREE with your Uni-Tite Service Center kit. This is a limited offer, so hurry and get yours! Only \$19.75 with Uni-Tite components to cover over 75 different dual television replacement controls!

## EASIEST — BEST — UNI-TITE



1. Click in proper shafts.
2. Slide units together.
3. Twist 90°

Presto! The assembly is made for good!

# CLAROSTAT

CLAROSTAT MFG. CO., INC. DOVER, NEW HAMPSHIRE

# FREE LITERATURE

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

- 1 Fuses & Fuseholders:** Form SFH-8 covers the Buss GMW fuse and HWA holder combination offering a lightweight space-saving protective device for multiple circuit apparatus. Bussmann Mfg.  
For more data, circle 10-48-1 on coupon
- 2 Booster-Couplers:** Four-page brochure describes line of transistorized booster-couplers, reported to add power boost to any TV or FM antenna. Channel Master.  
For more data, circle 10-48-2 on coupon
- 3 Semiconductors:** New bulletin, 14 pages, lists latest ratings and specifications for every semiconductor device in the firm's line. General Electric Co.  
For more data, circle 10-48-3 on coupon
- 4 Electronic Chemicals:** Form 61C, 6 pages, a new product catalog covers cements, chemicals, cleaners, oils and polishes. Injectorall Co.  
For more data, circle 10-48-4 on coupon
- 5 Speakers:** Catalog 165-G, "High Fidelity Loudspeakers for Stereo and Mono Listening," provides 24 pages of information. Well illustrated. Includes prices. Jensen Mfg.  
For more data, circle 10-48-5 on coupon
- 6 Transformers:** Exact replacement transformers, covered on two catalog sheets are: HVO-179, for Zenith S-46592, S-47071; and FM-259, for Westinghouse 235V058H01. Merit Coil & Transformer.  
For more data, circle 10-48-6 on coupon
- 7 Business Aids:** 1961/62 catalog, "Service Business Shop & Sales Aids," illustrates 62 different aids. Contains 2 bound-in order forms. Philco Corp.  
For more data, circle 10-48-7 on coupon
- 8 Microphones & Speakers:** Literature available covers: (1) line of modular microphones with adapters and accessories; (2) line of underwater speakers; (3) the Music/Aire line of weatherproof speaker systems. University Loudspeakers.  
For more data, circle 10-48-8 on coupon
- 9 Generators:** Features, applications and specifications are included in illustrated circular covering model 250 color convergence dot generator. Winston Electronics.  
For more data, circle 10-48-9 on coupon
- 10 PA Amplifiers & Systems:** Illustrated catalog, covering the new Commander Series, details the features of 12, 35 and 100 watt amplifiers; a phono top common to all units; locking panel covers; and a combination mixer/preamplifier. Harmon-Kardon.  
For more data, circle 10-48-10 on coupon
- 11 Meters:** Literature covers a new TV field strength meter. Compact. Completely portable. Has 6 transistors operated from a zener diode voltage-regulated battery supply. Sadelco, Inc.  
For more data, circle 10-48-11 on coupon
- 12 Test Instruments:** 1962 catalog of user-selected kits and electronic instruments includes: stereo and mono hi-fi; CB transceivers; radios; test equipment and tools. Conar Instruments Div. National Radio Institute.  
For more data, circle 10-48-12 on coupon
- 13 Business Opportunity:** A new Associate Store program, offering protected territory and other advantages, is covered in literature. Lafayette Radio Electronics.  
For more data, circle 10-2-1 on coupon

CUT HERE

Cut out and mail to ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minn.

Use this coupon, or your letterhead, before November 20, 1961

Please send me literature of companies whose code numbers I have circled below (includes editorial and advertised items):

Note: Code 10-3-1 means October issue, Page 3, 1st item on page.

10-2-1	10-20-1	10-26-7	10-48-5	10-50-5	10-56-1	10-60-3	10-67-1	10-74-1	10-80-2
10-3-1	10-20-2	10-26-8	10-48-6	10-50-6	10-56-2	10-60-4	10-68-1	10-75-1	10-81-1
10-5-1	10-21-1	10-27-1	10-48-7	10-51-1	10-56-3	10-61-1	10-68-2	10-75-2	10-82-1
10-6-1	10-23-1	10-28-1	10-48-8	10-52-1	10-56-4	10-62-1	10-68-3	10-75-3	10-82-2
10-7-1	10-24-1	10-43-1	10-48-9	10-52-2	10-57-1	10-62-2	10-68-4	10-75-4	10-82-3
10-9-1	10-25-1	10-45-1	10-48-10	10-52-3	10-58-1	10-62-3	10-69-1	10-76-1	10-82-4
10-10-1	10-26-1	10-45-2	10-48-11	10-53-1	10-58-2	10-62-4	10-70-1	10-76-2	10-82-5
10-11-1	10-26-2	10-47-1	10-48-12	10-54-1	10-58-3	10-64-1	10-71-1	10-77-1	10-83-1
10-13-1	10-26-3	10-48-1	10-50-1	10-54-2	10-58-4	10-64-2	10-72-1	10-78-1	10-84-1
10-17-1	10-26-4	10-48-2	10-50-2	10-54-3	10-59-1	10-64-3	10-72-2	10-78-2	10-C3-1
10-18-1	10-26-5	10-48-3	10-50-3	10-54-4	10-60-1	10-64-4	10-73-1	10-79-1	
10-19-1	10-26-6	10-48-4	10-50-4	10-55-1	10-60-2	10-66-1	10-73-2	10-80-1	

Name ..... Position .....

Firm ..... Address .....

City ..... Zone ..... State .....

Note: If you have given your residence address, please enter your company name and address on this line: .....

What type  
of TV Lead-in  
Cable do you  
need?

Your  
Belden Jobber  
has it!

Convenient lengths  
in coils and  
spools



Cord Sets and Portable Cordage •  
Electrical Household Cords • Magnet  
Wire • Lead Wire • Automotive Wire  
and Cable • Welding Cable

WELDOHM, PERMOHM, CELLULINE  
are Belden Trademarks  
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WELDOHM . . . two and a half times  
the flexing life and one and a half times  
the breaking strength of ordinary lead-  
in. Resists pulling, whipping, twisting.  
300 Ohm. No. 8230.



PERMOHM\* . . . for use under condi-  
tions of extreme salt spray, industrial  
contamination, rain, and snow. Gives  
stronger, clearer signals. 300 Ohm.  
No. 8285.



STANDARD 300-OHM LINE . . . of-  
fers low losses at high frequencies. Also  
ideal for use with FM receiving an-  
tennas. No. 8225.



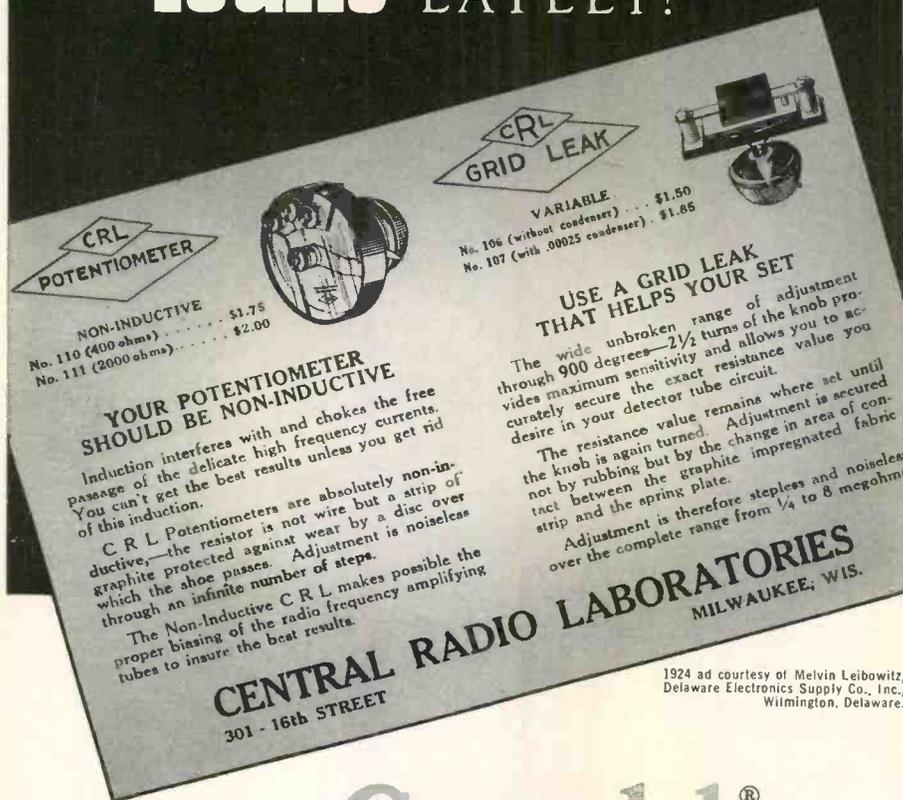
DECORATOR CABLE . . . this new  
300-ohm lead-in cable is of ivory color  
— blends into any interior decorating  
arrangement. No. 8226.



CELLULINE\* . . . excellent resistance  
to sun, abrasion, and wind. Installation  
easy . . . no end-sealing necessary. Gives  
strong UHF and VHF TV pictures.  
300 Ohm. No. 8275.

8-1-1

# BOUGHT ANY GOOD grid leaks LATELY?



you (and **Centralab**<sup>®</sup>)  
have come a long way since

## 1924!

If you worked on radios 38 years ago, you probably used the CENTRALAB grid leak that was advertised in the 1924 Citizen's Radio Call Book. It was a fine product in its day—but its day has passed, and CENTRALAB no longer makes it.

Instead we have a complete line of products that you need now for servicing radios, television sets, audio and industrial equipment. When you think about controls—or switches—or ceramic capacitors—or **PEC**<sup>®</sup> packaged circuits, you naturally think of the CENTRALAB line, renowned for quality and completeness.

Ask your distributor for your free copy of the latest CENTRALAB catalog—your guide to the finest in electronic components.

G-6148S

### Centralab

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.  
902K EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN  
In Canada: Centralab Canada Ltd., P.O. Box 400, Ajax, Ontario

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS

PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

For more data, circle 10-50-1 on coupon, p. 48

(Continued from page 26)

**STEREO:** Two-color illustrated brochure entitled "Why Stereo?" gives details on various kinds of stereo sources; describes ways of setting up stereo systems as well as converting mono systems to stereo. Eico Electronic Instrument Co., 83-00 Northern Blvd., Long Island City 1, N. Y.

For more data, circle 10-50-2 on coupon, p. 48

**PA SYSTEMS:** The easy-to-carry, 8 lb., Porta-PA covered in literature is designed for indoor and outdoor use. Has built-in reading rack and a microphone attachment to hold mike in place around speaker's neck. Requires no electrical outlets; operates on transistor amplifier circuitry. Universal Electronics Labs., 510 Hudson St., Hackensack, N. J.

For more data, circle 10-50-3 on coupon, p. 48

**TUBES:** "Picture Tube Interchangeability Guide," ETR-2764, a wall chart 24" x 8 1/2" which folds for use in desk or service case, covers 260 types of TV picture tubes. Lists type currently in the set, alternative replacement types and circuit changes if required. Electronic Components Div., General Electric Co., Owensboro, Ky.

For more data, circle 10-50-4 on coupon, p. 48

**AUDIO GENERATORS:** Sine-square wave audio generator, model TE-23, described in literature, features: front panel meter to monitor rms output; separate step and variable attenuators for both waveforms, dual cathode follower outputs and frequency response of 20 cycles to 1 mc  $\pm 1.5$  db except on .01 range. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y.

For more data, circle 10-50-5 on coupon, p. 48

### Polytran TWO-WAY RADIOS

Model CT-200 transistorized, portable, citizens band two-way radio operates in pairs or with existing mobile and base equipment. Powered by 9v dry batteries or rechargeable nickel-



cadmium batteries. Size, 1 1/4 x 2 3/4 x 5". Weight, 9 oz. Has press-to-talk switch and eight-section telescoping antenna. Polytran Industries Inc., 1010 Howard Ave., San Mateo, Calif.

For more data, circle 10-50-6 on coupon, p. 48

TRIM YOUR  
INVENTORY  
WITH

# THE COMPACT TUNG-SOL ET\* TRANSISTOR LINE



**ET-1**  
Mixer/Oscillator  
Converter PNP



**ET-2**  
IF Amplifier PNP



**ET-3**  
AF Amplifier  
PNP-6V



**ET-4**  
AF Amplifier  
PNP-12V



**ET-5**  
AF Amplifier  
PNP-9V



**ET-8**  
Mixer/Oscillator  
Converter NPN



**ET-6**  
AF Power  
Amplifier PNP



**ET-7**  
AF High Power  
Amplifier PNP



**ET-9**  
IF Amplifier NPN



**ET-10**  
AF Amplifier  
NPN-9V



**ET-11**  
AF Amplifier  
NPN-12V

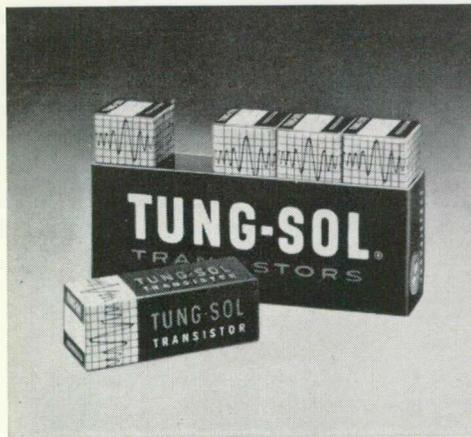
You can reduce the number of slow-moving items in your inventory . . . increase profits . . . cut wasted service time with the Tung-Sol ET transistor line.

The compact Tung-Sol ET transistor line meets virtually all common radio service requirements with a handy group of well-packaged transistors that are built to the highest standard of reliability in the industry. You will get more customer satisfaction and fewer callbacks with reliable Tung-Sol transistors. **Packaged for fast selection . . .** each Tung-Sol transistor is packed in a

carton clearly marked with type number and application. **Warranted for superior performance . . .** Tung-Sol quality control assures peak performance and rugged long life for each production unit.

**Priced for service business profits . . .** more profit per service hour with lowered inventory and fast, easy type selection.

For full information on the Tung-Sol ET transistor line and Tung-Sol's profit-building sales support program, contact your Tung-Sol distributor, or write: Tung-Sol Electric Inc., Newark 4, N. J.



\*ET for Entertainment—your guide to types specially developed by Tung-Sol for radio and TV replacement.

 **TUNG-SOL**<sup>®</sup>

## Heath OSCILLOSCOPES

Kit 10-21 general purpose 3" oscilloscope has identical vertical and horizontal amplifiers, with a frequency response of  $\pm 2$  db from 2 cps to 200 kc. Sensitivity, .25v rms/inch peak-to-peak deflection at 1 kc with an input impedance of 10 megohms shunted by 20  $\mu$ f. Employs twin-triode sweep generator which functions from 20 to 100,000 cps in four switch-selected ranges with automatic sync and retrace blanking. \$49.95. Heath Co., Benton Harbor, Mich.

For more data, circle 10-52-2 on coupon, p. 48



## G-E TUBES

All three of the 21" color tube types in use now are available for replacement purposes. While the firm has made the 21AXP22A available for some time, the 21FBP22, for G-E color TV receivers, and the 21CYP22A for sets of other makes, have now been added. Distr. Sales, Electronic Components Div., General Electric Co., Owensboro, Ky.

For more data, circle 10-52-3 on coupon, p. 48

Now you can  
sell citizens band  
with confidence  
pride, enthusiasm-  
and a *worthwhile return!*



CB-3

*littlephone*

Transceiver... \$149.50

Only Hallicrafters offers 8-channel convenience and all these quality performance features.

**The transmitter**... output circuit matches 50 ohm antenna systems. Standardized CR23/U crystals (3rd overtone, series resonant) readily available. Output amplifier adjustable for max. legal input. 100% modulation on positive peaks. Series-tuned 2nd harmonic trap for excellent TV suppression.

**The receiver**... sensitivity less than 1.0 UV for 10 db. signal-to-noise ratio. Electronic squelch works on less than 6 db. signal strength change. 6 kc. selectivity. Image rej. 40 db. min. Audio output over 2 watts. Auto. noise limiter, series and shunt diodes.

*...now you can sell*

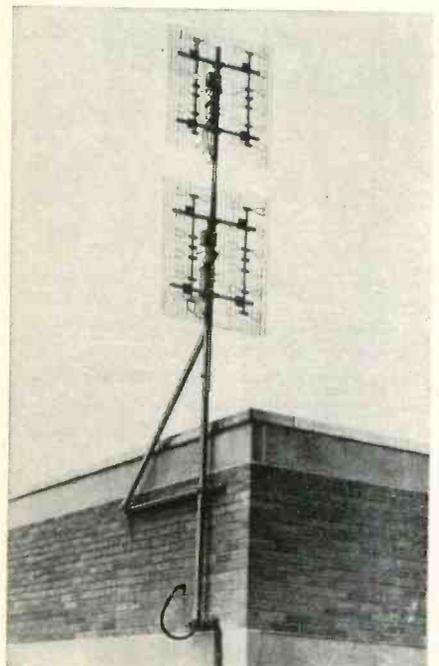
**h hallicrafters**

Chicago 24, Illinois

Limited number of Dealer Franchises available. Write for further information.

## Educational TV

The FCC and GWETA (the Greater Washington Educational Television Association) recently held a joint exhibition of UHF TV equipment in the lobby of the Department of Commerce Building, Washington, D. C. Its purpose was to acquaint TV owners in the area with the equipment necessary to receive UHF channel 26, Washington's new educational TV station scheduled to begin operation at the



start of the school term this fall. Featured in the exhibit was the JFD Electronic Corporation's line of UHF receiving and translator TV antennas. Included were translator models respectively designed for the following distance from the transmitter: 75-100, 50-100, and 25-50 miles. Also displayed were a corner reflector model for 25-50 miles, and a bow-flector model for use within 25 miles from the transmitting antenna.

# 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. K-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!

# QUICK PROFITS!

with this New **Mosley**  
2-SET COUPLER

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2 SETS --- 1 ANTENNA  
with the New  
**MOSLEY PC-2 COUPLER**  
for TV and FM

**Mosley PC-2 Two-Set Coupler**  
MADE IN U.S.A.

TV BLACK AND WHITE OR COLOR FM

Low Loss Printed Circuit  
Positive Full-Prong Connections  
Performance Engineered

List Price

**Mosley PC-2 Two-Set Coupler**  
MADE IN U.S.A.

TV BLACK AND WHITE OR COLOR FM

Low Loss Printed Circuit  
Positive Full-Prong Connections  
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**Mosley PC-2 Two-Set Coupler**  
MADE IN U.S.A.

TV BLACK AND WHITE OR COLOR FM

Low Loss Printed Circuit  
Positive Full-Prong Connections  
Performance Engineered

List Price

You'll enjoy installing the new PC-2 two-set coupler because your work and time will command a better price.

These neat new couplers, with a compactly engineered printed circuit design, provide high inter-set isolation and low forward loss — result more satisfied customers. PC-2 Dealer Net, \$1.42 each and Suggested List, \$2.37 each.

Pick up one of these handy cards at your Mosley distributor or write.

**Mosley**  
Electronics, Inc.

4610 NORTH LINDBERGH BLVD.  
BRIDGETON, MISSOURI

For more data, circle 10-54-1 on coupon, p. 48  
54

## B&K CRT CATHODE REJUVENATOR TESTER

New compact model 420 tests and rejuvenates picture tubes at correct filament voltage at 2, 6, and 8v, including 110° tubes and the new 19" and 23" tubes. Reported to spot the trouble and correct it in a few minutes, in the home without removing tube from the set. Checks for leakage, shorts and emission. Checks and repairs color tubes with accessory C40 adapter. Has easy-to-read good-bad scale. Operates on 117v 50-60 cycle a-c. \$54.95. B&K Mfg. Co., 1801 W. Belle Plaine Ave., Chicago 13, Ill.

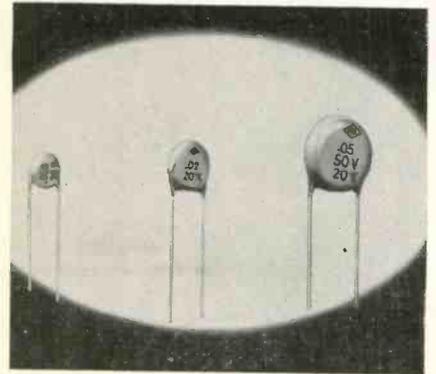
For more data, circle 10-54-3 on coupon, p. 48



## Centralab CAPACITORS

Type CK low voltage disc capacitors, designed for the high capacity, low voltage requirements of transistor circuitry, feature: range, 0.005  $\mu$ f — 0.1  $\mu$ f,  $\pm 20\%$ ; working voltage, 50v d-c; initial leakage resistance, over 7500 megohms; leakage resistance after humidity testing, over 1000 megohms; power factor, 2% maximum at 1 kc; thickness,  $\frac{5}{32}$ " and diameter range from  $\frac{3}{8}$ " to  $\frac{5}{8}$ " depending on capacity. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 10-54-4 on coupon, p. 48



new microphone kit for dealers



PRE-PRICED  
FOR FULL  
PROFIT  
MARK-UP

MADE  
IN AMERICA BY  
AMERICANS

- complete kit
- skin packed for identification and protection
- easy to store and re-order

CATALOG NO. 30-900 **16<sup>50</sup>** RETAIL

For the hobbyist, ham, or pro: a high impedance crystal microphone with 40-12,000 C.P.S. frequency response at minus 55 db; 6-foot flexible cable; clip-on stand and cord for desk, lavalier, or hand held use; and RCA type phono pin plug—skin packed and mounted on a self selling display board for impulse buying.

See your Audiotex Distributor.

Write for free Hi-Fi Stereo Accessories Catalog.

**audiotex**

**AUDIOTEX CO.**

a division of GC-Textron Electronics, Inc.  
400 S. WYMAN ST., ROCKFORD, ILL.

For more data, circle 10-54-2 on coupon, p. 48

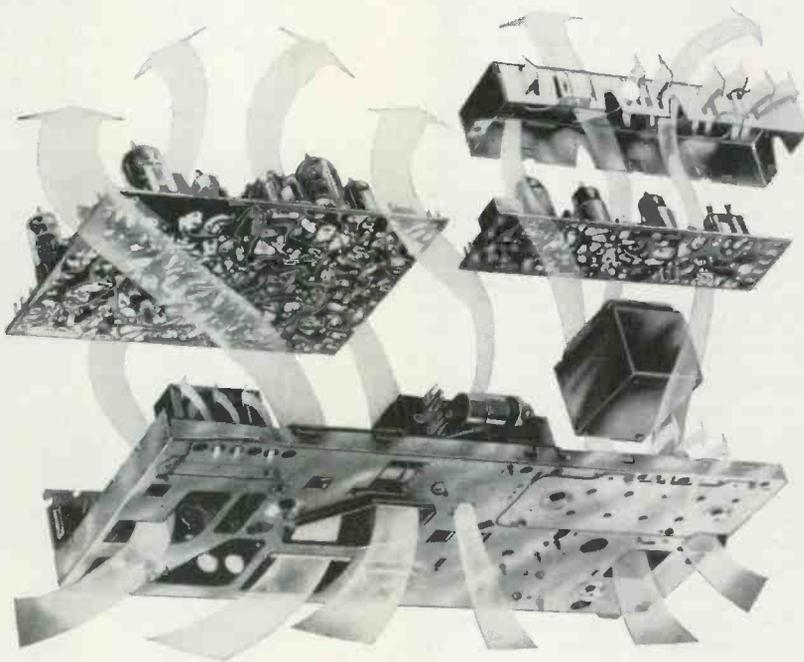
ELECTRONIC TECHNICIAN • October, 1961

*Another reason why you're  
hearing so much about Philco...*

# PHILCO for 1962

leads in TV reliability with the new

## ADVANCED COOL CHASSIS



Proved in Over  
2,000,000 hours of  
life tests...

**OVER  
76%  
LONGER  
TV  
LIFE**

**Exclusive Patented Construction *plus* increased air-flow beats TV heat**

Now for 1962, *increased air-flow cooling . . . larger cut-outs in the base . . . ventilated circuit panels* where critical parts are mounted. By a wider margin than ever, the *patented Philco Cool Chassis* beats the heat, major cause of TV breakdowns. Now proved in thousands of homes and 2,000,000 hours of life tests. Remember—*only Philco has it!* Just another reason why more dealers like selling Philco TV! Talk to your Distributor!

**NO PARTS UNDERNEATH!**

**NO HEAT TRAPS!**

PHILCO'S ON THE MOVE!

**GO WITH**

# PHILCO



*Famous for Quality the World Over*

### Injectorall SPRAYS

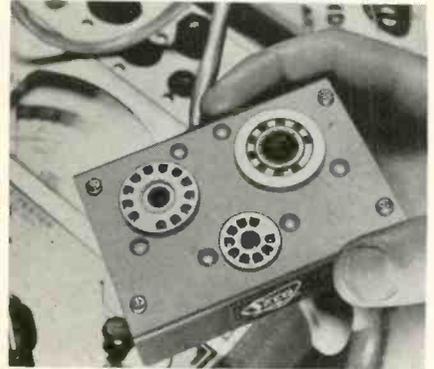
Lens Kleen #20 cleans and removes scratches from plastic TV windows. It is anti-static and anti-fogging. Formula contains special abrasive to minimize scratches. 6 oz. aerosol can, 99¢. Renew Spray #30WC, a silicone scratch cover polish, for walnut and mahogany TV cabinets, can be applied directly or with a cloth supplied with the can. No masking required. 6 oz. aerosol can, 90¢. Injectorall Co., 6 Bay 50 St., Brooklyn 14, N. Y.

For more data, circle 10-56-2 on coupon, p. 48



### Seco ADAPTORS

A new adaptor that accommodates three new tube bases: the 9-pin novar; the 12-pin compactron; and the new 10-pin tube base is announced. Designated adaptor No. 1171, it is designed for installation in the firm's model 107 tube tester. Size, 3½" long, 2⅜"



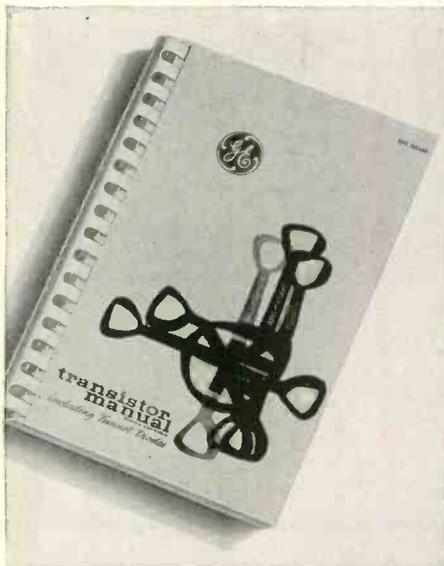
wide, ¾" high. Fits into the cord compartment of model 107 tube tester. Comes complete with 22" 12-wire cable. Full instructions for installation are provided. Set-up data on new tubes is also included. \$4.95. Seco Electronics Inc., 5015 Penn Ave. S., Minneapolis 19, Minn.

For more data, circle 10-56-4 on coupon, p. 48

### Paco SWEEP GENERATOR/ MARKER ADDER

Features of model G-32 include: electronic voltage regulator for r-f output; dual attenuators permit close control of output voltage to match circuit conditions; sweep width, continuously variable; also marker pips visually indicate spot frequencies on a displayed waveform without distorting its shape. Frequency coverage, 3 mc to 220 mc. Paco Electronics Co., 70-31 84th St., Glendale 27, N. Y.

For more data, circle 10-56-3 on coupon, p. 48



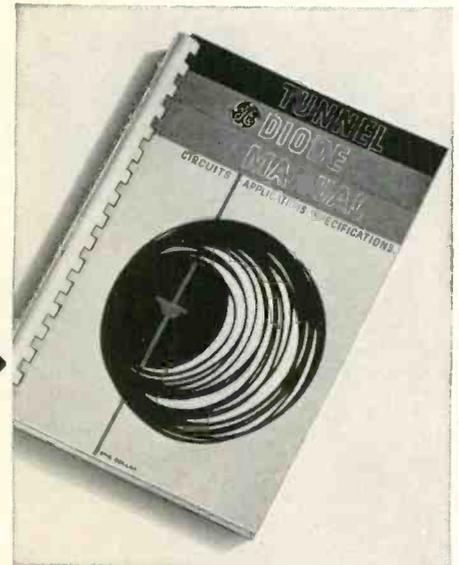
#### Transistor Manual

An industry classic, now in its 5th edition. 320 fact-filled pages on theory, construction techniques, signal characteristics, hi-fi and radio circuits, transistor radio servicing techniques, feedback and servo amplifiers, switching characteristics, unijunction transistor circuits, complete specs and JEDEC listings, introductions to silicon controlled rectifiers and tunnel diodes. \$1.00.

#### Tunnel Diode Manual

This is the most comprehensive presentation of theory, circuits, applications and specifications available today for tunnel diodes. Complete ratings and characteristics, tunnel diode specifications, chapters on tunnel diode amplifiers, oscillators, switches, logic circuits and tunnel diode test circuits. Also a bibliography of basic tunnel diode source material. Just \$1.00.

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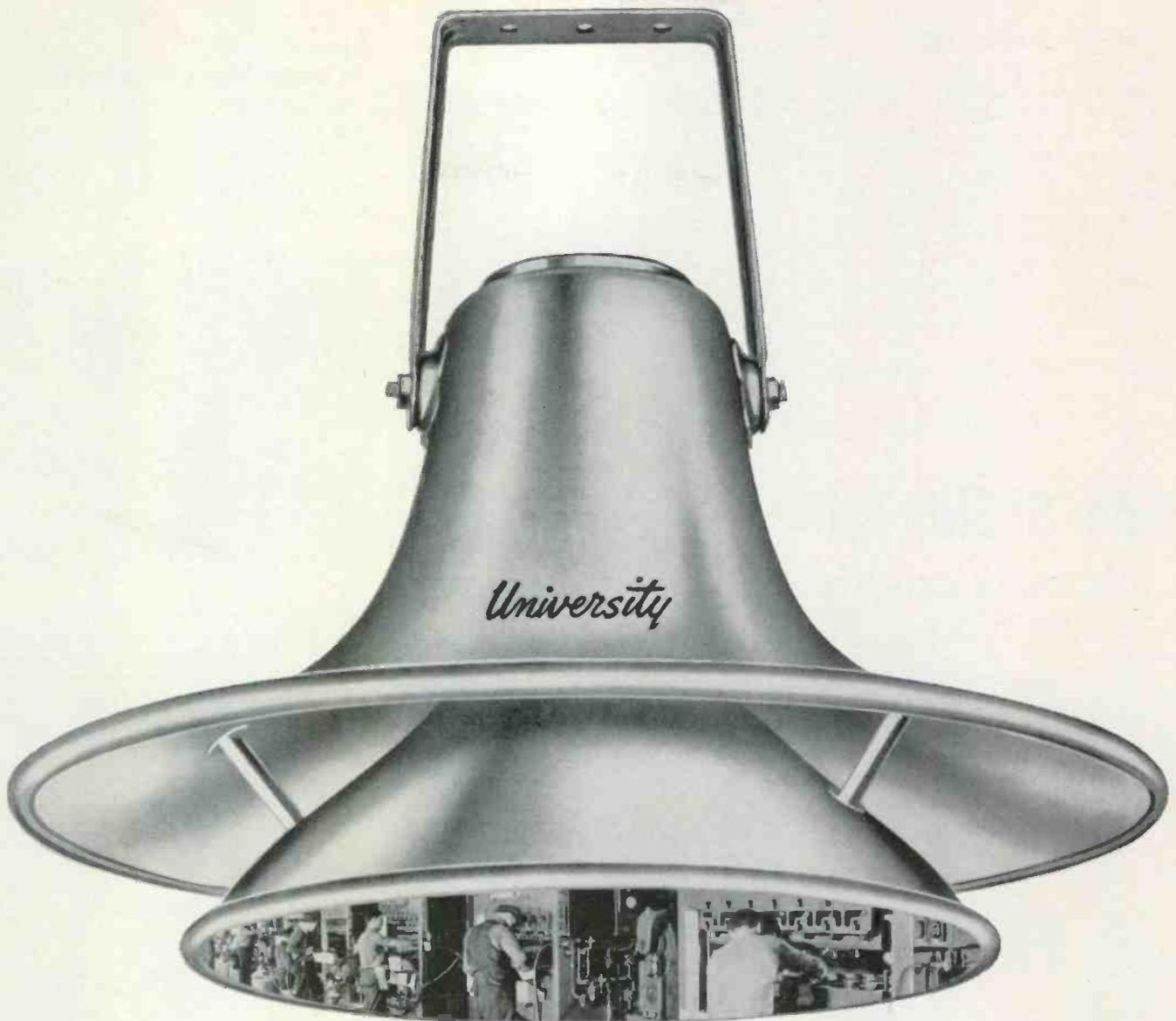
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# ATTENTION, PLEASE!

Heard clearly through production noises at the plants of the Ford Motor Co., General Motors, Curtiss-Wright and other leading companies . . . over UNIVERSITY Radial Trumpets.\*

And there are good reasons why University Radial Reflex Projectors are chosen to carry important messages to factory personnel. The higher efficiency of University Reflex Radial Projectors is one of the reasons. Rugged, weather resistant construction making them ideal for installations subject to weather extremes and for dust-laden atmospheres . . . plus uniform (and economical) 360° overhead sound distribution from a single projector, are additional reasons for their world-wide popularity.

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And that's only the beginning of the University paging story! For optimum sound reinforcement and penetration with low power systems, there's the MIL-A, CMIL-A, IB-A—for wide area coverage in medium noise level areas . . . the CIB-A—for long, narrow corridor installations . . . the bi-directional 2WP!

But for the complete story of University Public Address speakers, write Desk Z-10, University Loudspeakers, Inc., White Plains, New York.

*NOTE: All University P.A. Loudspeakers are F.C.D.A. approved.*

\*Engineered with HIGH 'A'—HIGH AUDIBILITY—exclusive with University!

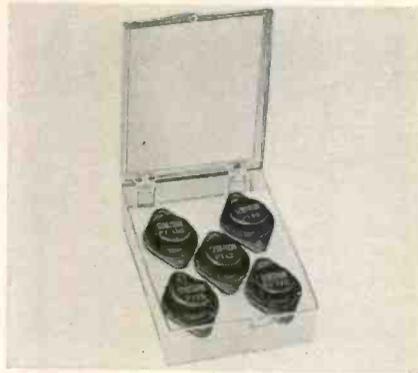


For more data, circle 10-57-1 on coupon, p. 48

### Semitronics TRANSISTORS

Kit 5PT, shown, contains 5 American-made power transistors designed to replace 100 of the most popular power transistors used in automobile radios. Also, not shown, Kit 8JP, for replacement of Japanese and other foreign transistors and diodes; 9TK, featuring 9 most popular PNP transistors and diodes; 10SP, containing 10 silicon rectifiers for TV and radio circuits; and 5GP containing 5 germanium glass diodes. Semitronics Corp., 370 Broadway, New York 13, N. Y.

For more data, circle 10-58-2 on coupon, p. 48



### Sencore

#### TV SWEEP CIRCUIT ANALYZERS

Model SS117 utilizes signal injection plus direct component substitution for testing circuits dynamically with the TV set turned on. Checks horizontal oscillator, horizontal output, horizontal deflection yoke, horizontal output



transformer, vertical deflection yoke and second anode voltage. External circuit measurements provided are: 0-300 and 0-1000v d-c for checking B+ and boost volts; 0-300 and 0-1000v P to P for checking sync and oscillator outputs; 0-300 d-c milliamps for checking horizontal fuse current. \$89.50. Sencore, Addison, Ill.

For more data, circle 10-58-3 on coupon, p. 48

## WHY SPEND \$10<sup>00</sup> - TO EARN \$1<sup>00</sup>

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### Eico BATTERY ELIMINATOR/ CHARGER

Features of model 1064 include: d-c voltage ranges, 0-8v and 0-16v; simultaneous monitoring of voltage and current on both ranges; automatic switching; separate voltmeter and dual-range ammeter; and continuous voltage adjustment. Current ratings:



0-8v range, 10 amps continuous, 20 amps intermittent; 0-16v range, 6 amps continuous, 10 amps intermittent. A-C ripple: 0-16v range, 0.3% @ 2 amps, 1% @ 6 amps, 1.5% @ 10 amps; 0-8v range, 1.5% @ 2 amps, 2% @ 6 amps, 4.5% @ 10 amps. Kit, \$43.95. Wired, \$52.95. Eico Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y.

For more data, circle 10-58-4 on coupon, p. 48

# NEW RCA VICTOR COLOR TV!

## New Performance! New Serviceability!

**New High-Fidelity Picture Tube!** RCA Victor's all-new, all-sulphide color picture tube, coupled with the improved bandwidth of the amplifier section, reproduces incredibly lifelike color . . . a higher brightness level . . . more detailed picture content.

**New Vista Tuner!** This is the super-powerful RCA Victor tuner that has proved in performance it can pull in a sharper, clearer picture than any other . . . even in many difficult signal areas.

**New Push-Button Circuit Breaker!** Provides positive protection of the chassis components—resets simply by pressing and releasing a button—eliminates the special B-plus fuse previously required for protection of the deflection circuitry.

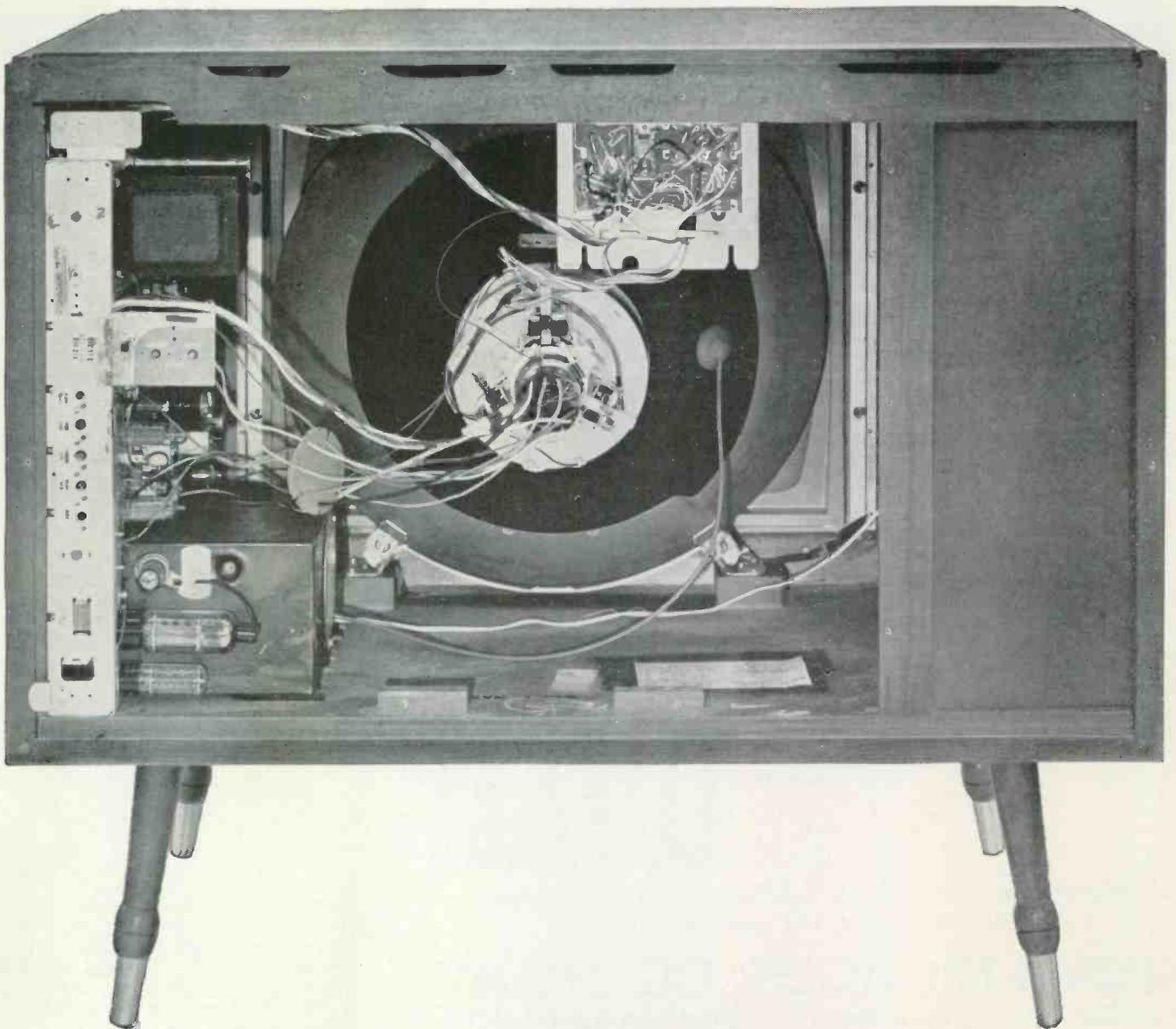
**New High-Voltage Connector!** Provides for easy measurement of voltage at the anode connector . . . simplifies connecting and disconnecting of high voltage. Saves you time . . . makes servicing more profitable.

Be sure to watch Walt Disney's new series, "The Wonderful World of Color" every Sunday, NBC-TV Network  
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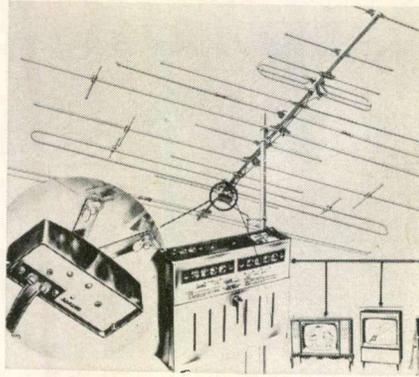
RADIO CORPORATION OF AMERICA



### JFD ANTENNA SYSTEMS

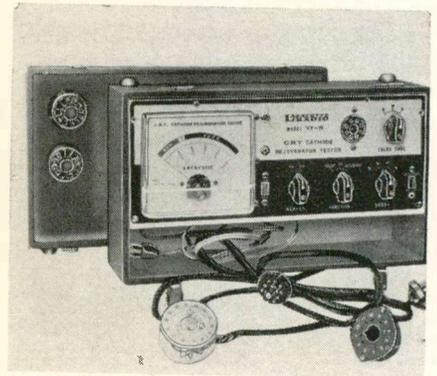
The Transis-tenna, a transistorized antenna-amplifier-distribution system, is available in 30 antenna models. It drives up to 4 TV and/or FM receivers simultaneously, and operates on 4 type D flashlight batteries. No separate balun is needed. Has high sensitivity, reported to improve the signal-to-noise ratio. Amplifier, mounted directly at the antenna terminals, amplifies the signal before unwanted signals are picked up by the downlead. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y.

For more data, circle 10-60-2 on coupon, p. 48



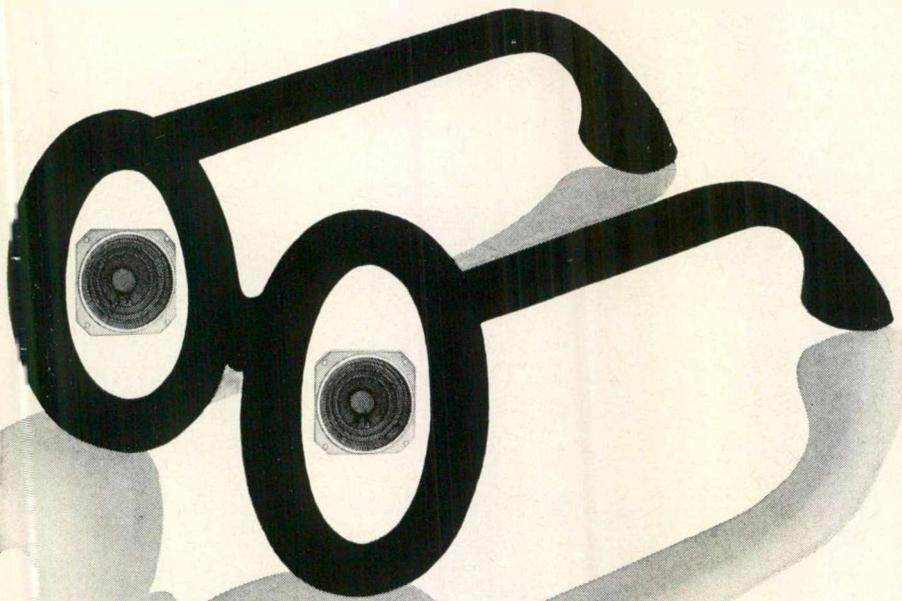
### Lafayette CRT REJUVENATOR/TESTERS

Lightweight, completely portable, model TE-19 features: rapid check out of b/w and color CRT's including 110° without removing them from the set; fast short test using a neon lamp indicator; quality determination using an emission test; rejuvenation of all CRT's; 4 1/2" meter for direct readings



on "good-bad" scale; filament voltage selector switch, 6.3 and 12.6v; separate checking and correcting of each gun; etc. Operates on 105-120, 60 cps, a-c. \$32.50. Adapter for new 23EP4 CRT, \$1.50. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y.

For more data, circle 10-60-3 on coupon, p. 48



*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**

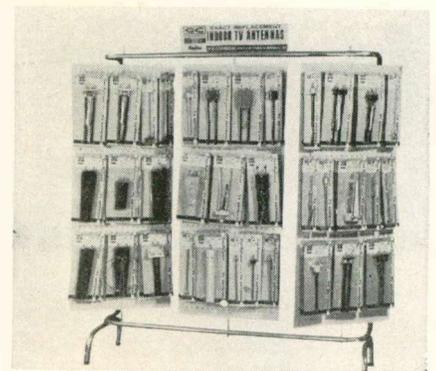
The NO CALL-BACK speaker with the exclusive Adjust-a-Cone Suspension  
Completely manufactured in the United States of America

**QUAM-NICHOLS COMPANY**

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### GC Radion ANTENNAS

More than 60 exact replacement indoor TV antennas are now available in self-service packaging. New GC Radion line-up features the 60 exact replacements (and also 7 all-purpose models) in color-coded and carded skin packaging, racked in a "space-miser" display. More than 15 different



TV makes are included, such as Admiral, General Electric, Hotpoint, RCA, Philco, Zenith, Sylvania, Westinghouse, Motorola, Olympic, Hoffman, Packard-Bell, Airline, and Silvertone. GC Electronics Co., 400 S. Wyman St., Rockford, Ill.

For more data, circle 10-60-4 on coupon, p. 48



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## Made where gas costs 60¢ a gallon.

Regular gas.

The only kind a Volkswagen needs.

The place is West Germany.

13 years ago, tradesmen used bicycles and motor scooters to get around the high cost of gas. Could Volkswagen make a truck that would do for business what our sedan did for families?

Our answer was the VW Panel Delivery. It ran on half the gas that others used.

Many still give all the credit to our en-

gine. (The efficiency of VW's 4-cylinder air-cooled car and truck engines is legendary.)

But to tell the truth, our light weight is just as important.

The engine itself is built of magnesium and aluminum alloys, one of the lightest designs in the world.

And our truck is designed without radiator, driveshaft or the heavy members used in bolted construction. For extra strength, the Volkswagen body is welded.

It's all one piece.

We save 1,600 lbs. this way. A  $\frac{3}{4}$ -ton load you do not buy gas for.

How much gas don't you buy?

The owner who saved \$480 a year over his former truck did not surprise us. (He did this driving 2,000 miles a month.)

Almost every VW owner gets over 20 miles a gallon and a few even get 30.

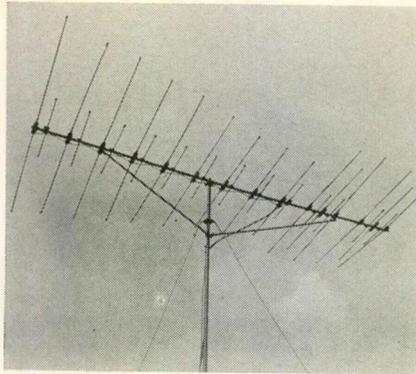
Our average is 24. What's yours?



### Channel Master ANTENNAS

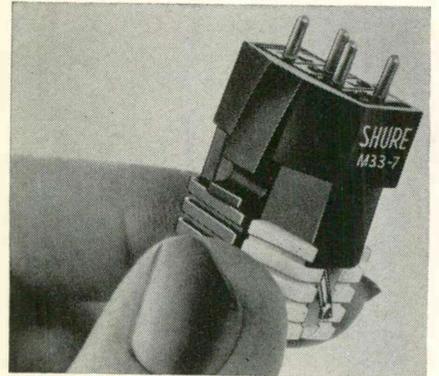
Six antennas, scaled from a super-fringe model down to a compact antenna for suburban markets, are announced in the new Crossfire line. Reported to solve the problem of dual-band VHF operations, over the entire 4 to 1 frequency spread. It is front fed. Driven elements, connected in parallel with a 2 wire feed line, run from the transmission line. Feed line, transposed between each successive pair of elements. Channel Master Corp., Ellenville, N. Y.

For more data, circle 10-62-2 on coupon, p. 48



### Shure STEREO CARTRIDGES

Specifications of the M 33 Dynetic cartridge are: frequency response 20-20,000 cps; output voltage (at 5 cm/sec at 1000 cps), 6 millivolts; channel separation, more than 22.5 db at 1000 cps; recommended load, 47,000 ohms; inductance, 600 millihenries; d-c re-



sistance, 750 ohms; compliance, 10x 10<sup>-6</sup> cm/dyne; tracking force, 1-3 grams. Available with either a .0005" or .0007" stylus. \$36.50. Also, not shown, M 77 with response of 20-17,000 cps and tracking force 3-6 grams. \$27.50. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

For more data, circle 10-62-3 on coupon, p. 48

## NEW HEATHKIT® TRANSISTOR TESTER



only \$54.88

- Complete DC analysis of all PNP, NPN transistors up to 15 amps
- DC gain (beta, alpha) read directly on calibrated scales
- 15 ua basic range for leakage (Icbo, Iceo) tests
- Four lever switches provide rapid test selection
- Built-in battery supply—provision for using external supply
- Ideal for servicing, design work, incoming inspection, production testing, etc.

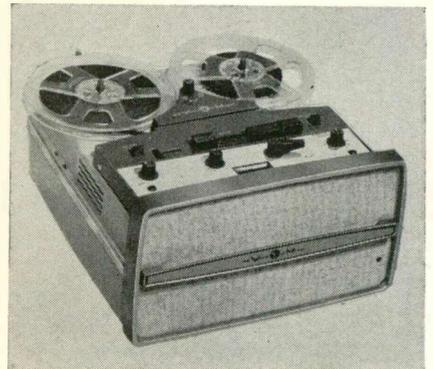
Superbly engineered with unique features, the new Heathkit IM-30 offers thorough DC analysis of all transistor types and checks of diode characteristics with high accuracy. Operation is simple! Four lever switches select tests of base current, gain, collector current, collector voltage, leak voltage, short test, diode or collector-to-emitter leakage (Iceo), and collector-to-base leakage (Icbo). Four rotary switches, one for voltage and one for current on both gain and leakage set desired conditions. DC Beta and DC Alpha are read direct from the calibrated panel scale after meter is nulled. Gain control is 3% wire-wound potentiometer for high accuracy. Variable bias control allows setting collector current to any value up to 15 amps. Basic tests are made using internal batteries (up to 9 v. in 1.5 v. steps). External DC supply terminals provided for higher voltages and current with appropriate meter ranges provided. Detailed instructions included. 7 lbs.

Kit IM-30...NO MONEY DOWN, \$6 mo. ....\$54.88

**SPECIFICATIONS—Checks:** Transistors up to 15 amps and diodes up to 1.5 amps. **Tests:** Shorts, DC Gain (Beta 0-300) (Alpha 0-9967), Leakage (Icbo, Iceo), Diode Forward and Reverse Current. **Meter:** Current Ranges: 15 ua, 150 ua, 1.5 ma, 15 ma, 150 ma, 1.5 A, 15 A; Voltage Ranges: 1.5 V, 5 V, 15 V, 50 V, 150 V (100 K ohm/volt). **Power supply:** Internal, seven 1.5 volt size D batteries provide 1.5, 3, 4.5, 6, 7.5, 9 volts collector supply for gain or leakage and 1.5 volts for bias; External, 0-50 volts for gain, 0-150 volts for leakage and 1.5 volts for bias. **Bias control:** Permits any collector current from 10 ua to 15 amps for gain tests. **Gain control:** 3% wire-wound potentiometer has calibrated scales to give DC Beta and DC Alpha directly when meter is at null. **Lever switch:** Four spring return levers will individually select the following tests; Base Current, Gain, Collector Voltage, Collector Current, Leak Voltage, Short Test, Icbo and Iceo or diode currents. **Two voltage selector switches:** Gain and Leak Test Voltages can be individually preset at different voltage levels. **Two current range switches:** Collector and Leak currents can be individually preset on different ranges. **Transistor and diode connections:** Universal transistor socket and binding posts. **External power supply connections:** Binding Posts for Gain, Leak and Bias supplies.

### V-M TAPE RECORDERS

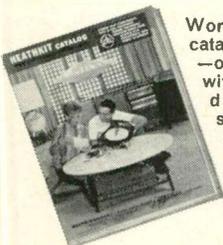
Model 730, monaural, records and plays back ½ track tapes of 7½, 3¾, and 1½ speeds/second. Features include: pushbutton controls plus a new record-play lever which prevents accidental tape erasure; separate bass and treble controls; "tone-o-matic" loudness control; 5"x7" hi-fi speaker with 2.15 oz magnet; three-positioned



mike; size, 7½"H, 13"W, 14"D; weight, 21 lbs. \$169.95. Also, not shown, model 722, stereo, 2 or 4 track, \$259.95; model 720, mono, ¼ track, plays back 2 or 4-track stereo tapes, \$225.00; and model 710, for institutional use, \$189.95. Voice of Music, 226 Pipestone St., Benton Harbor, Mich.

For more data, circle 10-62-4 on coupon, p. 48

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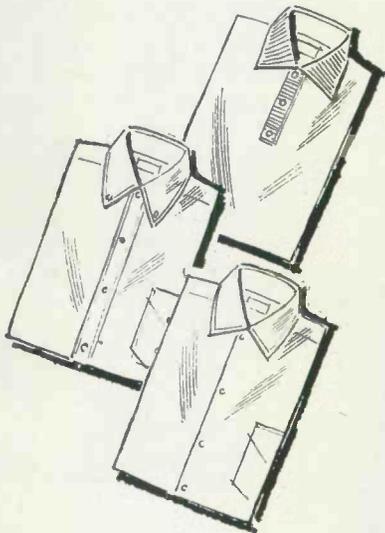
Zone \_\_\_\_\_

State \_\_\_\_\_

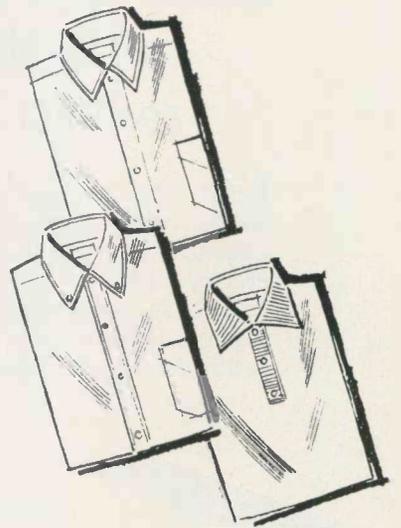
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### University SPEAKER SYSTEMS

Announced is the Classic Mark II, 15" 3-way high-compliance speaker system. Frequency response, virtually uniform from below 20 to 40,000 cps. Has heavy-duty high compliance 15" woofer; high-compliance, direct radiator 8" mid-range and Sphericon super tweeter. Power required to drive system, 10-60 watts. Impedance, 4 and 8 ohms. Dimensions, 35"W, 28 1/4"H, 17 1/2"D. \$295.00. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y.

For more data, circle 10-64-2 on coupon, p. 48



### Miracord TURNTABLE/CHANGERS

Studio Series automatic turntable and record changer is available in two models: Studio H model, with a hysteresis-synchronous motor; and Studio model with the lower cost 4-pole motor. Both models have: heavy one-



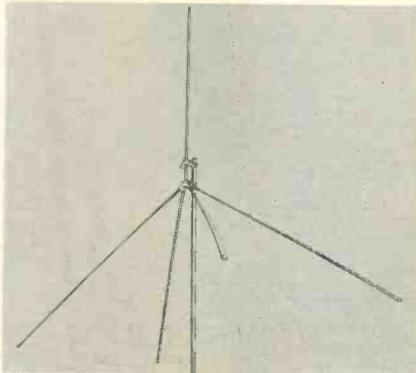
piece full 12" die-cast and dynamically balanced turntable; pushbutton control; a mass-balanced transcription type arm with stylus pressure calibrator, etc. Studio H model, \$99.50. Studio model, \$79.95. Prices do not include cartridge or base. Benjamin Electronic Sound Corp., 97-03 43rd Ave., Corona 68, N. Y.

For more data, circle 10-64-4 on coupon, p. 48

### Clear Beam CB ANTENNAS

Announced is a new series of economy citizens band antennas. Ground-plane, model GP-1, shown, features a unique design with a 1" diameter driven element and drooping radials to give improved impedance matching with coaxial lead cable. Also, model CBY3 is a three element yagi for 27 mc with full .10 and .15 wavelength spacing. The units net for \$9.95 and \$14.95 respectively. Antennex Div., Clear Beam Corp., 21341 Roscoe Blvd., Canoga Park, Calif.

For more data, circle 10-64-3 on coupon, p. 48



## Watch your SWL volume "take off" with this new, low-cost receiver from hallicrafters!

Here's Hallicrafters' answer to soaring demand for a high-performance, low-cost general coverage receiver in the beginner category—the sparkling new S-119 SKY BUDDY. Heavy national advertising schedule and attractive discounts for exceptional profit opportunity. Designed with ingenious simplicity for trouble-free performance. Order today from your Hallicrafters distributor!



DEALER FRANCHISES AVAILABLE. For information write to: Hallicrafters, Communications Div., 4401 W. 5th Ave., Chicago 24, Ill.

**S-119 "Sky Buddy"**  
factory wired \$49.95

S-120 Deluxe Receiver (not shown)—List \$69.95



### "SKY BUDDY" FEATURES

- AM plus 2 short wave bands (2-5.5mc. and 5.7-16.4mc.) covering aircraft, ships, foreign stations, amateurs, etc.
- Transformer-type power supply. Superheterodyne circuit with superb sensitivity and planetary drive for sharp, selective tuning.
- Built-in speaker and headphone jack, with function switch. Separate switch for voice or code reception.

# Electronically Controlled Home Laundry Dryer

• Employing moisture sensing "fingers" to "feel" clothes in its automatic home laundry dryer, the Maytag Company of Newton, Iowa, has developed a machine with an electronic control system.

Sensors on the three drum baffles continuously monitor the moisture content of the machine's load, eliminating overdrying or underdrying. The drying process control works independently of drum temperature, time, or humidity, the company said. When all articles in the load have reached the proper moisture content, the machine stops automatically. Only 3 electronically controlled automatic dial points are employed.

## How It Works

The electronic control box contains a sturdy printed circuit board, diode rectifier, resistors; a capacitor, photo conductive cell, actuating neon lamp, and relay.

When the dryer is turned on and the wet clothes are tumbled; current is supplied to the electronic control through the diode rectifier, as shown in Fig. 1. Moisture in the clothes completes a conductor circuit to ground through the sensor electrodes. At the same time a small current bleeds through a resistor and begins to charge a capacitor. As the clothes become more dry the circuit resistance increases and excess current is supplied to the capacitor.

When the capacitor charge reaches 74 volts it suddenly discharges through the neon lamp which flashes—interrupting the high resistance of the photoconductive cell, energizing the relay which closes the a-c circuit to the timer. Depending upon the machine's control setting, the cycle process is completed and the machine stops.

## Troubleshooting

When the automatic dryer dial is set on "Regular Dry," "Wash 'n

Wear," or "Damp Dry," the drying cycle is under electronic control. The two most probable trouble symptoms are as follows: (1) Clothes are dry but dryer continues to operate. (2) Clothes are not dry but dryer shuts off prematurely.

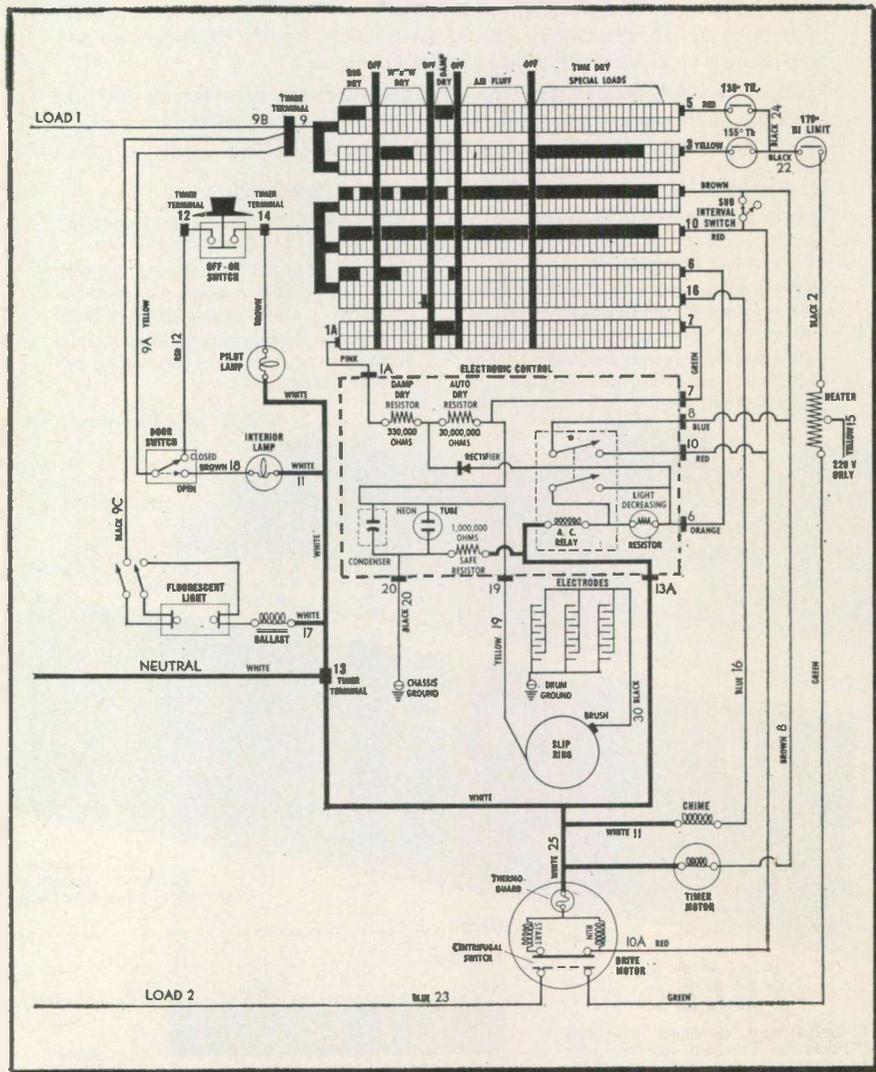
If either of the aforementioned symptoms occur, check the machine's ground connections at the cabinet frame, chassis ground and drum ground. These connections should be tight. Check the power cord and receptacle for correct "hot"

and "neutral" polarity. Inspect the carbon brush on slip ring for proper contact, and make sure the metal connection on the brush lead wire going to the electrodes is not touching the drum back. Check for loose or broken wires at the timer, electronic control and electrodes.

If no trouble is found after these checks and the trouble symptom still remains, the electronic control system must be checked.

First discharge the control capacitor by placing the bare ends of  
(Continued on page 73)

Fig. 1—Complete electro-mechanical and electronic control (center area) schematic diagram of Maytag's home laundry dryer that responds automatically to moisture in clothes.



## How C-B Radios Squelch Noises

(Continued from page 35)

associated R-C networks) biased to conduct when signals are received, but, to open on noise pulses. Avc is supplied by V-9A and is filtered by R-57. C-67 responds to noise pulses of short duration. These are fed to V-1B, a noise amplifier, by C-66. After amplification the noise is rectified by V-8C and applied to the avc

bus through R-53. It as a *positive* voltage used to keep a receiver's sensitivity high in the presence of noise, allowing weak signal pickup.

Squelch uses V-9B and V-7A to control V-7B. A cathode bias for V-9B is developed across R-24, the squelch control. For normal reception V-9B rectifies a part of the received signal (when the bias is overcome) and this provides a negative voltage on the grid of V-7A.

When V-7A isn't conducting V-7B operates as a normal amplifier with contact potential bias. With no re-

ceived signal V-7A conducts causing a drop across R-46. This biases V-7B to cutoff. Through R-22 the noise rectifier provides a positive voltage to the grid of V-7A to hold the squelch steady under noisy conditions.

A 6T8 (three diodes and one triode) is used in the circuit of Fig. 6. One diode section of V6 (pins 3 and 2) is used as a series noise limiter. This diode is normally biased for conduction permitting the signal to pass through it. A noise pulse momentarily biases the diode off by applying a negative voltage, caused by the rectified noise pulse, to the plate. The cathode voltage remains constant during a noise pulse because of the time constant provided by R25 and C38.

The triode section of V-6 amplifies the audio and feeds V-7, the audio output tube. A squelch circuit controls the grid of the triode section of V-6. This grid return goes to the squelch control which is part of a voltage divider between the screen of the I-F amplifier V-4 and the negative supply. Bias is set to just cut-off the triode in the absence of a signal.

A received signal causes an increase in the avc voltage which reduces the V-4 screen current. This increases the screen voltage, increases the positive voltage on the triode control grid and the triode conducts. A diode (pins 6 and 7 of V-6) clamps this grid to prevent it from going positive. Contact potential (the drop across R-50), provides operating bias for the triode part of V-6. A diode of V-6 (pins 1 and 7) is the detector for audio and avc.

A few typical squelch and noise limiter-squelch circuits have been discussed. Although a variety of circuits are used, the basic operation is essentially the same.

The price of an individual CB radio will usually govern the type circuit used. The more expensive units naturally employ more effective squelch circuits. •

for outstanding value . . .

## Build Your Own superb Scott Stereo Components!

Have fun . . . save money . . . get the best! Now you can build your own world-famous Scott components . . . and you can make substantial savings compared to the costs of the nearest equivalent factory assembled units.

H. H. Scott kits feature the same engineering, same high performance, same features and parts as do the factory wired components. Tuners have exclusive Scott Wide-Band design with factory aligned silver-plated front ends. Amplifiers use H. H. Scott's superb conservatively rated transformers.

Scott kits are fun to build, too. The wires are pre-cut to exact length and pre-stripped. Instruction books are in full color to help you see exactly what you're doing. Mechanical parts are factory-riveted to the chassis.

For a genuine H. H. Scott system at a real saving, choose from these fine kits:

LT-110 FM Multiplex Stereo Tuner Pre-wired and aligned front end and multiplex sections; Wide-Band design; 2.2 uv sensitivity (IHF); \$159.95\*

LK-48 48-Watt Stereo Complete Amplifier Kit A truly superior amplifier with power enough to drive even the most inefficient speaker systems. Only \$119.95\*

LK-72 72-Watt Stereo Complete Amplifier Kit Fabulous Scott features never before available in a kit: derived center channel controls; tape monitor; \$159.95\*

LT-10 FM Tuner Kit Unique Ez-A-Line alignment system. Sensitivity 2.2 uv (IHF); \$99.95\*

LC-21 Stereo Pre-Amplifier Kit Exceptional versatility. 16 front panel controls; frequency response for optional laboratory applications 8 to 50,000 cps! \$99.95\*

LK-150 150-Watt Stereo Power Amplifier Kit Conservative design, massive transformers unsurpassed performance. \$169.95\*

\*slightly higher West of Rockies.

LK-72 Amplifier Kit



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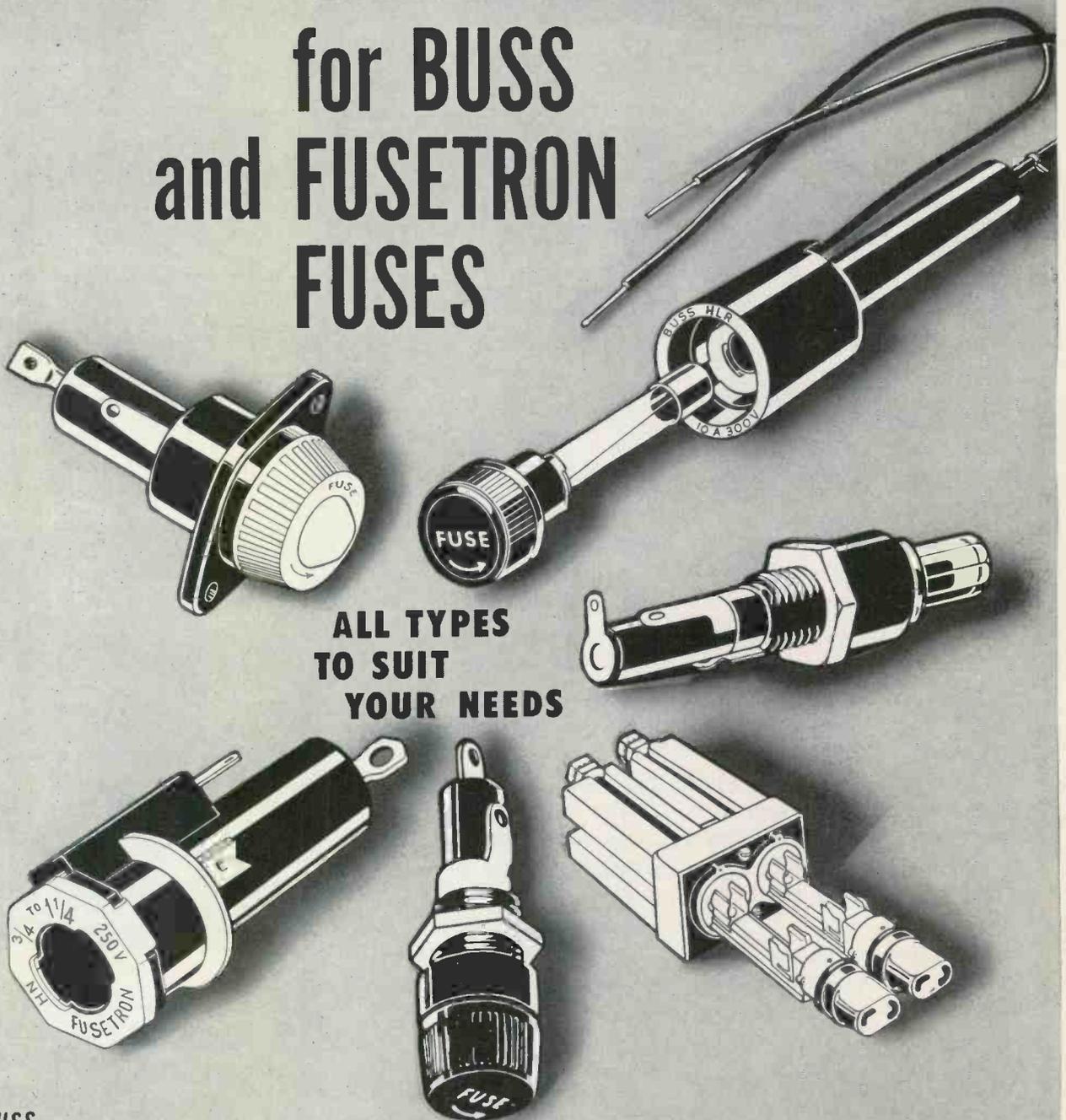
Colorful and detailed 20-page "Guide to Custom Stereo" including complete technical information on Scottkits.

Coming Next Month

How to Correct  
TV Sync Instability

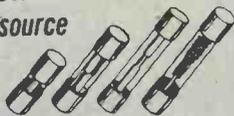
# Fuseholders

for BUSS  
and FUSETRON  
FUSES



ALL TYPES  
TO SUIT  
YOUR NEEDS

**BUSS  
and FUSETRON  
FUSES:** One source  
for all your  
fuse needs.



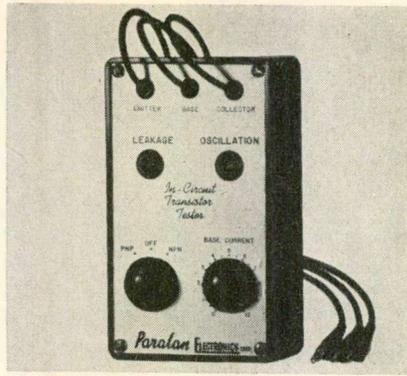
Get full data for your files, write for BUSS  
bulletin, Form SFB—it gives a comprehensive picture  
of the complete line of fuses and fuse mountings of  
unquestioned high quality.

BUSSMANN MFG. DIVISION, McGraw-Edison Co., UNIVERSITY AT JEFFERSON, ST. LOUIS 7, MO.

### Paralan TRANSISTOR TESTERS

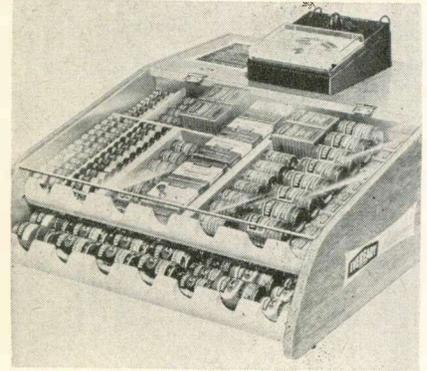
Model #TIC-161 in-circuit transistor tester is reported to test any type of transistor (even a power type) while it is still soldered in a circuit. It tests for short circuits, open circuits, leakage, oscillation, and comparative gain. It indicates whether a transistor is a PNP or NPN type. Will also test diodes and rectifiers of all types. Comes complete with three insulated test leads and batteries. \$15.95. Paralan Electronics Corp., c/o P. C. Paran, 64 Castleton Court, Oceanside, N. Y.

For more data, circle 10-68-3 on coupon, p. 48



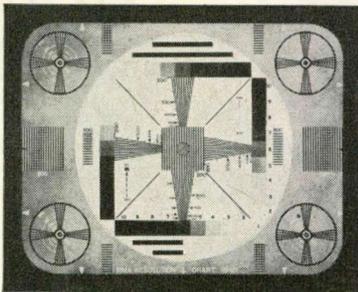
### Eveready BATTERIES

Eveready Battery Service Center, the #6 unit in the firm's Master Showcase series, is a complete self-service battery department which protects, displays, tests and dispenses all battery types. Tests flashlight and radio voltages under load conditions. 18" wide, 22" deep, comes with a battery assortment that covers popular flashlight,



transistor radio and photoflash types. Assortment, \$114.57. Service Center and Tester, without extra cost. Also, not shown, #8 \$463.52; and #7 \$335.50. Union Carbide Consumer Products Co., Div. Union Carbide Corp., 30 E. 42nd St., New York, N. Y.

For more data, circle 10-68-4 on coupon, p. 48



## TV TIPS FROM TRIAD

NO. 14 IN A SERIES

Bill, the Senior PTM, was being stubborn. Which was different.

Al, the Parts Salesman, was being persistent. Which was normal.

"What do you care what the price is, as long as it works? The higher the price the more profit you make?"

"I make, or you make?" asked Bill.

"The greater the profit the less the labor you have to charge for, to make the same money, and the happier the customer," said Al, ignoring the thrust.

"Like indoor antennas, \$11.95 list. I sold quite a few when they were \$2.95 list and forty off. Do you know who sells them now? The discount house and the price: 90¢."

"Well," said Al, changing ground rapidly. "You do need a flyback and I have two brands to choose from. Which will it be?"

"Let's look them over," said Bill, "and I'll decide on the basis of workmanship, appearance, and most complete information. If the price is better, I won't object."

\* \* \*

**MORAL:** Triad's new catalog TV-62 will show that prices have changed very little, but coverage, quality, and associated information are at a new high. If you are not on the permanent mailing list you may secure a copy by asking your Triad Distributor or sending a request to **Renewal Division, Triad Transformer Corporation, 4055 Redwood Ave., Venice, Calif.**

For more data, circle 10-68-1 on coupon, p. 48

**PROOF OF SUPERIORITY  
NO OTHER MICROPHONE  
CAN MATCH!**

**LEADING NEWSWEEKLY  
MAGAZINES PICTURE E-V  
MORE OFTEN THAN THE NEXT  
FOUR BRANDS COMBINED!**

Write now for catalog of  
microphones preferred by top radio, TV,  
newsreel and sound engineers!

**Electro-Voice** ELECTRO-VOICE, INC.  
Commercial Products  
Div., Dept. 10117  
Buchanan, Michigan

For more data, circle 10-68-2 on coupon, p. 48  
ELECTRONIC TECHNICIAN • October, 1961



ELECTRO-VOICE announces a complete direct-replacement phono cartridge line.

J. W. MILLER CO. introduces 5 shielded FM stereo multiplex inductors, as a series for constructing a multiplex unit. Inductors measure  $\frac{3}{4}$ " square x  $1\frac{1}{32}$ " high.

ADVANCED ACOUSTICS announces the Wafaire, 10-watt full range thin speaker system, utilizing the Bi-Phonic soupler principle.  $13\frac{1}{2}$  x  $21\frac{3}{4}$ " x  $3\frac{3}{8}$ " thick. \$69.50. Matched units, \$124.50.

JENSEN INDUSTRIES reports new list price policy. Entire line of diamond needles included mainly in three categories: \$4.95, \$5.95 and \$6.95, with most types falling into the \$4.95 category.

SUPERSCOPE introduces Sony model 111 a-c operated monophonic tape recorder.  $3\frac{3}{4}$  &  $1\frac{1}{8}$  speeds. Simplified one-knob control.  $8\frac{3}{4}$ " x  $4\frac{1}{2}$ " x  $7\frac{1}{2}$ ". 9 lbs. \$79.50 with microphone and case.

LORD'S ELECTRONICS introduces a series of speaker systems, trade marked "Verti-Sonic." Speakers are offered mounted on floor-to-ceiling pole room dividers and as floor models. Prices start at \$129.95.

SONOTONE announces a new, revised Phonograph Reference Chart and Service Guide, listing complete line of firm's stereo-mono, ceramic and crystal cartridges, and 85 record player manufacturers with a total of 1,777 models.

STEPHENS TRUSONIC announces new "10-Year-Plus" speaker warranty plan—a 10 year guarantee plus 10 year renewal provision by original owner. Plan is promoted by consumer ads, trade ads, window/counter displays and merchandise stickers.

RUS-LANG introduces model 12 bookshelf speaker system. Features flexible cabinet end panels of stiff laminated materials mounted on sponge rubber surrounds; 8" speaker; 8 ohms impedance; 20 watts; 6.8 Alnico V magnet; 40-14,000 cps. \$34.95.

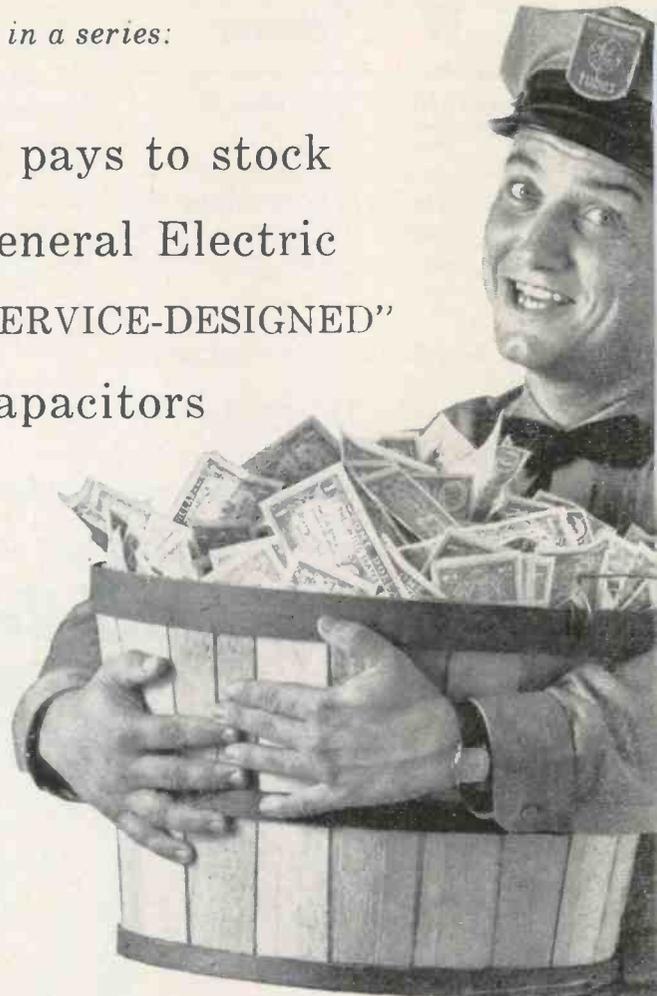
SHURE has created a \$17,000 20th Century Music Room to give away this fall in a nationwide consumer contest. Includes a complete stereo system, piano, furniture and carpeting. \$5,000 cash and \$1,000 in custom blueprints for a remodeled hi-fi showroom go to the distributor conducting the winning demonstration. \$1,000 cash goes to the salesman.

HEATH'S new Kit AA-11 push-button stereo preamplifier features switches and controls divided into two distinct groups. Primary controls, 9 push-button switches are on front panel. Eight secondary switches and controls, behind hinged cover on lower front panel. \$84.95.

J. HERBERT ORR ENTERPRISES announces the OrrTronic modular tapeplayer. Features include unique adaptation of a continuous-play tape cartridge and whip antenna tunable to AM broadcast bands, plays through a radio without direct connections. Frequency response, 50-10,000. Signal noise ratio, —45 db.

1st in a series:

## It pays to stock General Electric "SERVICE-DESIGNED" Capacitors



### INCREASE YOUR PROFITS

Save the premium you pay for slow-moving "exact" replacements in ordinary capacitor lines. General Electric "Service-Designed" capacitors are engineered for both mechanical and electrical interchangeability and are clearly marked for range of capacitance and voltage requirements. No slow movers. No more guessing or substituting for exact replacements. Make all your electrolytic capacitor replacements from smaller inventory and turn it into profits faster.

The complete "Service-Designed" line contains tubulars, twist-prong and miniature electrolytic and paper Mylar\* types. Get the full profit picture from your General Electric capacitor distributor. General Electric Company, Distributor Sales, Electronic Components Division, Room 8247A, Owensboro, Ky.

\*T. M. duPont Company

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

## TV In Germany

(Continued from page 41)

Other points of interest are that new buildings are using master antenna systems. Broadcast satellite translators are used in remote areas.

### Retailers And Service Dealers

Independent TV service dealers

as we know them in the U.S. are virtually non-existent in Germany. A set retailer either has his own service department, or uses the factory's service. Some independents do work on a contract basis for retailers and department stores, but they do not deal with the public. When a set needs repair, the owner almost invariably calls the dealer from whom he bought it.

There are no independent parts distributors as we know them. Tubes, antennas and other items are purchased by the dealer from

the distributor who supplies the sets. There are a small number of special retail shops for hams and hobbyists.

There are perhaps 10,000 to 15,000 TV dealers in West Germany. They receive about 30% discount, and sometimes get co-op ad funds. Most of the time dealers pay for promotion themselves, commonly using newspaper and motion picture ads. Typical dealers carry competing lines.

In Germany, one doesn't simply open a store. A municipal council usually decides first if doing so is in the public interest.

Before a technician can take an examination to get a license as a Master, he must spend 3½ years as an apprentice. A rank beginner might receive about \$100/mo., while the Master Technician earns \$250/mo., which is considered good pay. One-man shops do not need a license; larger ones do.

There are no self-service tube testers, or at least we never ran across any in a dozen cities and towns visited.

Where possible, German technicians try to repair sets in the home. Labor charges range from about \$1.50 to \$2.50 per hour. Very few TV technicians are unionized.

Nowhere in this report have we discussed TV in Eastern Germany. The reason is that TV is a rarity in that economically depressed part of Germany behind the Iron Curtain. In contrast, West German industry is booming, shops are full of goods, international trade is going full tilt, and new buildings have replaced bombed ruins. •

## give faster, better service with GC's NEW RADIO TROUBLE SHOOTER LAB

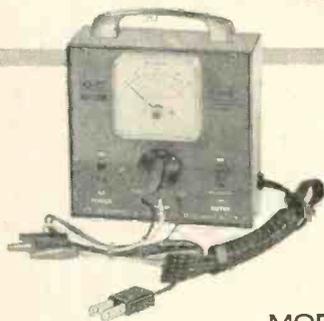
ALL NEW  
indispensable time saver

A needed "right arm" to every serviceman who works on transistorized equipment. Tests PNP, NPN, Power, Diodes, Rectifiers, Semi-Conductors on open or short test, ICO leakage, BETA gain, in-circuit or out-circuit measurements. As a Signal Generator, it emits a 400 C.P.S. audio signal for AF or RF/IF frequencies with variable output level. Use it as a Power Supply—Battery Eliminator at 100 MA continuous use, or up to 300 MA peak. The Volt Meter Milliammeter measures external DC voltage 0-24 and milliameters 0-100 without power supply. 110/115 volt AC 50-60 cycle. Weighs only 5½ lbs. Complete with 3 18" leads, 6 lead jacks, 8-foot built-in power cord, carrying case.

MODEL 36-568

DEALER NET

49<sup>50</sup>



... low cost power supply  
and battery eliminator

For extended operation without batteries at higher or lower than normal output voltage. Well filtered DC 0-24 volts checks current drain; large capacitor filter provides less than a fraction of 1% ripple. Ideal for recharging nickel cadmium batteries, and to align individual stages in transistor radios.

MODEL 36-562 DEALER NET 19<sup>95</sup>

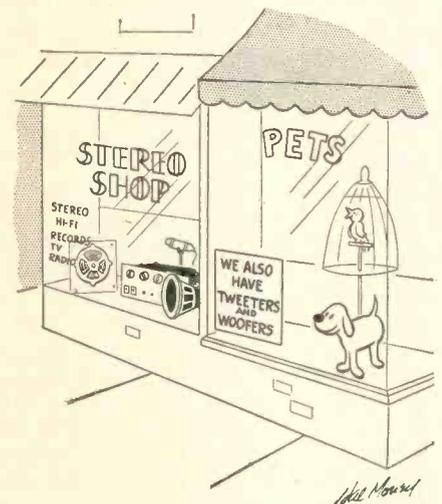
See your GC Distributor, or write for free 16-page Test Equipment Catalog.



more new products, customer-engineered by  
**GC ELECTRONICS COMPANY**

a division of Textron Electronics, Inc.

400 S. WYMAN ST., ROCKFORD, ILL.



# ASSOCIATION NEWS



## Florida

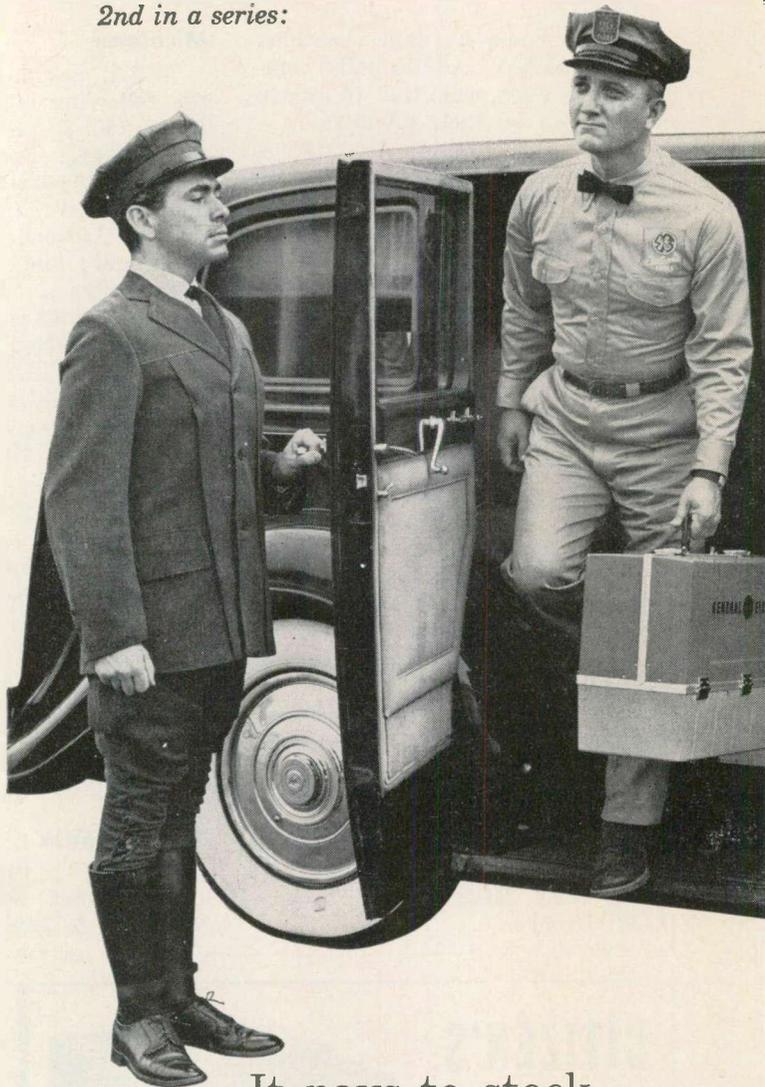
### Sift Ad Claims

TESA, Miami, reports that three local civic-business groups have combined to kill phony advertising in the area. The Better Business Bureau of Greater Miami, Advertising Club of Greater Miami, and the better business division of Miami-Dade County Chamber of Commerce have set up an advertising code which all advertisers are expected to support. A code committee will scan all complaints. They will first call a complaint to the advertiser's and ad-medium's attention. If the situation is not corrected by the advertiser the committee will then present the entire case to the State Attorney's office for prosecution. Provisions of the code include: advertising and selling of goods or services to be made on product merit alone, and prohibition of unethical attacks on a competitor's products or business policies. An advertisement should not present a misleading impression even though every individual statement in it may be literally true. In addition, no reduced price ads may appear if the former "higher price" was based on a fictitious mark-up. TESA, Miami, stated it is heartily in favor of this movement.

## Illinois

NATESA, Chicago, announced election of the following officers: Pres., Ralph Woertendyke; Sec'y-General, John Stafanski; Treas., Nelson Burns. NATESA also reported a unique employment plan utilized by a Toledo, Ohio TV service shop. This employer divides his service force into two groups. Each group alternates working six days (12 hours each day) and off six days; thus, each group has 26 weeks vacation every year. In operation, a group would work Thursday, Friday, Saturday, Monday, Tuesday and Wednesday. They are then replaced for the following six working days by the second group of service technicians. This system enables the shop owner to offer service 13 hours per day without paying overtime to workers. Employees are paid for a 40 hour week although only averaging a 36 hour week for

2nd in a series:



## It pays to stock General Electric "SERVICE DESIGNED" Capacitors

**MAKE AN EXTRA SERVICE CALL A DAY**—With the time you save in single-unit ordering and pick-up from your distributor, you could average one extra service call a day just by stocking G-E "Service-Designed" capacitors. Turn wasted time into profitable time.

General Electric "Service-Designed" capacitors are especially designed to the requirements of the replacement market, based on an exhaustive survey of all capacitors used in radio and television during the past ten years. The result: It is now *practical* for you to stock this important replacement item. Smaller inventory. Faster turnover. More profits because—A FEW WILL DO. For complete information on G-E capacitors, stocking kits and literature, see your authorized General Electric capacitor distributor. General Electric Company, Distributor Sales, Electronic Components Division, Room 8240A, Owensboro, Kentucky.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

For more data, circle 10-71-1 on coupon, p. 48

the year; however, paid vacations are eliminated. Additionally, employees are not permitted to secure employment on their off days.

### Indiana

TVTA, Scott County, has elected the following officers: Pres., Russell Berry; Sec'y, Bert Morgan. The Scott County organization recently joined IESA.

BRTSA, Bloomington, announced the following officers had been elected: Pres., Jess Boruff; V. P., Ross Carter; Sec'y, Ed Lefferson.

IESA, Indianapolis, says it has been reported that a lot of unwarrantable Sylvania receiving tubes are floating around in the Indianapolis area. These tubes are lettered in red with red alphabet code. The regular Sylvania replacement tubes are lettered in yellow with yellow alphabet code. The original equipment tubes are printed in green and have green date type figure codes. Only the latter two, printed in green and yellow, are warrantable.

### Kansas

TESA, Wichita, elected the following officers recently: Pres., Don Shaw; Sec'y, Mike Fowler; Treas., O. W. Brooks.

### Michigan

TESA, Saginaw County, elected the following officers: Pres., Stew Black; V. P., Ken Ackley; Sec'y, Ray Huegel; Treas., Roy Beyer.

TESA, the state organization, announced new officers are: Pres., Charles LaRoche; 1st V. P., Ray Bensinger; 2nd V. P., Jack Hemmert; Sec'y, Howard Larsen; Treas., Harold Ingalls. In addition, the organization has welcomed a new affiliate TESA, Berrien County. The affiliate's first slate of officers are: Pres., Camden M. Miars; Sec'y, Clayton Hill; Treas., Wilbur May.

### New Mexico

TESA, Albuquerque, advises that a new association, the State Television Association has elected the following temporary officers: Pres., Pat Barr; V. P., Alan B. Pickel; Sec'y-Treas., Norman Heck. The organization is reported in favor of State licensing for television and radio technicians.

### Pennsylvania

TSADV, Philadelphia, announced that State Senate Bills Nos. 798 & 799 have been intro-

duced into the State Senate. These bills advocate licensing radio and television service dealers and technicians in this area. Also reported was the show date of the Mid-Atlantic Electrictronics Representatives Association's High Fidelity Stereo show. It will take place October 27-29 at the Ben Franklin Hotel, Philadelphia, Pa.

FRSTA of Pa. announces Plaque and Citation awards will be issued at their October 15 gathering at the Hotel Harrisburgher, Harrisburg, Pa. The "Citation" is a new award that can only be issued to a past Plaque Award winner. This year's Citation will be awarded to ELECTRONIC TECHNICIAN Magazine.

### Virginia

VEA, Lynchburg, announced election of the following officers: Pres., Thomas B. Hudson; V. P., Lloyd O. Pflow; Sec'y-Treas., Earl W. Talley; NATESA Director Alec A. Driskill.

### Wisconsin

TESA, Jefferson and Dodge County, has elected the following officers: Pres., LeRoy Weber; V. P., Ken Wilkes; Sec'y-Treas., Carl Schuett.

## CITIZEN'S BAND RADIO

### CBD-5

5 Channel,  
crystal  
controlled —  
Dual voltage



12 Volts DC/115 Volts AC ... 3.2 Amps full standby current ... Transistor power supply ... Highly sensitive, selective, superheterodyne receiver with RF stage ... 2 IF stages ... Automatic noise limiter ... Adjustable quieting squelch ... Full 5 watt transmitter ... Dual tuned pi-network output circuit ... Universal mounting bracket included.

Five Channel • CBD-5 w/1 pair crystals ..... \$179.50

ALSO AVAILABLE

Single Channel • CBD-1 w/1 pair crystals ..... \$159.50

## PEARCE-SIMPSON, INC.

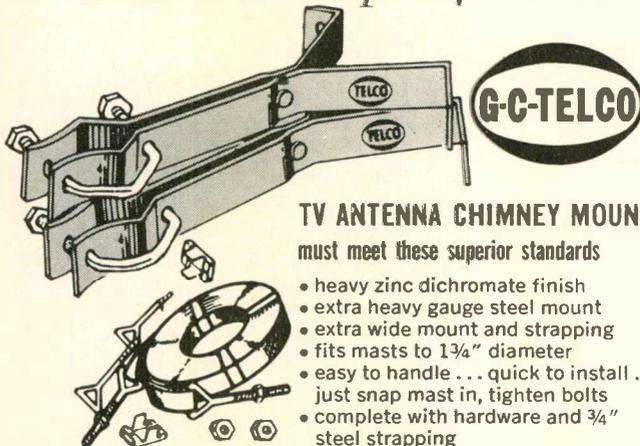
A Leader in Creative Electronics

2295 N. W. 14th ST., MIAMI 35, FLORIDA

DEALER INQUIRIES INVITED

For more data, circle 10-/2-1 on coupon, p. 48

MR. SERVICEMAN...  
*check and compare...do you get  
these valuable plus features?*



TV ANTENNA CHIMNEY MOUNTS  
must meet these superior standards

- heavy zinc dichromate finish
- extra heavy gauge steel mount
- extra wide mount and strapping
- fits masts to 1 3/4" diameter
- easy to handle ... quick to install ... just snap mast in, tighten bolts
- complete with hardware and 3/4" steel strapping

Order Mounts with Galvanized or Stainless Steel Strapping

mount with 24-ft. galvanized strapping  
mount with 36-ft. galvanized strapping  
mount with 24-ft. stainless steel strapping  
mount with 36-ft. stainless steel strapping

CAT. NO.  
8610  
8610L  
8930  
8930L

write for the GC Catalog FR-62 for complete hardware listing



## GC ELECTRONICS CO.

a division of Textron Electronics, Inc.

400 S. WYMAN ST., ROCKFORD, ILL.

For more data, circle 10-72-2 on coupon, p. 48

3rd in a series:

## Home Laundry Dryer

(Continued from page 65)

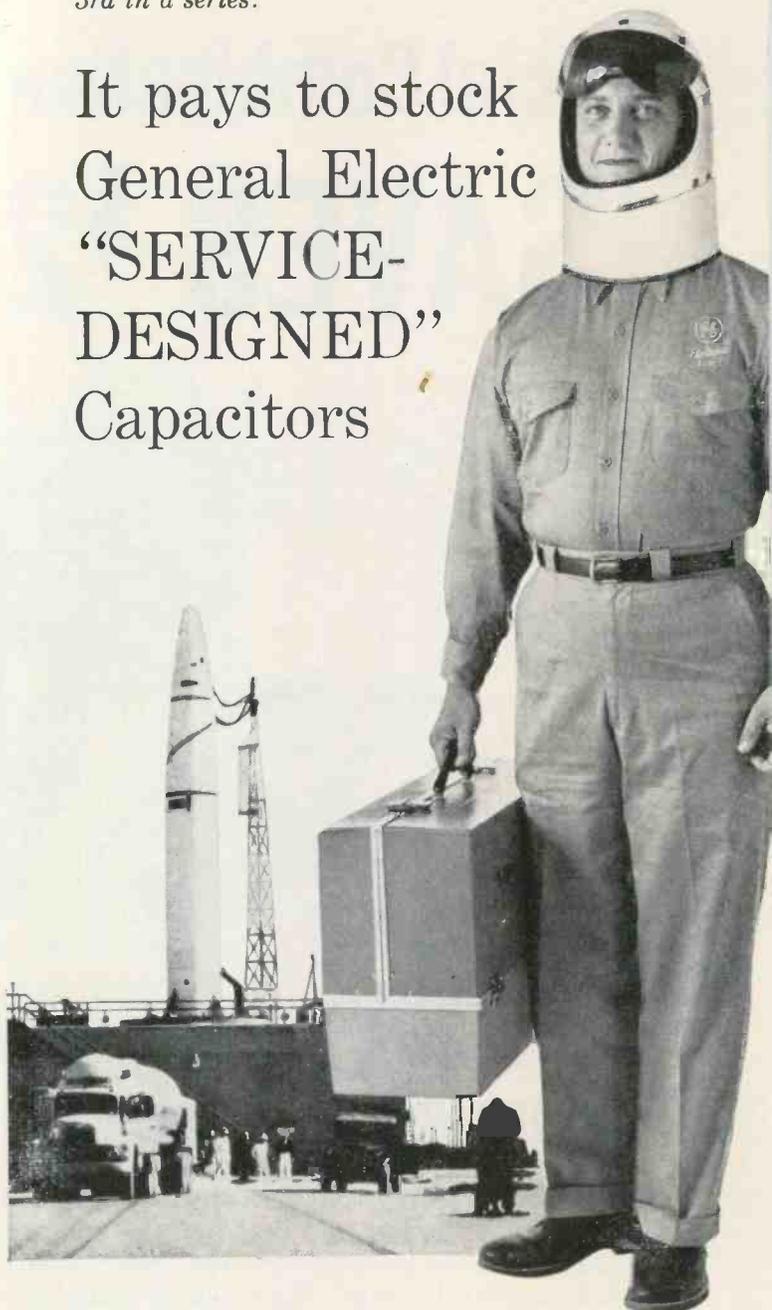
an insulated jumper wire on the two brown terminals. Then proceed as follows:

- (1) Remove electrodes from the control circuit by disconnecting the yellow 19 wire.
- (2) Turn timer dial to "start" position on "Regular Dry" dial setting and pull timer dial out. Use a neon continuity tester and check for power supply to the electronic control in the following manner:
  - a. Place test probes on red 10 control and neutral 13 on timer. Tests power to the relay.
  - b. Place test probes on orange 6 of control and neutral 13 on timer. Tests power to the diode rectifier.

If continuity tester shows no light on one or both tests, replace the timer.

- (3) Remove blue 8 wire from timer and connect it to one lead of a 2-1492 neon lamp. Connect the other

# It pays to stock General Electric "SERVICE- DESIGNED" Capacitors



**BENEFIT FROM G-E LEADERSHIP** in capacitor design and manufacture—General Electric's 70-year record as a leading manufacturer of advanced-design capacitors stands behind this line of replacement capacitors. G-E Alumalytic® Capacitors are being used as original components in many leading radio and TV sets. As the nation's largest supplier of aluminum and tantalum capacitors for military use, General Electric has furnished capacitors for every major U. S. missile. The same design and manufacturing skill that led to General Electric's development of foil-type Tantalytic® capacitors, the type most widely used for critical military applications, has created this line of "Service-Designed" capacitors. Get them from your authorized G-E capacitor distributor. General Electric Company, Distributor Sales, Electronic Components Division, Room 8239A, Owensboro, Kentucky.

the  
business-like  
approach

to  
SERVICE  
CHARGES  
and  
RECORD  
KEEPING



For customer's prices on every replacement part, plus flat rate and hourly service charge data, regional and national. Dave Rice's **OFFICIAL PRICING DIGEST**, listing over 63,000 items. \$2.50.

▲ AVAILABLE FROM YOUR DISTRIBUTOR ▼

If you want to operate on a professional level, Dave Rice's **OFFICIAL ORDER BOOKS** give you triplicate forms for order, invoice, and office records... spaces for tubes, parts, serial numbers, labor and tax charges, signatures, etc. 75c per book, \$6.50 for dust-proof box of 10.



Dave Rice's

**ELECTRONIC PUBLISHING COMPANY, INC.**

133 N. JEFFERSON ST. • CHICAGO 6, ILL.

For more data, circle 10-73-1 on coupon, p. 48

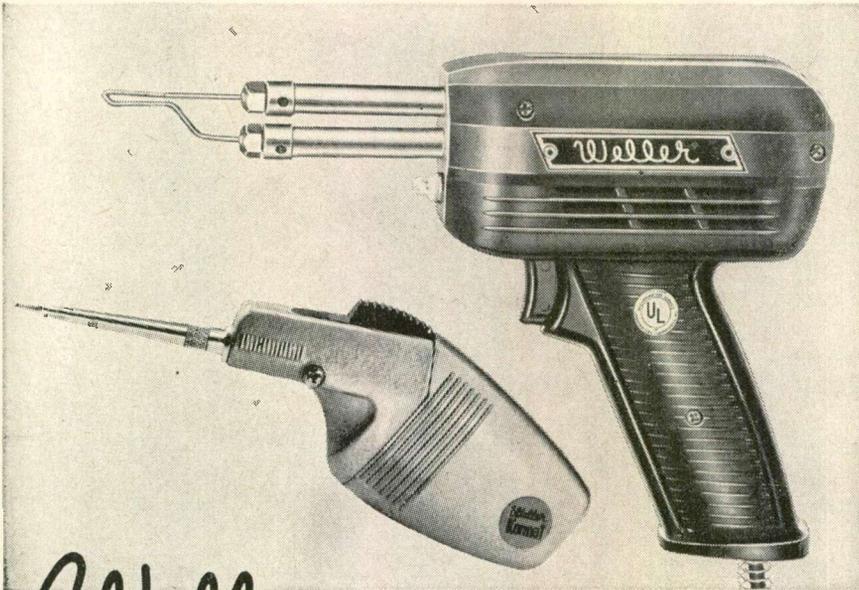
Progress Is Our Most Important Product

**GENERAL ELECTRIC**

For more data, circle 10-73-2 on coupon, p. 48

# Special Combination Offer

# SAVES \$244



## Weller Instant Heat Gun PLUS Solder Dispenser Tool

New, money-saving Weller combination assures faster, better soldered connections. Gun tip heats instantly when trigger is pulled—cools immediately when trigger is released. Spotlight illuminates work. Tip made of copper for maximum heat transfer, iron-plated for long life. Weller-Kormat Dispenser saves time—particularly in difficult-to-reach spots. It eliminates manual handling of the solder, and resulting

contamination that causes faulty connections. It also reduces solder waste and prevents finger burns.



MODEL WK81  
SOLDERING SET

100 Watt Soldering Gun  
Guaranteed 1 year.  
Model 8100B. Reg. list  
price.....\$6.44

Weller-Kormat Dispenser  
for wire solder from .028  
to .074". Reg. list price... \$5.95

Reg. list price value....\$12.39

**COMBINATION** \$9.95  
**PRICE**..... list

AT YOUR ELECTRONIC PARTS DISTRIBUTOR

WELLER ELECTRIC CORP., EASTON, PA.

For more data, circle 10-74-1 on coupon, p. 48

neon lamp lead to neutral post 13 of timer.

a. With timer set to last increment of "Damp Dry," electronic control should energize, and close the neon lamp circuit in 4 to 7 seconds.

b. With timer set on "Wash 'n Wear" or "Regular Dry," electronic control should energize and close neon lamp circuit in no less than 5, but not more than 9 minutes.

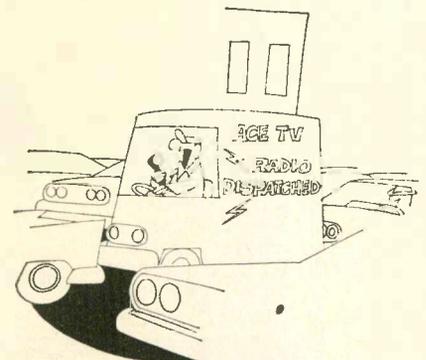
If the electronic control is not activated in the times previously described, the control unit should be replaced.

### Checking Electrodes

To check the baffle mounted electrodes, proceed as follows:

- (1) Discharge the control capacitor as previously described.
- (2) Replace the yellow 19 wire to electronic control unit.
- (3) Connect a 2-1492 neon lamp in the circuit as outlined in step 3 under electronic control test.
- (4) Follow procedures outlined in steps 3a and 3b under electronic control test. The neon lamp should light in not more than an additional 2 minutes.

If the neon lamp does not light as outlined, investigate source of electric leakage between yellow 19 wire and electrodes on drum baffles. Electrical leakage between electronic control and electrodes could be a result of broken insulation on electrode wire or the copper slip ring touching the blower housing or drum casing. Be sure the felt seal is dry; free of any moisture or lubricant. •

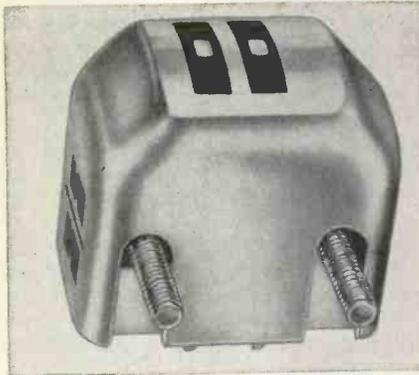


"Oh sure, sure, I'll catch those two callbacks, then rush right over to 14th Street."

### M-M CARTRIDGE TAPE HEAD

The new 5QT17 4-track stereo record and playback head is especially designed for ease in use of cartridge tape. Has a unique tapered profile which permits smooth insertion of cartridge tape. The taper eliminates corners which often catch the tape and interfere with insertion. Specifications for the new "QT" head are identical to those for the 5Q17. Michigan Magnetics, Inc., Vermontville, Mich.

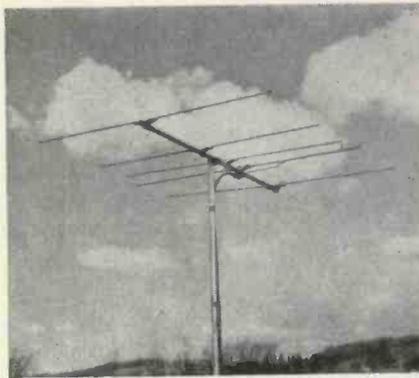
For more data, circle 10-75-3 on coupon, p. 48



### TACO ANTENNAS

Three, five, and ten-element FM gamma-tuned 72-ohm yagis are offered in a new series of FM stereo multiplexer antennas. Each model may be frequency-specified upon order. Advantages include: peak performance through cut-to-specific FM frequency design; gamma-tuned 72 ohm impedance; built-in coaxial connector; quick-rig construction; and full year warranty. Technical Appliance Corp., Sherburne, N. Y.

For more data, circle 10-75-4 on coupon, p. 48



## Miniature I. F. TRANSFORMERS OSCILLATOR COILS and LOOP ANTENNAS

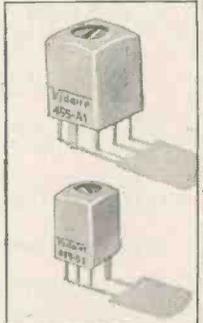
for Transistor Sets

GENERAL REPLACEMENTS FOR  
IMPORTED and DOMESTIC SETS

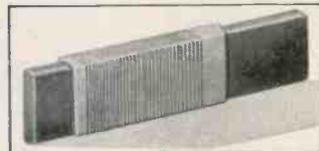
Size  $\frac{3}{8}$ " x  $\frac{3}{8}$ "  
PART NO. OPERATION  
455-A1 INPUT  
455-A2 INTERSTAGE  
455-A3 OUTPUT  
455-OA OSCILLATOR

Size  $\frac{1}{4}$ " x  $\frac{1}{4}$ "  
PART NO. OPERATION  
455-B1 INPUT  
455-B2 INTERSTAGE  
455-B3 OUTPUT  
455-OB OSCILLATOR

Packaged in Plastic See-  
Thru box in display car-  
ton with instruction.



MODEL LA-14  
FOR USE WITH  
148 MMFD.  
TUNING  
CONDENSER  
SIZE  
 $1\frac{1}{16}$ " x  $\frac{1}{16}$ "



MODEL LA-21  
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# Assure Good Steady Extra Income With a Route of 82-A Self-Service Tube Testers

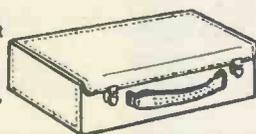
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Yes, not only is the 82-A the lowest priced and most compact Self-Service Tube Tester ever designed, but, the Upright Counter Display Panel slips off in a jiffy, and presto, you have a Standard Portable Tube Tester for bench or field use.



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## New Books

**FILTERS AND ATTENUATORS.** Edited by Alexander Shure. Published by John F. Rider Publisher, Inc., 87 pages, soft cover. \$2.25.

Volume 36 of the publisher's Electronic Technology Series is exceptional: A one-volume collection of theoretical and practical filter-facts, covering power supplies, audio, video and r-f types, was not easy to come by previously. Wide circulation of this book should eventually reduce the number of letters technical editors receive from readers asking for diagrams and component specifications on LC/RC graded filters, cancellation filters, tone compensation, speech clippers, crossover networks, rumble and scratch filters, constant-k and m-derived networks, notch filters and others. Attenuator and equalizer networks are also thoroughly explored. Charts, schematics and drawings are satisfactory.

**NEW SHORTCUTS TO TV SERVICING.** 2-volumes. By Leonard C. Lane. Published by Gernsback Library Inc., 160 pages each volume, soft cover, \$5.90 both volumes. Cloth bound (2-volumes). \$9.90.

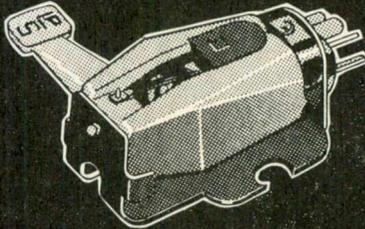
A 2-volume course in practical TV

servicing is based on home study material originally prepared by an electronics school for a TV manufacturer. This is not a book on TV theory. It begins in the first volume with front-end problems, and continues with troubleshooting i-f strips, video detector circuits, agc defects, and sync problems. The second volume covers picture tubes and circuitry, high-voltage, deflection, sound, low voltage, and miscellaneous troubles. It includes bench-tested techniques, tricks and troubleshooting shortcuts. The text is nicely illustrated with photos, drawings and schematics. Recommended as reference volumes or refresher material for anyone engaged in TV repair work.

**COLOUR TELEVISION.** By P. S. Carnt and G. B. Townsend. Published by Iliffe Books Ltd., Dorset House, Stamford Street, London S.E.1., 487 pages, hard cover. \$12.15.

The authors of this book have been actively engaged for some years in developing British color TV equipment adapted to American National Television System Committee (N.T.S.C.) standards. The book defines both the British and Continental versions of the N.T.S.C. system, with particular emphasis on the 405-line British version. Where differences exist between the 405, 525 and 625-line systems, they are fully explained. The first two chapters introduces the reader to color TV and the fundamental theories

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of colorimetry. Color CRT's, cameras and associated equipment are explained fully. Transmitting methods and circuits are reviewed. One chapter is devoted to N.T.S.C. specifications. Receiver and amplifier designs are reviewed. Reference frequency generators, test equipment and performance measurements are included. Chapters also cover receiver installation and troubleshooting. The last chapter analyzes some shortcomings of the N.T.S.C. system. Eight appendices include mathematical formulas for those desiring to apply this method to further understanding of color-burst waveforms, phase detectors, reactance and other special circuit functions. This is a comprehensive and well written book for rounding out the color TV reference library of the service technician as well as the design engineer. Charts, diagrams and photos enhance text material. Some color reproductions are included.

**1540 QUESTIONS & ANSWERS FOR ELECTRICIANS.** Published by Arco Publishing Co., Inc. 480 Lexington Ave., N.Y.C. 180 pages, soft cover. \$3.00.

This book contains many multiple choice questions appearing in various examinations given to aspiring professional electricians. Twelve examination question sections cover practically any question to be expected on an electrician's test. Questions on electric motors, generators and batteries; transformers, switches, electrical measurements, safety and judgement in electrical work, are but a few subjects covered in this manual. Each test section concludes with answers, allowing the prospective electrician to evaluate progress. For anyone desiring to become a professional electrician, this book offers an excellent opportunity for self training.

**FUNDAMENTALS OF UHF.** By Allan Lytel. Published by John F. Rider Publisher, Inc., 153 pages, soft cover. \$3.90.

As its title indicates, this book deals primarily with the fundamental theoretical principles and components used in that section of the radio spectrum called UHF (ultra-high frequency) which extends from 300 to 3000 mc. Chapters cover basics of wave propagation, transmission lines, resonant circuits, oscillators, transmitters, amplifiers and receivers, antennas and microwave component functions. Two final chapters review some UHF equipment applications and test equipment. The text is illustrated with charts, photos and diagrams. It can be recommended to the student as well as the working technician engaged in operating, installing, or maintaining UHF transmitting and receiving equipment.

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## Audio Power Amplifiers

(Continued from page 39)

Now that all the tubes have been checked and replaced where necessary, voltage measurements are in order. Voltages should be checked against values specified by the manufacturer.

B+ voltage measurements should be made by starting at the power supply. The output stage should be investigated next. Then work your way back to the amplifier's input stage. In this amplifier (Fig. 3), you would first check the voltage at pin 3 of V4, followed by the plates, screens and cathodes of V2 and V3. Finally, plate and cathode voltages of triodes V1B and V1A are observed. Improper voltages at any of these elements will indicate which stage requires closer inspection.

If voltage measurements are proper and trouble still exists you'll find signal tracing methods most useful. Before tracing, however, remove the feedback loop by breaking the connection of R11-C7 at the 16 ohm tap of the output transformer. Using the arrangement in Fig. 2, remove the scope's hot lead from the load resistor and use it as a probe. Trace the signal from the input at J1 to the output at the 16 ohm load resistor across the output transformer, applying the probe from grid to plate of each stage. Feed about 1/200 of the normal input signal strength to the input jack on the amplifier to avoid overload.

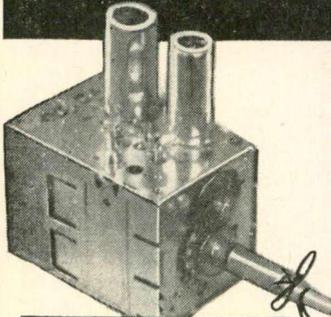
With the level control turned up fully to maximum output, the signals at J1 and pin 2 of V1A should be about equal. A defective or shorted potentiometer or open resistor R2 would alter this condition. The signal at the plate of V1 should naturally be many times that of the input grid. If the signal is not greatly amplified check for an open R4, open R5, or shorted C1. The a-c signal at the plate and cathode of V1B (pins 6 and 8, respectively), must be equal to each other and slightly less than the signal at the grid of that triode. The same signal conditions must exist at V2 and V3's grids. A shorted C3 or C4, or defective R6 or R7 are the most likely suspects to upset this condition. Finally, check the signal

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at the transformer's output taps.

If all indications are normal the difficulty usually exists in the feedback loop, consisting of C7-R11, or some defective forward loop components which can show up bad when the loop is closed—such as C3, C4 or the output transformer.

Voltage measurements and signal tracing may seem to be excess measures to troubleshoot hum complaints. However, many hum complaints are only the most *obvious* failings in an amplifier. A listener generally notices hum before he notices bad distortion or poor frequency response. Thus, hum may be only a side effect. It often is cleared up when other defects are corrected.

Hence, before troubleshooting hum for hum's sake, aside from obvious hum sources, you should be certain that the amplifier operates properly in all other respects. If the amplifier still has excess hum, approach the hum complaint as a separate major problem.

Another type of power amplifier is shown in Fig. 4. We'll dissect this unit too to see where trouble may occur.

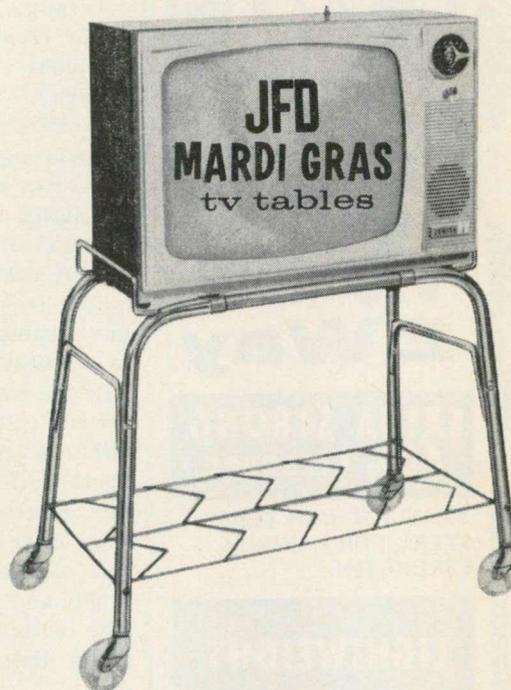
During normal operation a signal is fed through the volume control and parasitic suppressor to a pentode amplifier stage. This is direct-coupled to the cathode coupled phase inverter, V2A and V2B. The output from this is fed to a pair of output tubes, V3 and V4. A fixed bias supply is used in the screen tapped (sometimes called "ultra-linear") mode of operation.

R18 is used for d-c balance control to adjust for equal currents in the two output tubes. R24 is the d-c bias adjustment. It obtains its voltage from a tap of the power transformer's high voltage winding. Except for the bias tap, the power supply is conventional. A separate filament supply for the rectifier is the only addition.

Hum, voltage measurements and signal tracing procedures are similar to those employed with the first amplifier discussed. Two things should be noted here, though. First, there are *two* loops in the feedback circuit from the output transformer—one originating at the 16 ohm tap and another at the 4 ohm tap.

To disable both loops at once when signal tracing, disconnect the feedback circuit from the junction of R5

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80

and R6 in the cathode circuit of the pentode. The second point noted is the minimum hum and d-c balance conditions are identical. Thus, hum due to unbalanced output stages can be eliminated by carefully adjusting the d-c balance control.

Power amplifiers are subject to several major sources of complaints, aside from hum. Distortion is a frequent complaint by many customers.

Distortion degrees can be determined roughly by using the test setup shown in Fig. 2. Feed a sinusoidal signal to the input and observe the waveshape on a scope. If the output power is satisfactory and the output is sinusoidal, you can generally assume that the power amplifier is relatively distortion-free.

If the amplifier is found to be distorted, voltage and signal tracing methods will pinpoint the cause of trouble. If an amplifier checks out fine, a customer should be informed that there are many other distortion sources. The phono-pickup, tuner, and loudspeaker are all subject to this deficiency. In addition, many distortions actually exist in

the home hi-fi setup; they originate in records, tapes and broadcast programs.

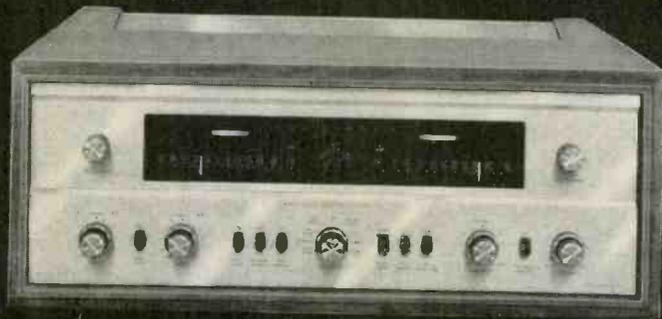
### Other Defects

Another amplifier complaint is poor frequency response. A minimum portion of your filter background will help you to find this type of trouble. Capacitors pass high frequencies and attenuate the lows if a signal is in series with it (Fig. 5). Thus, if a capacitor ages and becomes smaller in value, the lows would be further attenuated. In Fig. 4, C5 and C7 can produce this condition. In Fig. 3, a faulty C2 or C5 will attenuate bass further than it should.

Once again reaching back to your filter knowledge, you know that a capacitor will by-pass the highs without affecting the bass. High frequencies would be excessively attenuated if C2 was excessively large in Fig. 4 or C1, C3 and C4 too large in Fig. 3.

An "unclean" sound is a hi-fi service technician's sore spot. Frequently, an amplifier checks out fine but your customer insists it doesn't

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sound right. The customer could be right! His hearing may be finer than yours. You can double check your hearing by using the setup shown in Fig. 2. Feed a 25 cycle signal to the input of the power amplifier in question. Increase the amplitude slowly to the point of distortion, observing the output on the scope. Do you see pockets of oscillation on the scope trace (similar to that shown in Fig. 6)? This oscillation may make the music sound unclear. It should not exist.

If you see these pockets in the amplifier of Fig. 3, check R5, C1, C3 and C4. If this condition should exist in Fig. 4's amplifier check R8, C2, C8 and C9.

In addition to normal troubleshooting, quantitative tests are frequently desired. IM and harmonic distortion meters should be used for these tests. Square wave testing is frequently desirable, too. There are a number of inexpensive generators now on the market which produce adequate square waves. The square wave can frequently indicate just where the trouble lies. •

## Open Screen By-Pass

(Continued from page 42)

darkened and began to bend. At the end of fifteen minutes all video and sound disappeared, leaving only a raster.

Tube substitutions in the i-f. video output and age circuits, proved fruitless. Consequently, I pulled the chassis.

At the shop, voltage checks were initially normal. But, after about ten minutes the grid voltage (pin 7 of the 8AW8 video output tube) started to swing negative, finally reaching -15 volts at the end of fifteen minutes playing time. This biased the tube beyond cut-off. Additional voltage checks in the age circuit showed no age voltage present. Grounding the grid of the third i-f tube (4BZ6) dropped the grid voltage at the video output tube to normal.

A scope probe was applied to the third i-f tube's plate and the trace showed the tube was oscillating. This led me to believe that a by-pass capacitor must be open. After changing the 470  $\mu\mu\text{f}$  capacitor in the screen grid section of this circuit the set returned to normal operation. We have had three sets with the same symptoms and each time this capacitor was at fault.—  
*Harry Parker, West Palm Beach, Fla.*

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# ATR

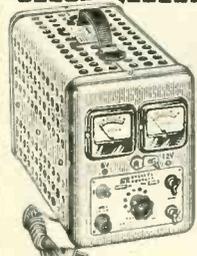
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Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls. 33-in. stainless steel antenna. Neutral gray-tan enameled 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

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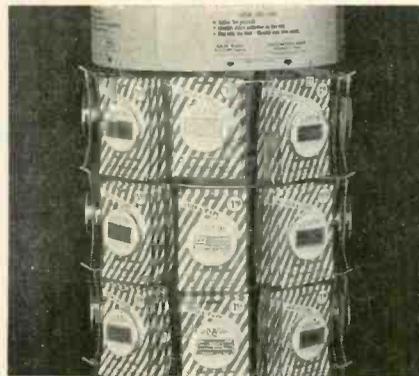
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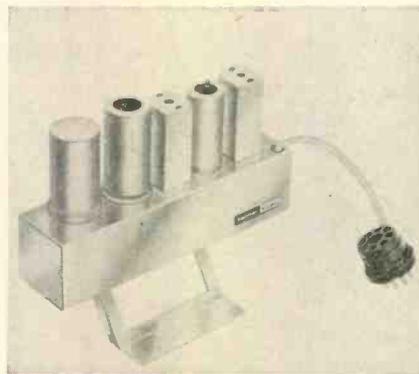


that libraries can be added to or edited. The pre-recording technique on Add-A-Tape is designed to be compatible on either 4 track or 2 track stereo playback. \$1.98, per 15 minute reel. Coleman Electronics Co., 133 E. 162nd St., Gardena, Calif.

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### Harman-Kardon FM STEREO ADAPTERS

Snap-on adapter MX600 snaps on to the rear of stereo receiver models TA230, TA224 and TA260. \$49.95. Also, not shown: MX500, plugs into space provided on chassis of models F500, ST360A, ST360 and ST350. \$39.95. MX700, self-powered, for the firm's tuners with multiplex outputs, \$59.95. And the Citation MA for all



Citation III FM tuners. \$89.95. Tuner and adapter available as single unit, Citation IIIX \$319.90. Citation IIIX kit, consisting of Citation III tuner kit and preassembled multiplex adapter, single package \$239.90. Citation III tuner alone, wired \$229.95. Kit, \$149.95. Harman-Kardon, Inc., Plainview, N. Y.

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# 78

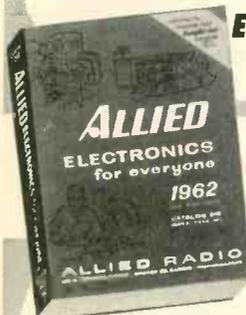
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LOOK! 1,000 USED TV'S

Costly, famous make console models with little or no tube replacement! Re-quire only minor adjustment. Perfect for resale, or as your own second set! 16", 17" and 19" screens none smaller! Sets shipped FOB, Harrison, N.J.

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Factory Used or Factory Second Tubes! TRU-VAC will replace FREE any tube that becomes defective in use within 1 year from date of purchase!

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0Y4	3BN6	5V4G	6AU5GT	6BQ6GT	6CS7	6SA7	7A4/XXL	7Q7	12BA7	12SN7GT	36
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1T4	5AM8	6AH6	6BC5	6CD6G	6H6	6SQ7	7C4	12AQ5	12CN5	19AU4GT	56
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3AL5	5T9	6AS5	6BK7	6CQ8	6S4	6X5GT	7G7	12A27	12S47	35C5	
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3BC5	5U8	6AU4GT	6BN6	6CS6	6S8GT	6Y6G	7N7	12BA6	12SK7	35Z5	

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Picture tubes shipped to continental USA and Canada — All tubes F.O.B. Harrison, N. J.

10B1P4	7.90	16K1P4	11.90	17H1P4	16.90	20H1P4	17.90	21AWP4	17.40	21XP4	17.40
12L1P4	10.40	16L1P4	12.10	17I1P4	16.90	21AP4	21.40	21EP4	17.20	21FP4	18.30
14H1P4	11.90	16H1P4	11.90	17Q1P4	13.80	21ALP4	18.70	21FP4	18.30	21G4	17.40
16A1P4	18.00	17AP4	15.40	17I1P4	18.90	21ATP4	18.70	21KP4	18.30	24AP4	30.40
18H1P4	12.10	17R1P4	13.40	19A1P4	18.30	21AMP4	17.90	21M1P4	22.30	24CP4	27.70
16H1P4	16.00	17C1P4	16.90	20CP4	15.80	21AU4	18.70	21V1P4	18.30	24HP4	29.70
10H1P4	12.10	17G1P4	17.80	20I1P4	15.80	21AV1P4	18.70	21W1P4	17.40		

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Offer limited to the following types only:  
1R5 - 1U5 - 3BC5 - 3BU8 - 5BK7 - 5U8 - 6AQ5 - 6BN6  
6BU8 - 6CD6 - 6EA8 - 6U8 - 12CU6 - 12BH7 - 12W6

UP TO **75% OFF**  
RAD-TEL'S FIRST QUALITY  
**BRAND NEW TUBES**

500 MA SILICON RECTIFIER Epoxy construction, size of 1-watt resistor  
I reverse at 450 Volts .3-ma

30c lots of 20 ea. | 35c lots of 10 ea. | 45c ea.

Each rectifier "Performance Tested" on an American TV Set

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Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
—	6AU7	.61	—	6J6	.67	—	12D4	.69
—	6AU8	.87	—	6J7	.62	—	12DB5	.69
—	6AV6	.41	—	6K6	.63	—	12DE8	.75
—	6AW8	.90	—	6L6	1.06	—	12DL8	.85
—	6AX4	.66	—	6N7	.98	—	12DM7	.67
—	6AX5	.74	—	6S4	.51	—	12DQ6	1.04
—	6AX7	.64	—	6S8	.76	—	12DS7	.79
—	6AX8	.92	—	6SA7GT	.76	—	12DT5	.76
—	6BA6	.50	—	6SG7GT	.41	—	12DT7	.79
—	6BA7	.84	—	6SH7GT	.49	—	12DT8	.79
—	6BA8	.88	—	6SJ7	.88	—	12DW8	.89
—	6BC5	.61	—	6SK7GT	.74	—	12DZ6	.56
—	6BC7	.94	—	6SL7GT	.80	—	12EK6	.54
—	6BC8	.97	—	6SN7GT	.65	—	12EG6	.56
—	6BD5	1.25	—	6SQ7	.73	—	12EL6	.50
—	6BD6	.57	—	6T4	.99	—	12EM6	.79
—	6BE6	.55	—	6T8	.85	—	12EN6	.78

—	6BF5	.90	—	6U8	.83	—	12EZ6	.53
—	6BF6	.44	—	6V6GT	.54	—	12F8	.66
—	6BG6	1.66	—	6V8	.86	—	12FA6	.79
—	6BH6	.65	—	6W4	.60	—	12FM6	.43
—	6BH8	.87	—	6W6	.71	—	12FR8	.91
—	6BJ6	.62	—	6X4	.39	—	12FX8	.85
—	6BJ7	.79	—	6X5GT	.53	—	12GC6	1.06
—	6BK7	.85	—	6X8	.80	—	12J8	.84
—	6BL7	1.00	—	6Y6G	.65	—	12K5	.65
—	6BN4	.57	—	7A8	.68	—	12L6	.58
—	6BN6	.74	—	7AU7	.61	—	12S8	.62
—	6BQ5	.65	—	7B6	.69	—	12SA7	.92
—	6BQ6	1.05	—	7EY6	.73	—	12SF5	.50
—	6BQ7	1.00	—	7F8	.90	—	12SF7	.69
—	6BR8	.78	—	7Y4	.69	—	12SH7	.49
—	6BS8	.90	—	8AU8	.83	—	12SJ7	.67
—	6BU8	.70	—	8AW8	.93	—	12SK7	.74

—	6BX7	1.02	—	8BH8	.90	—	12SL7	.80
—	6BY5	1.15	—	8BN8	.75	—	12SN7	.67
—	6BY6	.54	—	8BQ5	.60	—	12SQ7	.78
—	6BY8	.66	—	8CG7	.62	—	12U7	.62
—	6BZ6	.55	—	8CM7	.68	—	12V6	.53
—	6BZ7	1.01	—	8CN7	.97	—	12W6	.69
—	6BZ8	1.09	—	8CS7	.74	—	12X4	.38
—	6C4	.43	—	8CX8	.93	—	17AX4	.67
—	6C8	.90	—	8EB8	.94	—	17BQ6	1.09
—	6CB6	.55	—	8SN7	.66	—	17D4	.69
—	6CD6	1.42	—	9CL8	.79	—	17DQ6	1.06
—	6CE5	.57	—	11CY7	.75	—	17L6	.58
—	6CF6	.64	—	12A4	.60	—	17W6	.70
—	6CG7	.61	—	12AB5	.55	—	18FW6	.49
—	6CG8	.77	—	12AC6	.49	—	18FY6	.53
—	6CK4	.70	—	12AD6	.57	—	18FY6	.50
—	6CL8	.79	—	12AE6	.43	—	19AU4	.83

—	6CM6	.64	—	12AE7	.94	—	19BG6	1.39
—	6CM7	.66	—	12AF3	.73	—	19T8	.80
—	6CM8	.90	—	12AF6	.49	—	19V8	.79
—	6CN7	.65	—	12AJ6	.46	—	21EX6	1.49
—	6CQ8	.84	—	12AL5	.45	—	25AV5	.83
—	6CR6	.51	—	12AL8	.95	—	25AX4	.70
—	6CS6	.57	—	12AQ5	.60	—	25BK5	.91
—	6CS7	.69	—	12AT6	.43	—	25BQ6	1.11
—	6CU5	.58	—	12AT7	.76	—	25C5	.53
—	6CU6	1.08	—	12AU6	.51	—	25CA5	.59
—	6CY5	.70	—	12AU7	.60	—	25CD6	1.44
—	6CY7	.71	—	12AV6	.41	—	25CU6	1.11
—	6DA4	.68	—	12AV7	.75	—	25DN6	1.42
—	6DB5	.69	—	12AX4	.67	—	25EH5	.55
—	6DB6	.51	—	12AX7	.63	—	25L6	.57
—	6DE6	.58	—	12AY7	1.44	—	25W4	.68
—	6DG6	.59	—	12AZ7	.86	—	25Z6	.66
—	6DK6	.59	—	12B4	.63	—	32ET5	.55

—	6DN6	1.55	—	12BA6	.50	—	32L7	.90
—	6DQ6	1.10	—	12BA7	.84	—	35B5	.60
—	6DT6	.53	—	12BD6	.50	—	35C5	.51
—	6DT8	.79	—	12BE6	.53	—	35L6	.57
—	6EA8	.79	—	12BF6	.44	—	35W4	.42
—	6EB5	.72	—	12BH7	.77	—	35Z5	.60
—	6EB8	.94	—	12BK5	1.00	—	36AM3	.36
—	6EM5	.76	—	12BL6	.56	—	50B5	.60
—	6EM7	.82	—	12BQ6	1.06	—	50C5	.53
—	6EU8	.79	—	12BY7	.77	—	50EH5	.55
—	6EW6	.57	—	12BZ7	.75	—	50L6	.61
—	6EY6	.75	—	12C5	.56	—	57G3	1.00
—	6F5GT	.39	—	12CN5	.56	—	70L7	.97
—	6F6	.69	—	12CR6	.54	—	70Z5	.69
—	6GK6	.79	—	12CU5	.58	—	84/6Z4	.46
—	6GN8	.94	—	12CU6	1.06	—	807	.70
—	6H6	.58	—	12CX6	.54	—	117Z3	.61
—	6J5GT	.51	—			—		

Qty.	Type	Price												
—	OC3	.80	—	2AF4	.96	—	3Q5	.80	—	5AV8	1.01	—	5Y4	.59
—	OZ4	.79	—	2D21	1.20	—	3S4	.61	—	5BC8	.79	—	6A8G	1.20
—	1AX2	.62	—	2EN5	.45	—	3V4	.58	—	5BE8	.83	—	6AB4	.46
—	1B3	.79	—	3A3	.76	—	4AU6	.54	—	5BK7	.82	—	6AC5	1.05
—	1DN5	.55	—	3A4	.60	—	4BA6	.51	—	5BQ7	.97	—	6AC7	.96
—	1G3	.79	—	3AF4	1.02	—	4BC5	.58	—	5BR8	.79	—	6AF3	.73
—	1H5	.54	—	3AL5	.42	—	4BC8	.96	—	5BT8	.83	—	6AF4	.97
—	1J3	.79	—	3AU6	.51	—	4BN6	.75	—	5CG8	.76	—	6AG5	.68
—	1K3	.79	—	3AV6	.41	—	4BQ7	1.01	—	5CL8	.76	—	6AH4	.81
—	1L4	.68	—	3BA6	.51	—	4BS8	.98	—	5CM8	.90	—	6AH6	.99
—	1LD5	.59	—	3BC5	.54	—	4BU8	.71	—	5CQ8	.84	—	6AK5	.95
—	1LD5	.69	—	3BE6	.52	—	4BZ6	.58	—	5CZ5	.72	—	6AL5	.47
—	1LG5	.69	—	3BN6	.76	—	4BZ7	.96	—	5EA8	.80	—	6AL7	1.43
—	1LN5	.59	—	3BU8	.78	—	4CS6	.61	—	5EJ8	.80	—	6AM4	1.50
—	1R5	.62	—	3BY6	.55	—	4DE6	.62	—	5J6	.68	—	6AM8	.78
—	1S2A	.76	—	3BZ6	.55	—	4DK6	.60	—	5T4	.79	—	6AQ5	.53
—	1S4	.59	—	3CB6	.54	—	4DT6	.55	—	5T8	.81	—	6AR5	.55
—	1S5	.51	—	3CF6	.60	—	4EW6	.58	—	5U4	.60	—	6AS5	.60
—	1T4	.58	—	3CS6	.52	—	5AM8	.79	—	5U8	.81	—	6AS6	.80
—	1U4	.57	—	3DG4	.85	—	5AN8	.86	—	5V3	.90	—	6AT6	.43
—	1U5	.50	—	3DK6	.60	—	5AQ5	.52	—	5V6	.56	—	6AT8	.79
—	1V2	.50	—	3DT6	.50	—	5AS8	.86	—	5X8	.78	—	6AU4	.82
—	1X2B	.82	—	3Q4	.63	—	5AT8	.80	—	5Y3	.46	—	6AU6	.52

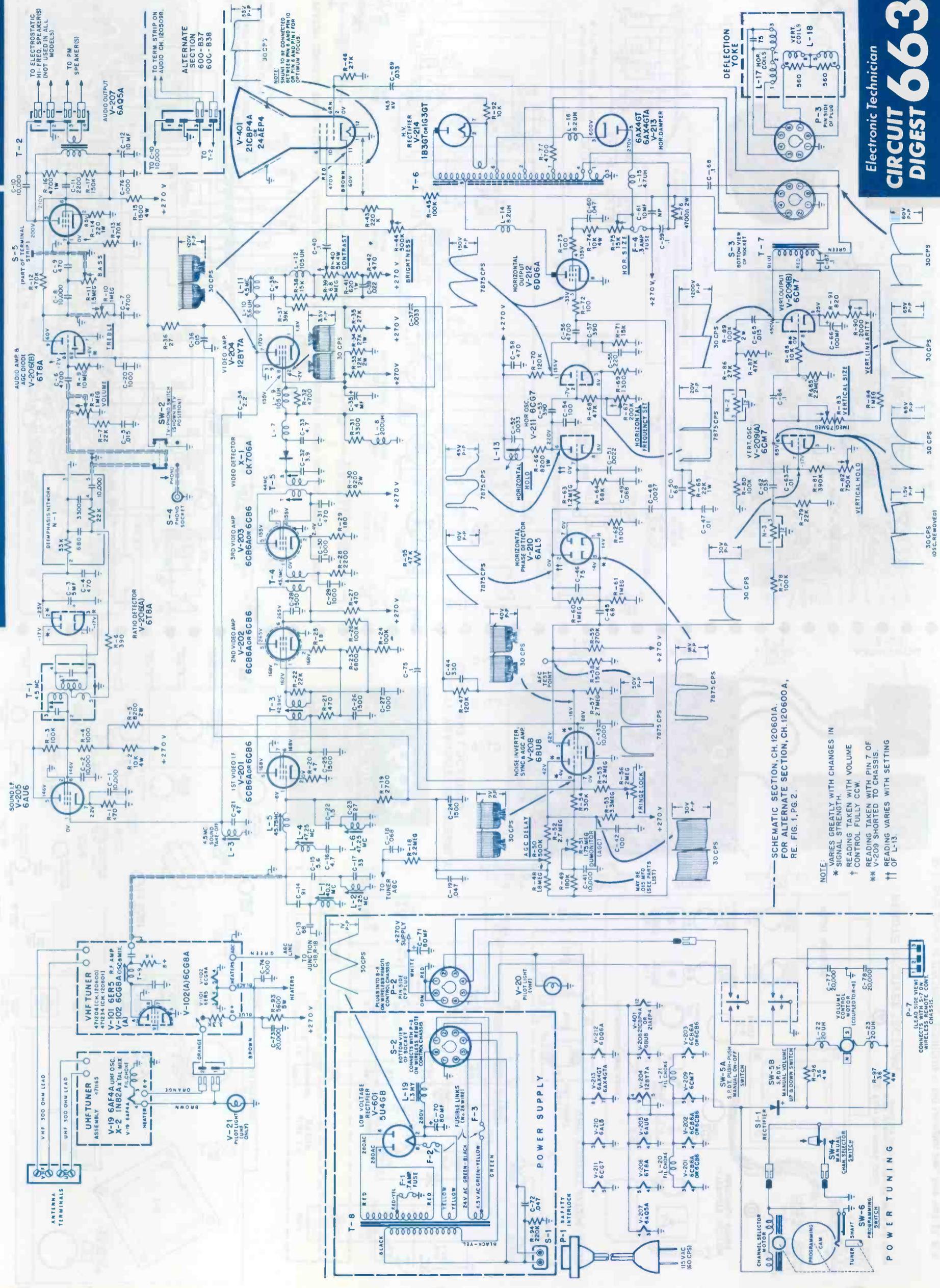
• NOT AFFILIATED WITH ANY OTHER MAIL ORDER TUBE COMPANY •

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

# RAD-TEL TUBE CO.

DEPT. ET-1061 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.



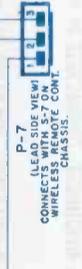
SCHEMATIC SECTION, CH. 120600A, FOR ALTERNATE SECTION, CH. 120601A, RE. FIG. 1, PG. 2.

NOTE:  
 \* VARIES GREATLY WITH CHANGES IN SIGNAL STRENGTH.  
 † READING TAKEN WITH VOLUME CONTROL FULLY CCW.  
 \*\* READING TAKEN WITH PIN 7 OF V-209 SHORTED TO CHASSIS.  
 †† READING VARIES WITH SETTING OF L-13.

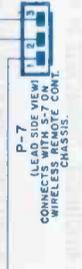
### POWER TUNING



### POWER SUPPLY



### DEFLECTION YOKE



### VIDEO DETECTOR



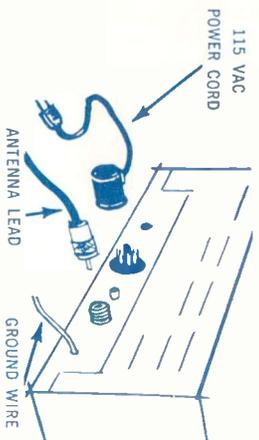
### AUDIO AMPLIFIER







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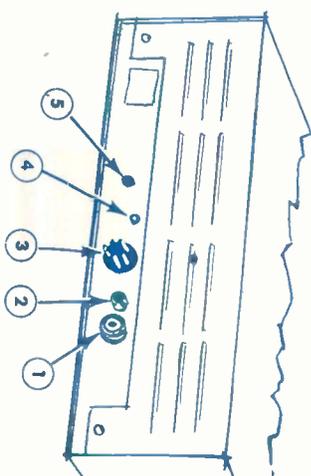
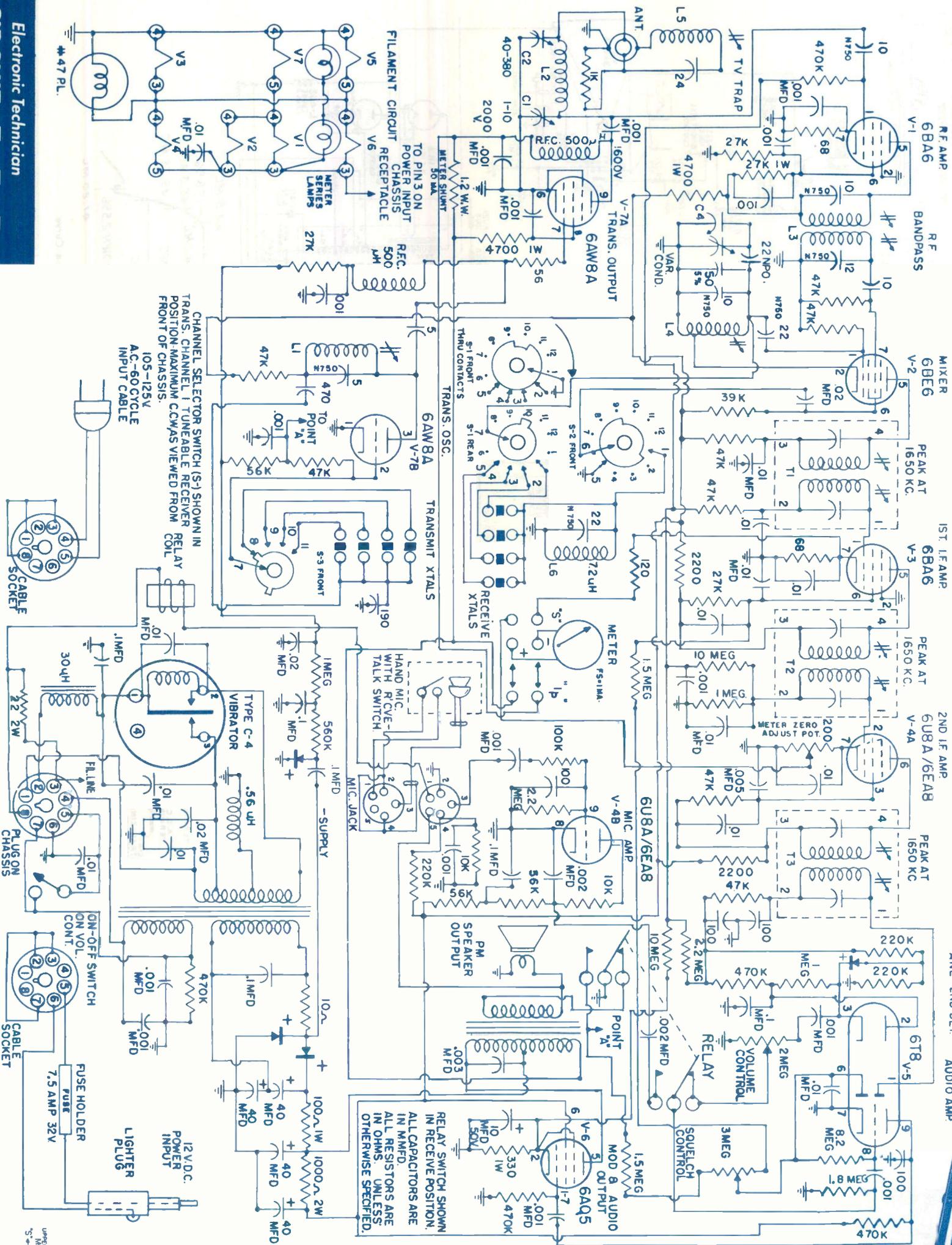


### RECEIVER

Sensitivity—1 $\mu$  volt  
Image Rejection—45db  
Selectivity  $\pm$  3 kc a 6 db  
IF Frequency 1650 KC  
Noise Limiter—Series Gate  
Audio Output—3 watts

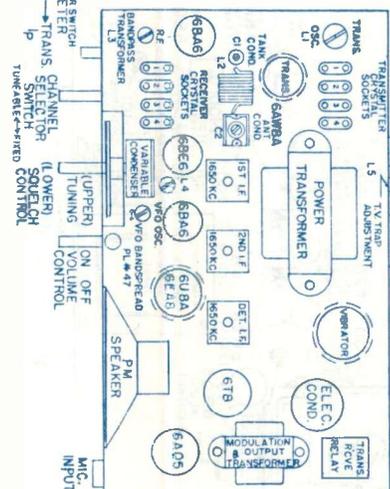
### TRANSMITTER

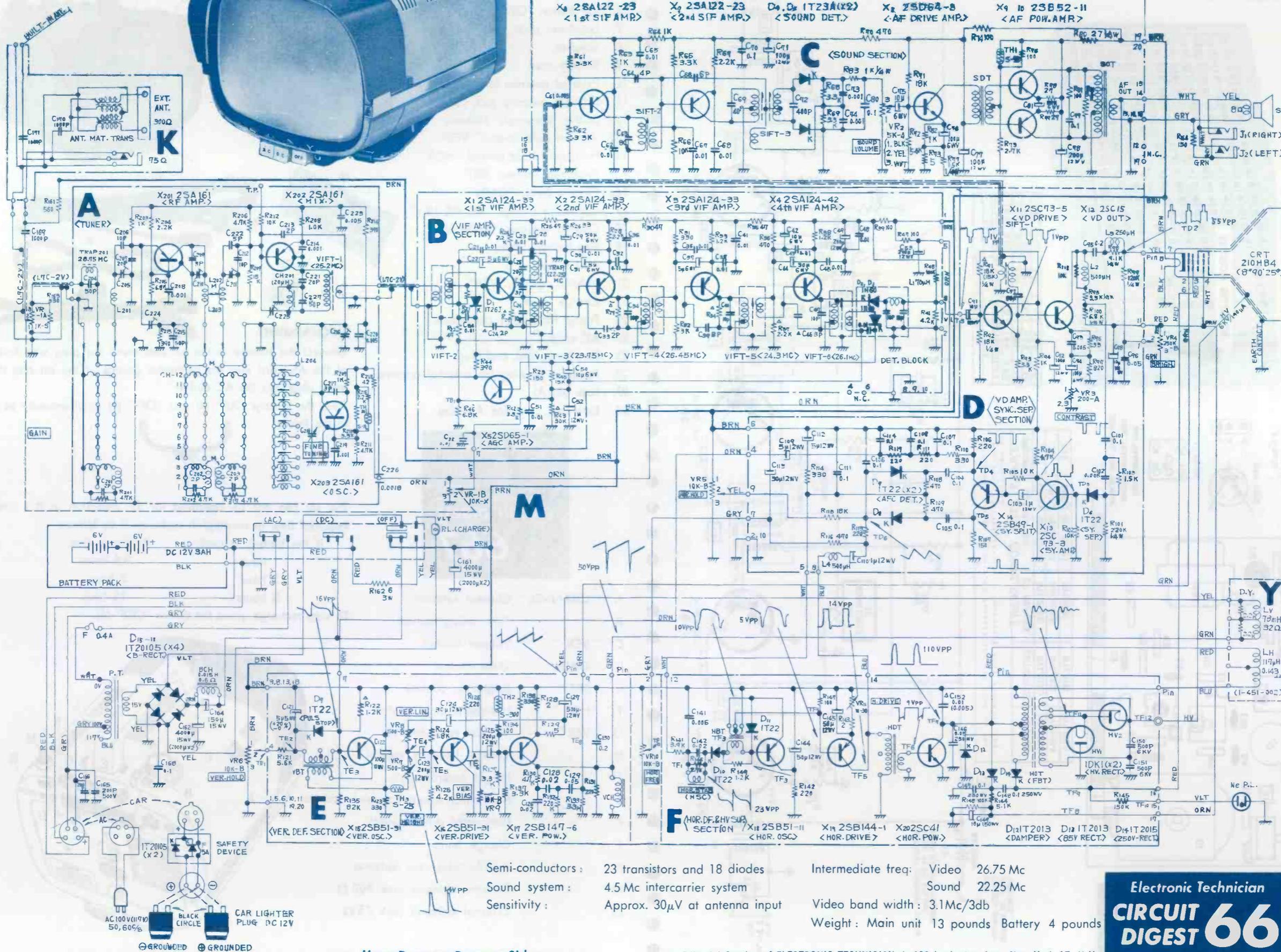
Oscillator using 3rd Overtone crystal control.  
Input Power—5 watts,  
Amplitude Modulation  
Pi-Network Output



### REAR APRON

- 1 ANTENNA CONNECTOR—For insertion of antenna cable terminated in a PL-259 connector as described in the section on antennas.
- 2 T. V. INTERFERENCE TRAP—For suppression of television interference. If this trouble occurs, see the section on interference.
- 3 POWER JACK—An Octal jack to mate with the octal plugs on the ends of the power cables.
- 4 SELF-TAPPING SCREW—For attaching a metal strap to obtain additional support in mobile operation.
- 5 METER ADJUST.—To adjust the "S" Meter for 0 reading with the meter switch in "S" position and no antenna connected.





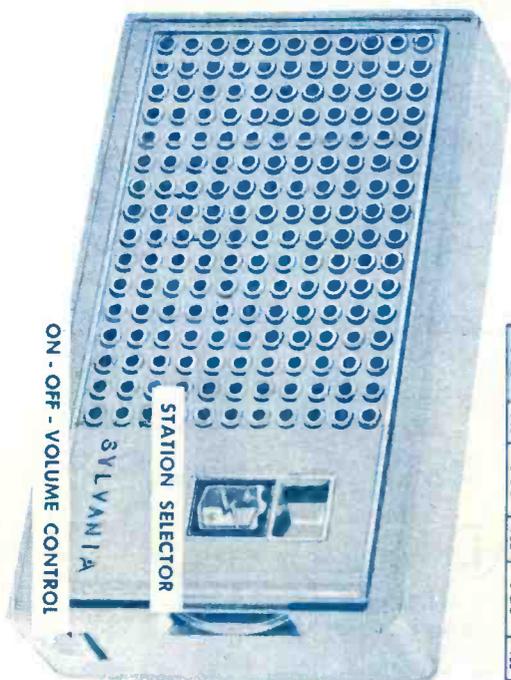
Semi-conductors : 23 transistors and 18 diodes  
 Sound system : 4.5 Mc intercarrier system  
 Sensitivity : Approx. 30 $\mu$ V at antenna input

Intermediate freq: Video 26.75 Mc  
 Sound 22.25 Mc  
 Video band width : 3.1Mc/3db  
 Weight : Main unit 13 pounds Battery 4 pounds

More Data on Reverse Side

An Editorial Service of ELECTRONIC TECHNICIAN ☆ 480 Lexington Ave., New York 17, N.Y.

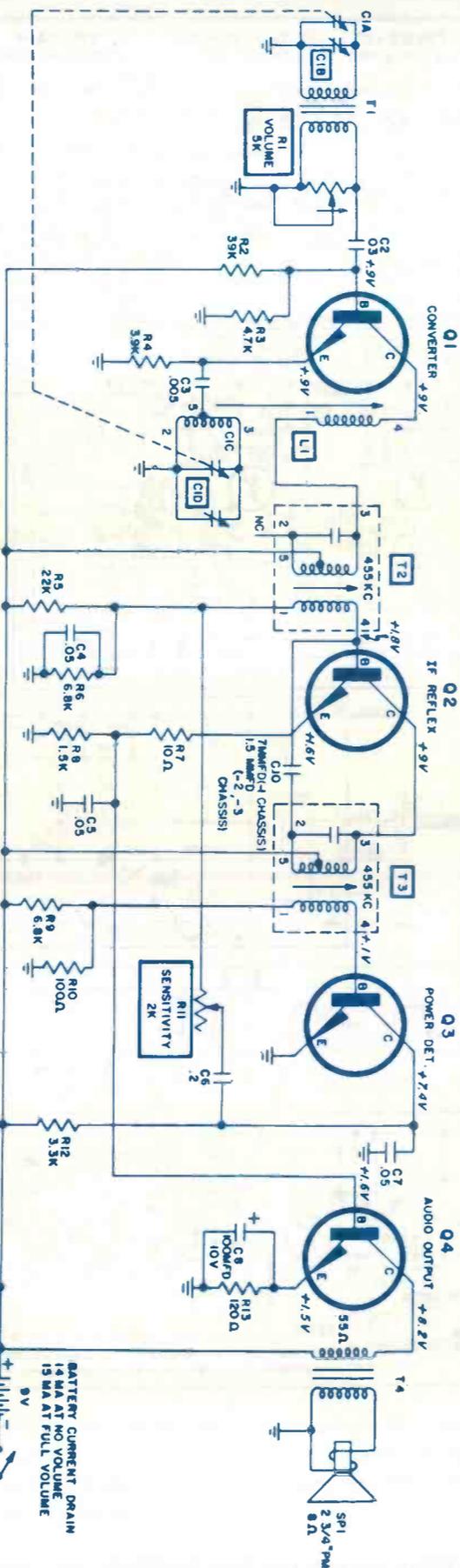
October • 1961



L1	BETWEEN RES	BETWEEN RES	T2	BETWEEN RES	BETWEEN RES	T3
1.04	1.5Ω	1.04	1.5Ω	1.04	1.5Ω	
2.03	0.5Ω	2.03	6.5Ω	2.03	6.5Ω	
2.05	.5Ω	2.05	2.5Ω	2.05	2.5Ω	
3.05	8Ω	3.05	4Ω	3.05	4Ω	

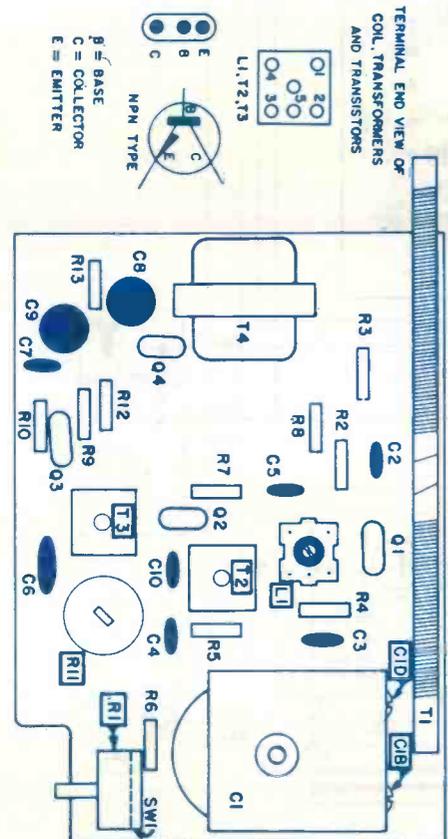
**IMPORTANT:** Groups of matched transistors are used in this receiver. If replacement is necessary same grouping must be maintained.

GROUP	CONVERTER	IF REFLEX	DETECTOR	OUTPUT
I	2N212 (SYL2133)	SYL2132	SYL2130	SYL2136
II	2N212 (SYL2133)	SYL2132	SYL2131	SYL2134
III	2N212 (SYL2133)	SYL2131	SYL2131	SYL2135



BATTERY CURRENT DRAIN  
15 MA AT NO VOLUME  
15 MA AT FULL VOLUME

SW1 SWITCH ON/OFF PAINT OF VOLUME CONT. NO.

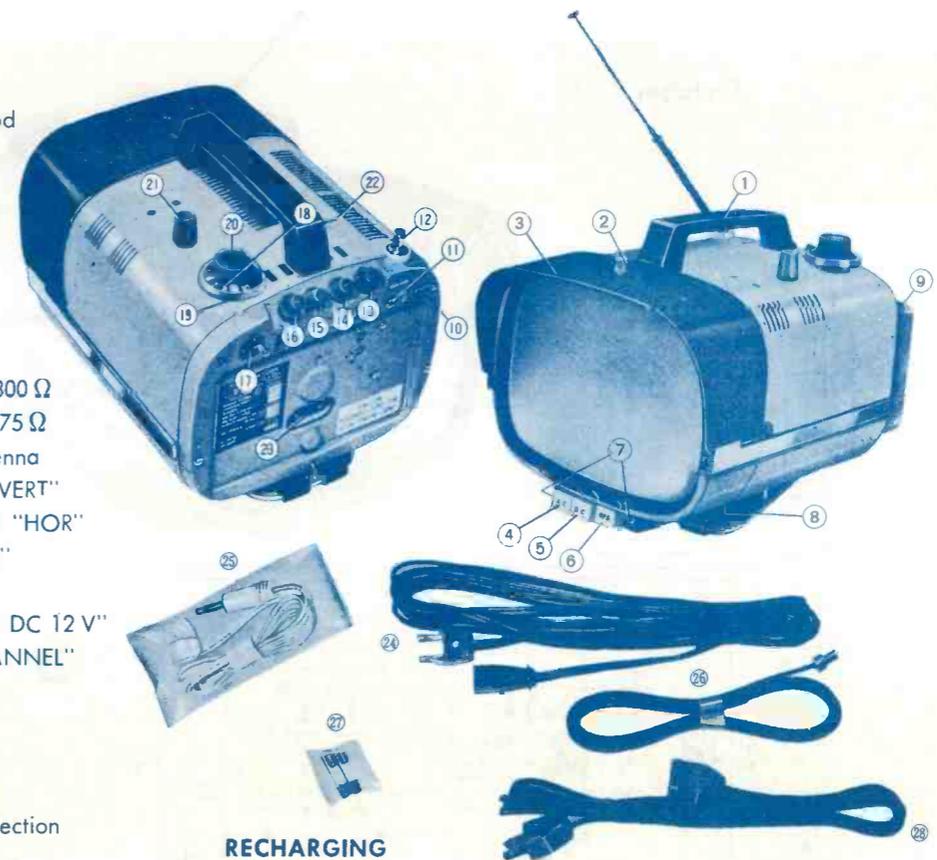


1. Carrying handle
2. Securing screw for hood
3. Hood
4. AC button "AC"
5. DC button "DC"
6. Off button "OFF"
7. Earphone jacks
8. Speaker
9. Battery case
10. External antenna jack 300 Ω
11. External antenna jack 75 Ω
12. Built-in telescopic antenna
13. Vertical hold control "VERT"
14. Horizontal hold control "HOR"
15. Brightness control, "BRT"
16. Gain control, "GAIN"
17. Connector prongs, "AC DC 12 V"
18. Channel selector, "CHANNEL"
19. Fine tuning control
20. Pilot lamp
21. Volume control, "VOL"
22. Charge lamp
23. Prongs for battery connection
24. AC cord
25. Earphone, cord, and plug
26. Feeder with plug for external antenna
27. Fuse (0.4 A)
28. Extension cord for AC line

**SONY**  
Transistor TV  
Model 8-301

Electronic Technician  
**CIRCUIT DIGEST**  
**667**

- A "CHANNEL" Channel selector
- B Fine tuning control
- C "VOL" Volume control
- D "GAIN" Gain control
- E "BRT" Brightness control
- F "HOR" Horizontal hold control
- G "VER" Vertical hold control
- H Vertical linearity control
- I Height control
- J Horizontal sweep frequency control
- K Horizontal drive control
- L Charge lamp
- M Built-in telescopic antenna
- N External antenna jack 300 Ω
- O External antenna jack 75 Ω



**RECHARGING**

Connect the battery to the set and insert the plug with four holes of the AC cord into the connector prongs of the set and the other plug into the AC outlet. Press the buttons "AC" (4) and "OFF" (6) simultaneously as shown in the figure.



The set can not be operated for TV reception in this condition. Required time to accomplish recharge is as follows:

If the battery is used	Recharge time
1 hour	3.5 hours
2 hours	7 hours
3 hours	10 hours

To stop recharge, press the button "OFF" (6).

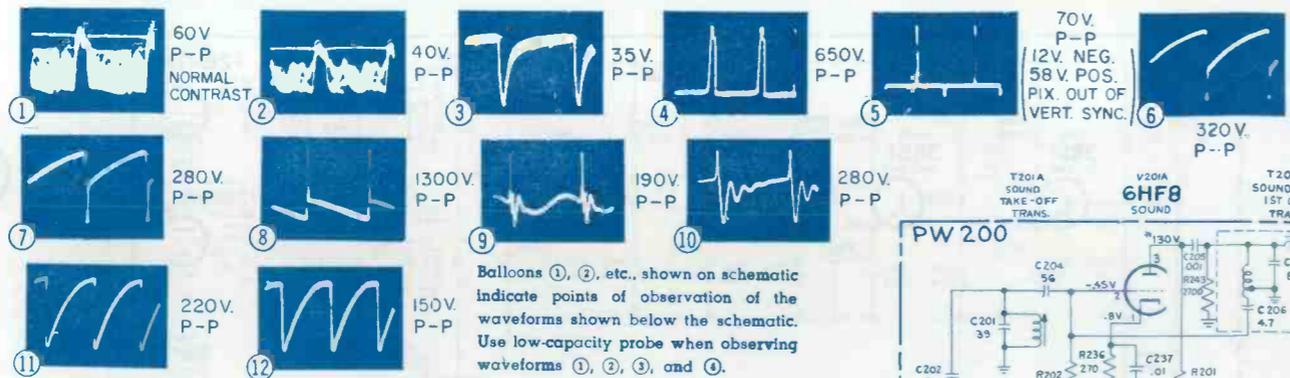


# ELECTRONIC TECHNICIAN 669

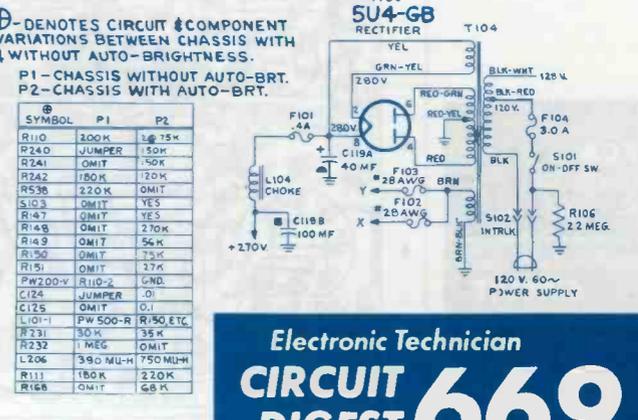
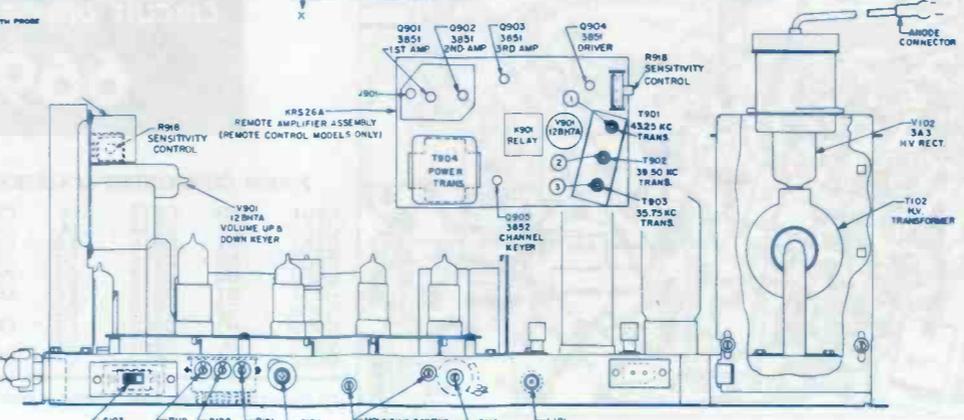
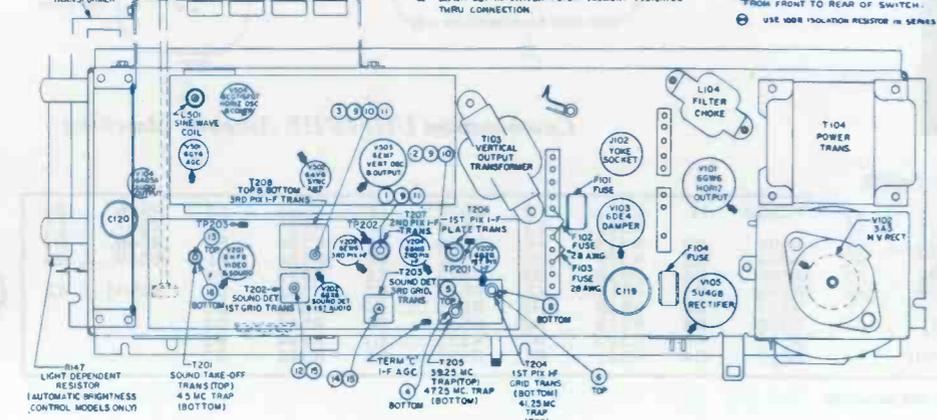
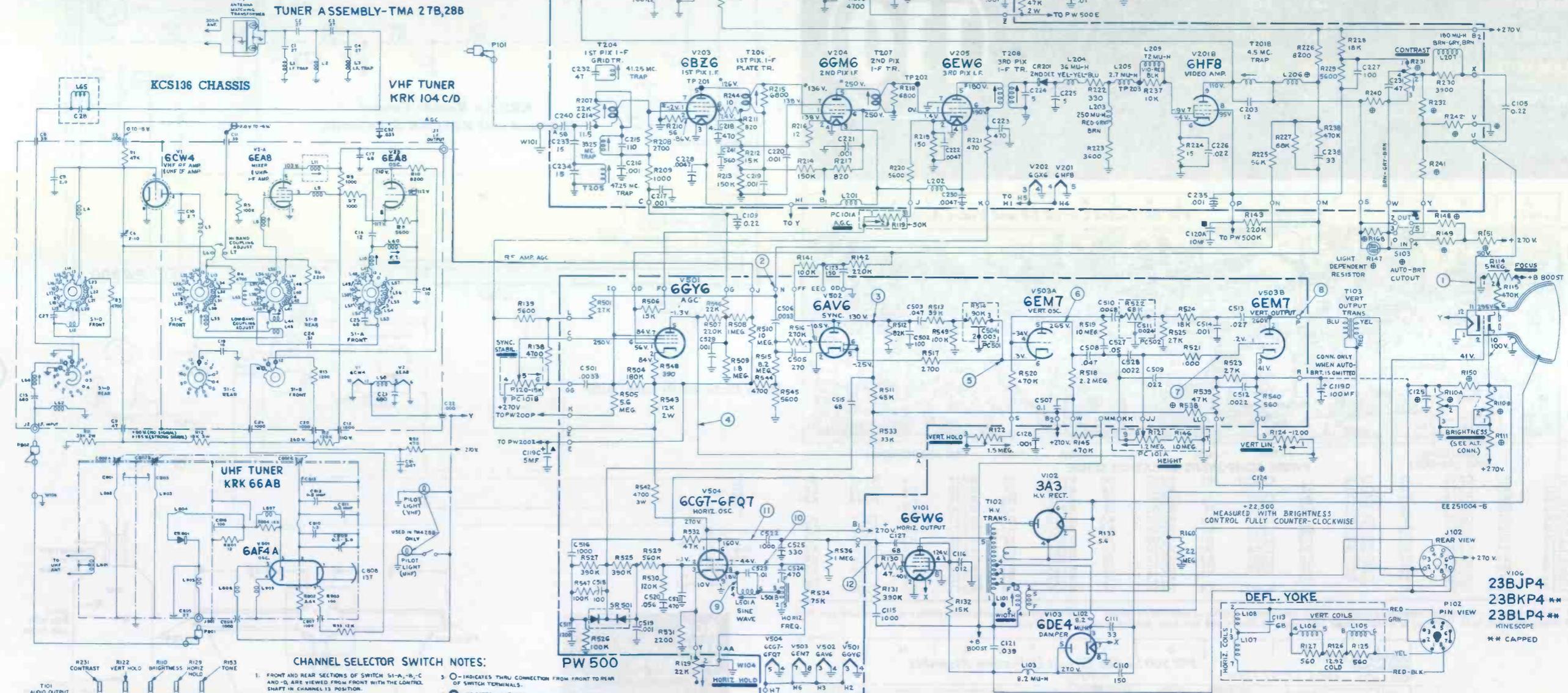
## CIRCUIT DIGEST

RCA  
TV Chassis  
KCS 136 Series

October • 1961



Balloons ①, ②, etc., shown on schematic indicate points of observation of the waveforms shown below the schematic. Use low-capacity probe when observing waveforms ①, ②, ③, and ④.



# ELECTRONIC TECHNICIAN

Trademark

## CIRCUIT DIGESTS

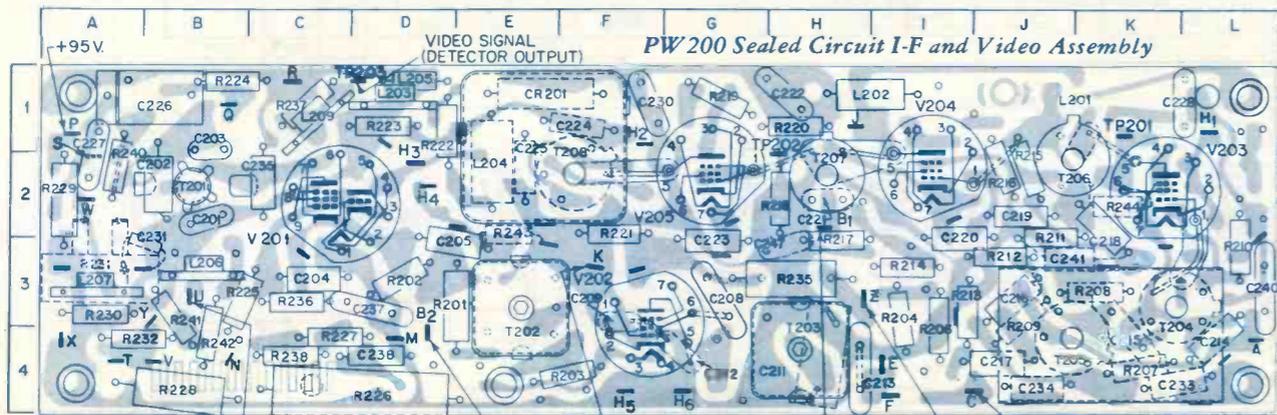
In This Issue (No. 110)

Circuit Digest Schematic No.

- DUMONT** TV Chassis 120600-A, 120601-A **663**
- GAMBLE-SKOGMO** TV Chassis TV-9620A **665**
- LAFAYETTE RADIO** Citizens Bond Radio, Model HE-20A **666**
- MOTOROLA** Auto Radio 1961 Plymouth Model MoPar 109 **664**

- RCA** TV Chassis KCS 136 Series **669**
- SONY** Transistor TV Model 8-301 **667**
- SYLVANIA** Transistor Radio Chassis 682-1, -2, -3 Model 4P19 Series **668**

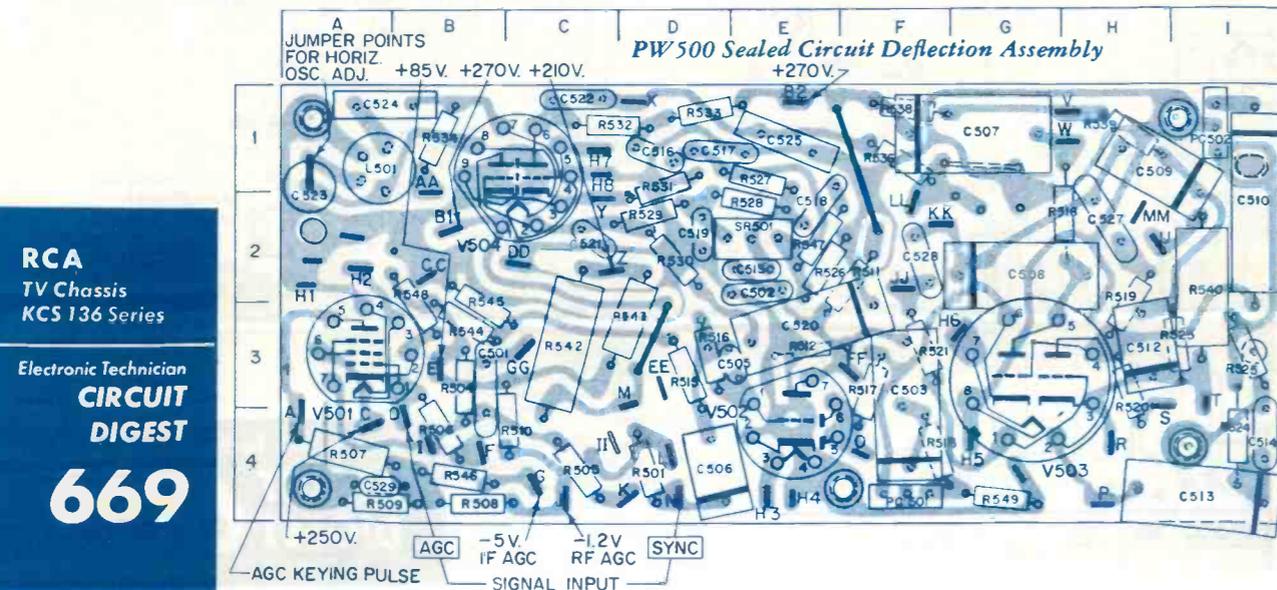
GROUP  
**110**



**PW200 COMPONENT LOCATION GUIDE**

C201	B2	C216	J3	C228	L1	CR201	E1	R202	D3	R215	J2	R227	C4	R242	B4
C202	B2	C217	J4	C230	F1	R203	F4	R216	J2	R228	B4	R243	E2	R244	K2
C203	B1	C218	K2	C231	B3	L201	J1	R204	I3	R217	H3	R229	A2		
C204	C3	C219	J2	C233	L4	L202	I1	R206	I3	R218	H2	R230	A3		
C205	D2	C220	I2	C234	J4	L203	D1	R207	K4	R219	G1	R231	A3	T201	B2
C208	G3	C221	H2	C235	C2	L204	E2	R208	K3	R220	H1	R232	A4	T202	E3
C209	F3	C222	H1	C237	D3	L205	D1	R209	J3	R221	F2	R235	H3	T203	H4
C211	H4	C223	G2	C238	D4	L206	B3	R210	L3	R222	D1	R236	C3	T204	K3
C212	G4	C224	F1	C240	L3	L207	A3	R211	J2	R223	D1	R237	C1	T205	K4
C213	H4	C225	E2	C241	J3	L209	C1	R212	J3	R224	B1	R238	C4	T206	K2
C214	L4	C226	B1	C247	H3			R213	I3	R225	B3	R240	A2	T207	H2
C215	K4	C227	A1			R201	E3	R214	I3	R226	D4	R241	B3	T208	F2

\*In TV-only models; jumpered in combination models. †In TV-only models; omitted in combination models. ‡In chassis without auto-brite; omitted in chassis with auto-brite.  
 ◊In chassis with auto-brite; jumpered in chassis without auto-brite. \*In chassis with auto-brite; omitted in chassis without auto-brite.



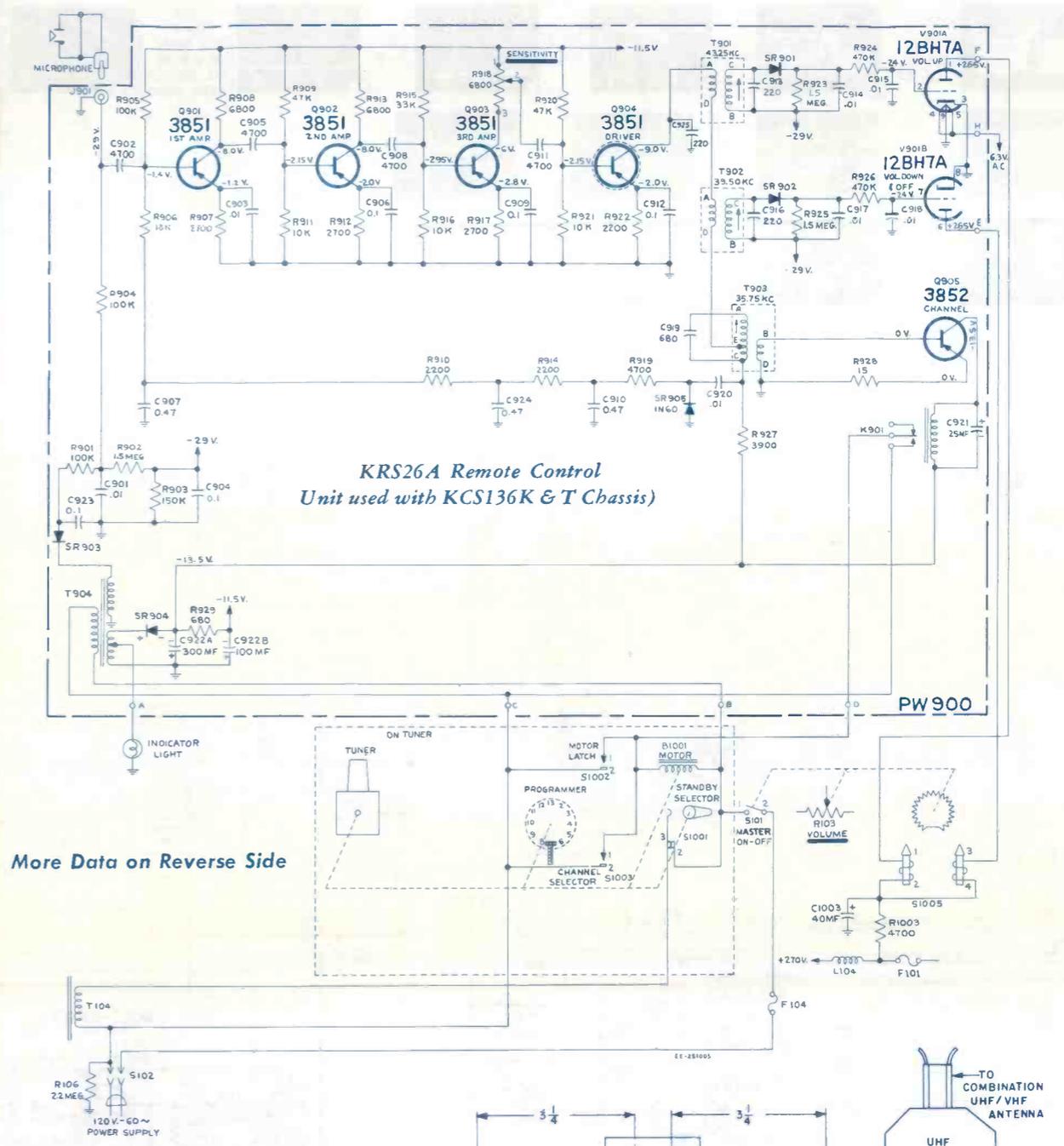
**RCA**  
TV Chassis  
KCS 136 Series

Electronic Technician  
**CIRCUIT DIGEST**  
**669**

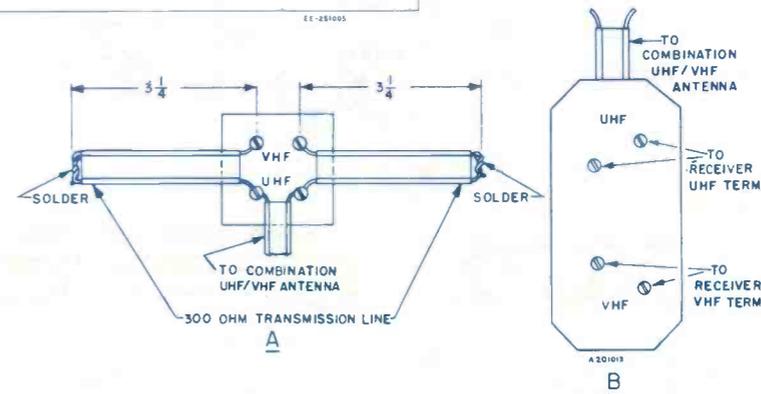
**PW500 COMPONENT LOCATION GUIDE**

C501	B3	C513	I4	C523	A1	PC502	I1	R511	F2	R523	I3	R533	D1	R546	B4
C502	E2	C514	I4	C524	A1	R501	D4	R512	E3	R524	I4	R534	B1	R547	E2
C503	F3	C515	E2	C525	E1	R504	B3	R513	F4	R525	I3	R535	F1	R548	B2
C505	D3	C516	D1	C527	H2	R505	C4	R515	D3	R526	E2	R536	F1	R549	G4
C506	D4	C517	D1	C528	F2	R506	B4	R516	D3	R527	E1	R537	H1		
C507	G1	C518	E2	C529	A4	R507	A4	R517	F3	R528	E2	R538	I2	SR501	E2
C508	G2	C519	D2			R508	B4	R518	H2	R529	D2	R539	C3		
C509	H1	C520	E3	L501	A1	R509	A4	R519	H2	R530	D2	R540	D3		
C510	I2	C521	C2			R510	C4	R520	H3	R531	D1	R541	B3		
C512	H3	C522	C1	PC501	F4			R521	F3	R532	C1	R542	B2		

‡In chassis without auto-brite; omitted in chassis with auto-brite.



More Data on Reverse Side



INDIVIDUAL  
WIDE-VIEW  
SCALE FOR  
EACH RANGE  
GIVES

# Quick, Direct, Error-Free Readings *without Multiplying!*



## New VTVM DYNAMATIC 375 Automatic Vacuum-Tube Voltmeter

- Individual Full-Size Scale for Each Range
- Range Switch Automatically Sets Correct Scale
- Only One Scale Visible at Any One Time
- All Scales Are Direct Reading
- No Multiplying . . . No False Readings
- Includes DC Current Ranges, too

Here's another exciting first by B&K. With direct-reading single scales, this professional automatic VTVM makes it easier, faster than ever to read the exact answer accurately on the correct scale . . . *without reading difficulty, calculation, or chance of error.* Greatly simplifies true reading of peak-to-peak voltages of complex wave forms in video, sync and deflection circuits, pulse circuits, radar systems, etc.

All scales are direct reading. Every scale is the same full size, and only one scale is visible at any one time. *Once you set the range switch properly, it is impossible to read the wrong scale.*

The DYNAMATIC 375 utilizes a single DC-AC ohms probe, anti-parallax mirror, and other desired features . . . to make accurate measurements with utmost convenience and reliability in laboratory, factory production, or service shop.

*Includes sturdy swivel stand which permits tilting "375" to any desired viewing angle, swings up as convenient carry-handle.*

<b>Ranges:</b> DC Volts	0 - 1.5, 5, 15, 50, 150, 500, 1500
AC Volts (rms)	0 - 1.5, 5, 15, 50, 150, 500, 1500
AC Volts (peak-to-peak)	0 - 1.5, 5, 15, 50, 150, 500, 1500
DC Current	0 - 5 ma, 50 ma, 500 ma
Ohms	0 - 500 ohms, 5 k, 50 k, 500 k, 5 meg, 50 meg, 1000 meg

**Input Resistance:** 11 megohms on all DC ranges

**Accuracy:**  $\pm 3\%$  full scale AC and DC

**Meter Movement:** Sensitive 100 microampere

**Precision Multiplier Resistors** with  $\pm 1\%$  accuracy

**Anti-Parallax Mirrored Scale** for precise readings

**Easy-to-See Iridescent Knife-Edge Pointer**

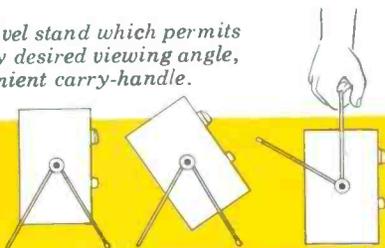
**Single DC-AC Ohms Probe** (supplied)

**Includes 1½ volt Battery. Operates on 117 volts 50-60 cycle AC**  
**Sturdy, handsome metal case** with convenient combination swivel stand and handle. **Size:** 10¾" x 6¾" x 4" deep. **Net wt:** 8 lbs.

Model 375

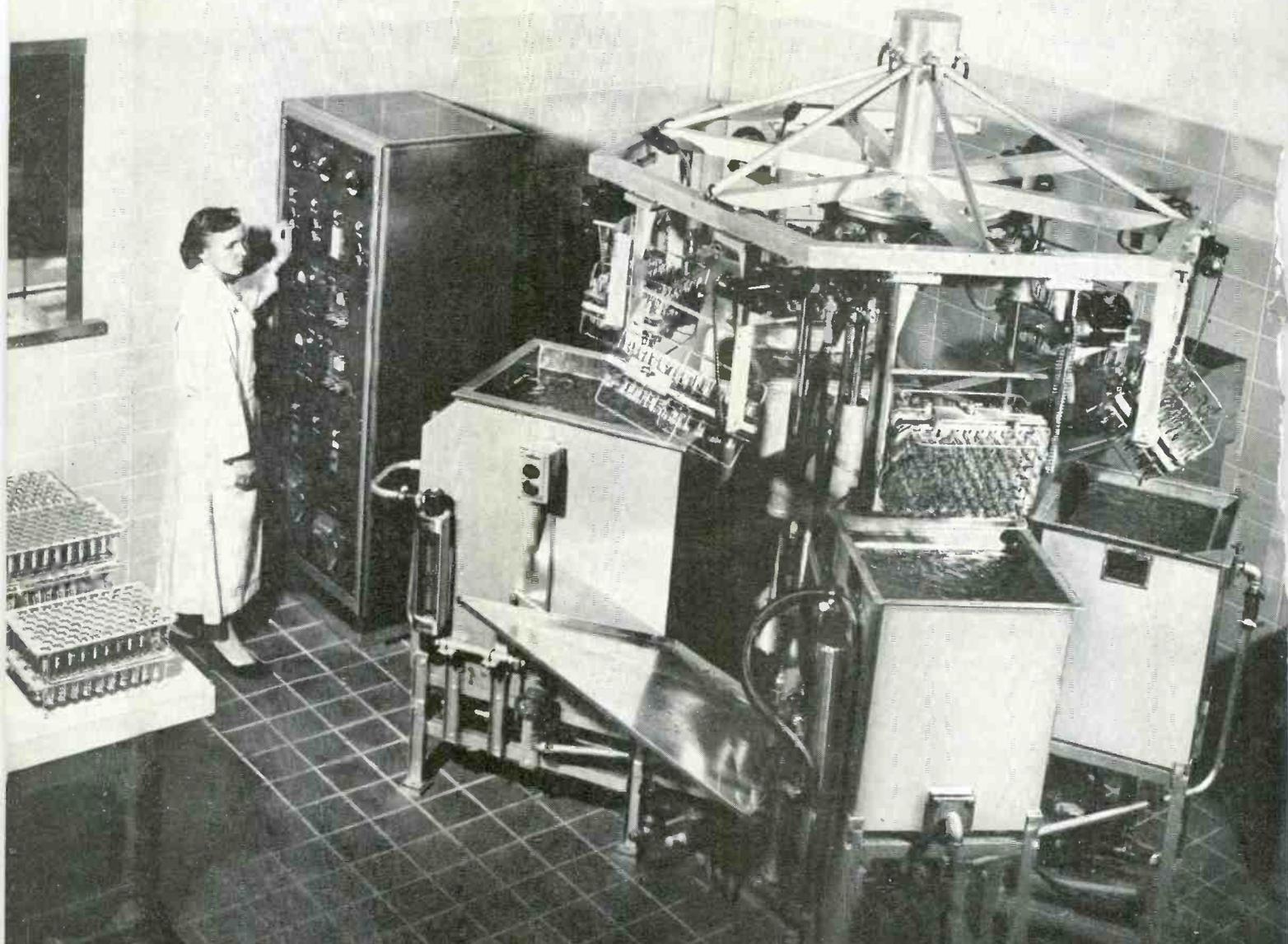
Net, \$89<sup>95</sup>

See Your B&K  
Distributor  
or Write for  
Catalog AP18-T



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 1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.  
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 Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.





## A SPACE-AGE BATH FOR ELECTRON GUNS

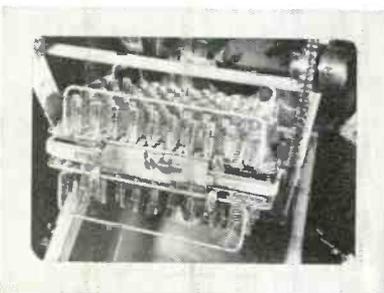
### Another RCA Precaution Against Picture Tube Callbacks

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