

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

WALDO M OWENS  
BOX 42  
JOSEPH UTAH

T11-61W A3 9W2301

BRIGHTNESS



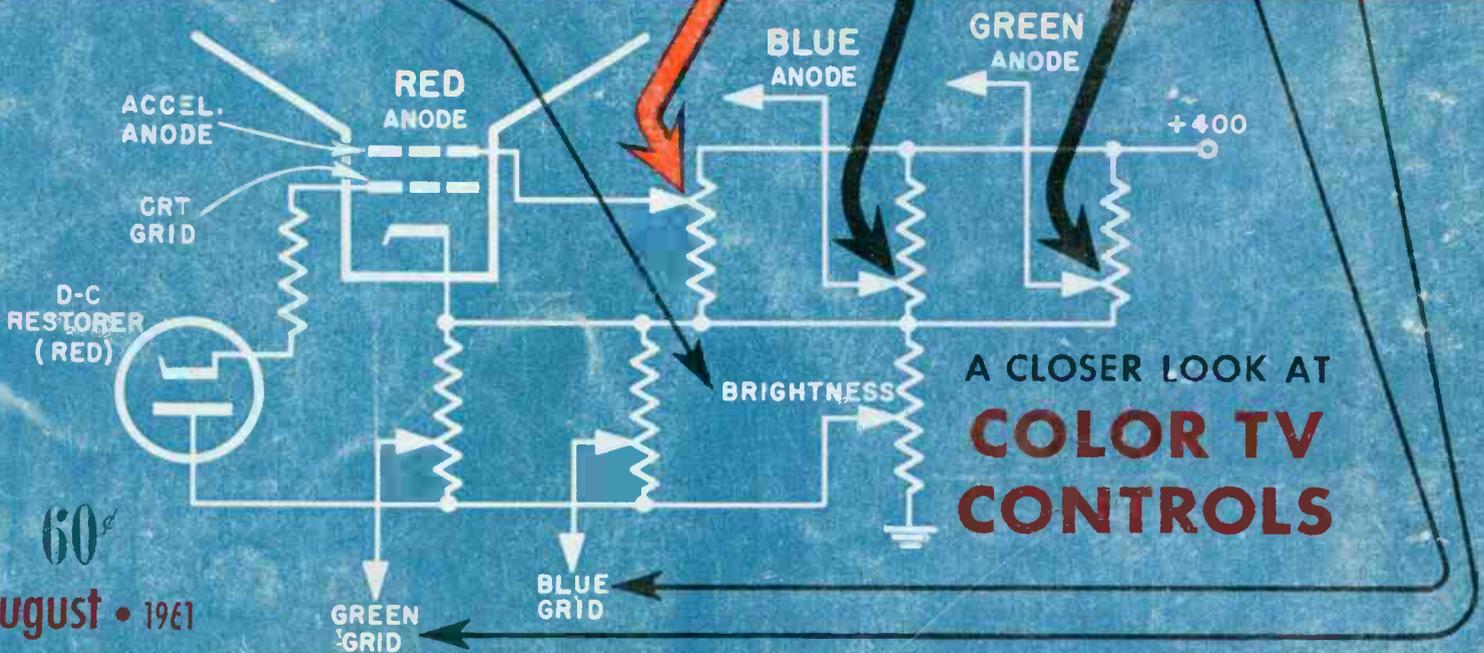
HUE



SCREEN



BACKGROUND



60¢

August • 1961

SYLVANIA'S

# BIG 9 covers the line!



New Sylvania 9-transistor kit provides replacement for over 300 NPN and PNP types.

**You Save Money**—reduce inventory requirements—eliminate slow-moving stock that can tie up your cash. You simply stock the new Sylvania kit of 9 fast-moving SYL types instead of more than 300 different types.

**You Save Time**—with only 9 types to choose from, *plus* the new Quik-Pik-Pak, you speed up servicing work, cut down bench time.



**Free Coupon Worth \$12.50** toward the purchase of the famous \$25 twelve-lesson Sylvania/RTTA "Transistor Servicing" course is included. Kit pays for itself immediately.



**Free Replacement Guide**, listing the more than 300 transistor types for which Sylvania's BIG 9 can be substituted, is included in every kit. Handy size for pocket carry or wall mounting. Your distributor has extra copies, too. Ask for one.

TYPE NUMBER	JOB DESCRIPTION	REPLACEMENT FOR
SYL 101	NPN, conv., mixer, osc.	18 types
SYL 102	NPN, if-amplifier	24 types
SYL 103	NPN, af-amplifier driver	21 types
SYL 104	NPN, af-power amplifier	12 types
SYL 105	PNP, conv., mixer, osc.	30 types
SYL 106	PNP, if-amplifier	40 types
SYL 107	PNP, af-amplifier driver	60 types
SYL 108	PNP, af-amplifier output	65 types
SYL 109	PNP, af-amplifier pwr output (popular auto radio type)	54 types

AT YOUR SYLVANIA TUBE DISTRIBUTOR'S...NOW!

# SYLVANIA

SUBSIDIARY OF

**GENERAL TELEPHONE & ELECTRONICS**



# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

World's Largest Electronic Trade Circulation

August, 1961

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ARTHUR P. SALSBERG *Managing Editor*  
JACK HOBBS *Technical Editor*  
HARVEY WETZLER *Associate Editor*  
B. V. SPINETTA *Assistant Editor*  
C. F. DREYER *Art Director*

Address all mail to  
480 Lexington Ave., New York 17, N. Y.  
Telephone YUkon 6-4242

HOWARD A. REED *Publisher*

## BUSINESS DEPARTMENT

R. L. KIPP *National Sales Manager*  
N. McALLISTER *Production Manager*  
M. RUBIN *Circulation Manager*  
M. KANE *Accounting Manager*  
A. MOYLAN *Accounting Supervisor*

221 N. La Salle St., Chicago 1, Ill.  
Telephone CENtral 6-1600

BERNIE EDSTROM *Regional Manager*  
15605 Madison Ave., Cleveland 7, Ohio  
Telephone LAKewood 1-7900



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**FRONT COVER** With color TV sales on the upswing, it's imperative that TV techs understand how color TV controls operate. This knowledge will speed-up installation and service call adjustments. For example, the cover illustration's red CRT screen could be due to customer control mis-adjustment. On the other hand, a service technician could be checking color purity by adjusting the CRT's red anode control to maximum, meanwhile turning down blue and green guns to minimum. See other color TV control adjustment methods in article starting on page 32.



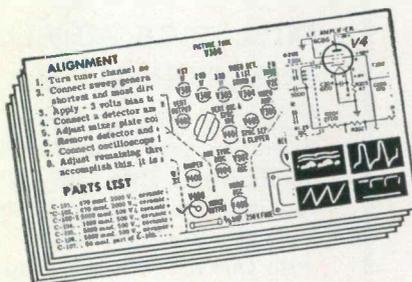
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## CIRCUIT DIGESTS



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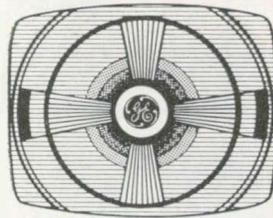
(16 pp. latest schematics & data)  
DELCO: Auto Radio 1961 Buick Model 980134  
MONTGOMERY WARD (Airline): TV Models W9-5220A, W9-5226A, W9-5230A, W9-5320A, W9-5326A, W9-5330A  
MOTOROLA: TV Chassis 436 Series  
RCA: TV Chassis KCS 137 & KCS 138  
TELEFUNKEN: AM-FM-SW Radio Model Jubilate 5061W  
ZENITH: TV Chassis 17G28 & 17G28Q



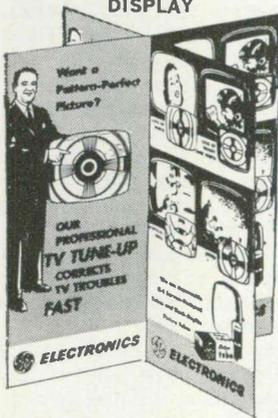
Here's a TV first! Commercials on your local station that feature an actual test pattern with which your customers can check the picture quality of their sets.

You, the independent serviceman, are tied in directly through your listing in TV Guide.

# IS TV TUNE-UP WEEK!



MOBILE WALL BANNER DISPLAY



COUNTER DISPLAY



## BUILDS BUSINESS FOR YOU 3 WAYS

**1.** TV Tune-Up Week builds an awareness of picture-quality deterioration—helps your customers prove to themselves the need for TV check-ups and preventive maintenance by you, their independent TV serviceman.

**2.** You, the independent service dealer, are the hero of TV TUNE-UP WEEK. On World Series television and in your regional edition of TV Guide, *your customers are urged to see you for prompt, professional service.*

**3.** As a participating dealer, you benefit from this national campaign at the local level—in your city, in your neighborhood, with your customers.



AD MATS



SET REPAIR STICKERS



MAILERS

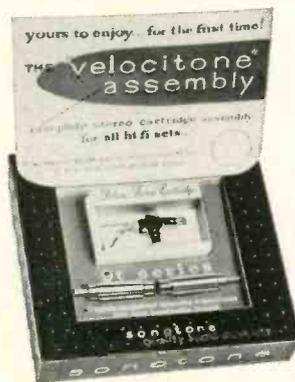
*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

# 11 down-to-earth ways to sell high-profit sound:

## Sonotone ceramic and crystal cartridges

One line of cartridges to meet virtually every service or replacement need, at a price that allows you excellent profits... that's what Sonotone offers you today. There are Sonotone ceramic cartridges for any sound system... and equalizers to convert any magnetic input for ceramic cartridge use. 70 phonograph manufacturers use Sonotone as original equipment. And more than 12,000,000 satisfied users make up a "pre-sold" market for your future service or sales profits. For full profit opportunity, stock the full Sonotone Cartridge line!



### Stereo:

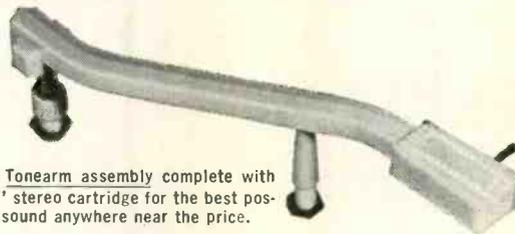
Velocitone Assembly DeLuxe "9T" cartridge plus matched equalizers for improved sound through any magnetic input system. Response: Flat  $\pm 1/2$  db from 20 to 6,000 cps, 1 db to 17,000 cps with deliberate rolloff to 20,000 cps.



"9T"—Superb quality for even the most advanced audiophile. Response: Flat  $\pm 1$  db from 20 to 17,000 cps, with deliberate rolloff to 20,000 cps.



"10T"—A budget-priced ceramic cartridge for inexpensive phonographs. Response: Flat from 20 to 15,000 cps  $\pm 2.5$  db.



"T1" Tonearm assembly complete with "12T" stereo cartridge for the best possible sound anywhere near the price.



"12T"—Crystal cartridge offering clear stereo sound at budget price. Response: Flat  $\pm 2.0$  db to 10,000 cps, smooth rolloff to 15,000 cps.



"8TA"—Fine economical replacement to achieve well-balanced reproduction from most popular systems.

Response: Flat  $\pm 2.5$  db from 20 to 15,000 cps, with gradual rolloff to 20,000 cps.



"16T"—Ideal cartridges combining top quality with moderate price... now original equipment on most leading phonographs.

Response: Flat  $\pm 1$  db from 20 to 10,000 cps, with smooth rolloff to 12,000 cps.

"18T"—Companion to the 16T with slightly greater output voltage, moderately priced and now original equipment with most phonograph manufacturers.

Response: Flat  $\pm 1$  db from 20 to 10,000 cps, with smooth rolloff to 12,000 cps.



"3T"—Crisp, clear highs... full authoritative lows. Outperforms expensive magnetic cartridges.

Response: smooth 20 to 20,000 cps, flat to 15,000 with gradual rolloff beyond.



"2T"—Wide spectrum response... ideal for monophonic replacement at less cost.

Response: smooth 20 to 20,000 cps, flat to 12,000 with gradual rolloff beyond.

### Monaural:

"1P"—Improves performance of even simplest record players.

Response: smooth 20 to 20,000 cps, flat to 12,000 with gradual rolloff beyond.

# Sonotone

ELECTRONIC APPLICATIONS DIVISION  
 O DEPT. C9-81, ELMSFORD N.Y.  
 R  
 P. In Canada, contact Atlas Radio Corp., Ltd., Toronto

Leading Makers of Cartridges • Speakers • Tape Heads • Mikes • Electronic Tubes • Batteries

## Editor's Memo



A number of TV service dealers are waging a good fight against bait advertising. Individually and through associations, they are enlisting advertising media—newspapers, telephone yellow pages, broadcasters—to their cause.

It's a battle worth fighting. Cut off the means of communicating bait ads to customers, and you reduce the number of people who get hooked by sharp operators—and by the touch of larceny in their own hearts.

Executives in charge of phone book yellow pages advertising do not allow false ads to be inserted, IF they know the true nature of the ad. It's up to you to inform publishers and station managers when they run come-on ads.

You can cite a recent consent order by the Federal Trade Commission which forbids Mars Electronics, Washington, D.C., from misrepresenting the prices charged for TV repair. Last November the FTC issued a complaint alleging that the \$1 service charge advertised was merely a form of bait and that in most instances sets were removed to the shop instead of being repaired in the home. Then if the owner did not want the repair made after the estimate is given, he must pay \$13.50 to get the set back. The complaint added that such charge is not clearly disclosed to the owner before the set is removed.

In the future, Mars must make clear disclosure of this fact.

The FTC complaint also alleged that the claims of "Factory Trained Technicians" and "Fully Guaranteed" work were false.

Of course, when we complain about someone else it's important that our own skirts be clean. Otherwise our efforts can boomerang.

Like the woman who had a skunk in her basement. Try as she may, she couldn't get him out. Finally she asked a shrewd old woodsman how to go about it.

He told her to drop pieces of bread along a trail leading from the basement to the woods. The hungry skunk would then follow the trail as he ate the bread, and she would be rid of him.

A week later the woman went to the woodsman again. He asked her if the skunk was gone.

"No," she told him, "but there are two more skunks there. They followed the bread trail from the forest to the basement."

*Al Forman*

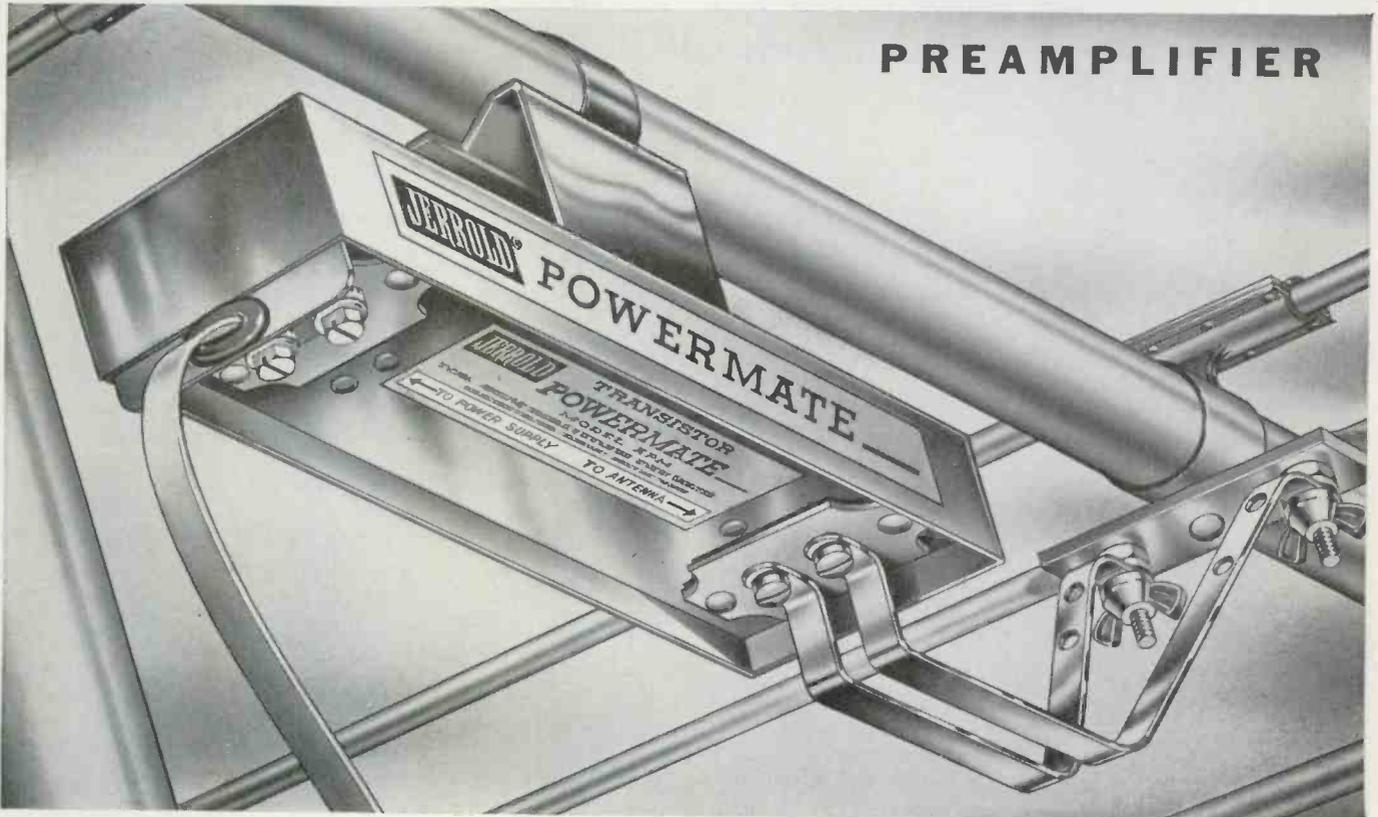
Introducing the perfect mate for any TV/FM antenna

**NEW**

**JERROLD**

**TRANSISTOR  
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 downlead losses) or at *any* other point—along the mast, on the wall or windowsill, behind the set—anywhere your best judgment dictates.

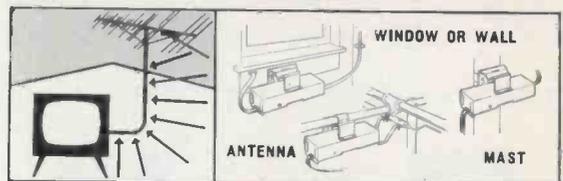
And look at this gain: An average of 13.9db at Channel 13 and 18.25db at Channel 2—by far the highest in the business! This remarkable gain gives any antenna system the lowest System Noise Figure obtainable—the key to better pictures.

See your distributor today, or write for special bulletin describing System Noise Figure. Begin cashing in on your big market for the new JERROLD Transistor POWERMATE!

*\$39.95 list, \$26.63 net, complete with power supply*

**JERROLD**® **ELECTRONICS CORPORATION**  
Distributor Sales Division, Dept. IDS-167  
The Jerrold Building, Philadelphia 32, Pa.

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

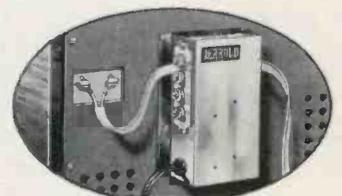


**MOUNT IT AND FORGET IT**

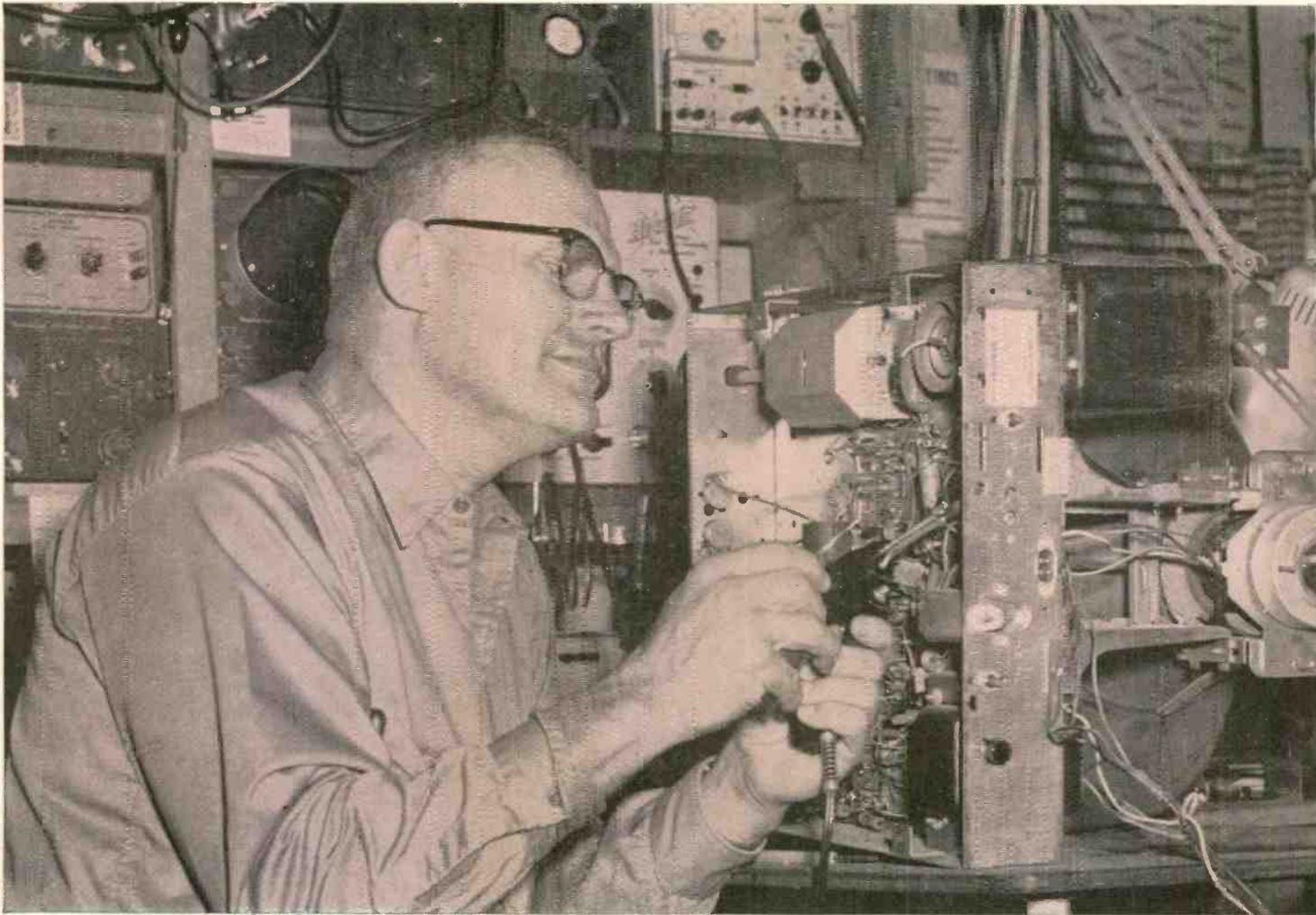
On the antenna or anywhere along the downlead, POWERMATE is up *for good*. Same 300-ohm lead that carries signal also carries 15 volts ac to POWERMATE. No tubes, no batteries to replace.

**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 transistor damage.



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



*Your Mallory distributor stocks these quality components*



**TC TUBULAR ELECTROLYTICS**

Economical filter capacitors. Hermetically sealed. Also special TCX type for  $-55^{\circ}$  C. Twin-pack keeps leads free from kinks.



**FP ELECTROLYTICS**

Original  $85^{\circ}$  C capacitor, now better than ever. Etched cathode gives hum-free performance. Chassis or printed circuit mounting.



**STA-LOC® CONTROLS\***

Your distributor can custom build in just 30 seconds, any of over 38,000 single or dual controls.  
\*U. S. Patent 2,958,838.



**GOLD LABEL® VIBRATORS**

Quietest ever made... for the best in auto radio servicing. Buttonless contact design gives longest trouble-free service, sure starts.

# "Never a call-back with Mallory"

*says Vern Maxwell, owner of Maxwell Radio & TV, Cantrall, Illinois*

"I check every capacitor used in my work, for value tolerance and insulation leakage. I have never rejected a Mallory capacitor, and have never had a call-back due to premature failure of a Mallory capacitor in my thirty years of servicing electronic equipment."

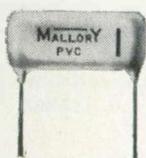
That's reliability for you. It's the kind of reliability that saves you money, builds your reputation, keeps customers satisfied. It's the kind of reliability that you can expect from the complete line of Mallory service-engineered replacement parts . . . the broadest line in the industry. On every job, make it sure by making it Mallory . . . famous for top quality at sensible prices.

◀ Vern W. Maxwell operates his service shop in the rural area north of Springfield, Illinois. Vern's customers rely on him for dependable service on everything from transistor radios to electronic organs. He in turn relies on the quality Mallory products supplied by Bruce Electronics in Springfield.

Distributor Division, Indianapolis 6, Indiana

P. R. MALLORY & CO. Inc.  
**MALLORY**

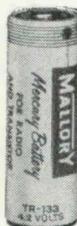
In Canada: A. C. Simmonds & Sons, Ltd., Toronto 7, Ontario



#### MALLORY PVC CAPACITORS

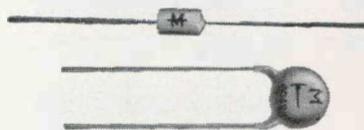
New, blue Mylar\*\* capacitors. Withstand moisture, heat, bending of leads and overloads.

\*\*Reg. T. M., E. I. du Pont de Nemours & Co., Inc.



#### MALLORY MERCURY BATTERIES

Tops for transistor radios. Up to 7 times more *sound power* . . . guaranteed against leakage . . . stay "live" for years when idle . . . won't fade. †T.M.



#### SILICON RECTIFIERS

Top quality, moisture-proof, 5-packs, in re-usable jewel boxes, on handy file cards. 50 volt to 600 volt ratings.



#### RMC DISCAPS®

Quality standard for original equipment. 5-packs, in re-usable jewel boxes, on handy 3" x 5" file cards.

®Trademark Radio Materials Company, a Mallory division.

**NEW CB VERSATILITY  
WITH EICO®**

*New Deluxe Citizens  
Band Transceivers  
give you everything  
you need for fast,  
reliable, economi-  
cal communication*



**770 Series**

	kit	wired
Model 770: 117 VAC only	\$69.95	\$99.95
Model 771: 117 VAC and 6 VDC*	79.95	109.95
Model 772: 117 VAC and 12 VDC*	79.95	109.95

\*Including Posi-Lock Mounting Bracket

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

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

**You profit with EICO  
Test Equipment & Hi-Fi**



DC-5 MC  
5" Scope #460  
Kit \$79.95  
Wired \$129.50



New Transistorized  
Stereo/Mono  
4-Track  
Tape Deck  
Wired Model  
RP100W \$399.95  
Semi-Kit Model  
RP100K,  
Electronics in  
Kit form.  
\$299.95

An exclusive EICO product designed and manufactured in the U.S.A. (Pat. Pend.)



Electronic Instrument Co., Inc. 3300 N. Blvd., L.I.C. 1, N.Y.  
ADD 5% IN THE WEST ©1961

Export Dept., Roburn Agencies Inc., 431 Greenwich St., New York 13, N. Y.



**Standard 760 Series  
of CB Transceivers**  
from  
Kit \$59.95 Wired \$89.95



NEW FM-AM Stereo Tuner ST96  
Kit \$89.95 Wired \$129.95 inc. FET



NEW 70-Watt Integrated  
Stereo Amplifier ST70  
Kit \$94.95 Wired \$149.95

New 40-Watt Integrated  
Stereo Amplifier ST40  
Kit \$79.95 Wired \$129.95

Over 80 products to choose from. Write for free Catalog ET-8 & name of nearest distributor. Most EICO distributors offer budget terms.

# LETTERS To the Editor

## Making Ends Meet

Editor, ELECTRONIC TECHNICIAN:

I am surprised by a repair dealer stating in his June letter: "I [can't] figure how a dealer that charges as much as \$20.00 for a repair that may have used a 20¢ condenser does not have enough left to pay his bills." I notice he didn't criticize such charging practice as being unwarranted. He wonders why they can't pay their bills when their profits are so high. Hmm? Has it not occurred to him that a repair dealer may have a busy week, realize little time for himself, collect cash in every case and still operate nearly in the red? Trouble is, repair dealers seldom admit that which most seriously affects our profit. Namely, recalls and tough dogs—unexpectedly, in most cases. Understandably, we don't talk about them. We do about everything else; no wonder our friends and customers think we are riding high. No need to wonder why they can't pay their bills; how do they stay in business?

OSCAR SCHECTAR

Schectar TV Service  
Pittsburgh, Pa.

## Wholesale Only for Licensing

Editor, ELECTRONIC TECHNICIAN:

This is to inform you that this distributorship of wholesale electronic parts has been solicited by a newly formed group of service dealers calling itself Dealers Action Committee for Pa. State TV License and consisting of a minimum of nineteen persons at last count, and of which they have furnished us a listing of names and addresses. They state that their sole purpose is to apply every effort to further the State License Bill in the Western Pa. area in support of Mr. Wayne Prather, President of the Pa. State Federation, who we understand has applied himself diligently to the promotion of this bill. We would appreciate it very much if these association people would supply us with listings of supporters so that we could help assist passage of their bill. As a Distributor for the past three years it has always been our policy to sell only to those service people who are directly in the service business and provide us with actual proof of filling out a Pa. State Sales Tax Exemption form. Mutual solidly backs the service dealer in this manner. This policy has now profitably won for Mutual a firm foothold in the distribution and we feel that we must bend every effort to assist the service dealer. It is very evident to Mutual why other elements of distribution remain opposed to licensing bills. Other distributors in this city sell both wholesale and retail. If licensing is in effect they know a good portion of their tinker sales will be lost. Over the past three years Mutual has in fact turned away thousands of dollars worth of these tinker sales. In turn legitimate service dealers turned their purchasing power toward Mutual. Service desperately needs a license not only for themselves, but for the explicit benefit of the consuming public.

HARRY J. HUNTER

Mutual Distributors, Inc.  
Pittsburgh, Pa.

## Windshield Wiper Effect

Editor, ELECTRONIC TECHNICIAN:

Over a year ago I wrote asking for information regarding "Windshield Wiper Effect" on channel 7. I got a reply stating that there would be an article in ELECTRONIC TECHNICIAN regarding this. However, to date I have not seen a write-up on this subject. Is there a chance that there will be an article in the near future? I enjoy your editorials and the magazine.

JOE M. STEPANICH

Chicago, Ill.

• See "Stop TV-Radio Interference," Mar. '60—Ed.

(Continued on page 10)

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

**TESTS**  
the Nuvistors

**TESTS**  
the New 12-Pin  
Compactrons

**TESTS**  
the New 10-Pin Tubes

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

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

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

**NEWEST  
FINEST  
MONEY-MAKER**

*for Professional  
Servicemen*



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

**Model 700**  
**DYNA-QUIK**  
*Fastest, Most Complete  
Most Up-to-Date*  
**DYNAMIC  
MUTUAL CONDUCTANCE  
TUBE TESTER**

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

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

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

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

Patented automatic compensation for line voltage variation. Large 4½" plastic meter with easy-to-read "Replace-Good" scale. Lists most commonly used tube types with settings directly on socket panel for fastest operation. Complete listing in reference chart in cover. Phosphor-bronze contacts for long life. 7, 9, and 10-pin straighteners on panel. Operates on 117 volts 50-60 cycle a.c. Hand-some leatherette-covered carrying case.  
Size: 16½" x 15¾" x 5½" deep. Net wt: 15½ lbs. **Net, \$169<sup>95</sup>**

## NEW TUBE INFORMATION SERVICE

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



## B & K MANUFACTURING CO.

1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.  
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.  
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

# We're pushing the full line...



(of **Centralab** Ceramic Capacitors)

Sometimes we get so wound up in talking about our "only from CENTRALAB" ceramic capacitors that we forget to remind you about the *standard* ones.

CENTRALAB has plenty of both—as well we should. We *pioneered* ceramic capacitors many years ago—and we still give you the finest product and the widest choice.

Discs, tubulars, buffers, trimmers, feed-thrus—for every standard and special application, in radio-tv servicing or industrial use—CENTRALAB makes them and makes them best. That's why CENTRALAB is the best ceramic capacitor line for you to buy.

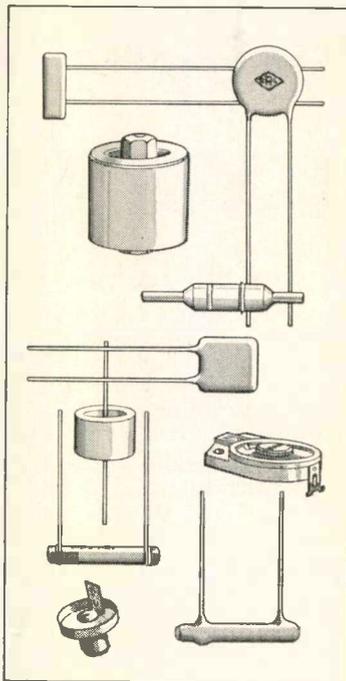
**Centralab.**

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.  
902W EAST KEEFE AVENUE • MILWAUKEE 7, WISCONSIN  
CENTRALAB CANADA LIMITED—AJAX, ONTARIO

D-6133S

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS

PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS



(Continued from page 8)

### Regrets Missed Copies

Editor, ELECTRONIC TECHNICIAN:

I have just recently started taking ELECTRONIC TECHNICIAN and I can't begin to tell you how sorry I am that I missed so many copies of it.

SAM TESTA, JR.

Mobile, Ala.

### Critical of Set Designs

Editor, ELECTRONIC TECHNICIAN:

I would like to make a few comments about the article in the March 1961 issue about "How to Substitute Unavailable TV Parts." The article is very good but the author seems to take a defensive attitude concerning the activities of TV manufacturers. He takes the stand that whatever they do is correct, and we should work a little harder and run around more to correct their slipshod methods of designing and building of TV sets. He does not mention why there should be so many different deflection components when there are only a few different size picture tubes to work with. I would like to know who is supposed to pay for all these research activities. Is it the customer, who bought the product in good faith, the manufacturer who by sloppiness or doesn't give a hoot for the repairman, or the repairman who is at the end of the line? Of course, we know it is the poor TV repairman who has to pay for this in extra time and labor and many of the boys are getting fed up with it and wonder when it will ease.

HARRY GOLDMAN

Harry's TV Service  
Detroit, Mich.

### Parts Cost

Editor, ELECTRONIC TECHNICIAN:

It is easy to see why more and more customers or potential customers are diverting their buying power toward the supermarket tube testers and using do-it-yourself pamphlets when it comes to service repair. Most people are confused by such a wide difference in price ranges to repair their set. There is such an unheard of different price range for parts. A number of instances parts of different kinds were sold to a customer for approximately five times the cost to purchaser. In one instant an item which cost \$1.50 was sold for over \$12.00, which I assume was to take care of the no service charge. When all the different services such as parts, service charge and or no service charge, labor or technical service, as it should be called, and taxes are added and presented to the customer you know why most potential customers go where they know why they spent their money and what it was for. The controversy between distributor and dealer seems to be

(Continued on page 12)



©1961 VOLKSWAGEN OF AMERICA, INC.

## 35,000 milesssssssssssssssssss

This flat's a year late.  
Most trucks would have had it 15,000 miles ago.

Not ours.

Volkswagen trucks put almost a ton less load on tires. Even though they carry more than most others.

(Did we ever tell you how we took off weight?)

First, our aluminum magnesium engine is the lightest of its kind in the world.

Second, our trucks are welded together. No bolts. (This is where our strength comes from.)

There are 13,000 automatic welds in every VW truck body. It's a solid hunk of steel. This got rid of the heavy members that bolted trucks need. Like the frame.

Third, no radiator, no driveshaft, no hood, no fenders. A loaded Volkswagen is as light on its tires as most other trucks empty.

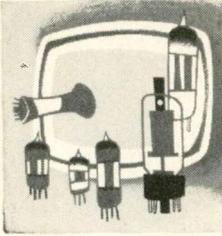
Even our rear engine saves tread. The cargo rides in the middle. The tires share the load equally.

We tell owners to expect about 35,000 miles on a set, normal driving. One set of tires on a Volkswagen lasts almost as long as two on other trucks.

Some owners say they get 40,000.

Others think this is a lot of hot air.





# The "Big Picture"

...informative shop talk from  
Sylvania Field Service Headquarters

## See how easy service is with new GT-555 chassis

You've been hearing a great deal about this advanced GT-555 chassis—how much faster and easier it makes TV service. Come to your Sylvania Service Clinic and see for yourself!

You'll see that it's clean and modular for easy access . . . that pulling assemblies is fast and easy with component "plug-in" feature and new bracket-mounting . . . that the new board color-codes circuits 5 ways, and designates parts, test and tie points, and tube pin numbers. All capacitors are plastic encapsulated, and the new Flexi-core transformer is a modern marvel. And much, much more.

Call the TV Service Manager at your local Sylvania TV distributor's now for time and place of the Service Clinic in your area.

Allentown, Pa.—Hemlock 4-9641  
 Atlanta, Ga.—Jackson 4-5891  
 Billings, Mont.—Alpine 9-5919  
 Birmingham, Ala.—Alpine 1-3243  
 Boston, Mass.—Beacon 2-7746  
 Bristol, Tenn.—South 4-4114  
 Buffalo, N.Y.—TR 3-3293  
 Charlotte, N.C.—Jackson 3-0324  
 Chicago, Ill.—Fillmore 5-0100  
 Cincinnati, O.—Capitol 1-1400  
 Cleveland, O.—Tower 1-1654  
 Columbia, S.C.—Alpine 6-2456  
 Columbus, O.—CA 4-6171  
 Dallas, Tex.—Fleetwood 7-4521  
 Davenport, Ia.—2-6204  
 Dayton, O.—Baldwin 2-6777  
 Denver, Colo.—Acoma 2-7701  
 Des Moines, Ia.—Cherry 3-1257  
 Detroit, Mich.—Lorain 7-7292  
 Dothan, Ala.—Sycamore 2-2115  
 Fargo, N.D.—Adams 5-0563  
 Fresno, Cal.—AM 8-6314  
 Grand Rapids, Mich.—Cherry 1-5491  
 Green Bay, Wis.—Hemlock 5-7529  
 Greenville, N.C.—Plaza 2-3143  
 Hamden, Conn.—State 7-3594  
 Honolulu, H.I.—55-171  
 Houston, Tex.—Capitol 7-2311  
 Indianapolis, Ind.—Melrose 6-3371  
 Jacksonville, Fla.—Exbrook 8-7577  
 Kansas City, Mo.—Victor 2-7361  
 Little Rock, Ark.—FR 6-1336  
 Los Angeles, Cal.—Adams 2-4161  
 Louisville, Ky.—Juniper 2-1686  
 Manchester, N.H.—National 5-6495  
 Mankato, Minn.—4501

Memphis, Tenn.—BR 2-2445  
 Miami, Fla.—Plaza 4-5595  
 Milwaukee, Wis.—Uptown 3-6050  
 Minneapolis, Minn.—Federal 8-7551  
 Nashville, Tenn.—Amherst 9-5631  
 Newark, N.J.—Market 4-2000  
 New Orleans, La.—482-5771  
 New York, N.Y.—Worth 2-3625  
 Oklahoma City, Okla.—CE 2-7641  
 Omaha, Neb.—342-6007  
 Philadelphia, Pa.—Greenwood 7-5000  
 Pittsburgh, Pa.—Fairfax-2-0300  
 Portland, Me.—Spruce 5-2371  
 Portland, Ore.—BE 4-7226  
 Providence, R.I.—Stuart 1-5700  
 Richmond, Va.—Elgin 5-7401  
 Salt Lake City, Utah—Davis 8-8211  
 San Antonio, Tex.—Capitol 6-1201  
 San Francisco, Cal.—Oxford 7-3500  
 Scranton, Pa.—Diamond 2-8221  
 Seattle, Wash.—Mutual 2-4655  
 Shreveport, La.—3-4256  
 South Bend, Ind.—Atlantic 7-3365  
 Spokane, Wash.—Fairfax 7-4421  
 Springfield, Mass.—Republic 4-8284  
 St. Louis, Mo.—Jefferson 3-6161  
 Syracuse, N.Y.—Granite 1-6169  
 Toledo, O.—Cherry 8-4251  
 Troy, N.Y.—Ashley 2-6160  
 Tulsa, Okla.—Luther 7-6765  
 Watertown, S.D.—Turner 6-5749  
 Washington, D.C.—Adams 2-1414  
 Welch, W. Va.—HE 6-2141  
 Wichita, Kan.—Hobart 4-7393  
 York, Pa.—York 8-1528  
 Youngstown, O.—Sweetbriar 2-1437

Sylvania Home Electronics Corp., Batavia, N.Y.

# SYLVANIA

SUBSIDIARY OF

## GENERAL TELEPHONE & ELECTRONICS



(Continued from page 10)

nothing as compared to obtaining and keeping public confidence in the local independent service repair shop.

BERNARD L. CAMP  
Barney Radio-Television Service Shop  
Houston, Texas

### X-Ray Hazard?

Editor, ELECTRONIC TECHNICIAN:

I have been a subscriber of ELECTRONIC TECHNICIAN for quite some time now and I would like to have your answer on a question which I have given quite a bit of thought to. I have done a lot of picture tube installations and TV servicing these past 8 years. Is there a chance that one would in time pick up enough X-ray radiation from this work that would be harmful to one's health?

HOWARD LASSEN  
Lassen TV-Radio Service  
Isle, Minn.

• We published a report on this subject in July 1957. Essentially it stated that unnecessary, prolonged exposure to any radiation is not recommended. Radiation effects add up over a period of time. However, radiation from picture tubes is so small that it is not a health hazard.—Ed.

### Back Copies for Sale

Editor, ELECTRONIC TECHNICIAN:

I have over 10 years back issues of the leading Radio TV magazines including, of course, ELECTRONIC TECHNICIAN, which I would like to sell. Can you suggest an outlet for them? All magazines are in very good condition.

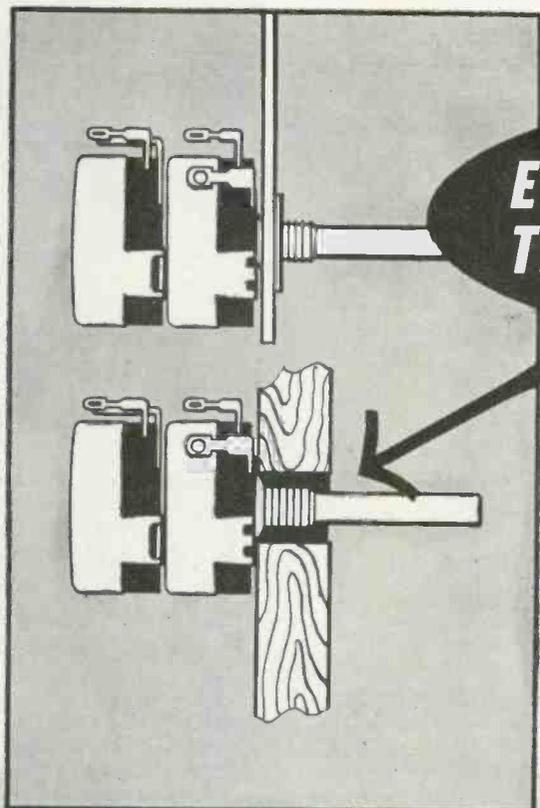
D. BERNARD FRITZ  
3550 St. Lawrence Ave.,  
Reading, Pa.

### Home Service Problems

Editor, ELECTRONIC TECHNICIAN:

I was quite pleased to see the article about TV repair estimates in May 1961, page 69. I have framed it. I personally try to get all the customers to bring their sets in. I found it saves them money and also makes for good customer relationship. Some of the things wrong with TV service in the house are: There are over 500 tubes used in television and this means an inventory of at least \$1000 to carry around. There is no way of knowing that these tubes are all 100% OK. Fifty percent of the time the TV is defective and needs shop work anyway. You are making a workshop out of the people's house. If you only put one tube in the TV and it comes on and seems to be OK, it can quit again within an hour. There are many more problems, too.

NORMAN FUNGER  
Norman Radio-TV Auto Radio  
Hollywood, Fla.



**ELIMINATE PANEL THICKNESS PROBLEMS**

**without dual bushing length stocking**

**New**

**CLAROSTAT**

**PANEL-JUSTER BUSHINGS**



Now—another "first" from Clarostat that eliminates the need for ordering  $\frac{3}{8}$ " or 1" long bushing length controls—a single standard length meets all panel thickness requirements—Panel-Juster threads on any standard Clarostat  $\frac{3}{8}$ " long bushing to make it a full 1" long bushing. Cuts inventory requirements in half! Eliminates waiting time for you and your customer for "special" 1" bushing controls! Stock them and use them...

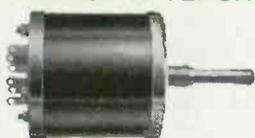
*another good reason for always buying Clarostat*

**CONSTANT IMPEDANCE CONTROLS**



Self-compensating L-pads and T-pads rated at 10 watts audio. Continuous range from 0.5 to 30 db attenuation.

**CONSTANT IMPEDANCE OUTPUT ATTENUATORS**



Linear attenuation in 3 db steps up to 24 db. Rated at 30 watts audio. Equipped with dial plate and bar knob.

**CONSTANT IMPEDANCE ATTENUATORS**



Compact controls rated at 4 watts audio. L-pads and T-pads. Attenuation of 30 db over 90% rotation, 60 db in remaining 10%.

**THEATRE SPEAKER CONTROLS**



Drive-in theatre controls for RCA, International, Motiograph and Simplex equipment. Available as L-pad, linear or tapered rheostat.



WRITE FOR COMPLETE DETAILS ON THE SOUNDEST SOUND CONTROL LINE IN THE INDUSTRY...

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

See us at WESCON Booth 1714.

# Tuning In the

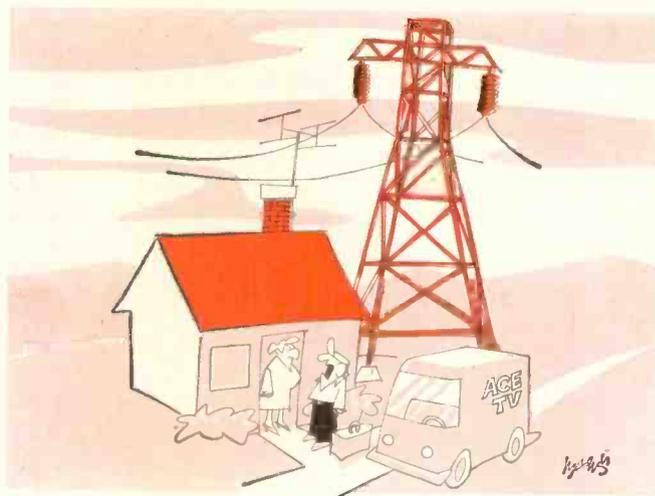
AS REPORTED LAST MONTH, Philco's Lansdale Tube Div. is discontinuing the manufacture of radio-TV tubes. However, the company's Accessory-Service Div. "is continuing the aggressive selling and merchandising of its complete line of renewal receiving tubes and cathode ray tubes," reports R. E. Nugent, vice-president of the division. The discontinuance is only for original equipment. Philco tubes will continue to be sold to service dealers.

*INSTANT START TV* has been announced by Westinghouse. Both pix and sound come on within a few seconds after the switch is turned. This is made possible by having half of the set's normal power on while the set is not working. The basis for this off-beat TV portable design is the fact that turning power on and off repeatedly shortens electronic component life. At half power, all components are kept at a constant temperature, and damaging surges are minimized.

## COMPUTER-MADE SPEECH



Bell Labs engineers Gerstman and Kelly listen to tape recording of speech synthesized by a digital computer. Punched cards coded for speech sounds are processed to actuate nine control signals corresponding to voice pitch, intensity, frequencies and timing. The machine will also sing (but Doris Day does a better job). Project purpose is to improve communication techniques.



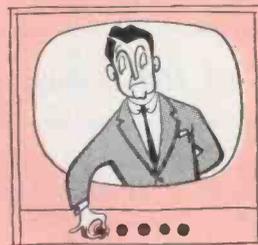
"The trouble's in your antenna and it's gonna stay there."

"TIP-TO-TOP" soldering technique for picture tube base pins has been shown by Sylvania. By extending the solder into the core of the base pins, technicians are said to be able to seat tube sockets with a minimum of effort. These tapered pins not only provide maximum contact, but the elimination of the rocking and twisting is claimed to prevent cracked bases or broken lead wires that may result from very tight fitting sockets.

A NEW PEAK in total electronic sales for 1961 is expected by the National Credit Office. Volume should exceed last year's \$10 billion, which was up 10% over 1959. However, profits in 1960 were down from 1959, despite the sales increase. The result was that for the 12-month period ending March 31, 1961, 42 electronic manufacturers became financially embarrassed or bankrupt. Their liabilities exceeded \$19 million. This compares with 39 manufacturers with \$8 million liabilities for the previous year. Increased labor and material costs, combined with stiff competition, poor management and slow receivables are blamed for the profit squeeze.

WATCHDOG TV has been installed in a seven-story Brooklyn apartment house by Bell Television. This security safeguard allows tenants in their apartments to check visitors at outside main and service entrances before admitting them to the building.

# Picture .....



TV SCANNING LINES can be annoying if the viewer sits too close. So numerous designers have thought of ways to get rid of the horizontal lines, or at least to make them less visible. Several years ago, TV maker Sanabria announced a mesh material which, when placed on the picture tube face, split the lines in half. Inventor Sanabria said he got the idea looking at the picture through his wife's stockings. We've never seen any of these split-line screens around. Now we hear that a West German outfit named Saba has come up with some face material which makes the dark horizontal lines invisible.

*DR. LEE DE FOREST, sometimes called the father of radio, has died. The 87-year old inventor developed the audion tube in 1906. This simple triode paved the way for modern radio and TV circuits.*

TURNABOUT. We've all heard U.S. manufacturers complain about Japanese electronic imports. Our government has been asked to clamp more stringent restrictions on such imports. Well, it seems that Japanese manufacturers have the same view about American electronic products imported in their country. The story is going around about the effort by a Tokyo department store to import 5000 RCA color TV sets. Japanese 17" color sets sell for about \$1000. The 21" U.S. sets would sell for under \$900, shipping and tariff included. The Japanese kicked like steers. They want their government to refuse to grant import licenses.

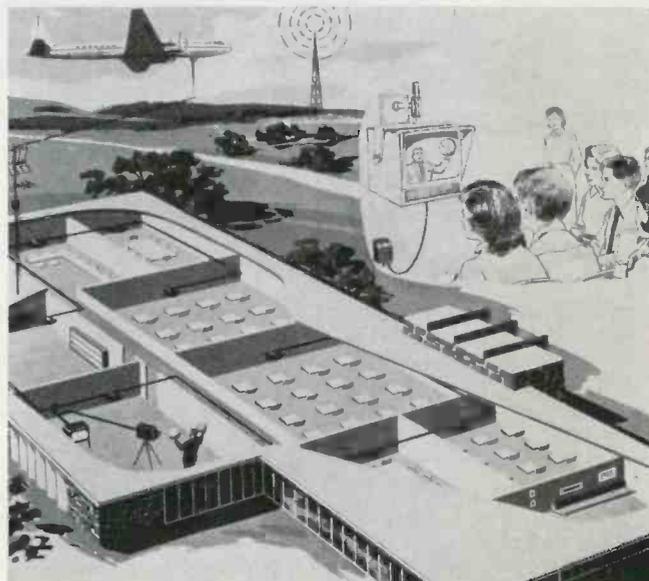
*VENUS bounced back some radio signals transmitted from the Mohave Desert in California. It took the signals about 6½ minutes to make the 93 million mile round trip. Purpose of the test was to find out if Venus spins on its axis, and if so, how fast.*

MEDICAL ELECTRONICS conference was held in New York City last month. Among devices demonstrated were: capsule-sized radio transmitters which are swallowed to telemeter data as they pass through the intestines; brainwave recorder calibrated to show how alert the subject is; permanently implanted electrodes to measure ovarian functions by temperature and pressure; central monitoring for nurse to observe pulse, respiration, etc. for 12 patients continuously and simultaneously; blood and bacteria counters which print counts automatically on a slip of paper; tiny closed-circuit TV; and plenty more.

## CALENDAR OF COMING EVENTS

- Aug. 18-20: National Alliance of Television & Electronics Service Associations (NATESA) Convention, Pick-Congress Hotel, Chicago, Ill.
- Aug. 22-25: Western Electronics Show & Conference (WESCON), Cow Palace, San Francisco, Calif.
- Aug. 22-Sept. 2: British National Radio & Television Show, Earls Court, London, England.
- Aug. 25-27: Tenth Annual Chicago High Fidelity-Home Entertainment Show, International Sight & Sound Exposition, Inc., Hotel Sherman, Chicago, Ill.
- Sept. 13-17: 1961 New York High Fidelity Music Show, New York Trade Show Building, New York, N. Y.
- Oct. 2-4: IRE Canadian Electronics Conference, Automotive Bldg., Exhibition Park, Toronto, Canada.
- Oct. 9-11: National Electronics Conference, (IRE, AIEE), International Amphitheatre, Chicago, Ill.
- Oct. 30-31: Radio Fall Meeting, (PGED, BTR, RQC, EIA), Hotel Syracuse, Syracuse, N. Y.
- Nov. 14-16: Northeast Research & Engineering Meeting (NEREM), Somerset Hotel, Boston, Mass.
- Nov. 30-Dec. 1: PGVC Conference, Professional Group on Vehicular Communications, Hotel Radisson, Minneapolis, Minn.

## AIRBORNE ETV DISTRIBUTION



This is a typical Jerrold installation for educational TV in the MPATI area (Midwest Program on Airborne Television Instruction). Circling aircraft transmits two videotaped courses over channels 72 and 76 to school. Signal is converted to VHF, amplified and distributed through school by coax to standard receivers. System provides for closed-circuit TV.

## News of the Industry

**HARMAN-KARDON** names **LARRY EPSTEIN** as Sales Manager of Commercial Sound Products.

**SIMPSON ELECTRIC** has named **FRANCIS L. O'DONNELL** as Marketing Manager.

**TRIAD TRANSFORMER** has appointed Miss **JEANN C. NIELSEN** as Sales Promotion Manager.

**GENERAL INSTRUMENT** has announced its acquisition of **PYRAMID ELECTRIC CO.**

**TENNA MFG.** announces the appointment of **DONALD G. BLECH** as Sales Manager.

**FEDTRO, INC.** has appointed **BERNARD KLEINMAN** as Advertising and Public Relations Director.

**CORNELL-DUBILIER** names **GLENN RONK** as Director of their new headquarters marketing organization.

**SPRAGUE ELECTRIC** reports that **JAMES M. PRICE** has joined the field sales promotion staff of **SPRAGUE PRODUCTS CO.**

**TECHNICAL APPLIANCE CORP.** names **DOUGLAS R. VINING** as Sales Manager, Defense and Industrial Division.

**PACOTRONICS, INC.** reports the promotion of **SIDNEY SOLOMON** to Sales Manager of **PACO ELECTRONICS CO. INC.**

**BELDEN MFG.** has issued a license to **CHANNEL MASTER CORP.** for the manufacture of **BELDEN** twin-lead foamed polyethylene transmission line cable.

**SYLVANIA ELECTRIC PRODUCTS** launched a new entertainment transistor promotion which "saves time, space and cost for service dealers while adding to their know-how."

**ARCO ELECTRONICS** recently dedicated their new 46,000 square foot headquarters plant on Community Drive, in the Lake Success Business and Professional Park, Great Neck, N. Y.

**ZENITH RADIO** reports the firm has pledged its continuing cooperation with dealers and independent servicemen in the servicing of black-and-white TV receivers, color TV receivers, which the company will introduce this Fall, and in the **PHONEVISION** operations.

**CHANNEL MASTER** announces the award of "Certificates of Proficiency" in Transistor Radio Servicing to all dealers successfully completing its course in the subject, in the **CHANNEL MASTER Service Clinic.**

**BLONDER-TONGUE's** newly appointed Regional Field Sales Managers are: **TOM SHEA**, Eastern region; **PAUL PUSECKER**, Midwestern region; and **LESLIE FAREY**, West Coast region.

**UNITED CATALOG PUBLISHERS' Radio-Electronic MASTER** celebrates its 25th anniversary with a 1600 page edition. The first **MASTER (1935)** had 300 pages. Now listed are more than 185,000 items.

**UNITED FILE-O-MATIC** announces battery data available to subscribers. Includes: latest cross-reference and replacement listing for Portable Battery Radios; replacement guide for Battery Operated Instruments; and a Quick-Find Chart.

**B&K MFG.** announces a new twice-yearly picture tube chart information service. Mailings of the new charts to be made in May and November, at a charge of \$1.00 for one year's subscription. Mail subscription order with payment direct to **B&K Mfg. Co., 1801 W. Belle Plaine Ave., Chicago 13, Ill.**

**SYLVANIA ELECTRIC PRODUCTS** announces the establishment of two branch service stations in New York to supplement TV, radio and phonograph service in the metropolitan area. These two **SYLVANIA** service operations are designed to augment, rather than replace, service already being provided customers by **SYLVANIA** dealers and service contractors.

**GENERAL ELECTRIC** reports that **L. BERKLEY DAVIS**, Vice Pres. of **GENERAL ELECTRIC CO.** and General Manager of GE's Electronic Components Division, has been re-elected President of the **ELECTRONIC INDUSTRIES ASSOCIATION.** Following appointments in GE's Television Receiver Department: **WILLIAM E. DAVIDSON**, General Manager; and **JOHN S. CHAMBERLIN**, Manager, product planning and market research.

**WESTINGHOUSE Electronic Tube Division** reports the following appointments: **FRED H. O'KELLEY**, Manager of distributor products sales; **CARMEN E. RAMICH**, Manager of industrial and military equipment sales; and **FREDERICK H. TOWNSEND**, manager of entertainment equipment sales. **W. F. BAKER** is Staff Assistant to the General Manager.



## Larger, longer scale meters

. Just what you asked for — AND MORE!

The previous "D-612T", rated best by servicemen, is now even *more* efficient with these improvements.

**New . . .** Clear plastic meters with 88% longer scale! Attractive — easier to read.

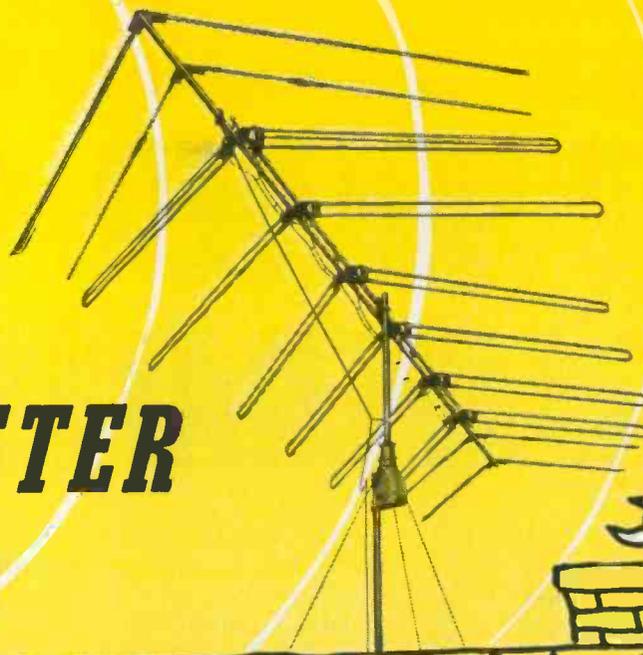
**New . . .** Insulated binding post terminals for increased versatility! Accommodate any common connection.

**New . . .** One full year warranty! Your proof of superior quality.

**Special filter circuit** holds ripple to less than 0.5% RMS up to 5A, less than 2% up to 10A . . . well below minimum critical requirements for transistor auto and personal radio work. Ideal for testing and servicing citizen's band transceivers, tube radios, DC motors, etc. . . . . *still only \$59.95 net.*



Write for New Catalog PS-561 giving all advantages  
**ELECTRO PRODUCTS LABORATORIES**  
 4501-V Ravenswood, Chicago 40, Ill., Longbeach 1-1707  
 Canada: Atlas Radio Ltd., Toronto 1279



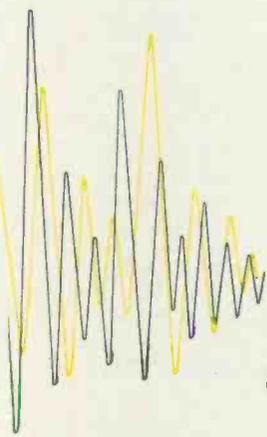
# **CHANNEL MASTER** has everything under the sun...

to keep your Summer Sales Simmering!

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

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

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



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

ELLENVILLE, NEW YORK

For more data, circle 8-17-1 on coupon, p. 45

# SIMPLY INTERCHANGE TIPS FOR 3 SOLDERING TEMPERATURES

Magnastat tips are available in 3 different temperature ranges: 750°F., 700°F. and 600°F. controlled to  $\pm 3\%$  approximate variance. Merely interchange the tip for the soldering temperature best suited for the job. Over 40 standard tip styles available in 3 temperature ranges.



**Weller**  
**MAGNASTAT**<sup>®</sup>  
**CONTROLLED TEMPERATURE  
SOLDERING IRONS**

- Automatically maintain correct soldering temperature
- Weigh only half as much as uncontrolled irons
- Give greater heat efficiency with lower wattage

Plus these advanced features for greater efficiency:  
 • Various tip types now available • New tip retaining nut minimizes freezing • New rubber shock absorber prevents sliding • New, rugged, non-arcing snap switch • Handle stays cool • New cord connection locks cord securely in place, yet permits easy replacement • 2 or 3-wire cords available.

3 MAGNASTAT SOLDERING IRONS ARE AVAILABLE

MODEL TC-552. 55 watts, for heat-sensitive soldering	\$9 <sup>00</sup> <sub>list</sub>
MODEL TC-602. 75 watts, for light to medium soldering	\$10 <sup>00</sup> <sub>list</sub>
MODEL TC-1202. 120 watts, for medium to heavy soldering	\$11 <sup>50</sup> <sub>list</sub>

Prices shown are for Magnastat Iron with tip and 2 wire cord.

Send for NEW literature on  
Weller MAGNASTAT Soldering Irons.

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

## Reps & Distributors

HYDE ELECTRONICS CO., Denver rep firm, has added MIKE NEWTON to the sales staff.

VACO PRODUCTS CO. announces the following rep appointment: PAUL KURTZ CO., for the state of Michigan.

ERA (Electronic Representatives Ass'n) reports the appointment of ROBERT J. MORGAN to the new post of Director of Education.

JERROLD ELECTRONICS CORP. reports that their annual "Rep of the Year" award has been presented to THE HEIMAN CO., Minneapolis rep firm.

GONSET DIV. YOUNG SPRING & WIRE CORP. has named A. W. WEART BROTHERS, as communication manufacturers' rep for northern Calif. and northern Nev.

PYRAMID ELECTRONIC CO. reports the addition of two distributors: ARROW ELECTRONICS INC., Mineola, N. Y.; and SUN RADIO & ELECTRONICS, New York City and Stamford, Conn.

LUKKO SALES CORP., Chicago distributor, reports reorganization and new management. Newly elected president is SANFORD LEVEY. S. ROBERT BERK is Vice Pres. SOL W. BERK is Chairman of the Board.

ELECTRONIC PUBLISHING CO. announces a new catalog, "Industrial Electronics," published by ENGINEERING SUPPLY CO., a corporate division of TEXAS INSTRUMENTS INC. Products of 100 manufacturers are listed.

SYLVANIA HOME ELECTRONICS CORP., TV marketing subsidiary of SYLVANIA ELECTRIC PRODUCTS, INC., announces appointment of IGOE BROTHERS, INC. as franchised distributor for metropolitan N. Y. area and N. J. Also, appointed for the St. Louis area is: BROWN SUPPLY CO.

SLATE & CO., Bronx, N. Y. distributors, announces an overall expansion and growth program. SLATE ELECTRONICS INC., a new corporation, is now parent company to SLATE & CO. Officers of the new corporation are: LAWRENCE SLATE, Pres.; IRVING STONE, Vice Pres.; and JULIUS PARISER, Secy.-Treas.

# BETTER THAN EVER IN ITS 31<sup>ST</sup> YEAR



## THE **PHILCO PLEDGE OF QUALITY** TO THE SERVICE-DEALER

When you insist on a Philco STAR BRIGHT 20/20 Picture Tube or Philco Receiving Tube, you're sure of unbeatably high quality. Type for type, there are many technical reasons why—but the most fundamental reason behind Philco's pledge of quality is the fact that Philco is here to stay . . . and the service-dealer is Philco's most important tube customer. The independent service-dealer has relied on the Philco

name for over 30 years . . . and Philco constantly raises its standards to make its good name even more of an asset to you—the service-dealer, in the coming years.

For quality that helps your reputation—and your profits, insist on Philco STAR BRIGHT 20/20 Picture Tubes and Philco Receiving Tubes. There's a Philco quality component for every TV repair need.

### Double Protection—both Bond and Warranty

Every Philco STAR BRIGHT 20/20 Picture Tube is Bonded to be built with all new picture making parts

. . . to the same rigid standards as tubes in newest and finest Philco TV sets. Plus a full year Warranty.

# PHILCO<sup>®</sup>

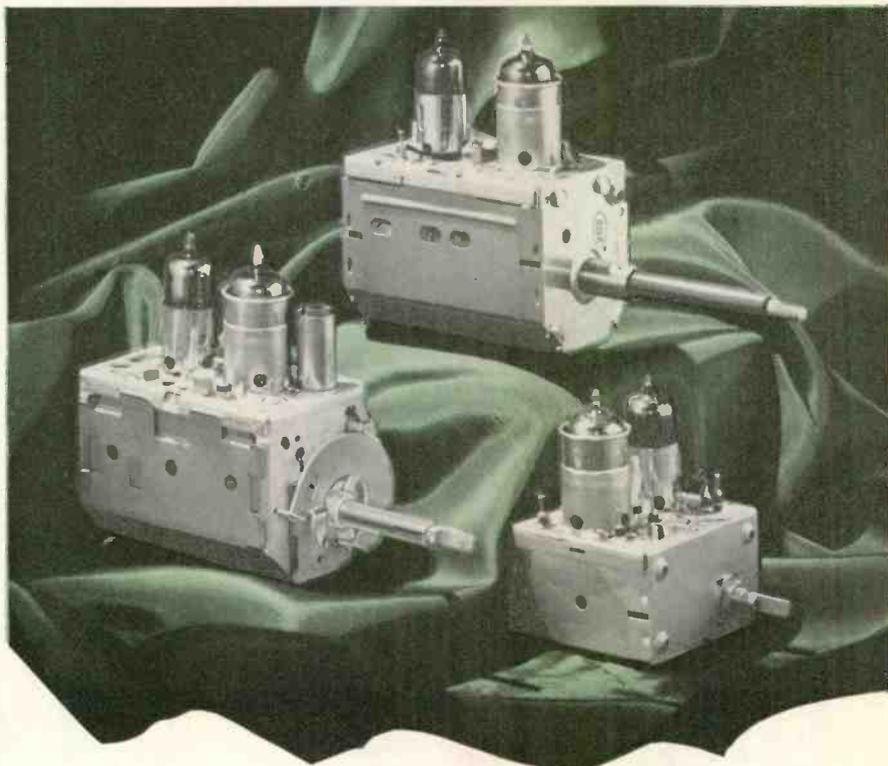


*Famous for Quality the World Over*

For more data, circle 8-19-1 on coupon, p. 45

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

# TOPS in the field- TARZIAN TUNERS



SILVER SEALED  
(switch-type)

HOT ROD  
(turret-type)

HI FI  
(FM) Tuner

Television and radio manufacturers are quick to appreciate the outstanding qualities and characteristics of the TARZIAN TUNER. It's a precision-built unit engineered and produced to assure unexcelled reception . . . especially in fringe areas.

That's why most engineers and designers specify and rely on the trouble-free TARZIAN TUNER for the best performance of their sets. After all, the TUNER is the "brain" of any receiver.

Sarkes Tarzian, Inc., *the* pioneer in the industry, offers manufacturers the HOT ROD (turret type) SILVER SEALED (switch type) . . . as well as the Hi Fi FM TUNER.

All with built-in HIGH QUALITY . . . DEPENDABILITY . . . UNEXCELLED PERFORMANCE . . . and at LOW COST!

For more information, write to: Sales Department, Tuner Division



## SARKES TARZIAN INC

east hillside drive • bloomington, indiana

Manufacturers of TV and FM Tuners • Closed Circuit TV Systems  
• Broadcast Equipment • Air Trimmers • Magnetic Tape • Semiconductors

## Catalogs & Bulletins

**WIRE & CABLE:** A new 4-page catalog covers the complete JSC wire and cable line. All wires are clearly illustrated with a full description for ease of ordering. Jersey Specialty Co., Burgess Place, Mountain View, N. J.

For more data, circle 8-20-2 on coupon, p. 45

**OSCILLOSCOPES:** Literature covers the features and specifications, uses and applications of the new compact NUScope, designed for use where a small oscilloscope is needed for service or test observations. National Union Electric Corp., Bloomington, Ill.

For more data, circle 8-20-3 on coupon, p. 45

**PLIERS:** An illustrated pamphlet covers the complete line, six different styles, of "Royal Swedish" pliers. Also available, the "Handicraft Tool Catalog" of X-acto precision hand tools. Handicraft Tools, Inc., Div. of X-acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y.

For more data, circle 8-20-4 on coupon, p. 45

**NEEDLES:** Reported as the first needle display to combine the actual merchandise, the selling literature, and complete needle data in one package, the new Jensen Needler can be a counter display, a wall display, a window exhibit, or a stock book. Jensen Industries, Forest Park, Ill.

For more data, circle 8-20-5 on coupon, p. 45

**TUBES:** The new type 6HB6, a T6½ miniature pentode described in literature incorporates a newly-engineered grid design which provides a more linear transfer characteristic and a transconductance of 25,000 micromhos. Industrial Components Div., Raytheon Co., 55 Chapel St., Newton 58, Mass.

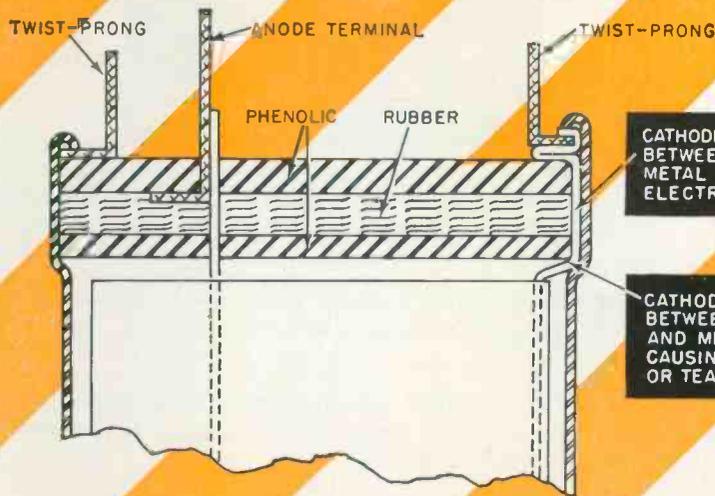
For more data, circle 8-20-6 on coupon, p. 45

**POWER SUPPLIES:** Colorful, illustrated, 6-page brochure covers filtered variable output power supplies, for all types of low voltage d-c applications. Includes selection guide, special features and specifications. Electro Products Labs., 4501 N. Ravenswood, Chicago 40, Ill.

For more data, circle 8-20-7 on coupon, p. 45

**TUBES:** Included in the new "Pacesetter" sales promotion campaign is the highlighted truck decal which carries this message: "Call Us First For Fast, Expert TV Service," a giant six-sheet (11 by 5 feet) full-color billboard poster which provides space for dealer's imprint identifying his store as RCA Silverama headquarters. Another key part of the program is a booklet of newspaper ad mats and several suggested radio and TV commercials. RCA Electron Tube Div., Harrison, N. J.

(Continued on page 24)



CATHODE TAB BREAKS SEAL BETWEEN RUBBER AND METAL CAN, PERMITS ELECTROLYTE SEEPAGE

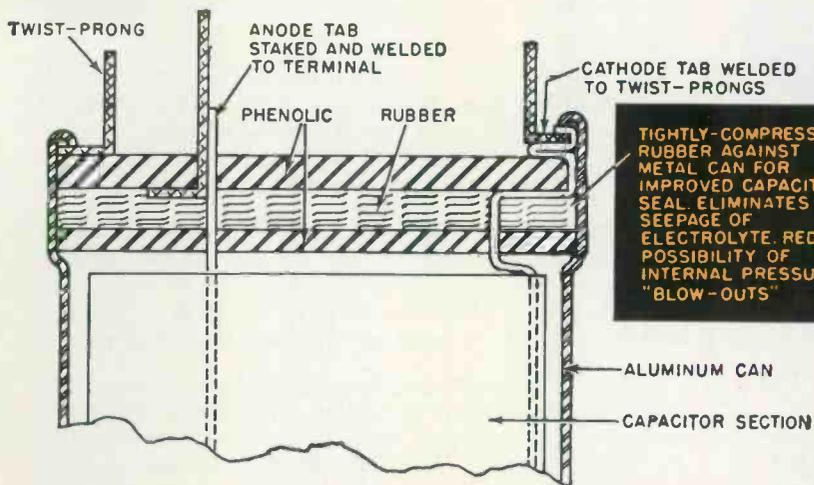
CATHODE TAB PINCHED BETWEEN BAKELITE DISC AND METAL CAN, OFTEN CAUSING TAB TO BREAK OR TEAR AT THIS POINT

ORDINARY ELECTROLYTIC CAPACITOR

**CAUTION!**

# DON'T RUIN CUSTOMERS' SETS WITH OBSOLETE 'LYTICS

**ONLY SPRAGUE TWIST-LOKS® HAVE THE NEW IMPROVED COVER DESIGN**



TIGHTLY-COMPRESSED RUBBER AGAINST METAL CAN FOR IMPROVED CAPACITOR SEAL. ELIMINATES SEEPAGE OF ELECTROLYTE. REDUCES POSSIBILITY OF INTERNAL PRESSURE "BLOW-OUTS"

SPRAGUE TWIST-LOK® ELECTROLYTIC CAPACITOR

Type TVL Twist-Lok Capacitors are now more dependable than ever! Sprague has developed a new cover design which provides a truly leak-proof seal and permits capacitors to withstand higher ripple currents.

Don't risk your reputation with "second-best" electrolytics—insist on SPRAGUE TWIST-LOKS!

Complete listings are shown in Catalog C-614. Get your copy from any Sprague distributor, or write Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

**SPRAGUE®**

THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER

# Sell the 2-Way Radio that Sells Itself... RCA MARK VII Radio-Phone



Manufacturer's Nationally Advertised Price  
"Top-of-the-Line" Citizens' Band  
2-Way Radio Equipment

The name "RCA" on this quality 2-way equipment is your best assurance of customer acceptance, dependable performance. Operates from car, home, office, boat or truck. Can be used at any location having 6 or 12 volt DC or standard 115 AC power source. Saves time! Saves money! Provides four crystal controlled channels for transmit and receive; manual receiver tuning for all 23 channels. Sensational value from RCA!

Additional RCA sales outlets are now being considered in many areas. Backed by a continuous national advertising program in leading publications, and by colorful promotional material and point of purchase sales aids. For full particulars, write RCA Telecommunication Center, Dept. Y-417, Meadow Lands, Pa.



The Most Trusted Name  
in Radio

RADIO CORPORATION OF AMERICA



EICO updates its 36-page booklet, "Guide to High Fidelity Stereo and Monophonic Sound." It's available for 25¢.

OXFORD ELECTRIC releases spec sheet on its line of 7 ceramic speakers. Weight, power, flux, size, etc., are detailed.

GENERAL ELECTRIC announces the "Sophisticate" on-the-wall stereo phono system @ \$239 without tuner. Other models are \$159 to \$600.

ELECTRO-VOICE's Thin Man mike model 652, available with 24" & 15" semi-rigid 1/8" necks, is designed for studio and stations needing a close mike.

ALTEC LANSING introduces two-way speaker system: 837A Avalon @ \$246, and 838A Carmel @ \$297. Cabinet alone is \$99, size 29 3/4" H x 35" L x 17 3/4" D. Also, 12" ultralinear bass speaker 414A @ \$54.

FISHER RADIO introduces the XP-4 speaker system @ \$199.50 finished, \$189.50 ready for staining. Included are 12" woofer, two 5" midranges, 2" tweeter, and 3-way crossover network with air-core coils.

CLAIRTONE SOUND, Toronto, will market the C-1000-R stereo receiver in the U.S. Price of this dual 35-watt with tuner is \$438.90; remote control unit CXR is \$159.95. Model C-1000, less remote provision, is \$394.95.

WHO'S ON FIRST. Both Zenith's WEFM, Chicago, and GE's WGFM, Schenectady, claim to be the first station to broadcast stereo FM under the new FCC standards. Event took place midnight, June 1.

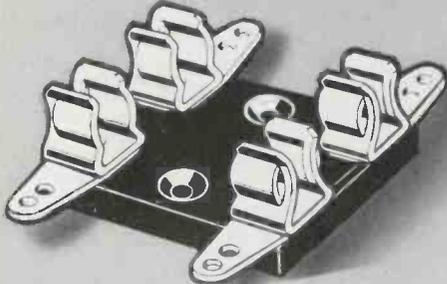
AUDIO DYNAMICS names Bert Gedzelman national sales manager, F. W. Moulthrop N. Calif. rep. Firm introduces the ADC 2 stereo moving magnet cartridge @ \$37.50. Ratings are 10-20,000 cps  $\pm$  2 db, L&V compliance 15.

H. H. SCOTT wins suit against Annapolis Electroacoustic and subsidiary Scott Radio Labs. After current items in stock are sold, the name "Scott" will have to be dropped by Annapolis. The new brand name will be "Ravenswood." No further damages were assessed.

JENSEN MANUFACTURING releases a new brochure which includes description of the 3-P series of slim speaker systems. New Model 3-P/1, 13 7/8" H x 25" W x 5 1/2" D is \$119.50; 3-P/2, 28 3/8" H x 21 1/4" W x 3 3/8" D is \$139.50. Both have woofer, 2 tweeters, midrange and ultra-tweeter.

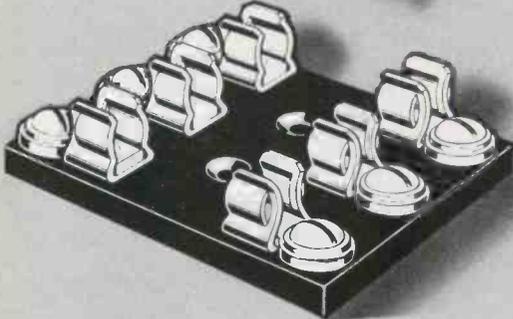
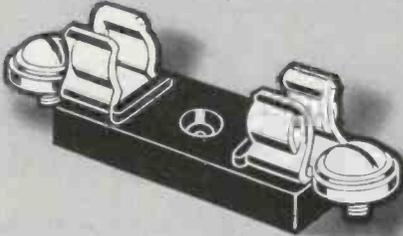
ERIC ELECTRONICS Goldline includes tuner Models 3357 FM @ \$56.75, FM-AM @ \$72.95; 3157 stereo @ \$99.95. Amplifiers include 3460P dual-10 @ \$80, 3160T dual-20 @ \$106.20, 3560T stereo @ \$149.95. Stereo receiver 5760G is \$169.95. Enclosures are extra. Prices higher in East.

JENSEN INDUSTRIES introduces snap-in cartridge kits. Eight cartridges and 26 brackets replace 432 cartridge types, said to be 65% of calls and reports that their needles will be sold by Decca in the 9,500 outlets served by Decca Distributing. Parts distributors will continue to handle line.

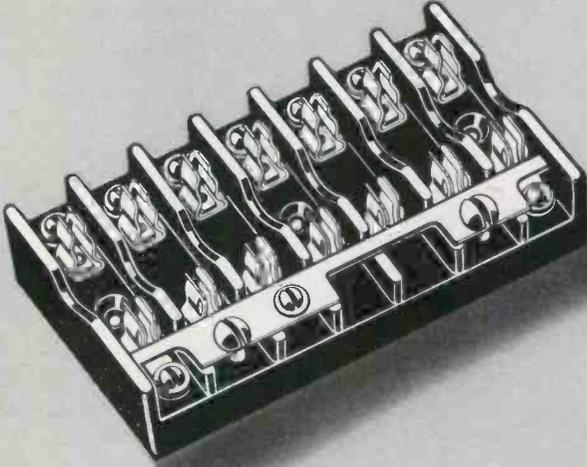


# BLOCKS

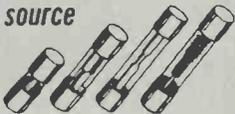
for BUSS  
and  
FUSETRON  
FUSES



*All types  
available  
for every  
application*

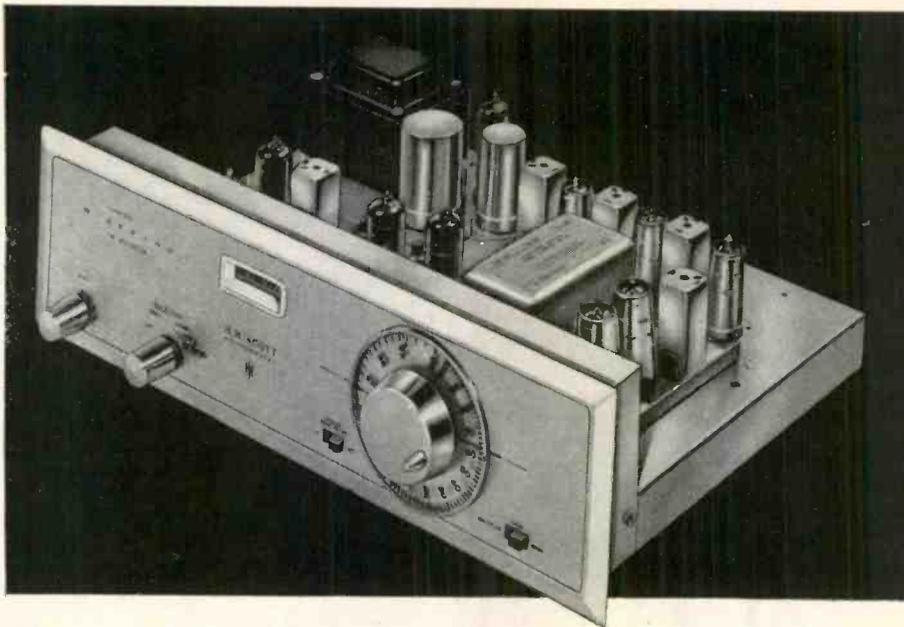


**BUSS  
and FUSETRON  
FUSES: One source  
for all your  
fuse needs.**



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.



Now . . . an FM tuner with multiplex built-in!

## New H. H. Scott FM Stereo Multiplex Tuner uses Wide-Band design for top performance

Here it is! No adaptor needed! The world's first Wide-Band tuner designed specifically for multiplex . . . H. H. Scott's new Model 350 FM Multiplex Stereo Tuner.

The FCC, in its recent acceptance of FM stereo multiplex, said that the approved system " . . . like any multiplex transmission at the edges of the channel involved. Accordingly, for optimum stereophonic reception, the (tuner's) bandwidth . . . must be considerably greater than that of monophonic (tuners) . . . "\*

From our very first design . . . the revolutionary 310A . . . H. H. Scott incorporated substantially wider IF bandwidth than conventional tuners. This gave better selectivity and usable sensitivity. The new 350 incorporates this same exceptional circuitry allowing reception of even weak multiplex stations with amazing clarity. You get other benefits, too — the 2 MC Wide-Band de-

tor provides superior rejection of interference and complete freedom from drift. The Wide-Band design of the IF's and detector give the new 350 a remarkable usable sensitivity of 2.5  $\mu$ v measured by stringent IHFM standards.

If you are considering a new tuner, or addition of an adaptor to a conventional narrow-band tuner, first listen to the new H. H. Scott Model 350 Wide-Band FM Multiplex Stereo Tuner. Its superiority in sound quality is so dramatically different that you will not want to settle for less.

### Important Technical Information

Usable (IHFM) Sensitivity: 2.5  $\mu$ v. 10 tubes, 11 diodes. Famous H. H. Scott silver plated front end. Tuning meter. Performance matches FCC transmission specifications. Can receive either monophonic or stereo multiplex programs. Special circuitry for perfect stereo tape recording. Dimensions in handsome accessory case 15 1/2"W x 5 1/4"H x 13 1/4"D. Matches styling of all H. H. Scott amplifiers. \$199.95 \* \*, case extra.

\*see paragraph 36, FCC Report and Order, Docket no. 13506, 4/19/61. Emphasis ours.

\* \* slightly higher West of Rockies.

**H. H. SCOTT**

H. H. Scott, Inc. Dept. 140-08  
111 Powdermill Road, Maynard, Mass.

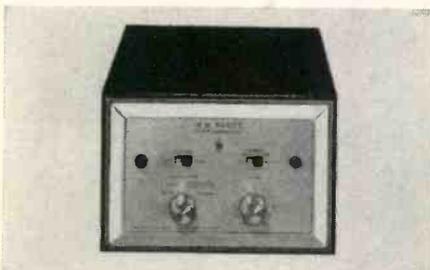
Please rush me full details on your Wide-Band Multiplex Tuner and Adaptor. Include new 1961 catalog.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Export: Morhan Exporting Corp., 458 Broadway, N. Y. C.



### Wide-Band Multiplex Adaptor

**Important News for H. H. Scott Tuner Owners**  
H. H. Scott has once again protected your investment against obsolescence. Your tuner, regardless of age or model, can be quickly converted to multiplex with the new Model 335 Wide-Band Multiplex Adaptor. Because of H. H. Scott's unique no-compromise Wide-Band design, we can guarantee superior multiplex reception only when the 335 and an H. H. Scott tuner are used together. 5 tubes, 8 diodes. \$99.95, case extra.

(Continued from page 20)

**TESTERS:** Literature covers two new Add-A-Testers. Model 661 quickly plugs into any 260 or 270 to make a rugged, dependable, portable d-c ammeter. Model 657 quickly plugs into any 260 to measure resistance values as low as .001 ohm. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

For more data, circle 8-24-2 on coupon, p. 45

**CB RADIO:** Model TR327 citizens band "D" phone, described in literature, features new universal power supply to permit swift changes between base station and mobile use. Four-channel operation. Five-watt input power. Also covered is companion unit TR 330 Han-D-Phone. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif.

For more data, circle 8-24-3 on coupon, p. 45

**FUSES:** Literature describes new fuse replacement kit containing 19 miniature fuse types for black-and-white and color TV sets. Assortment, totals 130 fuses, compactly packed in reusable plastic box, is accompanied by chart showing which fuse is required for each make of TV set. Sightmaster Corp., 50 Aleppo St., Providence, R. I.

For more data, circle 8-24-4 on coupon, p. 45

**GENERATORS & VTVM's:** Combination sine and square wave generator model G-34, covered in literature, has frequency range of 6 cycles to 750 kc. Additional literature covers model 48 vacuum tube voltmeter which employs a balanced vacuum tube bridge circuit for all voltage and resistance measurements. Paco Electronics Co., 70-31 84th St., Glendale 27, N. Y.

For more data, circle 8-24-5 on coupon, p. 45

**TRANSISTORS:** Operational characteristics of radio and TV transistors are explained in a special Transistor Data Chart. Utilizes standard rating figures and a complete listing by type and application. Consumer Products Div., Philco Co., Tioga & "C" Sts., Philadelphia 34, Pa.

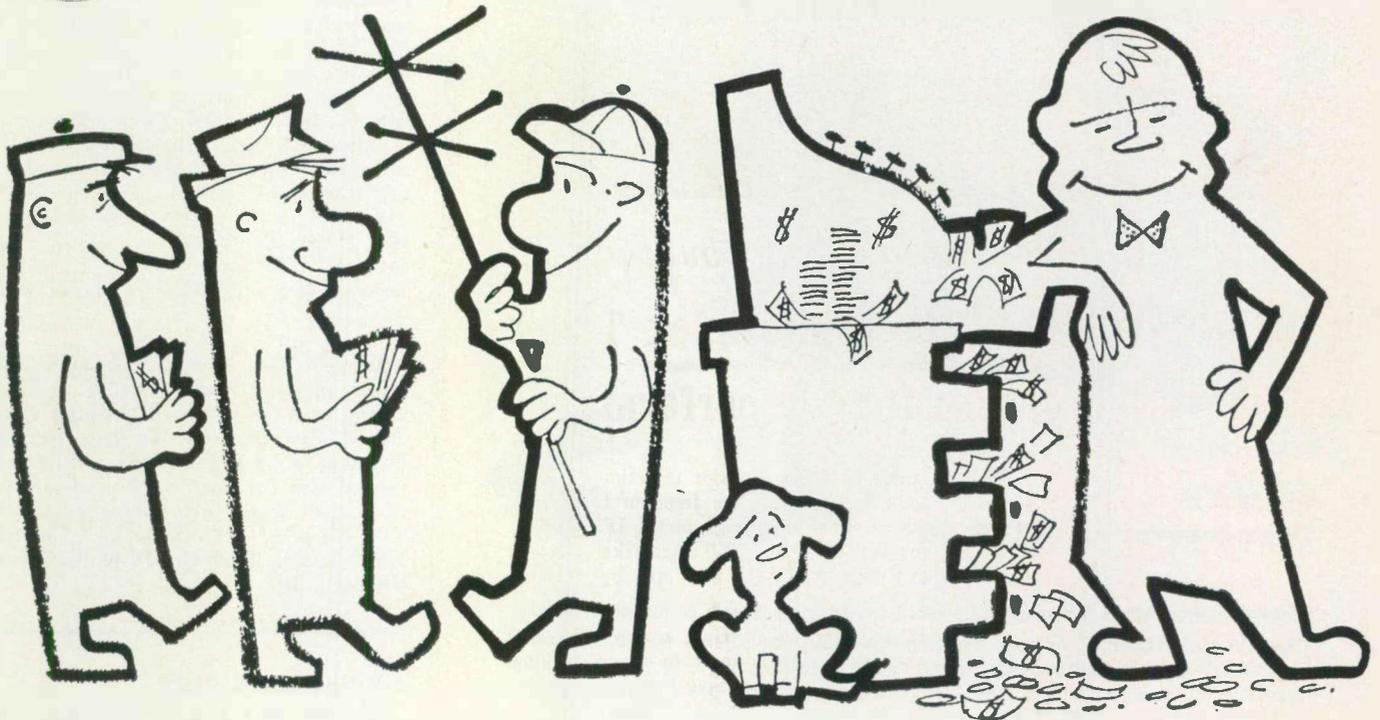
(Continued on page 26)



# TV Masts and Towers made of Armco ZINCGRIP Tubing put MORE profits in the till



for strength,  
rust-resistance,  
good looks



You'll hear that pleasant tinkle of the cash register more often, make extra profit when you sell TV towers and masts made of durable rugged Armco ZINCGRIP® Tubing. Here's why—

First, they are easier to sell. They have the rugged strength of steel that keeps antennas in alignment despite ice and wind. And your customers can see that the attractive, durable zinc coating hasn't flaked or peeled during fabrication. It won't flake during erection, either.

Second, they keep customers satisfied. That's because masts and towers of ZINCGRIP Tubing stay free of rust for years, look better longer than those made of painted or electrogalvanized tubing. And satisfied customers mean more sales in your complete line.

Sell masts and towers made of Armco ZINCGRIP Steel Tubing and see how they will boost your profits,

uphold your reputation for quality and service. Just mail us the coupon for names of manufacturers of TV masts and towers made of this special Armco tubing.

New steels are  
born at  
Armco

**ARMCO STEEL CORPORATION**  
2291 Curtis Street, Middletown, Ohio

Send me the names of manufacturers who make masts and towers of Armco ZINCGRIP Tubing.

Name \_\_\_\_\_

Firm \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



## Armco Division

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



**CB-3**

*littlefone*

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.

For more data, circle 8-26-1 on coupon, p. 45

**THE NEW DYNAMIC RAPID TROUBLE SHOOTER**

**METREX GENIE**

**POCKET-SIZED — TRANSISTORIZED SIGNAL GENERATOR**  
Tunable 50 cy. to 3.3 mc.

**7 INSTRUMENTS IN ONE!**

FUNCTIONS AS • RF • IF • AUDIO  
VIDEO • PULSE • BAR GENERATOR  
& VOLTAGE CALIBRATOR

Services — RADIO, TV, HI-FI,  
RECORDERS, PHONES AND INTERCOMS

The GENIE has a tunable range of 50 cycles to 3.3 mc. Output variable from zero to 9 volts peak to peak. The uniquely designed circuitry makes possible unusually stable operation and extremely low battery drain. The rugged diecast housing insures extreme durability and perfect shielding. 2 3/4" x 3 1/2" x 2" size is ideal for shop, lab, and field use.

**1495**  
less  
Batt.

WRITE TODAY FOR  
**FREE** TROUBLE  
SHOOTING  
GUIDE

Pat. Pend.

**METREX** 519 HENDRIX ST., BKLYN 7, N. Y.

(Continued from page 24)

**GENERATORS:** Model 830 multiplex stereo generator, covered in literature, operates in conjunction with an FM signal generator, an audio oscillator, and an oscilloscope, to provide a composite stereo signal in conformance with recent FCC multiplex decision. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.

For more data, circle 8-26-3 on coupon, p. 45

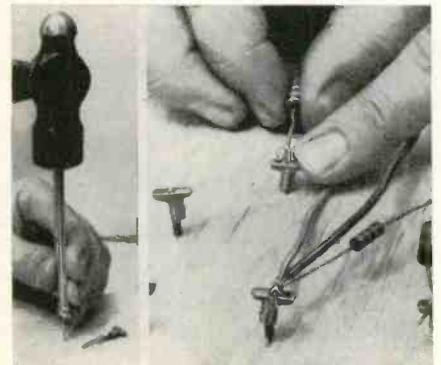
**TERMINALS:** Included in "Triple Feature" offer, described in literature, is Pak of 41 most popular solderless terminals and 91-page "Shop Kinks" book, both at reduced prices. Reverse side of display card, upon which Pak is mounted, are illustrations of the terminals together with pictures of appliances on which they should be used, plus other pertinent information. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

For more data, circle 8-26-4 on coupon, p. 45

**TUBES:** For use in ordering tubes and other parts, "Want Books," (ETR-2693), may be obtained through franchised distributors. Twenty printed business reply order cards, a duplicate record slip for each card, and a sheet of carbon paper are contained in the new 3 1/4 x 6" "Want Books." General Electric Co., 3800 N. Milwaukee Ave., Chicago, Ill.

#### E-Z Hook NAIL CLIPS

A new nail clip is especially designed to provide a quick convenient terminal for breadboard layouts, demonstration boards and experimental hookups built on plywood boards and similar material. Reported as ideal for harness boards. Advantages include: positive clamping action of the



connector and the time-saving "drive in" design which provide an ideal combination for use in making all kinds of harness cable assemblies. Will not bend, pick, balloon or damage leads. Easy to mount on board with hammer and simple driving tool. No drilling or counterboring required. E-Z Hook Products, 1536 Woodburn Ave., Covington, Ky.

For more data, circle 8-26-5 on coupon, p. 45

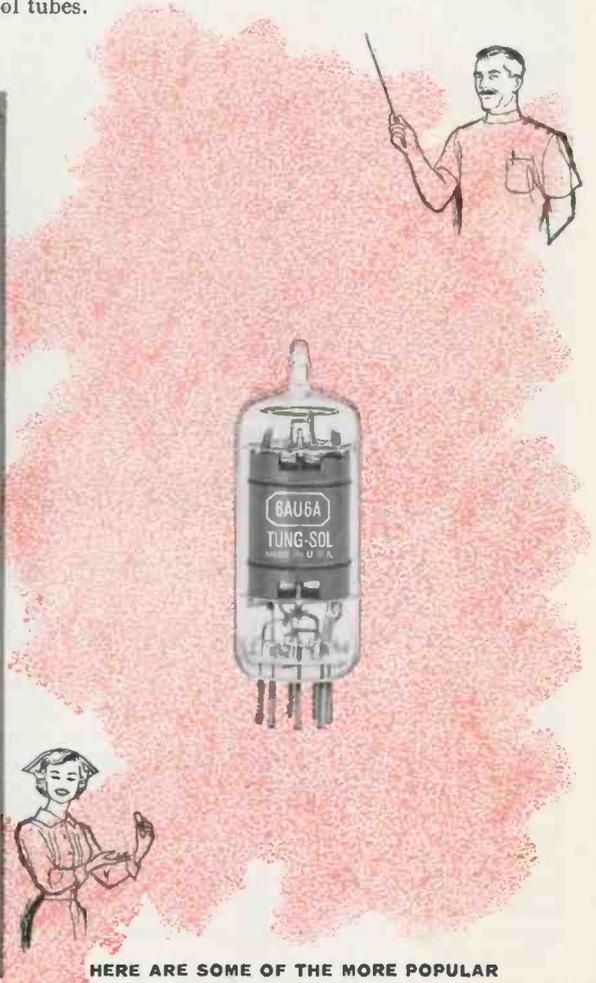
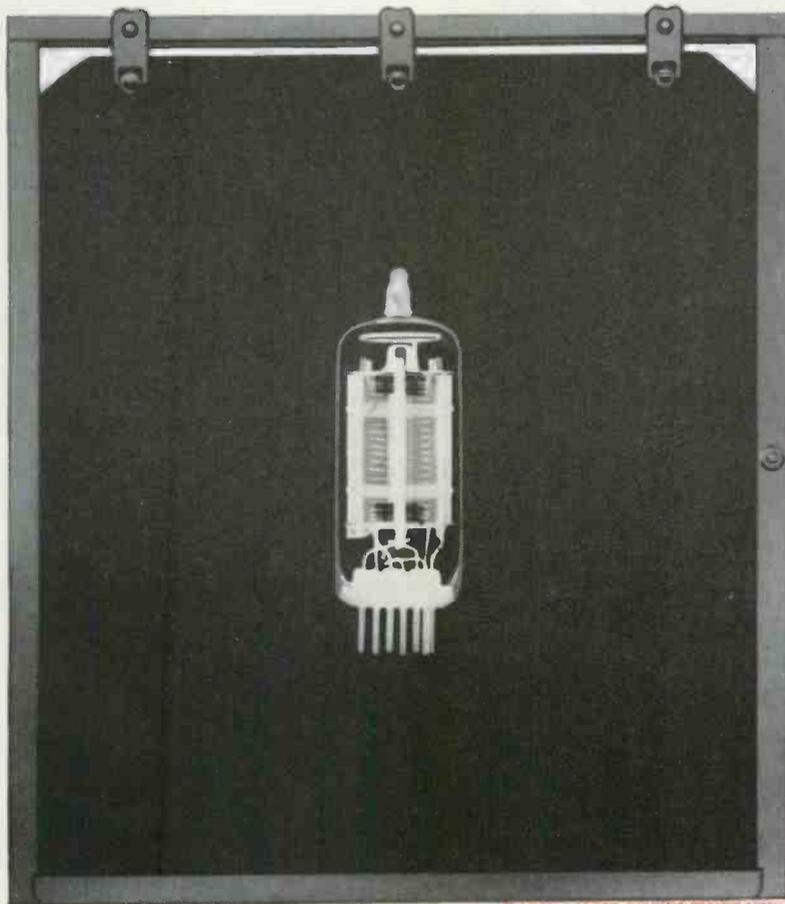
## ABSENCE OF "GRID EMISSION" AND GAS DEMONSTRATES GOOD HEALTH OF TUNG-SOL IF AMPLIFIER TUBES

Radio and TV doctors know that IF amplifier tubes must be physically sound in order to enjoy a healthy long life. Because they operate in a high impedance circuit, internal cleanliness is vital to avoid gas distress. Grid emission, which displays identical symptoms, likewise must be carefully avoided. Tung-Sol's exacting engineering standards and rigid quality control in every step of manufacture assure vigorous long life. Tung-Sol IF amplifier tubes are made in a humidity-controlled, dust-free atmosphere. The operator's hands never touch the cathode coating. Gas evacuation

and metal heating are done with critical precision by means of the most advanced equipment. As a result, Tung-Sol IF amplifier tubes possess unusual stamina and help you to maintain enviable standards in your service business.

### GOOD MEDICINE FOR PROFITS

One of the most highly recommended medicines for profits in radio and TV service business is the prescribing of tubes that are reliable. Cuts radio and TV set hospital visits. You can rely on Tung-Sol tubes.



HERE ARE SOME OF THE MORE POPULAR TUNG-SOL IF AMPLIFIERS:

- 1U4; 6AG5; 3AU6; 4AU6; 6AU6A; 12AU6; 3BA6; 4BA6; 6BA6; 12BA6; 3BC5; 4BC5; 6BC5; 6BH6; 6BJ6; 3CB6; 4CB6; 6CB6; 3BZ6; 4BZ6; 6BZ6; 12BZ6; 3DK6; 4DK6; 6DK6; 12AC6; 12BL6; 12AF6; 12EK6; 12EZ6; 18GD6A; 18FW6A



the first name to ask for when ordering



**TUNG-SOL®**  
IF AMPLIFIER TUBES

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

# NEW...Home TV Signal Amplifier

**Model AT-6 ONLY**  
**\$34.95**  
LIST

**TRANSISTORIZED WINEGARD "BOOSTER-PACK"**

**EXCLUSIVE!**  
GAIN CONTROL SWITCH

**EXCLUSIVE!**  
OUTPUT  
300  $\Omega$  75  $\Omega$

**EXCLUSIVE!**  
AC RECEPTACLE FOR TV

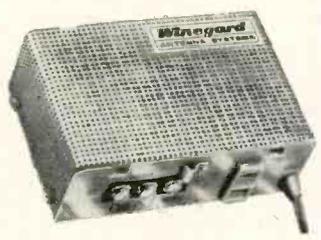
**Clears up snow, improves contrast, adds miles to reception distance!**

Here's the most unusual (and most useful) home TV-FM signal amplifier you've ever seen! Winegard "Booster-Pack" utilizes new low noise, high gain transistor\* to give you a flat gain of 16 db on the low band and FM... a flat gain of 14 db on the high band.

Shock-proof... full AC chassis with AC isolation transformer (not AC-DC). Draws only 1.2 watts... cost only 27c per year to operate if left on continuously. No heat radiation. Can be mounted on back of TV set, on baseboard, in basement, attic, etc. Use "Booster-Pack" as a single set booster or as a home system amplifier for up to 6 or 7 sets. (See right)

\*Special transistor so new that this amplifier could not have been produced until now.

**No other amplifier under \$80.00 has all these features!**



- Drives from 1 to 7 TV/FM sets
- Ideal for color
- Power Consumption: 1.2 watts

- Gain: Low and FM: 16 db  
High: 14 db
- Input: 300 ohm
- Output: 300 ohm and 75 ohm
- Transistor\*: Low noise, high gain type
- Power Transformer: AC isolation type
- Gain Control: 3-position switch
- AC Outlet: To receive TV set power plug
- Precision Wiring... finest quality throughout

**1 USE IT AS A "SINGLE SET" AMPLIFIER**

WITH ANY OUTDOOR ANTENNA

WITH "RABBIT EARS"

**2 USE IT AS A "HOME SYSTEM" AMPLIFIER**

WINEGARD "SIX-SET" COUPLER

300 OHM SYSTEM

8 DB to each set

DRIVES UP TO 6 SETS

75 OHM SYSTEM

8 DB to each set

DRIVES UP TO 6 OR 7 SETS

**New! Winegard "Six-Set" SIX SET TV COUPLER**

For connecting up to 6 TV sets to "Booster-Pack" or to Winegard Powertron antenna. 300 ohm input and outputs. Low insertion loss, positive isolation between sets.

Mod. LT-63  
\$7.95 List

ASK YOUR DISTRIBUTOR OR WRITE TO:

**Winegard**  
ANTENNA SYSTEMS

WINEGARD CO., 3019-8 Kirkwood Ave., Burlington, Iowa

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## *Service Dealer Discounting On The Rise*

"If you can't lick 'em, join 'em!"

That seems to be the attitude toward discounting of an increasing number of TV-electronic service dealers.

Plagued by drug store tube testers, retail-selling distributors and direct mail houses, servicers are looking for a competitive answer.

One answer is to become promotional, cut prices on tubes and other merchandise, and depend on increased volume to make up for the reduced profit margin. Many dealers who welcome the high profit on tube replacements recognize that it is a crutch, out of line with their own slim profits on labor, and out of tune with modern merchandising.

The trouble is that too few consumers are willing to pay an honest high labor charge. They prefer to pay through the nose for parts. So technicians frequently take the easy way out, pricing labor too low, parts at an inflated list.

If a dealer promotes tubes at 50% off list, he'd better find ways to make up for the difference. Even increased tube sales may not be enough. He must charge an adequate amount for his labor. On a tight accounting basis, most shops in most areas of the country are losing money if a basic house call is under \$4. A fair return usually requires \$5 or \$6. This higher price can be a problem when a service operator becomes a discounter.

In New York a discount group is setting up a franchise arrangement with service dealers. The central group does all the purchasing, benefiting from the large volume, and promotes the "specials" obtainable in its affiliated outlets. Advertising directed to consumers tells of money-saving sales. A portion of all store receipts go to the central group.

In Kansas City a number of service dealers have banded together to promote tube sales at reduced prices. Prices may be pegged to about 15% over cost, a dramatic contrast to as much as 150% over cost on a list price basis.

To date a relatively small number of independents have moved into the discount field. The trend indicates that more will. Whether discount service dealers will become a major element in the industry can not be predicted accurately at this time.

It behooves every servicer considering such a move to study it from all angles. Depending on type of plan, location, financing and business philosophy, it appears that discounting can be profitable for some dealers, disastrous for others.

# TV MANUFACTURERS

## ADMIRAL

### TV Chassis 20B7—Remote Relay

(See ET Circuit Digest #644, 7/61)

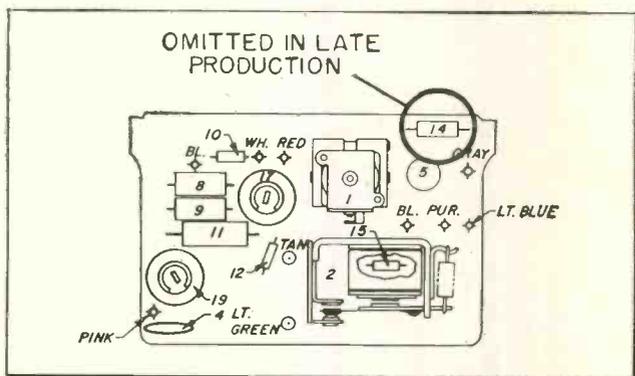
An alternate remote control volume step relay was used in later production "Son-r" models. Early production sets used a four position cam type step switch with three individual single pole switch sections. This was shown as K501.

In later production sets, this part is a wafer type switch, with a separate SPST blade type on/off power switch. Although the step relays differ physically and mechanically, they are electrically interchangeable. Either type may be used as a service replacement.

## DELCO

### 1961 Guide-Matic Auto Radios—Missing Resistor

In late 1961 production Guide-Matic Auto Radios, the 5.6-ohm, 2 watt resistor has been removed. A jumper wire is being used in its place. As soon as



Some Guide-Matic auto radios may be encountered with the 5.6 ohm filament resistor missing. New design Delco 12K5 tube filaments include this resistance internally.

new circuit boards are obtained, this island will be omitted; a copper strip will be attached directly to ground.

This change has been made because new 12K5 tubes have been obtained with the resistance already built into the tube filament. Therefore, watch your tube type replacement!

## EMERSON

### FM Tuning Unit #47116A—Broken Nylon Tuning Shafts

A number of Emerson FM tuners have been returned to the factory with broken tuning shafts. Examination of these units in almost every case has attributed the cause to improper attempt at field alignment.

Trying to align the tuner by holding the tuning knob stationary and adjusting one of the tuning slugs will, in almost every case, break the tuning shaft. An attempt of this type alignment is evidenced by tell-tale chipping away of the tuning slug bonding agent.

For these reasons, field alignment has never been recommended by the factory. Instead, the factory policy has been to try replacing the 6DT8 tube with one that permits over-all frequency range pick-up without the necessity of adjusting a tuning slug.

In the event a tuning shaft has been broken while attempting such an alignment, the factory will consider such tuners as physically damaged through abuse and they will no longer be acceptable for tuner replacement.

## GENERAL ELECTRIC

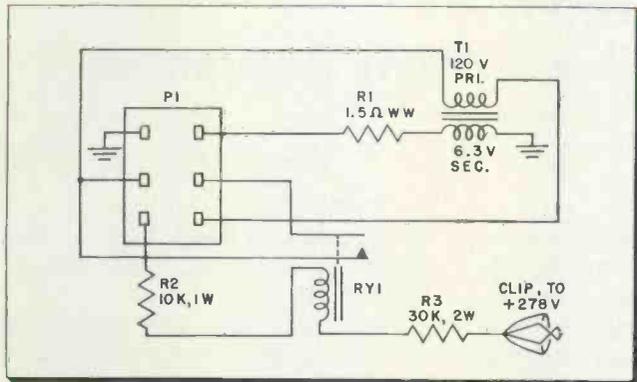
### Chassis MW—Substitute Power Box Permits Using Set Without Remote Receiver

It isn't necessary to leave your customer without a usable TV set when you remove their remote receiver for shop repair. The set can be used if a jumper device is employed. The device must complete the d-c circuit through the channel push-button switch and should include a power source for illuminating the channel indicator. Such a device is shown in the accompanying illustration.

The relay is a channel select replacement relay used in the remote receiver, and P702 is the same replacement plug as used on the receiver. The parts can be assembled in a utility box with maximum size of 3" x 4" x 5". This box will fit into the space provided for the remote receiver. Assembly isn't critical. However, the relay should be mounted so that the moving contact arm is in a vertical plane.

To use the unit, locate it in the position of the

# TECHNICAL DIGEST



Building this substitute power box will enable technicians to offer a customer use of his remote-tuned GE TV set when the remote receiver chassis needs shop work.

removed remote receiver and attach the plug to the TV chassis remote cable plug. Clamp the alligator clip to the wire wrap terminal on the main chassis sweep board where L407, the power supply filter choke is connected. Remove the hairpin cotter and slide the program wheel from the rear of the VHF tuner shaft to disable the automatic off position. Parts list is as follows:

- 1—ET8X84 Plug—6 prong plastic w/contacts P2
  - 1—ET62X54 Relay—Sensitive RY1
  - 1—ET14X87 Resistor—1.5Ω, 1/2W, wire wound R1
  - 1—\* Resistor—10,000Ω, 1W, carbon R2
  - 1—\* Resistor—30,000Ω, 2W, carbon R3
  - 1— Transformer—120V, Pri. 6.3V, 1 Amp. Sec.; T1
  - 1— Chassis—Utility box—3" x 4" x 5"
  - 1— Clip—Insulated alligator w/approx. 30" flexible #20 wire
- Assorted Hardware

\*Note: R2 and R3 may be combined into a single 40K Ω, 5W resistor

## MAGNAVOX

### Chassis 35 Series—Low Contrast

(See ET Circuit Digest #633, 4/61)

A complaint of decreased or low contrast in this chassis is frequently due to a defective 4300-ohm, five watt resistor (R218) in the video amplifier plate circuit.

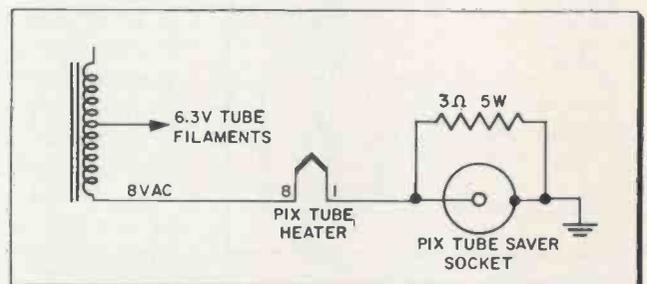
Investigations reveal that the plate load resistor's wattage rating is satisfactory, so don't substitute a higher wattage part. Failure is due to internal resistor defects and should involve only a few early production chassis. Current supplies of this resistor are entirely satisfactory.

## SETCHELL-CARLSON

### TV Chassis Model 159—Built-in CRT Booster

(See ET Circuit Digest #639, 6/61)

The manufacturer has installed an 8.2 volt built-in CRT booster in this chassis. A 3 ohm, 5 watt resistor is placed across the CRT heater, which obtains its voltage from an 8.2 volt heater transformer. Provides 6.3 volts to a new CRT. If the CRT's emission be-



This set has a built-in CRT booster! Filament voltage can be increased from 6.3 to 8.2 volts by shorting out a resistor.

comes low, the technician can short out this resistor and apply the full 8.2 volts to the CRT filament. Naturally, if a fresh picture tube is eventually installed, the 3 ohm resistor should be reinserted in the circuit by removing the jumper.

## ERRATUM

Correct May 1961 Digest, "Magnavox, Static Voltage Discharge"

From: ... add a 10 ohm (1/4 watt) resistor.

To: ... add a 10 megohm (1/4 watt) resistor.

# A Closer Look At Color TV Controls

## Obtain A Finer Color Pix With Accurate High Voltage, Convergence, & Purity Adjustments

DAVID R. ANDERSON

- A good working knowledge of color TV controls is essential to the TV technician. This knowledge will not only help when a receiver is be-

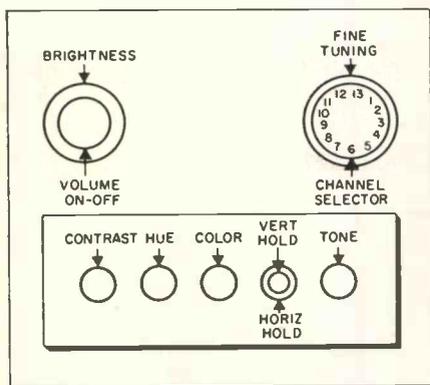
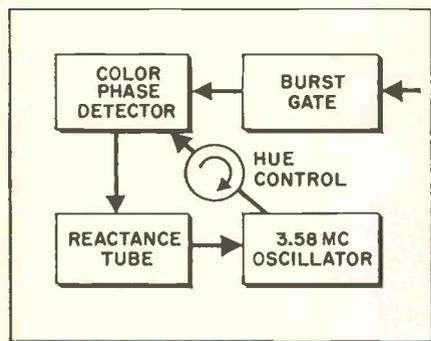


Fig. 1—Customer-operated controls on front section of typical color TV.

Fig. 2—Block diagram of essential sections associated with color TV's hue control. Control allows adjustment of 3.58 mc oscillator's phase.



ing serviced, it will also help when the technician has to explain the use of the controls to the customer.

While there is more than one model of color TV receivers, the function and operation of controls is essentially similar. However, since the large-screen, simplified-circuit sets are more modern, they will be used as examples.

Color TV controls may be divided into two groups. One group consists of controls used by the set owner. The other group includes controls adjusted by the technician during an installation or repair.

A typical layout of the user controls are shown in Fig. 1. All of the controls shown, with the exception of the hue and color controls, are common to the receiver's color and monochrome sections.

### User Adjustments

Procedures for adjusting these common controls are comparable to those used on ordinary black and white receivers. However, when viewing a color program, more care must be taken with the fine tuning control. This is necessary to keep adjacent channel sound interference at a minimum, and to produce adequate picture coloring.

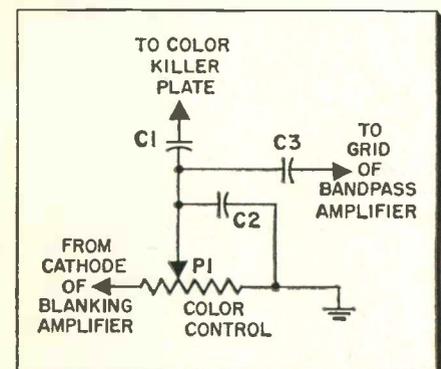
Hue and color controls may be a complete mystery to the new set owner, and some explanation is necessary. The customer will need to know that these controls must be adjusted to give the best flesh tones

in the picture being viewed. The technician, however, will need to know a bit more.

Technically, the hue control is used to balance the redness and blueness in the picture. Balance between these colors is achieved by accurately dividing their respective color carriers. Accuracy of the split is determined by the 3.58 mc oscillator's ability to duplicate the color burst phase.

To allow for corrections in the 3.58 mc oscillator's phase, a phase shifting network is inserted in the circuit. This is shown in the block diagram of Fig. 2. One phase shifting network component is variable, and this control extends to the front panel. This is the hue control. This control allows the user to accurately split the color carriers by using the familiar flesh tones as a guide.

Fig. 3—Basic color control circuitry varies colors from pastels to deep tints by increasing or decreasing the band-pass amplifier's gain.



Operation of the color control is shown in Fig. 3. Positive pulses from the blanking amplifier cathode are fed to the band pass amplifier's grid. When the color control P1 is turned toward its grounded end, the positive voltage to the band pass amplifier grid decreases. Thus, the amplifier gain is reduced. Turning the control in the opposite direction, of course, has the opposite effect.

Varying the band pass amplifier's gain permits the user to vary color depth or vividness, from pastels to deep tints. Again, as with the hue control, the color control should be set to give the most realistic flesh tones.

### Technician Adjustments

Controls to be adjusted by the technician may be divided into three categories: general controls, convergence controls, and CRT assembly adjustments.

General controls are high voltage, red, blue and green background, and screen adjusters.

The high voltage control sets the high voltage to the level recommended by the CRT manufacturer. The control is usually a pot inserted in the voltage regulator tube grid. The pot varies the regulator tube's operating point, and thus high voltage value.

Typical locations of the red, blue, and green screen and background controls are shown in Fig. 4. Screen controls are pots that vary the three accelerating anodes' voltage. Each anode has its own control, allowing each voltage to be adjusted independently.

This arrangement allows compensation for any variation that may exist between the CRT's three color phosphors. For instance, if the three anode voltages are equal and the green phosphor has more brightness capability than the red or blue, some allowance must be made, or color balance cannot be obtained.

In this example, if the green gun's anode voltage is lowered, electrons coming from this gun will slow down. Since brightness is determined by the speed at which the electrons strike the phosphors, slowing the electrons decreases the brightness. Hence, any variation in phosphor may be compensated

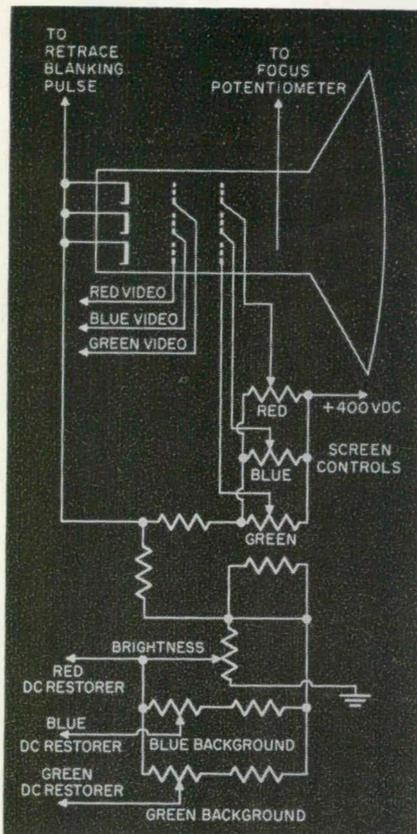


Fig. 4—Screen and background controls in typical CRT circuitry of color TV.

by adjusting the proper screen control. Background controls serve in the same manner to compensate for CRT gun variations independently controlling the cathode bias applied to each gun.

As shown in Fig. 4, the brightness control varies the bias on all three grids. The blue and green background controls adjust the bias on the blue and green grids only. This makes it possible to compensate for variations in the three guns.

In practice, both screen and background controls are adjusted to give a pure white raster. This indicates that the guns and phosphors of all three colors are balanced.

The second group of controls the technician must adjust are the convergence controls.

A simplified diagram in Fig. 5 shows the location of the vertical amplitude, vertical tilt, horizontal amplitude and horizontal shape controls. These are the dynamic convergence controls. The circuit shown is for one gun only. In an actual receiver, there would have to be three such circuits, one for each gun.

The vertical amplitude, or vertical tilt controls vary the current amplitude and wave shape in the convergence magnet coil. This varies the magnetic flux produced by the magnet and causes the beam for the color, being converged, to move.

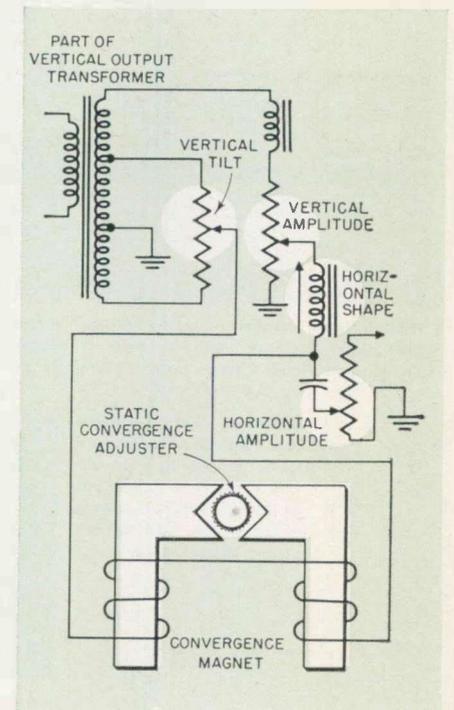
The circuit is designed so that varying the vertical amplitude pot will cause the beam to move in one direction while varying the vertical tilt control will cause the beam to move in the opposite direction.

The horizontal shape and horizontal amplitude controls operate in the same way as the vertical controls. However, it will be noted that adjusting amplitude control will have more effect on convergence at the center of the screen while adjusting the shape control will affect convergence at the edges of the screen. In addition to the dynamic convergence controls there are static convergence controls.

An example of a static convergence adjuster is shown in Fig. 5. This is a small adjustable permanent magnet set in the top of the convergence magnet. Rotating this small magnet varies the flux at the pole pieces, and causes the beam to move to a new position.

There is also a blue lateral adjuster which is an extra convergence control.  
(Continued on page 52)

Fig. 5—Dynamic and static convergence controls of typical color TV receiver.





# Higher-Priced Transistor Testers

## Lab Study Reveals Service Value of Costlier Instruments

EDITORIAL STAFF

ELECTRONIC TECHNICIAN

• How do higher-priced transistor testers stack up against the under \$30 testers examined last month? To answer this question, ET's Editors carefully examined seven higher-priced transistor test instruments: B&K model 160, Eico model 680, Hickok models 870 and 890, Precision model 960, Sencore model TR-110, and Superior model 88.

We arbitrarily divided our study into two groups, based on selling price, to simplify presenting test results. The first group of instruments, which we'll call medium-priced, sells from \$38.95 to \$69.95. The second group, which we'll call high-priced, sells from \$97.95 to \$298. (This latter group consists of a Precision and two Hickok instruments.)

### Medium-Priced Testers

The four medium-priced testers, B&K, Eico, Sencore, and Superior, have one feature that the instruments studied last month do not have. They are combination testers. That is, in addition to checking transistors' characteristics, *additional* test facilities are offered.

For example, B&K has provisions for supplying 0 to 20 volts d-c to substitute for a transistor radio's battery. Also, set current is automatically read on meter. Eico incorporates a 20,000 ohms/volt VOM which enables users to measure voltage (0 to 50 v.), current, and resistance. Sencore provides a 0 to 50 milliammeter to monitor current drawn from the radio's battery supply and has a voltmeter to measure battery voltage. It also incorporates a harmonic signal generator to permit stage-by-stage

troubleshooting. Superior also offers a harmonic signal generator for signal injection use. Additionally, a built-in amplifier/speaker permits signal tracing various stages.

From the foregoing, it's obvious that one of the reasons these testers are more expensive than the units examined last month is due to their added features. Ignoring these additional features for a moment, let's focus our attention on their transistor characteristics tests.

B&K's model 160 has significant differences compared to the low-priced testers examined last month. For one, it is not battery-operated; the unit has an a-c power supply. Secondly, it measures a-c gain, whereas last month's testers utilized d-c Beta measurements. (Two of last month's testers were used in oscillator circuits. However, they did not provide direct measurements.) As noted last month, in some applications the a-c test is preferred; in other instances, d-c is preferred. Icco leakage is measured, too.

Eico's model 680 is a battery-operated unit that measures leakage and Beta on a 50 microamp meter scale. It reads Icco and Icco leakage and measures d-c Beta directly. Good or bad readings for power transistors are indicated by the Icco readings ratio to the Icco ratio. The model we tested was a prototype unit. Final units are probably in production at this writing.

Sencore's model TR-110 checks transistor characteristics using d-c Beta measurements, as did their less expensive unit checked last month. Icco leakage indica-

tions are offered too. In addition, an in-circuit a-c gain test facility is included. Here, the general "goodness" of a transistor is checked in the set's circuit (without unsoldering leads). This test facility can be most helpful at times, even though impedance loading may sometimes give an erroneous reading.

Superior's model 88 tester measures relative transistor gain and transistor leakage in "ohms". The unorthodox leakage measurement readings force users to measure "leakage" of a known-good transistor in order to interpret leakage of the transistor being tested.

Considering only gain and leakage tests, these medium-priced testers are not basically too different from last month's less expensive group of instruments. Of course, there are differences, such as better construction, in some instances. Some instruments here are more accurate than others; some are more accurate and easier to use than last month's group. Others aren't. Examining the instruments' descriptions which follow shortly, a prospective buyer will have a better idea concerning their attributes. Viewing the instrument at a local distributor will further enable a purchaser to determine his needs.

If you're a technician who wants an inexpensive transistor tester, the under \$30 group examined last month and the four presented here give you a broad group to choose from. The four medium-priced testers reviewed in this study may be grouped with the testers examined last month. However, their extra facilities must be considered, too. If you like the idea of having a signal

generator, battery supply substitute, or any other of the added features combined with a transistor component tester, this is the group of testers you should carefully examine for possible purchase.

As you no doubt know, it is much easier to have a self-contained all-around tester than a group of separate testers, provided its size is not unwieldy. These four testers are comfortably sized. In addition to specific transistor tests, they do offer other test facilities normally essential to repair of transistor radios. Consequently, their potential as transistor component and circuit testers should not be underestimated. The following descriptions are followed by a detailed analysis of three higher priced transistor instruments.

**B&K, Model 160 @ \$69.95**—A-c powered unit tests  $I_{ceo}$  leakage and a-c (1000 cps) oscillator gain of low-medium-high power transistors. Has milliammeter; calibrated Beta dial. Leak-



age value is read on meter; gain value is read from control dial, after adjusting dial until meter needle is at correct scale line. Readings compared with manufacturer's provided rating chart. Can use transistor manual, too. Incorporates variable power supply for substituting for set's batteries; monitors volts and amps readings.

*Comments:* Medium-size; easy to operate. No set-up chart is needed. Has four permanently-secured retractable test leads (fourth lead is for tetrode transistors); off-position switch; high workmanship appearance. Fair to good accuracy. Accompanying rating chart includes conversion microamp readings.

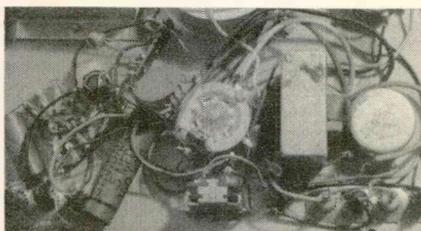
**Eico, Model 680 @ approx. \$40 wired**—Battery powered unit tests  $I_{cbo}$  &  $I_{ceo}$  leakage & d-c gain of low-medium-high power transistors and diodes.



Has 50  $\mu$  ammeter. Both tests indicate values directly on meter face. Readings compared with transistor manual ratings. Incorporates VOM facilities (0-50 volts, 0-20 meg  $\Omega$ , 50  $\mu$ a to 500 ma).

*Comments:* Compact-size; easy to operate. No set-up chart used. Gives approximate high-power transistor Beta readings by the ratio of  $I_{ceo}$  to  $I_{cbo}$ . (Manufacturer candidly states that battery-powered testers cannot accurately check high-power transistor Beta, which is, of course, true. Rough readings are generally satisfactory.) Static-type a-c Beta test method is described. Includes Beta zero ohms adjustment. Has three permanently-secured test leads. Fair to very good accuracy. Unit in kit form is approximately \$25.00. (Model examined was first prototype tester before final production commenced.)

**Sencore, Model TR-110 @ \$49.50**—Battery-powered unit tests  $I_{ceo}$  leakage and d-c gain of low-medium-high power transistors and diodes. Has milliammeter. Leakage is read on a

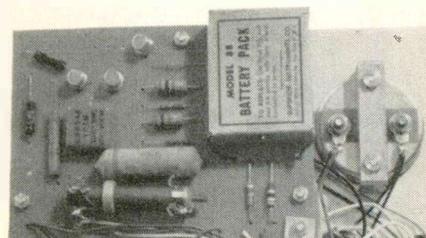


"good-bad" type scale that has lettered divisions. Gain readings made from "good-bad" or direct value scale. Bias set-up pot is employed. Transistors can be checked for rough gain without disconnecting from set under many circumstances with unit's separate oscillator test. Tester has signal injection circuit test facility. Uses a 2,000 cps signal, rich in harmonics, with two-position attenuator. Meter reads battery and voltage divider voltages, and current.

*Comments:* Medium-size; has hinged cover to protect face. (Mirror inside cover allows user to see opposite side of chassis while working.) Instrument set-up chart is needed. Manufacturer provides free up-date information for one year; nominal charge for charts afterwards. Three detachable test leads provided (has fourth jack for tetrode transistors); special test leads provided for in-circuit tests, too. Leads can be tucked into compartment space. Easy to operate once various test facilities are understood. Fair accuracy (out-of-circuit tests).

**Superior, Model 88 @ \$38.50**—Battery-powered unit tests relative leakage and d-c gain of low-medium-high power transistors. Has milliammeter.

Leakage (in ohms) and gain value read on meter scale. Leakage readings compared to known-good transistors;



gain readings from transistor manual. Unit has signal injection facility. Rich harmonic signal can be adjusted with attenuator control. Also provides signal tracer with volume control.

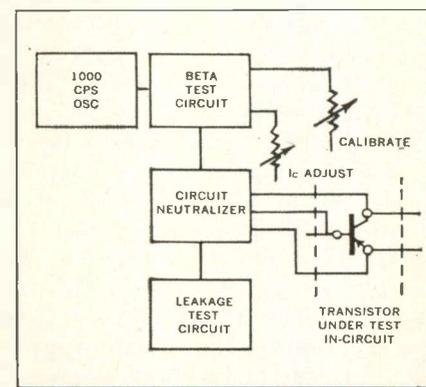
*Comments:* Medium-size; easy to operate. Has hinged cover for case; compartment for leads. No set-up chart needed. Method of using ohms scale to measure transistor leakage handicaps component tests. Has three transistor test leads for its three jacks; a pair of leads for signal injection; two leads for signal tracing (audio and demodulator). A three-transistor amplifier-speaker enables users to trace all radio stages. Also has external meter jacks to measure relative stage gain and an on-off switch. Poor to fair transistor test accuracy.

### Higher-Priced Testers

The three "higher-priced" transistor test instruments, Hickok's models 870 and 890, and Precision's model 960, are not relatively costly because of added circuit test facilities. Rather, their transistor component test provisions are more refined than the less expensive testers.

One tester is especially novel: the Hickok model 890. This instru-

Fig. 1—Hickok's Beta in-circuit tester counters the impedance-loading effect of a set's circuit, thereby permitting accurate in-circuit measurements with as low as 150 ohms circuit Z. An a-c bridge principle is used to eliminate inaccuracies.



## TRANSISTOR TEST INSTRUMENTS

Models & Prices	Test Functions		Test Indications		Semiconductor Tests			Miscellaneous	
	Leakage	Gain	Indicator	Readings	Low-Med Signal	High Power	Diodes	Other Features	Notes
B&K Model 160 \$69.95	I <sub>ceo</sub>	a-c	ma meter	Lkge value Gain value	✓	✓	*	1. Ext. Power Supply 2. Volt/amp monitor	1. A-c powered 2. Volts supply is variable 3. No set-up chart needed
Eico Model 680W \$40 (Approx.)	I <sub>cbo</sub> I <sub>ceo</sub>	d-c	50 $\mu$ a meter	Lkge value Gain value	✓	✓	✓	1. VOM 2. Beta calibr.	1. Simulated a-c Beta test 2. No set-up chart needed
Sencore Model TR-110 \$49.95	I <sub>ceo</sub>	d-c	ma meter	"gd-bad" Lkge "gd-bad" Gain & value	✓	✓	✓	1. In-circuit osc. test 2. Signal injector 3. Measures supply volts 4. Measures current	1. Mirror in case cover for viewing underside chassis 2. Free 1 yr. set-up info 3. Checks battery
Superior Model 88 \$38.50	I <sub>cer</sub>	d-c	ma meter	"ohms" Lkge Gain value	✓	✓	*	1. Signal injector 2. Signal tracer w/demod. probe	1. Lkge readings must be compared to known-good transistors 2. Has ext. meter jacks 3. Has 3 transistor amplifier 4. No set-up chart needed
Hickok Model 870 \$298	I <sub>cbo</sub> & others	a-c d-c	100 $\mu$ a meter	Lkge value Gain value	✓	✓	*	1. Battery charger 2. A-c & d-c Beta calibr. 3. Variable I <sub>c</sub> , V <sub>cb</sub> , V <sub>ce</sub> controls	1. A-c & bat. powered 2. Checks battery 3. Roll chart w/mfrs. ratings 4. Fused supply 5. Has VR tube
Hickok Model 890 \$129.50	I <sub>cbo</sub>	a-c	50 $\mu$ a meter	Lkge value Gain value	✓		*	1. In-circuit $\pm 5\%$ Beta tests 2. Measures circuit Z & transistor R 3. Beta calibr. 4. Variable I <sub>c</sub> & Collect. Volts	1. Out-of-circuit Lkge tests 2. No set-up chart needed
Precision Model 960 \$97.95	I <sub>cbo</sub> & others	d-c	100 $\mu$ a meter	Lkge value & arbitrary scale Gain value	✓	✓	✓	1. Variable I & V <sub>c</sub> 2. Line Volts adj. 3. Short test	1. Roll chart settings 2. Free 1 yr. test data 3. Fused internally

\* Front-to-back diode ratios can be broadly checked. However, manufacturer has not included specific measuring facility on tester or in operating manual.

ment makes accurate in-circuit tests of small-medium power transistors' a-c Beta. As shown in Fig. 1, the instrument employs an impedance neutralizing circuit before actual measurements are made. The circuit loading effects are nullified by adjusting "External Input Impedance" and "Dynamic Input Resistance" controls for null readings.

In most instances, the in-circuit Beta measurements are especially accurate and easy to read. The circuit impedance can be above 150 ohms to achieve this accuracy, which it generally is. Other "in-circuit" testers have this impedance requirement. But they do not offer the accuracy and readability of this Hickok unit. A-c Beta can also

be measured with a transistor out of the circuit.

I<sub>cbo</sub> leakage tests are made with this unit, of course. But leakage tests are *not* made with the transistor in the circuit. The transistor must be out of the circuit for this test.

Perhaps contradicting our previous statement that the three higher-priced testers do not have added circuit test facilities, this one does. It permits users to directly measure input circuit impedance and input transistor resistance. However, this is not a usual service need.

Precision's model 960 tester (the only under \$100 unit among the higher-priced ones) is a comprehensive transistor tester. It tests

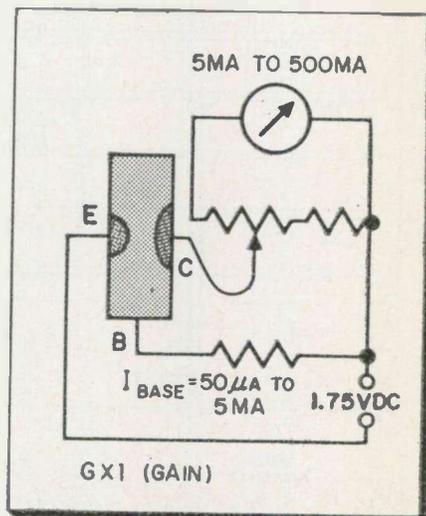


Fig. 2—Basic current gain test-circuit for Precision's model 960 tester.

(Continued on page 56)

# Installing Background Music Systems

*Number Of Speakers, Proper Mounting, & Power Levels, Are Important For Satisfactory Results*

DAVID BAIN  
Muzak Corp.

• The powerful influence of music on the mind and body has long been recognized, and special functional music, called "background music," has been used in business and industry to help prevent anxiety and

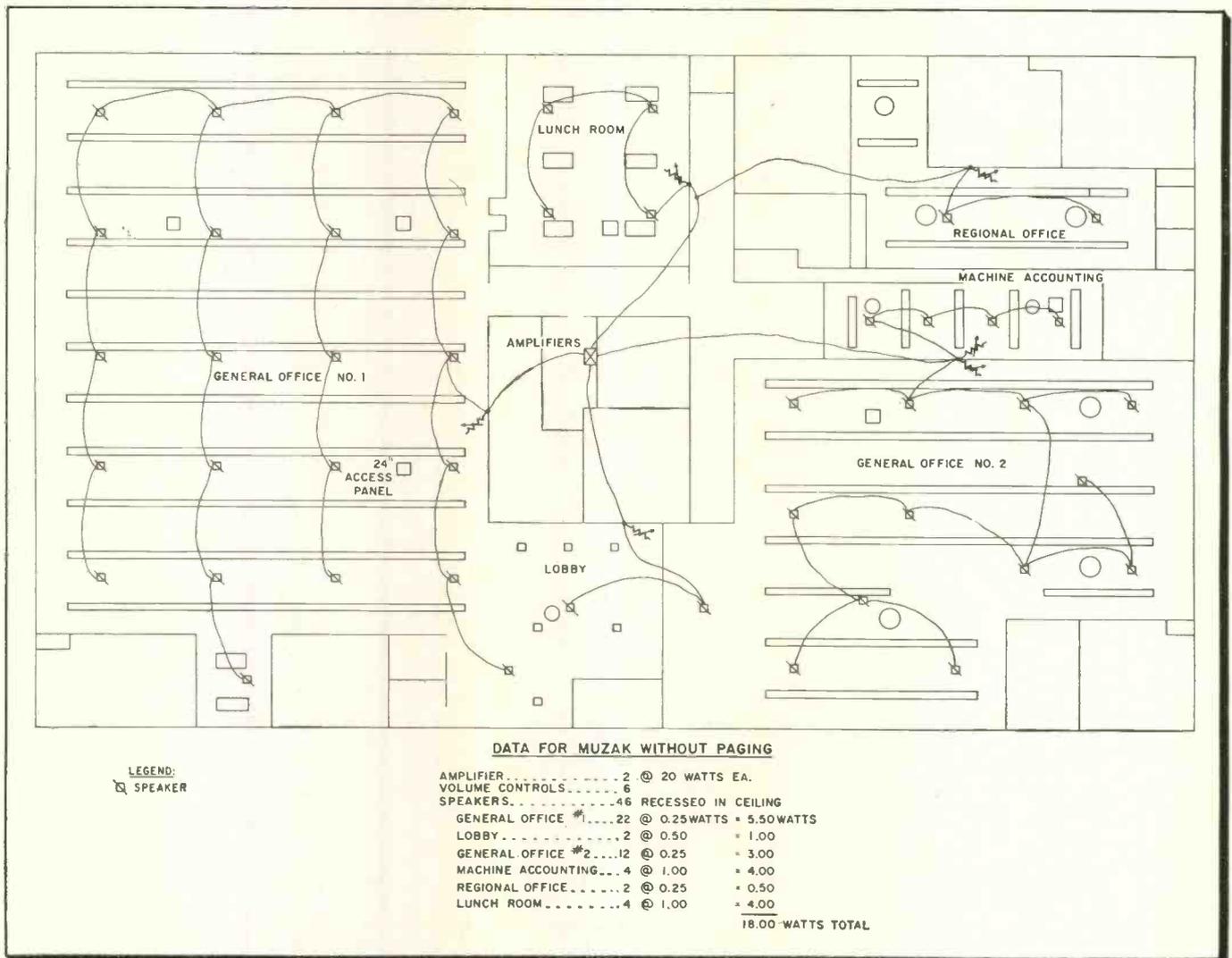
tension, monotony, fatigue, and to off-set various environmental noises. It improves efficiency and productivity, minimizes errors, accidents, absenteeism, and tardiness. Industrial plants, hotels, restaurants, banks, stores and many others use this music today.

To-be-heard but not-to-be-lis-

tened-to music originates from scientifically prepared tape recordings. It may be fed from a central location via telephone lines to subscribers. Small, continuously playing tape units may also be used directly at the subscriber's location.

The basic requirement of a background music system is to repro-

Fig. 1—Diagram of office background music distribution system employing two centrally-located 20 watt amplifiers and 46 recessed ceiling-mounted speakers.



duce the program source with the greatest fidelity consistent with the limiting factors of economics and program transmission.

### Survey & Equipment Selection

Before equipment is selected, a survey of the customer premises is naturally necessary to determine cost of materials for customer estimate. Importance of this survey cannot be over-emphasized. Final selection of a satisfactory system is not possible unless all factors are considered. Some of these factors, and reasons for their determination, are listed in Chart 1.

An ideal music system would be capable of reproducing sound from 20 to 20,000 cps with not more than one per cent distortion. Practical requirements of most wired-music installations usually preclude an ideal system, however, and a more realistic economic and technical approach is necessary. Hence, cost of components for an industrial system having an audiophile's ideal response is prohibitive.

This may appear discouraging at first glance, but a slight modification in specifications is possible without creating an inferior system. In fact, it is doubtful if ideal hi-fidelity would even be desirable under acoustic conditions prevailing in most areas. We are not installing a musical system designed for critical listening. Our interest is confined to production of quality background music.

Telephone transmission line characteristics is another factor limiting specifications. Although telephone lines are available with an essentially flat response up to 15,000 cps, cost of these facilities is very high. Considering all these factors, therefore, a frequency range from 50 to 8,000 cycles has been found entirely adequate for a majority of background music installations. Moreover, permissible harmonic distortion may reach 3 to 4% without seriously affecting reproduction.

If we are to reproduce adequate musical sounds over the range from 50 to 8,000 cps, all components in the system must have similar response capabilities. For instance, if a number of components have similar power or frequency response deficiencies from 1.5 to 2 db, total

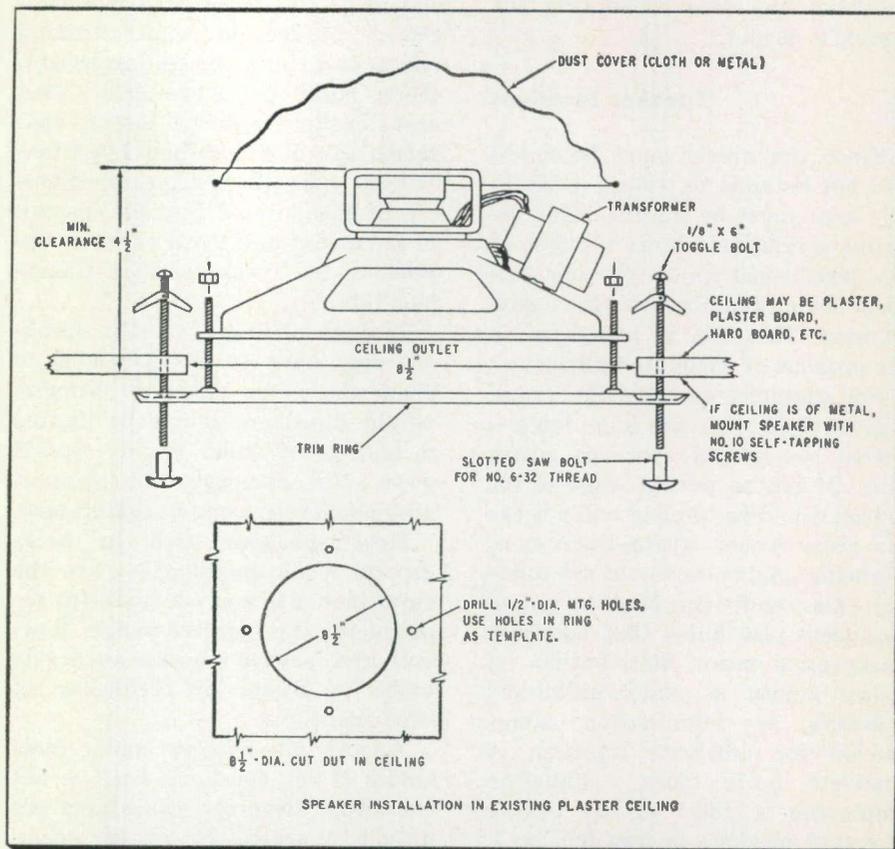


Fig. 2—Plywood frame and insert employed for flush-mounting speaker in ceiling.

system deficiency could equal the sum of the number of deficient components in the equipment line-up. Hence, each component must not contribute more than a minimal loss. To meet this requirement, each component selected should have a frequency range somewhat greater than required.

A good quality music source feed-

ing a fine power amplifier connected to an inferior speaker will produce poor results. This holds true for any inferior component in the equipment line-up. Output of the entire musical chain will be no better than the output of its most inferior link. It should be remembered, too, that a high quality component operated in excess of its ca-

### CHART I

Consideration	Reason
1. Number of square feet to be served	To determine total number of speakers required
2. Ceiling height	Spacing required between speakers
3. Noise levels in db	Determine power requirements for each speaker or group of speakers
4. Number of people in each area & amount of movement	Factors affecting sound coverage and volume level
5. Building design and construction, particularly ceiling and wall material	Determine best speaker mounting locations and wiring routes; wire above ceiling, through walls or between floors
6. Number of volume controls needed and best locations	Influences control type selection and wiring requirements
7. Environmental conditions—dust, corrosive fumes and temperature extremes	Selection of speaker types, location and wiring
8. Local building and electrical codes	All installations must conform to local codes

pabilities can also deteriorate the system's output.

### Speaker Locations

Since the music must be heard and not listened to, sound levels in any area must be limited. This requires a relatively large number of low level speakers to provide uniform sound distribution over a given area. This can be compared to the problem of adequate lighting.

For example, we could illuminate a given area with one huge lamp—giving *some light* over the entire area. Of course, persons close to the source would be blinded while those far away would strain their eyes. Lighting engineers would not tolerate this condition. Modern sound engineers also know that adequate background music distribution requires almost as many individual speakers as illumination lamps needed for adequate lighting. A complete large office installation employing a total of 46 ceiling mounted speakers is seen in Fig. 1.

Formulas have been evolved for determining the *minimum* number of speakers needed in a given installation. Ceiling mounted speakers

should be staggered with center-to-center separation approximating one to two times the ceiling height. High noise or acoustically dead areas require center-to-center separation of *not more* than  $1\frac{1}{2}$  times ceiling height. Serious problems can be encountered if wider spacing is attempted and more power is applied to the speakers. (See Charts II & III).

In high ceiling areas the speakers may have to be suspended to bring the sound down to optimum height. Speakers should be limited to heights of under twenty feet if good solid coverage and pleasant program levels are to be maintained.

Most speakers used in background music installations are the eight inch size and adequate for reproducing the required range. However, the speaker requires a suitable baffle for proper low frequency reproduction.

Almost all ceilings make ideal baffles if the speaker's back is not enclosed. Several manufacturers provide a protective speaker enclosure for ceiling mounted speakers. This is often considered a convenient manner for speaker installation, but small enclosures place se-

**CHART II**

Ceiling height, ft	Distance between speakers, ft	Approx. area covered per speaker, sq ft
8 and under	15	225
9 to 15	20	400
16 to 50	30	900

**CHART III**

Area covered per speaker sq ft	Number of speakers ceiling height, ft:		
	8 and under	9 to 15	16 to 50
200	1	1	1
400	2	1	1
500	2	2	1
750	3	2	1
1,000	4	3	2
1,500	7	4	2
2,000	10	5	3
5,000	23	13	6
10,000	45	25	12
25,000	112	63	28
50,000	223	125	56
100,000	445	250	112

vere limitations on a speaker's ability to reproduce low frequencies.

For example, an eight inch speaker normally requires an enclosure of not less than  $1\frac{1}{2}$  cubic feet—about 2,592 cubic inches. Some protective speaker enclosures provide as little as 150 cubic inches.

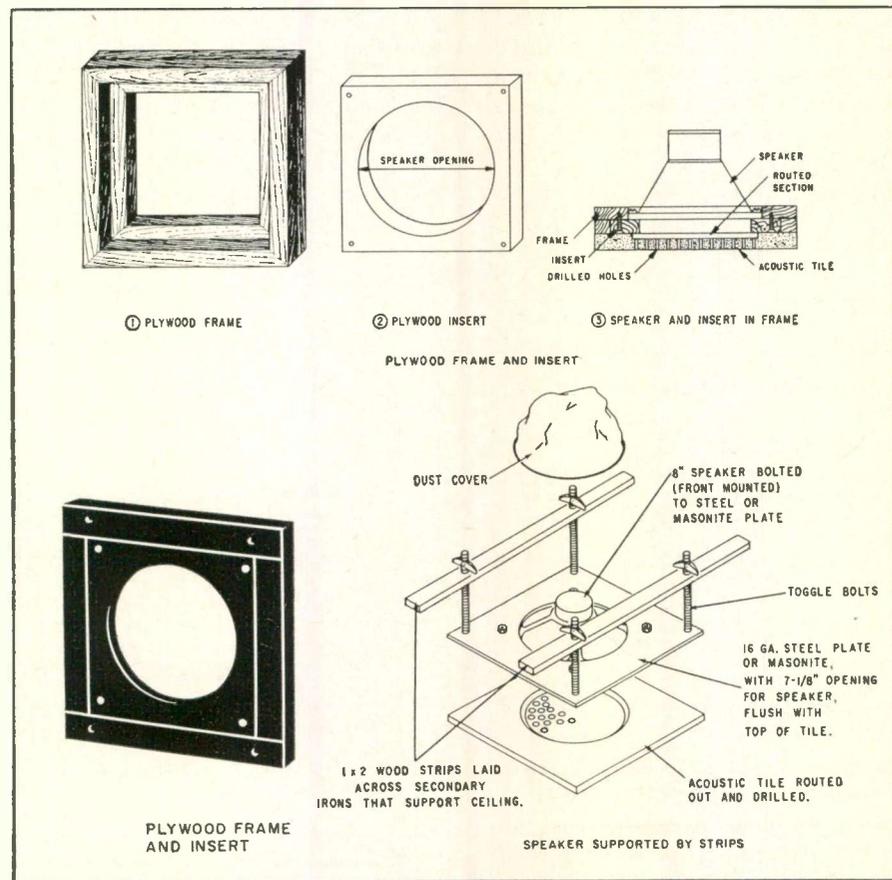
As previously mentioned, the most desirable method is to leave the speaker backs exposed except for a fireproofed covering of muslin or cheesecloth. The cloth prevents plaster chips and other material from falling on the speaker cone.

Building codes in some localities require a ceiling speaker to be completely enclosed. In these cases the enclosure should be as large as permissible, and in addition, relief holes should be provided for decreasing air pressure build-up. A number of speaker installation details appear in Figs. 2 to 5.

Another important link in the system is the speaker's line matching transformer. An improper choice here can result in high distortion, poor frequency response and considerable power loss. Some transformers are designed for low retail price rather than for a specific application. We have not yet found transformer materials that adequately substitute for iron and copper. Reduction of these elements to reduce manufacturing costs will only produce an inferior product—with unsatisfactory results. A transformer having good frequency response, low distortion and insertion loss, should be selected.

Method of connecting the total

Fig. 3—Speaker mounting in plaster, plaster board, metal, and other type ceilings.



speaker load to the final amplifier is another important consideration. Naturally, the load should match the amplifier's output impedance, or a power loss, overloaded amplifier, or distorted signal will result.

There are two impedance matching methods available. A direct impedance calculation may be made, or the popular 70 volt system can be employed. It is understood that either method, properly applied, will give the desired optimum power transfer with minimum distortion.

### Power Requirements

Assuming a definite amount of power has been allocated for each speaker—one watt for low noise areas, three watts for medium noise, and five watts for high level areas—we are now ready to consider total audio power needed.

Here again, we find ourselves in a dilemma between good transmission practices and economics. How much of a safety factor should be applied to our choice of required audio power?

Properly recorded background music does not require the dynamic range needed in reproducing music for entertainment purposes. This range is reduced to give a low even level of reproduction. Loud passages have been reduced and low passages have been increased. This is done only to remove the extreme excursions of a selection. A sufficient amount of relative dynamic range is retained in order to preserve the expression of the music. This eliminates the necessity for a safety factor comparable to that

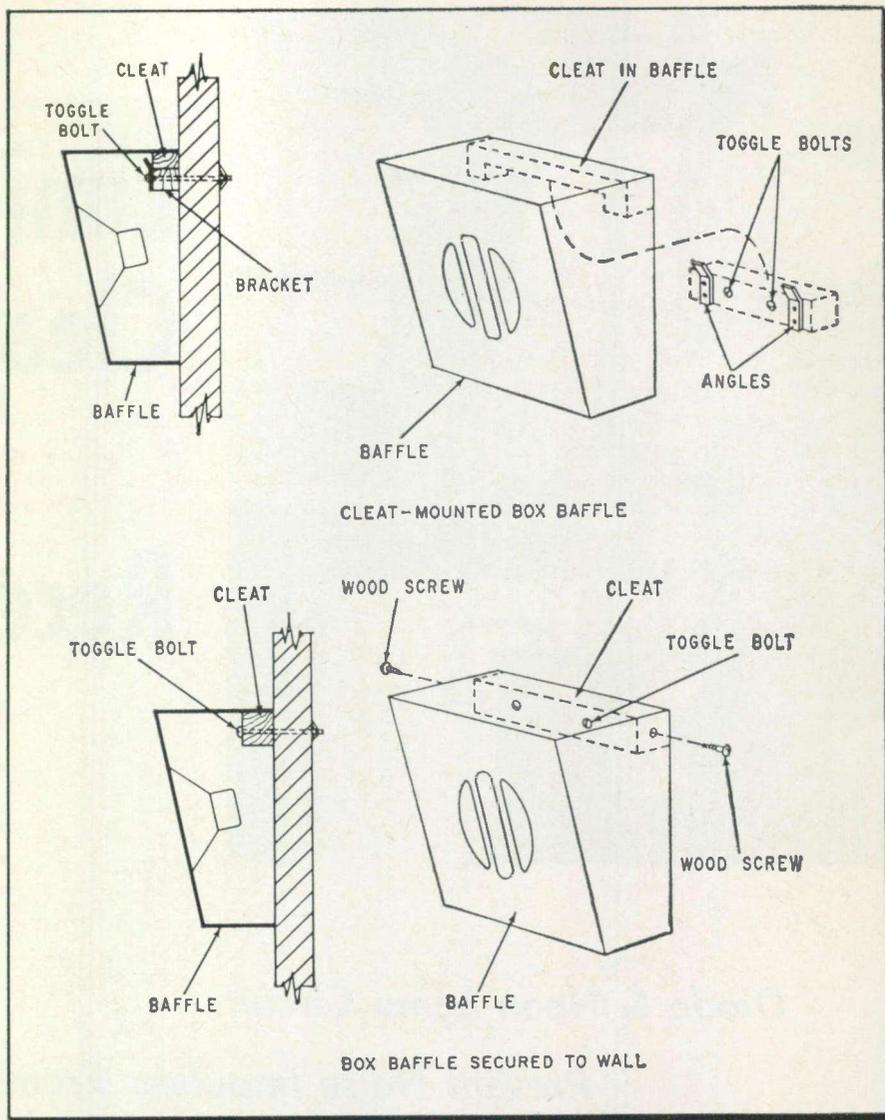


Fig. 4—Speaker box baffles can be easily secured to any type wall with cleats.

needed for audiophile hi-fi or for radio broadcast purposes. But a certain amount of level-variation is retained in the program material which demands a degree of power safety or cushion, as it is often called.

Obviously, then, we cannot choose an amplifier whose output rating equals the total power required for the installation. This would not provide for normal program level variations and serious distortion could result. Accordingly, good practice and experience dictates an amplifier with two or three times the total power requirement of the speaker system. This extra power not only insures against overload distortion, but allows some built-in room for future expansion of the system. (See Chart IV and V).

Although too much power is never a problem, excessive cost automatically limits power near opti-

imum requirements. And less than optimum power will result in high distortion, poor coverage, and worse—an unhappy customer.

### Wiring And Amplifier Location

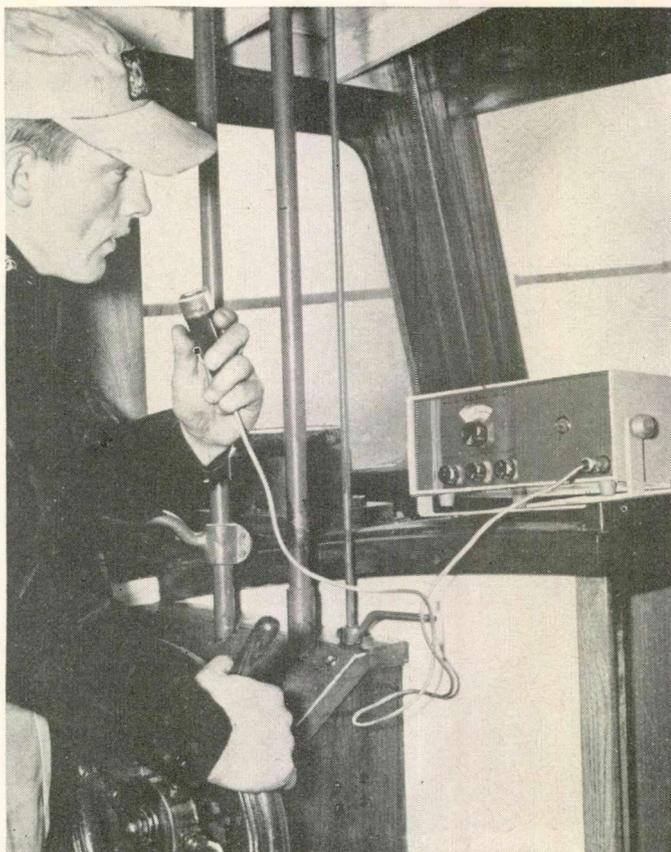
Wiring between speakers and amplifier is our next problem. This job is not as complex as installation of electrical wiring. Rigid con-  
(Continued on page 66)

CHART IV

Noise characteristic	Area to be covered	Weighted background noise levels db
very noisy conversation difficult or impossible	factory (very noisy)	90
	machine shop	90
	printing plant (average)	80
noisy voice must be raised to be understood	assembly line (average)	75
	factory (average)	75
	machine accounting	75
	auditorium (average)	70
	supermarket	75
	shipping department	60
	office (busy)	70-75
normal conversation easily understood	transportation waiting room	75
	restaurant (noisy)	75
	department store	65
	bank (public area)	65
	restaurant (average)	60
	office (quiet)	55
	hotel lobby	55
	hospital areas	55
	office waiting room	55

CHART V

Total number of speakers	Total amplification, watts background noise characteristic:		
	normal (up to 65 db)	noisy (66 to 77 db)	very noisy (78 to 90 db)
1	1/2	2	5
2	1	4	10
3	1 1/2	6	15
4	2	8	20
5	2 1/2	10	25
10	5	20	50
20	10	40	100
50	25	100	250
100	50	200	500
150	75	300	750
200	100	400	1,000



# Limiter Circuits Clean-Up Citizens Band Reception

## Diode & Neon Lamp Circuits

### Prevent Noise Impulses From Reaching Audio

ALLAN LYTEL  
Avco Mfg. Corp.

• Citizens Band radios are AM receivers/transmitters. Consequently, they are susceptible to ignition and other types of impulse noises that interfere with reception. Aside from noise suppression methods,

such as coax capacitors for generators, CB sets frequently incorporate *internal* noise reduction circuits.

To minimize noise during CB transmission, noise limiter circuits are used. (In contrast, squelch circuits minimize noise when the units are in a stand-by state.)

#### Noise Limiters

Fig. 1 shows how a series noise limiter operates in a simplified circuit. This diode detector provides a negative d-c voltage for avc and audio for the amplifiers. Switch S is in series with the audio and opens during noise pulses. In normal operation it is closed.

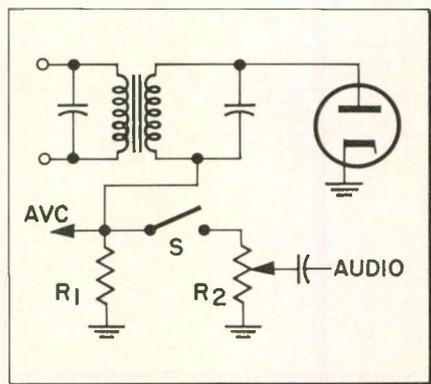
In an actual series noise limiter (Fig. 2A) a diode acts as a switch to keep noise pulses from the audio. V-2 is a diode detector providing avc voltage and audio. Normally, V-1 conducts, shorting R-3 and R-4 so that audio passes through cou-

pling capacitor C-2 to the volume control and the following amplifiers. Since R-1 equals R-2, the plate of V-1 has one-half of the voltage which is on the cathode. Because the cathode is more negative than the plate the tube conducts effectively, connecting C-2 to point B.

When a noise pulse is received and rectified by V-2 the plate of V-1 becomes more negative than its cathode. This occurs because the R-C time constant of R-3 and C-1 prevents the change in cathode voltage until C-1 charges. V-1 is then cutoff by the noise pulse and the audio does not reach C-2 since R-3, R-4, and C-1 act as a filter which will not pass pulses. Avc is taken from point A and audio from the volume control by C-2.

Fig. 2B shows this circuit as it appears in a popular Citizens Band unit. Point A on the avc bus is the diode bias, with C-25 as an audio bypass. This bias changes with the

Fig. 1—Simplified schematic drawing of a CB radio's series noise limiter circuit.



avc voltage and sets the point at which limiting begins. Audio across the volume control R-21 is fed to the first audio amplifier.

Shunt noise limiters (Fig. 3) operate so that the noise diode conducts only on noise peaks. In Fig. 3A, V-2 conducts only on noise pulses when its cathode is more negative than its plate; during conduction (R-1, R-2, and R-3 to ground) it is a short circuit across R-4.

In Fig. 3B the detector diode has R-3 and R-4 as its normal load to ground. Avc is taken off through its R-C network C-1 and R-1. Audio passes through R-5 and C-2 to the volume control. Because the plate of the noise diode goes to the avc bus through R-2, the tube does not normally conduct. Its plate is more negative than the cathode and it is held at this potential by the charge on C-3. A large noise pulse increases the drop across R-3. It makes the cathode of the noise diode more negative than its plate and the tube conducts, which shorts out the audio output. Because of the long time constant of C-3 and R-2 (22 micro-seconds) the tube conducts long enough for the noise pulse to be prevented from appearing in the audio output. When the pulse is gone C-3 has its normal voltage and again cuts-off the diode.

Neon lamps can act as effective noise clippers, too, firing if their proper voltage is reached. Fig. 4 shows two examples. In A the neon lamp is connected between the plate supply (B+) to the i-f amplifier plate. It's only during strong noise pulses that the plate potential is low enough to cause the tube to fire. When it does the neon lamp shorts the i-f transformer, preventing the signal from reaching the detector stage.

Fig. 4B shows an avc diode taking its signal through C-1 from the i-f amplifier plate. The negative voltage across R-2 is used for the avc. Here, too, a strong pulse fires the lamp and shorts the i-f transformer.

Some typical noise limiter circuits were presented here. Many variations exist—from ultra-simple to very complex. The noise limiting performance of a CB radio is, naturally, restricted to the efficiency of its noise limiter. The more complex circuits do a better job of keeping

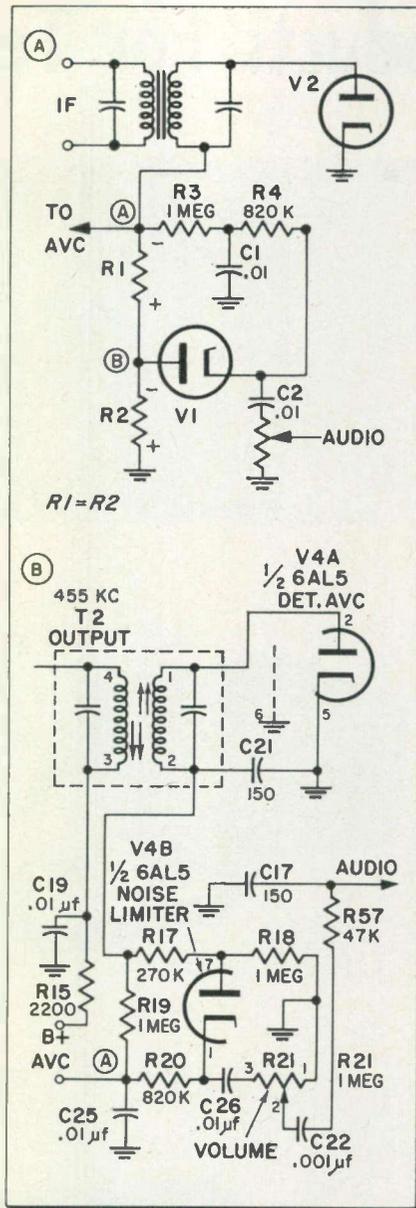


Fig. 2 (A)—Actual series noise limiter circuit with vacuum tube diode acting as a switch to keep noise pulses from the audio. (B) This same circuit as it appears in a popular Citizens Band unit.

unwanted noise out of the audio amplifier than the simpler ones, of course. All noise limiter circuits, however, should operate instantaneously. The CB operator should not be aware of any limiting action.

It should be pointed out that noise limiters do not relieve the importance of proper power supply filtering. Both external and internal anti-noise measures must be utilized to achieve optimum reception. •

Photo Credit: RCA Mark VII radio-*phone*.

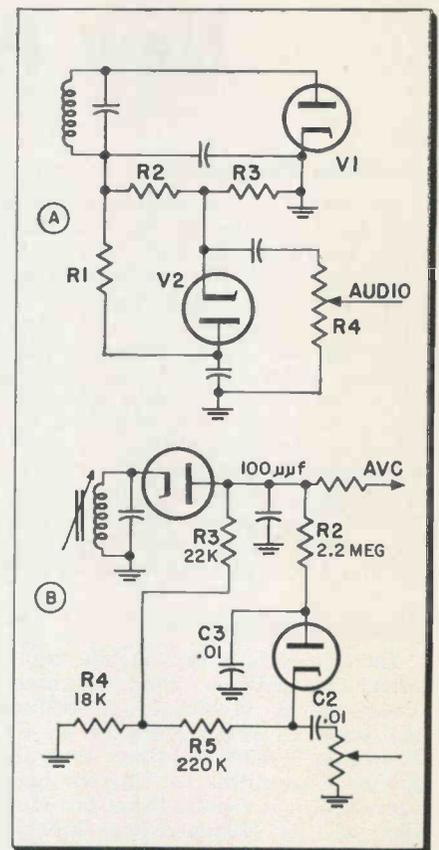
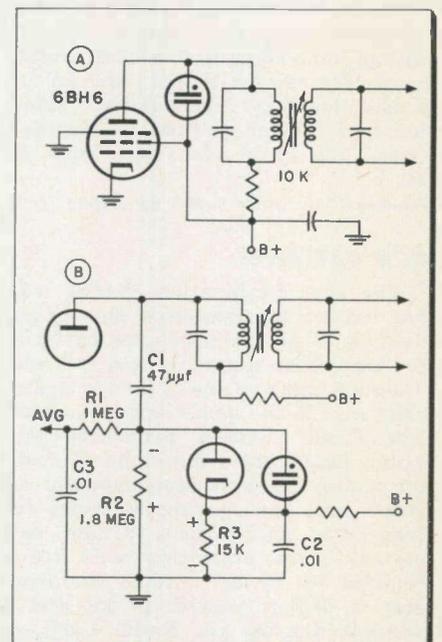


Fig. 3—Examples of shunt type noise limiter circuits. In circuit A, V<sub>2</sub> only conducts on noise pulses when its cathode is more negative than its plate. Limiter B utilizes the long time-constant of R<sub>2</sub> and C<sub>3</sub> to keep noise pulses out of the audio output circuit.

Fig. 4—Examples of neon lamps acting as effective noise clippers. When the neon lamp of circuit A fires, it shorts the i-f transformer, thus preventing noise pulses from reaching the detector stage. Circuit B's neon lamp also shorts out the i-f transformer when it fires. See text explanation.



# New Products For Technicians

## Raytheon CB RADIOS

An all-transistor pocket-sized citizens band transceiver, the new Ray-Ette, measures just 5½" by 2¾" by 1¾" and has a 46" telescoping antenna atop a practically indestructible high-impact case. 100 milliwatt transceiver permits 2-way communications between units at distances up to 2 miles over land and up to 5 miles over water. Complete with earphone, one set of crystals installed and a shoulder strap. Weight, complete with rechargeable batteries, less than 15 oz. \$99.95 Distributor Products Div., Raytheon Co., Westwood, Mass.

For more data, circle 8-44-1 on coupon, p. 45



## Browning CB RADIOS

Introduced is a new mobile transceiver for citizens band operators. Trade-named Mobilair, it utilizes the same advanced circuitry as the Browning R-2700 receiver and the S-Nine transmitter for citizens band operation. It is reported that introduction of the Mobilair was brought about principally by demand from present Browning base station equipment owners who asked for a mobile unit with the same basic specifications and high quality workmanship. \$159.50. Browning Labs., 100 Union Ave., Laconia, N. H.

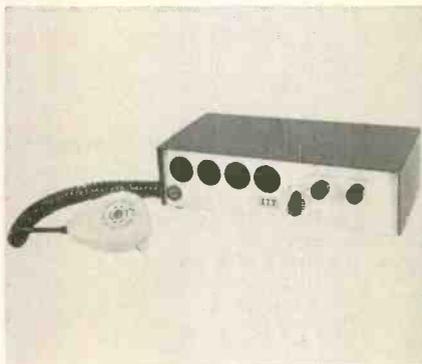
For more data, circle 8-44-2 on coupon, p. 45



## ITT CB RADIOS

Announced is a new citizens band radio-telephone, described as a fully-transistorized transceiver that will operate on either 12v or 110v power, merely by substitution of a proper power cord. No bigger than a cigar-box, the radio has full 5-watt input, with 2.5-3.1 watts into the antenna. Accessory features include: selective calling, tone signalling, a loud ringing alarm for service trucks; and an optional telephone-type handset. International Telephone and Telegraph Corp., 320 Park Ave., New York 22, N. Y.

For more data, circle 8-44-3 on coupon, p. 45



## RCA BATTERIES

The new combination change tray and battery merchandiser, shown, can hold up to six dozen popular batteries for transistor radios. It is a specially designed unit and one of the key dealer sales aids in the firm's new "Blueprint For Profit" battery promotion program. Requiring a minimum of counter space, the unit accommodates all small size, fast-moving batteries for transistor applications. Other new battery sales promotion aids are a colorful 5¼ by 13" outdoor thermometer, a dealer "essentials" kit and a window display kit. Radio Corp. of America, Harrison, N. J.



## Perma-Power PA Systems

The Roving Rostrum, has a 10-watt push-pull transistorized amplifier, and an Astatic series 330 dynamic low impedance microphone with response of 60-10,000 cps. The two loudspeakers are full fidelity 6" x 9" units with 10



oz. ceramic magnets. Either speaker can be used alone or they can be used simultaneously for greater audience coverage. Has inputs for phonograph or radio, and for microphone; outputs for auxiliary speaker or tape recorder. \$124.50, complete except for batteries. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill.

For more data, circle 8-44-4 on coupon, p. 45

## Seco ANTENNA TESTERS

Model 520 has simple direct reading scales and is made for use on 50 ohm coaxial transmission line applications. Uses a precision-built dual cylinder type air coupler. Measurements, accurate up into the 150 mc range. Primarily intended for direct reading of forward power and reflected power.



Can also be used as an in-line r-f power meter. Has 3 ranges, 0-10 watts; 0-100 watts; and 0-1000 watts. Dial scale, calibrated from .5 watts to 10 watts full scale. Standing wave ratio scale from 1:1 to 8:1. Accuracy, ±5% at full scale. Indicating meter, 80 μ amperes full scale. \$42.95. Seco Electronics, Inc., 5015 Penn Ave. S., Minneapolis 19, Minn.

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**2** Towers: Included in literature, covering the firm's line of towers, is the all new "G-10." Features include: 55,000 PSI steel, X-type bracing and light weight. Designed for TV-CB-2-way radio. E-Z Way Towers, Inc.  
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**3** Package Shipping: Literature covers comparative costs by bus, rail express, air freight. Gives facts on products carried, weights, sizes, service, speed and frequency. Greyhound Corp.  
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**4** CB Radios: Model CB-3, covered in literature, offers 8-channel convenience. Transmitter's output circuit matches 50 ohm antenna systems. Receiver's sensitivity, less than 1.0 $\mu$ V for 10 db signal-to-noise ratio. Hallcrafters.  
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**6** Wire: Complete wire catalog covers extensive line of 300 ohm lead in wire. Jersey Specialty Co.  
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**7** Garage Door Operators: Literature covers new radio control garage door operator. Features new all transistor receiver, portable transistor transmitter 72 coded radio channels, controlled garage light, etc. Perma-Power.  
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**8** Test Instruments: Model RS-24 regulated power supply, described in literature, provides reliable source of variable, regulated d-c plate voltages. Perfect for circuit testing and development. Eliminates need for a separate power supply for each new circuit. Precision Apparatus Co.  
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**9** CB Radios: Operating from car, home, office, boat or truck, the Mark VII Radio-Phone, described in literature, can be used in any location

having 6 or 12v d-c or 116 a-c power source. Radio Corp. of America.

For more data, circle 8-22-1 on coupon

**10** Semiconductors: 16-page catalog covers American-made line of transistors, diodes, rectifiers and service kits. Circuit diagrams illustrate typical transistor applications. Contains 4 different replacement guides. Pocketsize. Semitronics Corp.  
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**11** VTVM/VOM's: Model SM112, described in literature, is a VTVM with lab accuracy for bench, lab, or anywhere 115v a-c current is available. With a flick of the function switch it becomes a portable VOM. Sencore.  
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**12** Test Equipment: 8-page bulletin #2062 covers a line of electronic test equipment for industrial electronic/electrical applications including air conditioning, refrigeration and heating. Simpson Electric Co.  
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**13** Transformers: 32-page catalog lists detailed electrical and physical specifications for 870 transformers for a wide range of radio and TV and industrial applications. Stancor Electronics Inc.  
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8-11-1	8-21-1	8-26-5	8-45-6	8-60-1	8-64-3	8-70-2
8-13-1	8-22-1	8-27-1	8-46-1	8-61-1	8-64-4	8-70-3
8-16-1	8-23-1	8-28-1	8-46-2	8-61-2	8-64-5	8-71-1
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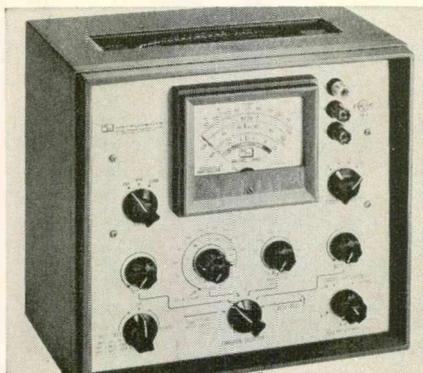
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# New Electronic Products

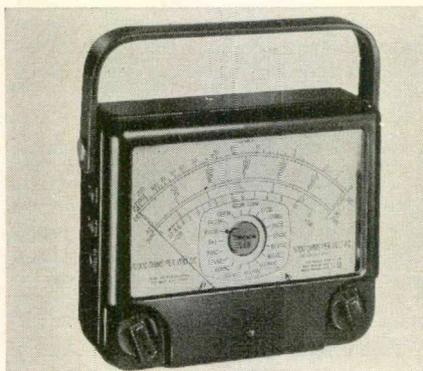
## Hickok TESTERS

A new in-circuit tester, designed to measure in-circuit parameters of all small and medium power transistors and diodes, is reported to measure a-c Beta in or out of circuit, with an accuracy of 5% with impedances as low as 25 ohms. The new tester utilizes the firm's method of neutralizing circuit impedance before tests are made to prevent inaccuracies. Diodes are measured for dynamic input resistance. Fully transistorized. Battery operated. Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio. For more data, circle 8-46-1 on coupon, p. 45



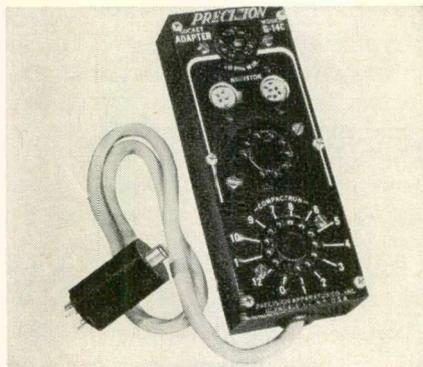
## Simpson VOM'S

Announced are two new Volt-Ohm-Milliammeters models 267 and 268. Both feature Simpson's large, easy-to-read 7 inch meter, and are ideal for TV and Radio service work, general laboratory work, general industrial applications, and production line testing. Microamp Ranges: 0-50 (Model 267), 0-60 (Model 268) Sensitivity of a-c voltage ranges to 5000 ohms per volt. DBM ranges, 20 DBM to +50 DBM one milliwatt in 600 ohms for "O" DB. Frequency response, 5 to 500,000 cps  $\pm 2$  DB. Price model 267 and 268 \$49.95. Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill. For more data, circle 8-46-2 on coupon, p. 45



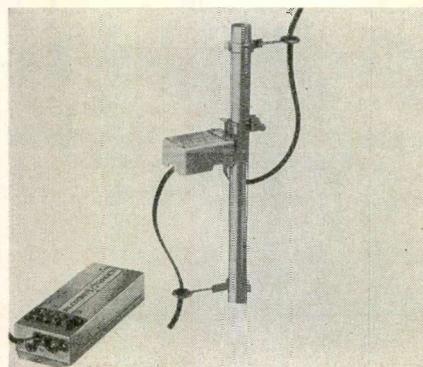
## Precision SOCKET ADAPTERS

Multi-socket adapter, G-140, is reported to instantly modernize any tube tester for the test of: 12 pin compactron tubes; 10 pin miniature tubes; 5 and 7 pin nuvistors; and novar types. The adapter cable plugs into the nine pin socket of the tube tester, the tester's grid cap is attached and the adapter is ready to operate. No complex switching required to adapt the 12 pin compactron to tube testers which have less than 12 test circuits. Precision Apparatus Co., Inc., 70-31 84th St., Glendale 27, L. I., N. Y. For more data, circle 8-57-1 on coupon, p. 45



## B-T BOOSTERS

AB-4 Signal Master, a new and powerful, transistorized, antenna mounted TV/FM four set booster with remote power supply is reported as the only antenna mounted booster with a built-in four set coupler. It provides gain and interset isolation necessary for sharp clear reception on up to four black-and-white or color TV sets, or FM sets. As an antenna mounted booster, it takes advantage of the optimum signal to noise ratio available at the antenna. \$29.95. Blonder-Tongue Labs., 9 Alling St., Newark, N.J. For more data, circle 8-46-3 on coupon, p. 45



## Sencore TUBE TESTER

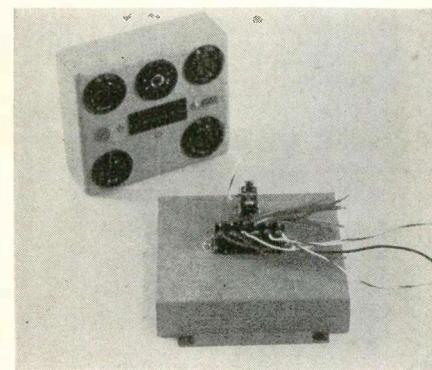
Announced is Mighty Mite tube tester, model TC114, designed to check all tubes that earlier tester's test but in addition, checks new GE compactrons, Sylvania 10 pin tubes, and RCA Nu-



vistors and Novars. Contains an adjustable cover with mirror for TV adjustments use and a set-up booklet. Dealer Net is \$67.50. Sencore Inc., 426 S. Westgate Drive, Addison, Ill. For more data, circle 8-46-4 on coupon, p. 45

## Jackson TUBE TESTER SOCKET MODIFICATION KITS

A kit for modifying existing 648R and 658 tube testers provides 14 sockets for testing new type tubes including compactrons, nuvistors and novars. It extends the service life and adds to the versatility of 648R and 658 tube testers now in use. Easy to



install. Consists of two basic parts: a compact, double-sided socket assembly containing 7 sockets on one side for testing older tubes; and 7 sockets on the other side for the newest and most popular tubes. Both sides of the assembly fit into the other part of the kit. \$24.95. Jackson Electrical Instrument Co., 124 McDonough St., Dayton, Ohio. For more data, circle 8-46-5 on coupon, p. 45

# How To Repair Pesky TV Tuner Defects

## Mechanical & Electrical Service Methods For Turret/Wafer Tuners

DAN GEORGE

• Electronic and mechanical failures in TV tuners can cause many trouble symptoms, including snowy pictures, loss of audio, video, etc. The time required to troubleshoot and effect repair depends primarily upon the technician's familiarity with the tuner's operation and construction.

While troubleshooting techniques employed may vary somewhat, they

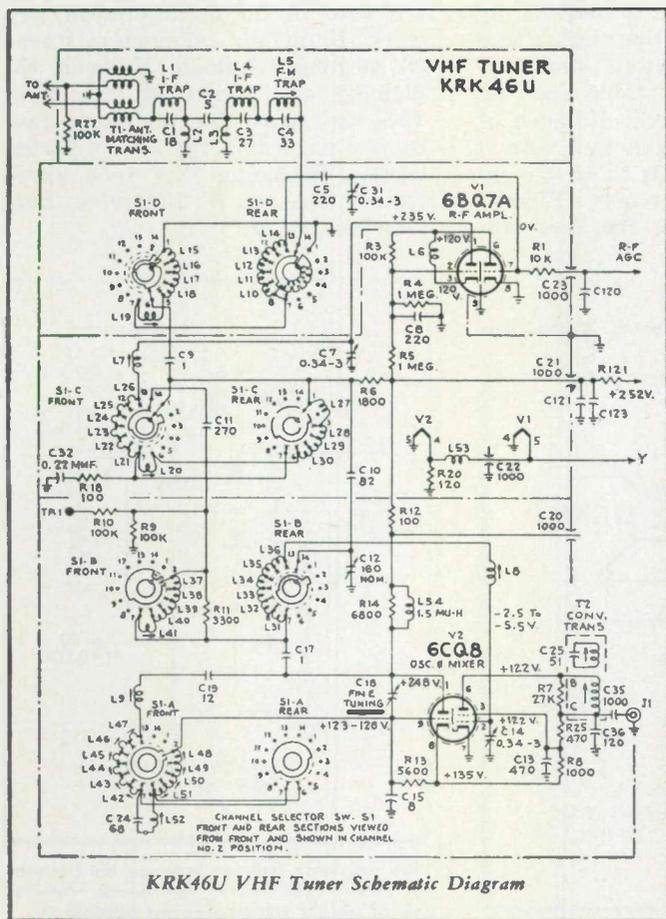
remain basically similar for both turret and wafer type tuners.

Every skilled TV technician knows it is not always easy to isolate certain types of faults which appear to be in the tuner. These symptoms can easily be caused by a defective antenna. Some can be caused by a faulty video component. Naturally, initial steps must be made in the direction of definitely isolating the fault to a particular section. Once the antenna and video

sections have been eliminated as sources of trouble, we can then go about locating the defective tuner component.

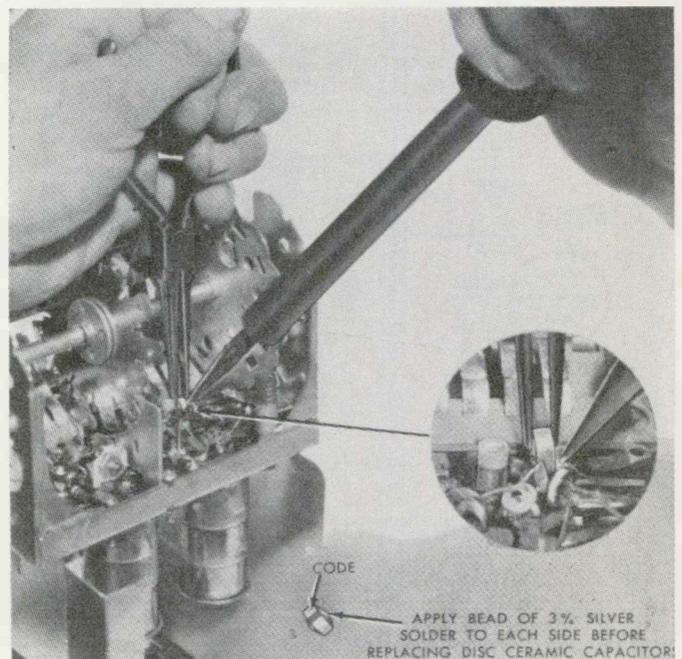
Many tuner failures in modern TV sets are caused by shorting r-f tubes—generally resulting in one or more damaged resistors. Old tubes should first be replaced by known good tubes before any tests are made. The set should then be turned on.

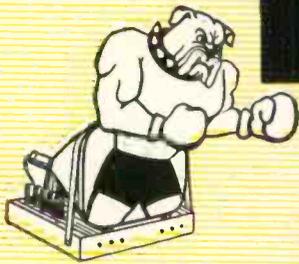
(Continued on page 68)



◀Fig. 1—Schematic diagram of an RCA KRK 46U VHF TV tuner. Snowy pictures, pix pulling, and absence of audio or video, may be caused by a tuner's mechanical or electronic defect.

Fig. 2—Illustrated is the proper method to be used when replacing ceramic disc capacitor's in Zenith "Target Turret Tuners."





# "Tough Dog"



## Corner

### Difficult Service Jobs Described by Readers

#### Contrast Control Causes Horizontal Pulling

My hardest case in 15 years of TV repairing was curing a Zenith chassis 17A30 of a severe horizontal pulling and a tendency to roll. I had brought it to the shop after having checked all tubes in my customer's home. I learned from the owner that the set had been serviced several times by others for this same problem. In each case the set would play for a few days then return to the original trouble.

Voltage and resistances in the horizontal oscillator and sync section checked normal. The horizontal waveform was next checked with a scope. Nothing unusual showed up except a slight indication of sync compression at pin 7 of the video amplifier, a 6CX8.

Next, I checked each capacitor and resistor in the sync and horizontal circuits, substituting new components in some cases. After going over the chassis with a fine

tooth comb, I still had my original problem.

While absent mindedly turning the contrast control I noticed that the wiper contact made a slight click when it passed a certain point. An ohmmeter check across the contrast control, R7, showed it to be open at one end of its rotation.

Replacing this control solved the sync problem. Variation of the old control gave normal contrast on the CRT but caused horizontal pulling. —M. E. West, Lenoir, N. C.

#### Horizontal Output Tube Causes Weaving

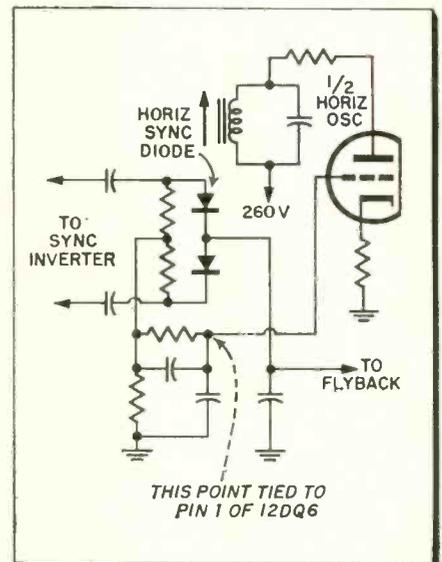
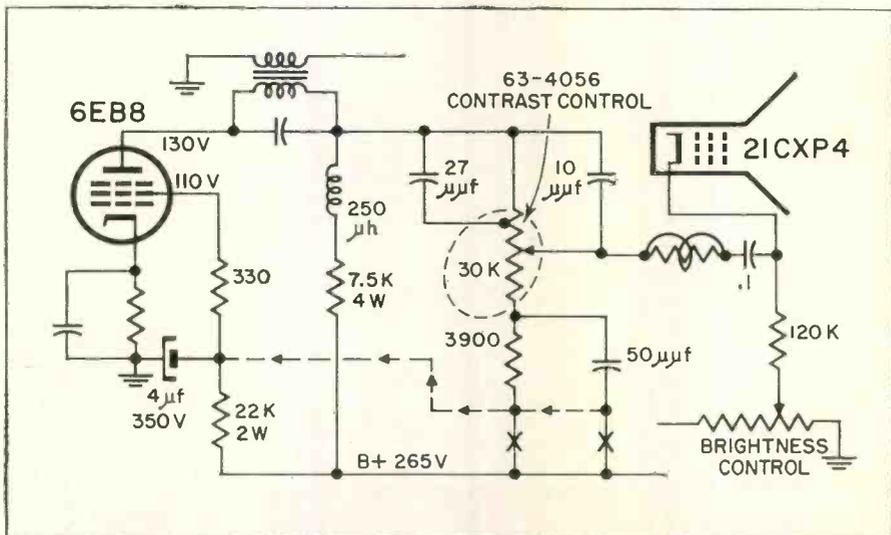
A customer brought an Admiral portable TV chassis #1501 to my shop recently with the picture and raster weaving. Vertical and horizontal sync seemed stable and picture quality was good. Because of the absence of a dark hum bar, I diagnosed the trouble to be a-c entering the sync circuits. First I checked all tubes in the sync sec-

tion, and they tested good.

I set up the chassis and checked the sync circuits with my scope. At the junction of C-450 and C-420 sine waves were observed with a little pulse riding up and down on them. The same condition appeared at the junction of C-451 and C-419. In fact, the entire discriminator section was saturated with a-c. Where was it coming from? It seemed to be originating at the horizontal output tube socket.

After more probing, I discovered the a-c disappeared when the horizontal output tube was removed. Close examination of this tube's socket revealed pin 1 was used as a tie point for R-452 and C-421, which are used in the discriminator network. Using my ohmmeter, I read 20 megohms leakage between the filament and pin 1 of this tube. This was more than ample to feed the a-c pulse into the sync discriminator. Replacing this tube cured the trouble.—C. W. Blatchley, East Freehold, N. J.

Picture pulling in a Zenith TV 17A30 was traced to a defective contrast control. Control was open but contrast was normal and could be adjusted on CRT.



High resistance leakage between the horizontal output tube heater and phase detector caused picture weaving on an Admiral TV.

# DOUBLES YOUR EFFECTIVE MANPOWER



Fix "Tough Dogs" Fast!

Save Half Your Time!

Step Up Your Profit!

**B&K** NEW  
MODEL 1076

## TELEVISION ANALYST

for Black & White and Color



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

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

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

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

Model 1076. Net, \$299<sup>95</sup>

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

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Combines all the features of both  
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COMPLETE R.F. and I.F.

HI-VOLT INDICATOR

VIDEO TEST PATTERN

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FM MODULATED AUDIO

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HORIZONTAL and VERTICAL  
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AGC KEYING PULSE

B+ BOOST INDICATOR

PICTURE TUBE MODULATION

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# Buying Guides For TV "Twin Lead" Wire

AL GOLDSTEIN  
Jersey Specialty Co.

• Suppose you were told that you could obtain a "Magic Tool" which would do the following on all your antenna installations: 1. Reduce callbacks. 2. Cut down db loss. 3. Decrease cost of material used. 4. Save time on each installation.

As you probably guessed, there is no such tool, but some of the foregoing benefits can be achieved. The secret is contained in the proper selection and use of twin lead wire. To emphasize the importance of 300 ohm twin lead, picture your reaction if you pulled a weak signal after putting up an elaborate antenna array. You're no different than most technicians if the *last* place you check for a defect is the lead-in wire.

For example, a poor selection of twin lead could cause a significant db loss in carrying the signal to a set. The result could be a weak signal. Perhaps this will be caused by using a gauge wire whose resistance is too high. As this resistance increases, so will the signal loss.

As you know, all lead-in wire is made with a definite gauge copper and insulation thickness. In general, a fringe or semi-fringe installation should always be made with 300 ohm wire that has at least 80 mils insulation thickness and no lighter than #20 gauge copper. For installations located close to the transmitter 80 mils or lighter insulation and #22 gauge copper should be satisfactory.

The point of the foregoing description is that lead-in wire should always be ordered by gauge and mil. For instance, "ship me 5000 feet of #20 gauge, 100 mil wire." By not specifying, you may be given #22 gauge instead. The difference in cost may save you up to \$1.00 per thousand feet, which is the average cost difference between #20 and #22 gauge copper. However, the insignificant per job savings may not warrant exposing yourself to a rehash or less than optimum customer TV set operation.

## Additional Buying Factors

The thickness of insulation also has a direct bearing on db loss. Heavier insulation means less loss, especially in wet conditions. Dampness, rain, snow, and proximity to salt water reduces the ability of flat 300 ohm to carry the signal. Heavier insulation creates a longer wet path, which cuts the signal loss. The greater durability of thicker insulation is another favorable factor.

In purchasing wire, three points to examine include: built-up center, bumpy and/or blistered wire, and width.

Wire having a tapered or curved appearance can provide excellent reception. However, some 300-ohm lead wire with thicker center insulation has much thinner insulation thickness at the tapered edges where copper conductors are located. Thus, if a technician is purchasing

tapered wire, he should check the edge insulation thickness with his distributor to assure it is not below required needs.

If a 300-ohm wire "special" is offered, inspect it for bumps and blisters. This type wire usually indicates a mixture containing re-used polyethylene. It generally does not meet dielectric requirements, resulting in sharp db loss due to the change in dielectric constant. As the dielectric constant changes, it changes impedance. Further, scrap material is usually porous, which permits moisture to accumulate, which again creates loss.

Some wire is produced with unusually wide spacing between conductors. This is fine up to the point where the twin lead begins losing its 300 ohm characteristics. Many factors determine 300 ohm impedance. The type of insulation, gauge of copper conductors, width between conductors, etc. All of these items are related so that a change in any one requires an adjustment in the other, to maintain impedance. For most technicians, the surest way of obtaining 300 ohm line is to purchase from a reliable manufacturer.

It pays to become familiar with the names and reputations of both large and small wire manufacturers. Twin lead should be purchased as carefully as you would purchase TV antennas. Both products are dependent upon each other for transferring a good signal to the input of a TV set. •



"We've converted several recent service calls we got through the Yellow Pages into profitable sales," says R. J. Misleh, owner, City Wide Television, Miami, Fla. "These sales were especially profitable since they were for color TV sets. The big thing our Yellow Pages advertising does is get us leads. People see our ad in the Yellow Pages, call in for television service, and often end up buying a new set. We depend on our Yellow Pages advertising to build our service business and boost sales!"



Display this emblem. It builds your business!

**CITY WIDE TELEVISION** *Authorized Service*  
REPAIR COLOR & BLACK & WHITE  
 ALL MAKES & MODELS  
 ALL WORK GUARANTEED  
 MEMBER TES - RTTG

**COLOR TV DEALER** 

Sales - Service - Rentals  
**NE 4-0506**  
11 S.W. 27th St. • Miami, Fla. NE 4-3717 • 124 N.W. 27th St.

Display ad (shown reduced) runs under TELEVISION-SERVICE. Call the Yellow Pages man at your Bell Telephone Business Office to help you plan your business-building program.

## Color TV Controls

(Continued from page 33)

ence magnet that only affects the blue beam position. This is an adjustable magnet clipped on the CRT neck, like an ion trap, and is placed directly over the blue gun. It acts in conjunction with a magnet internally mounted directly on the blue gun.

Rotating the lateral adjuster al-

ters the magnetic field produced by the magnet mounted on the blue gun—causing the beam to move in a lateral direction. This direction is at a 90 degree angle to the beam movement obtained when the blue convergence magnet is adjusted. This allows accurate static convergence to be accomplished.

The third group of controls to be adjusted by the technician consists of the CRT assembly adjusters. These are: purity control, field neutralizing assembly, and the yoke.

The yoke, of course, is adjusted in the same way as a monochrome receiver yoke.

The purity control consists of two ring type permanent magnets. These magnets are mounted around the neck of the picture tube. Magnetic flux produced by these magnets controls all three electron beam positions. Rotating the mag-

... if you are in business to make money

*then specify*

# GC RADION

## EXACT REPLACEMENT ANTENNAS



The market exists and it is *Big Business*. So — when you make that call, when you replace that antenna, make the replacement with a GC Radion Antenna. An Antenna that provides *you* and *your customer* with these advantages:

- 61 Models Covering 22 TV Set Brands
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- Pre Priced with True Resale Prices and Full Margin Markup
- Built by Radion — The Pioneer Name in Indoor TV Antennas

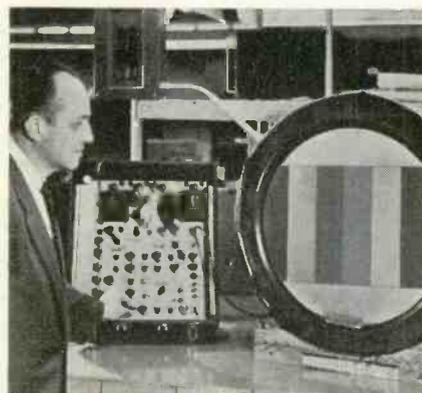
### ORDER YOUR STOCK OF ANTENNAS *Now!*

See your GC-Radion Distributor today for more information on this profitable line

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Division of Textron Electronics, Inc.

Western Plant: 3225 Exposition Place, Los Angeles 18, Calif.  
MAIN PLANT: 400 S. Wyman St., Rockford, Ill., U.S.A.



Hickok Electrical Instrument Co's NTSC standard color bar generator produces a pattern of seven colors for accurate adjustment of color TV receivers.

nets changes the flux density, which causes the electron beam's position to change. When properly adjusted, the purity control will position the beams so that they strike only the center of their respective phosphor dots on the CRT screen. This adjustment is made with the green and blue guns disabled. The purity magnet is rotated to produce an even red color over the entire screen.

The field neutralizing assembly consists of a ring of permanent magnets mounted around the CRT's face. These magnets are adjusted by pushing them in toward the CRT or pulling them away from it.

After color purity has been adjusted, any stray magnetic fields affecting the CRT may be neutralized by adjusting the neutralizing magnets.

Another thing the technician might take into consideration is the use of remote controls for color TV. While these controls operate on the same principal as those used for black and white receivers, it will pay to become familiar with them.

Once the technician has learned the basic fundamentals of color controls, they should present no problem. •



For stronger...clearer  
TV reception

# Belden PERMOHM\* TV Lead-in Cable

There's a Belden Lead-in Cable  
for every requirement



**STANDARD 300-OHM LINE**—  
Offers low losses at high frequencies. For use with TV and FM receiving antennas.



**CELLULINE † 300-OHM LINE**—  
Resists abrasion, sun, and wind. Provides strong UHF and VHF TV pictures.



**STANDARD 72-OHM LINE**—  
Can be used with all types of receiving antennas at high frequencies.



**WELDOHM † 300-OHM LINE**—  
Provides 2½ times the breaking strength of ordinary lead-in cable.



**DECORATOR LEAD-IN 300-OHM LINE**—For interiors only. Replaces unsightly cables. Neutral color blends into room's decor.



**STANDARD 150-OHM LINE**—  
For receiving antennas, matching transformers, and experimental applications.

Permohm conductors are encapsulated in cellular polyethylene. This exclusive 300-ohm line design provides clearer TV reception in all areas, including areas where conditions of extreme salt spray, industrial contamination, ice, rain, or snow are experienced. It further improves fringe area pictures on all channels, as well as strengthening UHF and color TV transmission. Ask your Belden Distributor about this improved 300-ohm cable. Permohm is available in packaged lengths of 50, 75, and 100 feet, and in 500- and 1000-foot spools.

\*Belden Trademark and Patent . . . U.S. Patent No. 2782251

## Belden

WIREMAKER FOR INDUSTRY  
SINCE 1902 — CHICAGO

Power Supply Cords • Cord Sets •  
Portable Cordage • Electrical  
Household Cords • Magnet Wire •  
Lead Wire • Automotive Wire  
and Cable • Aircraft Wires •  
Welding Cable

Belden Cable is Packaged  
in Standard Lengths for  
Display and Handling.



† Belden Trademark—Reg. U.S. Pat. Off.

# SHOP HINTS



## Pen Cartridge Cures Intermittent Filament

Set's having transformer mounted 5U4 socket's are prone to develop intermittent heaters when 5U4GB tubes are used as replacements. These tubes have excellent heat conduction down the heater pins and the trouble stems from the socket loosening. To replace this type socket is tedious and difficult.

I found a remedy for this problem. Simply cut two  $\frac{3}{8}$ " pieces of tubing from a ball point pen's cartridge. Slip these sections over pins 2 and 8 of the 5U4GB. Solder sleeves to the pins.

Then with a #30 drill bit enlarge the socket lamination only, on pins 2 and 8, so that they admit the modified tube.—*P. Ross, Fort Lee, N.J.*

## Repairing Broken Ferrite Cores

Ferrite iron cores used in horizontal flyback transformers, portable antennas etc., cannot be repaired by using ordinary cement. Clear cement will act as an insulator and prevent efficient core performance. I use the following method when cementing broken cores: Pour some powdered graphite into a metal jar lid. Then pour a larger amount of regular glue into the graphite—stirring as you pour.

When the mixture has become the thickness or consistency of thick syrup, place a small amount on both ends of the broken coil core. Let dry. Now, repeat the application, daubing a generous amount on the broken ends. Press the glue-ends firmly together. Place in a clamp and let dry. This will work, just try it!—*M. E. West, Lenoir, N. C.*

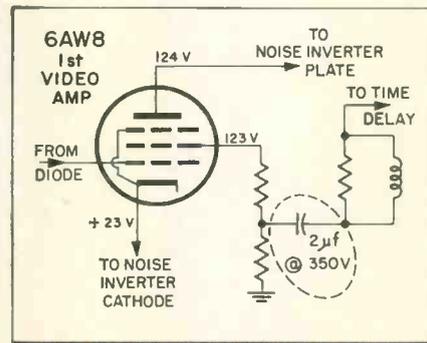
### SHOP HINTS WANTED!

\$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.

## Filter Causes Color TV Troubles

A  $2\mu\text{f}$  350 volt capacitor (C-401), located on the video amplifier board in RCA CTC9, 10 or 11 series color receivers, has proven to be a troublemaker.

If any of the above chassis are encountered with poor sensitivity, sound bars and 900 kc beat in the picture (but with traps properly adjusted), picture roll (vertical sync



In many RCA Color TV receivers a  $2\mu\text{f}$  filter capacitor, mounted on the video amplifier printed board may cause a variety of annoying picture symptoms.

pulse appears healthy), and the 4.5 mc trap ineffective, look for the trouble in this capacitor.

A large percentage of the aforementioned symptoms in these receivers have been eliminated by replacing this filter with a 450 volt  $2\mu\text{f}$  type. The defective component tested ok in every case, but replacing it cured the trouble.—*Paul Noel, Jr., York, Penna.*

## Preventing Tone Arm Damage

For many years I have had the problem of fastening tone arms on some record changers when transporting or repairing them. I have tried rubber bands, masking tape, string, etc. I now think I have found the ideal solution to the problem.

I keep a supply of pipe cleaners on hand for this purpose. With a

few twists, the arm is secured safely to the machine's spindle. The unfastening is equally as easy. Cleaners may be reused if desired, although the price is low enough to permit discarding them.—*Frank M. Dickinson, Stony Point, N.Y.*

## Hypodermic Grease Gun

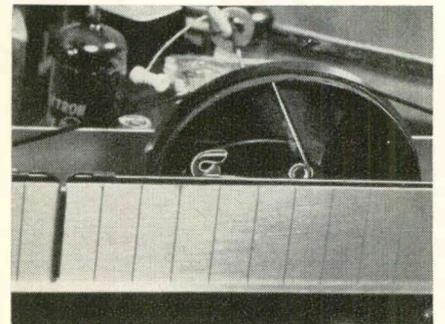
Looking for a way to get fine grease on hard-to-reach parts, I found an excellent method. I filled a hypodermic syringe with the grease.

Placing the needle on a part, a slight push on the syringe plunger results in the exact amount of grease just where I want it. Hard-to-reach areas in record changers are now easy. I can even grease a tuner's detent without removing the tuner cover!

For storage, I hung a medical test tube on my peg-board rack, put a little cotton on the bottom, and the syringe with needle fits in nicely.—*William White, Princeton, Florida.*

## Emergency Dial Spring

A large safety pin can be used as a dial pulley drive spring to replace the regular coiled spring in an emergency. Simply take a large safety pin and clip it into the dial



A large safety pin can replace the drive pulley's spring in an emergency. See Text!

pulley assembly and tighten the dial cord around it. If the regular dial cord is too old and frayed, it should be replaced.—*H. L. Davidson, Fort Dodge, Iowa.*

# 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 milliamper on VOM

### Batteries

one 1.5 volt "D" cell

### Accuracy

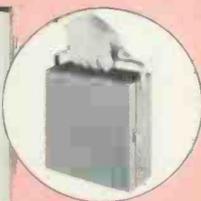
3 percent on DC volts; 5 percent AC volts with a 6 inch, 200 microamp, 2 percent meter.

### 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!

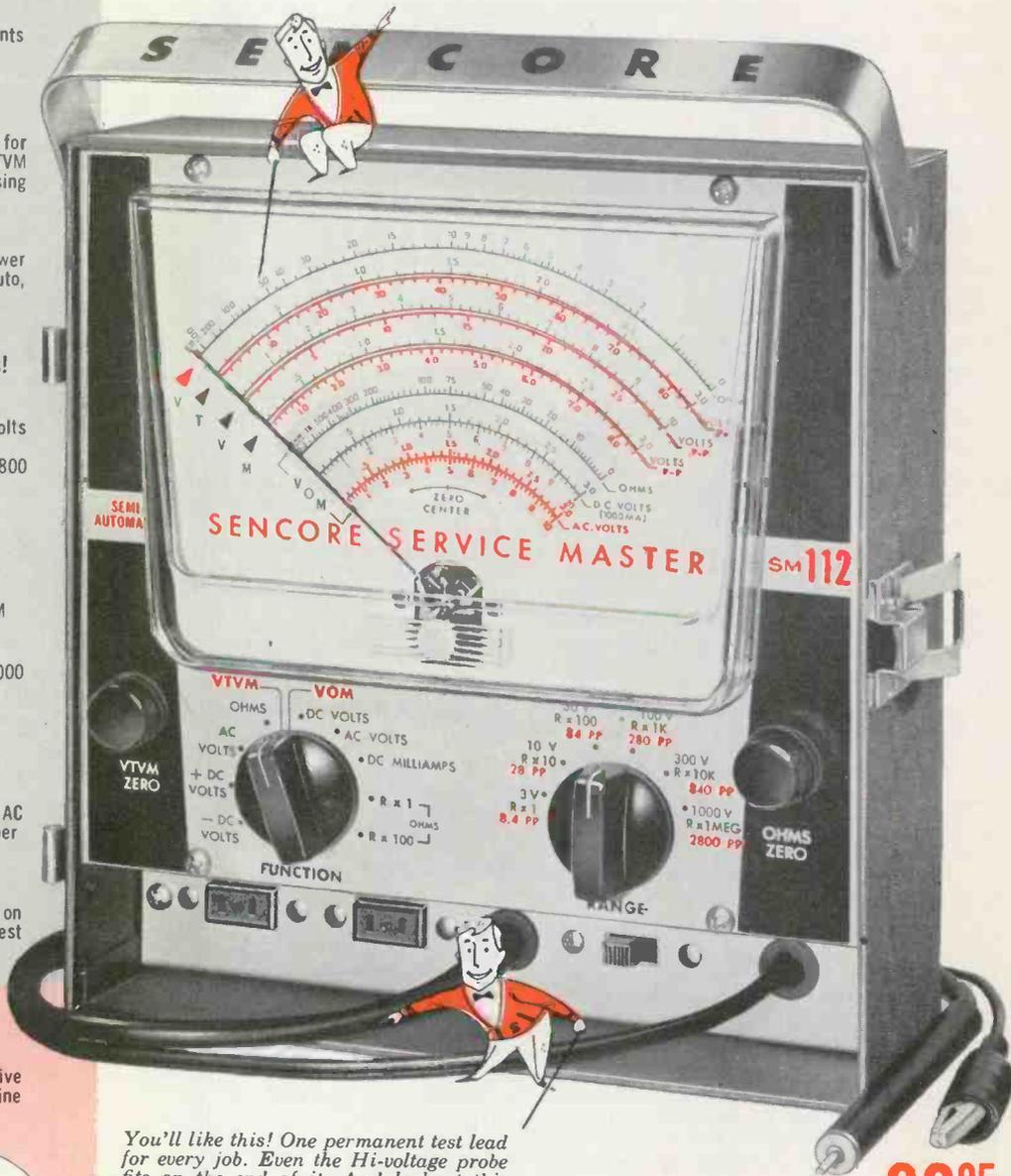
Unbreakable steel case and protective removable cover. No leads to drag or line cord to "hank".



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!



You'll like this! One permanent test lead for every job. Even the Hi-voltage probe fits on the end of it. And look at this storage compartment for test lead and line cord. The two 115 volt AC outlets sure come in handy on service calls!

# 69<sup>95</sup>

Model SM112 Only  
 No more than a complete VTVM alone!

Ask your Sencore distributor for the New Combination VTVM-VOM—there is no other!

MADE IN AMERICA



# SENCORE

ADDISON, ILLINOIS

## Transistor Testers

(Continued from page 37)

small-medium-high powered transistors for shorts, Icbo leakage, and Beta gain (see Fig. 2). Secondary tests, such as Iebo and Icbs, are also available.

The unit employs pulsating d-c for Beta tests. Base current can be switched to five ranges, 50 microamps to 5 milliamps, to provide higher currents. Collector voltage

can be switched to 17 ranges, from 0.5 volts to 100 volts. Roller chart data indicates control settings.

As you may have surmised, Precision 960 tester offers enough varied voltage and current settings to simulate actual transistor operating conditions under most circumstances. High power transistors, too, are tested with generally used collector currents, as opposed to the less expensive instruments' practice of using very low collector currents.

Hickok's model 870 instrument

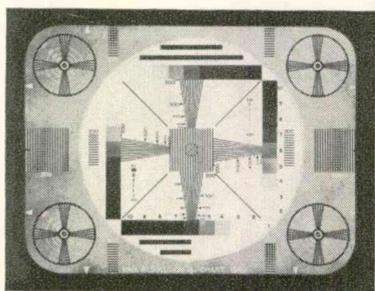
is the finest transistor component tester examined here. It is also the highest priced (\$298). Actually, it is two instruments combined: an a-c Beta tester and a d-c Beta tester (plus leakage tests, of course).

Like the Precision tester, it also offers voltages and currents that simulate under-load operating conditions for small-medium-high power transistors. However, its test ranges are considerably wider. Variable pots are employed to better pin-point manufacturers' transistor requirements. The roller chart itemizes actual manufacturers' specs. Consequently, the tester can be set up from a transistor manual.

The left side of the instrument incorporates a-c Beta tests (and leakage) for low signal transistors, the right side tests d-c Beta (and leakage) of medium and high power transistors. The roll chart indicates which test to use.

Hickok's 870 a-c Beta test makes use of a 1000 cps oscillator. The a-c signal developed in a resistor in series with the collector is amplified by an a-c bridge amplifier.

(Continued on page 58)



## TV TIPS FROM TRIAD

NO. 13 IN A SERIES,  
PART 2

"With four volts of video established at the detector it takes only a moment to check the peak-to-peak level at the video output. It is safe to assume that a -CB6 will have a gain of about 12 to 15 at full contrast, so you can expect from fifty to sixty volts of video drive to the CRT with positive-going sync if a fully lighted scene is being transmitted. If a dark scene is on, sync should amount to twelve to fifteen volts since it should represent about twenty-five percent of full modulation!

"That is your second 'for sure' check point and if it is normal, AGC should be your next concern."

"And," interrupted Joe, "next you will say that something 'for sure' goes on in the keyer circuit? I'll have to see that."

"Usually it's simple," countered Bill; "With a pentode keyer such as an -AU6 it goes like this: In the absence of specific information apply one hundred volts peak-to-peak more positive going spike to the plate than you have DC voltage on the keyer screen." With a voltmeter Bill measured pin 6 to be 280 volts. "Two hundred and eighty plus at least a hundred means that the plate must have a positive going spike of approximately three eighty to four hundred peak-to-peak.

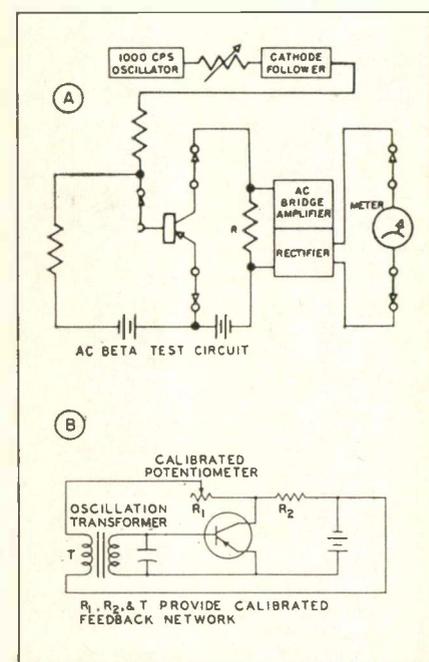
"So," continued Bill as he picked up a clip lead, "let's see what the tapped winding delivers. If we ground the tap we have about—" as he scoped rapidly—"fifty negative going, and almost five hundred positive going. I think we can tie the keyer to the five hundred!"

"That leaves blanking and AFC. Blanking is fed to what?" as he traced. "This looks like it—pin 2, grid, of the -FP4. So, here is your fourth 'for sure' factor. If the CRT grid is blanked you must have negative going spike to cut it off during retrace and in contrast to blanking the screen you cannot use an unlimited spike without developing 'telephone poles' on the left. So I think you can assume that the winding tap goes to ground and blanking connects to the negative going fifty volts of spike.

"Now for AFC. Since we have pretty much established the winding configuration we could probably settle AFC easiest by connecting the shaping network to one side or the other and see if the raster is normal or if the blanking bar seems to want to sync in the center of the picture, but even here we have a lead. It isn't quite as 'for sure' as the other points, but look at the value of the dropping resistor. If it is fairly high in resistance, more than a hundred thousand ohms, you are pretty safe in assuming that it will go to the high peak-to-peak point. This one is made of two 270K units in series so we'll connect it to the five hundred positive!"

**MORAL:** Facts you "know for sure" about TV circuits can be money in the bank, but many of these points are "for sure" only when your scope is a working partner and not a shop decoration. For more discussion of "Multiple Trouble" problems, look for PTM #4 to reach you soon if you're already on the Triad PTM mailing list. If you're not, a request to *Renewal Division, Triad Transformer Corp.*, 4055 Redwood Ave., Venice, Calif., will bring you a copy.

Fig. 3—(A) Hickok model 870's a-c Beta employs a calibrated a-c test circuit base current to produce collector current. The Ic signal developed across resistor R is amplified, rectified, and fed to the meter. (B) B&K's "dynamic" Model 160, on the other hand, uses a calibrated amount of feedback to cause the transistor under test to oscillate. The dial is calibrated in terms of feedback used.

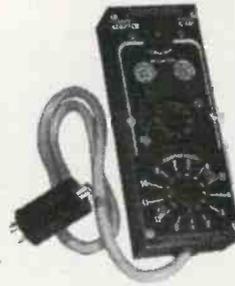




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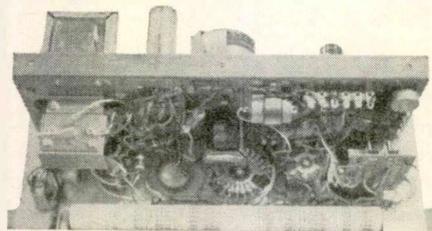
(Continued from page 56)

It is then rectified and fed to a metering circuit, which is calibrated as a function of Beta to permit direct a-c Beta readings. This circuit may be contrasted with B&K's method of measuring "dynamic" gain by examining Fig. 3. It's interesting to note that this Hickok instrument employs two types of power supplies: a-c and battery. The former is used for an intermediate supply; the latter for a low power supply. The batteries (two nickel cadmium) can be recharged. A charging network is incorporated in the tester which operates according to the battery charge switch on the tester's face.

This Model 870 transistor tester was commendably accurate and surprisingly easy to use after going through the test setup one time. Also, many secondary tests can be made with the tester, such as: collector saturation voltage, I<sub>ceo</sub>, I<sub>c</sub>, I<sub>ces</sub> leakage and an a-c input impedance test (with the addition of a capacitor and potentiometer).

Our test conclusions are given after the following descriptions.

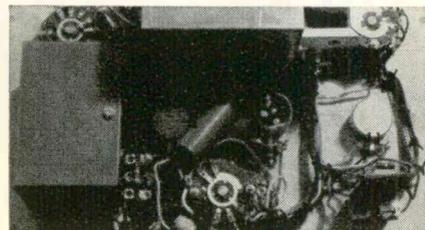
**Hickok, Model 870 @ \$298**—A-c and battery-powered unit tests low-medium-high power transistors. Actually two instruments in one, it examines transistors with either a-c (left side



of unit) or d-c (right side) Beta tests, as well as leakage tests. I<sub>ceo</sub> leakage value and Beta gain value is read directly on the meter scale. Other leakage tests can be made, too, plus a-c input impedance and collector saturation voltage. Has 100  $\mu$  ammeter. Variable controls permit application of the transistor manufacturers' recommended test voltage and amperage to the transistor being examined. A roll chart lists all essential test set-up information (subscription service is available). Specifications from a transistor manual can also be used. Batteries (used for small signal a-c tests) can be recharged by switching in a recharge circuit. They can also be measured on the tester's meter by a simple throw of a switch. Has separate a-c and d-c calibration controls.

**Comments:** Large-size unit has portable carrying case. Surprisingly easy to operate after only one trial set-up. Tests all transistors under typical operating conditions. Can even test industrial switching types. Has voltage regulator tube to assure steady line voltage; is externally fused. Test accuracy is excellent, as you may suppose, in line with the general construction and appearance quality of the instrument. Unfortunately, the price is beyond reach of many small service shops.

**Hickok, Model 890 @ \$129.50**—Battery-powered (one 22½ v. and four 1½ v.) unit tests I<sub>ceo</sub> leakage and a-c (1000 cps) Beta gain of low and medium-power transistors. It meas-

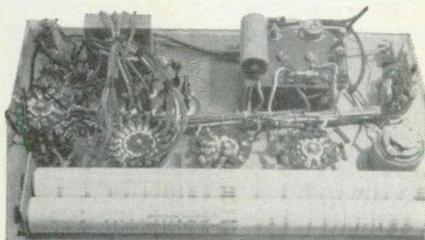


ures a-c Beta value of transistors without disconnecting them from their circuits. I<sub>ceo</sub> leakage values can be measured out of the circuit. Both tests are read directly on the meter scale. No set-up chart needed. Readings may be compared to transistor manual ratings. Has 50  $\mu$  ammeter. Also measures circuit impedance and transistor input resistance with calibrated controls.

**Comments:** Medium-size; fairly easy to use. Its accurate ( $\pm 5\%$ ) in-circuit a-c Beta test facility is a desirable feature. With this provision, a user can determine if a transistor's gain is good or bad without unsoldering it from the set. Of course, if gain checks good, the transistor may still be bad due to excessive leakage. It must be disconnected from the circuit to accomplish a leakage test. However, if a bad gain transistor is located, the user has happily discovered it without disconnecting all other good transistors. It does not test high-power audio output types, though, such as found in auto radios. Variable collector current and voltage for testing lower power transistors is provided. Test accuracy in circuit and out of circuit is generally excellent, excepting higher power transistors. Also, minimum circuit impedance for accurate in-circuit tests should not be below 150 ohms.

**Precision, Model 960 @ \$97.95**—A-c powered unit tests I<sub>ceo</sub> leakage and d-c Beta gain of low-medium-high power transistors and diodes. Other leakage tests can be made, too. I<sub>ceo</sub> leakage can be read on either an arbitrary meter scale to match unit's

roll chart indication or on a direct value scale. Gain value is read on meter scale. Other leakage tests can be made, too, plus a short test. Unit



has a 100  $\mu$  ammeter. Variable controls, though not as broad as the \$298 Hickok's range, is wide enough to simulate typical operating conditions. A roll chart lists all essential test set-up information. One-year free test data is provided; a nominal charge for renewing this service, optional, (\$1.25 each). Tester has a line voltage adjustment to assure measuring accuracy.

**Comments:** Large-size unit has portable carrying case. Easy to operate. Though roll-chart-control settings do not directly coincide with manufacturers' specification (code settings for simplicity), an unlisted transistor can be set-up for tests from a transistor manual. Test accuracy is good to excellent. A simple, thoughtful inclusion is the writing space provided below the roll chart for technicians to insert the chart's last transistor number. Anyone who has ever used a roll chart tester is aware of the irritation caused by rolling a chart to the very end, only to discover that the tube or transistor number is at the beginning of the chart's second half. A questionable inclusion, on the other hand, is the provision of four different transistor sockets plus test lead jacks. We've yet to use any of the sockets. Admittedly, *this* is a petty comment when contrasted with the good attributes of this tester. However, eliminating some of these sockets would lower the instrument's cost a few bucks.

ET's Editors employed the same 52 low-medium-high power transistors used for last month's tests to examine these seven medium/high priced transistor testers. In addition, eight high-power auto transistors were added (four known good and four known bad) to bring the total number of test transistors to 60 pieces.

**Accuracy:** As might be expected, the \$298 Hickok tester gave us the most accurate gain/leakage indications, based on our test results. The \$129.50 Hickok tester provided the second most accurate measurements of our seven testers. In addition, in-circuit Beta gain tests were especially accurate, too,

in most instances. (It should be pointed out, though, that this unit *cannot* check high-power transistors.) The third most accurate transistor tester examined was Precision's \$97.95 tester.

The three aforementioned testers were the only testers of the group that correctly and accurately identified the condition of *all* transistors tested. The other four testers gave us fairly accurate readings, too. However, each one "goofed" on one reading, indicating a transistor was bad when it was truly good, or good when it was truly bad. Other readings ranged from fair to excellent accuracy, depending upon the particular transistor tested. Certainly, readings of all units were sufficiently accurate for most service work.

**Other Features:** Each transistor tester has special added features that may meet special demands of a service shop. Hickok's model 870, Precision's model 960, and B&K's model 160 are a-c powered units. Consequently, battery power depletion is not a nuisance problem. (Hickok also employs batteries in the 870. However, a recharging circuit is incorporated. Also, a test position is included to read battery voltage.) Precision has a power line adjustment control to compensate for voltage variations. Hickok uses an OA-2 voltage regulator.

Hickok's large tester and Precision's tester can test high-power transistors under normal high collector current conditions. None of the other units can do this. Additionally, they both have controls to widely vary test conditions. Further, they each offer additional component tests, including specific test settings for diodes. Each tester utilizes a 100 microampere meter movement.

Hickok's smaller 890 tester has some test conditions that can be varied, too. These are limited, however, and are essentially for low-medium power transistors. High power transistors, such as auto radio output components, cannot be accurately checked. The unit's Beta in-circuit test provision is, of course, its prime selling point. Transistors' leakage cannot be measured, unless the components are disconnected from the circuit,

as pointed out previously.

The four other testers also have "added features." In some instances, the added features overshadow their component test provisions. An example here is Superior's signal injection and tracing facility for transistor circuits. Their transistor component test provisions are decidedly more limited than the other testers examined here. Conversely, its circuit tracing provisions are better than any tester in this group. (We'd like to point out here, though, that this study focuses on transistor component testers. Circuit tests are considered here as a secondary feature.)

The other three testers also have "extras" to offer, as noted at the beginning of this study. B&K's second strong feature is as an external battery supply & volt-amp monitor; Eico as a VOM; Sencore as a battery supply & current drain tester, signal injector, and broad in-circuit tester.

**Summary:** Based on component test accuracy and wide-range test facilities, our test results indicate that Hickok's \$298 unit is the most desirable transistor test instrument examined. Unfortunately, only service organizations doing a booming repair business in transistorized equipment can justify spending this amount of money for a tester.

Precision's \$97.95 unit is an accurate, wide-range transistor component tester, also. Though not as ideal or costly as Hickok's more expensive instrument—it doesn't distinguish between a-c or d-c Beta tests, among others (neither do any other testers examined)—it is an excellent all-around tester within \$\$ reach of many shops. Hickok's \$129.50 in-circuit tester is another excellent unit that should attract many service shop owners. Its ability to test gain without desoldering a transistor from a set is often desirable. However, some shops will find it limited due to its inability to check high power transistors; especially if the shop specializes in repairing transistorized auto radios.

B&K's model 160 and Sencore's TR-110 are combination transistor testers and transistor circuit checkers. B&K provides a substitute power supply, for example; Sencore provides a harmonic signal genera-

tor. Other features, as previously mentioned, are provided, too. Either of the indicated features is essential to repair of transistor radios. Therefore, if a shop doesn't have one or the other, and requires a transistor component tester, either tester should satisfy his test equipment needs. Each one does a nice test job for the money, too. B&K's unit checks leakage current on a calibrated meter scale; Sencore employs letter divisions (A, B, . . .). The former is more accurate; the latter is faster because

tolerances are not left to the user's judgment. Take your pick—you won't lose.

Eico's tester employs the best meter movement (50 microamp) among the medium-priced testers. It also has a VOM with limited volts range. Thus, it is a combination tester with yet another type added test feature. It has a Beta calibrate control to assure better test accuracy. Whereas B&K and Sencore divide their test efforts between component and circuit, Eico's attention to component test-

ing facilities make it, in our opinion, more a component tester than a circuit tester. Thus, if a shop's prime need is a good low-priced component tester, with an added VOM feature being secondary, look into this one.

On the other hand, Superior's attention to circuit testing leads us to believe it is more useful as a circuit tester than a component tester since it includes a signal injector and signal tracer with a self-contained transistor amplifier, speaker, and demodulator probe.

**Which One To Buy?**

This concludes ET's lab study of popular transistor testers. Together with last month's report on eight low-priced testers, we've examined a total of 15 transistor instruments. Three decidedly separate groups evolved from this study: low-priced component testers, medium-priced component-circuit testers, and high-priced component testers.

If you repair transistor radios, or wish to prepare for transistor TV sets (Philco, Motorola, and Sony transistor television sets are already being sold), you'll be buying a tester from one of these groups. The group you investigate will probably depend upon the income derived from transistor set repairs and/or sales or near-future anticipated work.

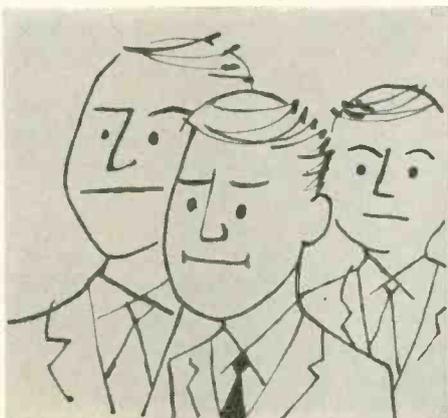
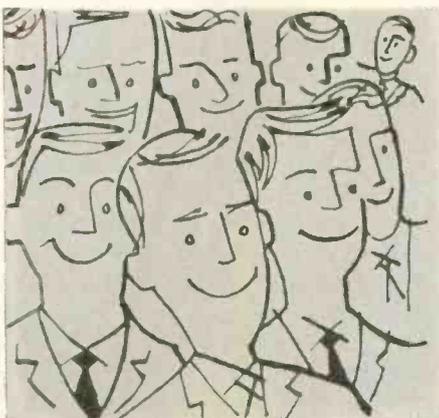
Shops with small-to-medium transistor set incomes will probably choose a tester in the low-priced or medium-priced group. Medium-to-large shops will generally consider a high-priced tester or, if they own an expensive unit, a less costly one to supplement it.

A choice between a low-priced and medium-priced tester should be predicated on whether or not additional test equipment features are needed. Shop transistor test equipment *should* include a substitute power supply, current drain monitor, and a circuit signal tester. If your shop lacks any of these features, you should seriously consider one of the medium-priced component-circuit testers to fill the gap. However, if you're operating within a very tight budget, you might lean towards a low-priced component tester and plan to purchase additional separately-avail-

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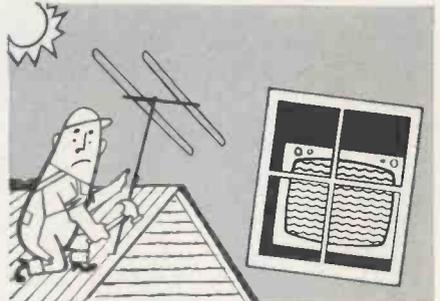
Announced are: 4GS8/4BU8 9-pin miniature dual pentode used as sync separator, sync clipper, and AGC in series string TV receivers; 6DT6A-7-pin miniature pentode used as AM-FM detector, limiter or amplifier; 6HJ8-9-pin miniature diode pentode used as i-f amplifier and video detector in TV receivers; 6HS8-9-pin miniature twin pentode used as combined

sync-AGC tube in TV receivers; 6EW7-double triode; 12FQ8-9-pin miniature twin double plate triode used as a harmonic generator in electronic organs; 14GT8-9-pin miniature duplex diode triode used as an FM detector and a-f voltage amplifier; 3AF4B-7-pin miniature triode used as UHF oscillator in TV receivers; 35HB8-9-pin miniature triode pentode used as an audio amplifier in stereo & monaural sound equipment. Sylvania Electric Products Inc., 730 Third Ave. New York 17, N. Y.

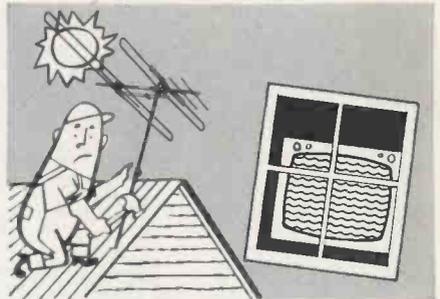
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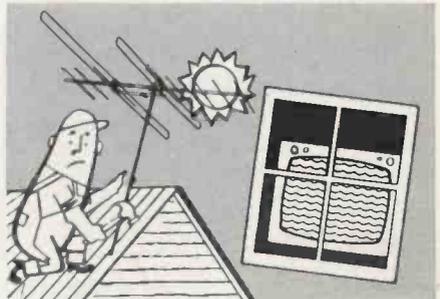
by JSC



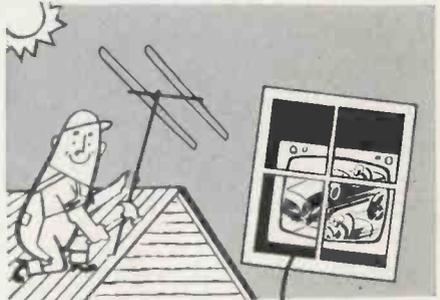
**FINEST ANTENNA**



**+ HIGH DB LOSS 300 OHM**



**= POOR RECEPTION**



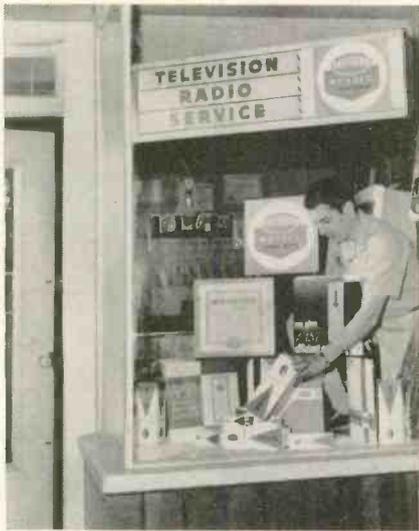
**FINEST ANTENNA + LOW DB LOSS 300 OHM  
= PURE RECEPTION**

Write Today For Complete Wire Catalog

**JERSEY SPECIALTY CO., INC.**  
P. O. Box 235, Wayne, N. J.

For more data, circle 8-64-2 on coupon, p. 45  
**ELECTRONIC TECHNICIAN • August, 1961**

## Window Display



New window display material has been created by Raytheon Company's Distributor Products Division for its 10,000 Bonded radio-TV service dealers.

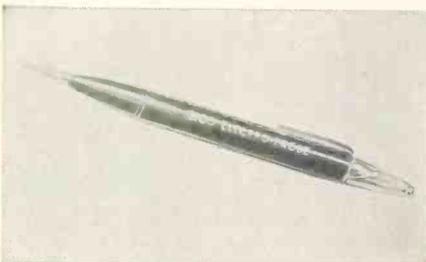
Six individual easel-backed signs, uniquely designed to fit in a variety of formations, feature the Raytheon Bonded Service.

Efficient service and high quality products are extolled on the brightly colored cards. Simple wire attachments permit stacking in pyramid, step, or block display formations, limited only by the dealer's imagination.

Obtained from Raytheon distributors, the \$2 display can also be used within the shop.

## Sico ELECTRIC TESTERS

An all around electric tester plugs direct into current source. Tests all a-c and d-c voltages from 110v to 550v. Indicates which side of the line is grounded and which side is live. Will



check if voltage is present at sockets, fuses, switches, appliances, etc. Also checks for possible electric shock by touching the tip of the probe against any kind of electrical device. \$1.00. Kapner, Inc., 1924 Washington Ave., New York 57, N. Y.

For more data, circle 8-63-2 on coupon, p. 45

## R-F Industries TV Antenna

Television antenna called Mite-Site, is a silver circuit printed on flexible B. F. Goodrich Koroseal vinyl. Material offers low di-electric loss for maximum RF efficiency. Shaped like two butterfly wings with a five-foot wing span. May be rolled into a ¼ lb pack 1' L X 1½" Diameter. Antenna is said to receive all TV channels with indoor installation except in fringe areas. Also useable for FM reception. Price approximately \$3.00. R. F. Industries, Inc., Summit, N. J.

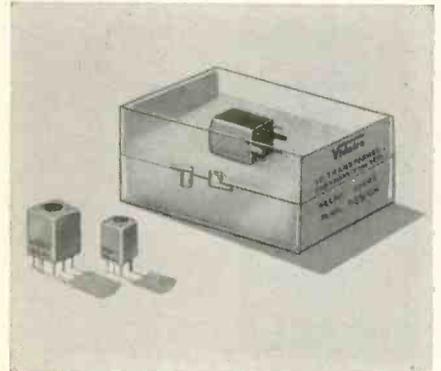
For more data, circle 8-63-3 on coupon, p. 45



## Vidaire TRANSFORMERS

Added to a line of i-f transformers and oscillator coils for miniature and sub-miniature type transistor sets are: four models in the ¼ x ¼ size and four models in the ⅜ x ⅜ size, comprising the input, interstage, output and oscillator transformers. All models are completely shielded and iron core tuned. With the ½ x ½ transformers, already in the line, the firm reports their units replace appx. 85% of all miniature and sub-miniature i-f transformers in use. Vidaire Electronics Mfg. Corp., 365 Babylon Turnpike, Roosevelt, N. Y.

For more data, circle 8-63-4 on coupon, p. 45

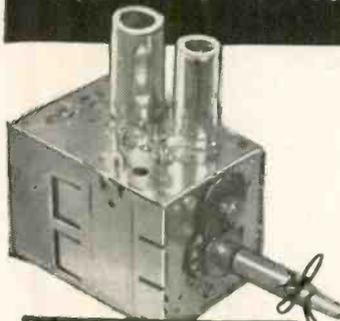


Professional Technicians Use CASTLE'S Complete

# TV TUNER OVERHAUL

ALL MAKES  
ONE PRICE

**\$9<sup>95</sup>**



**SAME DAY SERVICE!**

on Popular Types  
48 Hours most Others

VHF TUNERS • UHF TUNERS • UV Combinations\*

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

## NOW ALSO IN THE EAST

Castle pioneered TV Tuner Service almost a decade ago. Overhauling TV Tuners is our only business.

\*One piece construction. Separate UHF and VHF tuners must be dismantled.



**CASTLE TV TUNER SERVICE, INC.**

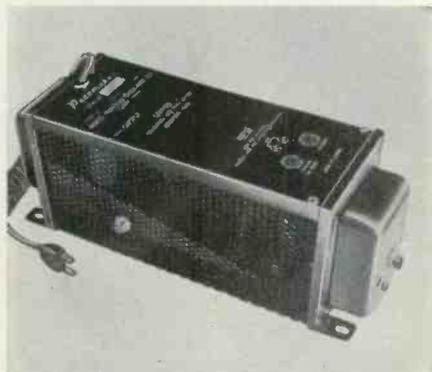
**NEW!** 653 PALISADE AVE., CLIFFSIDE PARK, NEW JERSEY

• 5710 N. WESTERN AVE., CHICAGO 45, ILLINOIS

• IN CANADA: 136 MAIN ST., TORONTO 13, ONTARIO

**Benco AMPLIFIERS**

A new broadband amplifier for master TV systems, the Pacemaker, offers up to 35 db gain. Designed for indoor use, it has a power rating of less than 50 watts. It may be used outdoors if a weatherproof container is provided. Reported to operate at peak efficiency even when being used for as many as



100 TV and/or FM sets at a time. Outstanding feature is its output capacity of 2v per band. Separate inputs are provided for high band and low band but a link allows it to be used with combined high band/low band inputs. Priced under \$100.00. Blonder-Tongue Labs., 9 Alling St., Newark, N. J. In Canada, Benco Television Associates Ltd., 27 Taber Rd., Rexdale, Ontario, Canada.

For more data, circle 8-62-2 on coupon, p. 45

**G-E RECTIFIERS**

Offered are three replacement types of Vac-u-Sel dual diode in a new wall card display. The dual diode, a selenium semiconductor device, finds its major application as an afc discriminator diode in TV receivers. May be used also in low power circuit applications where both economy and de-

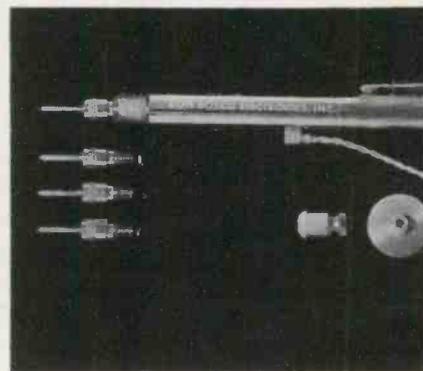


pendability are important considerations. 12 units per wall card. Each sealed in a plastic blister, mounted on a break-away section which has a replacement chart. The three types, 6GH1, 6GC1 and 6GX1 can replace 41 comparable parts found in more than 20 domestic TV sets. \$1.40. General Electric Co., Rectifier Components Dept., W. Genesee St., Auburn, N. Y.

For more data, circle 8-62-3 on coupon, p. 45

**Don Bosco SIGNAL TRACER**

The new Stethotracer, a pen-size, self-contained, transistorized signal tracer locates hum, oscillations, ground loop, and breaks in printed boards. Any low level  $\mu$ watt audio and modulated radio frequency signal can be detected or demodulated, then high amplified ((appx. 1000 times) and



reproduced through an earphone device at the output stage. It provides high gain (60 db), and operates from audio or microwave frequencies. Can also be used as an oscilloscope or voltmeter pre-amplifier. Don Bosco Electronics, Inc., 56 Route 10, Hanover, N. J.

For more data, circle 8-62-4 on coupon, p. 45

**TRU-VAC**

Each tube costs you only 17 1/2¢ each, and in quantities of 100 tubes only 16 1/2¢ each!

**SPECIAL OFFER**  
Buy 1 Tube at the Regular Price and Get Every Second Tube for Just 1¢

**1¢ sale**

IF SALE ONLY ON TUBES LISTED BELOW!

**1-yr. guaranteed Radio & TV Tubes**

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!  
ALL TUBES INDIVIDUALLY BOXED!  
COOE DATED & BRANDED "TRU-VAC"

Partial Listing Only . . . Thousands More Tubes in Stock!  
SPECIAL! 6SN7GT . . . 30¢ 6W4GT . . . 30¢

**35¢ ea.**  
\$33 Per 100 TUBES  
These Types Not Included in 1¢ Sale!

0Y4	3BN6	5U8	6AU5GT	6BQ6GT	6CU6	6SF7	7A7	7X7	12B06	14B6	50B5
0Z4	3RZ6	5V4G	6A8U	6B8U	6D6	6S07	7A8	7Y4	12BR7	14Q7	50C5
1A7GT	3C86	5V6GT	6AV5GT	6BR8	6DE6	6SH7	7B4	7Z4	12B7V	19AU4GT	50L6
1B3GT	3Q4	5X8	6AV6	6BS8	6DG6GT	6SJ7	7B5	12A8	12CA5	19B6G6	56
1H3GT	3S4	5Y3	6AW8	6SY5G	6DF6	6SK7	7B6	12A8S	12CN5	19J6	80
1L4	3V4	6A6	6AX4GT	6BZ6	6E5	6SL7	7B7	12AQ5	12F5	19T8	84/6Z4
1L6	4BQ7A	6AB4	6AK3GT	6BZ7	6F5	6S07	7B8	12AT6	12F8	24A	117Z3
1N3GT	4BS8	6AF4	6B8	6C4	6F6	6SR7	7C4	12A7T	12K5	25Z6GT	
1S5	4BZ7	6AH4GT	6RA6	6CA8	6H6	6T4	7C5	12A8U	12K7	27	
1T4	4CB6	6AH6	6BC3	6CD6G	6J4	6T8	7C6	12AV6	12L5	35A5	
1U4	5AM8	6AK5	6B8	6CF6	6J7	6U5	7C7	12AV7	12Q7	35B5	
1U5	5AN8	6AL5	6BD6	6CG8	6K6GT	6U8	7E5	12AX4GT	12R5	35C5	
1V2	5AT8	6AM8	6BE6	6CH8	6K7	6V6GT	7E6	12AX7	12S47	35W4	
1X2	5AV8	6AN8	6BF9	6CL6	6N7	6W6GT	7E7	12A27	12SJ7	35Z5	
2AF4	5AZ4	6AQ5	6B6GT	6CM6	6O7	6X4	7F7	12B4	12SK7	36	
2BN4	5BR8	6A06	6BH6	6CM7	6S4	6X5GT	7F8	12B6	12SN7GT	38	
2CY3	5C68	6A07	6BJ6	6CN7	6S7	6X8	7G7	12B7	12SQ7	39/44	
3A5	5J8	6AR5	6BK5	6CR6	6S8GT	6Y6G	7H7	12BD6	12V6GT	41	
3AL5	5R4	6AS5	6B7G	6CSC	6SA7	7A/XXL	7H7	12BE6	12WG6T	42	
3AU5	5T8	6AT8	6BL7GT	6CS7	6SD7GT	7A5	7S7	12BF6	12X4	43	
3BC5	5U4	6AU4GT	6BN6	6CU5	6SF5	7A6	7X6	12B7H	14A7/12B7	50A5	

\*For every tube you buy at 35¢ each, YOU GET A SECOND TUBE FOR JUST ONE PENNY!  
\*Buy 100 tubes for 33¢ each and GET AN EXTRA 100 TUBES FOR JUST \$1! Take your pick . . . tube types may be mixed!

1R5	6CQ8	12AF6
6AC7	6J5	12AU7
6AG5	6J6	12BL6
6AU6	6S7	12D4
6CB6	7N7	17AX4
6CG7	12AD6	17D4

**Sensational Offer!**  
"Self Service" TUBE CHECKERS  
**\$37.95**

Let your customers test their own tubes! These reliable, 22-socket tube checkers will return your investment in one week or less with little or no effort on your part! Handsome, field-tested console models COMPLETE WITH KEY FOR BOTTOM DOOR AND NEON-LIGHTED HEAD!

**LOOK! 1,000 USED TV'S**  
Costly, famous make console models with little or no tube replacement! Require 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.  
**\$16.95** As Is

Any Tube Not Listed Also Available at 35¢ Each!  
BRAND NEW 1-YEAR GUARANTEED TV PICTURE TUBES  
Below Listed prices do not include dust Add Additional \$5.00 Deposit on tube sizes to 20" on TV and 10" tubes—\$1.50. Deposit refunded immediately when dust is removed prepaid. Aluminized tubes—\$4.00. (U.S. only)  
Picture tubes shipped only to continental USA and Canada—All tubes F.O.B. Harrison, N.J.  
10BP4 7.50 16CP4 11.99 12HP4 16.99 20BP4 17.99 21AVP4 17.49 21XP4 17.49  
10CP4 10.49 16CP4 15.99 17CP4 18.99 21AP4 18.79 21FP4 18.39 21GP4 17.49  
11H/CP4 13.99 16CP4 18.99 17CP4 18.99 21AP4 18.79 21FP4 18.39 21GP4 17.49  
10DP4 16.99 17CP4 18.99 19AP4 18.39 21AMP4 18.99 21MP4 18.39 24CP4 21.79  
10HP4 12.99 12CP4 15.99 14CP4 15.99 21AP4 18.79 21FP4 18.39 24CP4 21.79  
10BP4 13.99 12CP4 15.99 20DP4 15.99 21AVP4 18.29 21WP4 17.49  
ATTENTION QUANTITY USERS! Big Discounts Are Yours . . . Call or Write For Our 1000 Tube "Terrace Label" Special Attention Branding Dept. 3028  
Money Chertally Refunded Within Five (5) Days. If Not Completely Satisfied!  
TRU-VAC (U.S.) PAYS YOUR POSTAGE—on orders of 25 or more in USA and Territories. Send approximate postage on Canadian and foreign orders. Any order less than \$5 requires the handling charge. Send 25¢ on G.O.D.'s. All orders subject to prior sale. Complying with Federal regulations, the following statement appears in all Tru-Vac advertising: Tubes appearing in this ad may be FACTORY'S RECONDITIONED or USED tubes and are clearly marked.

**TRU-VAC**  
Harrison Avenue • Box 107 • Harrison, N. J. HUMBOLDT 4-9770

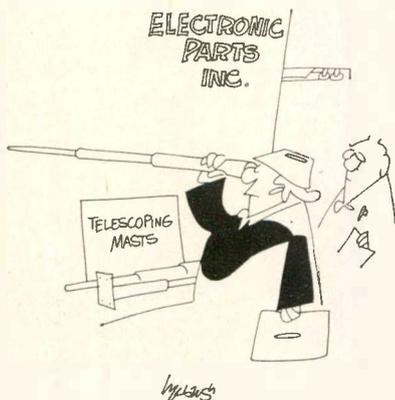
able equipment at a later date.

Higher-priced component testers, which offer more test accuracy than the other two instrument groups, can justify their purchase if the shop does—or plans to do—a significant amount of transistor set repairs and/or sales. Work on transistorized industrial gear may also point up the need for costly testers.

The small-medium-large shop rule-of-thumb is not inflexible, of course. A large shop, for example, may own a high-priced tester. But since a number of techs are probably working there, they need an additional tester to avoid tying up the big one. A small or medium-priced tester would be ideal. If there's a shortage of power supplies, or other additional equipment, a medium-priced combination tester would inexpensively improve service efficiency.

As you can see, you've got a wide selection of testers to choose from. Regardless of the choice, however, you'll find that your transistor repair ability will improve because you're using proper test equipment and acquiring added transistor circuit know-how. If you don't buy a transistor tester soon and dip into the transistor set pool, you may find a lot of transistor business passing you by. •

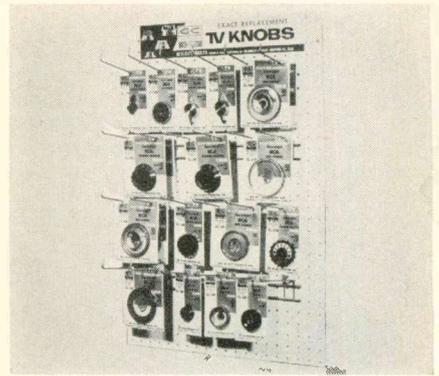
**COMING**  
**in September**  
**ELECTRONIC TECHNICIAN:**  
**STEREO 1962**



### GC TV & RADIO KNOBS

Self-service displays and best-seller knob selections are announced as the keys to a new knob promotion. Exact replacements for Admiral, G-E, Motorola, Philco, RCA, Westinghouse and Zenith are offered in dealer-sized assortments. Each knob is designed to be used with an all-purpose counter display rack, a self-service pegboard unit complete with easel and hooks. Brands can be intermingled. GC Electronics Co., 400 S. Wyman St., Rockford, Ill.

For more data, circle 8-61-2 on coupon, p. 45



Ralph  
Woertendyke  
tells  
**why**

HE USES

**STANCOR**  
**TRANSFORMERS**  
**EXCLUSIVELY**

"I just finished installing a Stancor replacement transformer in a TV set, and as per usual, it fit perfectly and works perfectly. So thanks for making my job easier by making available these fine exact replacement components.

"I found this transformer replacement by looking it up on the Stancor TV Replacement Guide. This saves me time. This makes me money. Stancor offers a vital service in addition to a good product. So, thank you for this service.

"I have been using Stancor exclusively for the last two years, as obtained through my distributor, Electronics, Inc. of this city. I am glad to buy your transformers, and I just wanted to take a few minutes to say Thank You."



Salina, Kansas  
Independent Service Dealer  
likes the time-saving,  
money-making features

*(The above is from an unsolicited letter, quoted with permission, received by Chicago Standard Transformer Corporation from the head of Television Engineering, 225 N. Santa Fe, Salina, Kansas.)*

**STANCOR ELECTRONICS, INC.**

(Formerly Chicago Standard Transformer Corporation)

3501 West Addison Street • Chicago 18, Illinois

# ASSOCIATION NEWS



## California

CSEA, Santa Clara Valley and Santa Cruz County, reports that ten TV and radio technicians were scheduled to receive "Journeyman Certificates" at their June 14 meeting. Five graduates, from the City College Senior Technician Class, will receive Master Technician Certificates. The five master certificates will be the first issued in this recently established classification. Five graduates from the four year course will be eligible to enroll in the Senior Technician class after a year of additional experience. In addition, CSEA reports that AB265 (the California Licensing Bill), has cleared the Assembly with an overwhelming majority vote for a "do-pass" through the Senate. However, it was placed in committee and further action may be postponed until the Governors Special Session in February 1962.

TSDA, San Mateo County, reports that Maurice I. Gershenson, Chief of the Division of Labor Statistics and Research, Department of Industrial Relations, State of California, has extended his thanks to the San Francisco Service Association for the role it played in establishing a budget for the self-supporting woman. The budget includes a 19" portable TV.

## Illinois

ARTS, Chicago, reports that House Bill 665, which supplanted HB 209, was defeated in the House Appropriations Committee. ARTS opposed the bill while TESA supported it.

## Iowa

TESA, Des Moines, reports the following officers were elected: Pres., Henry Gulliver; V.P., Dick Moon; Sec'y, Don Price; Treas., J. R. Jackson.

## Michigan

TESA, Detroit reports election of the following officers: Pres., Howard W. Larson; V.P., Dale F. Brock; Sec'y, John McCullough; Treas., George McDonald.

## Missouri

### Class Injunction Removed

TESA, Kansas City, reports that

the class injunction restraining Kansas City from enforcing the TV Service License Law was recently removed. This action releases the License Bill for full effectiveness for the entire City, except for four individuals who remain on the injunction order. It was also reported that seven of the eleven plaintiffs who were suing various members for libel, dropped their suits. Attorney for the plaintiffs required each defendant to sign a release before the original suit was dropped to guard against counter suits.

## New Jersey

AETA, Gloucester, reports election of the following officers: Pres., Tony DeFranco; V.P., Ray Dellinger; Sec'y, Joseph Papovich; Treas., Joseph Eberhardt.

## Pennsylvania

TSA, Delaware Valley, reports that color TV servicing classes will be conducted two nights each week. Groups of twenty, working at four benches, will have the services of an instructor supplied by RCA Service Co. School equipment will be supplied by Raymond Rosen, RCA distributor. The association also reported five members of the House of Representatives, Washington, D.C., had replied to letters concerning their stand on House Bill 10, the Self-Employed Individuals Tax Retirement Act of 1961. All representatives replying were in favor of the bill's passage.

## Texas

TEA, San Antonio, reports the following officers were elected: Pres., Gus Dwyer; V.P., Doug Anderson; Sec'y, George Stowe; Treas., Tom Boyd.

### Texas License Bill Dead

TEA, Fort Worth, reports that the TEA sponsored licensing bill, for the electronics industry, died in the Texas Legislature. The association said H.B. 300 was killed through action of many persons within the industry and not by outside influences. Indications were that most opposition came from some of the TEA-member shop owners while many association members were highly in favor of the bill's passage. Those reported elected to office include: Pres., Bill Borders; V.P., R. L. McDonald; Sec'y-Treas., Joe Stratton.

# TOP PERFORMER

...and profitmaker!



SELL—SERVICE—SATISFY

## RECEIVING TUBES

MADE BY  
GRAND PRIX AWARD-WINNING

# HITACHI



Choice as original equipment by  
manufacturers in the U.S. & abroad

From all points come good words about Hitachi tubes—on all points, tubes that can't be beat for performance and reliability. Most popular types are available . . . each made with strict quality-control to fully meet top American standards. Yet important cost savings guarantee you extra profits. And distribution's on a localized prompt-delivery basis.

### THE SAMPSON COMPANY

Electronics Division, 2244 S. Western Ave., Chicago 8, Ill.

See your HITACHI Distributor  
or write for CATALOG CT400-A

A COMPLETE LINE  
OF QUALITY ELECTRONIC  
COMPONENTS

For more data, circle 8-65-1 on coupon, p. 45

# FAST, DEPENDABLE TUNER REPAIR SERVICE

It just makes sense that a manufacturer of tuners should be better-qualified, better-equipped to offer the most dependable tuner repair and overhaul service.

Sarkes Tarzian, Inc., pioneer in the tuner business, maintains a complete, well-equipped Factory Service Dept.—assisted by Engineering personnel—and staffed by specialized technicians who handle **ONLY** tuner repairs . . . on **ALL** makes and models.

Tarzian-made tuners received one day will be fixed and shipped out the next. Cost is only \$8.50 and \$15 for UV combinations. That includes **ALL** parts and labor, and a 6-month guarantee against defective workmanship and parts failure due to normal usage. Replacements available at low cost on tuners beyond practical repair.

Tarzian-made tuners are identified by this stamping. When inquiring about service on other tuners, always give tube complement . . . shaft length . . . filament . . . voltage . . . series or shunt heater . . . IF frequency . . . chassis identification. All tuners repaired on approved, open accounts. Check with your local distributor for Sarkes Tarzian replacement tuners, replacement parts, or repair service.



**ONLY \$8.50 INCLUDING ALL PARTS and LABOR**  
**24-HOUR SERVICE**  
**6-MONTH WARRANTY**  
Tuners Repaired on Approved, Open Accounts

SERVICE MANAGER • TUNER DIVISION • DEPT. 2  
**SARKES TARZIAN INC**  
east hillside drive • bloomington, indiana  
edison 2-7251  
MANUFACTURERS OF TUNERS . . . SEMICONDUCTORS . . . AIR TRIMMERS . . . FM RADIOS . . . AM-FM RADIOS . . . AUDIO TAPE . . . BROADCAST EQUIPMENT and SHISH-KABOB GRILLES

For more data, circle 8-66-1 on coupon, p. 45

## 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 8-66-2 on coupon, p. 45

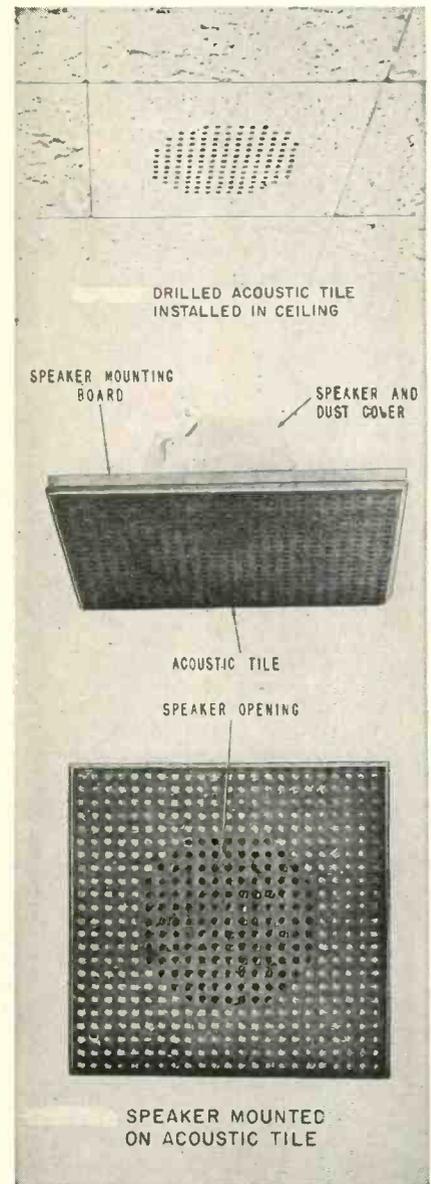
## Background Music Systems

(Continued from page 41)

duit is generally not required except in special cases or when local electric codes specify. Wire size for connecting the speaker loads to the amplifier must be selected to provide a power transfer of not less than 90%. Hence, line power loss should not exceed 10%.

Number 18 AWG twisted pair or larger, depending upon run lengths, is generally adequate. Insulation is usually plastic, sometimes with an additional nylon covering. Conductors may be stranded or solid—although solid conductor wire needs more handling-care to prevent

Fig. 5—Speaker mounted on board and acoustic tile is set into ceiling.



breakage. One conductor should be coded to facilitate proper speaker phasing throughout the system. All connections and splices should be soldered for lasting trouble-free service.

An amplifier's location should also be considered. It may be placed at a central point to provide short speaker runs which cost less to install, and power losses are maintained at a minimum.

Although a majority of installations may be centralized, there are situations which prohibit this method. For example, when large amounts of power must be transmitted over relatively long distances—between widely spaced buildings, or between widely scattered departments within a large building.

This problem is best handled by establishing a central program source and by using a 600 ohm distribution line. Amplification is then provided to bring the program material to a level suitable for feeding over the transmission line. Power required is usually only a few milliwatts and can be transmitted over great distances without serious loss in frequency. The line is then run to the location to be served. These lines may be privately installed, or leased from the local telephone company—when long dis-

tances are involved. Amplifiers are then installed in the various areas to be served and are controlled from those points.

Finally, physical location for all equipment, whether centralized or decentralized, must be chosen to provide adequate ventilation and accessibility for service.

In all extensive sound installations there will be special situations or conditions that must be considered on an individual basis. One of these is volume controls for adjusting individual speaker levels, or the level of a group of speakers. These controls should always be "L" or "T" type constant impedance pads.

Variable ambient noises in some factory areas, caused by machines being turned on or off at certain times, raises another problem. Speaker output level can be automatically adjusted by using a relay actuated by the power switch on the machine. Relay contacts remove or connect a fixed loss pad or volume control from the speaker line serving the machine area.

In addition to its background music function, a properly installed system can be used for paging, transmission of time signals at the beginning or end of working hours, and rest periods; besides providing a means for addressing or instructing personnel of an entire plant. •

### G-E TUBES

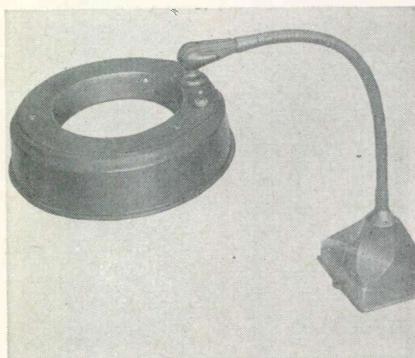
Type 6JC8, new miniature VHF triode-pentode, for use as a combined oscillator and mixer in TV front ends, contains a sharp-cutoff pentode and a medium-mu triode in a single envelope. The pentode section of the tube is designed to operate at maximum plate voltage and maximum screen supply voltage of 275v; maximum plate dissipation of 2.3 watts; maximum screen dissipation of 0.45 watts. In the triode section, maximum plate voltage is 275; maximum plate dissipation, 1.7 watts. It uses a T-6½ envelope, has a nine-pin, small button E9-1 base. Maximum seated height is slightly less than 2". Can be installed in any position. \$2.90. Receiving Tube Dept., General Electric Co., Owensboro, Ky.

For more data, circle 8-67-2 on coupon, p. 45

### Acme LAMPS

Announced is the Magniflex "Junior," an economy size of the original Magniflex. Reported to have all the features, usability and quality of the larger model at lower purchase cost.

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## TV Tuner Defects

(Continued from page 47)

After a careful visual inspection inside the tuner for charred, discolored or smoking resistors, tubes should be removed. Tube socket test adapters should be inserted in each tuner socket, and the tubes reinserted in these. Voltage measurements can now be made easily at each significant socket point of the r-f and oscillator-converter tubes.

If a voltage at any point fails to correspond closely with manufacturers specifications, a resistance measurement at this point will generally isolate the trouble to a faulty resistor or capacitor. Of course, a no-voltage reading at a significant voltage point would indicate an open resistor.

Both voltage and resistance measurements should be made carefully—with the set's antenna disconnected. Under these conditions (See Fig. 1), no voltage would appear at pin 7 of the 6BQ7A r-f amplifier, for example. If a voltage

does appear at this point, the fault would probably be outside the tuner—in the age source voltage divider network or associated circuitry.

In addition to tuner failures caused by faulty tubes, resistances and capacitors, many mechanical faults also develop. These include corroded strip contacts, weak spring contacts, and corroded wafer and spring contacts. Perhaps the tuner requires dismantling, cleaning, adjusting, and lubricating. These jobs are not difficult and can be done satisfactorily by every technician. Most repairs are frequently easier than replacing a multi-wire power transformer, for example.

### Mechanical Repairs

Mechanical faults in various turret type tuners are generally typically characteristic. These include worn and corroded contacts, corroded and de-tensioned spring contacts. A damaged or lost oscillator slug may require the slug or oscillator strip to be replaced occasionally.

If necessary, drums can be easily taken out of these tuners by removing two shaft retaining springs, and maneuvering the drum out carefully—making certain not to damage the fine tuning rotor plate.

When required, the drum's strip contacts should be cleaned. A good combination de-oxidizing contact cleaner-lubricant should be applied to the contacts with a stiff bristle brush. After waiting a few minutes for the cleaner to act, contacts should be polished and buffed with a soft cloth. A thin film of this cleaner is then applied to the contacts from a clean cloth.

The stationary spring contacts should be cleaned and lubricated in the same manner and then re-tensioned slightly if necessary. Same with the ground contact spring. A small amount of petrolatum (Vaseline) should be applied to the detent or around the detent-spring roller's perimeter. Tuners generally require this "going over" once a year. Cleaner-lubricants are applied to wafer type tuners with a stiff brush or sprayed on the contacts.

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Most of the individual parts for turret type tuners are available from the manufacturer and can be easily replaced if badly worn or a part becomes broken.

Some modern turret type tuners have two channel discs. A turret disc may become loose occasionally and slip on the shaft. Of course, not being synchronized, no stations come in on the TV. Although this may look like a case for tuner replacement, the repair can be made in a reasonable length of time with little difficulty.

The turrets and shaft assembly are first taken from the tuner housing by removing two retainer springs. Place the assembly against the top edge of a vice, with the metal sleeve of the loose turret against a flat surface of the vice. Score the sleeve in its center portion with the edge of a file. Hold the turret firmly to prevent it from rotating. Now center punch in this notch with a small sharp pointed punch by tapping lightly with a small hammer. This operation is preparatory to drilling a hole simultaneously through the turret sleeve and shaft. The assembly can be held firmly in the vice while drilling if too much tension is not applied.

Before starting to drill, synchronize the two turrets by turning the loose one to the proper position on the shaft. Be careful in this entire operation. Do not break the shaft, damage the parts mounted on the turret, or let the turret slip on the shaft while the hole is being drilled.

After the hole is drilled, a snug fitting metal or nylon pin or cotter pin is placed through the hole. The turret can never slip again. A very small drill should be used, approximately #50 or even smaller.

### Replacing Components

Some modern printed-circuit type turret tuners are not as mechanically and physically rugged as original conventional types. Hence, care should be exercised when making repairs or replacing parts.

For example, when replacing push-in disc type ceramic and feed-thru capacitors, a low wattage iron and low melting point solder should be employed.

Push-in disc capacitors are best removed and replaced with a split-

tip iron—which allows heat to be applied to both capacitor contacts simultaneously. When removing, these capacitors are lifted from the circuit at the instant the solder melts. This prevents damage to printed circuitry. Replacement is made in the same manner—removing the iron immediately after the solder flows. This prevents damage to the capacitor or to the printed wiring. Regular disc ceramic capacitors are replaced as shown in Fig. 2.

Component lead lengths and lead dress in all type tuners are extremely critical. Position of components is likewise critical. All new parts replaced should be positioned precisely in the same spot occupied by the old part. Leads should be of similar length, and direction of the lead should be the same.

All replacement components must have the same physical size as the original, with similar electrical characteristics. Otherwise, some difficult problems may arise.

Feed-thru capacitors are generally used at tuners' *agc* and *B+* inputs. Special care should be used in replacing these. Before attempting to remove a feed-thru capacitor, its terminal tips should be clipped off with diagonal cutters. This prevents shortening connecting leads.

Heat the metal mount at the side of the capacitor and when the solder melts, lift the defective capacitor out of the mounting hole.

Before the new capacitor is installed, draw the heated soldering iron over the mounting hole, covering the hole with a thin film of solder.

Now place the iron against the metal mount near the hole. When the solder film softens, slip the new capacitor through the hole. If additional solder is required, apply the iron to the metal near the capacitor and feed a small amount of solder at the hole's edge, and quickly remove the iron to prevent damage to the capacitor. Any original shielding found in a tuner should always be replaced. Grounds should always be soldered at the exact same place.

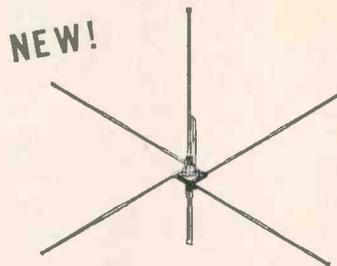
Knowledgeable technicians are making many profitable tuner repairs with little more difficulty than that encountered with other TV repairs. •

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## New Books

**ALTERNATING CURRENT ELECTRICITY.** By Alexander Efron. Published by John F. Rider Publisher, Inc. 96 pages, soft cover. \$2.25.

This latest addition to the publisher's Basic Science Series provides complete coverage of a-c concepts in a thoroughly understandable manner. A-c measuring instruments, polyphase circuits and a-c transformer principles, problems and solutions are fully explored. The last two chapters cover a-c motors and a-c rectifiers. An appendix describes the theory and practical use of the J-operator and its application to the solution of phase angle problems. Drawings and photographs are used to simplify explanations. The contents of this book can aid the technician or electronic student to easily unravel some of the more difficult problems encountered in alternating current applications.

**ELIMINATING MAN-MADE INTERFERENCE.** By Jack Darr. Published by Howard W. Sams & Co., Inc. 160 pages, soft cover. \$2.95.

This book outlines many types of radio interference, origins, and how to reduce or eliminate it. Interference to auto, aircraft, and marine radio; TV and two-way radio systems, is treated in separate chapters. Common interference types generally encountered, instruments necessary for locating the source, and equipment modifications necessary for eliminating or minimizing the interference are described. Text material is augmented with schematics, drawings, and photographs. Also included is a chapter relating case histories. This book should provide the technician with additional information regarding interference problems.

**BASIC TRANSISTORS.** By A. Shure. Published by John F. Rider Publisher, Inc. 146 pages, soft cover \$3.95, hard cover \$5.50.

Employing the now familiar "pictured-text" method, this book explains all about transistors in a manner anyone can understand. Basic transistor circuits are explained and their action completely described and analyzed. NPN and PNP types are covered. Transistors in single and multistage amplifier applications, methods of coupling, and special transistor circuits, such as control switching, are fully covered. Power transistor circuits, transistor oscillators, and tetraode transistors are also discussed. Questions and problems appear at the end of each chapter. The book can be recommended to any technician interested in fully understanding transistor characteristics, operation, and circuit configurations.

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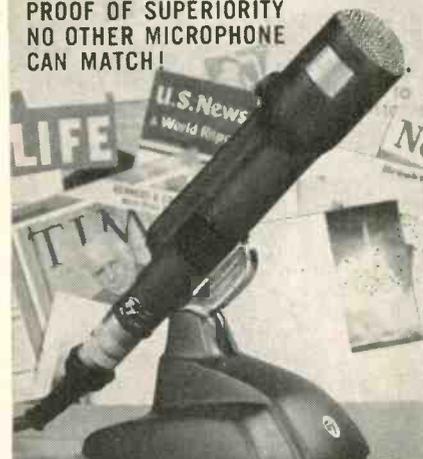
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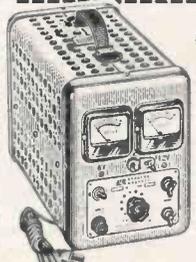
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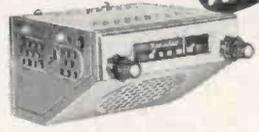
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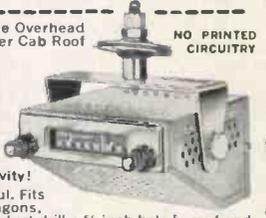
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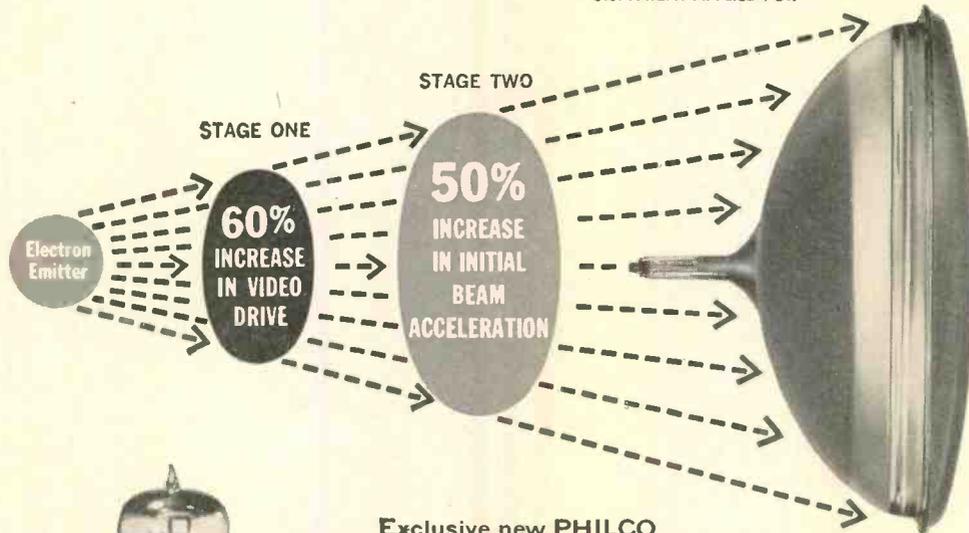
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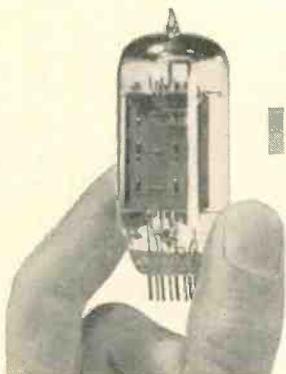
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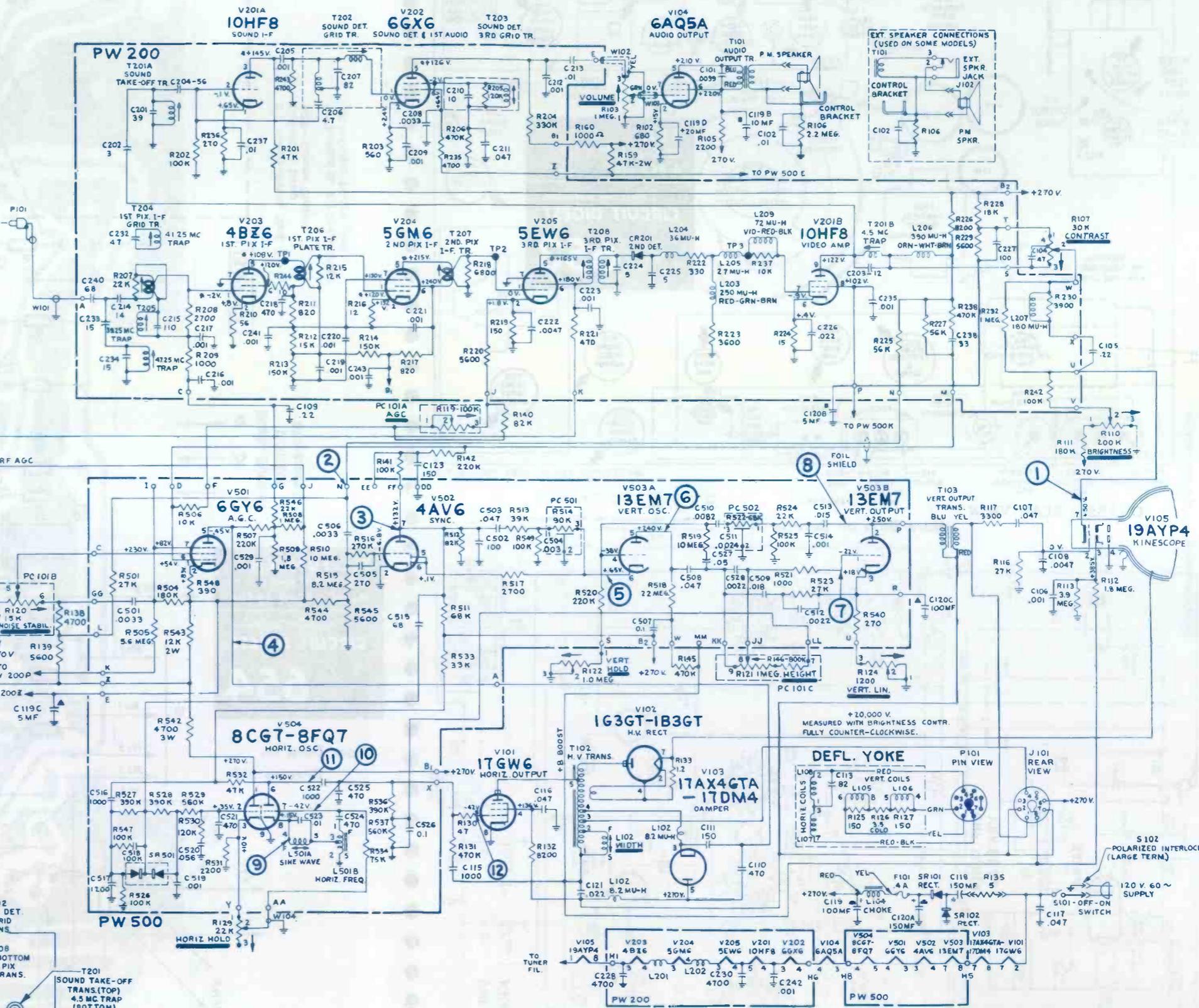
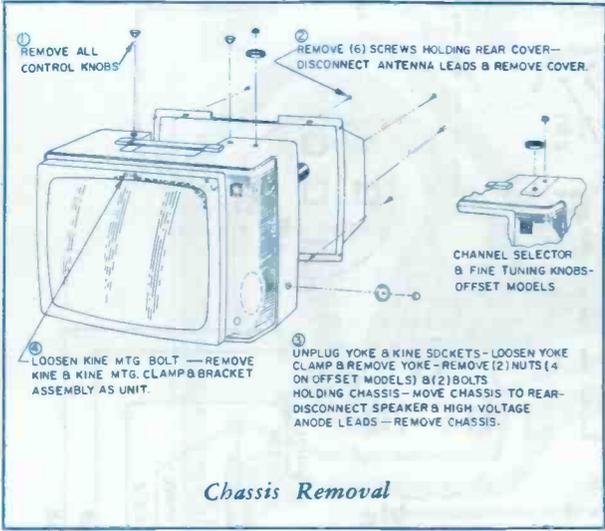
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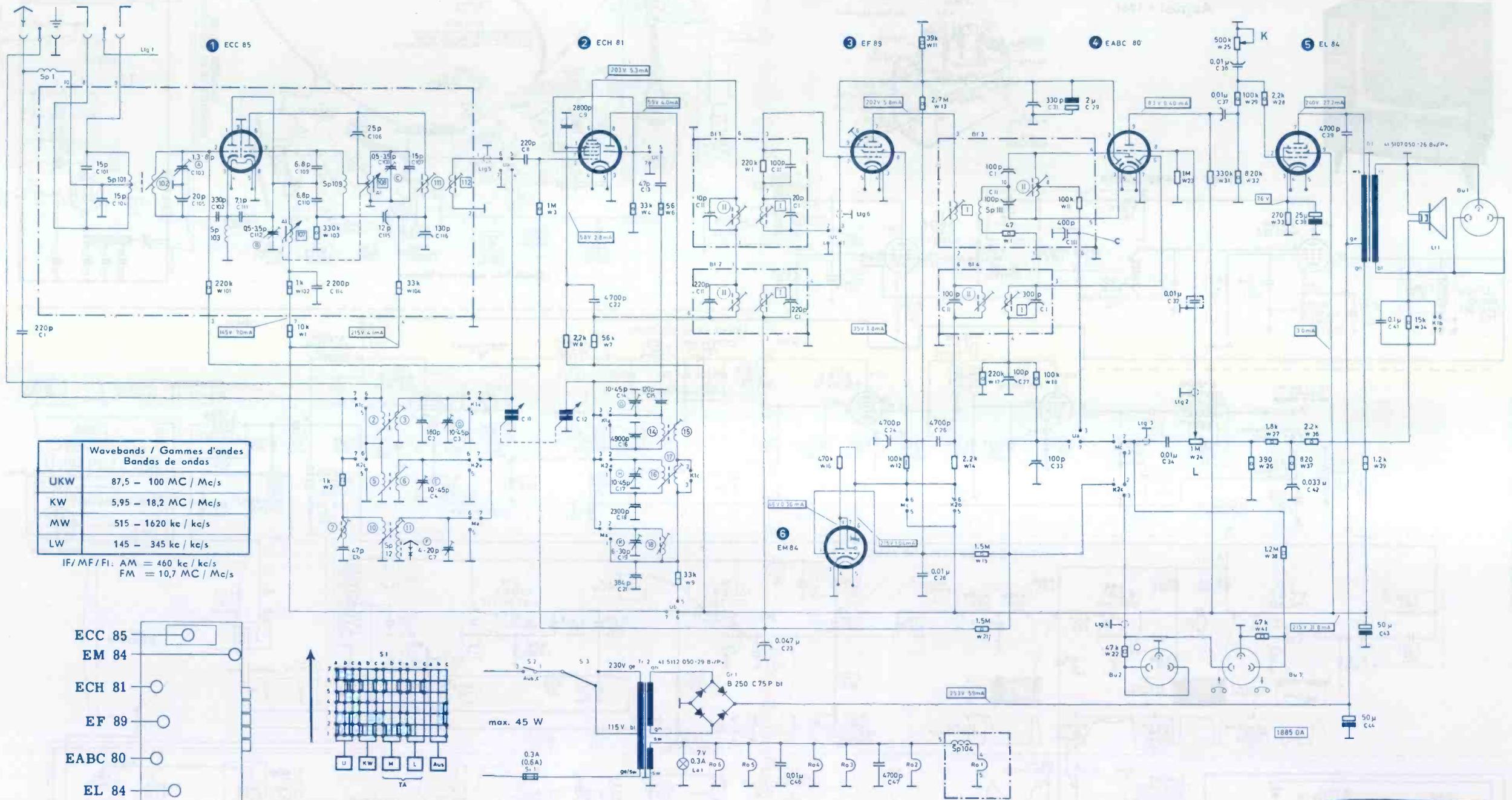






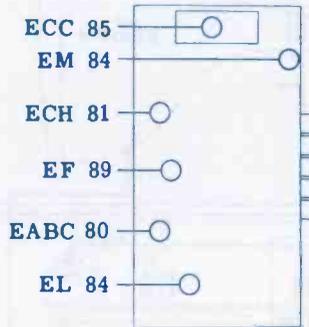


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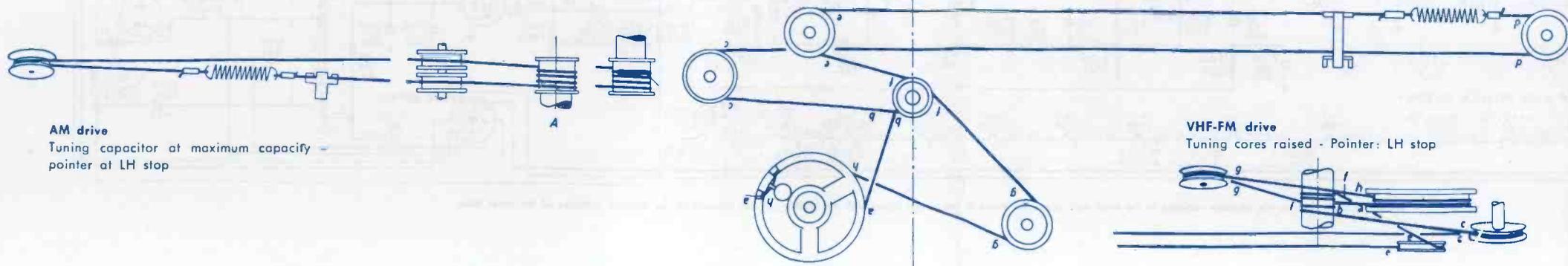


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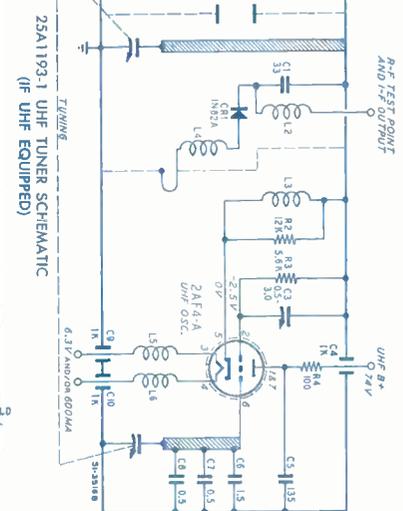
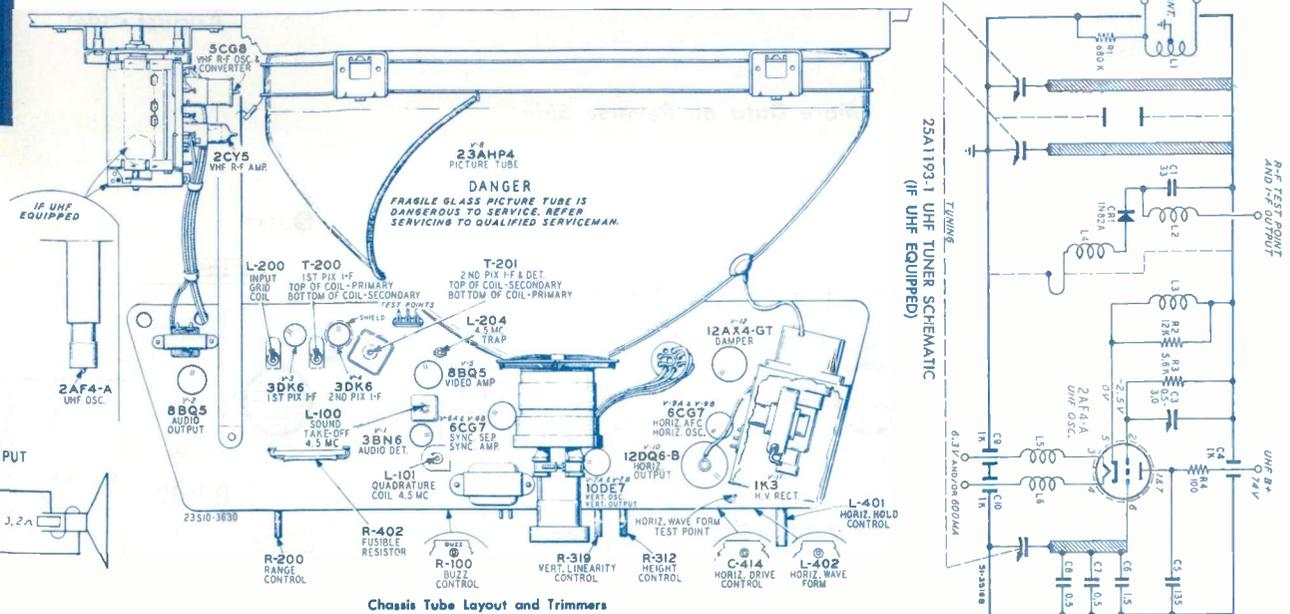
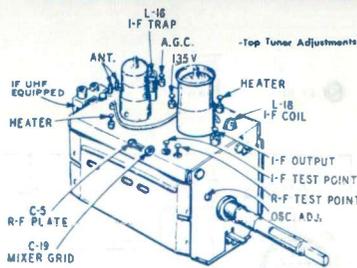
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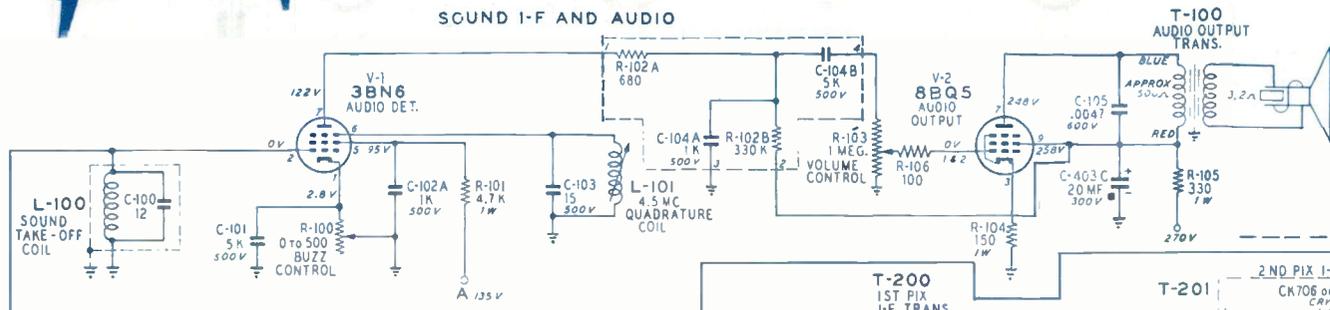
Pushbutton bank is shown in neutral position. On pressing one of the waveband buttons, the contact strip moves in the direction shown by the arrow.



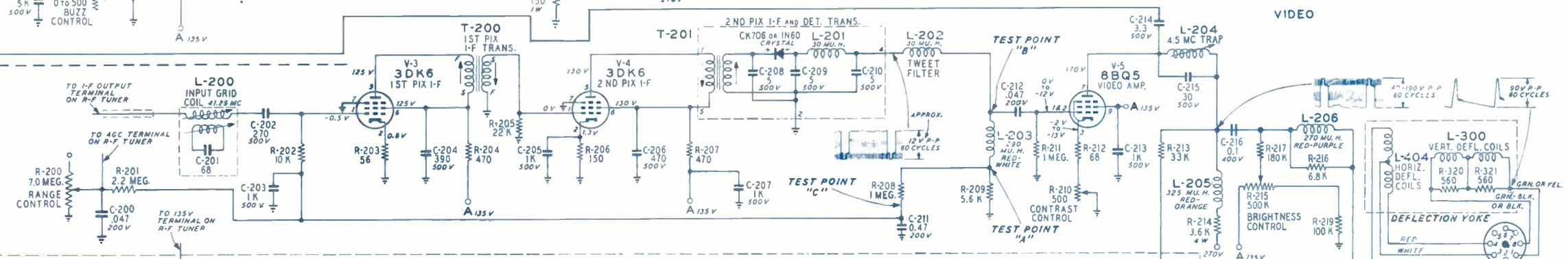
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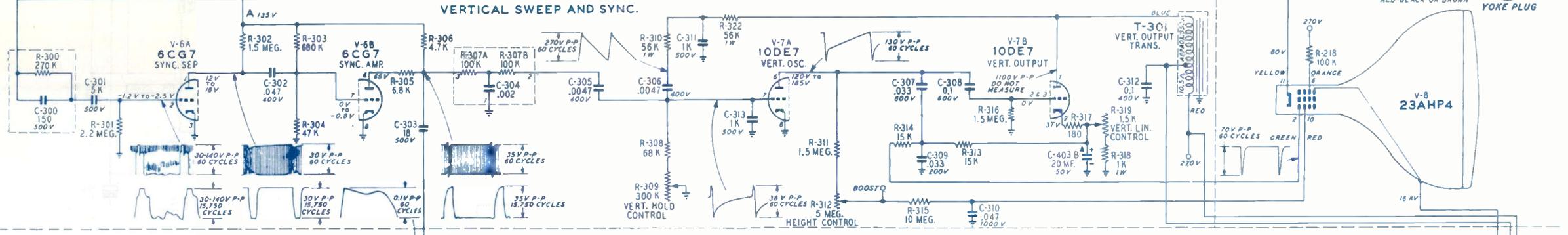
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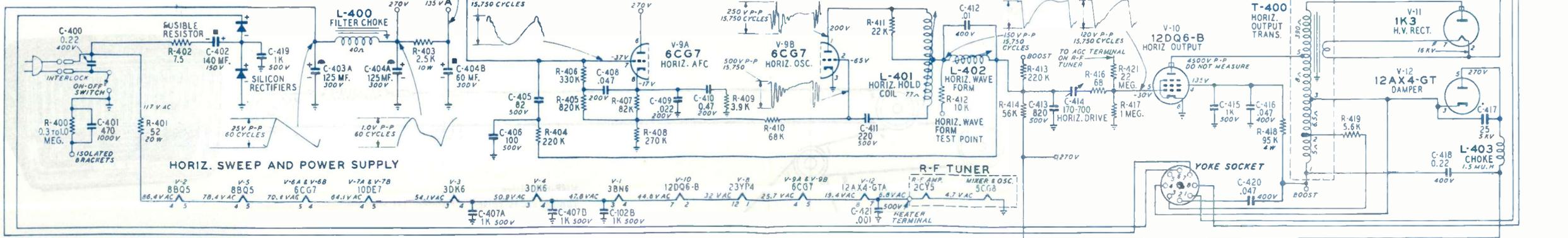
#### VIDEO



#### VERTICAL SWEEP AND SYNC.

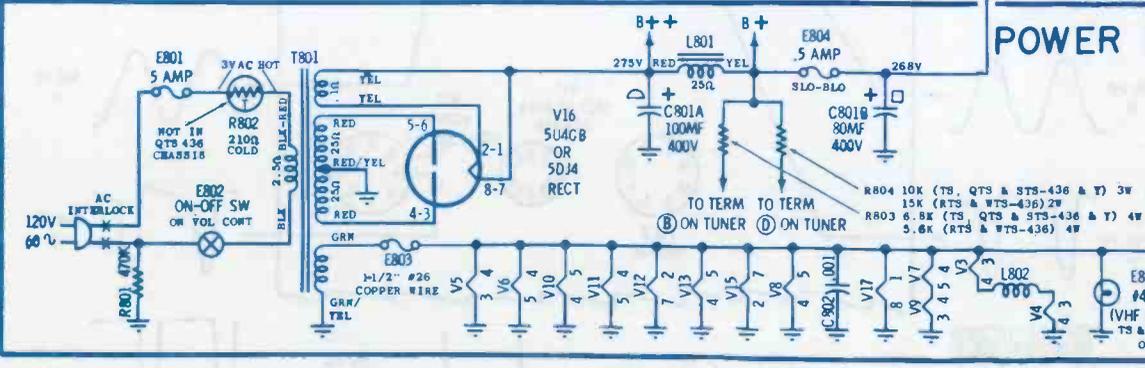
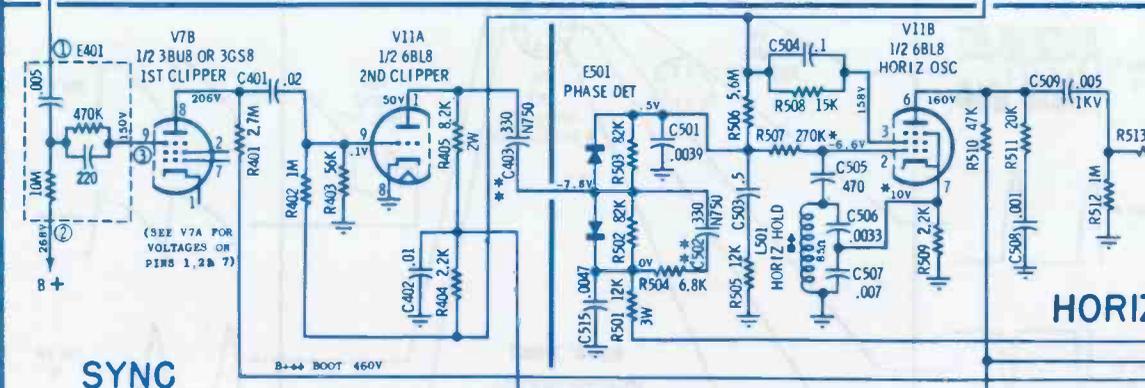
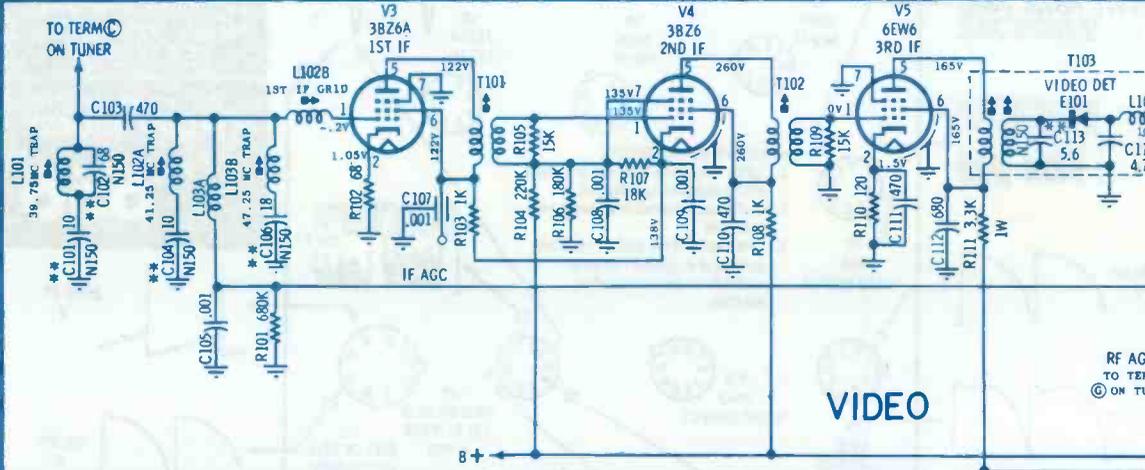
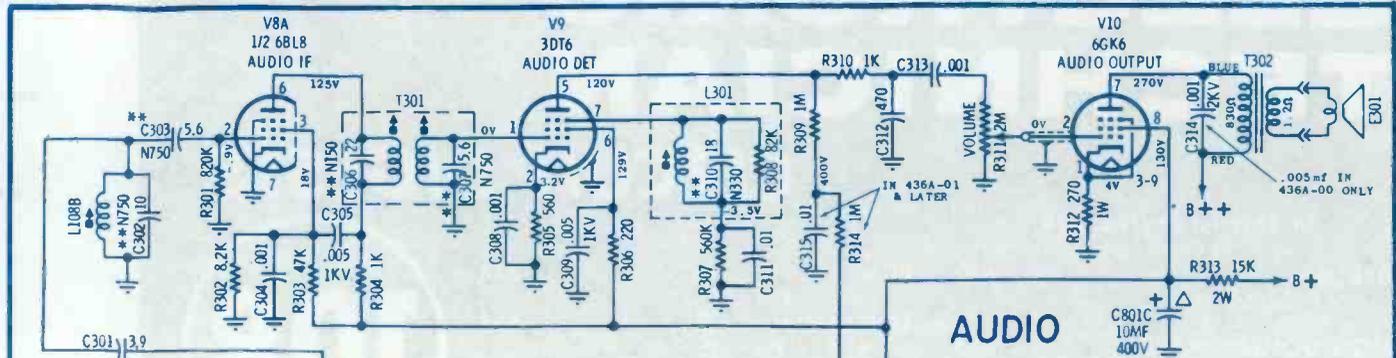
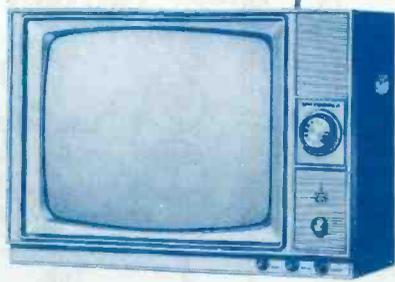
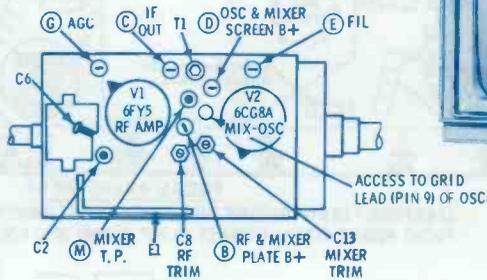
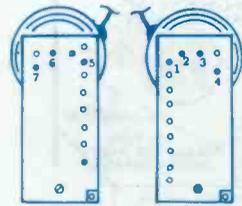


#### HORIZ. SWEEP AND POWER SUPPLY



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

More Data on Reverse Side





# 1401\* exact replacement electrolytics

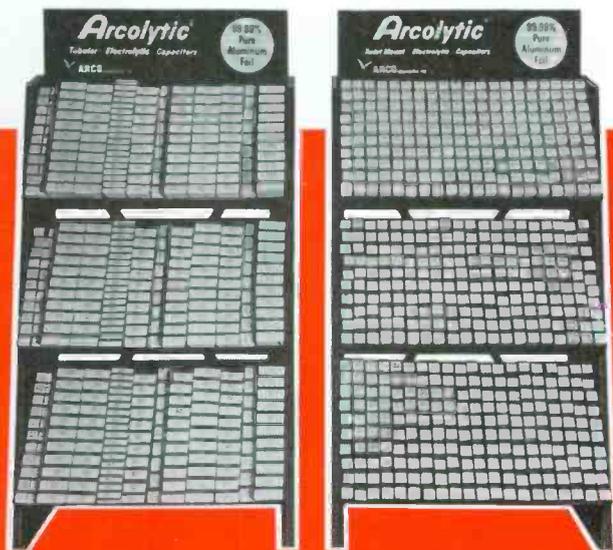


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## HOW SILVERAMA BECOMES "SILVER"

### High-Vacuum Aluminizing Assures Sharpest TV Picture Possible

Here RCA Silverama picture tubes become "silver" at the aluminizing station on our Marion, Indiana, production line. In a burst of light, aluminum is vaporized in a high vacuum and is deposited over the entire inner surface of the tube. Then the operator, with an RCA-designed electronic gauge, checks to be sure the aluminum film is of proper thickness. If it is not, the tube is rejected.

Such extra care in manufacture is an important reason why the Silverama you install today is free from "picture-spoiling" dark centers caused by an excess of aluminum deposited on the tube face. This extra care is the reason, too, why Silverama delivers

the brightest, sharpest picture your customers' sets can produce. Obviously, Silverama picture tube service is the surest way toward satisfied customers, repeat business, favorable word-of-mouth advertising for you—plus freedom from call backs and costly in-warranty failures.

Equally important is the fact that RCA is a picture tube manufacturer. This means that your customers can take advantage of the latest innovations in picture tube design and manufacture when they buy RCA Silverama. It is made with a precision electron gun, the finest parts and materials, plus a reused envelope.



Final checkout before shipment. Here Silverama tubes receive final focus check before being shipped to customers.



Packing for final shipment. Before it can go into this box, RCA has made certain this Silverama is the best picture tube modern science and technology can produce.

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



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