

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

**TV SWEEP  
ANALYZERS**

PRODUCT

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PRICE

**7 Makes  
Examined**

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BOX 42  
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T111-61N A3 9W2301

60¢

April • 1961

# SYLVANIA 6SN7GTB

with 3-point plate support  
"builds up" your  
**PROFIT PICTURE**



Sylvania extras mean built-in stability, higher performance and extra-long life — profit-protection for you!

Take, for instance, the new structure that supports each plate at three points to substantially reduce microphonics. Or consider how the triode sections are obliquely mounted to reduce catastrophic failure of both sections due to physical shock. Too, Sylvania 6SN7GTB's are built with specially treated micas to reduce interelement leakage; extra-clean welds to cut down on the possibilities of internal shorts.

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# SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS** 



# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

World's Largest Electronic Trade Circulation

April, 1961

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**FRONT COVER** TV sweep sections are tricky circuits to repair. Technicians can minimize service difficulties in these receiver circuits, however, by using sweep circuit analyzer instruments. Such test instruments can detect a single shorted turn of a flyback transformer or deflection yoke, and some have vertical and horizontal signal injection provisions to permit dynamic troubleshooting. For an exclusive study of seven "analyzers" by ET's editorial staff, see article starting on page 32.



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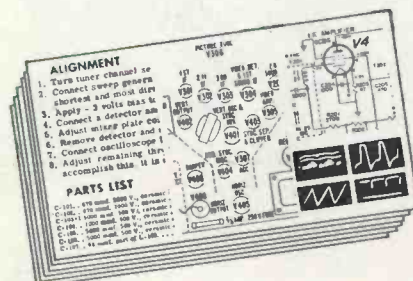
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# PHILCO

## Mother's Day

Choose from these most-wanted gifts for every girl on your list!

# FREE OFFERS

with your purchases of Philco receiving tubes

**FREE**  
with your purchase of  
**50 PHILCO**  
receiving tubes



Famous **WHITMAN'S** gift-wrapped, 2-pound **SAMPLER** Finest candy assortment

Famous Whitman's Sampler includes rich chocolate covered nuts, Jordan almonds, liquid fruits and cream center chocolates, mints, nougats, caramels, and moulded pieces. A perfect Mother's Day gift!

AD #3841

**EXTRA!  
EXTRA!**

For the man who wants the most!

**A GIANT 4 POUND  
WHITMAN'S SAMPLER**

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# 50 PHILCO

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AD #3840



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receiving tubes

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# FREE OFFERS

with your purchases of Philco receiving tubes



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#### Adjustable Chaise Lounge

70" long x 25" wide—5" solid wheels.

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Super-quality plus deluxe features! One year warranty on 3 H.P. 4-Cycle Briggs and Stratton Engine. Lifetime guarantee on steel housing!

- Safe-T-Wind starter
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- Staggered Wheel Design
- Adjustable Cutting Heights

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 VALUE

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**FREE** with purchase of 150 PHILCO receiving tubes

AD #3850



#### Family Size Picnic Basket

\$9.95  
 RETAIL  
 VALUE

#### FITTED TO SERVE SIX

- 26 piece ensemble—6 cups, 6 plates, 6 forks, 6 spoons, removable tray
- All in maple-tone basket with hinged cover. Lined interior.

**FREE** with purchase of 100 PHILCO receiving tubes

AD #3844



AD #3843

#### 3-Tier Suburban Pool

- Strongest inflatable pool
- A full 66" x 10"
- Decorative design
- Large "sit-on" sides

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### Accumulate your purchases!

You can add orders together for any item. May 31 is final date for starting an "accumulating" order.

## SEE YOUR PHILCO DISTRIBUTOR



# UNIVERSITY IS CHOSEN AGAIN FOR PRESIDENTIAL INAUGURATION

## Editor's Memo



Most people don't really know how to read. Oh, of course, they can read in a slow word-by-word fashion. But this is much more time consuming than it need be. Frequently educated-to-the-teeth college professors are among the slowest readers.

Here are some practical tips on reading quicker and getting more out of your reading, whether it be magazine, book or newspaper.

First, with periodicals, thumb through the entire issue quickly. Get a rough idea of what's inside, and make a mental note of those features in the table of contents that are of particular interest.

Then glance over the pages, paying attention to headlines, illustrations and captions to capture the essence of what each item covers.

Now that we have the "big picture," we're ready to read—and to learn to read more efficiently.

If/you/read/each/word/separately, /you're/wasting/time./

On the other hand,/if you read by phrases/your eyes are taking/a bigger bite/of the page./

Phrase reading takes practice, but it saves time by eliminating many small jerking eye movements. It also keeps your mind busy concentrating on the subject matter.

A related speed reading technique is space reading. Here you look at the space above the line of print, instead of at the print. This develops smooth eye movements when phrase reading.

Next we come to some tricks in column reading. The main thing to remember is that it's not always necessary to read every word. Maybe you do in one tricky paragraph of a complex technical analysis, but not usually.

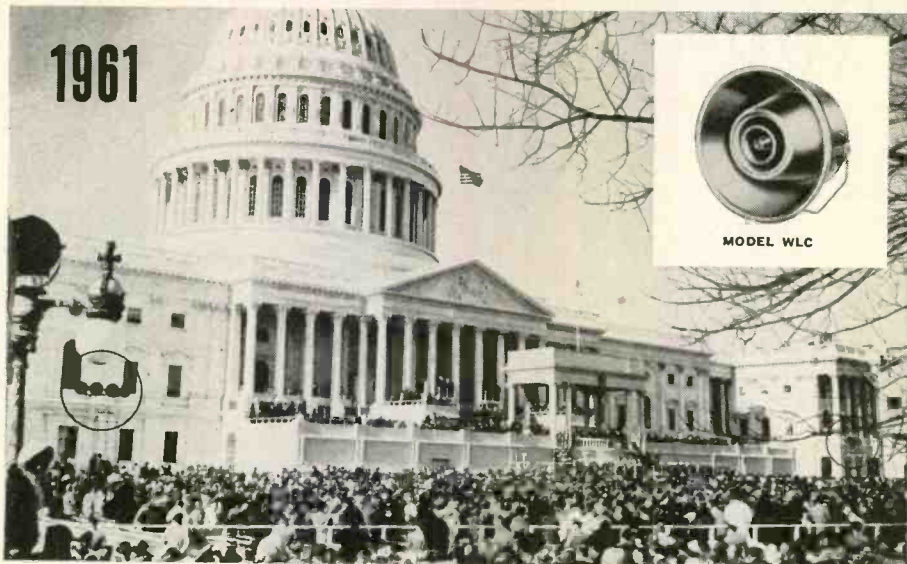
First thing is to indent. That is, don't read from the first to last letter of the line. Try restricting your eye scan from the second to next-to-last word.

Another technique is to scan columns raster-style, skipping one or more lines between scans. Out of the side of your eyes, your peripheral vision will pickup key words. The extreme of this is reading vertically along an imaginary line down the center of the column.

It can be done. Practice and concentration are required. The reward is more knowledge through faster reading.

*Al Foman*

1961



Flanking the main platform where the ceremonies took place are two arrays of four University WLC's each, the finest outdoor high fidelity speakers made. The heavy snow that fell the day before the 1961 inauguration had no effect whatsoever on the performance of these speakers.

## OUTDOOR HIGH FIDELITY LOUDSPEAKERS REPEAT SOUND SUCCESS OF '57

Wherever highest quality reproduction of voice and music is essential — with wide-angle coverage at high output levels, full frequency response and complete protection against the weather — that's where you'll find University up front. Not only at Washington's Capitol Plaza, but at auditoriums, parade grounds, stadiums and concert halls throughout the world. For all University's weatherproof speakers are *genuine dual-range systems*, with separate bass and treble drivers — resulting in full-bodied lows, cleaner highs, greater efficiency, less distortion and superior acoustic projection.



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For every public address installation, University's complete line of drivers, trumpets, paging/talk-back and many special purpose speakers assures you of the exact speaker required to do the job as specified, at minimum cost and without waste. For complete information, write Desk Z-4, University Loudspeakers, Inc., 80 So. Kensico Avenue, White Plains, N. Y.



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

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

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

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

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

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

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\*T.M.

## with the Mallory '61 Program



### AND KEEP 'EM SOLD...

Attach this sticker inside each radio. It reminds customers that you've replaced with Mallory Mercury Batteries... and reminds them to come back to you.



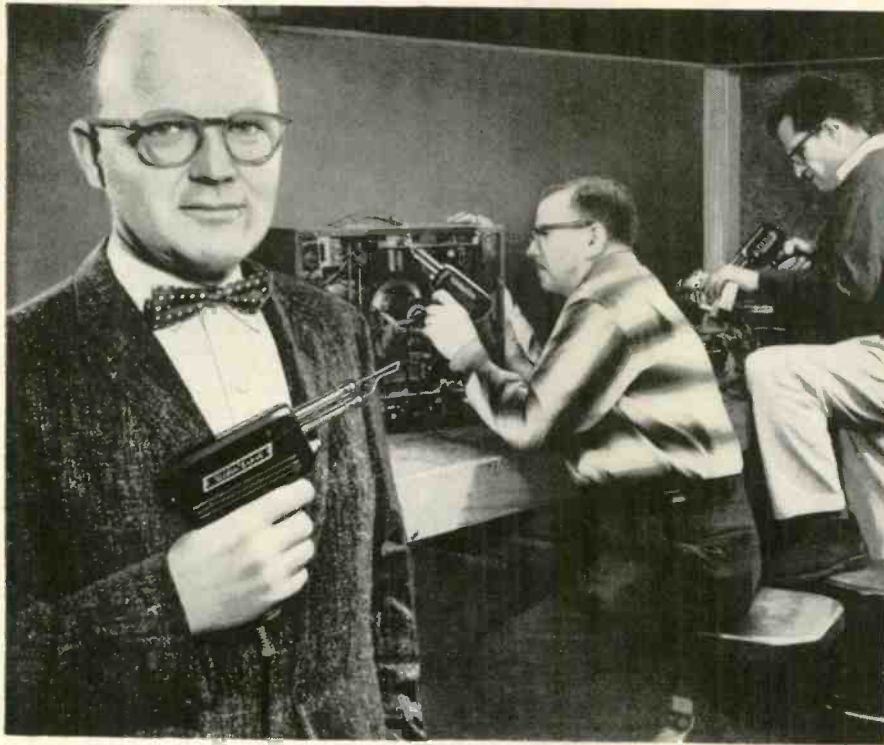
### NEW GUARANTEE AGAINST LEAKAGE...

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

Distributor Division  
Indianapolis 6, Indiana







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

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# Weller® DUAL HEAT SOLDERING GUNS”

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



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For more data, circle 4-8-1 on coupon, p. 50

## LETTERS To the Editor

### More On Licensing

Editor, *ELECTRONIC TECHNICIAN*:

I followed with interest the results of your Jan. vote poll concerning licensing. There are some observations which might be made from the figures given to date—if I may presume. The vote “against” as “for” was almost even. The matter on Association members “for” as non-members being “against” is interesting. It would appear to me that the organized groups could have made a very determined effort to get their members to register their vote for. Realizing that many unorganized men in the smaller communities would be disinterested, plain lazy, or uninformed, with no pressure exerted toward them to take an active part.

Also, many uninformed men know nothing about licensing, whether they are group members or not, and grasp at the licensing idea as the panacea of their ills. Many also have not even read a licensing law, although voting for it, again for the same reason, and do not realize what they can be letting themselves in for. Would you say that these are reasonable conclusions?

HOWARD WOLFSON, Editor  
*Common Sense*

*Assoc. Radio & TV Servicemen  
Chicago, Ill.*

... After reading the many letters and comments on licensing, I would like to state that I am completely against any state law which requires a part time or full time technician, craftsman, mechanic, or any other laboring man to purchase a license in order to earn a living. I am a part time electronic technician and no one has a right to say whether or not I should be allowed to continue my business, regardless of how many hours I work, or how much business I do, so long as I am honest with my customers. Most of the letters which I have read in your magazine indicate that the writers are full time technicians who are interested in getting rid of crooked servicemen and unreliable work. The only thing I can see in those comments are dollar signs.

I can't believe that a hard working, honest, and capable technician is in favor of licensing. Also, I can't believe that this type of person would have any trouble in doing a good business and having satisfied customers who would keep him in business. A full time technician who gyps his customers will soon be out of business, and so will a part timer.

CLETUS E. MARTIN

*Paducah, Ky.*

(Continued on page 10)





top  
team  
for TV



# **CHANNEL MASTER<sup>®</sup>**

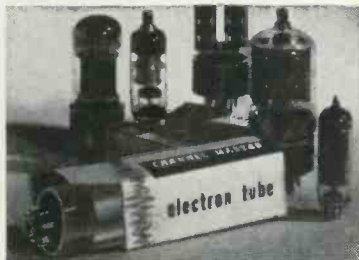
## **T-W ANTENNA and AUTOMATIC TENN-A-LINER**

You're looking at the most potent combination ever developed for getting crisp, clear TV reception in far-off fringe areas!

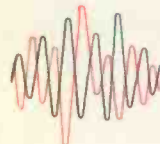
The Channel Master T-W is the most powerful broad-band antenna yet devised. It owes its superiority to a new and different approach in antenna technology... Channel Master's patented Traveling Wave principle.

And where a rotator is required, team the T-W with a Channel Master Automatic Tenn-A-Liner... the only rotator that aims the antenna within one degree of precise transmitter location. The ruggedness and dependability of the Automatic Tenn-A-Liner have been proved by hundreds of thousands of trouble-free installations.

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More Channel Master profit makers! America's fastest-growing tube line! Longer lasting, uniformly dependable, with minimum call-backs. No other tubes offer greater opportunity for profits than these fully proved performers.



**CHANNEL MASTER** works wonders in sight and sound  
ELLENVILLE, N. Y.

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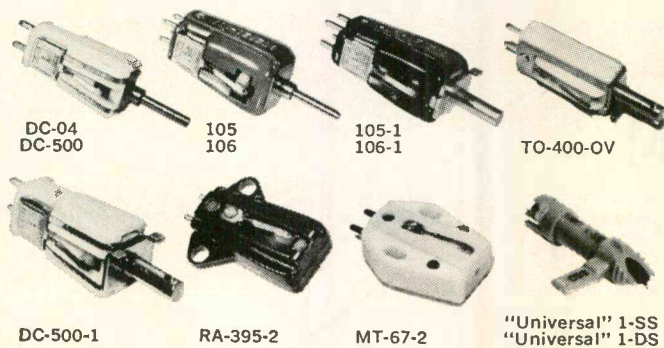
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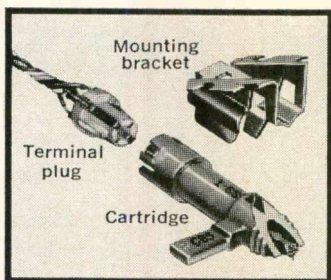
And only \$54.00\* buys the complete selection. You save yourself trips to your distributor, you build customer satisfaction, and you add extra profit potential to every service call. Get into the profitable cartridge business this easy, inexpensive way. Contact your CBS Electronics distributor now.

\*Suggested dealer net price



## NEW CBS "UNIVERSAL" STEREO FLIPUNDER CARTRIDGE

Fits millions of phonographs. Ideal for stereo replacements or conversions. Unitized cartridge installs easily with unique, pre-wired terminal plug and versatile mounting bracket. Choice of diamond/sapphire or sapphire/sapphire styli. You can use all of the flexible "package" or only the cartridge and parts you need. The CBS "Universal" and the famous CBS-Ronettes give you the complete 12-model replacement line.



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A Division of  
Columbia Broadcasting System, Inc.

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For more data, circle 4-10-1 on coupon, p. 50

(Continued from page 8)

### Noise Suppression Trouble

Editor, ELECTRONIC TECHNICIAN:

I have installed the noise suppression capacitors in my own car as suggested in your Circuit Digest 590, Oct. '60, for use with high frequency radio equipment. I have encountered regulator troubles since the installation. Please confirm that the schematic shown is correct as shown.

CHARLES D. HOOVER

Hoover Electronic Service  
Oberlin, Pa.

• The noise suppression schematic in Circuit Digests 590 is correct. Check that you are using high pass capacitors such as 0.1 feed through or coaxial type. Capacitors should be rated to take 20 amps and withstand 600 volts. These are not the regular 600 VDC tubulars. Also, be sure that the capacitor is not shorted out by failure to move the VR wire to the capacitor as shown.—Ed.

### BBB Wants Stereo Definition

Editor, ELECTRONIC TECHNICIAN:

We will be assisted by your informing us as to your understanding of the definition of the term "stereo."

ROBERT W. BEGHTOL, Manager  
Home Furnishings Dept.

Better Business Bureau  
New York, N.Y.

• It is our understanding that stereo, short for stereophonic sound, describes the system of sound reproduction which provides a depth effect for the listener. It requires the playback of such sound through two or more channels from recordings made by microphones separated spatially and electrically.—Ed.

### Memory Jogger

Editor, ELECTRONIC TECHNICIAN:

In my 32 years of active radio TV service activities, your magazine is probably the most diversified in the business. I find that I learn many things that would otherwise be lost to me or at best be time consuming locating the information. The best part of the magazine is the articles which jog my memory and cause me to re-learn forgotten basics. Keep up the good work.

THEODORE VITOLO

Central Radio Service  
Bay Shore, N.Y.

### Hearing Aids

Editor, ELECTRONIC TECHNICIAN:

The Feb. 1961 issue of ELECTRONIC TECHNICIAN carries a feature story titled "Servicing Transistorized Hearing Aids." While we appreciate your interest in this subject, we believe this story may create problems for some of our hearing aid users. Sonotone hearing aids are covered by a factory guarantee which is voided if the aids are serviced by anyone except Sonotone. Well-meaning, but uninformed, servicemen could solicit repair work from Sonotone users and cause the guarantees to be voided without realizing it. Also, practically all Sonotone hearing aids are covered by a replacement policy during the guarantee period. This eliminates all service problems as far as our users are concerned. Furthermore, this guarantee period can be extended, if the user wishes, beyond the original one year.

Because we have our own field organization, which sells only Sonotone products, we are fully capable of handling any service required for Sonotone hearing aids.

LEONARD KANE,  
Director of Advertising

Sonotone Corp.  
Elmsford, N.Y.

... I have been a subscriber to your magazine for many years, as I am in the electronic industry, and find it extremely beneficial. The prize of all prizes in your magazine was in the Feb. edition relating to servicing transistorized hearing aids. I have been for a long time consider-

(Continued on page 12)



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

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



**Standard 760 Series  
of CB Transceivers**  
from

Kit \$59.95 Wired \$89.95

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Test Equipment & Hi-Fi**



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



Stereo/Mono  
4-Track  
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NEW FM-AM Stereo Tuner ST96  
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For more data, circle 4-12-1 on coupon, p. 50

(Continued from page 10)

ing this field in conjunction to the present very successful business that I now have. The article your magazine published convinced me now is the time to make this move. I have already corresponded to all the parts and accessories suppliers, and most of the manufacturers for a possible dealer franchise for the selling of new hearing aids, which I know entails much more than servicing, to the customer.

L. F. DRILLIEK

American Radio & TV, Inc.  
Miami Beach, Fla.

... The article on servicing transistorized hearing aids was very good and up to date, but I think you overlook the fact that there are quite a few vacuum-tube hearing aids still around too. Anyway, there is a wonderful little booklet put out by the U.S. Dept. of Commerce, National Bureau of Standards, called "Hearing Aids." The number of it is NBS Circular 534, and can be bought from the Government Printing Office for 15¢.

WILLIAM H. ANTHONY

Black-Top Electronics  
Washington, D.C.

... Was quite interested in your article about transistor hearing aids on page 30 of your Feb. '61 issue, but you threw me when I reached the part on page 31 where it said, "The signal voltage developed across R5 is applied to the base of Q3 through C4 and is developed across R7." To put me straight, wouldn't C3 be a better condenser to feed the base of Q3 in the illustration?

I enjoy your articles a lot and please put me on the list of those who would love to be the "Old Pro" in 20 years that Mr. R. M. Thorson says he is in 10 years. It reminds me of a little kid who thinks he knows everything when he is 18 years old and then when he gets to be 50, reflects on just how little he really knew. Please keep up the good works for the poor servicemen who really need your helpful articles.

JOSEPH G. DORNIER

Dornier Radio & TV Service  
Baton Rouge, La.

• Our typographical error. Reader Dornier is right. Q3 base is fed through C3.—Ed.

**Multiplex Info At Right Time**

Editor, ELECTRONIC TECHNICIAN:

The Feb. '61 edition reached me today. I was sure pleased to read it. The article on multiplex by Alan Andrews was most enlightening and appreciated. The principle and conversion of present day non-multiplexed tuners was especially what I needed to answer a recent query and job presented to the shop. The radio station is soon going into multiplex transmission. Mr. Andrews' article gave me an insight much needed at this time.

NORMAN GIGNAC

'Lectric-Onics Workshop  
Brunswick, Me.

**Phone Numbers**

Editor, ELECTRONIC TECHNICIAN:

We agree that the telephone company is running out of letter combinations for designation of exchanges (Sept. "Tuning In"). But we who are about to have our entire area changed over to their new "2-5" system wonder about the imminence of "all number calling" which you mentioned. Buffalo and most of Western New York will, for some years, still have exchanges designated by letters, but they will range from TA to TX (plus a numeral) without any other meaning. My office, for example, has been in the MOhawk exchange. Next week it will be TL-6 plus the same 4 digit numbers I've had previously. If the nationally proposed program of AT&T calls for 7-digit numbers, someone had better tell New York Tel about it soon!

RICHARD S. LEVY

Buffalo, N. Y.

• All number calling is slated for the 1970's.—Ed.

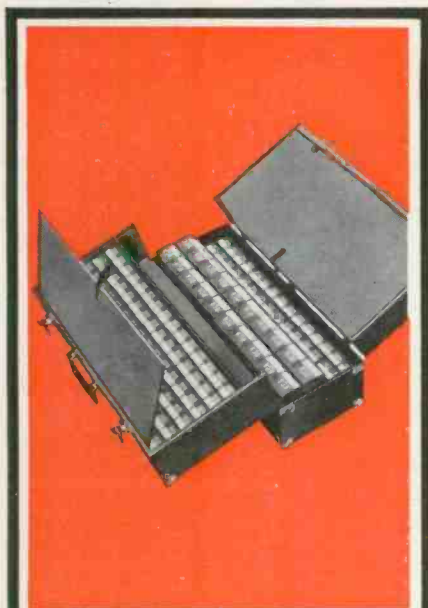




# ENTER ☆☆☆☆☆☆☆☆ THE WIZARD

-Symbol of RCA's Continuing Program to Make Your Work Faster and Easier.

The Wizard brings with him four of the most popular service aids ever offered by RCA. You keep asking for them, so here they are...



**RCA "TREASURE CHEST" TUBE CADDY**  
"Presto! And now you see the ever-popular RCA 'Treasure Chest' Tube Caddy. It's exceptionally strong yet lightweight, and holds over 260 tubes."



**RCA "QUICK CALL" TUBE CADDY**  
"And now, the younger brother of the 'Treasure Chest': the handy RCA 'Quick-Call' Tube Caddy! It's attractive, rugged, compact, and holds 162 tubes—just right for quick service jobs."



**RCA TV-TOTER TABLE**  
"Behold the RCA TV-Toter Table—that enables you to roll a chassis from place to place. Gives you more work and storage space in the shop."



**RCA TV-TOTER HANDTRUCK**  
"And finally, the RCA TV-Toter Handtruck, for safe handling of chassis or sets in shop or home. It's light and rugged... a real time and back-saver!"

Remember, these valuable RCA Service aids are designed to make your work faster and easier—and you know that fast service means satisfied customers. To find out how you can get these helpful items, check with your Authorized RCA Electron Tube Distributor. And tell him the Wizard sent you!"



RCA Electron Tube Division, Harrison, New Jersey



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA

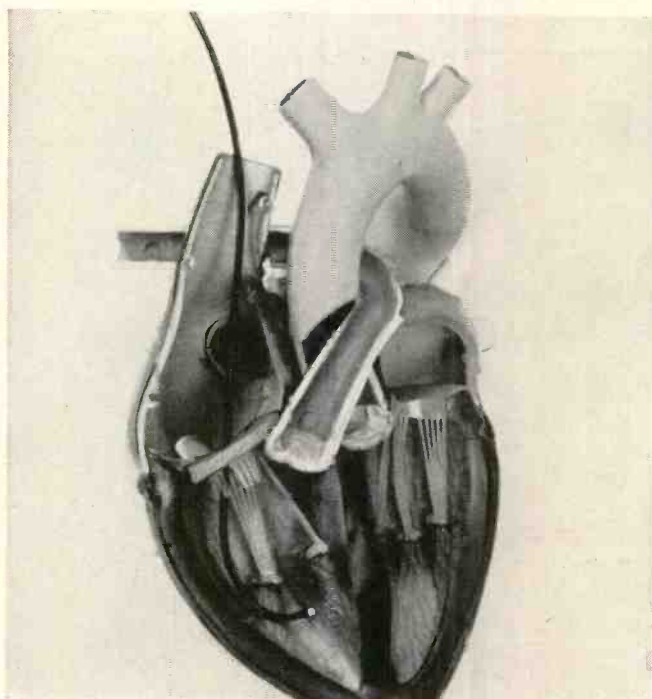
# Tuning In the

The electronics technician as seen by:

Sinclair



## ELECTRONICS STARTS STOPPED HEARTS



Radio-opaque coated stainless steel braid developed by National-Standard feeds 60 to 180 electrical impulses per minute to keep heart beating. Transistorized generator, the Pacemaker, made by Medtronic, Inc., of Minneapolis, operates 40 days on mercury cell batteries. Unit, the size of a cigarette pack, is worn around patient's neck.

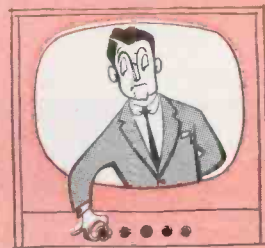
"ELECTRALERT" radio facilities designed for alerting firemen, emergency squads and off-duty personnel at military bases by receivers placed in the home, was announced by Nuclear Electronics. The receivers, normally quiet because of built-in squelch, are triggered by a tone signal from an encoder at the base station of a mobile radio system, and carry a 15-second alarm. Voice instructions can also be received. The receiver can be powered by car battery with use of an accessory car converter. A battery operated, transistorized encoder is to be made available for use with mobile radio transmitters. The firm, located at 2925 N. Broad St., Philadelphia 32, noted that "Standard low-band receivers are priced at \$131; high band units at \$140, and encoders as low as \$159.50

PENNSYLVANIA House of Representatives passed and sent to the Senate Bill 208 regulating sales of rebuilt radio and TV tubes. The vote was 194-0. The proposed regulations chiefly cover labeling and advertising of rebuilt tubes, requiring them to be plainly marked as rebuilt or reactivated. Businesses would also be prohibited from advertising tubes at a reduced rate when the reduction is from a fictitious price. (See Electronic Technician, January 1960, "New York Bill Regulates Tube Sales.")

SQUEAKING RABBIT belonging to eight-months-old Andrea Whalen of Watertown, Mass. causes her family's TV set to change channels when bunny is pressed. Set's remote control device evidently is activated by the toy's squeak.



# Picture .....



**JAPANESE EXPORT** of electronic products to the U.S. during the first nine months of 1960 totaled \$63,052,000, an increase over the \$46,166,000 in the same 1959 period, Electronics Div., Business and Defense Service Administration, reported. Sound recorders and reproducers reached \$1,882,000, a five-fold increase; receiving tubes, \$1,085,000, up more than 50%; radio-phonos, \$362,000, double; tube-type radios, \$1,958,000, more than three fold; and other radios having less than three transistors, \$2,672,000, a six-fold increase. Exports of radios with three or more transistors declined from \$18,874,000 to \$13,561,000 and exports of transistors, from \$624,000 to \$190,000. Exports of TV receivers were not significant. However, 2,555 units valued at \$124,000 were shipped to the U.S. in the third quarter of 1960.

**PHONETIC TYPEWRITER**, a machine which takes dictation through a microphone and turns it into type, syllable by syllable, has been patented by RCA. Invented by Dr. Harry F. Olson, Dir. of the Acoustical and Electromechanical Lab. of RCA at Princeton, and Herbert Belar, an associate, the equipment consists of a mike, a cabinet containing the speech-analysis mechanism and an electric typewriter. A code stored in the machine is linked to the keys of the typewriter. Since the machine puts down just what it hears, the typed copy is clear enough in meaning but not orthodox in spelling. It is suitable for notes to be filed and for interoffice correspondence, but requires further transcription for letters. Initial practical applications will be in simple forms whereby vocal orders can be given to machinery or a limited number of terms fed into a computer. A supermarket checker, for example, might speak numbers into the cash register, keeping his hands for packaging.

**THERE IS NO NEW THING** under the sun, not even stereo sound, notes IHFM. This "newest" hi-fi development is actually 79 years old, a patented discovery of Frenchman Clement Ader. The device was demonstrated at the 1881 Paris Exposition.

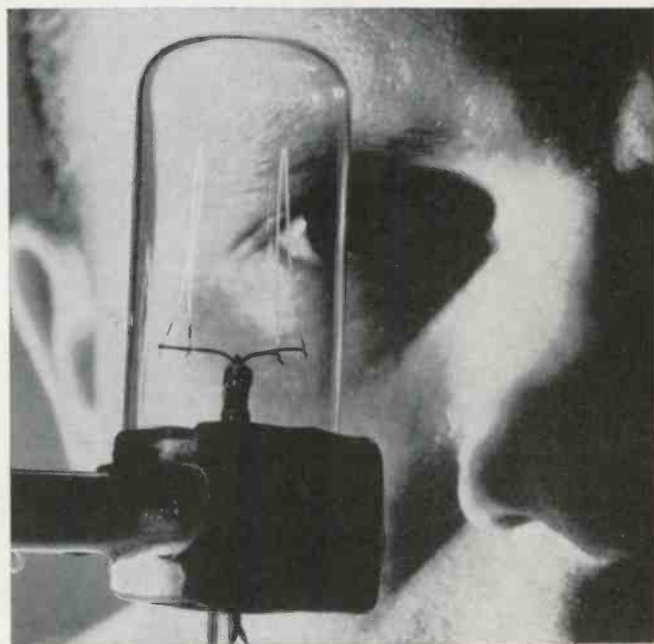
**INFRASONIC WAVES**, or very low frequency waves, have been detected and recorded, revealing that the atmosphere is filled with strange, inaudible sounds. This provides a completely new way to detect tornadoes, earthquakes and other natural phenomena at great distances, according to a group of NBS scientists reporting before a meeting of the Acoustical Society of America. Periods of these waves range from about one second to well over 200 seconds, with corresponding wave lengths between about 340 meters and 80 kilometers.

## CALENDAR OF COMING EVENTS

- Apr. 19-21: 13 Annual Southwestern IRE Conference & Electronics Show, SWIRECO, New Memorial Coliseum and Baker Hotel, Dallas, Texas.
- Apr. 26-28: 7th Region Technical Conference & Trade Show, IRE, Westward Ho Hotel, Phoenix, Ariz.
- May 2-4: 1961 Electronic Components Conference, AIEE, EIA, IRE, & WEMA, Jack Tarr Hotel, San Francisco, Calif.
- May 22-24: 1961 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- May 22-24: 5th Global Communications Symposium (GLOBECOM V), Sponsored by PGCS and AIEE, IRE, Sherman Hotel, Chicago, Ill.

**EDISON RADIO AMATEUR AWARD** for this year, sponsored by G-E, will be shared jointly for the first time by two amateurs and is granted for the first time for a scientific achievement. Winners are John T. Chambers, Palos Verdes Estates, Calif. and Ralph E. Thomas, Kahuku, Oahu, Hawaii. The pair set a one-way communications distance record of 2,540 miles on 432 megacycles. This and earlier records set over the same California-to-Hawaii course, on 220 and 144 megacycles, confirmed the theory that UHF radio communications was not limited to line-of-sight, thanks to tropospheric ducting.

## "DARK HEATER" CUTS TEMPERATURE



Electronic technician Henry Kowger examines two wires in lab demonstration of new RCA chemical coating (wire at right) which reduces operating temperature 20% below bright-glowing conventional heater (left). The new gray coating, reported to extend tube life, is being used in a variety of popular tube types.

Model D-612T \$56.00 net

# Lift it...



## you can feel the extra quality in an EPL DC POWER SUPPLY!

**Powers transistor circuits,  
12/6 volt hybrid/tube  
auto, marine radios**

EPL power supplies are heavier because they're built with top quality, heavy duty components to provide unequalled durability and performance. Ample regulation for operating solenoid tuning controls in auto radios. Patented conduction cooling gives greater safety margin, longer rectifier life and higher current carrying capacity.

- out-performs all others in its price class
- lowest ripple
- costs less per output
- reserve power to handle any service job
- backed by Certified Proof-of-Performance chart
- longer life

2 ranges: 0-8 and 0-16 volts continuously variable.

Less than 0.5% ripple up to 5 amperes. 2% ripple at 10 amperes.

10 amps. at 12 v. continuous duty. 20 amperes intermittent.

**FREE BULLETIN D612T**

**See the Difference at Your Jobber**



**ELECTRO  
PRODUCTS  
LABORATORIES**



4501-V Ravenswood, Chicago 40  
Canada: Atlas Radio Ltd., Toronto

Name \_\_\_\_\_

Address \_\_\_\_\_

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

9676

## News of the Industry

PACOTRONICS has added 20,000 additional feet of production space to their Long Island facilities.

CHANNEL MASTER announces the appointment of JOHN "CHICK" CIHOCKI as Dir. of Educational Services.

HEATH COMPANY reports the appointment of DONALD H. HARTMANN to the newly-created position of Executive Vice Pres.

SOUTH RIVER METAL has announced the promotion of MAX M. GOLDFINGER to the position of Sales Mgr. in charge of Distributor Accessories Sales.

B & K MFG. and NATIONWIDE W-J distributors jointly sponsored a Television Servicemen's Seminar attended by over 400 technicians. Seminar covered modern TV servicing techniques and better profits, with demonstrations of B&K test instruments.

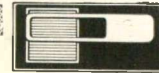
DRESSER ELECTRONICS launched a new standard line of HST transformers at a three day meeting of 40 officers and reps of DRESSER INDUSTRIES and ARCO ELECTRONICS, national distributor. A new 28-page catalog, cross-reference guide and price list was introduced. ARCO is currently moving to larger quarters in Great Neck, L.I.

GENERAL ELECTRIC Receiving Tube Dept. announces the following appointments: ROBERT R. PERKINS, Regional Commercial Engineer, equipment sales operation; J. FRED OTTILIE, Dist. Sales Mgr. in Ind. and central Ky. for electronic components; and H. DONALD NELSON, Dist. Sales Mgr. in Kans., Neb., and western Mo. for electronic components.

SYLVANIA Electronic Tube Div. makes the following appointments: KEVIN J. JOYCE, supervisor of entertainment equipment sales, mid-western region; ANTHONY R. GARCIA, Central Dist. Distributor Sales Mgr. with headquarters in Chicago; and ROBERT L. McNELIS, East Central Distributor Sales Mgr. with offices in Cleveland. Also announced are the following: DEAN A. HILL, Dist. Sales Mgr., Los Angeles; and C. JOHN BORLAUG, Chief Service Engineer with headquarters in Batavia, N.Y.

(Continued on page 18)

# CUSTOMER SERVICE ENGINEERS



## OUTSTANDING CAREER OPPORTUNITIES

Continued expansion of the PHILCO COMPUTER DIVISION has created a number of positions for persons with a minimum of 2 years of data processing equipment maintenance and/or installation experience.

Successful candidates will undergo advanced computer training in the PHILCO 2000 System at our Willow Grove, Pa. plant, prior to relocation at company expense.

## ASSIGNMENTS AVAILABLE IN MAJOR CITIES THROUGHOUT U.S.A.

Contact

**Mr. John Felos**

Professional Employment Manager

**COMPUTER DIVISION  
WILLOW GROVE, PA.**

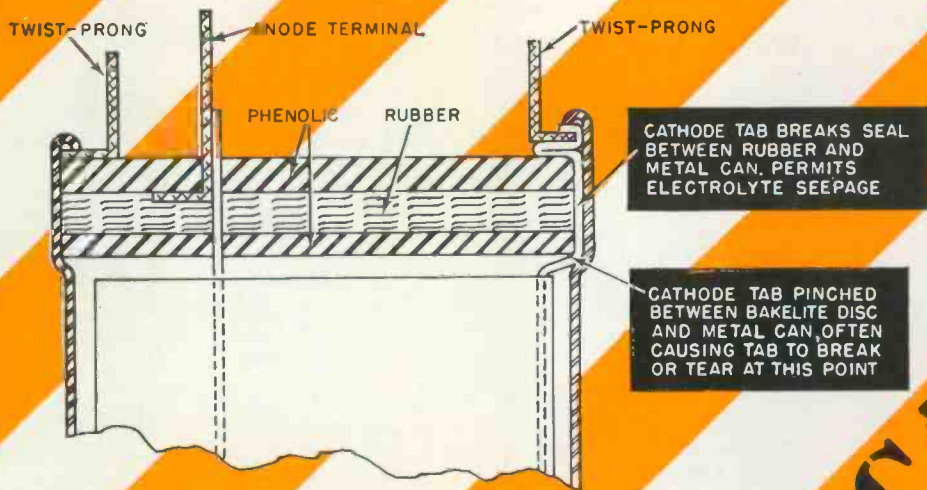
# PHILCO

 Famous for Quality the World Over <sup>®</sup>

For more data, circle 4-16-1 on coupon, p. 50  
16

For more data, circle 4-16-2 on coupon, p. 50  
ELECTRONIC TECHNICIAN • April, 1961





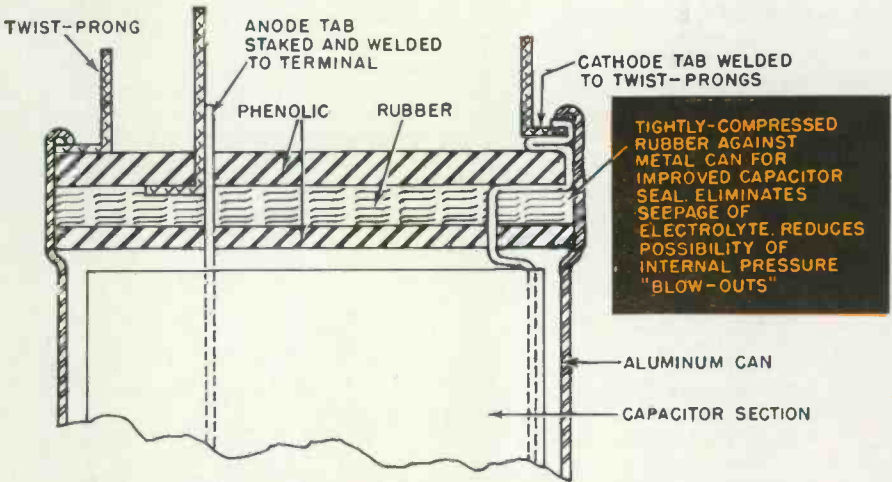
ORDINARY ELECTROLYTIC CAPACITOR

**CAUTION!**

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

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

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



SPRAGUE TWIST-LOK® ELECTROLYTIC CAPACITOR

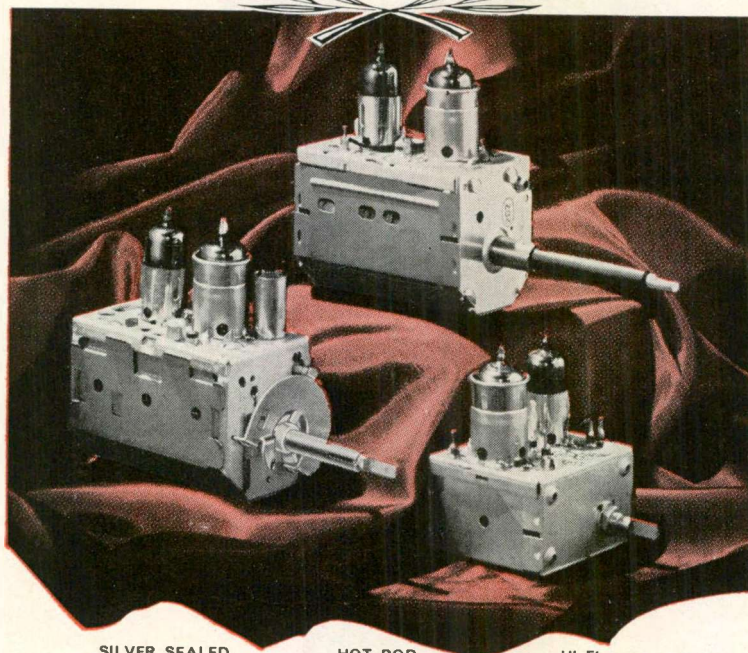
Type TVL Twist-Lok Capacitors are now more dependable than ever! Sprague has developed a new cover design which provides a truly leak-proof seal and permits capacitors to withstand higher ripple currents.

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.



**WORLD'S LARGEST CAPACITOR MANUFACTURER**



SILVER SEALED  
(switch-type)

HOT ROD  
(turret-type)

HI FI  
(FM) Tuner

It's only natural that the world's leading set manufacturers should rely on the TARZIAN TUNER . . . acclaimed as the world's finest.

Today, TARZIAN TUNERS are providing unexcelled performance in millions and millions of television receivers. Since the beginning of television (Sarkes Tarzian was a pioneer in the industry) leading set manufacturers have been equipping their receivers with TARZIAN TUNERS because they are assured of dependable performance. And, at LOW COST.

Sarkes Tarzian, Inc. is recognized as the world's leading commercial tuner manufacturer with licences in Canada, Mexico, Brazil, Argentina, Australia and Italy.

Only Tarzian offers manufacturers both the HOT ROD (turret-type) and SILVER SEALED (switch-type) . . . as well as the Hi Fi FM Tuner. All embody the high standards of QUALITY . . . DEPENDABILITY . . . and OUTSTANDING PERFORMANCE that have made TARZIAN products a leader in the field.



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

(Continued from page 16)

MERIT COIL elects ODEN F. JESTER as Vice Pres. in charge of sales and appoints GIL BALDOCK as Field Sales Mgr.

RCA opens a new sales office and engineering building at 6801 E. Washing Blvd., Los Angeles, Calif. to serve as headquarters for sales operations in the Los Angeles area for the Electron Tube Div. and Semiconductor and Materials Div.

CBS makes the following appointments: CALVIN GLOBE, Sales Promotion Mgr.; JOHN A. MAYBERRY, Merchandising Mgr., Distributor Sales; and JOSEPH L. YOUNGER, Mgr., Dealer Product Sales, St. Louis District.

STANDARD KOLLSMAN reports development of an extremely stable VHF TV tuner adaptable to UHF channels, by insertion of adaptor strips. Main feature is use of crystals to provide oscillator stability to tolerance of  $\pm 50$  kc. Developmental samples of tuner with adaptor strips for Airborn Educational TV channels are available.

ERIE RESISTOR Distributor Div. and TYCO SEMICONDUCTOR CORP. jointly announced that an agreement was concluded for Erie to market through industrial parts distributors Tyco's line of gallium arsenide varactor diodes, silicon controlled rectifiers, silicon power, intermediate power and small signal transistors.

GENERAL INSTRUMENT subsidiary, RADIO RECEPTOR CO., announces the Distributor Profit Participation Program through their Selenium Div. under which: all replacement rectifiers will be shipped separately packaged; distributors will benefit from quantity prices, no matter how small the order over the usual minimum \$10; and shipment of all orders will be made overnight either from the home office or central stocking areas.







# AMAZING NEW E-91 "EVEREADY" ALKALINE ENERGIZER

**Featured on big network TV campaign**



**GIVES TWICE  
THE LIFE  
OF STANDARD  
PENLITE BATTERIES!  
INCREASES  
YOUR BATTERY  
PROFIT!**

The amazing E-91 is great news for users of pocket radios . . . electronic equipment . . . photoflash . . . heavy duty lighting . . . children's toys! And millions of people will be hearing this news on nation-wide network TV!

This amazing new "Eveready" E-91 alkaline energizer is a *real* performer. Gives *twice the life* of standard penlite batteries in continuous service! Has higher energy, more power! Hermetically sealed, lasts longer with fewer battery changes! The E-91 is bound to be one of your biggest sellers. It's one of the best battery values in America!

**See the "Eveready" E-91  
Radio Battery on...**

"Outlaws" "Gunslinger"  
"Adventures in Paradise"  
"Wells Fargo" "Cheyenne"  
"Asphalt Jungle"

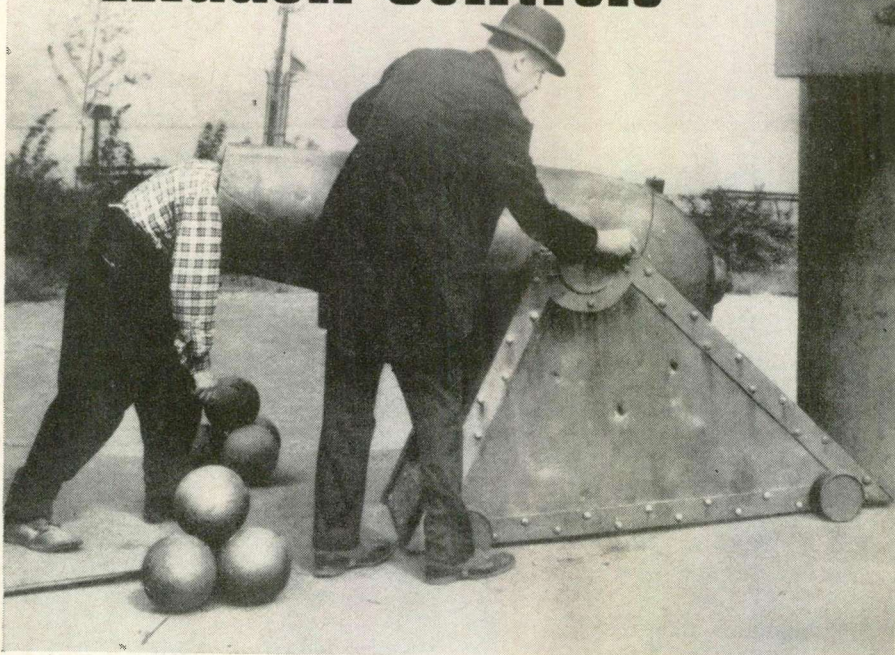
**Nation-wide TV creates big demand! Cash in! Order today!**



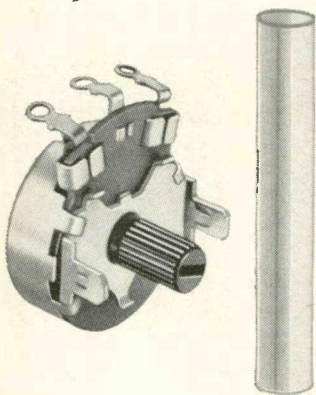
"Eveready", "Nine Lives" with the Cat Symbol and "Union Carbide" are registered trade-marks for products of UNION CARBIDE CONSUMER PRODUCTS COMPANY • Division of Union Carbide Corporation • 270 Park Avenue, New York 17, N. Y.



# Easy Adjustment of Hidden Controls



## With **Centralab** Twist-Tab Radiohms



You'll get a big bang out of CENTRALAB tab-mounted Radiohm Controls—because they're easy to install and easy to adjust. These Twist-Tabs are tailored to the *minimum* shaft length needed for TV hidden controls. When a *longer* shaft is needed, it's simple to use the 2" polyethylene extension packed with each unit. Nothing to saw—a snip of the scissors gives the needed length, and the adjustment slot is still there, and still easy to get at.

CENTRALAB Twist-Tabs are available in 25 values from 200 ohms to 7.5 megohms... rated at  $\frac{1}{2}$  watt,  $\frac{15}{16}$ " diameter,  $\frac{7}{16}$ " deep. Shoot over to your CENTRALAB distributor for full details.

**Centralab**

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.  
902D EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN  
CENTRALAB CANADA LIMITED—AJAX, ONTARIO

B-6115 S

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS  
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

For more data, circle 4-20-1 on coupon, p. 50

## Reps & Distributors

SLATE & CO. appoints BOB KAVESH to the sales staff.

GILBERT E. MILLER ASSOC. has been joined by ELMER GODBOLD.

ALLIED RADIO announces the appointment of LEWIS T. STEIN as Gen. Mgr. of the Dealer Div.

MONARCH INT'L, announces RADIO PRODUCTS SALES has been named exclusive distributor for southern Calif.

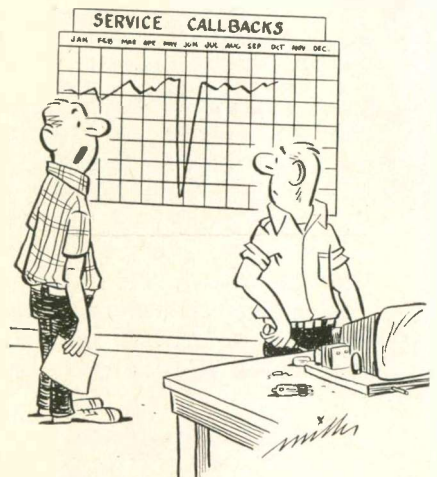
GAWLER-KNOOP has named WILBUR KELLY to the sales-service engineering staff covering southern N.J., eastern Pa. and Dela.

ARROW SALES reports the appointment of PHIL KAY to the post of Merchandise Mgr. of their entire chain of five branches in southern Calif.

R. V. WEATHERFORD has reached an agreement with FULLERTON ELECTRONICS for acquisition of the physical assets and facilities of that company.

ACCURATE ELECTRONICS names two sales reps as follows: HARRY C. FEHR, Chicago and all of Ill. and Wisc.; and DONOGHUE & ASSOC., western Pa., W. Va. and western Md.

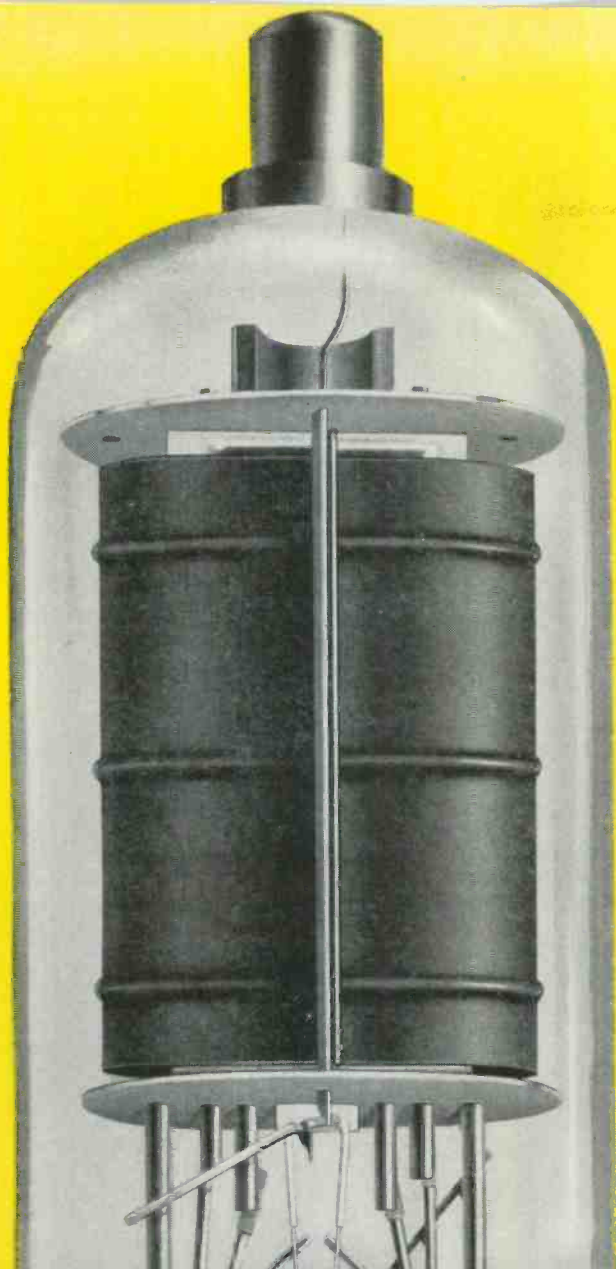
ERA's Second Annual Convention on Feb. 1st was attended by over 300 members. Elected were WALLY SHULAN, WALLY SHULAN & CO., Pres. for 1961 and LARRY HARRISS, L.H. HARRISS CO., Chmn. of the Bd.  
(Continued on page 22)



"Didn't you take your vacation in June, Harry?"

For more data, circle 4-21-1 on coupon, p. 50 →  
ELECTRONIC TECHNICIAN • April, 1961





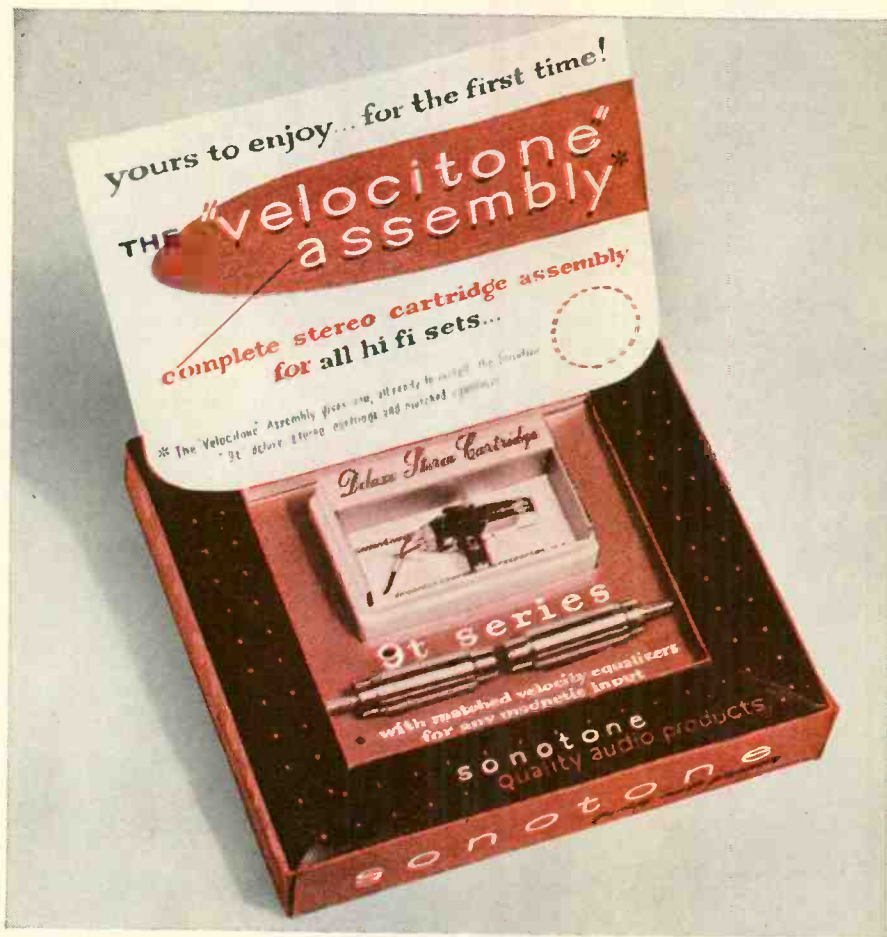
**RAYTHEON**  
**UNILINE**  
*FIRST IN QUALITY*

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



RAYTHEON  
COMPANY

DISTRIBUTOR PRODUCTS DIVISION  
411 Providence Turnpike • Westwood, Mass.  
For more data, circle 4-21-1 on coupon, p. 50



No stereo cartridge—not even the finest magnetic in the world—outperforms the  
**Sonotone Ceramic "Velocitone"**

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

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

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

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

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

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

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

**Sonotone**®  
 C O R P.

ELECTRONIC APPLICATIONS DIVISION, ELMSFORD, N. Y., DEPT. C9-41  
 IN CANADA, CONTACT ATLAS RADIO CORP., LTD., TORONTO

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

For more data, circle 4-22-1 on coupon, p. 50

(Continued from page 20)

ASTREX, INC. and RADIO ELECTRIC SERVICE CO. OF PENNA., INC. (RESCO) announce a merger agreement under which the Astrex name and identity remain intact; RESCO becomes an operating Div. of Astrex.

CADRE INDUSTRIES names four manufacturers reps to handle their new line of CB transceivers: NEW ENGLAND AREA REPRESENTATIVES, New England; MARSEY SALES CO., upper N.Y. State; KALBER & MACK, metropolitan N.Y. and northern N.J.; and MORRIS F. TAYLOR CO., Ala., Dela., Wash.D.C., Fla., Ga., Ky. (Ashland), Md., southern N.J., N.C., Ohio (East Liverpool, Steubenville, Warren, Youngstown), Pa., S.C., Tenn., Va. and W.Va.

NEDA, asked to state its views on the matter of governmental licensing of radio and TV service dealers and/or technicians, reports: "NEDA has not taken, at this time, a position in favor of or opposition to State, Regional, or Local legislation covering those who service Radio and/or Television receiving sets. The Bd. of Directors of our Assoc., in meeting Jan. 18, 1961, authorized its Pres. to meet with all segments of the electronics industry-manufacturers, sales reps of manufacturers, service dealers and/or technicians and distributors of electronic equipment, components and replacement parts—for the purpose of organizing an all-electronic Industry Committee to study ways and means of improving commercial operations within the electronics industry... NEDA sincerely suggests to all Legislators that they carefully study the impact of licensing a few members in the servicing phase of the electronics industry, at the expense of the many and, in particular, the general public."

**Catalogs & Bulletins**

**ANTI-STATIC COMPOUNDS:** 1961 data sheet covers newly strengthened anti-statics, #79 and #79-OL, for permanent destaticizing effects on instruments, controls and electronic devices. Merix Chemical Co., 2234 E. 75th St., Chicago 49, Ill.

For more data, circle 4-22-2 on coupon, p. 50

**SANDER:** Catalog sheet covers model 77 sander which incorporates a powerful reciprocating motor of new design. It is a straight line action sander having a 5/32" stroke. Operates at 14,400 strokes per minute. Weller Electric Corp., 601 Stones Crossing Rd., Easton, Pa.

For more data, circle 4-22-3 on coupon, p. 50

(Continued on page 24)



# SPRAGUE CERAMIC CAPACITORS

## THE Complete LINE THAT OFFERS MORE THAN MERE "CAPACITY"

"Rated" capacitance is not enough . . . *actual* capacitance during operation is equally important. Excessively high or low values as well as capacitance change with temperature can foul up a TV or radio set. Therefore, characteristics such as Capacitance Stability, Capacitance Tolerance, and Temperature Coefficient of Capacitance must be considered in replacement applications.

That's why the Sprague Ceramic Line is varied and broad—it includes capacitors with electrical and mechanical characteristics to meet practically every replacement requirement.

See complete listings in the new Sprague Catalog C-614. Get your copy from any Sprague Distributor, or write to Sprague Products Co., 65 Marshall St., North Adams, Massachusetts.

### CERA-MITE® CAPACITORS



Tiny, tough, dependable. Silvered flat-plate construction for high by-pass efficiency, high self-resonant frequency. Available in the following types to meet specific requirements:

- *General Application*, for by-pass and coupling
- *High-K*, for applications requiring guaranteed minimum capacitance values
- *Temperature-Stable*, for minimum capacitance change with temperature
- *Temperature-Compensating*, for applications requiring negative temperature coefficient
- *NPO*, for use where capacitance change with temperature is undesirable
- *AC*, rated at 125 VAC
- *Buffer*, rated at 2000 WVDC
- *Low-voltage*, for by-pass and coupling in transistorized circuitry
- *TV Yoke*, rated at 3000 and 5000 WVDC

### HYPERCON® CAPACITORS

Ultra-miniature discs for use in transistorized circuitry. Designed for by-pass and coupling applications in low voltage circuits where high capacitance and low power factor are important considerations. Superior in size and performance to comparably-rated aluminum electrolytic capacitors.

### "UNIVERSAL" CAPACITORS



Have multiple leads. Quick-fix capacitors for on-the-spot repairs. By using certain leads for terminals, connecting certain leads together, and removing certain leads, various ratings may be obtained. Available in General Application as well as High-K types.

### DOORKNOB CAPACITORS



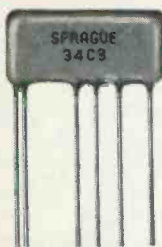
Available in 20 and 30 KV ratings. Molded guard rings lengthen surface creepage path. Complete with variety of screw-in terminals to meet all replacement requirements.

### BUTTONHEAD CAPACITORS



Screw-mounting units with flat disc capacitor elements seated in hexagon head. This series includes feed-thru capacitors for filtering leads through chassis, as well as standoff capacitors for by-pass applications.

### BULPLATE® CAPACITORS



Rugged multiple-section units which combine in one compact assembly all the capacitors used in one or more stages of a radio circuit. These space-saving capacitors are ideal for miniature sets.

# SPRAGUE®

THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER



## NEW COUNTER DISPLAY HELPS RCA BATTERIES SELL THEMSELVES!

This unique "Change Tray" Counter Merchandiser leads the list of dealer promotional aids in RCA's newest battery program. Here's a battery display with real use value! Now, every time you return a customer's change you automatically remind him of his battery needs.

### Other new RCA sales stimulators include:

- ★ Full-Line Battery Merchandiser
- ★ Outdoor Thermometer
- ★ Essential battery reference material
- ★ Full-Color "3-D" Window Display
- ★ Streamer, Decal, Counter Card

### Plus these special sales advantages of the RCA Line:

- ★ Wide choice of battery types: mercury, zinc-carbon, new alkaline!
- ★ Famous RCA reputation for quality
- ★ Customer acceptance second to none
- ★ Selective dealer distribution

Such solid support can pull in more store traffic for you. It can help you sell more batteries in '61 and develop additional business while doing so. Your Authorized RCA Distributor is the man to see!

RCA Electron Tube Division, Harrison, New Jersey



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA

(Continued from page 22)

**TV TRANSLATORS:** Literature covers two additions to a line of TV translators: model T-11 low power UHF translator, input TV channels 7-13, output UHF channels 14-84; model T-12 identical to T-11, except for input TV channels 2-6. Benco Television Associates, Ltd., 27 Taber Rd., Rexdale, Ontario, Canada.

For more data, circle 4-24-1 on coupon, p. 50

**TRANSISTOR AMPLIFIERS:** Bulletin #42-870 provides electrical and physical specifications on TA-12-B 4-stage transistor amplifiers. Measures .531"D, .228"H. Contains 4 transistors, 8 fixed resistors and 6 capacitors. Gain, 73 db at 1 kc. Frequency response,  $\pm 5$  db from 300 to 20,000 cps. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 4-24-2 on coupon, p. 50

**AMPLIFIERS, ANTENNA EQUIPMENT, CABLE:** Literature available: circular F20, covering bridging amplifier BA-4C for installation in trunklines immediately behind repeater amplifiers; catalog sheet F-1159, on community antenna equipment; brochure F-1156, on coaxial cable for TV systems; and circular F1148 on Equaline cables. Entron, Inc., P.O. Box 287, Bladensburg, Md.

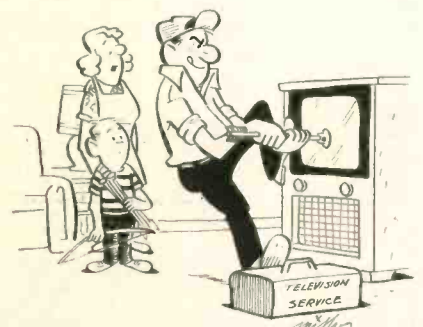
For more data, circle 4-24-3 on coupon, p. 50

**BATTERY CHARGERS:** Model T-8-16, described in current literature, is a dual voltage constant current charger, designed to charge nickel cadmium batteries without overheating or overcharging. Two-position switch sets voltage and current for 8v and 16v batteries, 1.4v and 24v accommodated by internal shunt change. Elf Inc., P. O. Box 302, Florissant, Mo.

For more data, circle 4-24-4 on coupon, p. 50

**ANTENNAS:** New Buddy Whip, described in current literature, is an 11 meter citizens band mobile antenna. Reported to give up to 10 db gain over bumper mounted antennas. Overall length, 96". Also covered is the Gizmotchy 2-in-1 citizens band beam antenna, can be switched from horizontal to vertical with a flick of a switch. Marina Communications, 10328 Venice Blvd., Culver City, Calif.

For more data, circle 4-24-5 on coupon, p. 50





# New Type BUSS FUSE SERVICE-STAND ASSORTMENTS

*Supplies fuse needs and  
saves service time*

## Most Practical Stand Yet Devised

Made of metal, the stand is sturdy and unbreakable, not like a fragile, plastic stand.

Keeps the fuses needed by the serviceman at his fingertips. Prevents scattering of fuses.

Can be hung on the wall or placed on the counter where the stand's wide base prevents accidental tipping.

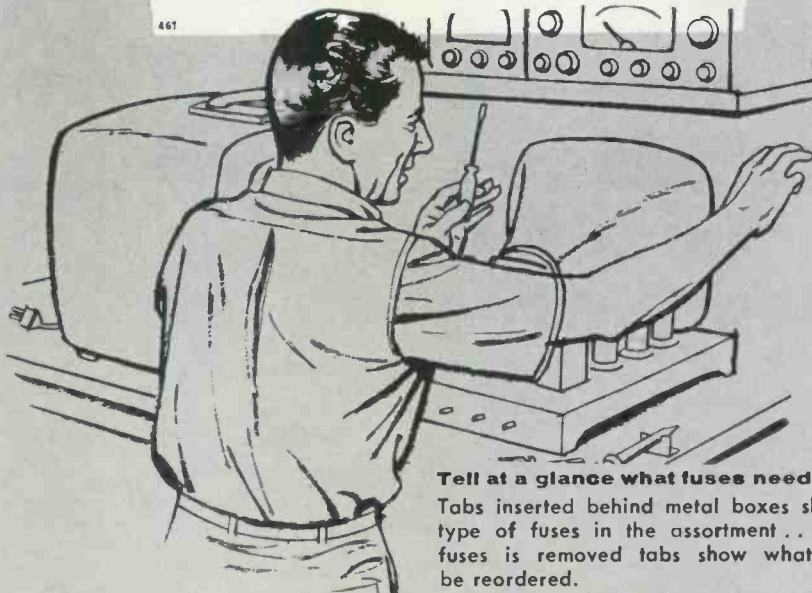
Each 5-in box is neatly held on its own shelf—easy to slide out without disturbing other boxes.

## Two Quick-Service Assortments with Stand

**No. 255 Full-Service** electronic fuse assortment contains 255 fuses—practically all the fuses you might need for TV and other electronic devices.

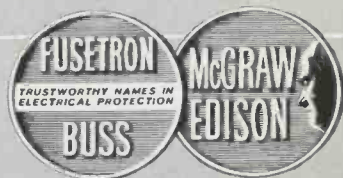
**No. 130 Special** electronic fuse assortment contains 130 fuses. It gives you one box of each size and type of all the popular fuses at a minimum investment.

Make your service work easier and more profitable by ordering the BUSS Electronic Fuse Service Stand Assortment best suited to your needs. Your Jobber has it or will get it for you.



**Tell at a glance what fuses need re-ordering**  
Tabs inserted behind metal boxes shows size and type of fuses in the assortment... when box of fuses is removed tabs show what items should be reordered.

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



BUSSMANN MFG. DIVISION, MCGRAW-EDISON CO. • UNIVERSITY AT JEFFERSON • ST. LOUIS 7, MO.

to take advantage  
of the best  
signal-to-noise ratio...  
mast mount  
this amplifier



to use ac power  
source up to  
1 mile from the  
antenna...  
plug in this  
remote power supply



## NEW BLONDER-TONGUE MODEL AB-3

### mast-mounted TV/FM amplifier with remote power supply

New engineering features incorporated in the Blonder-Tongue model AB-3 mast-mounted amplifier make it possible to utilize the maximum signal-to-noise ratio available at the antenna, and at the same time, power the amplifier from an AC source up to one mile away. Whether you use the AB-3 and its remote control power supply (RP-3) in a fringe area home installation, or as a pre-amplifier in a master TV system—by locating the amplifier close to the antenna, you take advantage of the best available signal with noise picked up by the down lead minimized.

The remote power supply sends AC power up to the mast mounted amplifier on the same down-lead that carries the antenna signal down. What's more, the remote power supply provides the correct power to the amplifier for any length of connecting cable up to one mile (when open twin-lead is used.) The RP-3 also serves to isolate the antenna signal from the AC and to provide an excellent impedance match for either 75 ohm or 300 ohm cable. This new amplifier employing a low noise frame-grid tube provides 22db (almost 13X) gain on VHF-TV and FM stations.

#### other features include:

**MAINTENANCE FREE OPERATION** — Matched remote power supply provides correct voltage for any length of down-lead, assuring longer tube-life.

**EASY INSTALLATION WITH 300 OHM TWINLEAD OR 75 OHM COAX**—Stripless terminals for 300 ohm twinlead; solderless "quick-disconnect" terminals for 75 ohm coax. No balun is needed because the input is matched to 300 ohm antennas.

**CHOICE OF MANUAL OR AUTOMATIC OFF/ON SWITCH** — Turns AB-3 on and off automatically when used with most TV sets.

**Model AB-3** (including RP-3 remote power supply) \$104.50.

Available through distributors.

Free System Layout Aid Available For Master System Installations. Write Dept. ET-4.

engineered and manufactured by

# BLONDER-TONGUE

9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc., Ltd., Toronto, Ont. Export: Morhan Export Corp., New York 13, N. Y.  
home TV Accessories • UHF converters • master TV systems • FM-AM radios

### Sencore DUAL TV BIAS SUPPLY

Model BE113 Alignopak can be used as a single 0 to 20v d-c supply or as a dual 0 to 20v d-c supply depending on the TV receiver design. Each supply can be applied to individual sections of the TV receiver (i-f and r-f for

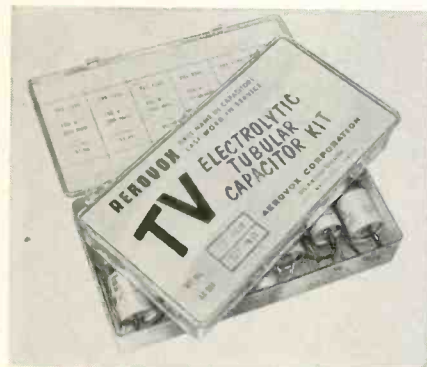


example) and adjusted to different voltage without causing interaction. It is a stepped up version of model BE3, a single supply, and is announced to meet the technician's needs when aligning or troubleshooting AGC on new TV receivers. \$12.75. Sencore, Addison, Ill.

For more data, circle 4-26-2 on coupon, p. 50

### Aerovox CAPACITORS

Electrolytic tubular capacitor kit AK-500, designed for the repair of series-string TV sets and AC-DC table radios, combines 6 type PRS "Dandee" units in the most popular values packaged in a handy reusable plastic box. They feature high quality and compactness. Manufactured with



aluminum cans and cardboard insulating sleeves, the single section units have bare tinned copper leads 3" long, negative grounded to case. Multiple units have insulated stranded copper leads 5" long; negative is common and grounded to case; common cathode. Aerovox Corp., New Bedford, Mass.

For more data, circle 4-26-3 on coupon, p. 50





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

Introductory "P-L" tube offer gives you these 15 fast-sellers:  
5-5U4GB, 4-6CB6A, 3-6SN7GTB, 2-6BQ7A, 1-12AU7A

What a deal! You get a selection of the hottest tube types on the market — 15 tubes in the five types that account for 20% of your business. Best of all you pay for only 14. CBS gives you a 6SN7GTB *free!*

### "Preferred Line"—the Dealer Line

CBS Electronics' new "Preferred Line" consists of the types *you* sell the most. And each and every CBS "P-L" type is quality-controlled for Total Reliability. This is your assurance of the best quality in the industry. To prove it to yourself try the free 6SN7GTB that comes with this offer.

See your distributor today. Get your free 6SN7GTB with your purchase of this "P-L" Profit Pack. Act now, offer is good for a limited time only.

## CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

### CBS "Preferred Line" tubes have TOTAL RELIABILITY to cut callbacks

All CBS "P-L" tubes are specifically engineered for utmost dependability. Total Reliability features include non-emissive plates (5U4GB), anti-gas bulb coating and anti-sag molybdenum screen grid (6CB6A), low-microphonic mount (6SN7GTB), long-life coil heaters (6BQ7A and 12AU7A).

And all CBS receiving tubes have earned the Good Housekeeping Guaranty Seal. The lady of the house will recognize it immediately as a seal of confidence in you and the CBS tubes you sell.





The Businessman in the Serviceman suit is aware that color TV sales will sky-rocket in 1961\*. He realizes *every* color TV owner is a prime *antenna* prospect. That's why he recommends a JFD Hi-Fi TV antenna installation for fidelity color reception as well as best black and white. It delivers the picture that viewers pay for... earns him the prestige and profits he is in business for.

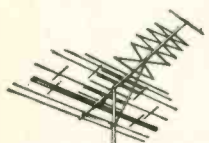
\*For all 1961 sales of color receivers will top 200,000 units. — Wall Street Journal

THE BRAND THAT PUTS YOU

# JFD

IN COMMAND OF THE MARKET

JFD ELECTRONICS CORPORATION  
BROOKLYN 4, NEW YORK



HI-FI HELIX



HI-FI BANSHEE



HI-FI FIREBALL



# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## *Color TV—Ready For An Upswing?*

After seven years of false starts, consumer apathy, and industry frustration, it looks as if color TV may be ready to move. This long delayed breakthrough will be the result of many factors.

First of all, RCA's tenacity in pushing the medium after a reported loss of \$130,000,000 is starting to pay dividends. Last year the company made a seven figure profit on color TV.

Though it is estimated that there are only a little over 500,000 color sets in use, this year's sales alone are expected to boost this figure by almost 200,000.

The early designs, tube laden and expensive, have been replaced with compact units selling for under \$500.

Improved reliability has accompanied the circuit simplification, and service contract cost has dropped in five years from \$149.50 to \$69. With improved serviceability and more sets in use, service dealer hesitation about accepting color TV has diminished.

The color TV message has begun to sink into the public's mind. NBC is said to have put on more than 1200 hours of color program last year. CBS may be expected to increase its color programming and ABC may have to change its no-color policy as the demand increases. The pressure on the TV networks for more color programs may also come from advertisers. Eastman Kodak has switched sponsorship of a program, at least partly because color television would be available on the new program.

An improved color CRT offering a brighter-sharper picture using higher efficiency sulfide phosphors is being included in RCA color sets. The new tube allows the dot registration to be accomplished more easily in the field, and the adjustable equalizer magnets are eliminated.

Even as large a company as RCA has found how difficult it is to put across color TV. Some other manufacturers have token color sets in their lines, primarily to placate dealers. Still other manufacturers, having been burned once, are holding back their own color sets until the market develops further.

So it is a welcome bit of news to learn that Zenith has announced its planned entry this fall in the color TV business. A completely new line of color sets will be introduced, priced \$600 and up. Zenith will accent the reliability and serviceability of their sets.

We strongly urge close attention to the needs of color television sales and service. Within the next year, it could well become a very meaningful piece of business for service dealers who are ready, willing, and able.

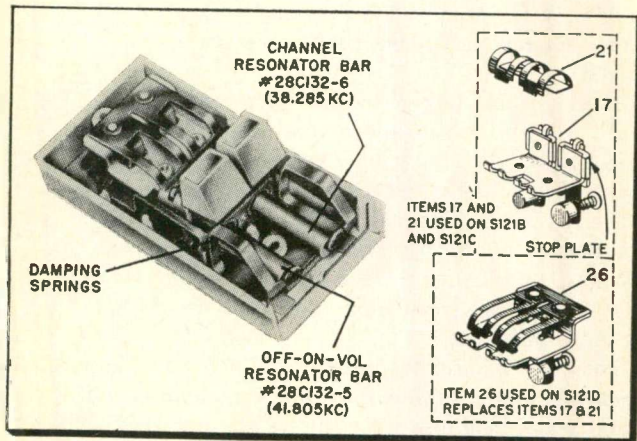
# TV MANUFACTURERS

## ADMIRAL

### Son-R Tuner Hammer Replacement

Early production 15H1 chassis used a Son-R S121B or C model tuner. Later production models are using an S121D model. The Hammer Spring Assembly in this tuner is interchangeable with the older models. The following instructions should aid the technician in replacing a broken hammer assembly:

(1) Remove two screws from the bottom of the tuner. Remove the metal plate and the third screw.—S121B Only—Remove damping screws (18). (2) Remove Actuator Springs (14) from the bottom of the mechanism and the Phillips head screws from the top.



Admiral Son-R tuners used in Model 15H1 TV chassis can utilize later production hammer assemblies at replacement time.

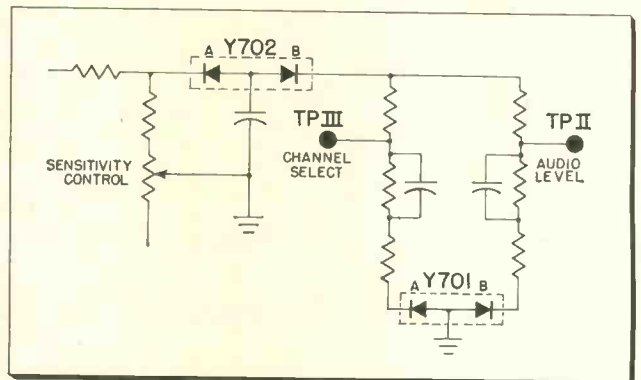
Remove and discard items (21) and (17) from the tuner (Old Hammer Assembly). (3) Remove items 3, 4, 19 and 20 and remount them to the new part (#26). (4) Reassemble the entire unit and check Hammer-Rod Gap Spacing. Before securing bottom plate press each button to check unit operation.

## GENERAL ELECTRIC

### "Sonic" Remote Relays—Contacts Remain Closed

If a Sonic Type Remote receiver currently in use exhibits the following symptom:

Remote control unit inoperative because relays remain closed continuously, the dual diodes may be at fault. Voltage readings at TP II & III indicate bias



Test Points II & III are used in GE's Sonic Remote Receiver for in-circuit testing of bias and detector diodes.

voltage is missing. (Depending upon the sensitivity control's setting, normal bias voltage at the test points should read between  $-4.5$  to  $-11$  volts.)

(a) Check the cathode of diode Y702A for 5 to 12 volts a-c as the sensitivity control is varied from maximum clockwise to maximum counter-clockwise. If voltage varies as indicated, short out Y702A. Recheck TP II & III and if d-c bias voltage appears, the component is open.

(b) If bias doesn't appear, remove the short from diode Y702A and short out Y702B. A bias reading at TP II & III indicates that Y702B is open.

(c) If, after these tests, bias voltage is still missing, the diodes can be assumed good and the fault lies within the receiver's circuitry.

### Sound or Channel Functions Change Without Transmitter Use

Measure the bias voltage at TP II & III (should read about  $-7$  volts) and short out diode Y702A. Recheck bias voltage: if bias voltage disappears Y702B is shorted. Check Y702A for a short by shorting across Y702B. If Y702A is shorted, noise immunity of the sonic receiver is lost. Even the TV receiver's horizontal pulses will trigger the remote control functions in this case.

## PACKARD BELL

### Models RPC-8R & RPC-9R—Increased Reverberation

To increase reverberation in these early models





PART I

# TV Sweep Circuit Test "Analyzers"

*ET Examines Seven Test Instruments To Learn How They Answer TV Deflection Service Problems*

ELECTRONIC TECHNICIAN  
Editorial Staff

• A TV service technician, whose prime sales product is time and knowledge, should seriously consider purchasing service "tools" that can shorten his repair time. With this in mind, ET's Editorial Staff examined seven sweep circuit

test instruments that can speed up TV repairs.

**Sweep Circuit Analyzers**

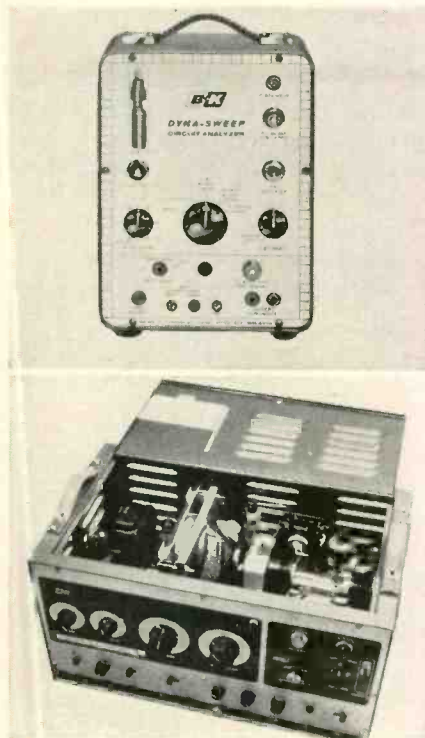
The test instruments examined here, generally called "analyzers," all have one thing in common: they are utilized in servicing the vertical and/or horizontal sweep sections of a television set (see Fig. 1). Some of the instruments provide out-of-circuit (static) tests of components,

such as flyback transformers and deflection yokes. Others have signal injection provisions which, in effect, permit "under-load" (dynamic) testing of components and circuit stages.

Let's briefly examine the instruments to determine each one's applications (an at-a-glance survey of instrument features is shown in an accompanying chart):

**B&K Model 1070**

"Dyna-Sweep Circuit Analyzer."  
(Inside view shows Model 1076)



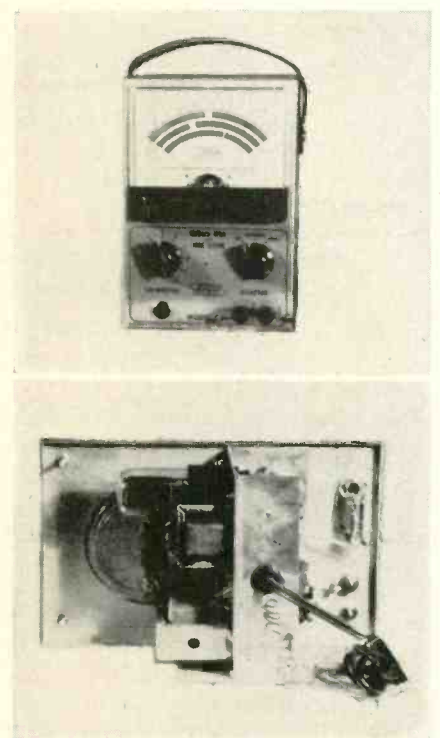
**DOSS Model 250**

"Pioneer Horizontal Sweep Quantalyst"



**EICO Model 944**

"Flyback Transformer & Yoke Tester"





B&K, model 1070 @ \$74.95, model 1076 @ \$299.95—Model 1076 incorporates all the sweep circuit checking features of model 1070 plus many others for different circuit sections. Though ET used model 1076, only those sweep features contained in model 1070 are included in this study.

Provides signal outputs for vertical and horizontal pulse substitution while TV set is operating. Also provides composite sync signals. Indicator is TV set's CRT, such as raster returning. Presence of B+ boost is indicated by a neon lamp that emits a red light. Unit has clip-on high voltage indicator lamp to detect high level r-f pulses.

Flyback transformers and deflection yokes can be individually tested with the set turned off. An indicator light shows whether the component being tested has continuity or is shorted. The yoke's vertical winding can be driven directly with the set turned on. The horizontal winding can be checked for shorts with the set on by employing a plate drive signal at the output stage and disconnecting the yoke's horizontal winding. The TV set's CRT indicates results.

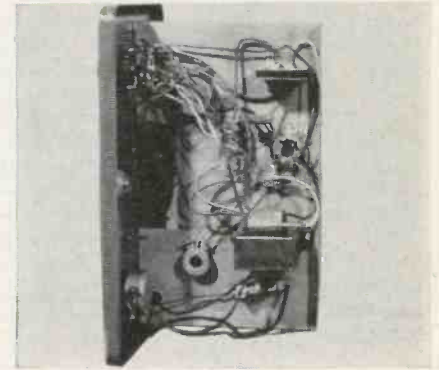
The unit has two neon lamps, a selector switch, sync level control, and calibration control; a separate high level r-f pulse neon detector is also provided. Instrument's plate drive is generated by a 6XQ6 tube which derives B+ voltage from the TV set being inspected.

*Comments:* Easy to operate. Medium size; has carrying handle; sturdy appearance. Separate coaxial test leads for checking flyback and yoke shorts (continuity tests use separate output jacks). A separate output for plate drive signals provides signals high enough to directly drive flybacks and yokes with a full raster. A gain control is not provided for either grid or plate drive signals.

**Doss, Model 250 @ \$129**—A VOM meter-switch arrangement enables the unit to make various voltage, current, resistance tests within the horizontal circuit. Tubes must be removed from the TV set and inserted in adapter tube sockets that attach to the instrument and reinserted in the chassis tube sockets. Most tests are made with the TV set turned on. Yoke and flyback tests are made by substituting a variable inductance yoke load and noting meter readings. TV set is turned on for these tests. Inductance readings of coils in the 4 to 36 millihenry range may be made with the set turned off. Also, horizontal oscillator frequency can be measured and drift determined.

Unit has 12 separate switch or control knobs and six neon lamp indicators.

*Comments:* Most of these tests can also be made with a standard VOM, though circuit tracing, cutting into circuits, etc., are eliminated. Operating information on complex switch arrangements is listed on units' front lid. Unit is battery-operated and pack-

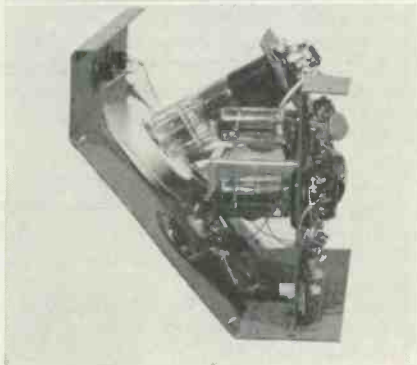
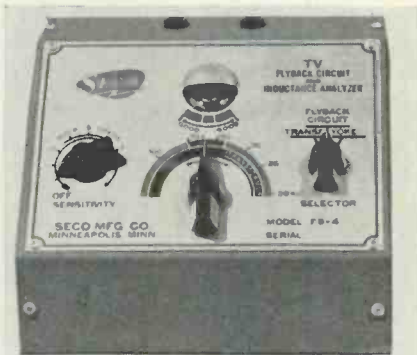


**SIMPSON Model 382**  
"In-Circuit Horizontal System Analyzer"

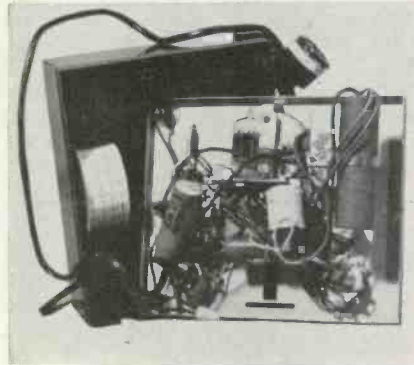
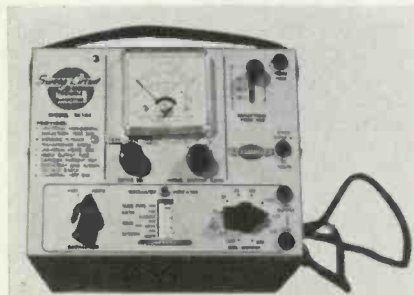
aged in a light-weight, attractive medium-size case with carrying handle.

**Eico, Model 944 @ \$34.95** wired—Tests shorts in flyback transformers and deflection yokes. A continuity test indicates if the component is open-

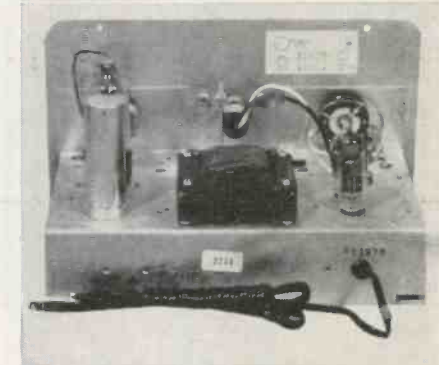
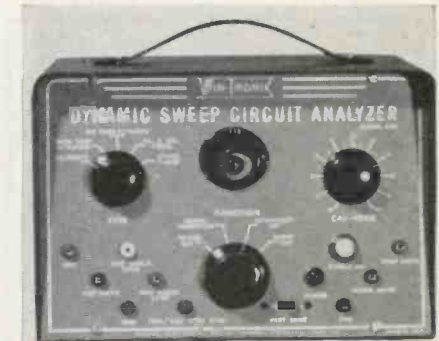
**SECO Model FB-4**  
"TV Flyback Circuit and Inductance Analyzer"



**SENCORE Model SS105**  
"Sweep Circuit Troubleshooter"



**WINSTON Model 820**  
"Win-Tronix Dynamic Sweep Circuit Analyzer"



circuited. A meter is employed as an indicating device; it has three easy-to-read "Good"- "Bad" scales. A calibration control and selector switch (which includes air-core and iron-core settings) is included. Has one 6K6 tube. Tests are made with the set turned off.

*Comments:* Easy to operate. Doesn't detect breakdowns that occur only with under-load conditions. Its VTVM size doesn't take up much bench space. Has carrying strap. Available in kit form for \$24.75.

**Seco, Model FB-4 @ \$38.95**—Checks the flyback circuit as a whole. A 6E5 "magic eye" tube is employed as a "Good-Bad" indicator. If the eye indicates "Bad" for the whole horizontal output circuit tests, the flyback transformer and yoke facility of the instrument can be used. The components can be tested for short or continuity. The unit has a sensitivity control, and selector switch. Has two tubes besides 6E5 indicator: 12AU7 and 6C4. Tests are made with the set turned off.

*Comments:* Easy to operate. Doesn't detect breakdowns that occur only with under-load conditions. Small size; front face is angled for easy viewing. No carrying handle. For flyback continuity tests, user must short out each winding one at a time and observe the eye tube for loss of signal.

**Sencore, Model SS-105 @ \$42.95**—Provides signal outputs for vertical and horizontal pulse substitution

**Fig. 2—Seco's "Quick Check"** of the whole horizontal output circuit can be made without disconnecting any parts. Opening or closing of eye tube shows results.

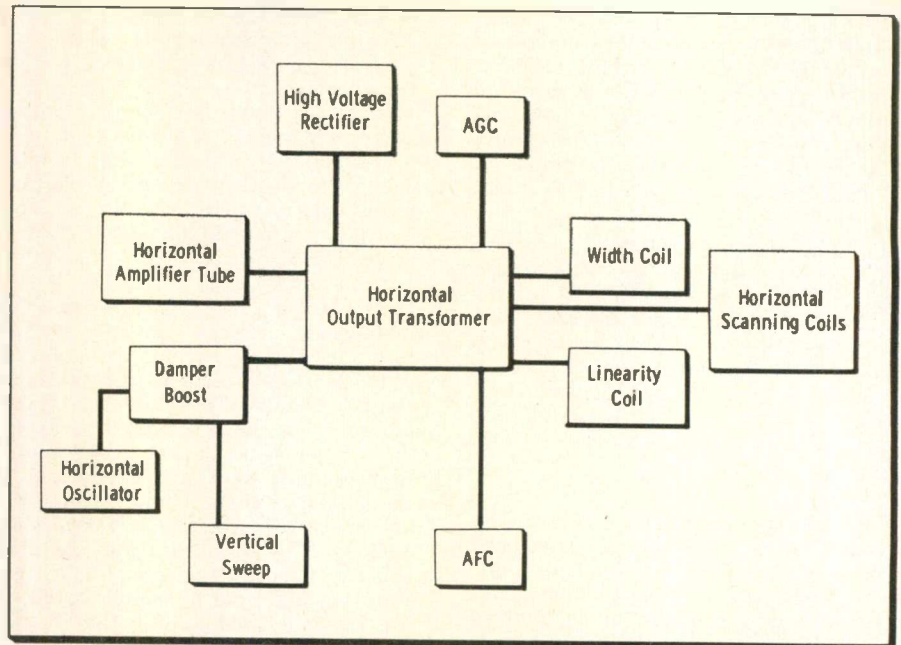
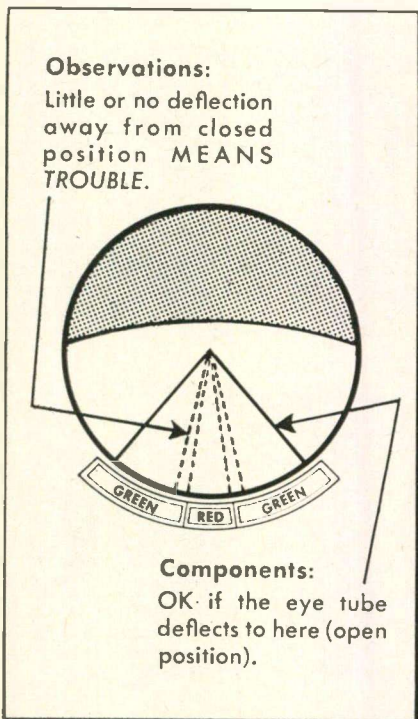


Fig. 1—Circuits associated with the horizontal output stage of a TV receiver.

while TV set is operating. Also provides horizontal sync signal (late model, Run 7 or higher). Indicator is TV set's CRT, such as raster returning. A tube socket adapter permits monitoring the horizontal tube's cathode current by automatically breaking the circuit. The instrument's milliammeter indicates current. Adapter pins on this special socket enable technicians to make top-of-chassis voltage readings or signal injection. A d-c voltmeter permits B+ boost measurements.

Yokes and flybacks are tested by substituting a variable yoke load. Only one lead of the TV set's yoke must be disconnected. Yoke test indicator is the CRT or restoration of high voltage. Flyback test indications are read directly on the unit's calibrated meter scale. Tests are made with the set turned on.

Unit has an oscillator output control, vert-horiz switch, meter selector switch, cathode current switch, and variable inductance yoke coil (5 to 40 millihenrys) lever. Has one 12AU7 tube and a 1N295 diode.

*Comments:* Simple to operate. Small size makes it an excellent bench and tube caddy instrument. Has carrying handle. Roll chart in instrument lists popular horizontal output tube cathode, screen, grid measurements and pin numbers. Has a neon oscillator to indicate that the instrument's oscillator circuit is operating. Voltmeter is not intended for high impedances, such as bias checks. CRT screen is not driven to full deflection by vertical signal injection at the vertical output tube's plate, though sufficient deflection is provided to determine if the stage is operating.

**Simpson, Model 382 @ \$69.95**—Tests the horizontal circuit as a whole. If the indicator (meter) points to "Replace" for the whole horizontal circuit test, the flyback transformer and yoke facility of the instrument can be used. These components can be tested for short or continuity. The unit has a meter adjust control, function switch, and a screwdriver balancing adjustment. Has one 6K6 tube. Tests are made with the set turned off.

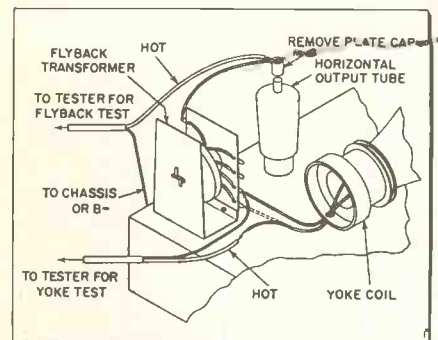


Fig. 3—Simpson's tester leads shown in two checking positions: flyback & yoke.

*Comments:* Easy to operate. Doesn't detect breakdowns that occur only with under-load conditions. Also measures capacitance between 10  $\mu\text{f}$  and 0.1  $\mu\text{f}$ . Unit is large (almost one foot in length); has bakelite handle for portable use. High quality appearance.

**Winston, Model 820 @ \$69.95**—Provides signal outputs for vertical and horizontal pulse substitution while TV set is operating. Also permits substitution of vertical, horizontal, and composite sync signals. The TV set's CRT indicates results, such as raster returning.



Tests flybacks and yokes for shorts and continuity. A neon lamp is employed as an indicator. The TV set being inspected is turned off for these tests. Different switch settings are available for iron core, air core flybacks and B&W and color yokes.

Settings include: flyback/yoke type switch, function switch, and frequency calibration control. The unit has two tubes: 12AU7 and 6BQ6, 1N34 diode, and an overload pilot light.

*Comments:* Fairly easy to operate. Medium size (slightly smaller than the Simpson Model 382); has carrying handle. Has positive or negative sync outputs. Signal injection provisions do not include gain controls. CRT is not driven to full deflection by vertical signal injection at the vertical output tube's plate, though sufficient deflection is provided to determine if the stage is operating.

### Sweep Component Tests

The great mystery surrounding flyback and yoke checking is prompted by the inability of "standard" service instruments, such as ohmmeters, to detect a breakdown other than a direct short or complete open circuit. Unfortunately, many flybacks and yokes are "un-

cooperative"; they frequently exhibit a short of only one or two turns. These small shorts don't change the overall resistance of the component enough to permit a service shop ohmmeter to detect a definite ohms difference. Therein lies the service problem.

Service technicians frequently trace a defect to a questionable flyback or yoke and install a new component. Sometimes it works; sometimes it doesn't. Whether it does or doesn't, these time-consuming guessing games are unnecessary today—and unprofessional!

All the sweep circuit test instruments previously described have facilities to test flybacks and yokes. Most employ a grid-dip meter principle that measures the Q of a coil with the TV set turned off and the component disconnected from the circuit. Some employ a substitute yoke load to check both flybacks and yokes with the set turned on. Also, test instruments that have signal substitution provisions can effectively detect a defective flyback or yoke by eliminating other stages (set is turned on for these tests).

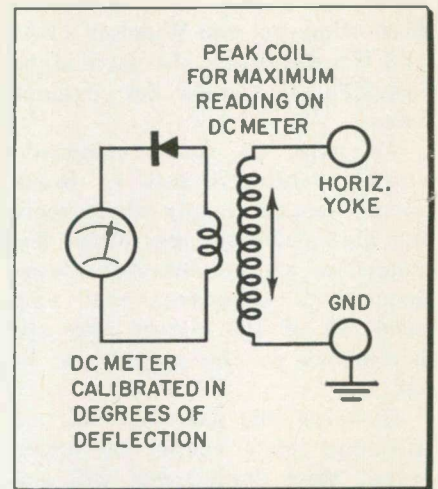


Fig. 4—Sencore's internally substituted yoke is employed to check flybacks as well as yokes. The flyback's transfer of energy to the yoke is picked up by a coil, rectified and fed into a d-c meter whose scale is calibrated in deflection degrees.

We will discuss the grid dip static type and substitute load dynamic tests here, leaving the signal substitution applications for Part II, which will appear next month.

Test instrument manufacturers that utilize the out-of-circuit Q measuring principle to check fly-

## SWEEP TEST INSTRUMENTS

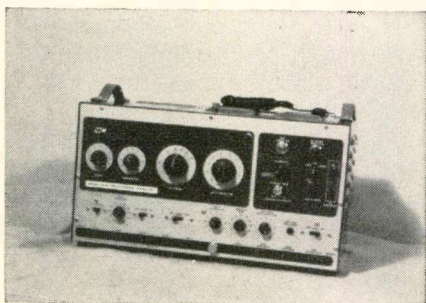
Models & Prices	Component Tests			Signal Injection			Miscellaneous		
	Overall Horiz Defl System	Flyback	Yoke	Other	Vert Defl System	Horiz Defl System	Sync	Other	Indicator
B&K Model 1070 \$74.95		✓	✓		✓	✓	Composite (D)	1. B+ Boost neon indicator 2. HV indicator neon	Neons, TV's CRT
DOSS Model 250 \$129.00		✓ (A)	✓ (A)	✓ (B)				1. "No circuit-trace" VOM readings 2. Horiz freq measuring	Meter, neons
EICO Model 944W \$34.95		✓	✓						Meter
SECO Model FB-4 \$38.95	✓	✓	✓						Eye
SENCORE Model 55-105 \$42.95		✓ (A)	✓ (A)		✓	✓	Hor	1. Output tube K current 2. D-c Voltmeter	Meter, neon, TV's CRT
SIMPSON Model 382 \$69.95	✓	✓	✓	✓ (C)					Meter
WINSTON Model 820 \$69.95		✓	✓		✓	✓	Ver, Hor, Comp		Neons TV's CRT

- A. Substitute internal yoke load
- B. Coil inductance
- C. Capacitors
- D. Addit. output: blanking bars

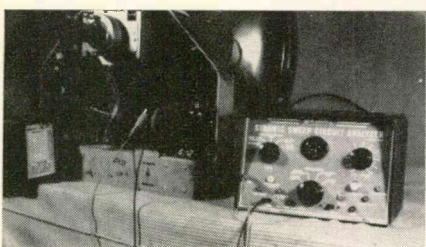
backs and yokes are: B&K, Eico, Seco, Simpson, and Winston. (B&K and Winston units also have signal injection provisions for dynamic tests.)

As with all static component checkers, intermittents or breakdowns that occur only when receiving high pulse voltages under load conditions are not detected. Consequently, a component that tests good out of the circuit may still breakdown in the plugged-in TV set.

However, the usefulness of out-of-circuit tests cannot be underrated. Most breakdowns will succumb to these tests and indicate "Bad" or "Replace" if defective. The few components that check good, though breaking down in the set, will put the technician back in

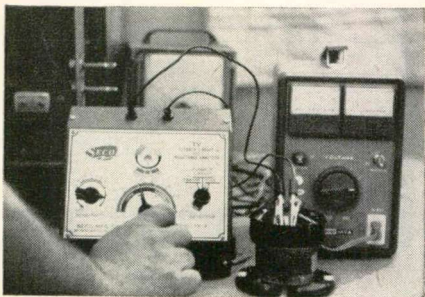


Front view of B&K 1076 TV Analyst. Unit can test flybacks and yokes out-of-circuit and provide sweep signal tests.



Winston tests Admiral TV's flyback for shorts with the set turned off.

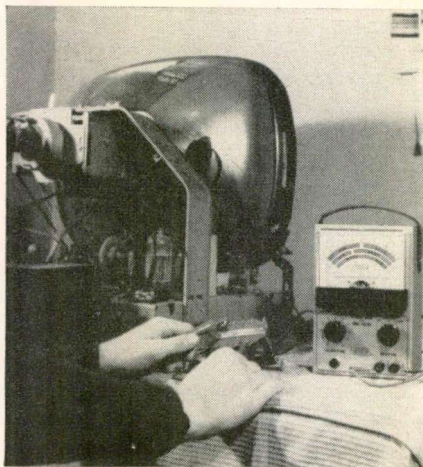
Seco FB-4 checks yoke winding (open eye indicates "good"). Other instruments here are: Eico power supply (foreground) and Heath VTVM (background).



the position he was in before using the instrument—part substitution. Summarizing, the technician will have gained, say 80%, to pluck a number from the sky, knowledgeability of flybacks' and yokes' operating condition.

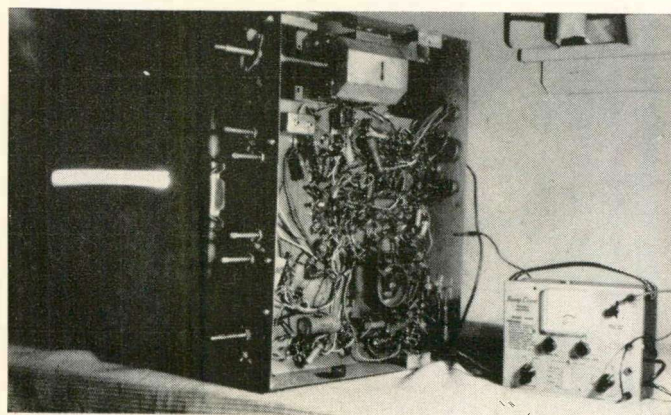
Every instrument here has a setting up procedure before testing components. The manufacturer may use a "calibration," "sensitivity," or "meter" control to compensate for line voltage variations and instrument component value changes, etc.

Two instruments, Seco Model FB-4 and Simpson Model 382, give a quick check of the *entire* horizontal deflection system without disconnecting circuits. (Simpson directs lifting off the plate cap lead of the horizontal output tube, while Seco doesn't require lifting the cap.) One lead is attached to B- or ground. The TV set is turned off. Results are read on the instrument's indicator; a meter in the case of Simpson and "eye" tube for the Seco (see Fig. 2).



Flyback continuity checks "good" with an Eico Flyback & Yoke Tester.

Sencore's substitute winding for the set's horiz. winding restores high voltage (see vertical line).



The measurements are based on all TV sets' horizontal output transformer, coils, distributed capacity, etc., being self-tuned to about 50 Kc. A short or open will severely influence this resonant frequency.

If the horizontal system components collectively check satisfactorily, it indicates that the defect is *before* the output circuit; perhaps in the horizontal oscillator, for example. (Again, this assumes that components do not break down only under load.) If a defect is indicated, further inspection in the output circuit is necessary to locate the offending component. Now, the B&K, Eico, and Winston instruments can be brought into play, together with the Seco and Simpson (which was not used in actual tests because the manufacturer inadvertently sent us a 220 volt, 50 cycle unit).

All the previously mentioned sweep test instruments check flybacks and deflection yokes by measuring the relative quality of a component's Q. If the inductive reactance of a component is reduced, while the resistance remains fairly constant, the Q will be lowered. Even one or two shorted turns will decrease the Q sharply and can be identified by a SHORT test.

### Yoke Tests

With the set still turned off, a deflection yoke test may be made if this component is suspect. Some manufacturers specifically recommend that a continuity test be made first; others recommend that a short test be made first.

B&K's 1070 provides a direct signal to the yoke's vertical winding, which in effect is a dynamic check since it is made with the set



turned on. The horizontal winding, however, is out-of-circuit checked for continuity and shorts. Disconnecting the horizontal windings from the TV set, B&K test leads are inserted into "Leakage-Continuity" jacks and the "Calibrate" control is turned counter-clockwise to the "Leakage-Continuity" position. Test leads are placed across the winding. Continuity is indicated by a glow of the test indicator lamp. Leakage from vertical winding-to-horizontal winding and windings-to-frame can also be determined by the glow of the test lamp. (Glow from 0-10 megohms.)

To test a short in a yoke's horizontal winding, B&K employs a shielded cable that attaches to a "Flyback-Yoke" output. After adjusting the "Calibrate" control until the test indicator lamp just goes out, the leads are attached across the winding. If the lamp glows the winding has a short.

Eico's 944 checks the horizontal and vertical windings of a yoke. After calibrating the instrument, one lead from each section is disconnected (any resistor shunting the coils must be disconnected).

The selector switch is set at "Continuity" and the calibration control is adjusted. After inserting test leads in the test binding posts, the leads are connected across the winding being tested. The meter should point somewhere in the "Good" region. If the pointer remains stationary or falls into the "Bad" region the winding is for all purposes open-circuited.

For a short test, the selector is attached to "Short" and the instrument is calibrated. Once again, the pointer should read in the "Good" region of the meter's scale if it is satisfactory. If not, the pointer will dip into the "Bad" section.

Seco's FB-4 gives an indication of whether the yoke or flyback is defective through their initial overall horizontal systems check, depending on how open or closed the eye tube indicator appears. Further, horizontal and vertical windings can be checked for shorts by connecting the two test leads to one of the two coils of a winding and setting a "Frequency Control" knob. A function switch is turned to "Yoke." The eye indicates if the winding is good or not. Checking the second coil of a winding is

recommended since they should check out exactly like the first. (Vertical coil damping resistors must be removed.) The FB-4 does not check continuity or leakage. This has to be done with an ohmmeter.

Simpson's 382 uses a coaxial cable for test leads. When testing for shorts in the horizontal winding of a yoke, the function switch is set for "Shorts." Applying the test leads across the horizontal winding (unit doesn't check vertical winding), the meter pointer will indicate "Good" or "Replace."

Continuity is checked in the same manner, except that the function switch is set for "Continuity." The test uses an a-c ohmmeter circuit.

Winston's 820 employs a "Type" switch that can be turned to either black & white or color yokes position for deflection yoke testing. The color position is for yokes 16 millihenrys and higher, where color yokes will normally fall. The function switch should be turned to "Short test." After calibrating the unit, the yoke under test should be unplugged or the hot leads of each winding disconnected. Test leads placed across either the vertical (damping resistors must be disconnected) or horizontal winding will test for shorts or opens. If the neon indicator continues to glow or flicker the winding is not shorted; If the neon is extinguished, the winding has a short.

Continuity tests are accomplished after setting the function switch to "Continuity" and type switch to "Calibrate." A "Cal-Freq" control is turned maximum clockwise to make the indicator glow when test leads are shorted. Connecting leads across a winding will cause the neon to glow if continuity exists. Leakage tests can be made with these control settings, also. The indicator is, once again, the neon lamp. The neon shouldn't flicker at all if the yoke is good.

#### Flyback Tests

When testing flyback transformers out-of-circuit, it is necessary to disconnect all associated components, such as yoke leads, output and rectifier plate cap leads, one side of the width coil, etc., unless otherwise indicated. The TV set is

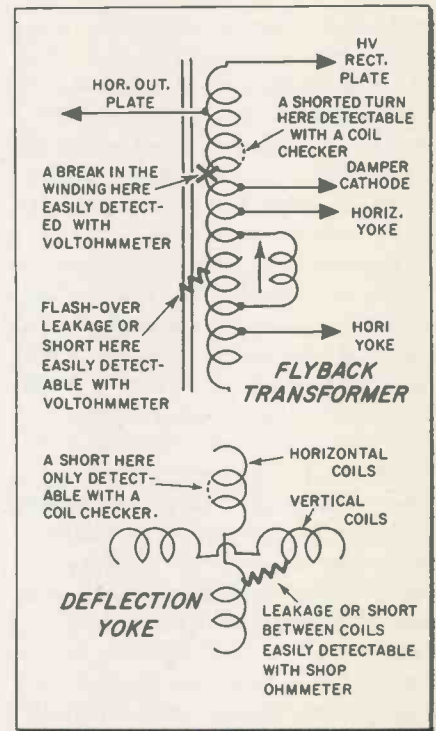


Fig. 5—An ohmmeter can usually reveal open circuits or leakage, but can't detect a low number of shorted turns. You need a coil checker or signal injector to accurately locate this trouble.

turned off, as in all other static tests here.

B&K employs the same basic method of checking flybacks as checking yokes. Continuity of the various flyback windings may be measured. A short test is made by connecting the unit's shielded cable between the plate lead of the horizontal output tube's cap lead and the high voltage rectifier's cap connector.

Eico employs the same flyback checking method used for yokes. The manufacturer suggests removing the HV rectifier tube from its socket. The unit is calibrated so that the meter pointer is set at the "Air Core" meter scale position or the "Iron Core" position, depending upon which type transformer is tested. The test leads are placed at the two plate cap terminals of the flyback for short tests. Results are read on the meter as "Good" or "Bad."

Seco uses the same method to check flybacks as yokes. A function switch is turned to "Trans." and the two test leads are connected to the primary of the flyback or the equivalent primary if an auto transformer is tested (manufacturer's manual indicates test points for different transformer

designs). Using the sensitivity and frequency control settings suggested by the manufacturer, the eye tube indicator should open if the flyback is free of shorts. Flyback continuity can be checked by shorting out each winding and observing the eye indicator for signal loss if continuity exists.

Simpson uses the same method to check flybacks as yokes. The shielded cable is connected between the horizontal output plate cap lead, which is removed from the tube, and receiver ground. With the function switch set at "Shorts" the meter pointer will indicate "Replace" if there are one or more shorted turns in the flyback. (See connection drawing in Fig. 3). For continuity tests, the grounded lead is transferred to the plate cap of the HV rectifier tube. Setting the function switch at "Continuity," the pointer will indicate "Replace" or "Good." Other coil sections are tested in a similar manner.

Winston checks flybacks in the same manner as yokes. The Type switch, however, can be switched to iron core or air core positions, whichever one is applicable. Test leads are connected between the high voltage rectifier's removed cap lead and the horizontal output tube's removed cap lead. If the neon indicator glows or flickers the component is not shorted. If it's extinguished, it is bad.

#### Substitute Load Tests

Both Doss and Sencore utilize an adjustable substitute yoke load as a basis for checking flybacks and yokes. These tests are made with the TV set turned on.

Sencore suggests that the horizontal winding of a yoke be checked (by a substitute load) before checking the flyback under similar conditions. The test method is a simple one—and a dynamic one, since the TV set is operating. Here's how the SS105 is used to check a yoke: The high side of the yoke in the TV set being inspected is disconnected (if the yoke has three leads, disconnect the center one also). A test lead is inserted into a "Horiz Yoke" jack (a red high voltage lead is provided for this purpose) and another lead is inserted in a "Gnd" jack. The red

test lead is now connected to the terminal where the TV set's yoke lead was removed. The ground lead is connected to chassis ground (not the low side of the yoke).

Turning the set on, the user moves the millihenrys control up and down (range: 5-40 millihenrys), meanwhile observing the CRT screen for a bright vertical line. It's also advisable to watch for restoration of high voltage by monitoring the second anode lead with a HV probe, listening for the flyback "whistle," or other method because the CRT may be defective or ion trap misaligned and not show a vertical line. If high voltage returns, the yoke is defective.

Flybacks can also be checked with the aforementioned setup. Setting the meter selector to "Flyback Check," the set is turned on and the millihenry control is moved for a peak on the meter. The meter has a flyback check scale calibrated in degrees of deflection. If checking a 90 degree yoke the peak should read 90 or more degrees if the flyback is good; slightly under—the flyback has shorted turns; no reading—the flyback is open.

The HV rectifier lead should be disconnected to insure that a tube short doesn't affect the reading. Also, a defective component in the transformer's load circuit will show up as a defective transformer. If the meter indicates a defective transformer the user should test these components (capacitors, linearity coils, or width coils) before changing the flyback.

The flyback check uses a yoke load in this manner: A small pickup coil is wound on the instrument's variable inductance yoke to pickup energy delivered to the yoke by the flyback. The amount of energy is proportional to the degree of deflection. This a-c energy is rectified and fed into the d-c meter, which is calibrated in deflection degrees. See Fig. 4.

Doss' Model 250 operates in the same basic way. The meter here reads horizontal output cathode current. If a flyback is good, cathode current will change about 12 to 20 ma (an upper neon lights) when moving the variable yoke inductance control. Current changes from about 20 to 60 ma (lower neon lit) for autotransformer types. The unit's yoke inductance

can be varied from 4 to 36 millihenrys.

#### Test Results

All instruments (except Simpson's 220 volt, 50 cycle unit) were put through their paces by ET's Editors. The Editors employed the instruments to check numerous flybacks (including autotransformer and conventional transformer types) and yokes (including 52°, 70° and 90°). Some parts were known to be good, others were known to be bad. One yoke was questionable, breaking down only under load.

Excluding the component that only became defective under operating conditions, our findings were as follows:

The Seco FB-4 indicated a defect in the overall horizontal circuit when a flyback loading component other than the flyback and yoke was defective (we shorted turns of a width coil in a 16" Garod TV set). The subsequent component tests indicated that the flyback and yoke were good. However, we did learn from overall circuit and flyback-yoke tests that some other component in this area was defective. Simpson's 382 also provides an overall circuit check.

In addition to Seco's and Simpson's instruments, the other static component testers, B&K, Eico, Doss, and Winston, identified whether a yoke or flyback was good or defective. However, because they don't provide an overall circuit check, they did not indicate another defect existed in the circuit where width coil turns were purposely shorted. (B&K, Sencore, and Winston can check the overall circuit through signal injection.)

Some questionable readings were evidenced with some components. However, comparing readings of a known-to-be good component of the same type can guide the user.

The yoke that broke down only under load (in an Admiral 21A3Z chassis) could not be detected as bad by any of the out-of-circuit test instruments; they indicated that the yoke was good. Only the Sencore and Doss instruments correctly revealed the yoke as being defective. (High voltage was restored by substitution.) Using the

*(Continued on page 58)*



# When To Choose Fringe TV Antennas For Strong Signal Areas

## Applying DB Gain & Polar Response To Overcome Poor Reception

DAN GEORGE

• Although TV reception is generally considered satisfactory in most areas close to the transmitter, technicians are often confronted with reception problems at these points. In fact, a separation of only a few streets between customers can mean the difference between good or poor reception.

In view of the large number of spotty reception areas, it's the wise technician who asks his antenna customer pertinent questions *before* installing an antenna. A few well directed questions about previous reception, neighbors' reception, etc., can frequently aid choosing a satisfactory antenna type.

A troublesome ghost in a close-to-the-transmitter area would be a typical example of an antenna problem. The installation would

have to overcome whatever reception difficulty is causing the ghost. This could be, as an example, water towers and apartment buildings. How successfully a technician overcomes this and similar difficulties may depend on his antenna theory background, as well as his practical experience.

### What Is Antenna DB?

Antenna specifications in advertisements or brochures can be meaningless unless the proper antenna is selected for the particular job. Decibel gain indicates a particular antenna's gain above that of a standard half-wave antenna (for every six db gain the antenna voltage is doubled).

As an example, if an antenna is rated at 24 db gain, the signal available at the TV tuner will be 16 times that of a standard half-

wave antenna's pick-up. The relationship of db gain to voltage ratio is as follows:

Voltage Ratio	Power Ratio	DB Gain
1	1	0
2	4	6
3	9	9.5
7.07	50	17
10	100	20
20	400	26
31.6	1000	30

In special problems, a technician could use the test set-up, shown in Fig. 1, to help find a workable an-

Fig. 1—Using a dipole antenna and field strength meter, a technician can determine area signal strength and choose an antenna with suitable db gain. Meter leads are attached across antenna terminals.

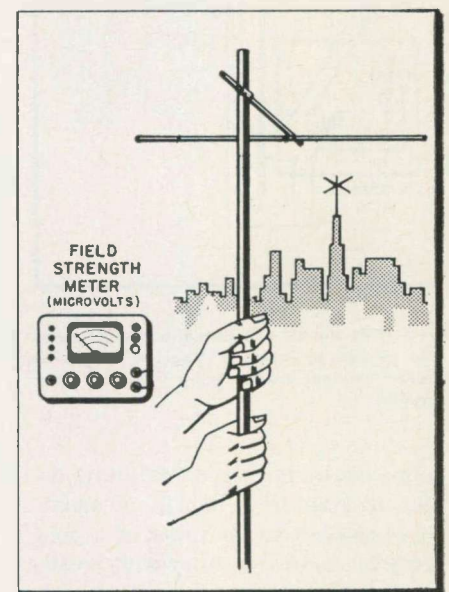


CHART I

Antenna	db gain	Bandwidth	Field Pattern	Remarks
Conical	2½ to 4db LB 4 to 6db HB	Broadband, with minimum drop off if cut for channels 2 or 3	good on LB Fair on HB	Sensitive to reflections
Yagi	8 to 13db depending upon number of elements	Broadbanded types or very narrow band antennas available	boasts the channel far which its cut, having equal coverage of rest.	Suitable antenna for fringe area reception and is very directive as well.
Inline	1½ to 3db LB 4 to 5db HB	broadband, minimum drop off on low band.	good coverage of all channels	Very sensitive, can be aimed for ghost elimination in strong signal area.
Dipole	0	narrow	good on 2, 4, 5 poor on HB	Simple antenna for very high gain area. Of no use in fringe area.

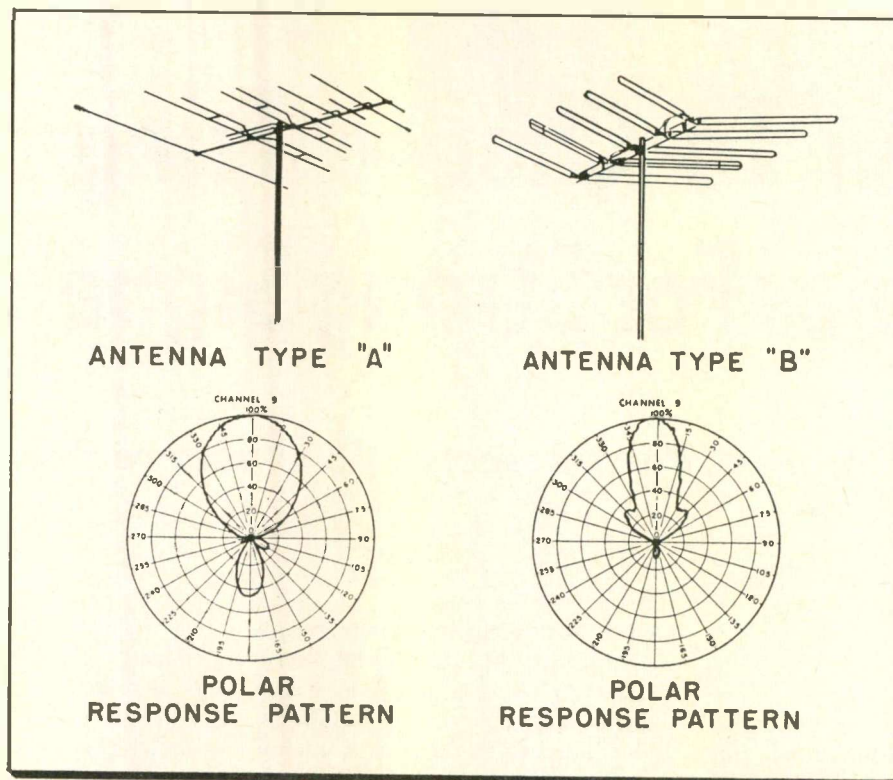


Fig. 2—(A) Offers high gain and directivity, but pattern indicates this antenna is a poor selection for ghost areas. (B) Has high gain, very directive, and pattern shows this antenna would be very useful in areas where ghosts are a problem.

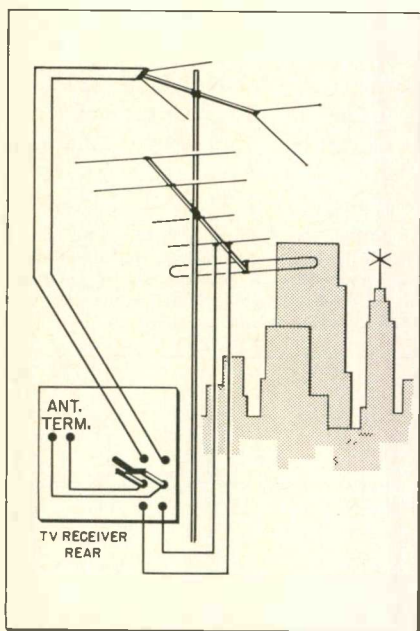


Fig. 3—This double-run antenna system overcame ghosts by using a Yagi to boost the affected channel, and a Flying V for the other channels.

tenna. By mounting a standard dipole antenna to a length of mast, and feeding it to the input of a field strength meter, a microvolt reading for comparison checking can

be obtained. Using an antenna chart would allow the technician to select a suitable antenna, giving useful gain, frontal lobe sharpness, and front-to-back ratio characteristics.

#### Choosing An Antenna

Many types of VHF antennas can be found at the local parts distributor. Among them are the conical, yagi, broad-banded yagi types in a number of configurations, in-line, and others. One or more of these available antenna types can generally be depended upon to provide optimum results under almost every type of local condition.

The average "ghost" situation, for example, calls for application of antenna theory to help select the proper antenna and solve the problem in a practical manner. Sharpness of the antenna's frontal lobe, front-to-back ratio, and its overall gain usually governs choice. A manufacturer's polar response pattern generally contains enough technical information to establish the antenna's limitations.

An example of two polar re-

sponse patterns are shown in Fig. 2. In (A) an antenna offering suitable gain and satisfactory directivity characteristics is shown. This antenna would be useful in areas where signals are weak but where the ghost problem is at a minimum. In pattern (B) the antenna offers somewhat higher gain and sharper directivity. The front-to-back ratio of this antenna indicates that it would reject most signals from its sides and rear. Hence, it would be useful in a ghost area. Naturally, the antenna selected for a critical area must have at least the aforementioned characteristics shown in (B) to permit pinpointing the TV transmitter by proper orientation.

Before sharp directivity and high gain antennas became available, service technicians sometimes employed a wire-mesh "trap" mounted a few wavelengths away from the original installation to reduce an unwanted ghost. This obstruction would cause some of the ghost signal to reflect away from the antenna. This method proved rather inadequate.

Ghosts caused by reflected signals are best treated as any other



broad band interference that cannot be eliminated externally or internally by normal means. It can be eliminated only by increasing the receiver's signal-to-noise or signal-to-interference ratio. Paradoxically as it may appear at first glance, this can be done by decreasing the receiver's input, or by increasing antenna gain—depending upon circumstances.

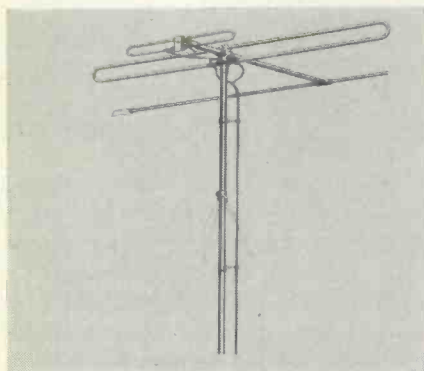
For example, suppose the TV receiver is in an area where the signal at the receiver input measures 1,000 microvolts. A strong ghost is reflected from a high building, tank, or hill—a mile away at an angle of 90° from the antenna's frontal lobe axis. Suppose the ghost signal represents effectively 50 microvolts at the antenna. If the signal input to the receiver is attenuated with a variable pad—the ghost signal is attenuated accordingly in approximate proportion. Hence, at some point above the receiver's normal input requirements the reflected signal disappears be-

low the receiver's normal operational level.

On the other hand, if the ghost is being reflected at a sharp angle, say 30 degrees, from the antenna's frontal lobe direction, and the direct signal is slightly above normal requirements, the problem can best be solved by installing a very high gain antenna having very sharp directivity. If only one channel is

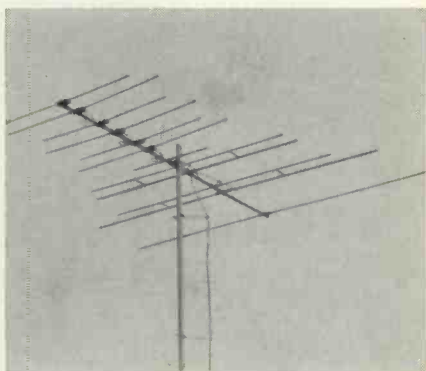
involved, obviously a straight, multi-element, single channel yagi would be employed. If a number of channels are being received on one antenna, the ghost will probably appear stronger on one station than on others—and a rotor for orienting, or a variable pad for adjusting signal input to this single channel may be employed.

There are many high gain antennas available, and the technician's choice is often determined by past experiences: Fig. 3 is an example of how an antenna problem was solved through the use of a "yagi" and "flying V." This run was terminated at a DPDT switch mounted to the back of a TV receiver. The antenna Chart I which includes gain, bandwidth, field pattern and area of usual application of various antennas, can aid the technician in solving most unusual reception problems. •

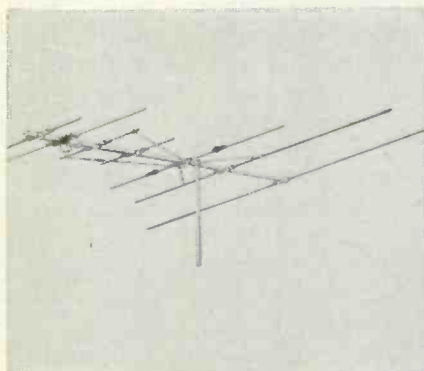


**Amphenol**

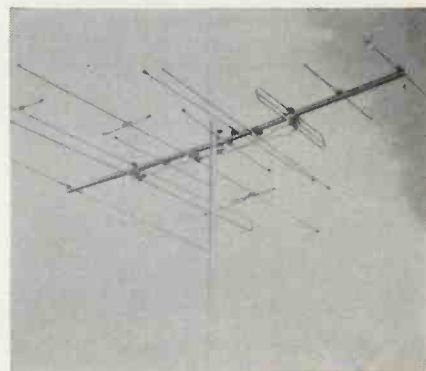
*Illustration Credit: RCA Service Co., Camden, N. J.*



**Channel Master**

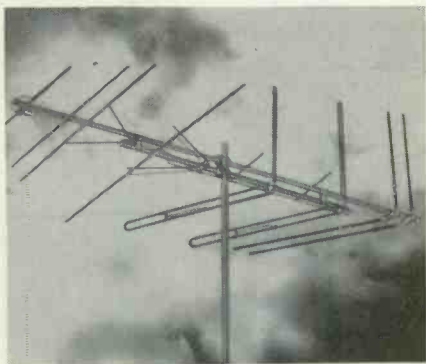


**Clear Beam**

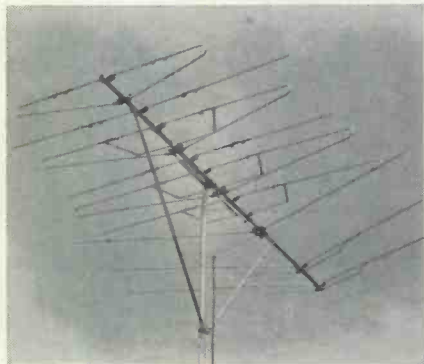


**JFD**

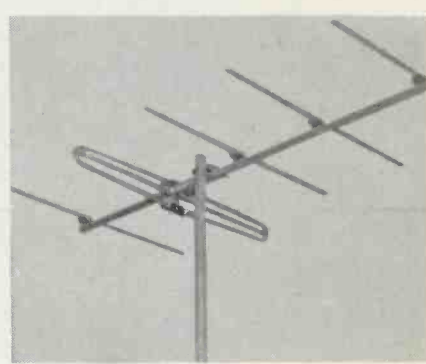
**Taco**



**Trio**



**Winegard**



# Communications at Timken Roller Bearing Co.

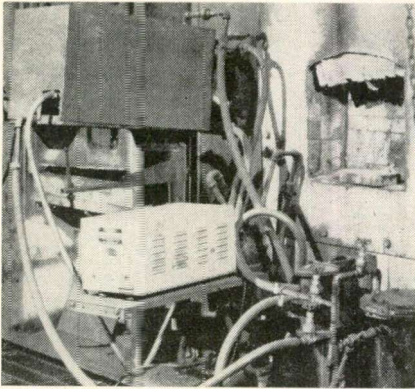


Fig. 1—A Diamond Power Specialties Corp. "Utiliscope" TV camera and power supply in action at a re-heat furnace.

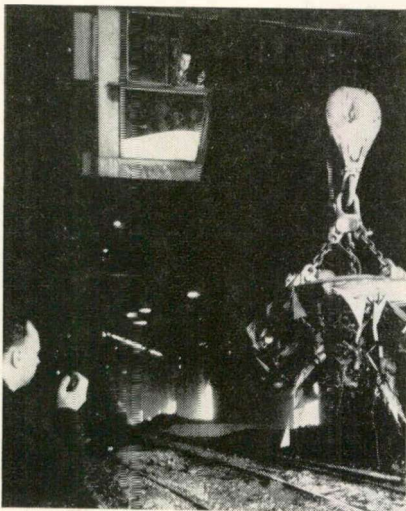


Fig. 2—Overhead crane operator in cab receives instructions from the ground via two-way carrier-current radio.

• The Timken Roller Bearing Co., Canton, Ohio, is a good example of how large manufacturing firms are improving operating efficiency through an effective communications program.

## Plant Applications

As an example, closed-circuit television systems are employed in Timken's tube mill operation to prevent pile-up or misalignment of steel tubes which are automatically moved through a furnace. A second furnace, utilized to cool tubes, also employs CC-TV to position steel tubes as they are stacked and moved. Both operations are supervised by one control operator. Company-modified RCA 8" portable TV sets are used as monitor TV units. See Figs. 1 and 3.

Two-way radio communications equipment is also used extensively for routing material handling carriers and in-plant and outside traffic dispatching. Diesel locomotives that transport scrap iron and ores to Timken's melt shop are equipped with tone-controlled mobile radio units to eliminate distracting "chatter" that often resulted in locomotive operator lowering the sound volume—and consequently missing calls.

Overhead crane carriers, whose operators are comfortably ensconced in enclosed, air conditioned cabs above the heat and fumes of steel-making operations, are no longer contacted by hand signals. Instead, an intercom-type system powered on the same lines used by the cranes provides the communications link with the ground, as shown in Fig. 2.

## Test Instruments

Service and maintenance is provided by Timken-employed technicians. The Company's well-equipped electronic maintenance shop helps keep electronic gear in top operating condition, thus minimizing expensive down-time. A corner of the electronic shop, shown in Fig. 4, illustrates the high-quality instruments employed. They may be identified from left-to-right, as follows:

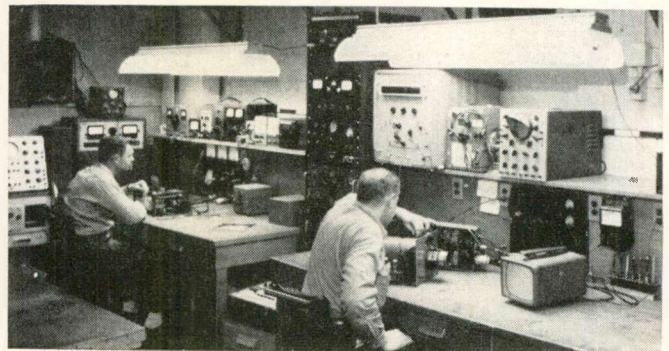
### First Bench

Tektronix Model 545A Oscilloscope  
Motorola Frequency & Deviation Monitor  
Heathkit Oscilloscope OL1 (on top of Monitor)  
Electro Model F D-C Power Supply  
Triplet Model 625-NA VOM  
Triplet Model 1236 Crystal Calibrator  
(Continued on page 70)

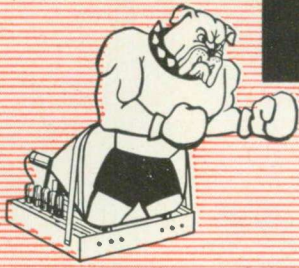


Fig. 3—Operator in control pulpit makes certain steel tubes are properly positioned, using two separate TV monitors.

Fig. 4—Timken's impressive array of electronic test gear aids technicians' service work. See Text for equipment identification.







# "Tough Dog" TV

# Corner



## Difficult Service Jobs Described by Readers

### Sound And Picture Interference

Recently, a Crosley TV, Model No. H17TOBHa, came into my shop for repairs. The complaint was "flashing" in the picture, and a "crackling" noise in the sound.

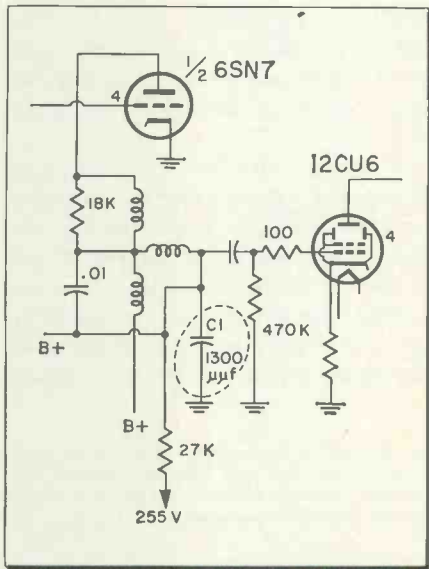


Fig. 1—Picture flashing and cracking sound in a Crosley TV Model H17TOBHa was traced to the circled capacitor.

Since the defect appeared in the sound and picture, I thought it might be a defect in the B+ supply.

A scope check for noise pulses in the B+ supply indicated I was on the right track. However, after substituting parts in the B+ supply, the trouble still remained.

I then decided to troubleshoot the horizontal section with my Sencore SS105 Sweep Circuit Analyzer (using the instrument's substitute pulse) since the trouble caused horizontal flashing.

I fed in a signal from the analyzer to the horizontal output tube's grid, and the flashing no longer ap-

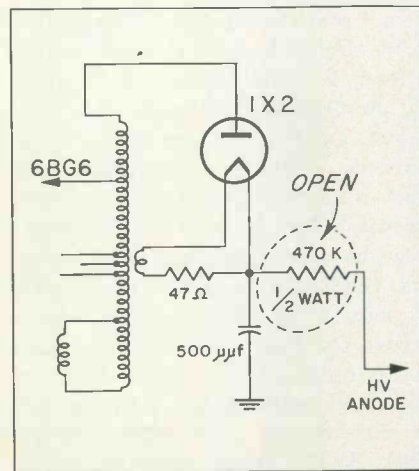
peared on the CRT screen! This indicated the trouble was originating somewhere before the horizontal output tube—probably in the horizontal oscillator.

Referring to the manufacturer's schematic, I traced the line in the horizontal oscillator circuit between B+ and ground (deducing that leakage between B+ and ground was causing the trouble). Capacitor C-1, shown in Fig. 1, was substituted and the set returned to normal operation.—George Wanless, Merrill, Wisconsin.

### Bars From HV Arcing

A Hoffman TV chassis, Model 156, was brought to the shop for repair. The customer complained that the screen would suddenly show a number of horizontal bars

Fig. 2—Horizontal bars in a Hoffman TV Model 156 were caused by an open resistor in the HV rectifier circuit.



### TOUGH DOGS WANTED

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

when the brightness control was advanced.

I placed the set on the repair bench, turned the power on, and observed that the number of bars changed when the brightness control was varied. Also, an audio tone could be heard. An a-c voltage was observed on my scope and measured with a VTVM at the grids of a number of the set's tubes. By using a plastic tube held to my ear I was able to hear an audio tone (with the speaker disconnected) at the HV filter capacitor.

When the 47ohm and 470K resistors at the 1X2 socket, shown in Fig. 2, were disconnected from the circuit, the sound stopped. Of course the raster disappeared from the CRT also. The two unsoldered resistors were checked with the VTVM. The 470K resistor checked completely open. After it was replaced the set worked normally.

Apparently the high voltage was arcing internally across a small open gap in the resistor. The frequency of the discharge also varied with brightness control variation.—Maury Kerr, Redondo Beach, California.

# Auto Radio Noise Reduction Techniques

## Coaxial Type Capacitors Prevent Ignition Noise From Interfering With Radio Reception

WILLIAM ASHBY  
Cornell-Dubilier Electronics Div.

• A natural byproduct of an automobile's (or marine craft's) ignition system is an r-f signal that interferes with radio receiver reception. Any part of the ignition system that sparks due to make-break electrical contacts can be an interference offender, which includes the distributor, voltage regulator, and spark plugs.

One method employed to reduce noise due to contact arcing is the *confinement* method. Here, any source of noise is isolated and the entire area is completely shielded to prevent r-f radiation. Although this procedure is effective, it is a relatively expensive way to reduce interference. In most cases, noise due to spark discharge, arcing contacts, generator brushes, etc., can

be economically reduced to reasonable levels by noise *suppression* methods. This is accomplished by bypassing r-f energy to B- through capacitors.

### Noise Suppression Capacitors

Noise suppression capacitors are utilized to prevent ignition noise from entering the receiver and, thereby, causing static. This can be accomplished with conventional bypass capacitors that are specially enclosed in weather-proof metal housings which also act as a "ground" lead. Their effectiveness depends on actual circuit conditions. That is, capacitors have different load impedances to r-f at the point of bypass. This results in varied noise component bypassing abilities. Further, their bypassing effectiveness greatly diminishes in Citizens Band and FM receiver megacycle frequency areas.

In order for a bypass capacitor to be effective when shunted across a load,  $Z_L$ , the bypass impedance,  $Z_B$ , should be relatively small. As shown in Fig. 1, the bypass impedance, including capacitance and lead inductance, forms a parallel circuit. The bypass effectiveness may be calculated by considering the reduction in total impedance,  $Z_T$ , caused by shunting the bypass across the load. For example, a  $Z_B$  of 10 ohms placed across a  $Z_L$  of 100 ohms reduces the  $Z_T$  from 100 to 9.1 ohms:  $(10 \times 100)/(10 + 100)$ . So the bypass effectiveness is

90.9%. If, however,  $Z_B$  were 10 ohms and  $Z_L$  were only 1 ohm, a similar calculation would show only 9% effectiveness. Cross sectional basic structure of a regular type bypass capacitor is shown in Fig. 2.

A better capacitor for noise suppression is the co-axial or feed-thru capacitor. This capacitor is designed to completely surround the conductor carrying the r-f component. Since r-f currents travel on the conductor's surface, removal of the noise component is more effective.

Fig. 1—To be highly effective a bypass capacitor's r-f impedance should be small compared to the r-f load impedance.

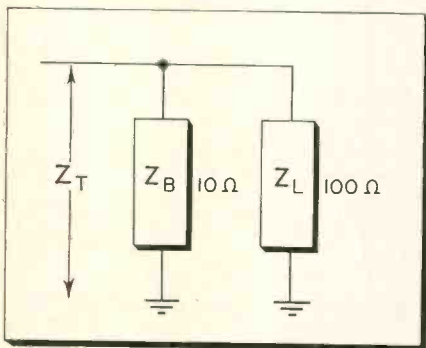
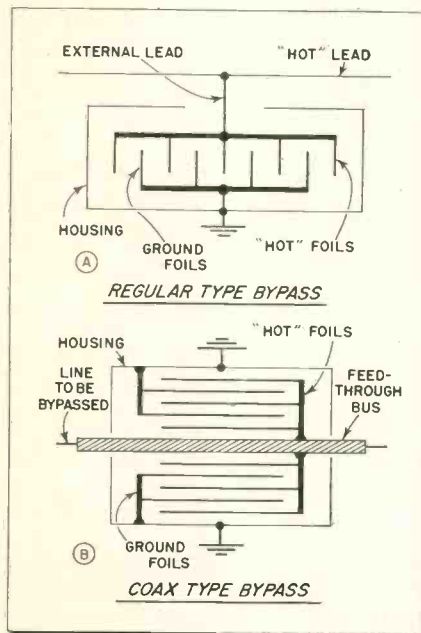


Fig. 2 (top) Basic structure of a regular type bypass capacitor, and (bottom) coaxial type structure which provides more effective filtering at higher frequencies.





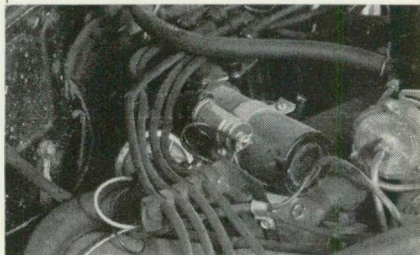
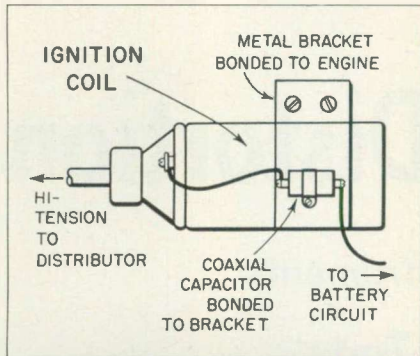


Fig. 3 (top) Drawing of ignition coil terminals, cables, and proper placement of coaxial capacitor. (Bottom) Spark coil with coaxial capacitor securely attached and grounded to coil's mounting strap.

tive using co-axial capacitors than conventional bypass capacitors (See Fig. 2).

### Receiver Installations

When a technician installs a receiver in an auto or boat that has not been properly prepared for noise suppression, he must naturally accomplish this work, too. The freedom of static displayed by the receiver he installs will be largely determined by his installation and noise suppression considerations.

To begin with, mobile radio equipment must be correctly installed according to manufacturers' instructions. All equipment must be properly bonded to ground, and shielded cable having adequate size wire must be used from the d-c supply source to the equipment. Secondly, ignition suppressors or resistor type spark plugs—plus a distributor suppressor will minimize r-f radiation.

Particular care should be taken to properly bond the engine in several places directly to the main frame or common ground system. Heavy tinned copper braid should be used for bonding. This reduces radiation from the engine itself. Metal parts in proximity with the ignition system should also be bonded to the engine block. All

metal-to-metal connections, such as the metal case of an ignition coil, should be cleaned and firmly bonded to the engine. All bonding leads should be as short as possible. All metallic hose lines, mechanical linkages, etc. from the carburetor or engine accessories, should be similarly treated. Exhaust pipes should be bonded to the engine frame in several places.

### Eliminating Interference

After the receiver has been installed, together with the proper antenna, the technician faces the "acid" test: is there any static interference? If a sharp, "popping" pulse type noise is heard in the receiver when the engine is running, try a 0.5  $\mu$ f, 40 amp, 50 volt coaxial capacitor at the spark coil as shown in Fig. 3. Remove the low voltage primary wire (battery cable) from its terminal on the spark coil. Bolt the capacitor directly to the coil mounting bracket—as close to the coil terminal as possible. Connect a very short lead from one end of the capacitor to the spark coil primary terminal. Attach the previously removed primary wire (battery cable) to the opposite end of the coaxial capacitor.

Start the engine. While it is running, loosen the generator bracket and relieve tension on the drive belt until the generator stops turning. Turn on the radio receiver—with the squelch or noise clipper controls turned off. Tune the receiver to a weak signal. Listen for the "popping" pulse type noise which will vary with engine speed. The noise should be greatly reduced and weak signals should be much stronger than the noise.

Re-tighten generator bracket so that the generator is again operating normally. Listen for a grinding noise or "whine" from the receiver. If present, this interference will probably be caused by sparking at the generator brushes.

To reduce this type interference stop the engine and remove the generator. Clean mounting bracket and bosses to insure good bonding of the generator to engine block ground. Bond the generator and its mechanical mounting to the block with heavy braided strap. After the generator is replaced, install a 0.5  $\mu$ f, 40 amp, 50 volt coax-

ial capacitor close to the armature terminal on the generator, as shown in Fig. 4. Make certain the capacitor mounting bracket makes clean contact with the generator frame. Attach the shortest possible lead from the generator's voltage regulator terminal to one side of the capacitor. Attach the voltage regulator cable to the other side of the capacitor.

Start the engine again, and tune in a weak station on the receiver.

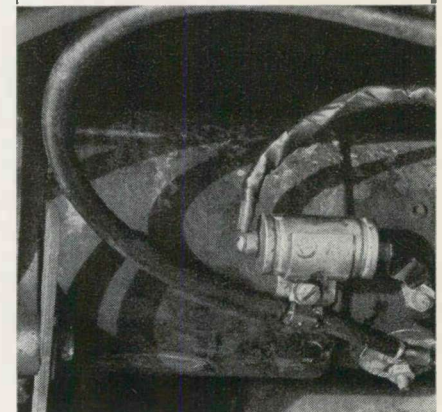
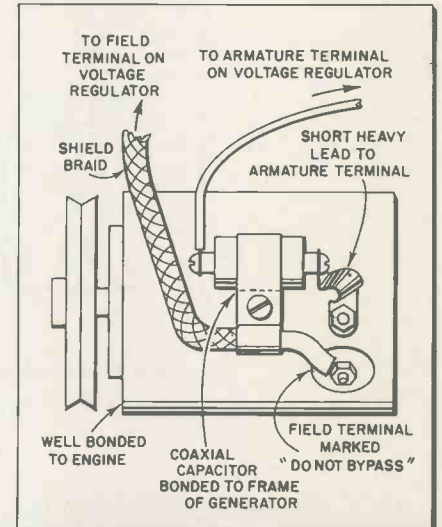


Fig. 4 (top) Drawing of generator terminals, cables, and coaxial capacitor placement. (Bottom) Generator armature is connected to coaxial capacitor with short heavy copper lead. Generator field cable is shielded from terminal to voltage regulator.

The generator brush noise should have disappeared or dropped to a very low level. Overall noise from high level sources should now be well below the bothersome level.

When spark coil and generator noise have been reduced, other low level noise may become apparent.

(Continued on page 65)

# How To Measure Hi-Fi Distortion

## Selection & Application Of Test Instruments For Harmonic & Intermodulation Tests

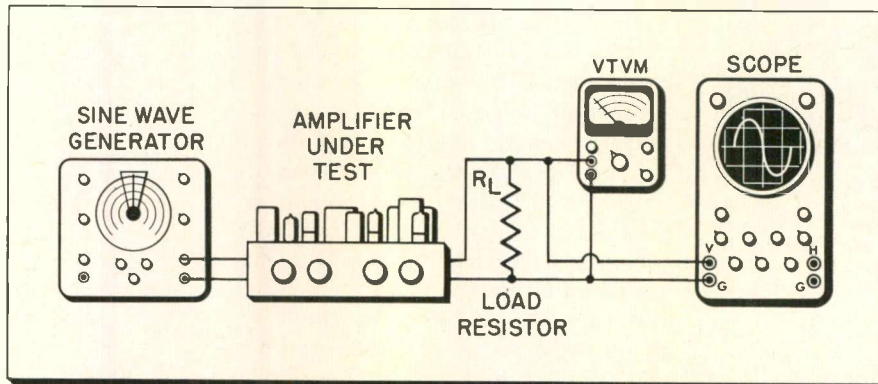


Fig. 1—Audio distortion test set-up with sine wave generator, a-c voltmeter, and scope.

MANNIE HOROWITZ  
Electronic Instruments Co.

• The three most vital requirements of a good high fidelity system are: low noise and hum, low distortion, and good frequency response. Noise and hum are the most obvious defects, and thus the most annoying to the listener. Because of its fatiguing effect, distortion probably ranks second only to noise.

Elimination of distortion has become almost an obsession with many listeners. On some occasions the service technician may feel that the customer is overcritical—but this assumption can seldom be justified. The customer must be satisfied, and usually can be.

### Types of Distortion

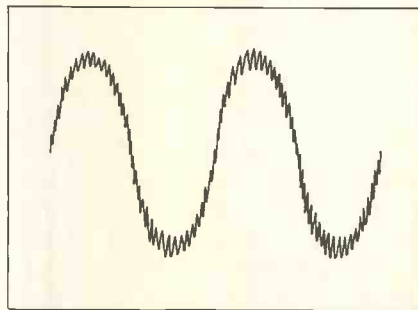
The audiophile is primarily concerned with two types of distortion: (1) Harmonic (2) Intermodulation.

**Harmonic Distortion**—It can be recalled that a perfect sine wave is normally considered to be distortion-free. Assuming that the sine

wave shape is not perfect, mathematical analysis will show that we now have harmonics: plus the initial fundamental frequency, twice the fundamental frequency (2nd harmonic), three times the fundamental, (third harmonic), etc. The amount of harmonic content in the total signal is referred to as the percent of harmonic distortion.

**Intermodulation Distortion**—IM may be compared with heterodyning in an ordinary AM receiver. As we already know, when an incoming radio signal beats with the local oscillator's signal, we obtain

Fig. 2—Two cycle scope display of a 60 cycle sine wave with 7000 cycle sine waves superimposed for IM distortion tests.



a resultant difference frequency of 455 kc (the i-f) the sum frequency of the two signals, as well as the two original signals themselves. The latter three components are discarded. Thus, at a given instant, if a 400 cycle violin tone and a 1000 cycle clarinet tone from an orchestra pass through an amplifier having IM distortion, a 1400 and 600 cycle tone would also be produced. The result would make it difficult to distinguish the individual instruments.

The distortion test set-up, shown in Fig. 1, may provide the means for satisfying most customer "distortion" complaints.

A 1000 cps signal generator sine wave is fed to the input of the amplifier under test. A load resistor,  $R_L$ , replaces the speaker at the amplifier's output. This resistor should equal the amplifier's output impedance within approximately 5%, and have a power rating at least double that of the amplifier. Output waveform is then observed on an oscilloscope while adjusting the gain. Voltage is measured on an a-c meter simultaneously. When



this output voltage is squared, and divided by the load resistance, the amplifier's output can be easily determined. The level at which distortion begins can easily be determined also. Of course, the normal or abnormal amount of harmonic distortion which may be present on the sine wave is observed on the oscilloscope screen.

Although this test may result in providing satisfaction for many customers, others will require the technician to make more exacting distortion tests. Accordingly, instruments for more refined measurements will be needed.

To check for intermodulation distortion, two audio frequencies are sent through the amplifier simultaneously. These tones are usually 60 and 7000 cps. The latter frequency's level should be set at one fourth the amplitude of the former. The resultant signal should appear as shown in Fig. 2.

The output of a linear, undistorting amplifier, will show only the 7000 and 60 cps signals on the scope trace. If distortion is present, the sum and difference frequencies, 7060 and 6940 cps respectively, will also be present. The relative amplitudes of these undesirable frequencies, as compared with 7000 and 60 cps, will determine the percentage of intermodulation distortion in an amplifier. In actual listening tests, IM seems to be a more indicative test of listening quality than does harmonic distortion.

### Test Instruments

The quality and accuracy of test instruments vary considerably. Prices usually range accordingly. The technician must select the equipment that serves his needs adequately. The degree of instrument accuracy will depend largely upon Hi-Fi quality demanded by the customer.

The most commonly required instrument is the harmonic distortion meter. In this unit's measuring process the fundamental signal is eliminated, all other frequencies are passed, while distortion percent is indicated on a calibrated meter scale. An ideal instrument response is shown in Fig. 3A. Note that the dip for the fundamental frequency,  $f_1$ , must be sufficiently sharp to pre-

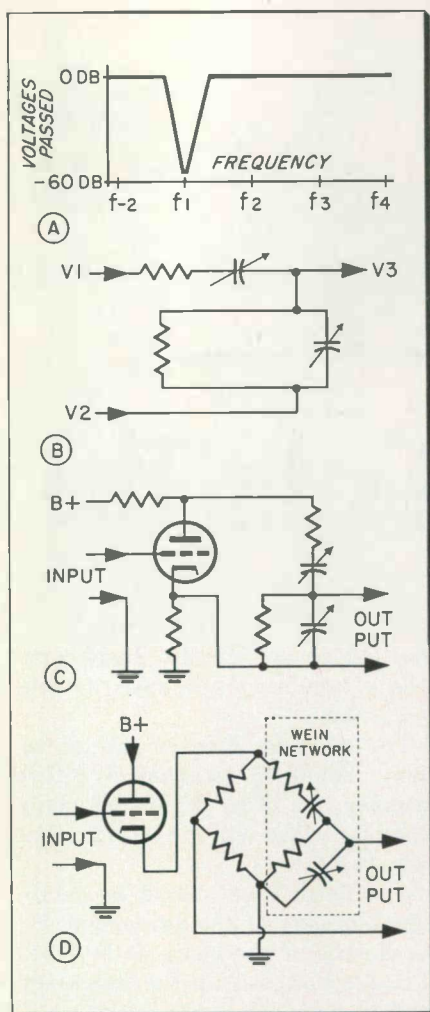


Fig. 3 (A)—Ideal frequency response of harmonic distortion meter with fundamental frequency sharply attenuated. (B)—Network employed in meter for attenuating fundamental frequency. (C)—Phase splitter circuit incorporating null network. (D)—Cathode follower circuit with full Wein bridge network for easier balancing and highly efficient fundamental rejection.

vent attenuation of the various harmonics. An inadequate instrument will attenuate at least the 2nd harmonic.

The fundamental frequency is eliminated by passing it through an RC network in the instrument circuit—essentially one-half of a Wein bridge, as shown in Fig. 3B. The network is tuned by varying the two capacitors. When proper voltages are applied to the two ends of the network, a null is obtained at the network output for the frequency under test.

Two methods are used to drive this Wein network. One is a phase splitter type circuit (see Fig. 3C), and the other is a cathode follower (see Fig. 3D). In either case, con-

siderable feedback must be used around the network for obtaining a sharp deep null—the more feedback, the greater the dip at the fundamental frequency.

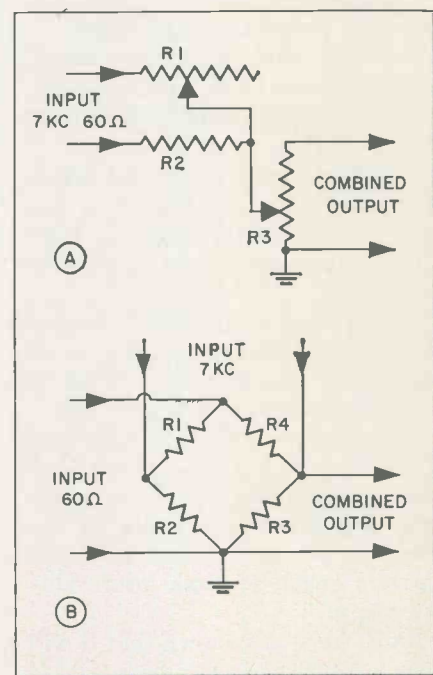
The cathode follower arrangement is considered more stable. Furthermore, the high impedance plate circuit capacity of the phase inverter upsets bridge balance. This problem does not arise in the cathode follower.

The Wein network in Fig. 3C, does all the work to attain a sharp dip. In 3D the network is incorporated in a full bridge circuit. This arrangement has the threefold advantage of providing a deeper null, easier balancing, and better fundamental frequency rejection.

Response of the instrument's voltmeter should be reasonably flat up to at least three times the frequency under test in order to include the third harmonic in the measurement. Thus, if the analyzer is to measure frequency distortion up to 20 kc, the voltmeter must be capable of linear response up to at least 60 kc.

Another consideration is the instrument's power supply regulation. Although good regulation is not a necessity, it does enhance the  
(Continued on page 68)

Fig. 4 (B)—This method of mixing high and low frequencies may result in IM distortion at the signal source. (B)—Bridge mixing provides complete signal separation and prevents interactions between two signals.





## To Avoid Disagreements After Buying or Selling A TV Shop

# Be Sure It's In The Contract!

ERNEST W. FAIR

◆ Some day, sooner or later, almost every shop owner will have an opportunity to purchase another business, sell his own, or arrange a consolidation. The problems that will arise in handling the deal are manifold but one most important stands out above others—be sure *it's* in the agreement!

Because so little data has been presented on the subject we have checked with a number of recent sale transactions, with lawyers and with accountants, and come up with a number of points that should be covered in any such agreement—subjects we should make sure are covered by the sale, purchase or merger agreement.

◆ Definite legal ownership should be established by not only inspecting titles but checking them against county clerk's records.

◆ The date should be set for taking an inventory, books closed on this date and creditors established before making the actual agreement or terms.

◆ Experience has proven it best to make such transfers of title as of the first of the month in order to expedite balance sheets involved.

◆ The agreement should, in the case of a sale or purchase, include a clause prohibiting the selling party from going into the radio-TV repair business within the area for a given length of time, preferably five years.

◆ Experience has shown that it will always pay to have a lawyer, and if

possible an accountant, handle details of any sale, purchase, or consolidation.

◆ The effective date of the agreement should be established before entering into other details, as many other decisions will hinge upon that date itself.

◆ A definite time should be established as part of the agreement for the closing of the business involved in order to speed up the necessary accounting.

◆ The assets included in the stipulated price should be set out in detail and not generalized.

◆ A check should be made for mortgages and liens against such a business or property before entering into any agreement.

◆ Where an impartial arbitrator is needed in establishing values a supplier salesman covering the territory can generally be depended upon to do the best and most impartial job.

◆ Transfer of accounts past 30 days due on the books should be avoided if possible. Generally such accounts are transferred only for collection purposes and the new owner receives a fee for handling.

◆ A base method of pricing all inventories should be established at the beginning of negotiations; whether it be cost or market value.

◆ A complete analysis of the tax situation should receive close study before an agreement is entered into; this should include all local, state, or federal taxes paid by the business.

◆ Most "losses" in such purchases occur in over-valuation of dead

stock inventory, goods almost impossible to realize value from. The newest trend in handling this situation is a dual inventory base figure, that is, one for movable merchandise of value and another for that fitting into the "dead stock" category.

◆ When such an agreement cannot be reached "pick and choose" arrangements are often made with the purchaser taking only the inventory he deems worthy of purchase.

◆ Where accounts receivable are to be collected by the purchaser a definite interval time should be established for remittance by purchaser to seller of such collections.

◆ A definition within the agreement should establish what constitutes reasonable effort on the part of the buyer to collect old accounts.

◆ A disposition of credit balances in accounts receivable should be established at the agreed time of closing of the business.

◆ Any lease, monthly and weekly rentals, including stores and concessions, prepaid at the closing date of transfer of the agreement, should be apportioned as part of the transfer agreement.

◆ All service contracts, licenses and permits of the business should be listed in detail and a determination made of those that are transferable and the agreement should stipulate which transferable items are to be apportioned.

◆ A detailed outline of insurance coverage should be prepared by the seller for the purchaser and this

*(Continued on page 62)*



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For more data, circle 4-56-1 on coupon

**12** CB Two-Way Radio: Literature covers Mark VII for use in any location having 6 or 12v d-c or standard 115 a-c. Radio Corp. of America.  
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Please send me literature of companies whose code numbers I have circled below (includes editorial and advertised items):

Note: Code 4-3-1 means April issue, Page 3, 1st item on page.

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4-4-1	4-18-1	4-24-4	4-50-3	4-53-1	4-60-1	4-63-1	4-68-2
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4-7-1	4-20-1	4-25-1	4-50-5	4-55-1	4-60-3	4-65-1	4-70-1
4-8-1	4-21-1	4-26-1	4-50-6	4-56-1	4-60-4	4-65-2	4-70-2
4-9-1	4-22-1	4-26-2	4-50-7	4-57-1	4-60-5	4-66-1	4-71-1
4-10-1	4-22-2	4-26-3	4-50-8	4-58-1	4-60-6	4-66-2	4-71-2
4-11-1	4-22-3	4-27-1	4-50-9	4-59-1	4-61-1	4-66-3	4-72-1
4-12-1	4-23-1	4-28-1	4-51-1	4-59-2	4-61-2	4-67-1	4-72-1
4-16-1	4-24-2	4-49-1	4-51-2	4-59-3	4-61-3	4-67-2	4-72-1
4-16-2		4-50-1	4-51-3				4-C3-1

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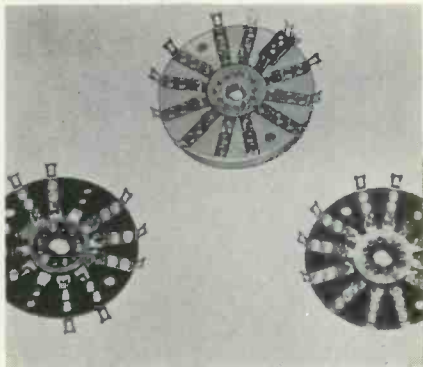
City ..... Zone ..... State .....

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



### Centralab SWITCHES

A new 1½" diameter switch section, available in both phenolic and ceramic, has double eyeleted contact clips. Switches, containing these sections, available as single, dual or multiple section units. Rated, 2 amps. at 15v d-c, 150 milliamps. at 100v a-c. Sections available in any switching



combination from 1 pole, 12 position, to 4 pole, 2 position. Voltage breakdown, phenolic sections, 1000v a-c rms; ceramic sections, 1500v a-c rms. Both types available with a-c line switches attached at rear in SPST, DPST and SPDT switching arrangements. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 4-51-2 on coupon, p. 50

### Fisher STEREO RECEIVER

Model 500-S FM-AM stereo receiver is a lower-priced team-mate to models 600 and 800 and follows the design principles of those models. It is a completely integrated system of matched components on one compact chassis. Addition of a pair of speak-



ers and a turntable completes a home music system of flexibility and quality. FM sensitivity, 1.6µv for 20 db quieting (300-ohm antenna), 2.4 µv (IHF standard). Hum and noise, 62 db below signal level for 75 kc deviation at 100 µv input. \$349.50. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.

For more data, circle 4-51-3 on coupon, p. 50

### Jensen SPEAKERS

Components of the thrifty model TF-3 4-speaker 3-way hi-fi loudspeaker system are: one 10" Flexair woofer; 2 special mid-range units; and a new hemispherical radiator. Sono-Dome Ultra-Tweeter. The unit is finished on four sides for horizontal or vertical placement. In furniture finished oiled walnut cabinet, with complementary rattan grille fabric, \$99.50. Also available in unfinished gum hardwood, \$79.50. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.

For more data, circle 4-51-4 on coupon, p. 50



## NOW TEST ALL TUBES

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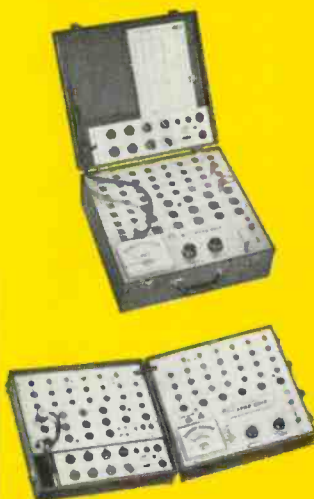
Merely by adding the new "610" to your Dyna-Quik, you have all the advantages of fast, multiple-socket testing, *plus freedom from obsolescence*. Makes your B&K Model 500, 550, or 650 Tube Tester *more useful and more valuable than ever!* Enables you to test all present plus future TV, radio and other tube types for all shorts—gives highly sensitive grid emission and gas test—checks for leakage and life—with *laboratory accuracy*.

Speeds complete tube test, sells more tubes on-the-spot, saves call-backs, insures your professional reputation, and brings more servicing profit. *It pays to invest in B&K professional equipment.*

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### NEW TUBE INFORMATION SERVICE

Get test data on new tubes even before you encounter them in the field. Subscribe now to New Tube Information Service for owners of B&K tube testers. Issued every 3 months, at \$2.50 per year.



Photos above show how easily the new Model 610 Test Panel fits into the B&K Models 550 and 650 Dyna-Quik Tube Testers.



### B & K MANUFACTURING CO.

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

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

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

# SHOP HINTS



## Tuner Repair

In recent times I have encountered a number of similar defects in the tuner wafer switch assembly of certain types of TV sets. The fine tuner on these sets consists of a metallic semi-circle printed on a stationary wafer. A brass ring rotates about this metal semi-circle to act as a variable capacitor, as shown in Fig. 1.

A lug to which an oscillator coil is attached, is riveted to the wafer and makes contact with the semi-circular stationary metal. This riveted connection generally gives trouble. An attempt to solder this connection proved unsatisfactory. Repair can be made as follows:

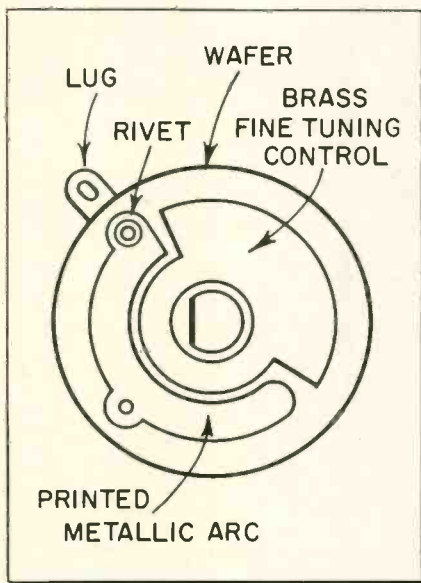


Fig. 1—Fine tuner slippage can be overcome by tightening the rivet and "painting" an area close to its mounting. See text!

Hold a piece of heavy metal in back of the wafer behind the rivet-head, using a properly shaped tool to fit the rivet (rounded punch), tap the tool lightly a few times to spread tighten the rivet.

Clean the rivet and its immediate surroundings carefully with very fine sandpaper. Apply a few coats

of silver printed circuit repair paint.

If the rivet appears to be loose, with noticeable movement present, apply additional coats of silver paint.—*Charles B. Randall, Randallstown, Md.*

## Paper Trimmer Cuts Wire

Considerable time may be saved when cutting short lengths of hook-up wire for kit assembly or shop



Fig. 2—Hook-up wire can be cut to exact lead length by utilizing a fairly heavy bladed paper trimmer, as shown.

repair work by utilizing a fairly heavy bladed paper trimmer, as shown in Fig. 2. Since a scale in inches is mounted on the trimmer, different lengths of wire can be quickly measured and cut. Most paper trimmers have a heavy blade that can cut #20 (and smaller) wire easily and without leaving a nick in the blade.—*H. Leeper, Canton, Ohio.*

## SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unaccepted 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.

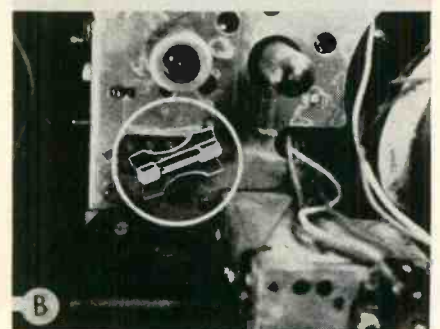
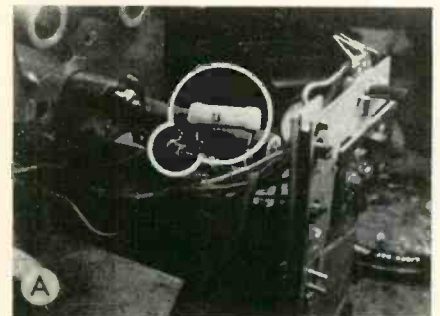
## Rectifier & Fuse Changes

If you get a "Q" or "S" line GE portable TV, with the rectifier blown out, it may be better to replace it with one of the new silicon types. If you'll mount this on a terminal strip, together with the fuse-resistor, you can install the whole thing on top of the HV cage, just behind the antenna connection terminal board, as seen in Fig. 3A.

If the fuse blows in the same set, the chassis has to be removed to replace it. To save time, solder a pigtail fuse of the proper rating on the small 8-terminal board just above the tuner, as shown in Fig. 3B. If you don't have a pigtail fuse solder in one of the pigtail-fuse replacement holders and snap a standard fuse in as shown. Fuse connects to second terminal from left, bottom row, and upper right, top row, as seen from back of set.

—*Jack Darr, Mena, Arkansas.*

Fig. 3 (A)—When original rectifier fails, it may be advisable to replace with silicon type mounted with fuse-resistor on terminal strip atop the HV cage. (B)—To eliminate necessity for chassis removal in event fuse blows, fuse is relocated on easily accessible terminal board above tuner.





# TUBES



# ARRIVE

# SAME DAY!



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

# New TV Booster-Antenna System

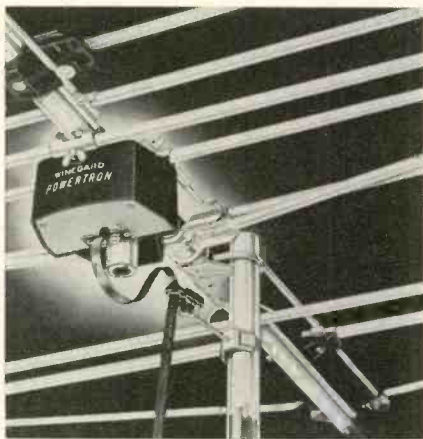
• A new all-channel Yagi TV antenna by Winegard Co., Burlington, Iowa, incorporates an r-f amplifier directly on the antenna. Called the "Powertron," the integrated amplifier-antenna initially

amplifies TV signals at the point of interception rather than at a TV receiver's tuner. Consequently, weak signals are amplified for better signal-to-noise ratio. See Fig. 1.

replaced without detaching any part. Components are operated well below their ratings for long life.

Fig. 3 illustrates the Powertron r-f amplifier's electronic circuit. The signal is fed from the ele-  
(Continued on page 56)

Fig. 1—Winegard "Powertron" antenna boosts signals at the antenna itself, producing up to nine times more gain.

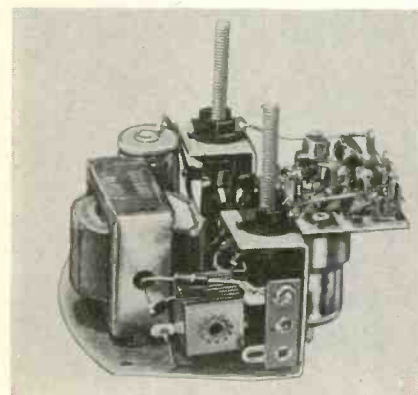


## Circuitry

Power for this antenna-mounted booster is furnished by a Powertron power supply used in the home that converts 117 volts a-c to 24 volts a-c. The voltage for the antenna amplifier is fed along 300 ohm lead-in-wire; an isolation network separates the TV signal from the power voltage. The power supply uses an isolation transformer.

An exploded view of the amplifier, shown in Fig. 2, shows the weather-proof housing and the electronic unit. A 6DJ8/ECC88 twin triode tube is employed, whose life expectancy is from two to five years. The tube can be easily

Fig. 2—"Booster" unit with cover removed shows twin-triode, matching transformers, rectifier and associated circuitry.



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Finest recessed latches on the market. Fool-proof, safety catches make it impossible for doors to fly open in travel.

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**IMMEDIATE DELIVERY!** WRITE FOR BULLETIN AND NAME OF DEALER.



Optional Canopy Top, at left, has 53" floor-to-roof height. Body is also available with compartment-high telescopic roof.

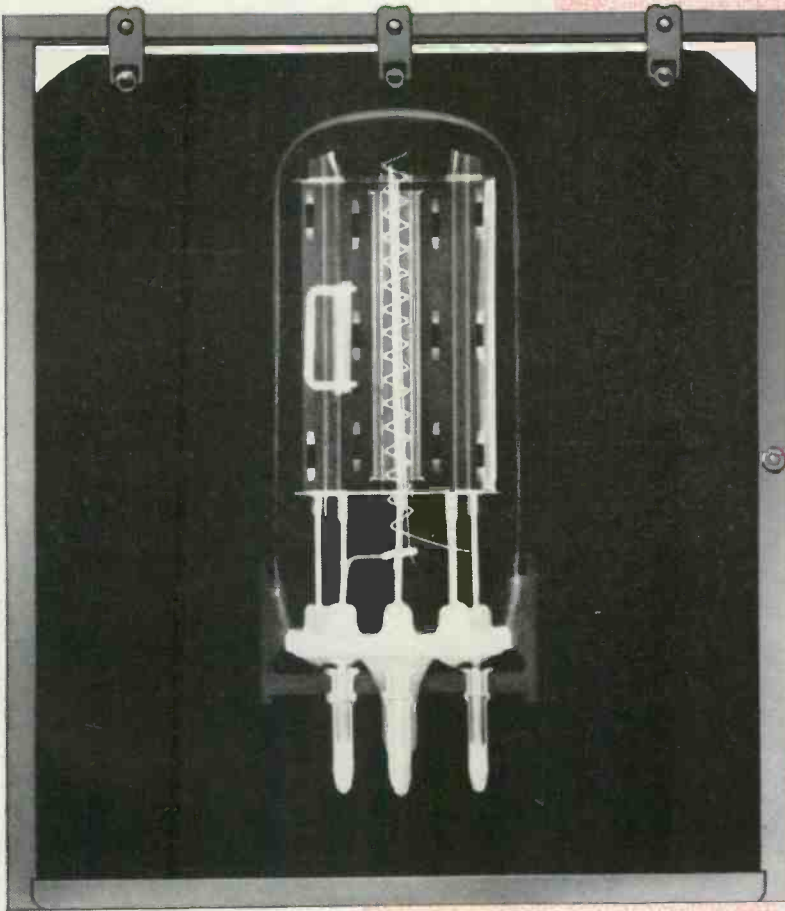
**McCABE-POWERS BODY COMPANY**  
5900 N. BROADWAY • ST. LOUIS 15, MO.



# damper tube exhibits tolerance of high voltages



Thorough examination of the subject reveals physical characteristics conducive to exceptional longevity. Immunity to the high voltage ailments that plague so many less rugged damper tubes is due mainly to unusual care attending the tubes' formative stages. Outstanding qualities are noted in electrophoretically coated heater peaks and insulator coils; a "cool" running cathode; a copper core plate designed for maximum dissipation and less back emission. All of these minimize arcing. In addition, the electrically isolated insulator coil maintains high voltage insulation with the shortest possible warm-up time. In every respect, the Tung-Sol damper tube exhibits structural standards that approach an ideal far above more common types. Tubes of this family are certain to prove fully reliable under the most adverse conditions.



**JUST WHAT THE DOCTOR ORDERED**

All modern damper tubes trace their genealogy directly to improved designs created by Tung-Sol. Where diagnosis of a customer's TV set indicates damper tube replacement, be sure to prescribe Tung-Sol. These are some of the more popular Tung-Sol damper tubes:

- |               |       |
|---------------|-------|
| 6/12AF3       | 6DA4A |
| 6/12/17AX4GTB | 6DE4  |
| 6/19AU4GTA    | 6V3A  |
| 6/25W4GT      | 12D4A |



the first name to ask for when ordering

**TUNG-SOL<sup>®</sup>**  
**DAMPER TUBES**

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

## TV Booster Antenna System

(Continued from page 54)

ments D1 and D2 directly into the double-tuned transformers T1 and T2. These transformers are designed to exactly match the characteristics of the Powertron Tapered T driven elements on all channels.

Inductance L1 elevates the relatively low transformer impedance to the high impedance of the tube

grid. L2 resonates with the grid to plate capacitance, neutralizing the first r-f stage on the low band. The high band is neutralized by inductance L3, being in series resonance with the cathode to ground capacitance of the second stage. The grid is grounded in the second stage, through C6, so no neutralizing is needed. Here the signal is injected into the cathode. The output of this stage is fed into a pair of series-connected transformers marked T4 and T3. T4 resonates in

the high band, and T3 across the low band. These special input and output transformers make it possible to amplify all channels simul-

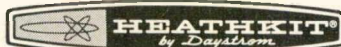
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VTVM  
ON YOUR BENCH!**

Designed specifically for service bench use, the Heathkit IM-10 incorporates an outstanding array of features for convenient operation and precision performance. An over size 6" 200 ua meter with multi-colored scales and high contrast panel screening show at a glance the correct range and scale to use for fast, easy reading of all measurements. Recessed "zero" and "ohms" adjust controls prevent accidental change in control settings. Separate 1.5 and 5 volt AC scales allow highly accurate measurement of low voltage AC. The IM-10 measures AC and DC voltage to 1500 volts in seven ranges and resistance from .1 to 1000 megohms in seven ranges. Db calibrations are provided for relative voltage measurements with 10 db steps between ranges. 1% precision resistors and husky capacitors provide high accuracy and wide frequency response. High impedance 11 megohm input circuit. Clean, open circuit layout and wiring harness assure easy assembly and maintenance. Complete with test leads. 9½" H x 6½" W x 5" D.

Kit Model IM-10 . . . 7 lbs. . . \$3.30 dn., \$5 mo. . . . . **\$32.95**



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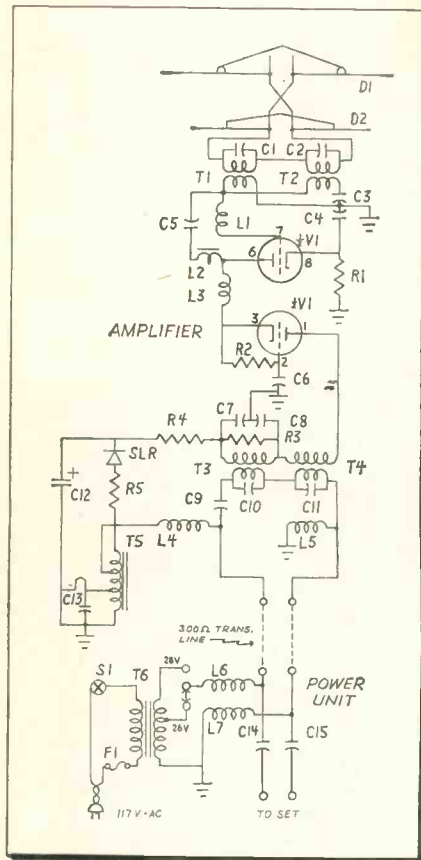


Fig. 3—Schematic diagram of booster-power supply antenna system. Components in the booster include: Capacitors C<sub>1</sub> & C<sub>10</sub>—18μf; C<sub>2</sub>, C<sub>3</sub>, C<sub>8</sub>, C<sub>11</sub>—8.2μf; C<sub>4</sub>, C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub>, C<sub>9</sub>, C<sub>12</sub>—500μf. All capacitors (except C<sub>12</sub> the filter) are ceramic types. Resistors include: R<sub>1</sub>—47 ohms, R<sub>2</sub>—100Kohms, R<sub>3</sub>—1Kohms, R<sub>4</sub> & R<sub>5</sub>—150 ohms. The selenium rectifier is rated at 65 ma. Power supply components include: Capacitors C<sub>14</sub> & C<sub>15</sub>—0.005μf ceramic disc types and a 1 amp. fuse.

taneously in both halves of the twin triode.

The manufacturer reports the antenna will drive up to 10 TV sets direct and can be used up to ¼ mile away from the receiver. •







ELECTRO-VOICE announces appointment of Adolph Wolf as Vice Pres.-Manufacturing, and Jon Kelly and Rod Griggs to their regular sales staff.

KARG LABS. institutes a 2-year repair and parts replacement warranty on all models.

SHURE names Donald H. Bittner to Eastern regional distributor sales manager, and Roger W. Ponto to the distributor sales dept.

EASTMAN KODAK announces its entry into the magnetic recording tape field, beginning later this year.

OXFORD ELECTRIC announces Model W12J616 12" woofer designed for use in enclosed cabinets. Range from 20-4500 cycles. \$29.50.

DE WALD RADIO announces Model P-1400 "Concerto" stereo amplifier/preamp, 17½ watts/channel, ±1 db, IHFM rating. Priced at \$99.95.

BOGEN-PRESTO appoints M. S. Sumberg to newly created position of Dir. of Sales, Sound Products & Hi-Fi, Harold Barton, Sales Mgr., Hi-Fi Equipment.

SHERWOOD produces Model S-5500 24 watts/channel stereo amplifier/preamp. Frequency response is ±1 db 20-40,000 cps, phono hum and noise —60 db, @ \$159.50.

CBS announces new products: the 3-1-C reverberation unit for home music systems; and the new HF series of stereo, twin-stylus turret cartridges, tracking at 2 grams with frequency response of 30-20,000 cps.

HEATH adds new products: GD-61 Heathkit Reverberation System @ \$69.95; "Legato-Compact" speaker system AS-21 from \$224.95; Heathkit stereo-phono console GD-31, \$149.95 assembled, \$129.95 kit.

LAFAYETTE introduces RK-120 transistorized, battery operated tape recorder, weighing 4 lbs., speeds of 1½ and 3¼ ips, @ \$79.95. Also announced is stereo headphone set designed for direct connection to amplifier, \$15.95.

JENSEN MFG. offers dealers Model TF-3 display/demo speaker system @ \$29.50. Printed wood front in lieu of cloth gives prices. Regular model with 10" woofer, 2 mid-ranges and tweeter is \$99.50 finished, \$79.50 unfinished.

SWITCHCRAFT introduces two "plug-in" cables, two-conductor, shielded and 25' long. No. 93BU94 has Amphenol MC3M & MC3F plugs; No. 91BU92 has Cannon and XL3-11 & XL3-12 plugs. Catalogs S-590 & No. 108 describe complete cable line.

ALLIED RADIO announces new products: Knight KN-825 "Add-On" Electrostatic Tweeter, response from 1 kc up, 90° dispersion, \$26.95; KN-3010 10 watt PA amplifier, response 2 db, 70-10,000 cps, \$29.95; and KN-850 speaker, response 30-20,000 cps, \$79.50 in 12" version, 15" version, \$89.95.

# RCA MARK VII RADIO-PHONE



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

## TV Sweep Circuit Test "Analyzers"

(Continued from page 38)

signal injection facility of B&K, Sencore, and Winston also satisfactorily pointed to a defective yoke (horizontal winding was at fault).

Although our tests pointedly showed that the static tests were accurate in the majority of instances, they do not: (1) accurate-

ly identify a component that breaks down only under load. (2) provide for a wide range of design differences (Eico and Winston do have different settings for air core and iron core transformers which gives them greater indicating flexibility than the others). As a result, it is foreseeable that components known to be good will sometimes have to be checked so that the instruments' readings of the part being tested will not be questionable.

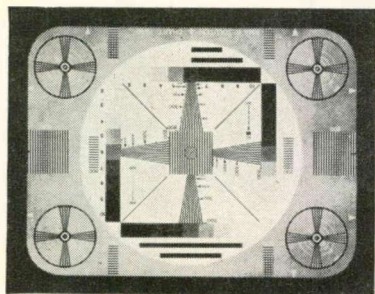
Also, leakage and short tests can

be accomplished with any VOM or VTVM ohmmeter, as illustrated in Fig. 5. Therefore, the prime test facility of *out-of-circuit* Flyback-yoke testers is detecting shorts of a low number of turns. This they do commendably, though with some restrictions as previously mentioned.

The substitute yoke load method seems more accurate. However, even here, other components which are not disconnected, as in the case of flyback checks, can invalidate test results. If the indicator points to a bad flyback, components in the flyback's load circuit must still be checked. No such reservations exist for the substitute horizontal winding yoke tests, though; such tests accurately reveal a defective winding.

Under-load breakdowns can be detected with instruments that provide vertical and horizontal signal substitution (B&K, Sencore, Winston). Another advantage offered by these three instruments is provision for inspecting the vertical sweep circuit of a TV receiver. Still another advantage is inspecting horizontal circuits *before* the output plate stage. However, some units without signal injection facilities offer extra features that may attract service technicians; for example, Doss' VOM readings without tracing circuits and Simpson's capacitance meter. The B&K, Sencore, and Winston instruments will be discussed in Part II of this article, next month. Here, the applications of signal injection testing on TV sets will be covered.

Summarizing, all the instruments covered in this article are valuable to a service shop. They relieve technicians from the time-consuming and expensive task of replacing components only to discover that some associated part was causing the trouble. Signal injection instruments, however, offer greater flexibility than the individual component test instruments, as you shall see next month. •



## TV TIPS FROM TRIAD

NO. 12 IN A SERIES

"—and you can see the 'glitch' on the trailing edge of horizontal sync," said Bill as he pointed to the offending interloper on the scope pattern. "Now, let's review: You're worried about your procedure because of the days you've lost on this job with multiple trouble. It loses horizontal hold on change of channels, or on some station switches, but it's perfectly stable otherwise. It has a slight 'S' in the vertical raster and a variable sync buzz in the audio. Now, what have you done so far?"

"What haven't I done?" muttered Joe under his breath, "so far I've shunted the electrolytics with good units of greater capacity than the originals, I've rebuilt the sync separator, AFC, and horizontal oscillator, with new parts and realigned the sound detector, all with no results."

"Sounds a little long on 'shotgun' and a little short on planning," commented Bill, with a twinkle in his eye, "since the 'glitch' shows up at the video detector it's very likely introduced in the tuner because of poor bypass. The 'S' in the vertical is also indicative of poor bypass, and you may have been fooled by trying to shunt a multiple unit like that four section electrolytic. Install a new high quality electrolytic and I'll wager that your buzz and 'glitch' will disappear. That spike is getting in at the tuner and looks just like sync to the sync separator."

"Whenever you change channels or the station switches in a way that interrupts sync, the AFC system locks in on its own reference pulse and 'hold' is not only lost, but actually locked out if the circuit incorporate a keyed AGC system."

"The hardest lesson I had to learn was to discipline myself to determine the basic problem, and then, one by one, repair the obvious. This meant not only taking positive steps with the filter system, but also not worrying about shading in the raster until I had replaced the covers on the cage or IF strip. If I fixed the visible problems, one at a time, the mysterious elements seemed to take care of themselves, or become easy to identify."

\* \* \*

**MORAL:** Many a Professional Television Man has had to replace a flyback or other component before he could determine the original reason for receiver failure. "Multiple trouble" is the theme of PTM #4 which will be mailed to people on our mailing list in the near future. If you are not on our mailing list, you can be by writing to **Renewal Division, Triad Transformer Corp.**, 4055 Redwood Ave., Venice, Calif.

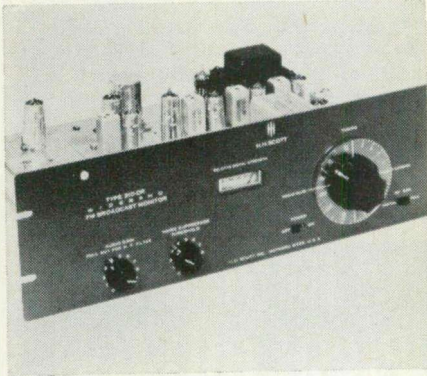
### NEXT MONTH!

Final Part II  
of  
TV Sweep Circuit  
Test Analyzers



### Scott FM TUNER

Model 310-DR features: sensitivity, 2  $\mu$ V (IHFM standards); distortion, less than 0.5%; frequency response,  $\pm 0.75$  db from 20 cycles to 75 kc; capture ratio, 2.2 db; selectivity, 50 db; and cross modulation rejection, 85 db. Other unique features of this

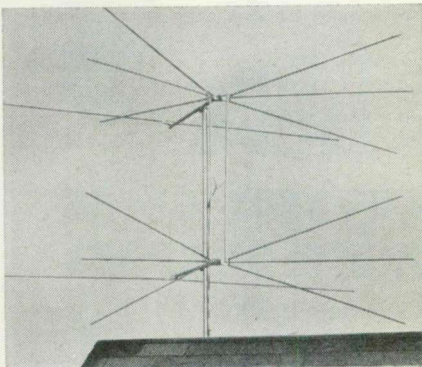


broadcast monitor tuner include the dynamic interstation noise suppressor and exclusive electronic relay. It utilizes the firm's wide-band design and silver plated front end. \$220.00. A 600/150 ohm transformer model is also available. H. H. Scott Inc., 111 Powdermill Rd., Maynard, Mass.

For more data, circle 4-59-3 on coupon, p. 50

### TACO Antennas

An improved conical antenna design, the Courier, incorporates a "slide trombone" bracket, designed to provide more positive positioning of the elements, resulting in extended life and improved performance. Completely factory assembled with all terminal screws and wing nuts staked

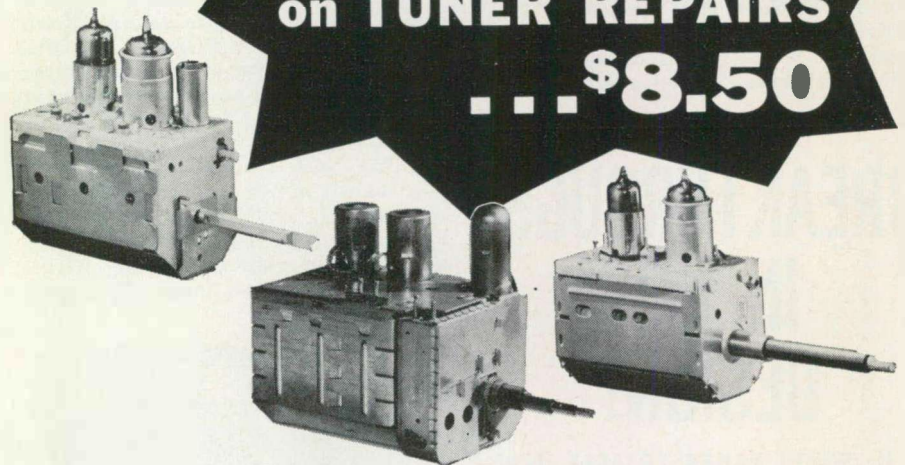


in place. Takes less than one minute to ready for installation. A full 1" diameter aluminum crossarm provides extra rigidity, while the special U-bolt maintains horizontal and vertical alignment of the assembly. Designed to withstand the most adverse weather conditions. Available in five models. Technical Appliance Corp., Sherburne, N. Y.

For more data, circle 4-59-4 on coupon, p. 50

## Now—24-Hour Tuner Service

**Tarzian Offers 24-hour  
Direct Factory Service  
on TUNER REPAIRS  
... \$8.50**



TARZIAN tuners received one day will be repaired and shipped out the next. No increase in price: \$8.50 per unit and \$15 for UV combinations. That includes *all* replacement parts, and a 6-month warranty against defective workmanship and parts failure due to normal usage. Tuners repaired on approved, open accounts. Replacements available at low cost on tuners beyond practical repair.



Tarzian-made tuners easily identified by this stamping. When inquiring about service on other than Tarzian-made tuners, always give tube complement . . . shaft length . . . filament voltage . . . series or shunt heater . . . IF frequency . . . chassis identification. And, allow a little more time for service on these tuners. Use this address for fast, factory repair service:

SERVICE MANAGER • TUNER DIVISION • DEPT. 28



## SARKES TARZIAN INC

east hillside drive • bloomington, indiana  
edison 2-7251

Mfgs. of Tuners, Semiconductors, Air Trimmers, FM Radios, AM-FM Radios, Audio Tape, Broadcast Equipment and Shish-Kabob Grilles

For more data, circle 4-59-1 on coupon, p. 50



THE HANDIEST THING  
SINCE  
ELECTRICITY

FROM 6 INCHES  
TO 10 FEET LONG



Tap-A-Line — mounted on or behind work benches, in the lab, on test tables, in lamp or appliance stores — provides multiple taps from a single power source. Safe — concealed conductors — tight positive contacts — easy to install in any position.

Sold by Electrical, Electronic and Hardware Jabbers and Dealers

**Tap-A-Line Mfg. Co.**

P. O. Box 563  
Pompano Beach, Fla.





## Motorola AUTO ANTENNAS

Golden Beam auto antennas feature an exclusive single-unit construction and Permalock design for easy installation. All units are completely installed from the outside of the car. The antenna cable is permanently connected to the mast to eliminate many auto antenna problems. A patented locking feature permits the antenna to be securely fastened at any angle; assures good ground connection and prevents road vibrations. The entire antenna consists of only four separable parts. New accessories supplied are: hole drilling saw for cut-

ting required 1" hole in car body using a conventional 1/4" electric drill; special wrench which is the only tool required for installing any Motorola antenna; and a snaking tool. Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.

For more data, circle 4-60-3 on coupon, p. 50

## Paco POWER SUPPLY

Model B-12 features fully-variable and regulated d-c plate voltages from 0-400v at 150 ma maximum, and also provides bias voltages from 0-150v at 2 ma and three 3-ampere a-c filament outputs: two at 6.3v, plus an exclusive 12v filament output. It has high stability, with an output variation of less than 1/2 of 1%, (or .3v, whichever is greater), from zero load to full load. Less than 0.4% or 0.5v output variation for ±10v line voltage variation from 117v a-c input. Kit, com-



plete with assembly instruction manual, \$69.95. Wired, \$99.95. Paco Electronics Co., 70-31 84th St., Glendale 27, L. I., N. Y.

For more data, circle 4-60-4 on coupon, p. 50

## Sylvania TUBES

Eight new receiving tubes are: type 5R4GYB, T-12 glass octal full wave duo diode, improved version and direct replacement for 5R4GY; type 12AX7A, T6 1/2 (9-pin miniature) high mu twin triode, similar to 12AX7 except for improved hum and noise characteristics; 12GA6, T5 1/2 (7-pin miniature) heptode, similar to 12DA6 except for remote cutoff characteristics; 12FR8, T6 1/2 (9-pin miniature) pentode, triode, diode for i-f amplifier, a-f amplifier and second detector in auto radios; 14GT8, T6 1/2 duplex triode, high mu triode designed as a FM detector and a-f voltage amplifier set in home radios; 6EZ5, T-9 beam power pentode, features high permeance and high plate dissipation; 35EH5, T5 1/2 (7-pin miniature) power pentode similar to 50EH5 except for slightly lower characteristics; and 6GK6, T6 1/2 power pentode featuring high power sensitivity. Sylvania Electric Products Inc., 730 Third Ave., New York 17, N. Y.

For more data, circle 4-60-5 on coupon, p. 50

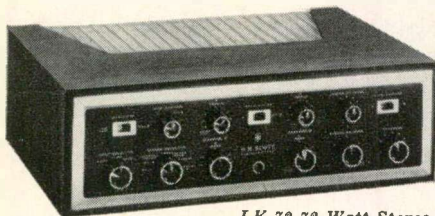
## Electromatic POWER SUPPLIES

An improved line of stabilized power supplies absorbs ups and downs of input voltage and delivers stabilized output voltage within ±1%. The Catalog 200TV, with an output capacity of 200 watts is suitable for use as an external stabilizer. TV sets, hi-fi instruments, and appliances may be plugged in to achieve a constant 118v, 60 cycle output. The Catalog 260DTV with an input range of 95-118v has an output of 255 plate volts at 280 ma; an output of 6v at 8.8 amperes for filaments. Electromatic Industries, Hollywood, Fla.

For more data, circle 4-60-6 on coupon, p. 50

# BREAKTHROUGH IN KIT DESIGN!

H. H. SCOTT TAKES TOTALLY NEW APPROACH... MAKES KITS EASIER-TO-BUILD, BETTER-PERFORMING!



LK-72 72-Watt Stereo Complete Amplifier kit, \$149.95.\*



LT-10 Wide-Band FM Tuner kit (2.2µv sensitivity) \$89.95.\*

**BREAKTHROUGH!** Here, for the first time, are kits with the performance, features and handsome good looks of H. H. Scott factory-assembled components... kits so expertly designed that you can achieve professional results in just a few hours.

Look at these innovations: ● All mechanical parts such as terminal strips and tube sockets are firmly pre-riveted to chassis. ● All wires pre-cut and pre-stripped. ● Electronic parts are mounted on special cards in order used. ● Full color diagrams in easy-to-follow instruction book reduce errors. ● New Kit-Pak container acts as worktable.

**H. H. SCOTT**  
H. H. SCOTT Inc. (11 Powdermill Rd., Dept. 140-04, Maynard, Mass.)

Rush me complete technical specifications on H. H. Scott kits. Include your new "1961 Guide to Custom Stereo."

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

\*Prices slightly higher West of Rockies  
Export: Telesco International Corp., 171 Madison Ave., N. Y. C.

For more data, circle 4-60-1 on coupon, p. 50

## The Modern "PUSH BUTTON" way to protect ELECTRONIC PARTS!



- Prevents corona in high voltage section
- Keeps lead-in connections tight
- Prevents rusting and pitting of antenna
- Goes on in seconds—DRIES IN MINUTES

**KRYLON**

## CRYSTAL CLEAR ACRYLIC SPRAY

Protect radio, TV and hi-fi equipment indefinitely against humidity and dust with Krylon Crystal-Clear, the modern "push button" acrylic spray. High dielectric strength, excellent weatherproof qualities. Available at your favorite radio-TV repair shop.

KRYLON, INC., Norristown, Pa.

Paint touch-up work easily, expertly, with Krylon Spray Paints—choice of 24 colors

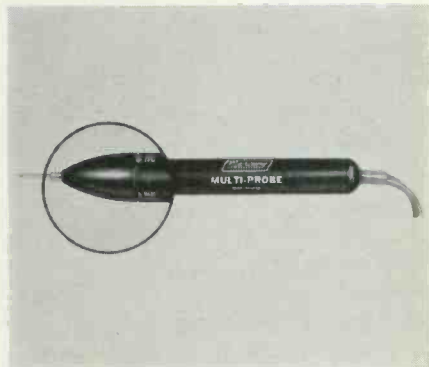
IF YOU PRIZE IT...KRYLON-IZE IT!

For more data, circle 4-60-2 on coupon, p. 50  
ELECTRONIC TECHNICIAN • April, 1961



### Mercury MULTI-PROBE

Model MP-1 multi-probe extends the range of operation of any VTVM, oscilloscope, or signal tracer. An exclusive rotating probe head enables selection of the four probe functions. As a d-c probe, it provides isolation for all d-c voltage measurements. As an a-c/ohms probe, it is used for all



low impedance, low frequency voltages. As an r-f probe, it is a demodulator for checking r-f voltages in TV/radio r-f and i-f stages. As a low-capacity probe, it is used for high impedance sync circuits. \$9.75. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y.

For more data, circle 4-61-2 on coupon, p. 50

### EICO BENCH SUPPLIES

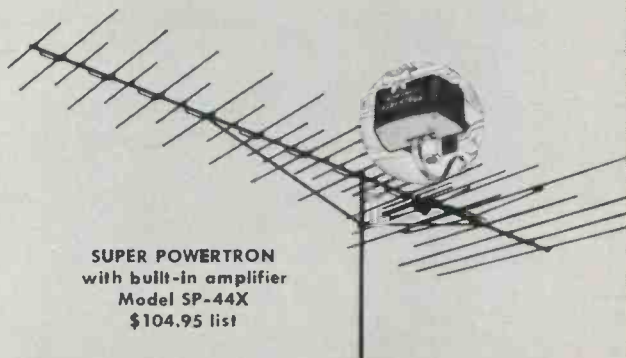
Models 1073 and 1078 variable a-c bench supplies, for production line testing, quality control, and service work, feature highly efficient variable auto-transformers of toroidal core design and smooth rotary brush-tap controlled by a dial on the front panel. Both units are capable of delivering



0-140v a-c from a 120v a-c power line. Model 1073, current rating 3 amps; ammeter ranges, 0-1 and 0-3 amps. Model 1078, current rating 7½ amps; ammeter ranges, 0-2½ and 0-7½ amps. Model 1073 kit, \$35.95; wired, \$47.95. Model 1078 kit, \$42.95; wired, \$54.95. (Eico) Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y.

For more data, circle 4-61-3 on coupon, p. 50

# BY FAR WORLD'S MOST POWERFUL!



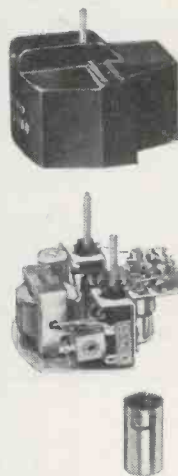
SUPER POWERTRON  
with built-in amplifier  
Model SP-44X  
\$104.95 list

## Winegard Electronic POWERTRON TV ANTENNA

This is the antenna the whole TV industry is talking about! 30 elements driving a *built-in* electronic amplifier . . . making the Super Powertron by far the world's most powerful TV antenna. Recommended for extreme distance reception or *any* installation where only the best is good enough. You'll be amazed when you try one!

### BUILT-IN AMPLIFIER ADDS 14 DB GAIN TO POWERTRON

Photo shows high impact housing that weather-proofs built-in Powertron amplifier. All components operate well below ratings. The amplifier plate circuit draws 15 milliamps at 120 volts, and we use a 170 volt, 65 mill rectifier. The filter condenser is rated at 250 volts . . . more than a double safety factor. The 6DJ8 frame grid tube has a normal life expectancy of 2 to 5 years . . . and is easily replaced if necessary. Antenna with amplifier includes compact remote power supply that converts 117 volt house current to 24 volts. Sends 24 volts up lead-in wire—greatly amplified signal comes down same wire.



SEE YOUR DISTRIBUTOR OR WRITE

**Winegard**  
ANTENNA SYSTEMS

WINEGARD CO., 3019-4 Kirkwood Ave., Burlington, Iowa

## Be Sure It's In The Contract

(Continued from page 48)

coverage checked item by item with the agent handling the insurance for every detail; checked as to its sufficiency to cover the new operation and as to status of premiums.

- ◆ Seller should arrange with all utilities to "cut off" billing to the date of closing.
- ◆ Agreement should cover deposits

on utilities, if transferrable, and how they are to be paid by the purchaser.

- ◆ Status of the business being purchased with leading suppliers should be checked closely before agreements are entered into.
- ◆ Provision should be established in the agreement for handling of unpaid accounts or contracts.
- ◆ The agreement should provide that the seller should notify all vendors regarding sale of the property and request that "cut off" statements be rendered both to the seller

and to the purchaser.

- ◆ Stipulation should be made covering all salary and wage liabilities, liability for wage claims and retroactive adjustments and transfer of social security or withholding tax funds deducted from employees wages and salaries and not remitted.
- ◆ A complete study of the rental situation or lease on the building, where property purchase is not involved, is recommended. Under certain conditions in some cities rent adjustments granted may be rescinded retroactively. This should be provided for to establish liability thereof.

- ◆ Outline of all zoning regulations covering the operation of the business should be made for study.

- ◆ Agreements with employees as to vacations and pay, sick benefits, insurance, etc., should be outlined by the seller in detail where not covered by contracts. These should be checked with employees.

- ◆ Check should be made of local or state tax on personal property involved, status, amount and liability for payment prior to effective date of the agreement, should be established as part of the agreement.

- ◆ An adjustment clause should be made covering prepaid or accrued real estate taxes, mortgage interest, etc., if any.

- ◆ Responsibility for violation of any building ordinance past or present, should be established at the time of agreement, method under which it is to be treated and the cost of remedying the situation fixed if it does occur.

- ◆ Definite disposition of all books and accounting records of the seller pertaining to the business should be established, the purchaser given the right to examine them for a reasonable length of time, and if they are left on the premises for the convenience of the purchaser, the degree of responsibility should be definitely established.

- ◆ An article of the agreement should establish who is to pay for Federal Revenue Stamps on various documents and agreements, any local or state taxes involved in the transfer, and any fees for experts hired in arranging the transfer.

- ◆ Recording and registration fees, mortgage taxes and fees and any chattel mortgage filing and fees should be provided for as part of the agreement.

**COMPARE** QUAM **SPEAKERS**

feature for feature

then decide for yourself which brand gives you the best value and the best performance in every speaker installation

	QUAM	BRAND A	BRAND B
ADJUST-A-CONE SUSPENSION to assure precise voice coil centering and alignment	YES	NO	NO
U-SHAPED POT to give you lowest possible energy loss and accurate magnet alignment	YES	NO	NO
ALNICO V MAGNETS	YES	YES	YES
HUMI-GARD CONE for greater heat and humidity protection in outdoor speakers	YES	NO	NO
AVAILABLE WITH SPECIAL VOICE COILS, SPECIAL FIELDS	YES	NO	NO
ADVERTISED TO THE PUBLIC	NO	YES	NO
LISTINGS IN PHOTOFACTS AND COUNTERFACTS to save you time, assure correct replacements	YES	NO	NO
THIRTY YEARS OF EXPERIENCE in engineering and manufacturing quality loudspeakers under same ownership	YES	NO	NO

Write

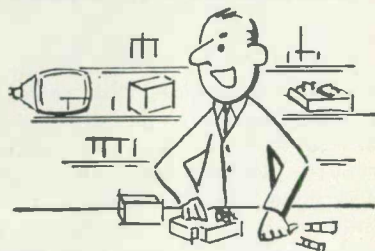
for your free copy of the QUAM General Catalog, listing the full line of QUAM speakers for radio-tv replacement, public address, and high fidelity. QUAM speakers are completely manufactured in the United States of America.

**QUAM-NICHOLS COMPANY**

226 East Marquette Road • Chicago 37, Illinois



## Mr. Dealer and Service-Technician:



### THE SWITCHCRAFT LINE OFFERS YOU . . .

- ✓ Convenience features that cut work time
- ✓ Durability and performance
- ✓ Unsurpassed quality
- ✓ Full profit margin
- ✓ Designs by American Engineers
- ✓ American made to rigid standards
- ✓ Products accepted as standard by Electronic Manufacturers

### SWITCHCRAFT COMPONENTS

*"often copied - never equalled"*

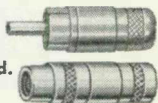
#### "PHONE PLUGS"

"Littel-Plugs" "Tini-Plugs" and "Micro-Plugs" for dependable and easy connections.



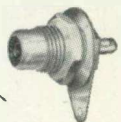
#### "PHONO PLUGS" AND "EXTENSION JAX"

Removable handles. Shielded. Nickel Plated Brass.



#### "PHONO JAX"

Eliminate rivet mounting. Convenient replacement for old style Jaxes. Types for front and back of panel mounting.



#### "LITTEL-JAX" "TINI-JAX" "MICRO-JAX"

Dependable and low in cost. Tip spring "firmly holds" mating plug.



Only a few of the many Switchcraft Components are shown here. Your Distributor carries the Complete Switchcraft Line --

**BE SURE TO SAY "SWITCHCRAFT"**

Write for Catalog CS-60

**SWITCHCRAFT**  
INC.

5583 N. Elston Avenue  
Chicago 30, Illinois

Canadian Rep: Atlas Radio Corp., Ltd.  
50 Wingold Ave., Toronto

For more data, circle 4-63-1 on coupon, p. 50  
ELECTRONIC TECHNICIAN • April, 1961

◆ Agreement should be reached as to future income, franchise or other tax liabilities applicable to periods prior to the date of sale, etc. which may be unknown or contingent at the time of sale.

◆ A clause should provide for a method of arbitration on any subsequent differences or misunderstandings which may result from the agreement itself.

These points will serve any shop owner as assurance that the factors ordinarily causing disputes, misunderstandings and later losses, have been eliminated from any purchase or sale of a business. •



#### Arkansas

TESA, Little Rock, has installed the following officers for 1961. Pres., Merrill Breeze; V. P., Bill Woodridge; Sec'y, Harold Carter; Bus. Mgr., W. T. Head; Treas., Norman Baxter; Sgt.-at-Arms, Harold Hicks.

#### California

RTA, San Jose, reports nearly 1,000 TV shop owners and technicians have signed up for intensive training in color TV servicing. Scattered throughout the Northern California area, the 12 schools are being sponsored by A. H. Meyer Company, a San Francisco distributor.

#### Assemblyman Sponsors License Bill

CSEA, Fresno, announced that Long Beach Assemblyman William S. Grant is carrying the ball for CSEA/APA's Consumer Technical Service Business Act (AB265) at the current Legislative session in Sacramento. The license bill covers television, radio and home appliance repair, service and maintenance.

#### Illinois

#### Extended Warranties

NATESA, Chicago, expresses strong disapproval of radio-TV manufacturers' extended warranty trends. The national association points out labor coverage for 90 days being offered by some manu-

# WEAK

## TV signals get STRONG with new all-AC Winegard WBC-4X signal booster



Here's a sure, easy way to deliver better TV reception to your customers — sell them a Winegard WBC-4X Signal Booster. Get new distance, cut snow, get more picture contrast. Winegard WBC-4X has one tube, 4 sets of no-strip lead-in terminals, on-off switch, antenna disconnect plug. Runs 1 — 4 sets. It's all AC — no "hot" chassis. Only \$27.50 list. Ask your distributor or write for technical bulletin.



Everything from antenna to set

# Winegard

ANTENNA SYSTEMS  
3019-4 Kirkwood, Burlington, Iowa

For more data, circle 4-63-2 on coupon, p. 50

facturers and portending one to five year warranties. Further, NATESA says that factory authorized agencies are losing a minimum of \$2.00 per job. ". . . it begins to look like the factories want professionals to turn down this work so they can enter the retail business on the excuse of unavailability of independents." The association observes that extended warranties are mere sales gimmicks paid for by the buyer and indicates they are pressing U.S. government agencies to stop the usurpation of the rights of the little man and the consuming public. NATESA states, "We believe that our cause transcends the right of 120,000 Americans, most of whom are one man businesses . . . is a test of whether Americans will be forced into economic slavery. . . ."

### Indiana

#### Oppose "Free Service" Gimmick

IESA, Indianapolis, Board of Directors has gone on record opposing the "Free Service" gimmick announced by Philco Corporation. The Association's officers expressed a belief that the plan would ultimate-

ly threaten the free and independent operations of the service dealer. The board also felt the plan would force other manufacturers to enact similar plans—thus increasing the "squeeze" on independent service.

ESTA, Henry County, has elected the following officers: Pres., Thornton Dixon; V.P., Berl Dickey; Sec'y, George L. Koons; Treas., Brent Hay.

TVSMA, Jackson County, announced the following officers had been elected: Pres., Keith Ault; V.P., Charles Baker; Sec'y, Ray Nichols; Treas., J. Allen Brackemyre.

SIETA, Dubois & Spencer Counties, elected the following: Pres., Cloyce Springston; V.P., Charles Lamberson; Sec'y, Ralph Schneider; Treas., Ed Kress.

RTSA, Evansville, reported the election of Paul Wurtz as the association's new president.

### Michigan

TSA, Detroit, reports that its four-month efforts to arrive at any

agreement with local distributors has yielded no favorable results. Approximately one-third of the jobbers attended a meeting at the invitation of the Association last November. Some indicated a favorable disposition to arbitrate the dealer-jobber code which TSA presented. Distributors were to set up a committee to study the proposals, and report. Nothing has materialized. The Association announced that one jobber's advertisements invite hams, experimenters, Hi-Fi enthusiasts and others to buy. Another donates door prizes to a retail Citizens Band club with an invitation to buy supplies.

### Missouri

TEAM, Kansas City, advises that the libel suits for damages brought against TESA by ten plaintiffs is \$400,000.00, and not ten million dollars reported in various publications.

### Pennsylvania

TSDA, Glenolden, a member of the Tri-State Council which includes AETA, TSDA, and RSA of Gloucester, N.J., Wilmington, Del., and Trenton, N.J., respectively, have already formulated preliminary plans for Tri-State's Telerama '61. The affair is planned to take place June 30-July 1, 2 and 3rd in Atlantic City.

TSDA, Wilmington, announced election of the following officers: Pres., Henry Dale; V.P., Jim Mayhart; Sec'y, Will Owens; Treas., Jim Malloy; Publicity Dir., Arnold Zenker.

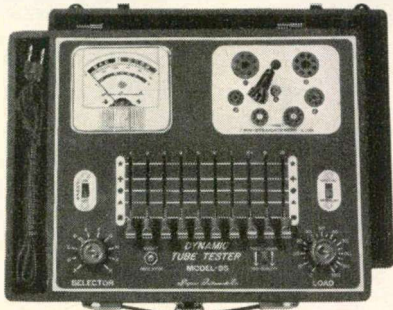
### Discuss License Bill

FRTSAP, Harrisburg, reported a state-wide meeting February 19th at the Harrisburger Hotel was attended by 100 people, including State Assemblymen, the Chief Investigator of the State Attorney General's office, distributor organizations, and independent service dealers and technicians. The meeting was devoted to a discussion of the State Licensing bill to be presented soon to the Pennsylvania Legislature. Howard A. Reed, Publisher of ELECTRONIC TECHNICIAN Magazine, was the moderator.

TESA, Luzerne County, has elected the following officers: Pres., Dan Grant; V.P., Ted Petrikonis; Sec'y, Milan Krupa; Treas., Joe Czapracki.

Superior's New Model 85—a DYNAMIC type

## TRANS-CONDUCTANCE TUBE TESTER



• THE "FREE-POINT" LEVER TYPE ELEMENT SWITCH ASSEMBLY marked according to RETMA basing, permits application of test voltages to any of the elements of a tube.

• NEW IMPROVED TYPE METER with sealed air-damaging chamber provides accurate, vibration-less readings.

• FREE FIVE (5) YEAR CHART DATA SERVICE. The chart provided with Model 85 includes easy-to-read listings for over 1,000 modern tube types. Revised up-to-date subsequent charts will be mailed to all Model 85 purchasers at no charge for a period of five years after date of purchase.

• Employs latest improved TRANS-CONDUCTANCE circuit. Tests tubes under "dynamic" (simulated) operating conditions. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured as a function of tube quality. This provides the most suitable method of simulating the manner in which tubes actually operate in radio, TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading.

• SYMBOL REFERENCES: For the first time ever in a trans-conductance tube tester, Model 85 employs time-saving symbols (★, +, ●, ▲, ■) in place of difficult-to-remember letters previously used. Repeated time studies proved to us that use of these scientifically selected symbols speeded up the element switching step. As the tube manufacturers increase the release of new tube types, this time-saving feature becomes more necessary and advantageous.

• SPRING RETURN SAFETY SWITCH guards Model 85 against burn-out if tube under test is "shorted."

• AN ULTRA-SENSITIVE CIRCUIT is used to test for shorts and leakages up to 5 megohms between all tube elements.

Model 85 comes complete, housed in a handsome portable cabinet with slip-on cover. Only . . . . .

**\$52<sup>50</sup>**

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

Try it for 10 days before you buy. If completely satisfied send \$12.50 and pay balance at rate of \$8.00 per month for 5 months. — No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.  
Dept. D-884, 3849 Tenth Ave., New York 34, N. Y.  
Please rush one Model 85. I agree to pay \$12.50 within 10 days after receipt and \$8.00 per month thereafter. Otherwise I may return, cancelling all further obligation.

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_  
All prices net, F.O.B., N.Y.C.



# Auto Radio Noise

(Continued from page 45)

An intermittent, rough, "burping" noise can originate in the voltage regulator. This can be reduced in the following manner:

Obtain a metal box large enough to contain the voltage regulator, with sufficient additional room for 2 bulkhead mounting type feed-thru coaxial capacitors. Capacitors should be .25  $\mu$ f rated at 20 amp, 200 volts. Mount the two capacitors in holes drilled in one end of the box, as shown in Fig. 5. Two short leads are connected from each ca-

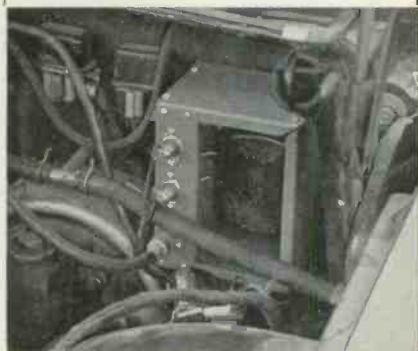
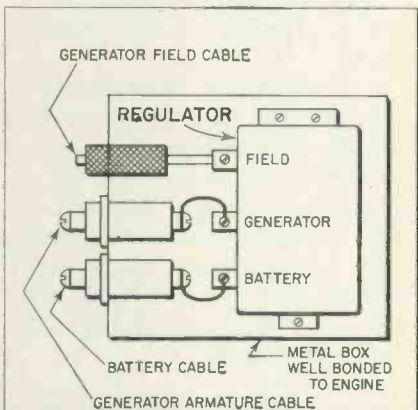


Fig. 5 (top) Regulator, terminals, and coaxial capacitor placements in shield box. (Bottom) Regulator shield box showing standard coaxial cable connector at end of generator field cable.

pacitor to the regulator's generator and battery terminals respectively. The generator and battery leads are then connected to the proper capacitor terminals on the outside of the regulator shield box as shown.

Do not use a capacitor on the generator field lead. A piece of braided cable shield should be pulled over this lead, from the

Buy in Confidence At Lowest Prices!  
FAMOUS MAKE

# ACCRA TRON

TV & RADIO TUBES

## 40¢ EACH

FULLY GUARANTEED FOR 1 YEAR!!

- FREE Replacement of any tube that becomes defective in use within 1-YEAR from date purchased!
- Used or factory second tubes!

ALL TUBES INDIVIDUALLY BOXED, CODE DATED & BRANDED "ACCRA TRON"  
1,000's Of Tubes In Stock At All Times... Below Is Part Listing! Send For Complete List!

**SPECIAL!** 6SN7GT . . . . . 30¢  
6W6GT . . . . . 30¢

FREE CHEATER CORD WITH ORDER OF \$7 OR MORE!

OZ4	SU8	6BA6	6CM6	6SQ7	12A27
1B3GT	5V4G	6BC5	6CM7	6T4	12B4
1R5	5X8	6BC8	6CN7	6T8	12BA6
1S5	5Y3	6BE6	6CQ8	6U8	12BA7
1T4	6AB4	6BF5	6CR6	6V6GT	12BE6
1U4	6AC7	6BG6G	6CS7	6W6GT	12BF6
1U5	6AF4	6BH6	6CU5	6X4	12BH7
1V2	6AG5	6BJ6	6CU6	6X5GT	12BQ6
1X2	6AH6	6BK5	6DC	6X8	12BY7
2AF4	6AL5	6BK7	6DE6	6YG	12CA5
2CY5	6AM8	6BL7GT	6DG6GT	7A4/XXL	12CNS
3BC5	6AN8	6BN6	6DQ6	7A7	12D4
3BN6	6AQ5	6BQ6GT	6H6	7C4	12F8
3BZ6	6AQ6	6BQ7	6J5	7F8	12K5
3CB6	6AQ7	6BS8	6J6	7N7	12K7
3S4	6AS5	6BY5G	6J7	12A8	12L6
3V4	6AT6	6BZ6	6K6GT	12AR5	12R5
4BQ7A	6AU4GT	6BZ7	6K7	12AQ5	12SA7
4BZ7	6AU5GT	6C4	6S4	12AT6	12SJ7
5AM8	6AU6	6CB6	6S8GT	12AT7	12SK7
5AN8	6AU5	6CD6G	6SA7	12AU6	12SN7GT
5AV8	6AV8GT	6CF6	6SG7	12AUT	12SQ7
5AT8	6AV6	6CG7	6SH7	12AV6	12V6GT
5CG8	6AW8	6CG8	6SJ7	12AV7	12V6GT
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shield box to the generator. The braid should then be bonded to the generator frame and to the regulator shield box (see Fig. 2 also). Regular coaxial cable connectors may be used on this cable at the regulator shield box to facilitate bonding and connecting. This operation should reduce regulator "burping" to a very low level.

Brush-type motor interference from windshield wiper, fan, blower, etc., can be quickly isolated by switching them on-and-off while

listening to weak signals on the receiver. Any offending device should first be bonded to the main frame or ground. Install a specially designed bypass capacitor rated at .25  $\mu$ f, 100 d-c volts as close to the low voltage terminal as possible (see Fig. 6).

On equipment in non-metallic marine hulls, run a very heavy ground—a copper plate at least four inches wide from stem to stern along the inside hull—as far below the water line as possi-

ble. Bond all metal used on the boat to this ground. Use heavy copper braid. Bond engine block, drive

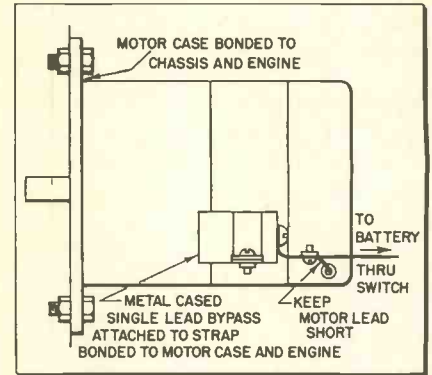


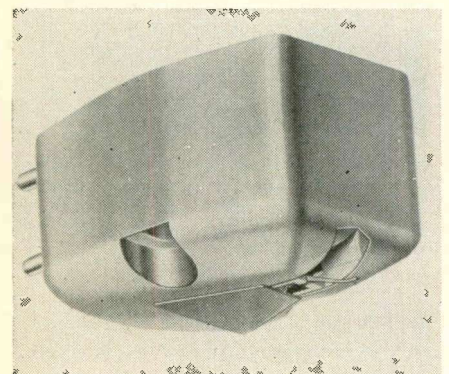
Fig. 6—Method of mounting special type bypass capacitor to eliminate interference from accessory motors.

shaft, rudder posts, etc. directly to the main ground strap. Every piece of metal in contact with the water must be bonded to this common ground.

A check of the effectiveness of the steps that have been taken to eliminate interference to radio reception can easily be made by observing noise being radiated by other idling or moving vehicles. They will generate much more noise in your receiver than your own engine—unless they have been equally "de-noised." •

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3AL5	6AN8	6CM7	7B4	12F8
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4BZ7	6AUB	6DC6GT	7E6	12SN7GT
4CB5	6AV5GT	6DQ6	7E7	12SQ7
5AM8	6AV6	6F6	7F7	12V6GT
5AN8	6AW8	6H6	7F8	12W6GT
5AT8	6AX5GT	6J5	7G7	12X4GT
5AV8	6B8	6J6	7H7	13AU4GT
5A24	6BC5	6J7	7Q7	15B6GG
5CG8	6BC8	6K7	7S7	19T8
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	6BE6	6Q7	7X7	35A5
	6BE8	6S4	7Y4	35B5
	6BGG	6S8GT	7Z4	35C5
	6BH6	6SD7GT	12A8	35W4
	6BJ6	6SF5	12A8S	35Z5
	6BK5	6SG7	12AQ5	50A5
	6BK7	6SH7	12AT6	50B5
	6BL7GT	6SJ7	12AT7	50C5
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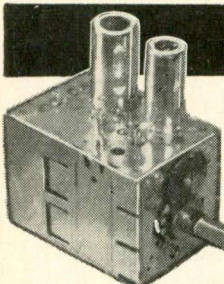
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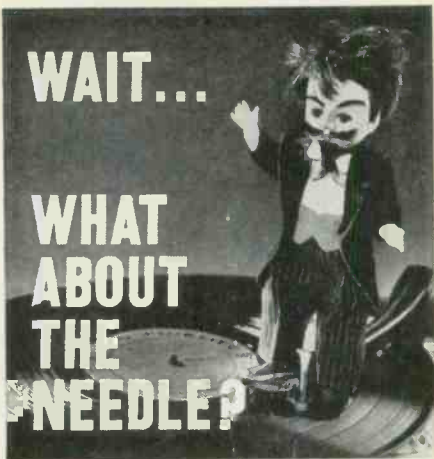
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## New Books

**BASIC MATHEMATICS, Vol. 1.** By Norman H. Crowhurst. Published by John F. Rider Publisher, Inc. 144 pages, soft cover. \$3.90.

Here is the initial manual of a four volume course in mathematics by a former Senior Lecturer on Mathematics at the South East London Technical College. The approach taken by the author is: learn by doing, not by memory. Problems in counting, addition, subtraction, division, multiplication, decimals, areas, angles, and other basic elementary math are presented in a practical, simplified manner. Numerous drawings complement the text. This text can provide an illuminating foundation for understanding more advanced mathematics.

**COLOR TV SERVICING.** By Walter H. Buchsbaum. Published by Prentice-Hall, Inc. 262 pages, hard cover. \$7.85.

This is the second printing of an excellent guide for color TV servicing. Commencing with the principles of Colorimetry, the text proceeds to cover each section of a color television receiver, including: installations, adjustments, and troubleshooting defects; 19 chapters in all. Pictures, drawings, and schematics adequately illustrate the text (first printed in 1955). The book may serve well as a color TV guide for technicians unfamiliar with color sets or a reference manual for the more advanced technician.

**ELECTRONIC ORGAN HANDBOOK.** By H. Emerson Anderson. Published by Howard W. Sams & Co., Inc., 272 pages, soft cover. \$4.95.

Many modern electronic organs are presented here with the "back cover" removed. Once the technician has passed the complicated looking keyboard, he will recognize familiar everyday components already encountered while repairing hi-fi and TV units. The text explains how an electronic organ works (outlining the theory of tone generators, waveshaping, keying, and amplifier circuits) and an organ speaker-amplifier, including: Baldwin, Conn, Gulbrandsen, Hammond, Kinsman, Lowery, Thomas, Wurlitzer, and Leslie. Schematic drawings, photos and charts enhance text material. A six page glossary is helpful, too. Operations and functions discussed include pedal selection, harmonic drawbars, vibrato system, amplifier and power supplies. Troubleshooting and repair of each instrument is fully covered. A separate chapter covers how to use a commercially available organ tuner device, the Conn "Strobotuner." The electronic technician interested in organ repairs will find this handbook essential when called upon to repair one of the 8 listed organs.

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## Hi-Fi Distortion

(Continued from page 47)

instruments capabilities to some degree.

The IM analyzer also requires careful consideration when purchasing. The two signals employed in the analyzer must have reasonably low harmonic content. The 60 cps signal is frequently taken from a winding on the power transform-

er. This is an undesirable arrangement—generally resulting in a high percentage of distortion. This distortion can seldom be filtered satisfactorily. In a better unit, a separate independent transformer is used to produce the 60 cps signal.

Two methods of mixing the high and low frequency signals are commonly used. As shown in Fig. 4A, high and low frequencies are combined across R-3. The low frequency is divided between R-2 and R-3, while the high frequency amplitude is varied by R-1, and divid-

ed between R-1 and R-3. For one setting of R-3, the relative amplitudes of the high and low frequencies are constant. Unless R-1 and R-2 are extremely large and R-3 is negligible in comparison, variations of R-3 will change the relative amplitudes of the two frequencies. This method of mixing can cause interaction between the low and high frequencies resulting in IM at the signal source.

This frustrating problem is overcome by using bridge mixing, as shown in Fig. 4B. In this way, there is complete separation of the two signals. No interaction exists between signals and thus no IM



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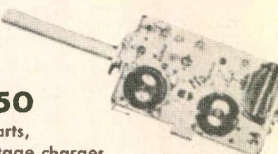
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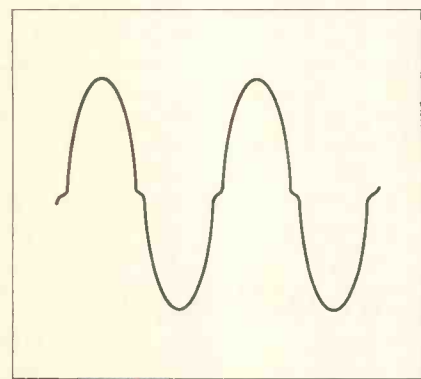


Fig. 5—Scope trace of sine wave from distortion meter with shape at zero point an effect of Wein bridge circuit.

distortion is generated in the instrument.

Another important instrument consideration is the filter system employed. A high quality constant K type, with at least two and preferably three sections, should be included.

### Using Harmonic Distortion Meters

In a practical test setup, a low distortion signal generator is employed with the harmonic distortion meter. This generator should normally have less than 0.1% distortion over the range from 20 to 20,000 cps. Some instrument specifications that claim less than 1% distortion may actually check out in the vicinity of 0.1%. Others specifying 0.1% actually check out with much more distortion. An example of the former type is a Hewlett-Packard 200 CD which measured near 0.1% distortion despite its obviously conservative 1% guarantee. Good units at various prices



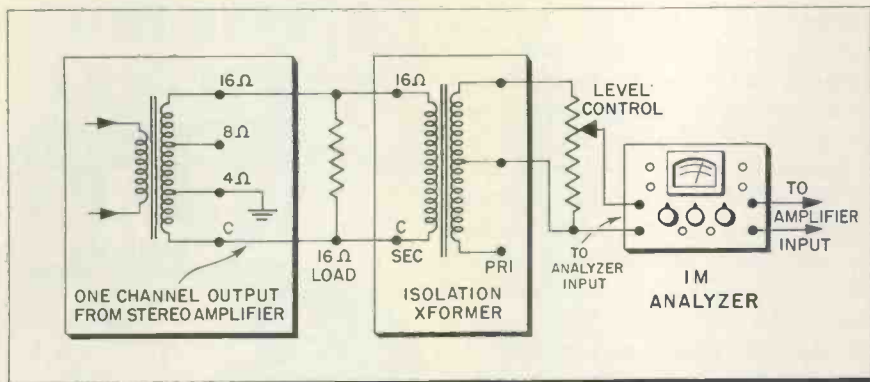


Fig. 6—An isolation transformer is used in an IM distortion analyzer hook-up for testing a stereo amplifier when its output transformer's 4 ohm tap is grounded.

are readily available at jobbers. If a 0.1% distortion instrument is not required, higher distortion units are available at lower prices. In any event, the instrument should be from a reputable manufacturer who guarantees his specifications, or it should be checked out on a good distortion meter to determine if it meets with the technician's requirements.

The distortion meter audio oscillator, and amplifier under test should be set up exactly as described in the manufacturer's instruction book. Follow his recommended procedure for each step of the operation. Depending upon the type of instrument, attach the vertical leads of a scope to the terminals so marked on the distortion meter, and set the signal level on the analyzer as described. Adjust the scope so that two cycles of the sine wave appear on the screen—to fill an area approximately two by two inches on the graticule. The sine wave will appear somewhat as shown in Fig. 5 due to the Wein bridge circuit. Distortion percentage will be indicated on the meter.

Switch to the distortion position on the analyzer and then adjust the frequency and balance controls to get the minimum deflection on the distortion meter. If multiple sine waves appear on the scope screen (4 cycles, 8 cycles, etc.) and the distortion meter reads above the desired limit, too much distortion exists in the amplifier. This can be caused by a bad tube or other faulty component. If the harmonics ride on a thick pattern, the meter is probably reading hum or noise, and not distortion. A lower reading can only be achieved when the hum is eliminated.

At times, this hum cannot be eliminated because the signal-to-noise ratio for the particular stage or amplifier may be too high. In this instance, the distortion should be considered in proportion to the thickness of the hum signal. The meter reading should be multiplied by the ratio of distortion components in the signal to the composite (hum + distortion) appearing on the scope. This will indicate the approximate percentage of distortion in the amplifier under test. The rest of the meter reading is merely hum and noise.

Do not measure the distortion (either harmonic or IM) through an equalized amplifier stage. This will give an untrue and weighted reading because the frequency response of such a stage is not flat. Similarly, tone controls, loudness controls, etc., must be set to obtain maximum flat response for which the amplifier is capable. Only under this condition will readings be valid.

#### Using IM Distortion Meters

IM readings should be made as instructed by the instrument manufacturer. Do not disregard instruction on accurate settings of relative signal amplitude levels.

A problem in measurement will occur in some stereo amplifiers—where the 4 ohm tap on the output transformer is connected to ground instead of common. A large output transformer, with power capabilities at least double that of the amplifier, should be used for isolation purposes, and should be connected as shown in Fig. 6, between the amplifier output and input on the IM analyzer. Measurements can then be made in accordance with manufac-

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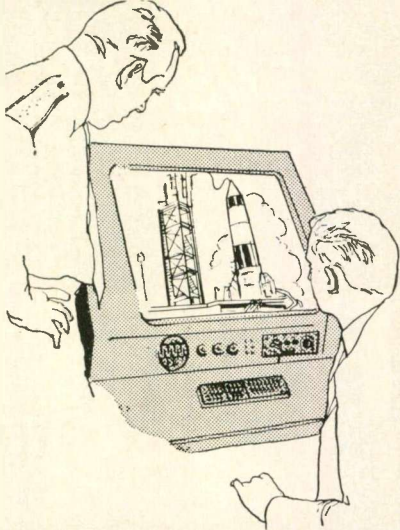
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turers' instructions.

Poor readings indicate some non-linearity. Unbalanced output tubes or any defective component can be the cause of excessive distortion. It is frequently possible to track down the offending stage by feeding the signal to the various points inside the amplifier, and working back from the output to the input of the amplifier's circuitry. This same tracing method may also be used in tracking down excessive harmonic distortion. •

## Communications at Timken

(Continued from page 42)

Measurements Corp. Model M360 Generator  
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Cabinet (top-to-bottom)  
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While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

## TELEVISION TUNER SERVICE CO.

2103 West 3rd Street, Bloomington, Indiana

**\$6.00** PLUS POSTAGE AND C.O.D. CHARGES AND MAJOR PARTS **\$6.00**

*Available to you!* . . . . . A fast and efficient television tuner repair service that can serve the serviceman.

Two-day in and out handling.  
Repair and realignment to factory specs.  
Clean and relubricate switches and turrets.

Discount prices for replaced parts.  
Return shipping charges prepaid.  
Charge for this service is \$6.00 plus major parts.

Send tuners by parcel post or air express. Include all broken parts and tuner model and number. Take special care to pack tuners well to prevent transit damage.

VHF • UHF • UV COMBOS • FM TUNERS

For more data, circle 4-71-1 on coupon, p. 50

ELECTRONIC TECHNICIAN • April, 1961

# PRODUCTS FOR MODERN LIVING





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

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

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

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



**ATR "A" BATTERY ELIMINATOR**

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

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

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

**AUTO-RADIO VIBRATORS**

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

There is an ATR VIBRATOR for every make of car!

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



**ATR CUSTOMIZED KARADIO**

Vibrator-Operated with Tone Control

ATR KARADIO . . . is ideal for small import cars or compact American cars! Unit is completely self-contained—extremely compact! Powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. The ATR Customized Karadio comes complete with speaker and ready to install. Can be mounted in-dash or under-dash—wherever space permits! No polarity problem. Neutral Gray-Tan, baked enamel finish. Overall size, 7" deep, 4" high, and 6½" wide. Shipping weight, radio set, 7 lbs. Model K-1279—12 for 12V Dealer Net Price. . . **\$33.57**  
Model K-1279—6 for 6V Dealer Net Price. . . **\$33.57**

There is a trim plate kit for YOUR CAR!



**ATR TRUCK KARADIO**

Excellent Tone, Volume, and Sensitivity!  
Compact, yet powerful. Fits all trucks, station wagons, most cars and boats. Just drill a ½ inch hole in roof and suspend the one-piece unit (aerol chassis and speaker) in minutes. Watertight mounting assembly holds antenna upright. Yoke-type brackets let you tilt radio to any angle.

Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls. 33-in. stainless steel antenna. Neutral gray-tan enameled metal cabinet. 7 x 6½ x 4 in. high over-all. Shipping weight 10½ lbs.  
Model TR-1279—12 A for 12V Dealer Net Price **\$41.96**  
Model TR-1279—6A for 6V Dealer Net Price **\$41.96**

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



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

For more data, circle 4-71-2 on coupon, p. 50

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# ask YOURSELF

\* \* \* \* \*

## THESE Four QUESTIONS ABOUT BUYING OFF-BRAND SPEAKERS

### Can I Tell My Customers The Name Of The Speaker I've Installed?

Jensen is a name you can mention with pride and confidence. Jensen Viking and Weathermaster speakers benefit from the tremendous prestige of Jensen's HiFi lines.

\* \* \* \* \*

### Do I Pay More For Jensen?

No. You may find an off-brand "deal" occasionally, but you get consistent competitive year-round lowest cost and highest quality when you concentrate on Jensen.

\* \* \* \* \*

### Can Off-Brands Give Me Proof Of Performance?

Jensen has designed every type of speaker for the military. Jensen speakers have been under the pole... and around the world—*outside* submarines. This know-how is a bonus extra in every Jensen speaker.

\* \* \* \* \*

### How About Availability?

Jensen speakers are stocked by fine jobbers and distributors everywhere. You can depend on replacements being available.



COMPARE OFF-BRAND ANSWERS TO JENSEN ANSWERS . . .

*. . . you'll find once again that there is something better from . . .*

**Jensen** / MANUFACTURING COMPANY  
 DIVISION OF THE MUTER CO. / 6601 S. Laramie Avenue, Chicago 38, Illinois

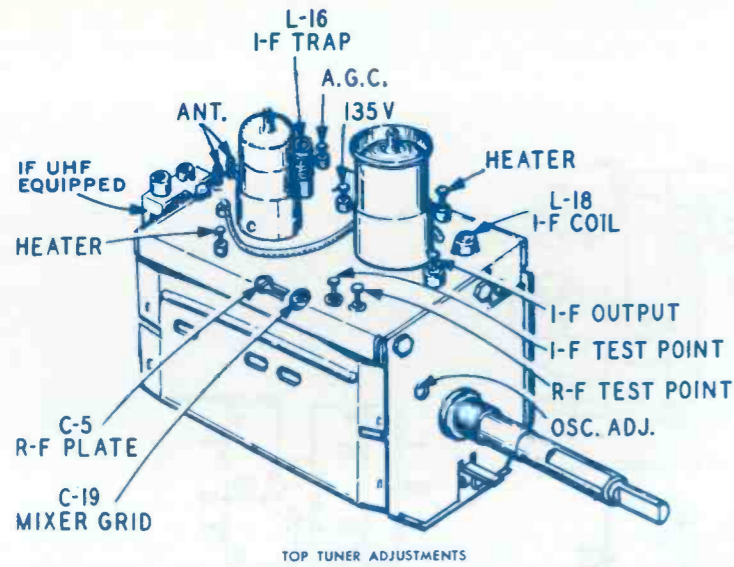
IN CANADA: RENFREW ELECTRIC CO., LTD., TORONTO • IN MEXICO: UNIVERSAL DE MEXICO, S.A., MEXICO D.F.  
 (92 pages in this issue, including Circuit Digests)

For more data, circle 4-72-1 on coupon, p. 50

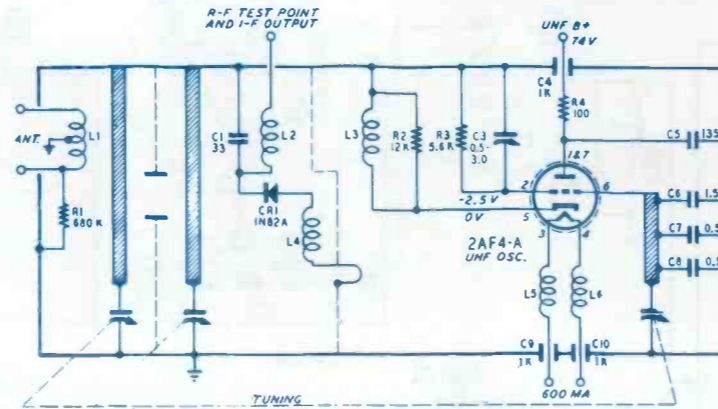
ELECTRONIC TECHNICIAN • April, 1961



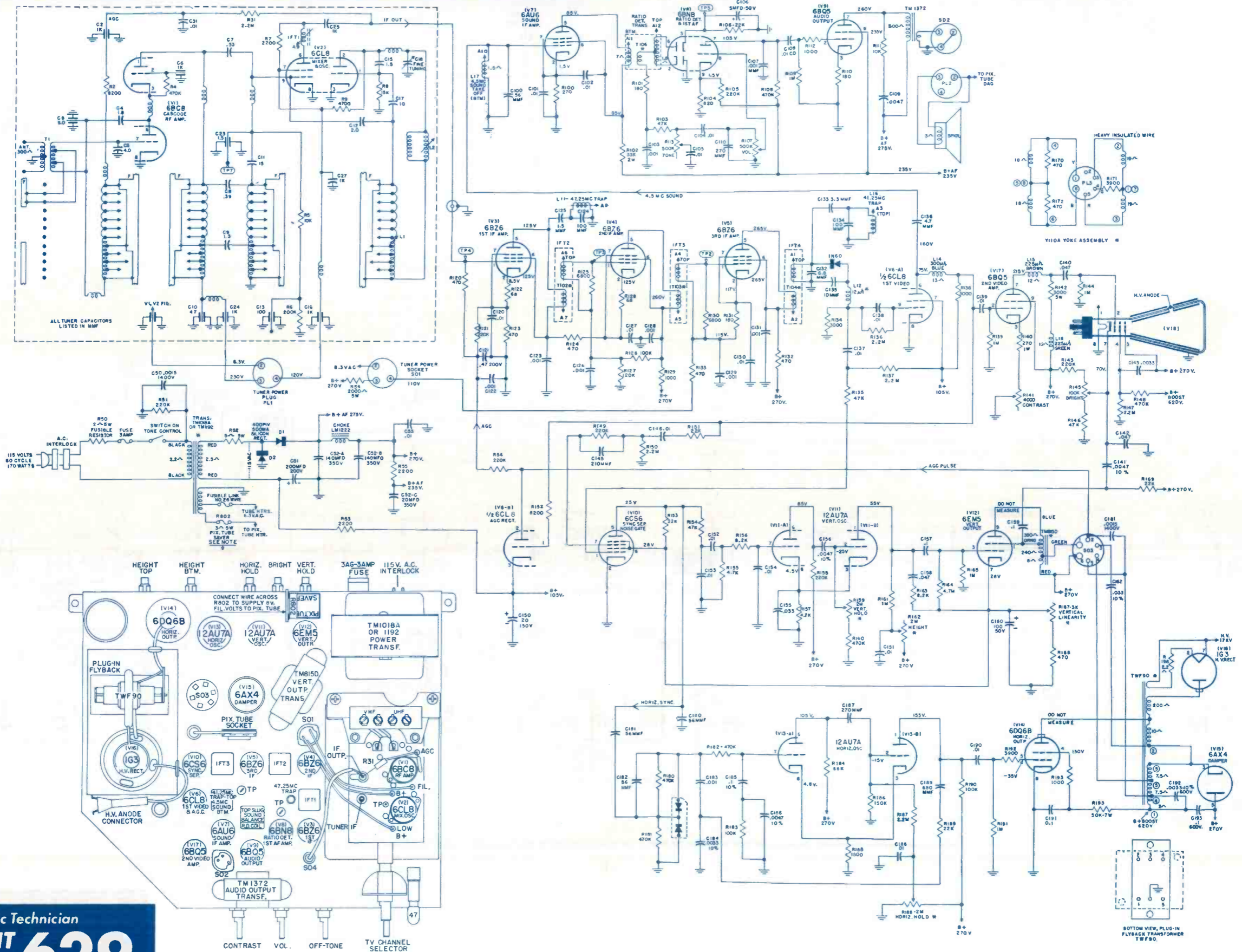
April • 1961



UHF TUNER SCHEMATIC (IF UHF EQUIPPED)









- A52-3128** 60 Cycle Power Transformer  
 Primary Black-Black 1 Ohm  
 H.V. Sec. Red-R/Y-Red 44 Ohms Center Tapped  
 12.8V Green-G/Y-Green Less than .1 Ohm  
 5.0V Yellow-Yellow Less than .1 Ohm

- A51-0428** Hor. Osc. & A.F.C. Transformer  
 A to C 20 Ohms  
 A to D 69 Ohms  
 A to F 72 Ohms

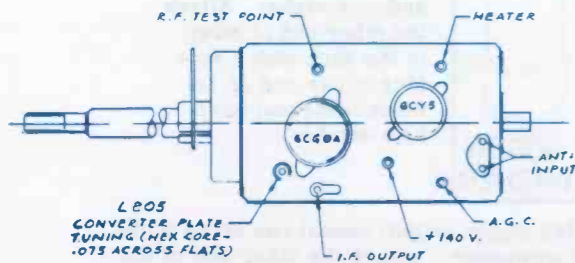
- A52-3104** Audio Output Transformer  
 Primary 360 Ohms  
 Secondary 0.5 Ohms

- A52-3129** Filter Reactor 5. **A51-0418** Hor. Width Coil  
 42 Ohms 6.5 Ohms

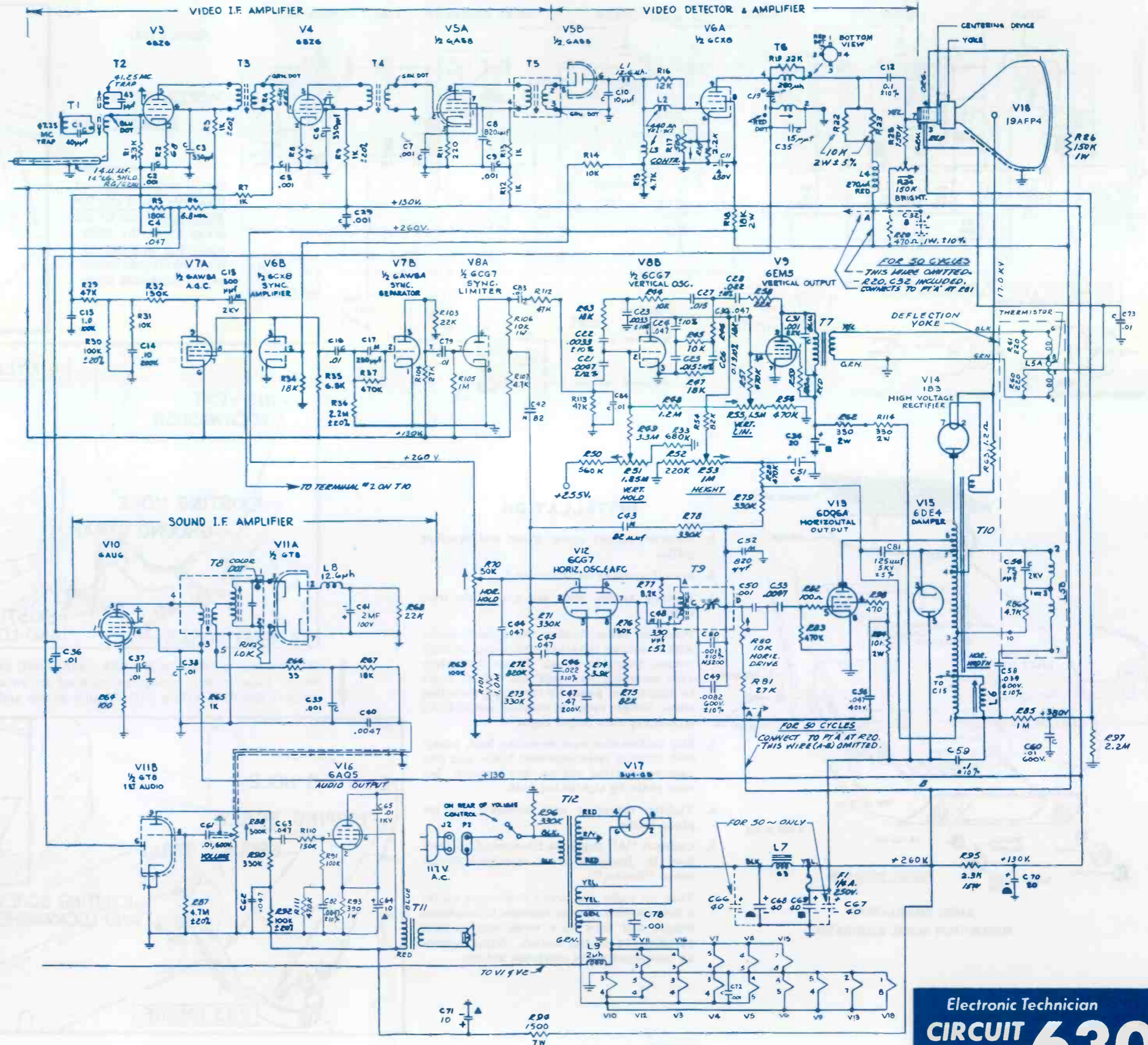
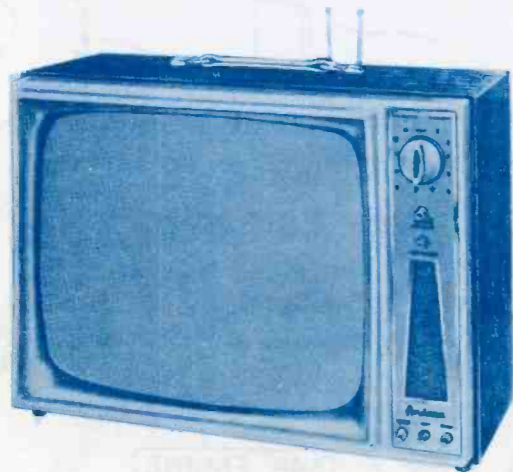
- A52-3106** Vertical Output Transformer  
 Primary 460 Ohms  
 Secondary 4.05 Ohms

- A52-3096** Deflection Yoke At 25° C  
 Horizontal Coils 2 to 7 35 Ohms  
 Vertical Coils 4 to 6  
 (With temperature compensating resistor) 17.6 Ohms  
 (Without thermistor) 13.8 Ohms

- A52-3120** Horizontal Output Transformer  
 Terminals 1-2 1.94 Ohms  
 2-3 6.0 Ohms  
 3-4 9.0 Ohms  
 4-5 1.8 Ohms  
 5-6 11.5 Ohms  
 6-H.V. 338 Ohms

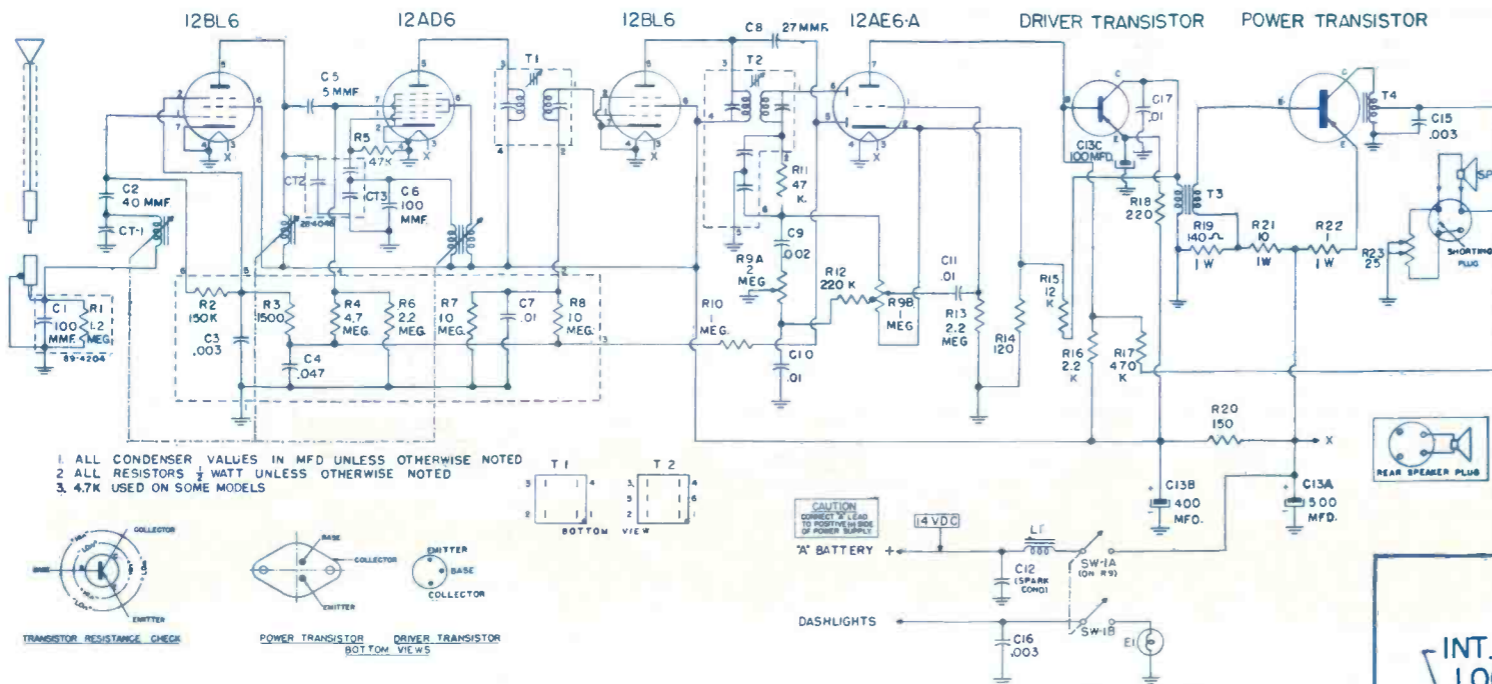


TUNER-TERMINAL LOCATIONS

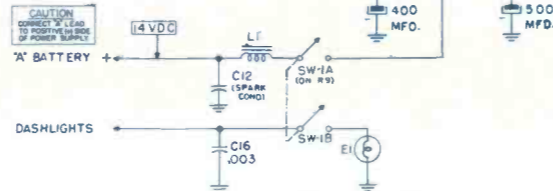
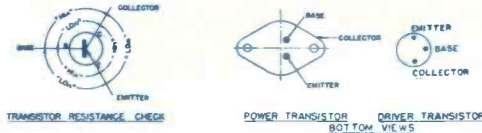




Pin	12BL6 RF		12AD6 Conv.		12BL6		12AE6		Power		TRANSISTOR		Driver	
	Res	V	Res	V	Res	V	Res	V	Res	V	Pin	Pin	Res	V
1	5 MEG	-35	50K ohms	-5	8 MEG	-4	2.2 MEG	-6	30	11.5	BASE	150	10	
2	5 MEG	-6	1 ohm	0	0	0	120 ohms	0	3.8 ohm	11	EMITTER	330	11	
5	80 ohms	11.8	110 ohms	11.8	140 ohms	11.8	6 MEG	-2	0	0	COLLECTOR	170	1	
6	70 ohms	11.8	70 ohms	11.8	70 ohms	11.8	500 K	-6						
7	300 ohms	.0	MEG	-.25	0	0	150	10						



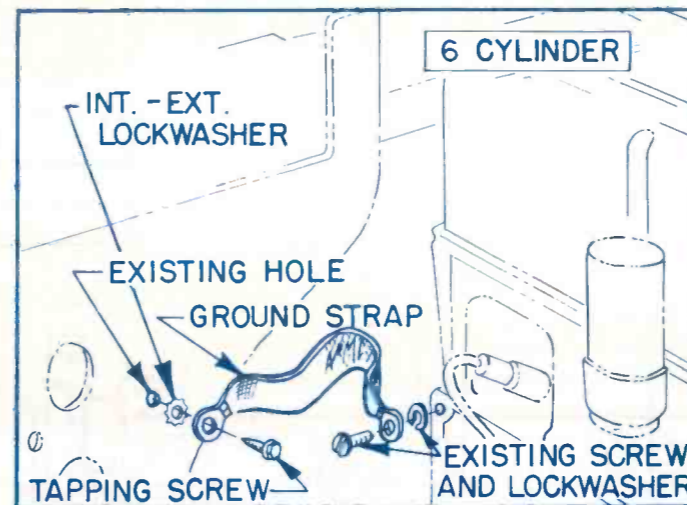
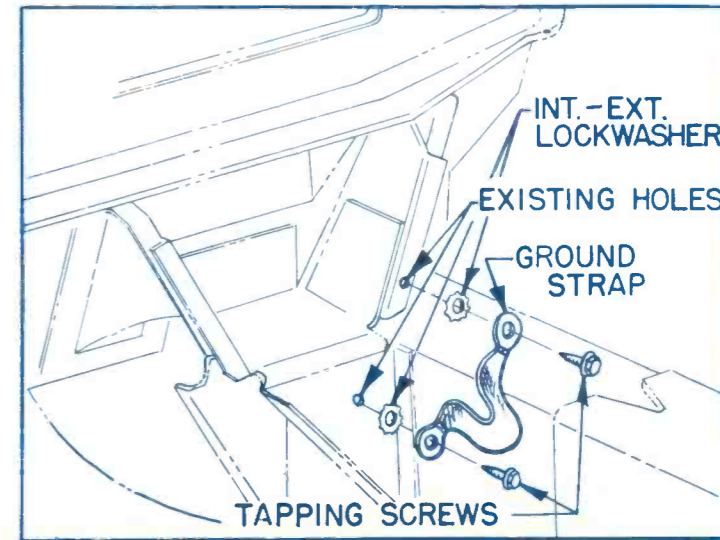
1. ALL CONDENSER VALUES IN MFD UNLESS OTHERWISE NOTED  
2. ALL RESISTORS 1/2 WATT UNLESS OTHERWISE NOTED  
3. 4.7K USED ON SOME MODELS



April • 1961

### MOTOR NOISE ELIMINATION

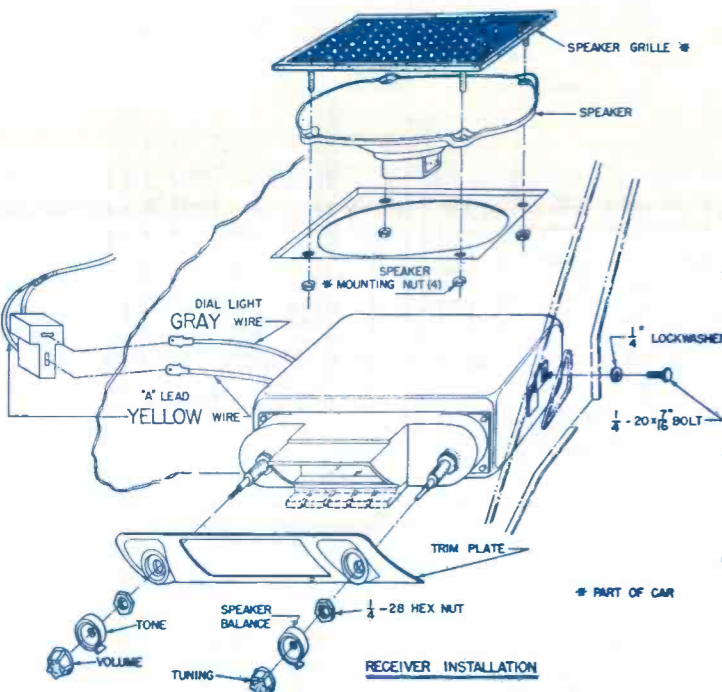
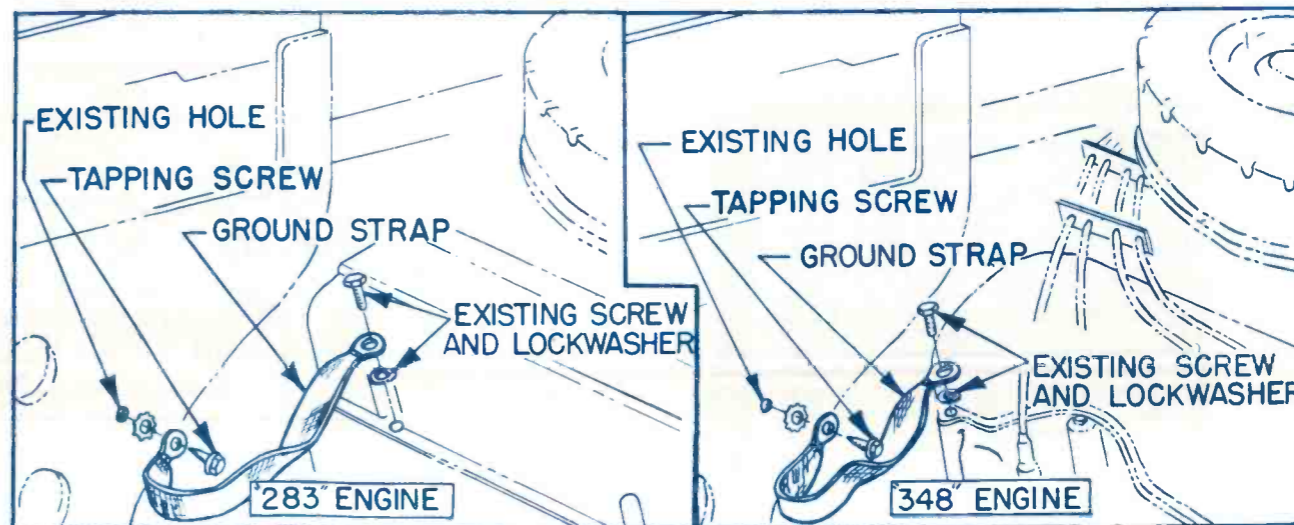
On all vehicles except those equipped with the 348 engine, install one strap from the body mounting bracket to the dash-frame brace on the right side only.



### INSTALLATION OF GROUND STRAPS

On vehicles equipped with a six cylinder engine, install one strap to the existing screw and lockwasher. Attach the other end of strap to the dash with a tapping screw and an internal-external tooth lock-washer.

On vehicles equipped with a 283 engine (left) or a 348 engine (right) install one strap to the rocker panel cover, using the existing screw and lockwasher. Attach the other end of the strap to the dash with a self-tapping screw and internal-external lockwasher.



RADIO INSTALLATION  
PUSH-BUTTON MODEL ILLUSTRATED

### INSTALLATION

1. Remove dummy cover plate and speaker grille.
2. Install speaker as illustrated.
3. Remove knobs, nuts and trim plate from radio.
4. Position radio behind instrument panel with mounting bushings protruding through control holes in panel. Place trim plate over mounting bushings and attach radio to instrument panel by replacing mounting nuts. Retain radio in mounted position by tightening nuts finger tight.
5. Slip lockwasher over mounting bolt. Insert bolt through re-inforcement brace and into captive floating nut on rear bracket. Secure radio by tightening bolt.
6. Tighten mounting nuts securely and replace knobs.
7. Connect "A" leads as illustrated. Install fuse in junction block terminals designated "Radio."
8. Turn on radio and allow it to warm up for a few minutes. Raise antenna to maximum height and tune in a weak station near 1400KC (14 on dial scale). Adjust antenna compensator for maximum volume.



# ELECTRONIC TECHNICIAN 632

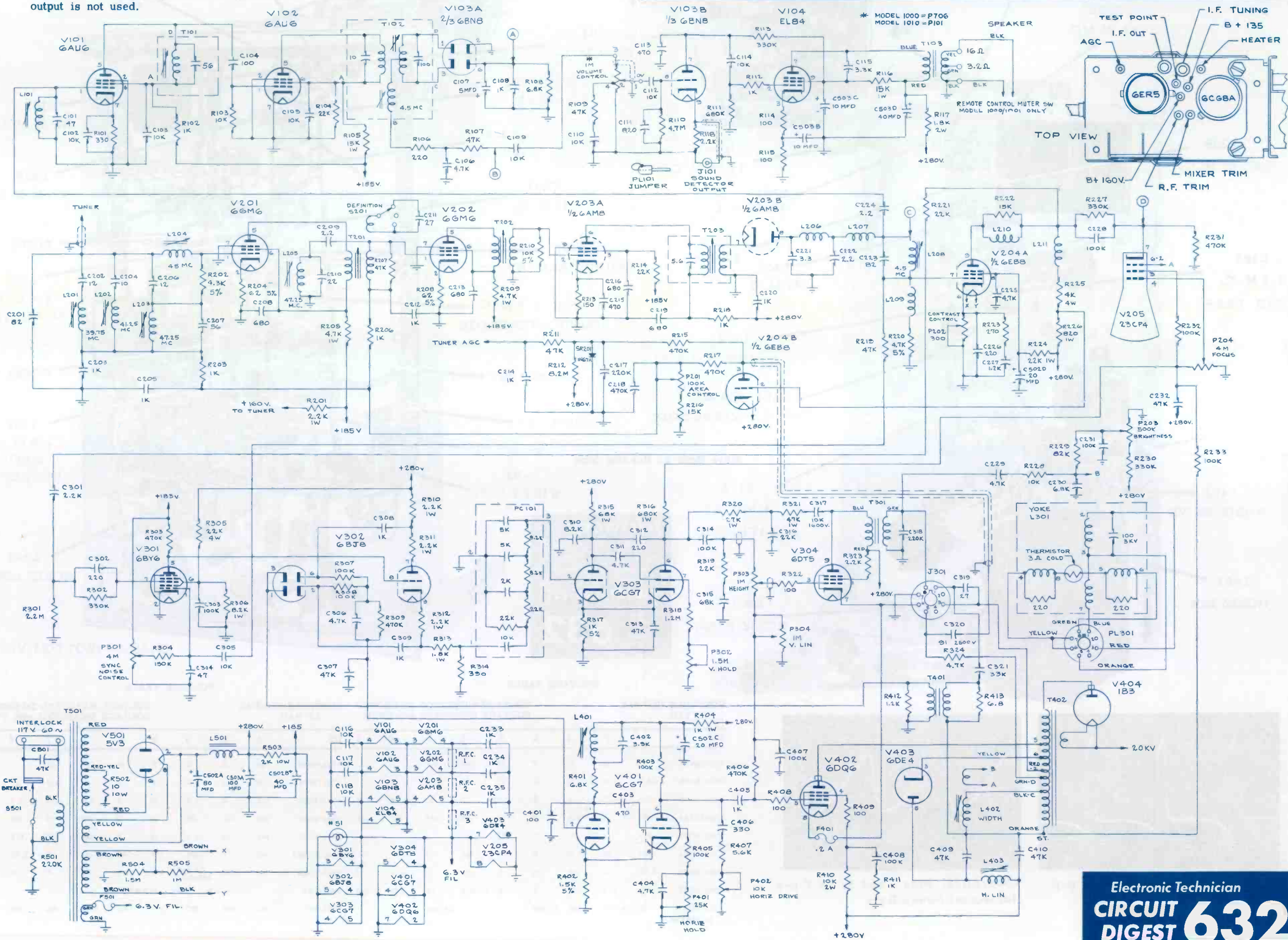
## CIRCUIT DIGEST

**FLEETWOOD**  
TV Chassis 1000 & 1010  
Models 1001 & 1011

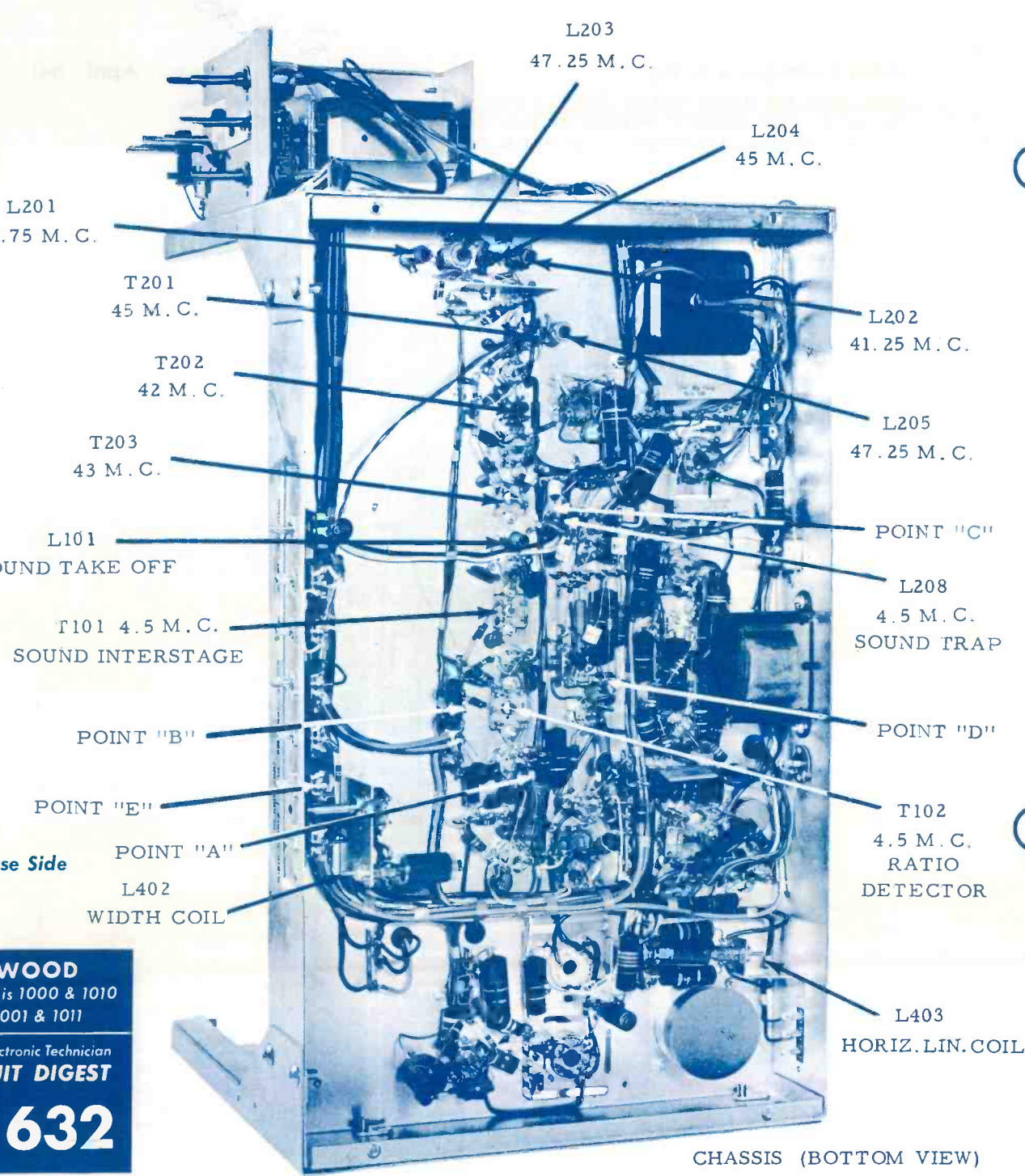
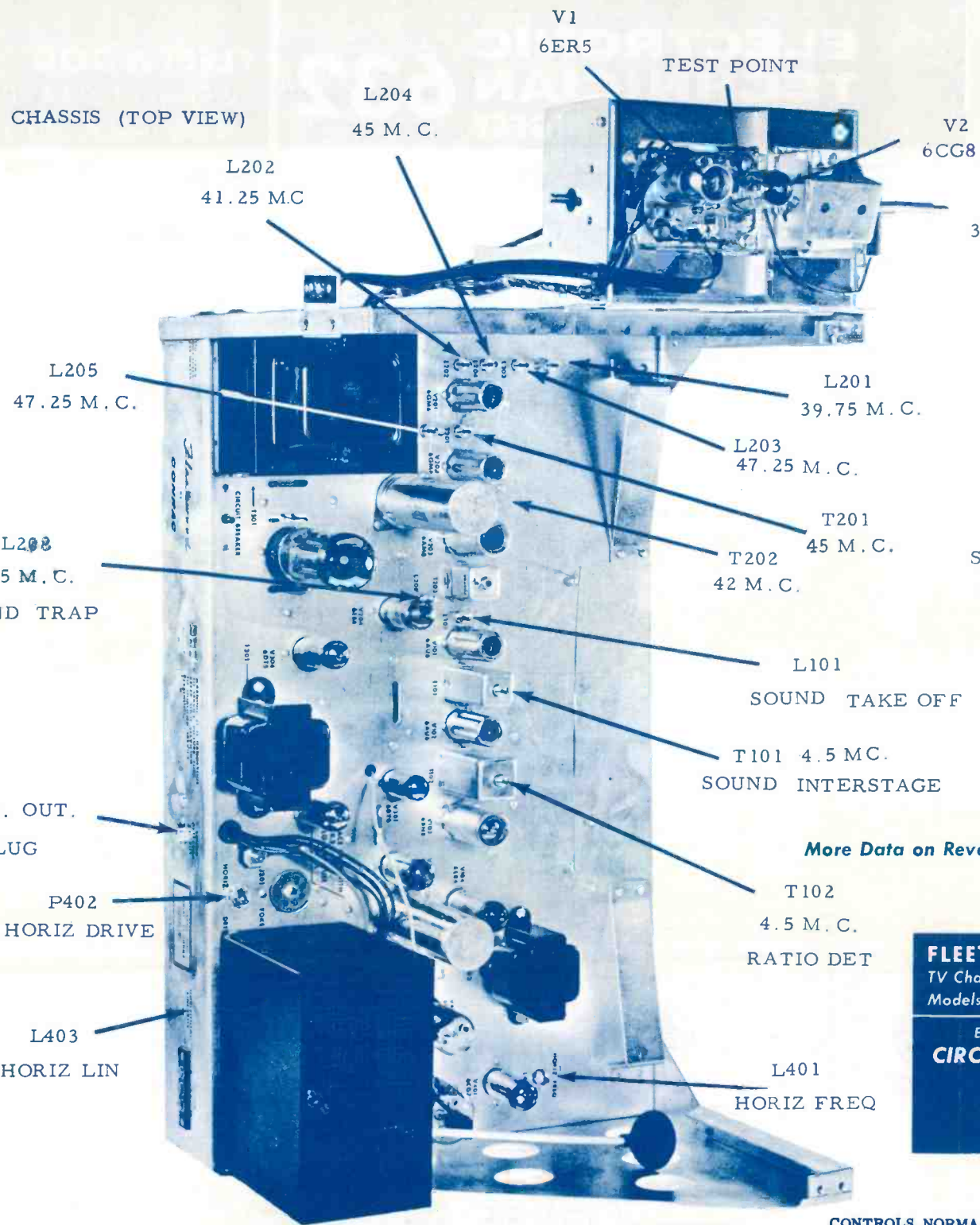
VIDEO BANDPASS: 3.75 MC

ANODE VOLTAGE: 20,000 V. April • 1961

**HIGH FIDELITY AUDIO CONNECTION:** A Cathode Follower Jack is located in the rear apron of the chassis to permit quick, easy connection to a high fidelity system. A short-circuiting plug should be inserted in the jack if the cathode follower output is not used.





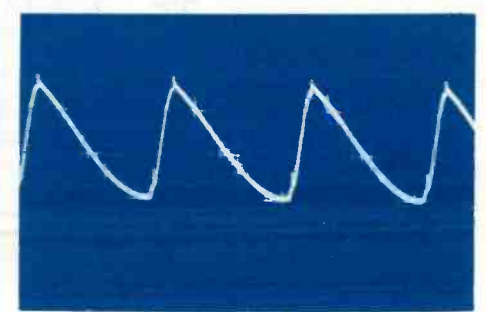
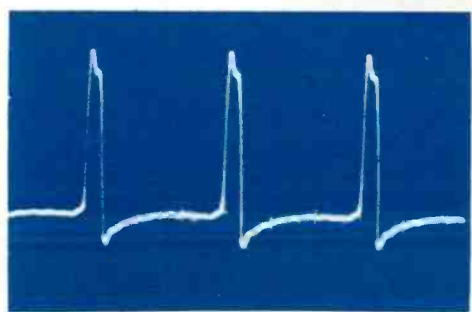


More Data on Reverse Side

**FLEETWOOD**  
 TV Chassis 1000 & 1010  
 Models 1001 & 1011

Electronic Technician  
**CIRCUIT DIGEST**

**632**



V204B/6EB8, Pin 3, 900 V p-p  
Horizontal Sweep Rate

V302/6BJ8, Pins 1 and 3, 15 V p-p  
Horizontal Sweep Rate

VOLTAGE TABLE

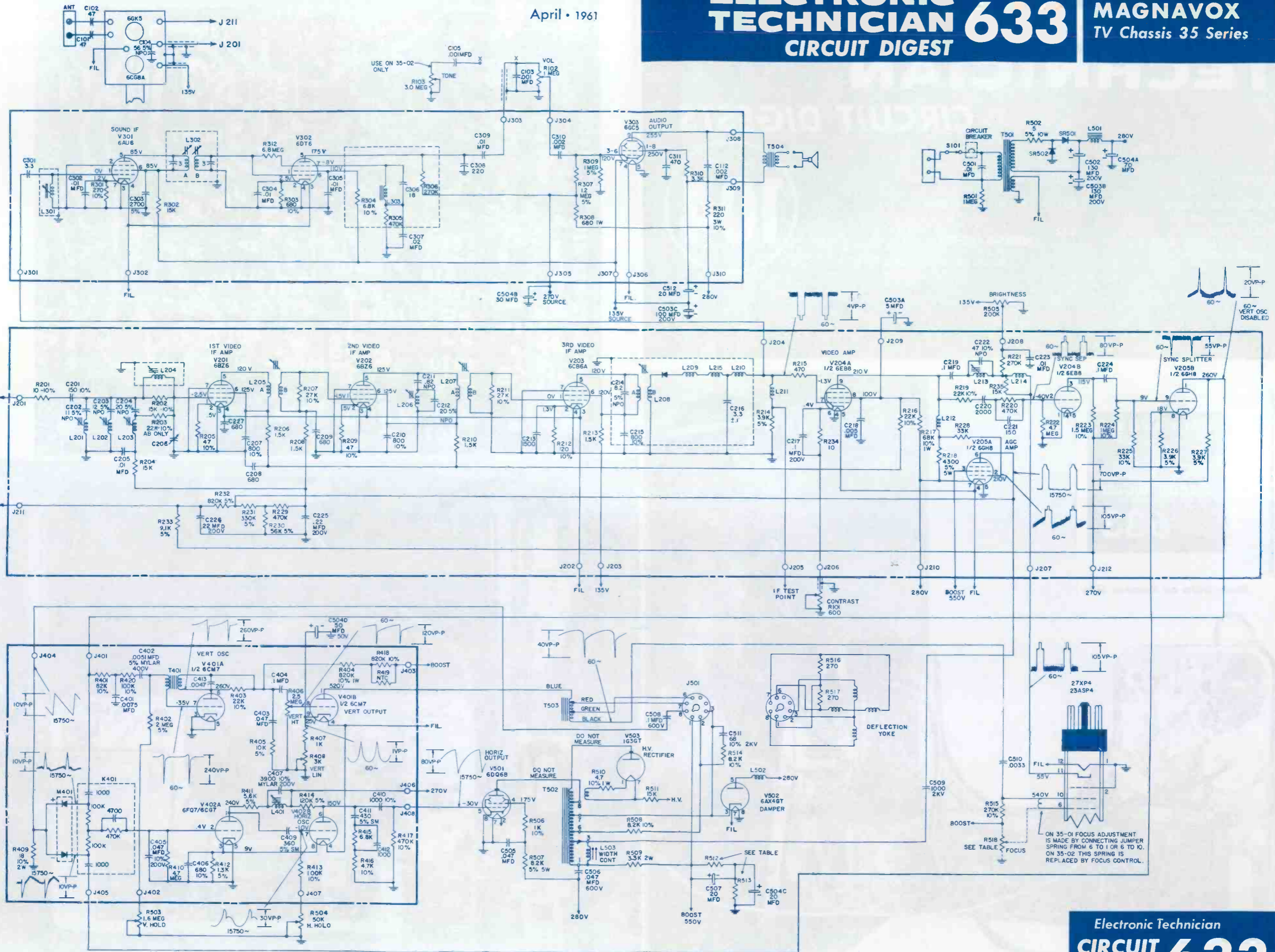
CONTROLS NORMAL 117 VAC	VOLTAGE MEASURED TO GROUND VOLTAGE MEASURED with VTVM									
	PIN	1	2	3	4	5	6	7	8	9
V101/6AU6	0	G	G	F	184	184	2.7			
V102/6AU6	-19.5	G	G	F	67	73	G			
V103/6BN8	-5.9	G	-6	F	G	-13	46	-7.8	G	
V104/EL84	NC	0	5.4	F	G	NC	225	NC	180	
V201/6GM6	-3.4	.32	G	F	165	168	G			
V202/6GM6	-3.4	.36	G	F	159	160	G			
V203/6AM8	1.70	0	135	G	F	270	0	-4.7	G	
V204/6EB8	285	274	-24	F	F	0 to 3.6	-5	230	243	
V205/23CP4 or 23AVP4	F	0-155	600	0-600			125-190	F		

VOLTAGE TABLE

CONTROLS NORMAL 117 VAC	VOLTAGE MEASURED TO GROUND VOLTAGE MEASURED with VTVM									
	PIN	1	2	3	4	5	6	7	8	9
V301/6BY6	66	G	G	F	80	27	-25			
V302/6BJ8	0	25.5	0	F	G	-28	203	81	82	
V303/6CG7	100	0	3.4	G	F	195	-38	3.4	G	
V304/6DT5	280	NC	-27	F	G	NC	0	NC	275	
V401/6CG7	240	96	9.3	G	F	160	-15	9.3	G	
V402/6DQ6A	NC	F	NC	170	-45	-24	G	1.45		
V403/6DE4	NC	NC	Do Not Measure	NC	270	NC	F	G		
V404/1B3	-	DO NOT MEASURE	-							
V501/5V3	NC	290	NC	-5.4	NC	-5.4	NC	290		



April • 1961









# BURGESS New Product Promotion NEWS

SPRING 1961

## Burgess Distributors' Salesmen Offer New Full-Range Profit Opportunities

FREEPORT, ILL., (BNS) . . . Burgess Distributors' Salesmen have hit the road with the newest, most complete portable radio battery sales program in industry history.

### NEW PROMOTIONS

The all-new 1961 campaign provides radio-tv servicemen and appliance dealers from coast to coast with everything they need to rack up the biggest portable radio battery sales ever.

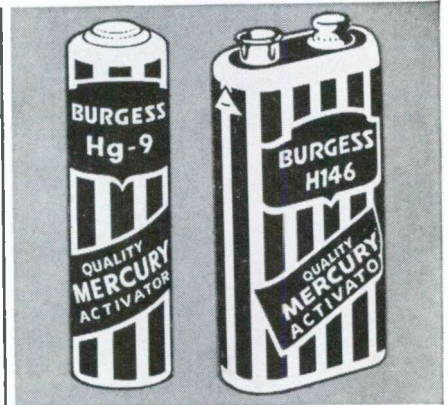
### NEW PRODUCTS

Leading the way are new products. Burgess now offers magnetic recording tape and a complete line of Mercury (continued in next column)

cury batteries, in addition to their world famous line of zinc-carbon batteries and their sealed nickel-cadmium rechargeable batteries.

### GREATER SALES

Servicemen and dealers everywhere will be given the complete story by Burgess Distributors' Salesmen. These men will explain how to sell more batteries with the Burgess full-range sales program.



*This new, eye-appealing label design identifies the expanded full line of Burgess Quality-Controlled Mercury Activators.*

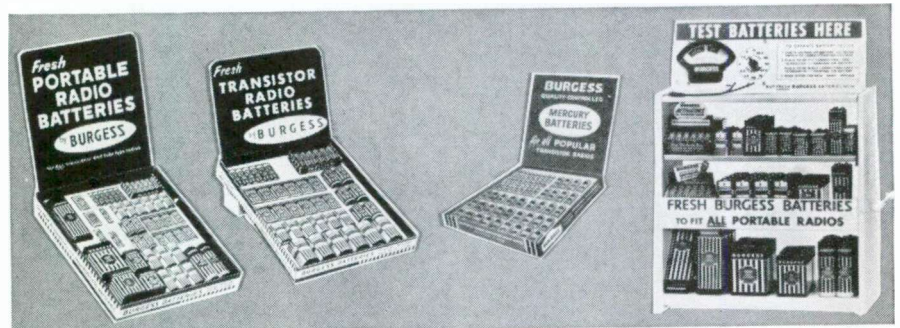
## Big Dramatic BURGESS Ads Scheduled for '61



Burgess Portable Radio Batteries will again be pre-sold in 1961 to literally millions of portable radio owners!

Big, colorful advertisements such as this full page Saturday Evening Post color ad will be seen by millions of readers in top-ranking national magazines.

## New BURGESS Selling Aids Announced

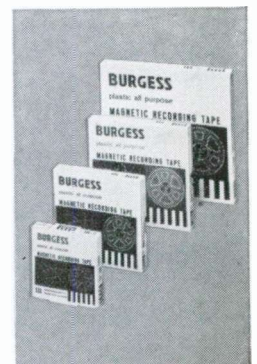


Burgess has unveiled a sales-building line of compact, complete displays to fit every merchandising need. Servicemen and dealers are asked to

contact their distributor salesman for full information on how they can get these dynamic, new displays!

## New BURGESS Magnetic Recording Tape Now Available

40 years of successful developments in acoustics, coatings, coating processes, and solid state physics, have enabled Burgess engineers to produce a superlative magnetic tape characterized by these quality features: SUPERB FREQUENCY RESPONSES; LOW NOISE LEVEL; HIGH SENSITIVITY; UNIFORM TROUBLE-FREE PERFORMANCES ASSURED BY BURGESS QUALITY CONTROL.



**BURGESS BATTERIES** BURGESS BATTERY COMPANY · FREEPORT, ILLINOIS  
DIVISION OF SERVEL, INC.

For more data, circle 4-C3-1 on coupon, p. 50



TUBE QUALITY BY TESTING AND CONTROL



## THIS LITTLE TUBE WENT TO MARKET...AND THIS LITTLE TUBE STAYED HOME

Only the RCA tube on the left—which has passed one of the toughest series of quality-control tests in the industry—can be classified “Ready for Shipment.”

The tube on the right failed only a single test. You can see that RCA made sure it will never end up on your shelf.

RCA quality-control testing is done automatically on a unique machine which can perform 14 basic tests. Tubes failing a single test are automatically rejected, and these are exhaustively analyzed to determine the cause of failure, so corrective action can be taken. *Then they are destroyed!* That's why there's no such thing as an RCA “second”.

Automatic testing is but one phase of RCA quality control. In addition, large samples are taken from each production run and subjected to thorough life, quality, and rating checks. No production run can be released until the samples meet specifications.

RCA's extra care in quality control is your assurance that you can depend on RCA replacement tubes. Give yourself this extra advantage on every service job, and help reduce customer call-backs. Call your Authorized RCA Tube Distributor today. *RCA Electron Tube Division, Harrison, New Jersey.*



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA