

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

WALDO M OWENS  
BOX 42  
JOSEPH UTAH  
T11-61N A3 9W2301

# STEREO STEREO 1962

60¢

September • 1961

# Wake Up



**A new day is dawning in electronics. Transistors are here to stay... they are now being used everywhere; in radio, television, Hi-Fi, intercoms, and in nearly all new electronic equipment...**

**Why put off transistor circuit servicing any longer... there's gold in them thar hills. But you must be equipped to do the job fast and efficiently. Here are the tools that you will need.**



## NEW SENCORE TRANSI-MASTER

This Tester will analyze the entire circuit in minutes and test transistors in-circuit or out of circuit. Here is how you can pin point troubles step by step.

First, check the batteries with the 0 to 12 voltmeter. If the batteries are O.K., check the current drain with the 0 to 50 milliamp meter. A special probe is provided so that you do not need to break the circuit. Excessive current indicates a short; low current indicates an open stage or cracked board. All PF schematics indicate average current.

If trouble is not located by now, isolate the trouble to a specific stage by touching the output of the harmonic generator to the base of each transistor and note spot where sound from speaker (or scope where no speaker is used) stops or becomes weak. The generator becomes a sine wave generator for audio stages to help find distortion.

If trouble points to a transistor, check it in a jiffy with the exclusive in-circuit power oscillator check provided by the TR110. A special probe is also provided for this.

If the transistor checks bad in-circuit, remove it and give it an out of circuit check with the oscillator check or the more accurate DC check. The DC check is provided for comparison reasons, experimental or engineering work and to match transistors in audio output stages. Beta (current gain) is read direct or on a good-bad scale for service work.

**DEALER NET. ONLY \$4950**



*Tests all transistors  
in-circuit or out-of-circuit*

### Model TR110

**It's a COMPLETE TRANSISTOR TESTER**

- SIGNAL TRACER • VOLTMETER
- BATTERY TESTER • MILLIAMMETER



## NEW SENCORE TRANSISTOR AND DIODE CHECKER

Here is a low cost tester that has become America's favorite. The TR115 provides the same DC out of circuit checks as the TR110; leakage and current gain. Beta (circuit gain) can also be read direct or as good or bad. Opens or shorts in the transistor are spotted in a minute. The TR115 checks them all from power transistors to the small hearing aid type. Japanese equivalents are listed also. This famous tester is used by such companies as Sears Roebuck, Bell Telephone and Commonwealth Edison. New circuits enable you to make service checks without set-up charts even though charts are provided for critical checks.



**Model TR115  
Dealer Net  
\$1995**



## SENCORE BATTERY ELIMINATOR AND TROUBLE SHOOTER

For replacing batteries during repair.

Many servicemen say that they wouldn't service transistor circuits without this power supply. The tried and proven PS103 is a sure fire answer. It can be used to charge the nickel cadmium batteries as well. Dial the desired output from 0 to 24 volts DC and read on meter. Low ripple insures no hum or feedback. Total current drawn can also be read on the PS103 by merely flicking the function switch to milliamps. The PS103 is the only supply that will operate radios with tapped battery supplies such as Philco, Sylvania and Motorola. No other supply has a third lead.



**Model PS103  
Dealer Net  
\$1995**

Now in stock at  
your Authorized  
Sencore Distributor



# SENCORE

ADDISON, ILLINOIS

# ELECTRONIC TECHNICIAN

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World's Largest Electronic Trade Circulation

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Administrative, Editorial and Sales  
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Production and Circulation  
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CHICAGO OFFICE  
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Telephone CEntal 6-1600

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September, 1961

**FRONT COVER** Stereo sound equipment sales are being stimulated by a number of technical developments and refinements, such as: FM multiplex, reverberation systems, speaker innovations, cartridge and tonearm developments, and changer and tape improvements. STEREO 1962's technical articles about these components and its Buyers Directory of Manufacturers starts on page 75.



## FEATURES AND ARTICLES

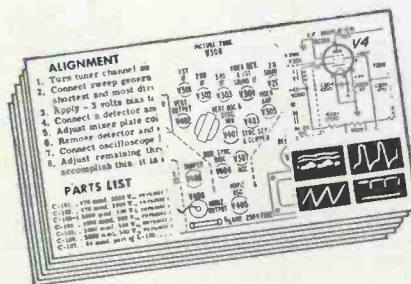
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# "When it's Mallory...I know it's reliable"



Don Domers (center), shown here with servicemen Everett Hammond and Jess Cody, has built a growing business on a reputation for quality servicing of radio, TV, auto radio, hi fi and stereo sets, and antennae

installation. Don has had his own shop for 29 of his 34 years in radio servicing, now has 7 employees. He's also an authorized Philco, Motorola and Sylvania dealer, having carried the first two lines for 20 years.

*Your Mallory distributor stocks these quality components*



#### TC TUBULAR ELECTROLYTICS

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



#### FP ELECTROLYTICS

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



#### STA-LOC® CONTROLS\*

Your distributor can custom build in just 30 seconds, any of over 38,000 single or dual controls.

\*U. S. Patent 2,958,888.



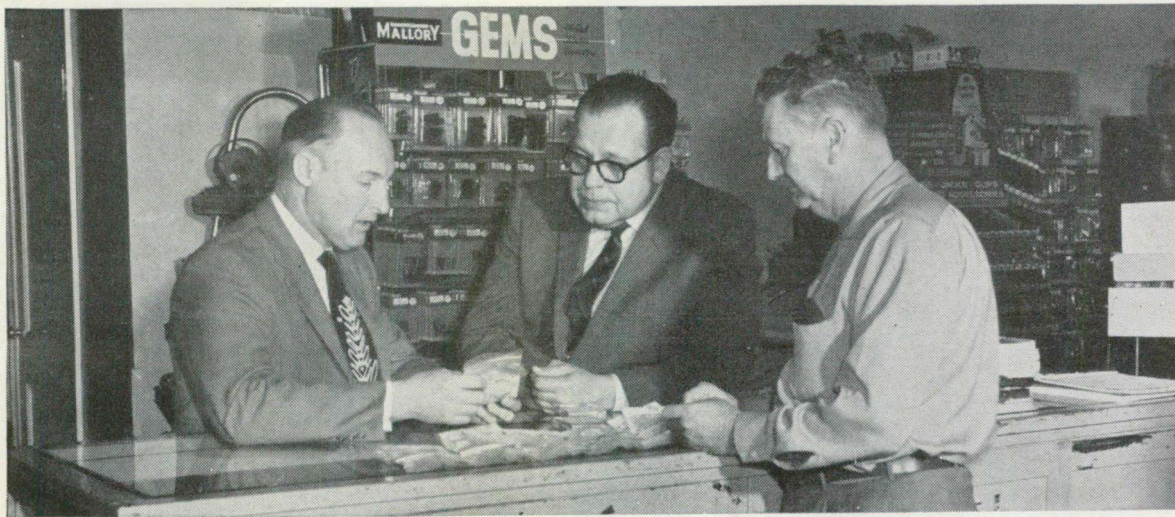
#### GOLD LABEL® VIBRATORS

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

## says Don Domers, Terre Haute service dealer

"Wherever possible, I always use Mallory parts . . . and I've never had a call-back caused by one. When they're labeled 'Mallory', I know they're dependable. I first tried new PVC capacitors for that very reason—then I found a lot more reasons for liking them. For instance, the handy zip-lip plastic pack keeps stock visible and easy to count, can be hung on my rack for fast use; and PVC's flexible plastic jacket never cracks when we bend or solder the leads."

You'll find this kind of money-saving, customer-pleasing reliability in all Mallory replacement parts. It's the industry's broadest line . . . all top quality . . . all sensibly priced. See your Mallory distributor soon.



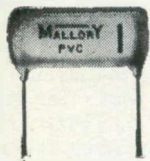
Don Domers buys all his parts from Mallory distributor C. T. Evinger Co., Terre Haute, a quality distributor who handles quality parts. He's shown here with Charlie Evinger and salesman Max Springer.

Put an end to call-backs . . . buy your parts from Mallory authorized distributors.

Distributor Division, Indianapolis 6, Indiana

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

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



### MALLORY PVC CAPACITORS

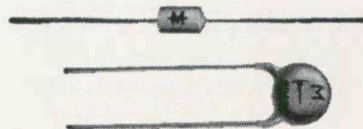
New, blue Mylar\*\* capacitors. Withstand moisture, heat, bending of leads and overloads.

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



### MALLORY MERCURY BATTERIES

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



### SILICON RECTIFIERS

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



### RMC DISCAPS®

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

®Trademark Radio Materials Company, a Mallory division.

For more data, circle 9-3-1 on coupon, p. 41

*lowest cost  
master antenna system  
ever developed*



**NEW  
BLONDER-TONGUE  
TRANSISTOR 4-SET  
BOOSTER—MODEL IT-3**

*All the gain you need from one antenna for 4 TV or FM sets!*

This new transistor-operated 4-set booster provides higher gain and lower noise than any comparable vacuum tube unit. There are no tubes to replace, lower power drain and negligible heat — all contributing to lower cost, longer maintenance-free operation than any unit on the market. List price of model IT-3, \$32.50.

**SUPERB 1, 2, 3 or 4 SET PERFORMANCE**

- **1 SET**—B-T 'straight thru' circuit provides full gain without isolation losses (Gain: 9 to 14 db, TV; 8 to 12 db, FM).
- **2, 3 OR 4 SETS**—splitting circuit provides gain and inter-set isolation necessary to provide top performance on 2, 3 or 4 sets. Gain two sets—each set 4 to 8 db; Gain three sets—each set 3 to 4 db; Gain four sets—each set 2 to 3 db.

*Sold through distributors. For details write: Dept. ET-9  
engineered and manufactured by*

**BLONDER-TONGUE**  
9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc. Ltd., Toronto, Ont. • Export: Morhan Export Corp., N. Y. 13  
home TV accessories • UHF converters • master TV systems • industrial TV systems • FM/AM radios



**Editor's  
Memo**

The demand for efficient automation equipment and large scale financing encourages the urge to merge in small and medium sized companies. We're no exception. ELECTRONIC TECHNICIAN has merged into a large trade paper publishing enterprise called Ojibway Press.

Mergers affect various people in different ways. In our case the publisher and editors are not affected. We'll be here at the same stand (480 Lexington Ave., New York 17, N.Y.). The same editorial and advertising departments will continue to serve readers and advertisers with the best possible magazine we can produce, as we have in past years.

The production, accounting and circulation departments are moving out to Ojibway headquarters (1 East First St., Duluth 2, Minn.) where high speed data processing equipment is located. Such equipment should allow more rapid handling of subscriptions and ad insertions. Incidentally, readers notifying us of changes of address should direct such information to our Duluth address. And advertisers sending us plates for the November and subsequent issues of ET should direct them to our production department in Duluth.

The size of Ojibway Press, 17 trade publications and printing and engraving plant, plus extensive financial resources should assure the continued development and strengthening of ET. Working with a number of other editors in fields such as food, textiles, paper and office equipment should make for some interesting mutual brain picking. We're never so smart that we can't learn ways to improve our publication. Readers are excellent sources of improvement ideas; so are other editors.

We've had many entertaining guesses hurled our way on the name Ojibway. Some people thought there was Irish in it. Others ventured that it combined the names of several men. Still others come up with a stunned, "O-who?" Well, there's no mistaking the name, and that's for sure.

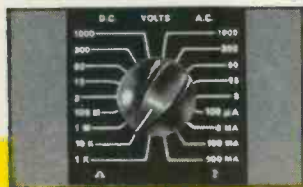
Ojibway is a 100% red-blooded American Indian name, taken from the tribe of the Algonquin family. Their home has been the Lake Superior area, where Duluth is located.

In the days ahead we plan to whoop it up with the liveliest issues ever.

*Al Forman*

First real VOM advance in 20 years

SET IT!

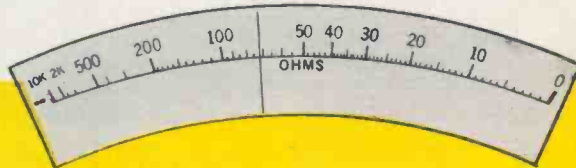


SEE IT!



READ IT!

DIRECTLY—ACCURATELY  
WITHOUT MULTIPLYING



ALL-NEW

**B&K**

# V O Matic 360

AUTOMATIC VOLT-OHM-MILLIAMMETER

- Individual Full-Size Scale for Each Range
- Range Switch Automatically Sets Correct Scale
- Only One Scale Visible at Any Time
- No Multiplying . . . No False Readings
- Meter Protected Against Extreme Overload
- Mirrored-Scale for Precise Readings



WITH  
BURN-OUT PROOF  
METER

## EASIEST—FASTEST—ERROR-FREE READINGS

Once you set the range switch properly, it is impossible to read the wrong scale. Readings are easiest, fastest of all—so easy the meter "practically reads itself." Eliminates reading difficulties, errors, and calculations.

All scales, including the ohms scale, are direct reading. You do not have to multiply. Saves time and trouble. Gives you the right answer immediately. Ohms-adjust control includes switch that automatically shorts out test leads for "zero" set.

Every scale in the V O Matic 360 is the same full size . . . and only one scale is visible at any one time, automatically. Supplemental ranges are also provided on separate external overlay meter scales.

This new-type automatic VOM is another innovation by B&K that gives you features you've always wanted. Outdates all others.

Net, \$59<sup>95</sup>

Includes convenient stand to hold "360" for correct viewing in 4 positions.

- Ranges:** DC Volts — 0 - 3, 15, 60, 300, 1000, 6000 (20,000 Ω/v)  
 AC Volts — 0 - 3, 15, 60, 300, 1000, 6000 ( 5,000 Ω/v)  
 AF (Output)— 0 - 3, 15, 60, 300 volts  
 DC Current — 0 - 100 μa, 5 ma, 100 ma, 500 ma, 10 amps  
 Resistance — 0 - 1000 ohms (3 Ω center)  
                   0 - 10,000 ohms (50 Ω center)  
                   0 - 1 megohm (4 k Ω center)  
                   0 - 100 megohms (150 k Ω center)

- Supplemental Ranges:** 18 separate external overlay meter scales for:  
 DC Volts— 0 - 250 mv      Capacitance—100 mmfd to 4 mfd  
 Audio Power Output—up to 56 watts      DB (decibels)  
 Peak-to-Peak AC (sine) Volts— 0 - 170, 850

**Polarity Reversing Switch and Automatic Ohms-Adjust Control**

**Frequency Response AC:** 5 - 500,000 cps

**Burn-Out Proof Meter:** Protected against overload and burn-out

**Complete with 1½-volt and 9-volt batteries and test leads**

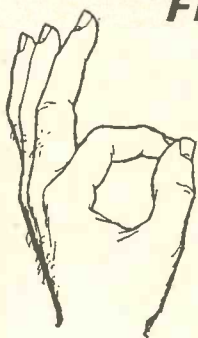
Ask Your B&K Distributor for Demonstration  
or Write for Catalog AP18-T



**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.

# Sarkes Tarzian

## SILICON RECTIFIERS THAT MEAN FEWER CALL-BACKS FOR YOU



If you prefer them, you have lots of company!

Returns have just been tabulated from a mailing by Brand Name Survey, an independent research organization, to 23,000 service technicians in 36 states—all major market areas in the United States. More technicians like yourself prefer Sarkes Tarzian rectifiers than the next two most popular makes combined!



▲ Tarzian 400 and 600 volt F and H series units are available in handy Ten Packs or Doubler Replacement Kits, and in bulk; M150 and M500 units in Conversion Kits and in bulk. Nine standard tube replacement rectifiers replace over 95% of all popular vacuum tube rectifiers; S5347 replaces 6BW4 or 12BW4 in Citizen's Band radios. Four "condensed stack" selenium rectifiers, more efficient and SMALLER than before, now cover your 50 to 500 ma requirements.

Tarzian silicon rectifiers are available in the shapes, sizes, and specifications you need to do your work right—and quickly. They are available from distributors everywhere. And they combine the low price and high quality that is a Tarzian trademark.

Ask your distributor for a copy of the new Tarzian "Distributor Line" catalog, and make the performance of these preferred devices part of your good service.



## SARKES TARZIAN, INC.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices

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For more data, circle 9-6-1 on coupon, p. 41

# LETTERS

## To the Editor

### License Bill

Editor, ELECTRONIC TECHNICIAN:

In your publication of June 1960, you published an item entitled, "Death of a License Bill." We do not wish to have this happen in Pennsylvania. A group of service dealers formed a committee called Independent Service Dealers Action Committee (ISDAC). We felt it was about time some one took the bull by the horns.

We flooded our Senators with letters and phone calls, until Senator Staisey became interested. We now have bills #789 and #799 introduced to the Senate on June 21, 1961, by Messrs. Staisey, Camiel, Devlin, and Van Sant. Members of ISDAC are: George W. Oswald, Chairman; David Baird; Norman Falck; Tom Scholler; William Vaupel; Norwell Jackson; Sylvester Zorko; Robert Barozzini; Ronald Rishack; Milton Salomon; Ted Karsinski; John Kerns; Jack Rishack; Joseph Simandl; Taylor Thompson; John L. Goblick; Harry Schaup; and William Cornelius.

GEORGE W. OSWALD

Liberty TV Service,  
Pittsburgh 16, Pa.

### Interference

Editor, ELECTRONIC TECHNICIAN:

I note with interest your articles on TV Set Radiation, pages 15 and 29 of the July 1961 issue. There is an awful lot of buck passing in this business and our electronic publications are not the exception.

I will give you an example. I invested about \$300 in citizens band radio about the first of April 1961 and from the time it was put in service to the present date I have been unable to use it when my neighbor to the west have their TV in operation on any channel on CB. Now, of course we like to get along with our neighbors and for that reason I have not made a complaint to the FCC as yet. As you may know, when FCC (District Offices) receive a complaint of this kind their first move is to send out a form letter to each party, like a pacifier, attempting to settle a neighborhood quarrel. If that doesn't work they may send some one to investigate about a year or so later, and this is what I mean by buck passing.

H. B. CANNON

H. B. Cannon Electronics  
Tracy, Calif.

### Battery Price War

Editor, ELECTRONIC TECHNICIAN:

We received a letter from Eveready batteries on prices. Here is a part of the letter we wrote to them in reply. In keeping with my contention that the  
(Continued on page 10)





*CHANNEL MASTER*  
*PUTS A BRIGHT **NEW STAR***  
*IN THE SKIES*

*Turn the page and learn why this is  
the most powerful TV antenna of all time!*

*Because today's fringe area reception problems cannot be solved by yesterday's antennas...*

# CHANNEL MASTER

*Channel Master's world-famous Antenna Development Laboratory has done it again! By using a brand new concept in antenna design... PROPORTIONAL ENERGY ABSORPTION... Channel Master meets the fringe area challenge with the most powerful TV antenna ever produced... the Crossfire!*

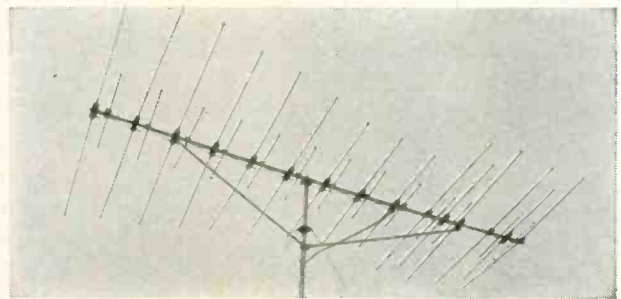
## Proportional Energy Absorption works like this!

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

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

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

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

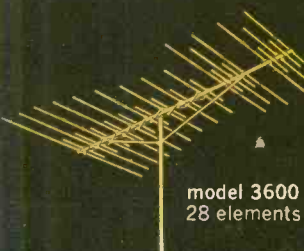


## ... And the Crossfire is Gold!

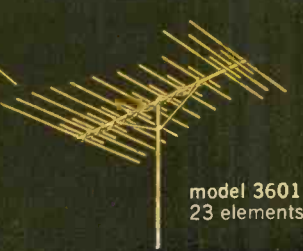
The Crossfire's performance is matched only by its beauty. Channel Master's exclusive E\*P\*C Process gives the antenna a lustrous golden coating that enriches its appearance and protects it for years against corrosion.

Channel Master's E\*P\*C Process is *not* anodizing! The disadvantage of anodizing is that the anodized film is an electrical insulator, and must be removed by *abrasion* wherever metal-to-metal contact is required. Therefore, anodized antennas have no surface protection on the very parts that need it most! Channel Master's E\*P\*C Process protects the *entire* antenna. It is the same protective treatment now required on all commercial jet aircraft and on rockets like the Redstone.

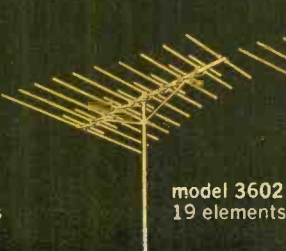
**THERE'S  
A CROSSFIRE TO MEET  
EVERY RECEPTION PROBLEM!**



model 3600  
28 elements



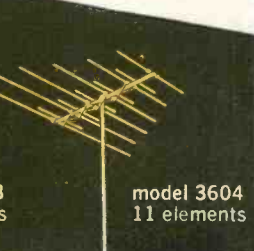
model 3601  
23 elements



model 3602  
19 elements



model 3603  
15 elements



model 3604  
11 elements

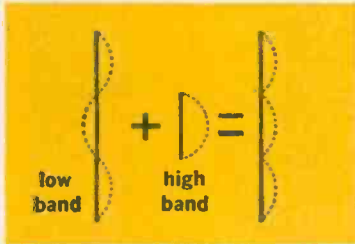
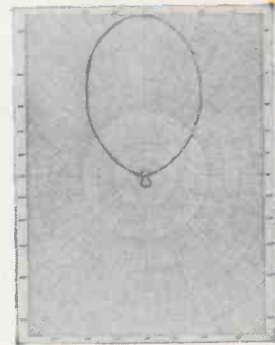
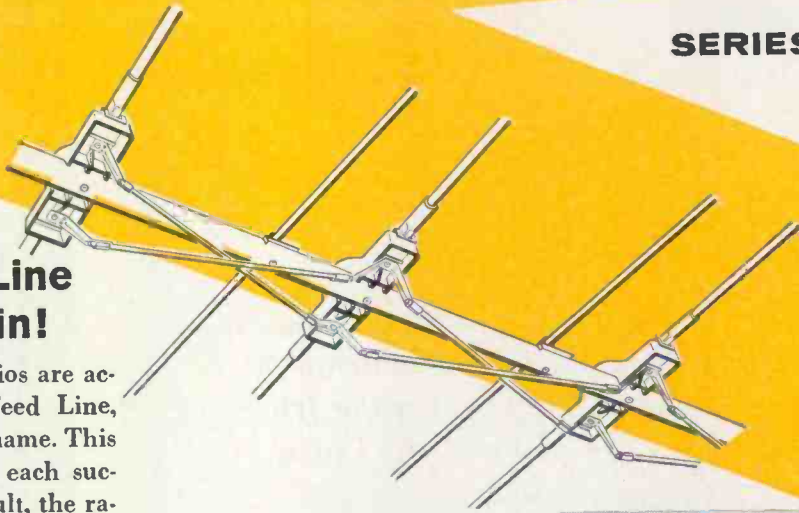
# INTRODUCES THE NEW, GOLDEN crossfire

SERIES 3600

## Transposed Feed Line Means Cleaner Gain!

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

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



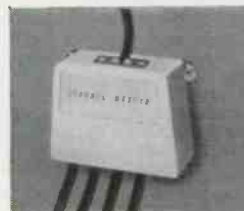
## Revolutionary New Dual Dipole System

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

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

For still more power... add the new  
**CHANNEL MASTER JETRON**

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



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

**model 0020**

For more data, circle 9-9-1 on coupon, p. 41

model 3605  
7 elements

\* Patent Pending

Copyright 1961, Channel Master Corp.

**FAST,  
ACCURATE TESTERS  
FOR C/B INSTALLATION  
AND ALIGNMENT BY  
SECO**



**MODEL 510**—complete with all necessary cables and adapters  
**\$46.95 NET**

**TRANSMITTER TESTER**

Designed especially for citizens band (C/B) and other low power transmitters up to 160 MC. Calibrated for direct percentage reading of amplitude modulation; 0-5 watts RF output; 0-400 ma. RF output. Connection provided for headphones or scope.



**MODEL 500**—wired and factory tested  
**\$29.95 NET**

**2-WAY RADIO TEST SET**

Combination Crystal Checker, RF Signal and Field Strength meter—ideal for C/B. 0-50 ma. meter for final amplifier tuning. Use as RF output indicator. Checks activity on third overtone transmitter crystals—checks fundamental and high overtone crystals at fundamental frequency. Powered by two 1.5 c. "C" cells.



**MODEL 520**—complete with instructions  
**\$42.95 NET**

**ANTENNA TESTER**

For 50 ohm coaxial transmission line applications. 1000 watt maximum dual air cylinder coupler inserts no error up to 160 MC. Simplified direct reading scales give quick GOOD-POOR results as well as percent. Direct reading of FORWARD POWER and REFLECTED POWER. 0-10, 0-100 and 0-1000 watt ranges



**Model 511A**—  
**\$21.50 NET**

**ATTENU-LOAD**

Ten db "T" pad attenuator for reducing power levels by ratio of 10 to 1 . . . fully shielded 50 ohm termination for coaxial cable applications.

**SECO TUBE TESTERS**

**GRID CIRCUIT TUBE TESTER**—Tests for Grid Emission, leakage, shorts and gas in one operation! Two new exclusive tests—Cathode Continuity Check and Inter-element Short Test with short identified to pin number. Easy to operate.

**MODEL GCT-9** \$32.95 NET

**GRID CIRCUIT & TUBE MERIT TESTER**—Offer complete TV tube type coverage—incorporates patented Seco Grid Circuit Test plus reliable Cathode Emission Test—also checks filament continuity and provides open element test.

**MODEL 78** \$69.50 NET

**DELUXE COMPLETE TUBE TESTER**—Three complete tests: Dynamic Mutual Conductance Test on pre-wired chassis—Cathode Emission Test for all tubes by free point selector system—"Good-Bad" meter indicates merit. Nationally accepted Grid Circuit Test.

**MODEL 107** \$139.50 NET

**DYNAMIC TRANSISTOR CHECKER**—checks transistors "in" or "out" of circuit. Permits matching of similar transistor types. No set-up necessary.

**MODEL 100** \$19.95 NET



**SECO ELECTRONICS INC.**  
5015 Penn Ave. So.,  
Minneapolis 19, Minn.  
Please send more information on MODELS . . .

- 510  500  520  511A  GCT-9W  107  
 100  78  FREE Selling and Installing Citizens Band Equipment Bulletin

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

For more data circle 9-10-1 on coupon, p. 41

10

(Continued from page 6)

almighty dollar is the greatest moving force, I am certain that this letter will end up with all the others I have written to you. After all, I cannot expect you to offend one of your best advertisers.

"Re: the new prices of the Eveready 216 and 226 batteries. I wish to speak very frankly about the prices of the import batteries vs. the domestic. My customers are price conscious on the 216 battery. They can buy the import for \$.19 at the Strauss Stores. We pay \$.21 for the import and retail it for \$.45. The price of the Eveready was dropped to \$.47 our cost. We have been retailing it for \$.95. As a result of your price drop and a greater margin of profit for us, we have succeeded in turning sales in your direction.

"You are as aware of your selling price as against your cost as we are. If we can invest \$.21 to make \$.24, why invest \$.47 to make \$.22? If you wish to carry on a crusade against the imports, do it with your money not ours.

"We will sell your battery, only if you leave us a proportional margin of profit."

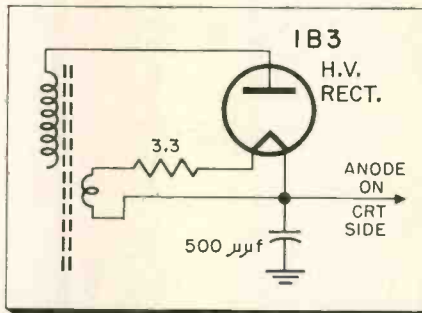
HARRY WALKER

Westbury, L. I., N. Y.

**HV Rectifiers**

Editor, ELECTRONIC TECHNICIAN:

Being a subscriber to your wonderful magazine, I wonder if you can publish this letter or else advise me what to do to improve the following circuit to prevent frequent replacements of tube 1B3. This happens in a TV Muntz model 2055B. The set was sparking badly on the side of CRT where the grounding rib is located. A complete check shows that the CRT is weak, so I decided to omit the internal and external coatings as a filter using now the regular 500  $\mu\mu\text{f}$  20v door knob capacitor instead. As it appears below:



The set now performs O.K. It has a clear and sharp picture but the HV rectifier requires frequent replacements. Seems to be overloaded. I added to the picture tube a brightener as the CRT is somewhat weak.

FRANK BOU

47 Oswego Ave.,  
Auburn 6, N. J.

• See "Troubleshooting TV Hi-Volt-  
age Rectifier Circuits," Dec. 1960 ET  
—Ed.

(Continued on page 13)

**how often  
could you  
have used...**

**an  
Xcelite  
"Seizer"?**

Handy as an extra hand or helper. Clamps lightly or tightly . . . for moments or minutes.

two-position snap-lock

slim, serrated jaws

Outreaches, out-holds needle-nose pliers. Hardly a spot too small for it. Approx. 6" long. Dozens of uses: Holds and positions wires for soldering . . . retrieves small parts from inaccessible places . . . it's a heat sink. Two-position snap-lock won't slip, yet releases with a twist of the fingers. All stainless steel—precision machined and tempered for smooth action and years of service.

2 Models: No. 43H curved nose and No. 42H straight — Ask your distributor to show you Xcelite Seizers today.



XCELITE, INC. • ORCHARD PARK, N. Y.  
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

For more data, circle 9-10-2 on coupon, p. 41  
ELECTRONIC TECHNICIAN • September, 1961



18FW6A  
18FX6A  
18FY6A  
32ET5A  
36AM3B

# SYLVANIA BEATS THE HEAT

Familiar numbers, aren't they? But the "A" and "B" versions are brand-new . . . introduced by Sylvania to help you hold onto your home radio service profits.

The 100-mA heater concept, pioneered by Sylvania, offers "cool" operation in series-string connection. But "series-string," as you know, can be pretty hard on heaters at the instant of "turn-on"; can shorten tube life; can mean a call-back. Now, Sylvania has incorporated significant controls on warm-up time of the heaters. Surge voltages on any one heater in this 5-tube complement are therefore minimized, expectant tube life is extended. Benefits to you? Obvious . . . high probability of mighty few callbacks due to *Sylvania* tube failure.

You too can beat the heat of profit-burning callbacks. Don't just order "tubes." Always order SYLVANIA TUBES. Electronic Tubes Division, Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

New, improved 100-mA AC-DC tubes feature controlled heater warm-up time . . . increased heater life . . . defeat profit-burning callbacks!



# SYLVANIA

SUBSIDIARY OF

**GENERAL TELEPHONE & ELECTRONICS**



### Transmission Line Cables



8225



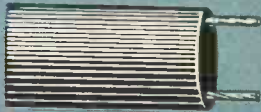
8226



8230



8285



8235

### Microphone and Shielded Power Supply Cables



8410

RUBBER



8411



8413

PLASTIC



8420

# Mr. Service Technician:

Ask your Belden jobber about this complete wire and cable line

What types of wire and cable do you need? Ask your Belden electronics jobber for complete specifications on types, sizes, insulations, and convenient spooled lengths. Available from stock.

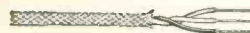
### Hi-Fi, Stereo, and Phonograph Cables



8421



8430



8419

### Rubber-Vinyl Multiconductor Portable Cordage



8462

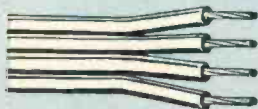
8888

### Power Supply Cords

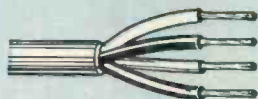


17106

### Antenna Rotor Cables



8464



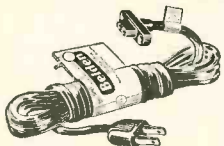
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### Hook-Up Wire

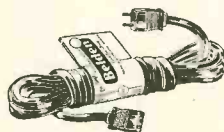


8800

### TV and Cheater Cords



8874



8875

### Aluminum Ground Wire



8018

**Belden**  
WIREMAKER FOR INDUSTRY  
SINCE 1902  
CHICAGO

power supply cords • cord sets and portable cordage • electrical household cords • magnet wire • lead wire • automotive wire and cable • aircraft wires • welding cable

(Continued from page 10)

### Attention Gremlin: Hertz IS in Renting

Editor, ELECTRONIC TECHNICIAN:

We enjoyed reading the write up in the June 1961 issue about Hertz Rent-All Corporation. In this instance, however, a gremlin found its way into the type of your fine magazine.

Hertz Rent-All Corporation, which now operates three stores in Chicago and is the forerunner of a planned national chain of company-owned and licensee stores, definitely is affiliated with The Hertz Corporation. The Corporation operates a rent a car division, a truck leasing division, and a car leasing division—as well as several subsidiaries, one of which is the Hertz Rent-All Corporation. The parent company is headquartered in New York while the rent-all stores were launched in Chicago. Just wanted to straighten out the record.

Best wishes to you for the continued success of your magazine.

M. D. KRAMER

The Hertz Corporation  
New York 21, N. Y.

### Civil Defense

Editor, ELECTRONIC TECHNICIAN:

I would like to request a reprint of an article titled N.E.A.R. (National Emergency Alarm Repeater) appearing on page 32 of the December 1960 issue of your magazine.

I belong to a large National Organization devoted to the Defense and Preparedness of our Nation and would like to bring this phase of Civilian Defense directly to their attention.

JAMES K. BLACKBURN

Michigan City, Indiana

### Distribution Practices

Editor, ELECTRONIC TECHNICIAN:

Commenting on your June editorial, "Distribution Practices and Legal Woes," I think the natural tendency of an unconcerned observer would tend to favor the service dealer winning out. This is what I would like to see, but I also see clearly facts in favor of distributors.

I think there is no adequate solution. One of the criteria for a distributor extending a discount could well be "do you have a catalog from such and such an electronics mail order house in such and such a metropolitan area?" So, as a first step, this mail order business would have to be stopped which is obviously impossible. There are too many other angles to be discussed that it is useless to discuss.

I do not believe any legal rulings will ever be practical unless they are made to apply to the real sources—the manufacturers and the big mail order houses, and such legal rulings will also have to encompass drastic measures of standardization. So the matter is impractical.

E. F. SCHWARZ

Petersburg, Virginia

### We Make Sure Advertisers Deliver

Editor, ELECTRONIC TECHNICIAN:

I wish to thank you for your follow-up in response to my complaint about one of your advertisers. Please be advised that the merchandise in question was delivered last Monday afternoon, thanks to your intercession.

While I am writing, I would like to compliment you on publishing a fine magazine. I particularly enjoy the technical articles presented, the problems of servicemen, and also the circuit schematics. I file the schematics and they come in handy.

JOSEPH F. SHIELDS

Buffalo 25, New York

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

## NEW CB VERSATILITY

WITH **EICO**®

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



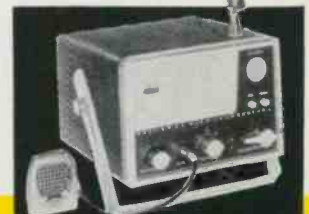
U. S. Pat. No. D-170, 970  
**770 Series**

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

\*Including Posi-Lock Mounting Bracket

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

The entire transmitter oscillator circuit and RF final in every EICO transceiver, kit and wired, is 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). This permits you to build the kit and put it on the air without the supervision of a commercial radiotelephone licensee.

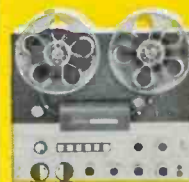


**Standard 760 Series of CB Transceivers**  
from  
Kit \$59.95 Wired \$89.95

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



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



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

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



Electronic Instrument Co., Inc. 3300 N. Blvd., L.I.C. 1, N.Y.

ADD 5% IN THE WEST ©1961

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

# Tuning In the

**MICROWAVE TUBES** in batches of 9,000 per month are flowing from The Machlett Laboratories, a subsidiary of Raytheon Company, as a result of a \$1,100,000 Navy contract. More than 75,000 ceramic planar type UHF tubes will be delivered to the Navy.

**RECEIVING TUBE SALES** continued upward in May but TV picture tube sales continued downward. The Electronic Industries Association reported receiving tube sales totaled 29,823,000 in May, compared to 28,687,000 units sold in April. Year-to-date sales of receiving tubes, however, was 147,291,000 as compared to 160,508,000 in 1960. May TV picture tube sales were 673,315, compared to 722,110 in April. The EIA reported transistor sales up slightly in May with year-to-date sales well ahead of 1960.

## WHEELS OF FORTUNE MAKE TUBES



Giant wheels act as automatic lead wire loading devices to speed production of tiny nuvistor tubes. The thimble-sized tubes are used in tuners of nearly all RCA television receivers, both color and black and white. Five different types of this small, rugged, high-efficiency tube are currently in RCA's nuvistor family.



"How's it going?"

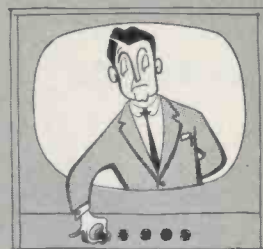
**23" RECTANGULAR COLOR CRT** with 90° deflection has been developed by Motorola. "For years," the company said, "tube makers have told us that a wide angle, short-necked color tube was several years away, if ever. Well, here it is today." \$100,000 was spent this year in developing the prototype tube to prove it could be done. Motorola does not plan to go into picture tube manufacturing, and will share its technical findings with the industry. "Our color tube labs are open to the industry," an executive announced.

**AN ELECTRONIC PHARMACIST** has been added to the growing list of automated skills, according to American Druggist. The 96-drug "brain" may eventually be capable of taking over many functions now performed by registered pharmacists, and reduce the cost of filling most prescriptions. The patient's name and prescription are placed on a plate. The plate is fed into the machine and the automatic dispenser does the rest, including accounting.

**AIR TRAFFIC CONTROLLERS** who direct air traffic from instrument-filled booths at air fields may soon be wearing miniature radio transmitters attached to their bodies while on duty. Tests will be conducted by the F.A.A. to determine what stresses traffic controllers are subjected to and what can be done to reduce them. Similar tests may also be given pilots at take-offs and landings. The equipment to be worn by controllers weighs less than four pounds and has a small antenna attached. A van parked in the airport will be equipped with receiving and recording equipment for telemetering signals.



# Picture .....



**SERVICE WORK BIDS** from independent service companies to local Westinghouse Distributors will be the system used to select independent authorized service stations. Service companies will be appointed by local distributor management. A phone information service for customers to obtain conveniently located service stations will be featured (phone Western Union and ask for Operator 25).

*TV PREVENTIVE MAINTENANCE* promotion by General Electric will use a World Series baseball theme. The campaign, "World Series Week is TV Tune Up Week," will be scheduled from Sept. 30 through Oct. 6—timed to coincide with the World Series games which begin on October 4. Mel Allen, noted sports announcer, will be featured in the TV commercials which are based on a "Test Pattern" story aimed to demonstrate to consumers exactly how TV set performance can be improved with a tune-up by qualified independent service technicians.

**HEARING TESTER** can accurately establish a person's comfortable loudness level, effective individual frequency characteristics, and acoustic power that particular ears can tolerate. The Acousti-Phon, introduced by Acousticon International, a division of Dicotograph Products Inc., can translate measurements to determine specific types of hearing aids best suited to individual hearing defects.

**AUTOMATED ELECTRONIC HIGHWAYS** may graduate from the drawing board to a practical 100-mile test strip within the next two years. The Federal government anticipates a full-scale test of the project—envisioning fail-safe speeds in excess of 70 miles an hour on electronically controlled traffic lanes. The system provides automatic steering, braking and acceleration, utilizing a signal device buried in the road-bed or along the highway's side. Portable control packages and computers would be placed at various entrance points along the route. When a car approaches the automated highway, electronic sensing devices attached to the underside of the car would take over. A cable extends from the car's electronic equipment to a cut-off button at the driver's seat. The driver can release his car from the automated track at any exit along the way. If the car's guidance system breaks down, the control center is notified via a flashing light and help is dispatched.

## CALENDAR OF COMING EVENTS

- Sept. 13-17: 1961 New York High Fidelity Music Show, New York Trade Show Building, New York, N. Y.
- Oct. 2-4: IRE Canadian Electronics Conference, Automotive Bldg., Exhibition Park, Toronto, Canada.
- Oct. 9-11: National Electronics Conference, (IRE, AIEE), International Amphitheatre, Chicago, Ill.
- Oct. 9-13: Fall Convention & Technical Exhibit, Audio Engineering Society, Hotel New Yorker, New York, N. Y.
- Oct. 13-15: 2nd Annual Denver Stereo & Hi-Fi Show, Norman J. Murfield & Associates, Ltd., Albany Hotel, Denver, Colo.
- Oct. 30-31: Radio Fall Meeting, (PGED, BTR, RQC, EIA), Hotel Syracuse, Syracuse, N. Y.
- Nov. 14-16: Northeast Research & Engineering Meeting (NEREM), Somerset Hotel, Boston, Mass.
- Nov. 16-19: Northwest Hi-Fi, Music & Stereo Show, Audio Div. Paul Bunyan Chapter, ERA, Municipal Auditorium, Minneapolis, Minn.
- Nov. 30-Dec. 1: PGVC Conference, Professional Group on Vehicular Communications, Hotel Radison, Minneapolis, Minn.

## THIS IS STEREO BROADCASTING?



Judging from the "Roaring Twenties" garb of the woman, it's too early in the century (1927) for stereo. Therefore, the radio's two tuning dials do not indicate it's an AM-FM stereo set. Instead, this early Radiola superhet employed separate oscillator and r-f controls to select stations (tuning condensers were not ganged). These were the "good old days"?

# WORLD SERIES WEEK

**G. E. in Cooperation with Independent TV Servicemen Launches Unique National Campaign — Sells Immediate Need for Your Service to Millions of Set Owners.**

Never before a sales-building campaign like this—combining the power, coverage and prestige of World Series television with the flexibility of actual business-building emphasis to your customers in your own local area. It is aimed at those set owners—your customers—who put up with sub-standard TV performance. *This is your campaign.* It sells the immediate need for your professional service right when demand hits its peak—World Series Time!

Plan now to tie-in with TV TUNE-UP WEEK. It's easy, effective—no red tape. Get full details from your General Electric tube distributor. HE MUST RECEIVE NAMES OF PARTICIPATING DEALERS BY SEPTEMBER 8. General Electric Company, Distributor Sales, Electronic Components Division, Room 7244B, Owensboro, Kentucky.

*Complete sales package helps you cash in on* **TV TUNE-UP WEEK**

**THIS G-E TEST PATTERN WILL HELP YOU CHECK THE PICTURE QUALITY OF YOUR SET**

Seeing a test pattern on your screen is the best way to personally check the quality of your TV picture. It simulates comparison with a normal picture. With G.E.'s helpful test pattern, Mr. Allen will show you exactly how to test the quality of your picture. For time and station, see the following notes.

By detecting a minor difficulty early and having it taken care of before it can cause big trouble, you may save money. You, your family and friends can enjoy the World Series and all the new fall programs without irritation or eye strain from faulty reception.

The independent service dealers shown here are offering professional TV tune-up and repair specials this week. For your assurance of prompt action, they have a supply of dependable G.E. electronic tube and Black Dayite picture tubes on hand.

**In New Jersey, Connecticut, NY State and Pennsylvania:**

<b>BRIDGEWATER</b>	<b>PARSONS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>
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<b>BRIDGEVIEW</b>	<b>PERKINS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>

**In New York City, Long Island and Westchester:**

<b>BRIDGEVIEW</b>	<b>PERKINS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>
<b>BRIDGEVIEW</b>	<b>PERKINS</b>
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**TV GUIDE**

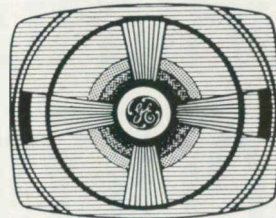
**FULL-PAGE AD PLUS YOUR NAME IN SEPTEMBER 30 ISSUE OF TV GUIDE**

This hard-hitting message launches TV TUNE-UP WEEK to 8 million television families... alerts your customers to the World Series TV Tune-Up commercial and sells your professional repair and maintenance service. Your name-and-address listing here ties you in directly—in your local edition of TV Guide—with this nationwide campaign.

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

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

# IS TV TUNE-UP WEEK!



MOBILE WALL BANNER DISPLAY



COUNTER DISPLAY



## BUILDS BUSINESS FOR YOU 3 WAYS

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

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

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



AD MATS



SET REPAIR STICKERS



MAILERS

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

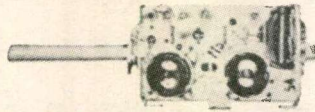
## PRECISION TUNER SERVICE

P. O. BOX 272  
BLOOMINGTON, IND.

1200 S. WALNUT ST.  
EDISON 99653

**7.50**  
V or U  
COMBO PLUS  
\$9.95 POSTAGE

6 MONTH WARRANTEE



All Types T.V. Tuners Cleaned, Repaired and Aligned to Factory Specifications. Same day in shop service on most Tuners. Price Includes Minor Parts; Major Parts at Cost Price. We use Original Parts if possible. State Make Model and Enclose all Parts and Tubes. Pack Well and Insure.

ALSO HAVE LARGE STOCK OF EXCHANGE TUNERS. WRITE FOR TYPES AND PRICES

For more data, circle 9-18-1 on coupon, p. 41

## News of the Industry

REGENCY ELECTRONICS named A. C. ELLES as vice president.

PACOTRONICS has elected Exec. Vice Pres. SOL S. SPARER to the board of directors.

SIMPSON ELECTRIC has appointed JACK DE GEORGE as sales administration manager.

HALLICRAFTERS CO. names EARL W. GRAY, product manager for citizens band radio equipment.

P. R. MALLORY & CO. INC. has appointed JAMES L. NICHOLS, manager of the distributor division.

SONOTONE offers a three-color counter/window display in promoting their line of more than 200 tube types.

GENERAL ELECTRIC's district office in northern Calif. has moved from San Mateo to 1485 Bayshore Blvd., San Francisco, Calif.

ZAM & KIRSHNER, advertising and public relations firm, announces their appointment as agency for SEMITRONICS CORP.

H. H. SCOTT's manufacturing area has been increased 50%, by leasing portion of Maynard Mills, less than 1 mile from present facilities.

STANCOR ELECTRONICS has opened warehouse and facilities in Dallas, Texas. Office address is: 1925 Cedar Springs, Dallas 1, Texas.

RCA VICTOR's new 24-page catalog of 4-track and 2-track 7½ ips "living stereo" reel tapes is a complete listing, featuring the world's greatest artists.

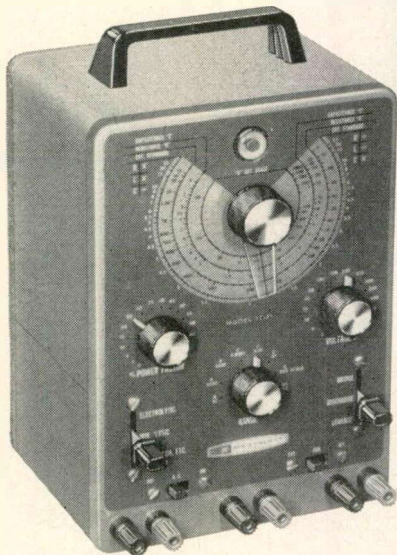
VOLKSWAGEN owners, whose vehicles need replacement parts, can save up to 43.6% by specifying factory-rebuilt rather than new parts when they talk service at their authorized Volkswagen dealerships.

PACIFIC ELECTRONIC TRADE SHOW is scheduled for Feb. 1962. Pres. GENE ROTHMAN announces following appointments: Chairman of Board, FRANK ECKERT; Vice Pres., VIX ZACHARIAH; 2nd Vice Pres., C. T. "CAP" KIERULFF; Secy-Treas., NORB DEAN; and Honorary Advisor, CHARLES SILVEY. A. BYRON PERKINS & ASSOCIATES is retained as show manager.

(Continued on page 20)

NEW  
HEATHKIT

# CAPACITOR CHECKER



JUST \$29<sup>95</sup>

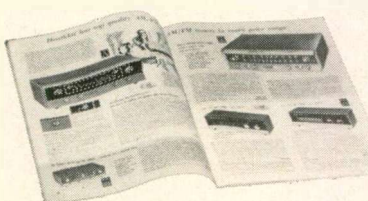
- Latest design features
- New modern styling
- Highly versatile and accurate

An outstanding test instrument value! Tests all condenser types for value, leakage, shorts and power factor, resistance from 5 ohms to 50 megohms. Capacity measurements are made in four ranges from 10 mmf to 1000 mfd on direct reading scales—no involved calculations! Special design includes low bridge voltage for safe testing of easily damaged miniature electrolytics, 16 switch-selected leakage testing voltages, 3 leakage sensitivities and special discharge circuit. A new comparator circuit permits measurement of unknown "L", "C", or "R" values using an external standard. These and many more circuit refinements make it an unmatched value at this low price! 7 lbs.

Kit IT-11 . . . NO MONEY DOWN, \$5 mo. . . . \$29.95

*Everything is  
New at Heath!*

Send for your FREE 1962 Heathkit Catalog Now! It's the world's biggest kit catalog . . . 100 pages . . . over 250 quality kits . . . complete description, specifications, many schematics, and details on all that's new at Heath. We'll be glad to send your friends free copies too!



HEATH COMPANY Benton Harbor 24, Mich.  
Please send Free Heathkit catalog

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

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STATE \_\_\_\_\_

# BEST

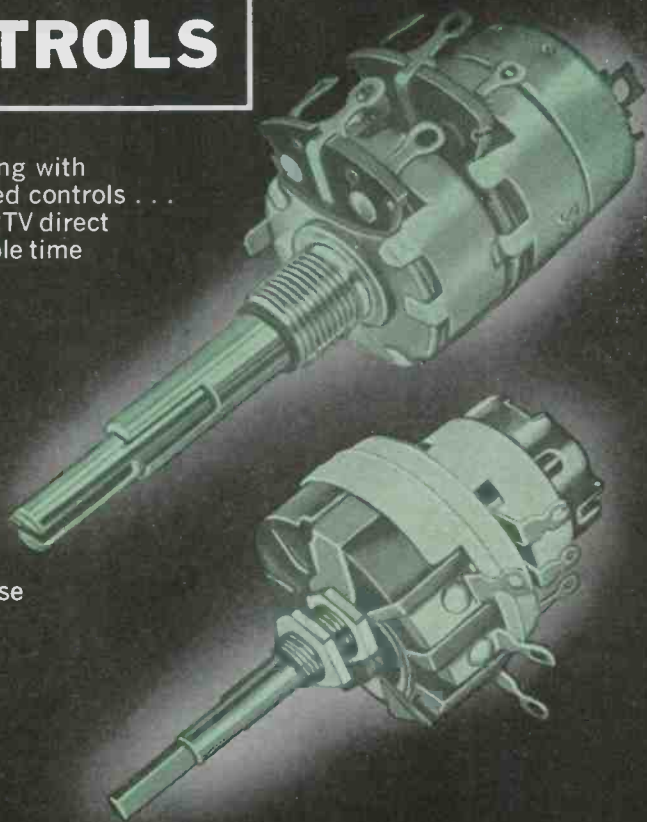
FOR FAST PROFITABLE SERVICING

## RTV CONTROLS

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

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

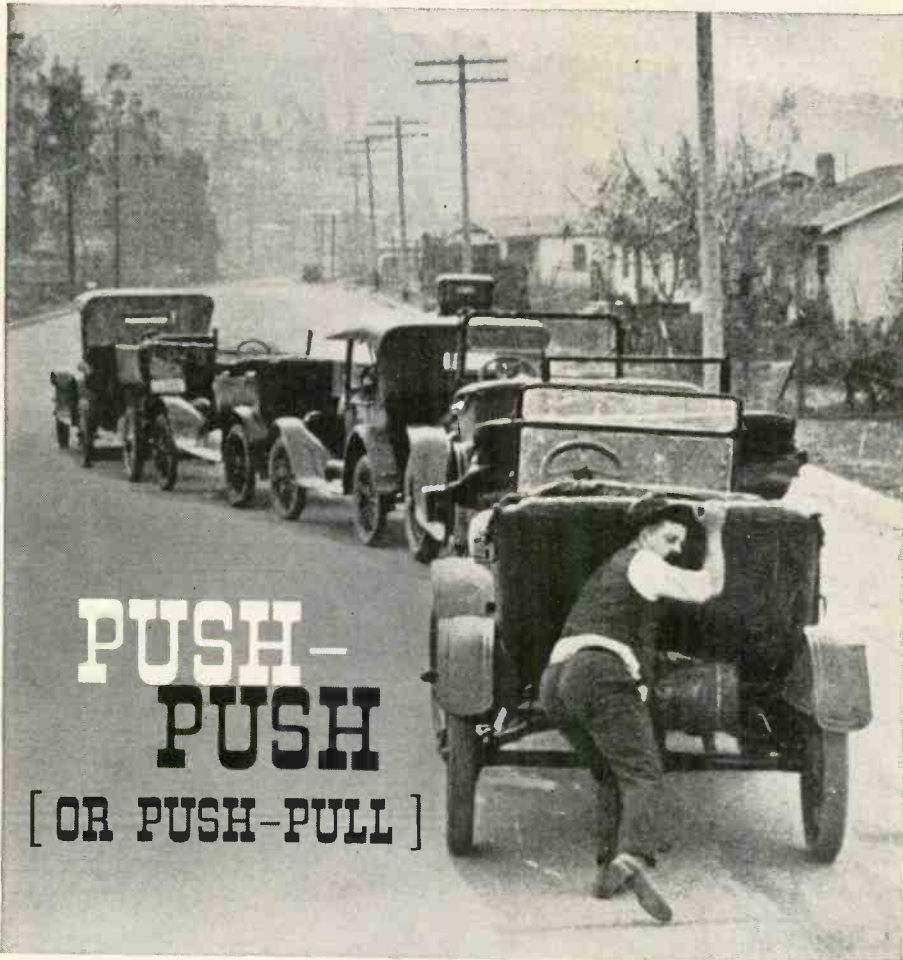
For FAST PROFITABLE SERVICING—always ask for Clarostat RTV controls . . . There are more than 1500 Clarostat Distributors to guarantee local service.



# CLAROSTAT

CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE



## controls from **Centralab**®

... won't make car-pushing easier but they will make your job much simpler.

This is because CENTRALAB has the most complete line of push-push and push-pull controls on the market. They are available in four different types—Adashaft, Universal Shaft, Fastatch for dual concentrics and Twin types for stereo. These push-push and push-pull controls are now used in over 78% of the television, radio and hi-fi sets coming out of the factories. In addition, you can make your customers happier by installing these convenient-to-use controls when replacing the standard volume controls.

You will find the CENTRALAB replacement you need at your distributor. Contact him now for your copy of the latest CENTRALAB catalog listing hundreds of other CENTRALAB replacement components . . . or write us directly for your free copy.



ACTUAL SIZE

**Centralab**®

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

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

(Continued from page 18)

**AEROVOX CORP.** announces the first two-year warranty on capacitors and resistors in all markets. Also a new slogan, "Technical Leadership—Manufacturing Excellence."

**PICKERING & CO.** announces a new dealer bonus plan which involves free offer of smartly styled Scandinavian modern counter display case for the firm's cartridges and styli.

**SENCORE's** Vice Pres. ED FLAXMAN recently held 11 dealer meetings during a two-week trip through Texas and southern Calif., talking to over 2000 service dealers. The firm has been conducting Service Clinics all over the U. S. and Canada for more than three years.

**DELCO RADIO** names DUANE L. BILLIET, manager marketing services; DON C. CRIFE, manager sales operations analysis; CLIFFORD H. BAKER, marketing specialist; RICHARD L. GERHART, sales engineer for static machine controls; and CALVIN E. FIELDS has been added to the staff of semiconductor sales engineers.

**RAYTHEON CO.** reports the election of KENNETH M. LORD to vice president—manufacturing and purchasing. E. NEVIN KATHER has been named general manager, semiconductor division. New appointments in the distributor products division are: JOHN T. THOMPSON, general manager; RALPH B. KNAPP, Jr., manager of operations; DONALD B. WHITTEMORE, eastern zone manager; and JOHN A. MAYBERRY, central zone manager.

## Reps & Distributors

**BLONDER-TONGUE LABS.** reports the appointment of J. MALCOM FLORA, Plymouth, Mich., as rep in the state of Michigan.

**JACKSON ELECTRICAL INSTRUMENT CO.** reports the appointment, as exclusive Canadian rep, of TRITEL ASSOCIATES LTD., a newly formed company, at 81 Sheppard Ave., Willowdale, Ontario.

**TERMINAL-HUDSON ELECTRONICS, INC.,** New York, N. Y. distributor, reports the appointment of IRWIN HECHT to the new post of vice president for sales. TERMINAL-HUDSON recently acquired HECHT ELECTRONICS, INC., rep firm of Roslyn Heights, N. Y., of which MR. HECHT is president.

(Continued on page 24)

TRAIN . . .



THEN SHARE THE PROFITS



# IN THE BOOMING COMMERCIAL TWO-WAY AND CITIZENS BAND RADIO SERVICE BUSINESS

### HERE'S HOW RAYTHEON WILL HELP YOU —

Now Raytheon can train you and franchise you as a Certified Raytheon Service Station operator, qualified to service Raytheon's expanding line of commercial two-way and citizens band radio equipment, as well as other brands. There are 2.5 million units in use today, and the number is growing every day!

**TRAIN TO SERVICE** — Raytheon's Communication Technician's Correspondence course will give you a thorough groundwork in the operation, installation and maintenance of this equipment. On completion of the course, you will be qualified to take the exam for the FCC Class II license which is required for servicing CB and commercial two-way radio. The cost is \$96.00 and it is available either direct or through your local Raytheon distributor.

**PROFIT AS A RAYTHEON CERTIFIED SERVICE STATION** — Then, with Class II license and adequate test equipment you can become one of a national network of independent service facility operators franchised to service Raytheon Ray-Tel CB equipment. Operating a Certified Service Station, you'll be reimbursed by Raytheon for all authorized parts and labor required in repair of in-warranty Ray-Tel units

### MAIL THIS COUPON NOW

Mail this coupon now for full details. Join others cashing in on this growing new field.

#### RAYTHEON COMPANY

Distributor Products Division  
411 Providence Turnpike  
Westwood, Massachusetts  
Box No. 52

- Please send me your brochure describing the Raytheon Communication Technician's Course.
- Please send me details on the Raytheon Certified Service Station Service Program.

Name \_\_\_\_\_

Company Name \_\_\_\_\_

Address \_\_\_\_\_

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

Name and Address of Raytheon Distributor  
\_\_\_\_\_

**RAYTHEON**

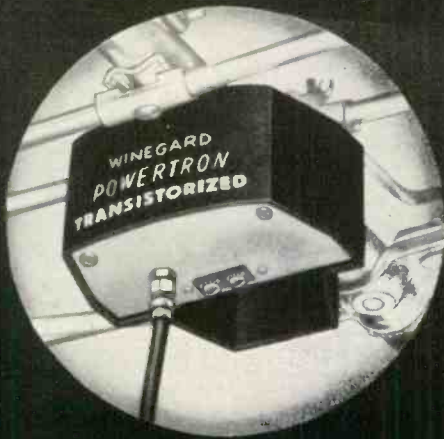
# RAYTHEON COMPANY

DISTRIBUTOR PRODUCTS DIVISION

# Why the WINEGARD ELECTRONIC MOST EFFECTIVE TV ANTENNA...

**DESIGNED TOGETHER  
TO WORK TOGETHER... WINEGARD  
POWERTRON ANTENNA AND  
BUILT-IN AMPLIFIER!**





**TRANSISTORIZED!**





**MODEL SP-55X**

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

## WHY? BECAUSE...

-  **IT CAPTURES MORE SIGNAL** than any other all-channel antenna ever made. Patented design, electro-lens director system, dual "TAPERED T" driven elements, 30 precision-tuned elements in all.
-  **IT'S THE ONLY TRUE ELECTRONIC ANTENNA.** Only the Winegard Powertron is built with the amplifier as part of the driven element—not an "add-on" attachment.
-  **IT ELIMINATES ALL SIGNAL LOSS** that normally occurs between the driven element and the amplifier due to transmission and coupling mis-match.
-  **IT BOOSTS WEAK SIGNALS UP OUT OF THE SNOW** far better than any other antenna or antenna-amplifier combination made.

 **FOR VIVID COLOR, HIGH DEFINITION BLACK AND WHITE AND LONG DISTANCE RECEPTION,** nothing can compare to the Super Powertron. Thousands have been installed all over the country and our files are full of testimonials from grateful TV viewers and Service-Technicians alike.

 **WINEGARD IS THE ONLY MANUFACTURER THAT MAKES BOTH ANTENNAS AND RF AMPLIFIERS.** Because of this you can feel confident of getting the very best. But don't take our word for it—let your eyes and ears and field strength meter tell the story.



**MODEL P-55**  
Powertron — transistORIZED, 14 elements.



**MODEL P-55X**  
Powertron with Pack — Transistorized, 21 elements.



**MODEL SP-55X**  
Super Powertron — transistorized, 30 elements.



# POWERTRON is by far WORLD'S

Not 60%...Not 70%...but over 95% efficient

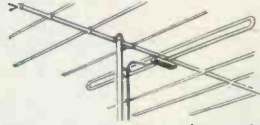
## OUTFEATURES — OUTPERFORMS ORDINARY ANTENNAS WITH "ADD-ON" TYPE SIGNAL BOOSTERS!

THIS IS BETTER —



Exclusive amplified "Tapered T" driven element for perfect match and lowest possible signal-to-noise ratio. Only Powertron has it.

THAN THIS —



Not an after-thought "add on" signal booster hung on an ordinary antenna — not an old fashioned mast mounted booster.



ONLY POWERTRON HAS BOTH 300 OHM TWIN LEAD OR 75 OHM COAX TERMINALS ON BUILT-IN AMPLIFIER.

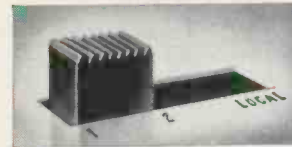


ONLY POWERTRON GIVES YOU YOUR CHOICE OF TRANSISTORS OR TUBES (TUBE MODELS 300 OHM ONLY).

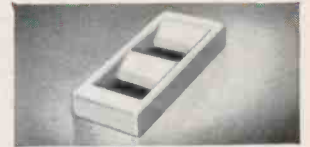
### POWERTRON HAS COMPLETELY AC POWER SUPPLY



Transistorized Model has rectifier and filter in power supply — not in amplifier, where servicing is difficult. No batteries. Costs 27c to operate for full year. Battery types require \$5 to \$9 in batteries a year to operate continuously at maximum efficiency.



ONLY POWERTRON HAS RANGE CONTROL SWITCH TO PREVENT OVER-DRIVING TV SETS ON EXTRA STRONG CHANNELS.



ONLY POWERTRON HAS AC PLUG-IN OUTLET FOR TV SET BUILT INTO THE POWER SUPPLY.

POWERTRON IS 100% CORROSION-PROOFED — ANTENNA IS GOLD ANODIZED, ALL HARDWARE IRRIDIZED, AMPLIFIER HOUSING OF HIGH IMPACT PLASTIC.

### ONLY THE POWERTRON CAN DO ALL THIS!

1. Powertron will drive up to 10 TV sets and each set will have a better picture than an ordinary antenna will deliver to one set.
2. Powertron will drive a TV signal through one-half mile of lead-in with signal to spare—permits you unprecedented flexibility for remote installations.
3. Powertron will virtually eliminate snow and interference even on an old TV set.
4. Powertron will deliver superlative color reception far better than a non-electronic antenna.
5. Powertron brings in stations beyond the reach of non-electronic antennas—delivers greatest reception distance.

**LIFE**

POPULAR  
MECHANICS

Successful  
Farming

POPULAR  
SCIENCE

LOOK

Field & Stream

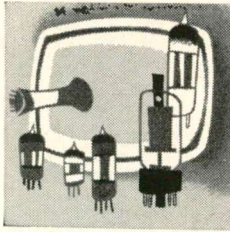
AND WINEGARD POWERTRON is the only antenna presold to your customers—nationally advertised in the biggest consumer advertising campaign yet! So stock up now—take advantage of the demand Winegard is building for you.

Write for free technical bulletins.



# Winegard

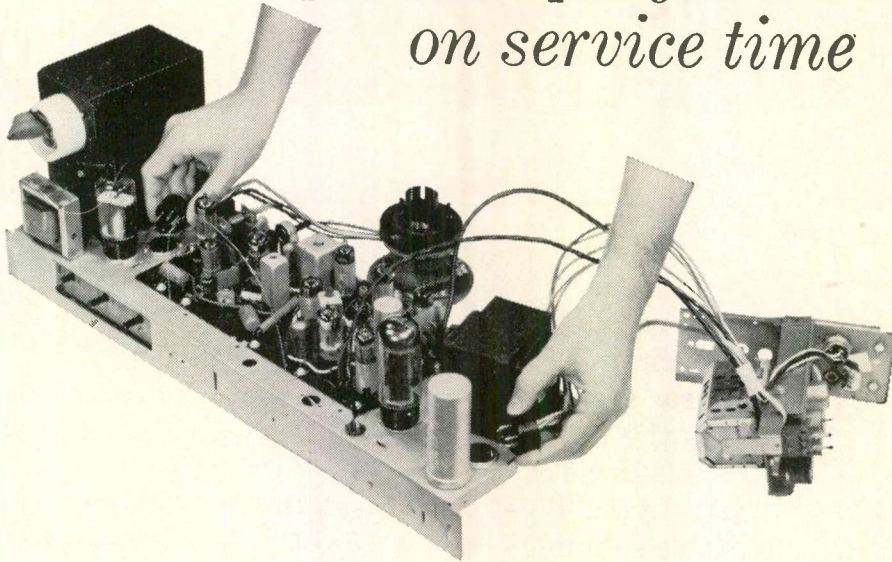
ANTENNA SYSTEMS  
Winegard Co., 3019-9 Kirkwood, Burlington, Iowa



# The "Big Picture"

...informative shop talk from  
Sylvania Field Service Headquarters

## Now... "pull the plugs" on service time



"Time is money," you know... and untangling, pulling and remounting wired-together TV assemblies eats up plenty of valuable service time. But see how this new GT-555 chassis on the new 1962 Sylvania TV Sets "unplugs" that time-tangle and frees you for profitable servicing.

All wiring from major components to the chassis has easy-to-remove plugs... tuner cluster, deflection yoke, picture tube high voltage lead, speaker system and remote receiver. The HaloLight® mechanism is also a plug-in. Now you can separate and pull whole assemblies in seconds (put them back in seconds, too, so you're saving time at both ends).

But that's not the whole "plug-in" story. The mountings make good use of the same principle. The chassis, for instance, has push-studs on front that fit neatly into special cabinet-mounted brackets. That means no more of those tough-to-get-at front screws to struggle with.

You don't have to remove any screws to get at the Mylar-insulated high voltage transformer, either. It has a new, hinged lid (with safety-lock device) for easy access. A simple thing, but typical of the thought and care in this new, service-designed GT-555 chassis, and another reason why TV service experts like the new Sylvania TV Sets.

### SERVICE TIP OF THE MONTH

Symptom—Noisy or intermittent tuner (button contact type).

Cause—Faulty bonding of buttons to solder strips at the rear of the wafers.

Cure—Spraying with cleaner fluid will produce temporary repair. Resoldering the button of the noisy or intermittent channel will effect a permanent cure.

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

# SYLVANIA

SUBSIDIARY OF

## GENERAL TELEPHONE & ELECTRONICS



(Continued from page 20)

CENTRALAB has appointed PRICE SALES CO., East St. Louis, Ill., rep firm, to cover eastern Mo. and southern Ill.

CHEMTRONICS, INC. announces the appointment of DON KOHLER, Seattle, Wash., as rep in the north-western states.

RAY R. HUTMACHER ASSOCIATES, Chicago rep firm, announces the appointment of ARTHUR B. MAYER to the sales staff.

OXFORD ELECTRIC CORP. has appointed the newly formed Minneapolis rep firm, JAMES LEE CO. for the states of N. Dak., S. Dak., Minn. and western Wis.

ERA (Electronic Representatives Assn.) has graduated fifty members who have completed the Business Management Institute Courses conducted by the UNIVERSITY OF ILL., Urbana, and the AMERICAN UNIVERSITY, Washington, D. C.

VOCALINE CO. OF AMERICA reports the following rep appointments: COLLINS-HAVERCAMP, Kansas City, Mo., for Kansas, Iowa, Mo. and Neb.; the MAITLAND K. SMITH organization, Atlanta, Ga., for the southeast; and JACK YOUNT, Dallas, Texas, for Texas, Okla., Ark., Miss., and La.

## Catalogs & Bulletins

**ANTENNAS:** The Commuter, model 309, especially designed for all-channel suburban reception, is described in literature. This 6-element, twin driven antenna has separate low band and high band directors and dipoles. Channel Master Corp., Ellenville, N. Y.  
For more data, circle 9-24-1 on coupon, p. 41

**CAPACITORS:** A selection chart and price list of new single-section tubular electrolytic capacitors is available from franchised distributors. Ask for chart ETR-2609A. General Electric Co., Owensboro, Ky.  
For more data, circle 9-24-2 on coupon, p. 41

**TEST EQUIPMENT:** Form 7508-C-860 covers: model 107 tube tester; model 78 grid circuit and complete tube tester; model GCT-9 grid circuit tube tester; model 500 2-way radio test set; model 100 dynamic transistor checker; model HC-6 in-circuit current checker; model 208 VTVM; model FB-4 fly-back circuit and inductance analyzer; and model PS-2 battery eliminator. All models described, illustrated, and covered by specifications and prices. Seco Electronics Inc., 5015 Penn Ave., South, Minneapolis 19, Minn.  
For more data, circle 9-24-3 on coupon, p. 41  
(Continued on page 26)

Another outstanding product by the **HIDDEN 500\*** who plan for your future:



## TYPE TE LITTL-LYTIC<sup>®</sup> CAPACITORS



Transistors revolutionized the industry. And to make the most of their inherent advantages, they called for an entirely new group of components. Here, Sprague Research was the first to answer the call with the smallest truly reliable dry electrolytic made for transistor circuits—the Littl-Lytic. This reasonably priced capacitor is the most reliable subminiature you can buy for transistorized radios, hearing aids, wireless microphones, pocket wire recorders, and other miniature electronic equipment.

The remarkable reliability of Littl-Lytic is the result of a new manufacturing technique in which *all the terminal connections are welded*. Units are hermetically sealed and metal encased . . . *with no pressure joints . . . there are no "open circuits" with the passage of time*. Leakage current is extremely low as the result of the use of high purity foil and ultra-stable formation techniques. Sprague's catalog replacement ratings are the most comprehensive in the industry. They assure you of exact replacements to meet your day-to-day service requirements.

Littl-Lytic is a typical example of how Sprague Research keeps its products up-to-the-minute. Reliable components mean reliable service work—your business keeps pace with the electronic industry when you use Sprague.

\*The "Hidden 500" are Sprague's 500 experienced researchers who staff the **largest research organization in the electronic component industry** and who back up the efforts of some 6,000 Sprague employees working in 14 manufacturing operations—four at North Adams, Mass.; Bennington and Barre, Vt.; Concord and Nashua, N.H.; Lansing, N.C.; Grafton, Wis.; Visalia, Calif.; two at Ponce, Puerto Rico; and Milan, Italy.

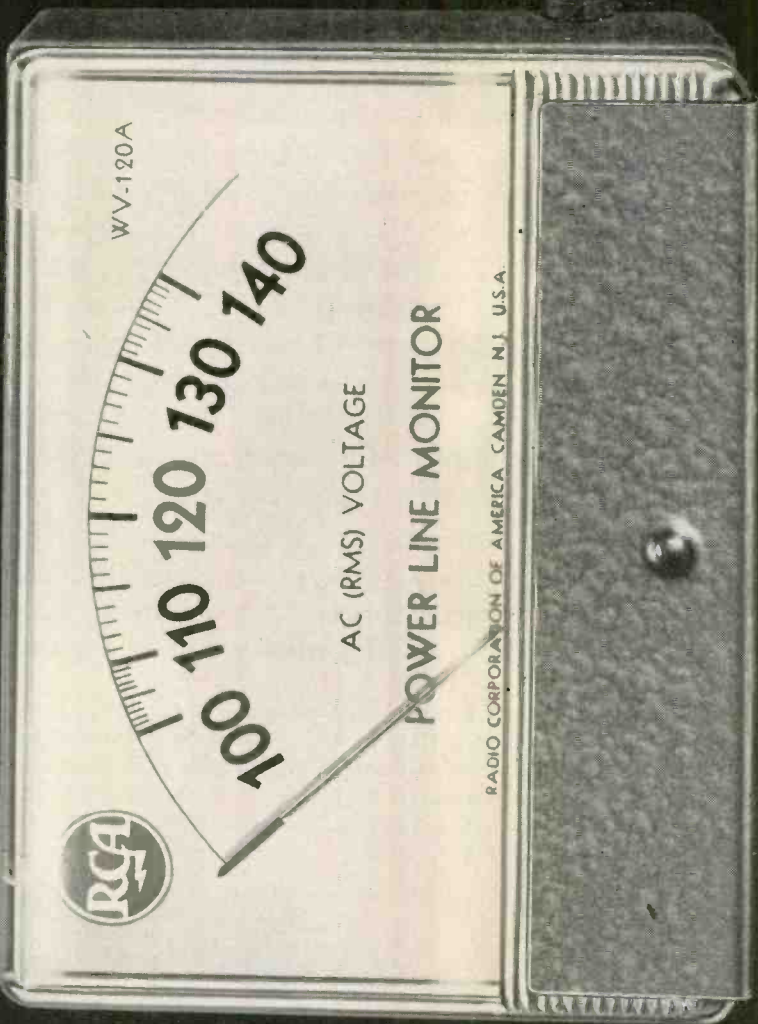
don't be vague...insist on

**SPRAGUE<sup>®</sup>**

world's largest capacitor manufacturer

# KEEP A CONSTANT CHECK ON YOUR LINE VOLTAGE

ACTUAL  
SIZE



with the New RCA WV-120A  
**POWER LINE MONITOR**

- **EXPANDED SCALE**  
Scale is expanded from 100 to 140 volts for easy reading
- **HIGH ACCURACY**  
±2% at 120 volts; ±3% at 100 and 140 volts
- **TRUE RMS READINGS**  
Moving-vane type meter gives accurate RMS readings, even when line voltage is not pure sine wave
- **FAST METER ACTION**  
Reveals "bounces" and fluctuations in line voltage
- **LARGE NUMERALS, LARGE POINTER, LARGE SCALE**  
Provide easy readability from distance of ten feet or more
- **CONVENIENT WALL MOUNTING**  
Holes are provided in rear of case for wall mounting
- **LOW PRICE—ONLY \$14.95\***  
Extremely low priced for a large-sized, expanded scale, RMS meter of such high accuracy

See the RCA WV-120A at your Authorized RCA Distributor.

\*U.S. Price (Optional)

Electron Tube Div., Harrison, N. J.



The Most Trusted Name  
in Electronics

(Continued from page 24)

**TRANSFORMERS:** Catalog sheet lists model numbers, functions, specifications and prices of a new line of transistor transformers. Merit Coil & Transformer Corp., Merit Plaza, Hollywood, Fla.

For more data, circle 9-26-1 on coupon, p. 41

**SOLDERING IRONS:** Catalog #111, superseding #110, covers 80 models in 7 distinct types, 20 to 700 watts; 1/8 to 3/4" tips. Includes many new items and improvements. Hexacon Electric Co., 642 W. Clay Ave., Roselle Park, N. J.

For more data, circle 9-26-2 on coupon, p. 41

**COMPONENTS:** A new catalog, Barry's Green Sheet, features electronic tubes, semiconductors, transformers, chokes, meters, wire, test equipment and other components and equipment. Barry Electronics Corp., 512 Broadway, New York 12, N. Y.

For more data, circle 9-26-3 on coupon, p. 41

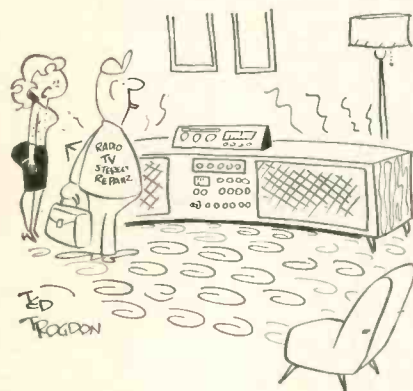
**RADIOS:** Literature available (1) Covering 5-tube superheterodyne table radio, model ST61. Features include a 3 1/2" PM dynamic speaker and built-in ferrite bar antenna. (2) Covering 6-transistor pocket radio, model S640. Features include a dynamic 2" speaker, 535-1600 kc frequency and full AM broadcast band. The Sampson Co., 2244 S. Western Ave., Chicago 8, Ill.

For more data, circle 9-26-4 on coupon, p. 41

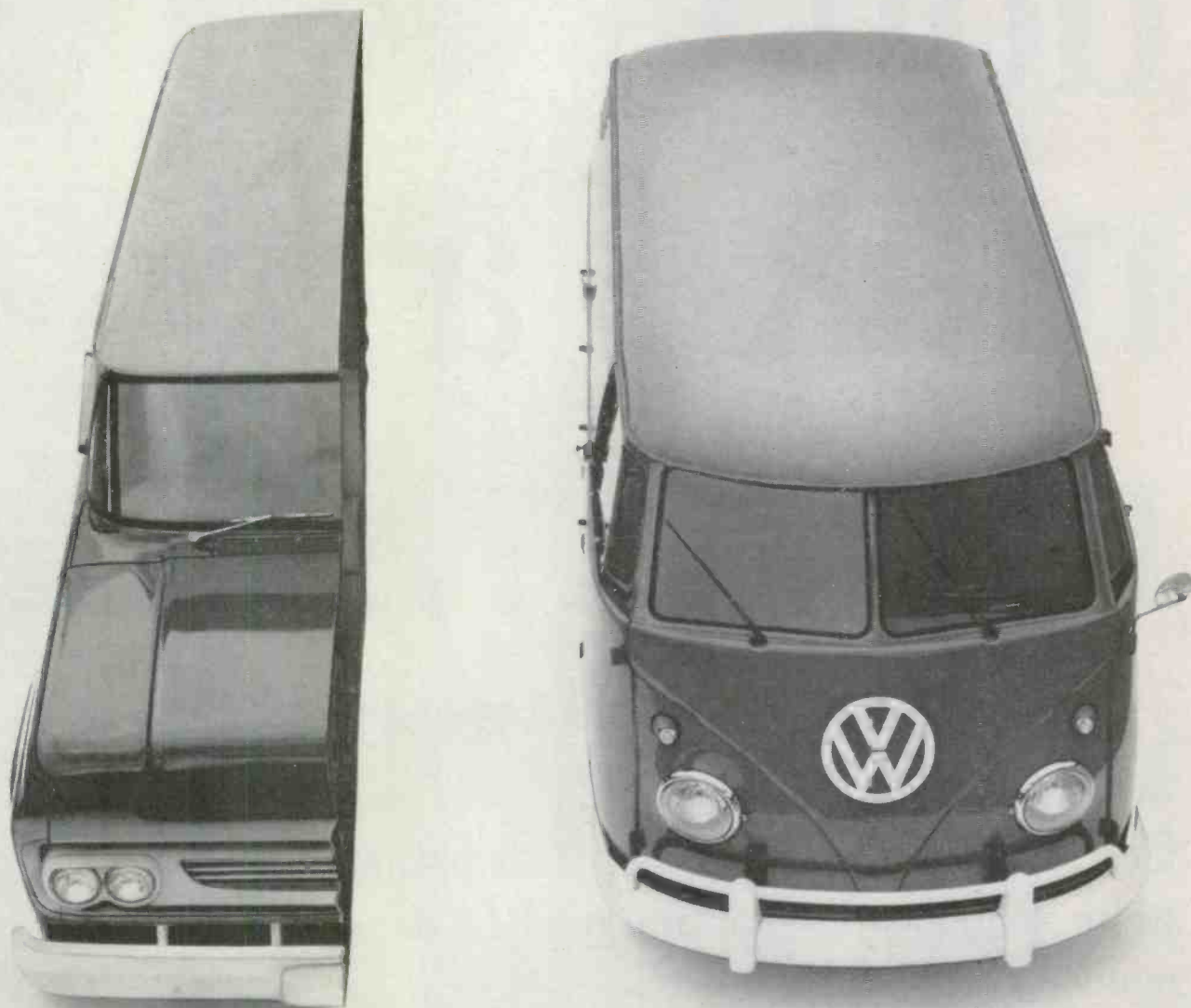
**TV DISTRIBUTION SYSTEMS:** Audio-Trol, described as a new dimension in TV distribution systems, is covered in literature. Unused TV channels are utilized to transport music, voice, radio, etc. to every TV receiver on the system. Also covered is the drift-free FM tuner, model FT-100, for converting FM signal into an audio source to feed into the Audio-Trol. Jerrold Electronics Corp., 15th & Lehigh, Philadelphia 32, Pa.

For more data, circle 9-26-5 on coupon, p. 41

**SERVICE MANUALS:** The 1961 Master Index, 44 pages, lists volume and page reference to Radio Volumes 1 through 21; and TV Manuals TV-5 through TV-18. Price, 25¢. Order direct from Supreme Publications, 1760 Balsam Rd., Highland Park, Ill.



"It doesn't need fixing—I just want to know how to turn it off."



©1961 VOLKSWAGEN OF AMERICA, INC. \*SUGGESTED RETAIL PRICE.

## They cost the same to run.

Compare a whole Volkswagen with half of an ordinary panel delivery.

The upkeep is almost the same.

VWs get 20 to 30 miles a gallon on gas, for instance. And about 35,000 miles on tires.

About twice as much as a conventional truck.

(A loaded VW is as light on its feet as other trucks empty. That's one of the reasons it costs so little to run.)

Also, a whole VW will cost no more to

service than half of a standard truck. Owners tell us the VW has cut their repair bills around 50%.

(After all, we've been perfecting the same truck for 12 years.)

But half a truck won't carry the VW's 1,830 lbs.

This is only 170 lbs. less than a ton. Even if you put your standard half-ton back together, it wouldn't take it.

There is one advantage to cutting an ordinary truck in half. It will be easier to

get into than a VW. But not much.

Our side doorway is almost 4 feet wide. And for \$85\* more, you can get another just like it on the other side.

But of course you wouldn't really cut a truck in half. People would point at you.

The real question is the upkeep of a whole truck. And you can run two Volkswagens for the same money.



Or just one and keep the difference. Some people can't think of anything but money.

For more data, circle 9-27-1 on coupon, p. 41

# don't make a move... until you see the new

## **JFD** REGISTERED TRADE MARK **transis-tenna**

**Electronic Antenna-Amplifier-Distribution system —  
to be announced within the next 15 days**

*featuring . . .*

- 1** **The first truly electronic antenna . . .** *Transistorized* amplifier mounts directly to antenna terminals for highest possible signal-to-noise ratio.
- 2** **Priced to sell in thousands** (not in ones or twos) from \$39.95 to \$79.95 retail, complete with antenna, amplifier power supply and line tap-offs.
- 3** **Universal mounting adaptor** permits installation on any antenna dipole insulator—any conical, any yagi or any inline.
- 4** **Choice of AC power or battery power supply** for unlimited installation flexibility. Assures you maximum mounting convenience. Best signal-to-noise figure, maximum signal transfer.

*Plus many other advances.*

Your JFD distributor will be glad to demonstrate the exclusive advantages of the advanced *transistorized* JFD Transis-tenna. See him first. You will be glad you did.

**JFD ELECTRONICS CORPORATION**

*world's largest manufacturer  
of TV antennas and accessories*

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## "STEREO 1962"

Our fourth annual roundup on stereophonic sound—STEREO 1962—is presented this month. It thoroughly covers the technical aspects of every element contained in a stereo system, as well as analyzing new developments such as FM multiplexing. In addition, this special issue includes an up-to-date manufacturers directory for the electronic trade that can be useful every day of the year.

In view of these features, this year-round stereo reference should help readers prepare for stereo equipment buying, selling, and servicing responsibilities to their customers.

## Hi-Fi Repair Dilemma

A number of electronic service dealers refuse to repair hi-fi equipment. This business stance creates a two-fold problem: customers cannot obtain conveniently located service and service dealers are forsaking substantial profits.

Unfortunately, these service dealers don't realize that this type work demands higher service charges to compensate for the extra time and knowledge required to put a hi-fi component into top operating condition. A higher labor charge is always justified, of course, when a customer wants service work beyond merely replacing a defective component.

Hi-fi set owners often want added service such as accurately aligning an FM tuner or balancing an audio output stage after replacing a tube or other part. In contrast, radio-TV set owners rarely request specialist service or, if they do, quickly change their minds when they learn about the additional cost.

Thus, many technicians solely in the radio-TV service field do not normally restore a TV set's original video response, say 3 Mc bandwidth; they replace an i-f transformer, resistor or capacitor to restore lost video—not the set's playing potential. And, naturally, they're not paid for restoring full bandwidth. Here is where hi-fi repairs differ from radio-TV repairs. The extra service dollars are available in hi-fi service.

It's time that service technicians utilized their *full* electronic service knowledge. Hi-fi repair is an area where they can do it. It's in strong demand, and there's a fine service profit in it.

# TV MANUFACTURERS

## DELCO

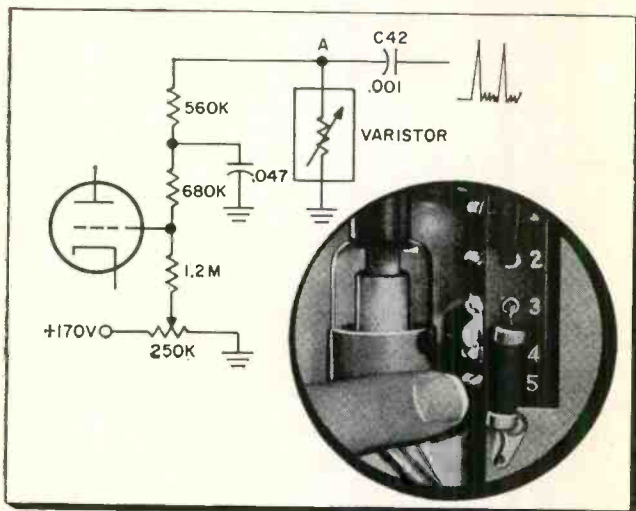
### 1961 Tempest Auto Radios — Reduce Motor Noise

There have been some reports of ignition interference on early 1961 Tempest auto radios. If this condition is encountered, it can be corrected by installing a ground strap between the rear of the cylinder head and the dash board. The ground strap is now being used in production.

## PHILCO

### 1962 Portable TV's — New Horizontal Control Circuit

Philco's 1962 portable and compact TV's will have a small, insignificant-appearing component housed in the high voltage cage. However, this little device, a



Varistor located in high voltage cage of 1962 Philco portable and compact TV's serves as automatic bias controller for set's horizontal output tube. Variations in light and dark picture conditions will be "averaged" through application of a positive horizontal flyback pulse to tube's grid circuit.

varistor, controls the TV's horizontal output circuitry.

The varistor's control ability is possible because its resistance varies inversely as the voltage across it. Its primary job is to maintain the horizontal output transformer's voltage constant under varying loads caused by light and dark picture conditions. Increased loading (picture white content increase) reduces pulse amplitude. Decreased loading (picture dark content increases) increases pulse amplitude. The RC network (560K/.047  $\mu$ f) smooths out or "averages" bias variations. Hence, anode and scan voltages are stabilized. Here is how it works.

A pulse voltage from the flyback xformer is coupled through capacitor C-42 to one side of the varistor at point "A" and then to the HO tube's grid. Any voltage variation between point "A" and ground will naturally affect the output tube's conduction.

The positive flyback pulse voltage charges capacitor C-42, and raises the voltage across the varistor. The greater the flyback voltage, the greater C-42's charge. When the voltage from the flyback decreases, capacitor C-42 begins to discharge and the potential difference between point "A" and ground decreases. The varistor's resistance increases quickly, reducing current flow. Hence, automatic bias control for the horizontal output tube's grid.

Bias level is dependent on pulse amplitude, and pulse amplitude is governed by bias level. When no pulse appears at C-42 the varistor's resistance is approximately 200 megohms and current flow is cut off.

## RCA

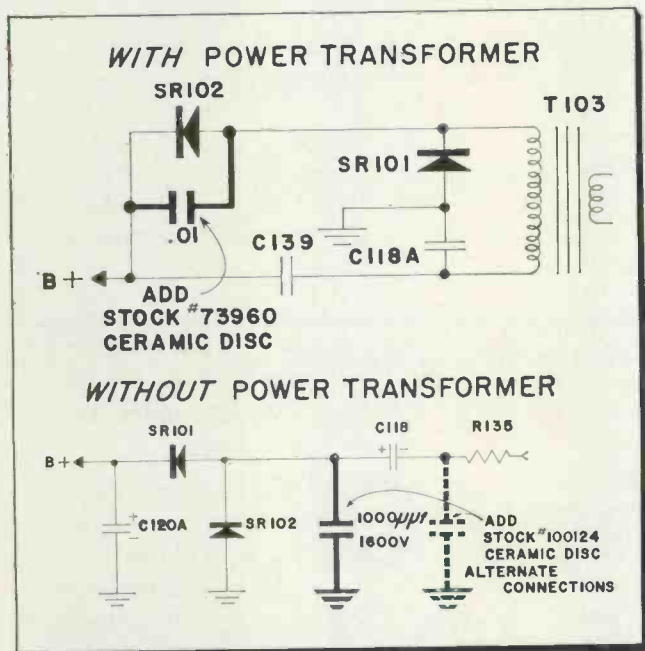
### Eliminate Hum Bars

In TV instruments using silicon rectifiers, a condition of hum bars may be encountered, especially if "rabbit ear" type antennas are used. This condition is caused by radiation from the silicon diodes in the power supply and may be corrected by adding a ceramic disc-type capacitor across one of the diodes. This capacitor is connected, as shown, for power transformer sets. Sets without power transformers should have this capacitor connected to the input side of the input filter capacitor. The ground connection



# TECHNICAL DIGEST

of the capacitor should be made to the nearest mounting stake of the printed wiring board.

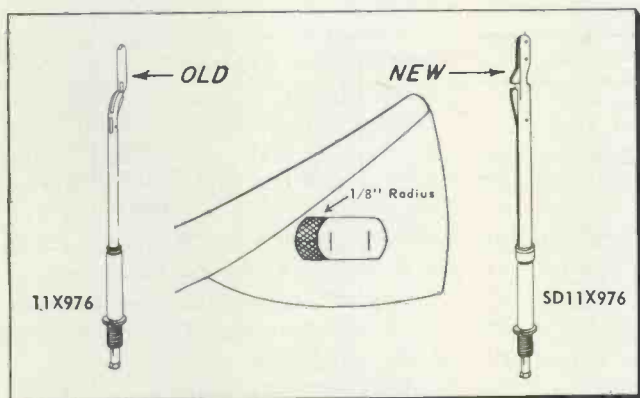


Some RCA TV receivers using silicon rectifiers exhibit hum bars due to power supply radiation. Adding a disc-type ceramic capacitor, as shown, should correct this condition.

## WEBCOR

Models 100, 101, 110, 113, 114, 115, 116, 121, 122, 1121 & 1122 — New Spindle Adaption

Installing new type spindles in some Webcor record changers requires that the record ballast arm's spindle hole be enlarged.

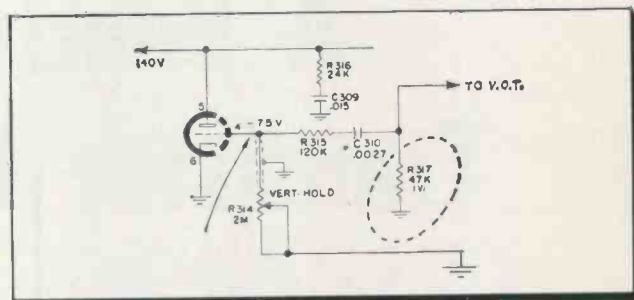


When the original 11X976 spindle is replaced with an improved one, SD11X976, the spindle hole in the record ballast arm must be enlarged. Use a rat-tail file to enlarge the hole on a 1/8 inch radius. Observe extreme caution to prevent scratching the paint on the top of the ballast arm. The 45 RPM spindle adapter must be replaced with a A1930 unit when the new spindle is used.

## WESTINGHOUSE

Chassis V-2377, 2378, 2379, 2384, 2389, 2409, 2411, 2412, & 2414—Vertical Circuit Modifications

Loss of vertical hold, hold at one end of the control, and/or loss of some vertical linearity and height, can sometimes be traced to a defective re-



Poor vertical hold in some Westinghouse TV chassis has been traced to a defective resistor.

sistor which opens for some unknown reason. This component is a green-bodied, one watt, 10% tolerance resistor in the vertical output or vertical discharge circuit. Use a high quality, equal value component, if replacement becomes necessary.

In V2377 series chassis the component is R-315 (27K). In chassis V-2378, 79, and 2389, the component is R-316 (22K). And in series 2384, 2409, 2412, it is listed as R323 (82K). V2411 chassis uses a 47K resistor listed as R317.

Although this particular resistor has caused problems in the indicated circuits, it must be noted that the same resistor will not affect other circuit functions in these chassis. The offending resistors have been removed from factory stocks.

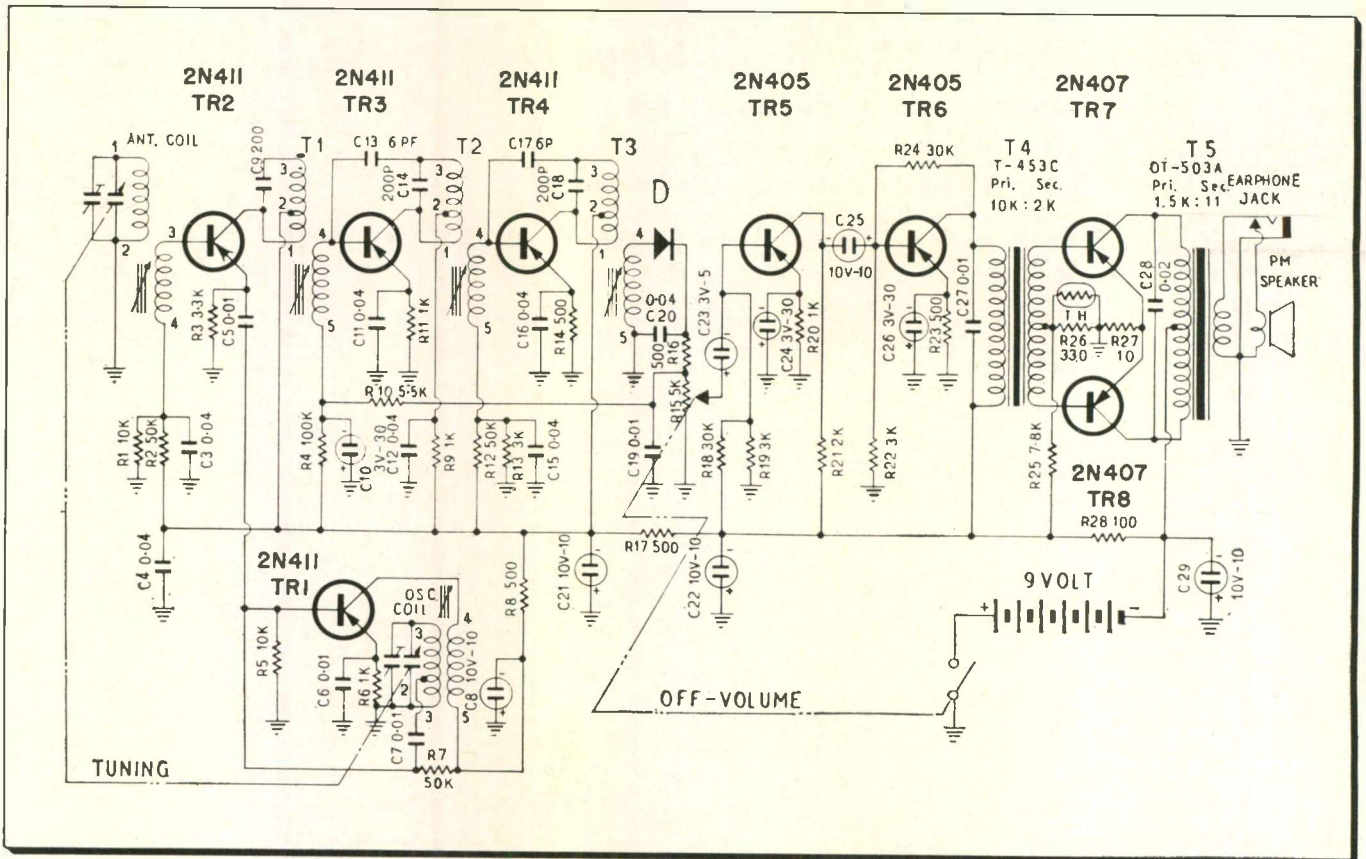


Fig. 1—Schematic of portable radio using 8 PNP transistors, diode detector, and push-pull audio output.

# A Bench View Of Transistor Radio Defects

LOUIS E. GARNER, JR.

• Servicing transistor radios can be almost as easy as a-c/d-c sets. A few circuit checks and a simple servicing procedure will place you next to the *hot shot technician*.

Remember, the transistor radio has electronic failures that fall into a pattern, the same as that TV chassis you just repaired. And section-alizing TV defects became second nature in your troubleshooting procedure. The same situation prevails here.

To begin, you will receive your share of dead sets that are repaired by replacing a battery or soldering a broken lead. But, by the same token you will encounter other sets

that will require more than a hot soldering iron to restore them to normal operation. Don't panic when the set needs further troubleshooting.

If the unit still doesn't operate after you have tested all transistors as shown in Fig. 1, your next few steps can make the set a "dog" or a "snap."

## Tracking "Garbled" or "Muffled" Sounds

Aside from a dead stage, which is comparatively easy to isolate, audio circuit complaints are of three general types: (a) distortion (sound is garbled), (b) change in frequency response (sounds "tin-

ny"—excessive highs, or sounds "muffled"—excessive lows), and (c) low gain (not enough volume). Noise and motorboating (or oscillation) are less common, and frequently caused by power supply defects.

Circuit-wise, the usual cause of distortion is a change in stage bias, generally as a result of excessive leakage in a by-pass or coupling capacitor. A high  $I_{cbo}$  (leaky transistor) is a less common cause. For example, leakage in C-23 (Fig. 1) will reduce TR-5's base bias. This may permit the stage to be driven to cut-off on positive signal peaks, with resulting clipping and distortion.

On the other hand, excessive leak-

## Typical Audio, I-f and R-f Stage Failures Are Examined

age in the transistor would result in a higher-than-normal voltage drop across collector load R-21, and could permit the transistor to be driven to saturation on negative peaks resulting in clipping and distortion. Since signal peaks are clipped in either case, the change in output sound quality would be about the same. Here, individual stage bias tests with a Voltmeter, plus a check of TR-5 would isolate the defect.

An increasingly common cause of distortion in midget sets is warpage of the loudspeaker frame, causing the voice coil to rub on its pole piece. Often, the complaint shows up only at high volume or when the set is held in a certain way. The best check here is to try a substitute speaker.

If a customer complains of a change in frequency response: "The set sounds tinnier than it did when new," for example, it is best to hear him out. The complaint frequently indicates a real circuit defect.

Electrolytic capacitors used for coupling and by-passing transistorized audio circuits can lose capacity as they age. This, in turn, can bring about a severe drop in the circuit's low frequency response. For example, a drop in the value of C-23, C-24, C-25 or C-26 (Fig. 1) will cause a corresponding drop in low frequency gain. This causes the highs to be accentuated and sound becomes "tinnier."

On the other side of the coin, a value increase in by-pass capacitors C-27 or C-28 can attenuate the highs. Overall volume is reduced and, in some cases, muffled sound results. Fortunately, these defects are comparatively easy to isolate by substitution tests.

In a few sets, excessive collector current leakage in one stage can cause a severe loss of low frequencies. Referring to Fig. 1, excessive leakage in TR-6 will increase the d-c through T-4's primary. This may lead to core saturation and a drop in primary impedance, particularly at low frequencies. The result is an overall loss of stage gain, but with low frequency losses predominating. Unless the increase

in TR-6's current is enough to cause an appreciable change in the IR drop across R-28, the defect may not show up in standard Voltmeter bias checks. In this case, a test of the set's transistors would identify TR-6 as the culprit.

### R-f, I-f Defects

Typical defects resulting from r-f and i-f circuit defects include poor selectivity (can't separate stations), low gain (tunes only the strong stations), oscillation (squealing, motorboating, etc.), interference, and poor dial tracking.

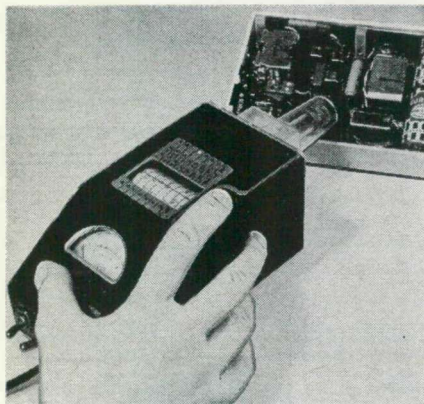


Fig. 2—A grid dip meter can be used to check approximate frequency to which a receiver's oscillator circuit is tuned.

Almost any of these complaints may be caused by improper alignment or a shift in alignment as a result of vibration or the replacement of circuit components. A check of set alignment is, in itself, a good test technique.

For example, if an i-f transformer has a broad response and is difficult to peak, it can indicate excessive loading. This could possibly be caused by an internal short or a leaky transistor. Excessive loading of a tuned circuit, of course, lowers "Q," reduces gain, and causes poor selectivity.

In addition to misalignment, r-f or i-f oscillation may be caused by an open by-pass or neutralizing capacitor, by defective shielding, or by a shift in critical lead dress.

Where the oscillation is general, a useful technique is to *misalign* the receiver deliberately, thus killing the oscillation. The stages are now realigned one-by-one, starting at the last i-f and working towards the front-end. Shielding and lead dress are inspected as realignment proceeds, with by-pass capacitors checked by shunting with units known to be in good condition.

Replacement of a defective component may lead to secondary troubles in some cases. Beta readings of stock transistors of the same type number may vary widely. Thus, the replacement of a defective low beta transistor with a new high beta unit may cause oscillation or other improper operation. In a neutralized i-f stage, the replacement of a transistor may call for a change of the neutralizing capacitor. Referring to Fig. 1, for example, replacing TR-3 may necessitate changing C-13's value.

A few set manufacturers furnish replacement i-f transistors with matched neutralizing capacitors under a single stock number. In other cases, the proper capacitor value must be determined experimentally. A good technique here is to make up a "gimmick" capacitor by twisting two short lengths of insulated wire together (about a half-inch or so). Tightening the "twist" will increase capacity, loosening it or cutting the lead length will reduce capacity, permitting an exact adjustment for optimum value.

As a general rule, however, the more common r-f and i-f troubles can be isolated using conventional stage testing techniques such as signal tracing and signal injection. Once the defective stage is isolated, bias checks with a voltmeter helps in the isolation of defective components.

The harder to isolate "tough" r-f defect is frequently associated with the oscillator-converter circuit. For example, an excessively strong oscillator signal may cause birdies, tweets and blocking. This condition may be corrected by replacing the converter (or local oscillator) transistor, or by shunting the local os-

(Continued on page 62)

# How To Repair Your Own Oscilloscope

## Step-By-Step Procedures For Isolating HV, Vertical & Horizontal Sweep Problems

DAVID R. ANDERSON

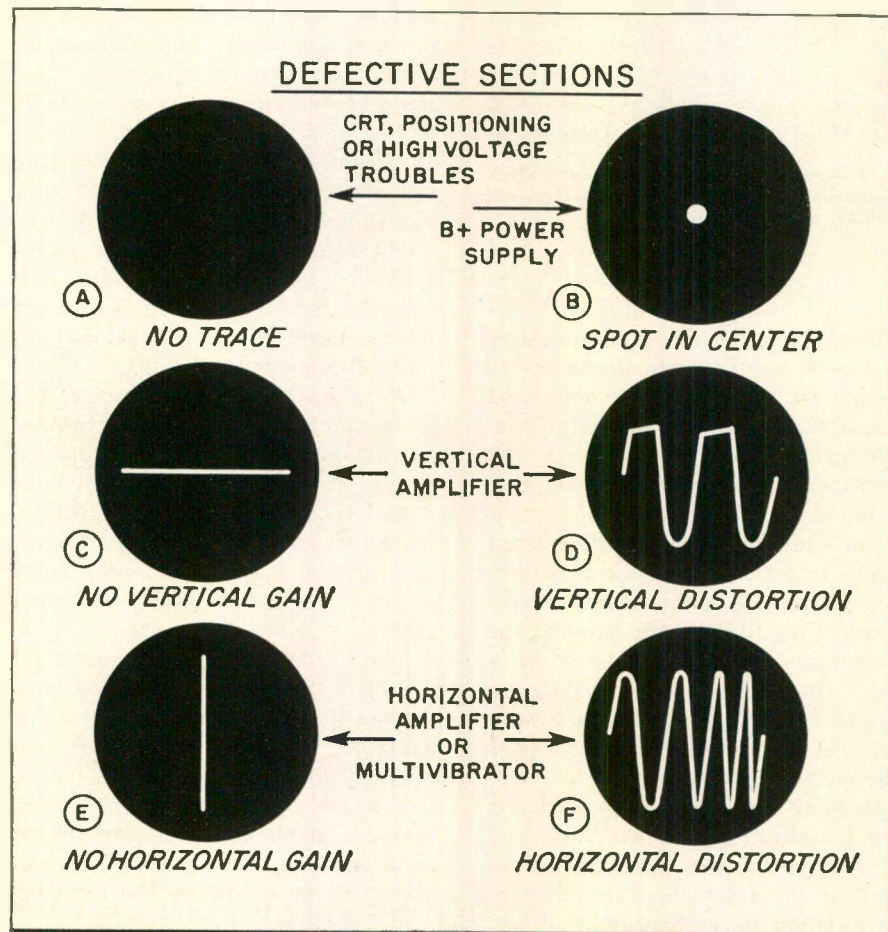
• Locating the defective section in a scope is not a difficult job. Fortunately, the scope may be used to signal trace itself.

Once the defective section has

been found, the signal tracing procedure may be carried still further to determine which circuit, of the defective section, is at fault. When the faulty circuit has been located it is a simple matter to make resistance and voltage measurements to locate the defective component.

To begin the isolating procedure, the scope must be divided into sections, each of which has its own function to perform. In general, it may be divided into five sections. These are: vertical amplifier, horizontal amplifier, multivibrator, HV power supply, and the B+ power supply.

Fig. 1—Preliminary isolation of defective sections is made by observing scope's screen.



### High Voltage and Positioning

A good indication of the defective section can be obtained by examining the CRT screen. In some cases, however, the indications will be such that the defect could exist in any one of several sections.

As an example, the screen of the CRT appears blank, as shown in Fig. 1A. Turning up the intensity control and adjusting the positioning controls fails to produce a trace. In this case the defect could be in any of three sections, assuming the CRT is good.

If the high voltage power supply is defective there would be no trace because of no high voltage. If either the vertical or horizontal amplifier positioning-circuits are defective, there would be no trace because it is being deflected off the screen.

Therefore, it is necessary to use the scope to signal trace itself in order to locate the defective section. The problem is to determine whether the high voltage section is defective, or if the trace is being deflected off the screen.

A quick way to do this is to pull out the B+ rectifier. This removes all deflection voltages from the ver-

tical and horizontal plates of the CRT. With the deflection voltages removed a spot should appear in the center of the screen, as shown in figure 1B. If the spot does not appear, and the CRT is good, no high voltage is present and the defect is located in the high voltage power supply. This power supply may then be checked for the defective component.

If a spot does appear when the B+ rectifier is pulled out, this is an indication the trace is being deflected off the screen. It is now necessary to determine if the beam is being deflected off the screen horizontally or vertically.

To accomplish this, allow the B+ rectifier to cool for a few minutes, leaving the scope turned on. Then plug the rectifier back into its socket.

As it warms up look at the screen of the CRT, and note in which direction the trace drifts. If it goes off the screen in direction A or B, as shown in Fig. 2, the vertical deflection circuit is at fault. If it goes off the screen in the direction of C or D, the horizontal deflection circuit is at fault.

### Vertical Amplifier

In some cases, a look at the screen of the CRT will pin point the trouble to a single section. An example of this is shown in Fig. 1C and D. In both cases the defect is clearly located in the vertical amplifier. This is so because there is a trace, and it is being swept horizontally. Therefore, the high voltage, B+, horizontal amplifier, and multivibrator sections must all be working.

The vertical amplifier, however, usually contains more than one circuit, and the scope must be used to signal trace itself to determine which circuit is defective. Fig. 3 shows a block diagram of a typical vertical amplifier.

To use the scope to signal trace its own vertical amplifier a large value capacitor is connected to the filament supply of the scope. The filament voltage is then applied, through the capacitor, to the grids of the various circuits in the vertical amplifier.

For example, if V-1 is the defective circuit, a normal trace, with reduced gain, would appear when the filament voltage is applied to the

grid of V-2. When the filament voltage is applied to the grid of V-1, however, the defective trace will appear on the screen. V-1 is then the defective circuit, and it may be investigated for the defective component.

### Horizontal Amplifier and Multivibrator

When a defective trace such as the one shown in Fig. 1E or F appears, the defect can be in either the horizontal amplifier or the multivibrator. Here again, the scope may be used to signal trace itself to determine which section is defective.

When a trace appears as shown in Fig. E, there is no horizontal gain. The horizontal amplifier can be quickly checked by switching the scope horizontal selector switch to external sweep. This connects the input of the horizontal amplifier directly to the horizontal input jack mounted on the panel of the scope. The horizontal gain control is set for maximum gain, and the horizontal input jack is touched with a finger.

If the amplifier is working, some horizontal deflection will take place, indicating the defect is in the multivibrator. The multivibrator may then be checked with resistance and voltage measurements for the defective component.

If there is no deflection, the horizontal amplifier is at fault. This still leaves the problem of locating the defective circuit. This may be accomplished by using the same method used to locate the defective circuit in the vertical amplifier.

When the trace appears as shown in Fig. 1F, it is again necessary to determine if the defect is in the multivibrator or the horizontal amplifier.

One way to do this, if another scope is handy, is to examine the multivibrator's output waveform. If the sawtooth is curved as shown in Fig. 4A, the multivibrator is at fault. A good sawtooth wave shape is shown in Fig. 4B. If another scope is not handy for checking the multivibrator, the horizontal amplifier may be checked for distortion. This is done by connecting the filament voltage through a capacitor to the horizontal input jack.

Then, with the horizontal gain

(Continued on page 72)

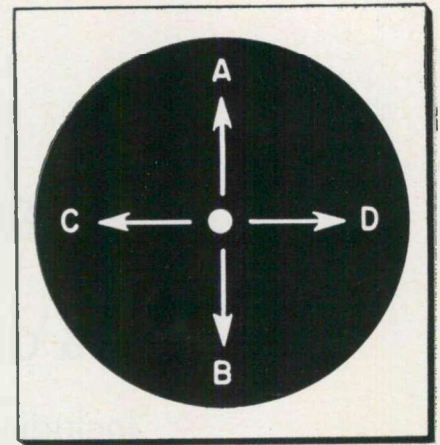


Fig. 2—A fault can be isolated to the vertical or horizontal section by observing direction of spot's deflection off scope screen, when power is first turned on.

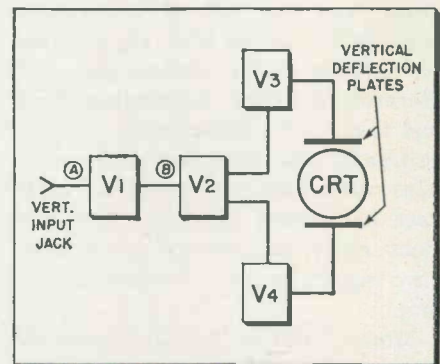


Fig. 3—A defective vertical amplifier stage can be isolated by coupling a 60-cycle a-c signal from scope's filament supply through a capacitor to points A & B.

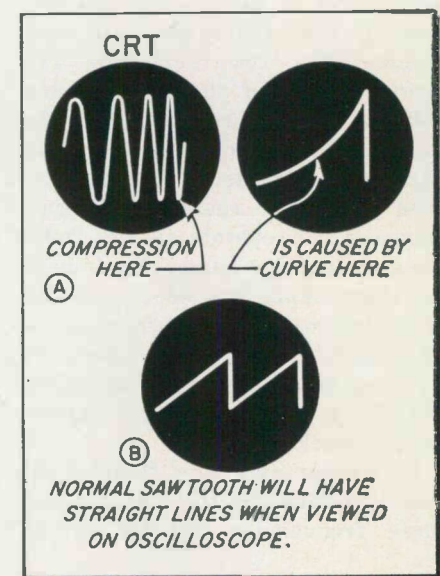


Fig. 4 (A)—Compression in the 60-cycle sine wave is caused by unlinear rise in horizontal multivibrator sawtooth. (B)—Normal sawtooth wave has a linear sweep.

# Business Microwave Systems

## Functions & Operations of Over-10,000 Mc Equipment, Including 'Phones, Switchboards & Tones

LEO G. SANDS\*

• The FCC has reaffirmed its grant permitting the use of microwave frequencies by all who are eligible for mobile radio station licenses. Heretofore, only companies that had their own right-of-way, such as railroads, pipe lines and power utilities were eligible to operate private microwave systems. Now, almost every commercial enterprise may install its own microwave system.

Most of the prospective users of microwave systems are eligible for licensing only in the General Business Radio Service. Operation of General Business Radio Service microwave stations is permitted only on frequencies above 10,000 mc.

The FCC, by restricting the largest number of potential microwave users to frequencies above 10 kmc, accomplishes two purposes. The over-crowding of the 2000-mc and 6000-mc bands is reduced. And, the industry is forced to develop this part of the spectrum hitherto unused except for radar. Other type licensees can operate in the 2000-Mc and 6000-Mc bands. Equipment for these bands has been available from several manufacturers for a number of years. But, equipment for frequencies above 10 Kmc (10,000-Mc) is just beginning to appear on the market.

By recognizing the limitations, and by utilizing the advantages, these frequencies can be put to

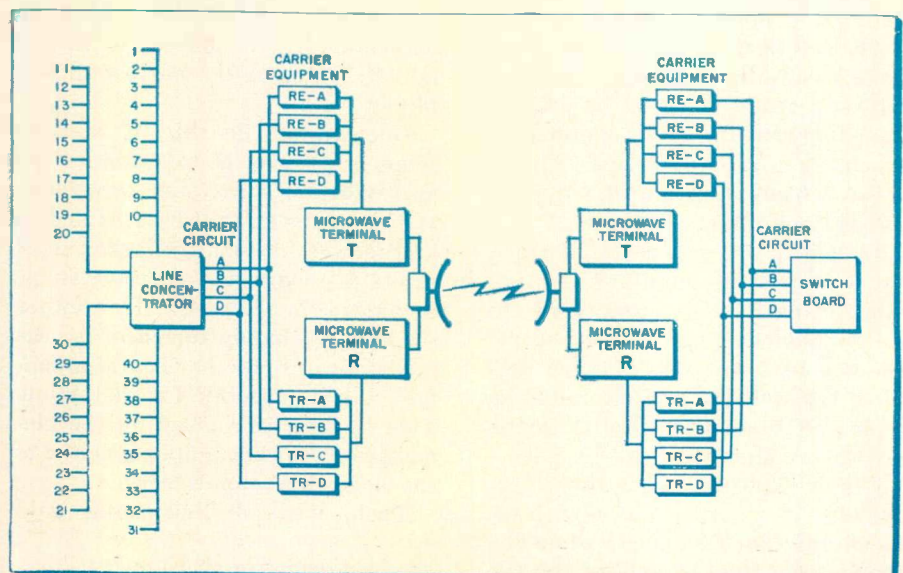
good use. The use of directional antennas is required by FCC rules. The antenna beamwidth must not exceed 4° at the 3 db points. This is advantageous, since more systems can operate on the same frequency (in a general vicinity without mutual interference) when the antennas are correctly beamed. Also, passive reflectors can often be used in lieu of repeaters to get around corners, because of the ease with which the beam can be reflected.

There are disadvantages, however, in operating at such high frequencies. The range between stations is definitely limited. Rainfall, for instance, can cause serious attenuation of the signal. Compensation for such signal losses can be provided to a degree by higher an-

tenna gain. Fading is more pronounced too at the higher frequencies. The typical business user of a microwave system will have no need for a long hop. His requirement will be for communications from one business location to another, which are usually only a few miles apart. A department store in Chicago, for example, has been planning to use microwave to link its Chicago, Evanston and Oak Park stores, all of which are within a single microwave hop of each other.

A department store in San Francisco, on the other hand, will require at least a two-hop, and perhaps a three-hop, system to provide a link with a branch store in San Jose. Here, the distance is almost 50 miles, and there are intervening mountains. The use of a repeater

Fig. 1—Block diagram layout illustrating four microwave voice channels that can handle 40 independent telephone extensions.



\* Mr. Sands, a prominent communications expert, has written numerous books and articles concerning this specialized electronics field.

station is required.

The typical business user will require only a few communications channels. Therefore, in the near future, he should be able to buy his equipment for considerably less than someone who has an ultimate need for as many as 600 channels.

Under existing agreements, the microwave system cannot be used for extending telephone circuits from a switchboard owned by the telephone company. The microwave circuits can be used only for "private" telephone circuits, such as those served by a PAX or other private switchboard, completely disassociated from a telephone company.

A few voice channels, however, will handle an abundance of communications traffic. As shown in Fig. 1, a microwave system equipped for four voice channels can be used for interconnecting a much larger number of telephones to a distant switchboard.

### 'Phone Carrier System

Four switchboard circuits are fed to four telephone carrier terminals. Each consists of a carrier transmitter and a carrier receiver. The terminal for channel No. 1, for example, consists of TR-A and RE-A.

At the other microwave station, the four channels are available at each of four carrier terminals. Each of these terminals is connected to a line concentrator. In Fig. 1, there are 40 independent telephone extensions fed to the line concentrator.

Normally, only a few of the telephones are in use at the same time. Therefore, a private circuit to the switchboard is not required for every telephone. By using a line concentrator, every telephone has a private line at its disposal when one is required.

When telephone No. 1, for example, is lifted from its hook, the line concentrator automatically connects it to carrier circuit A, B, C or D, whichever is not in use at the time. Telephone No. 1 is now connected to the switchboard. By means of a coded signal, the operator is able to identify the calling telephone as extension 1. She then connects telephone 1 to the desired telephone.

When another telephone is lifted from its hook, the line concentrator

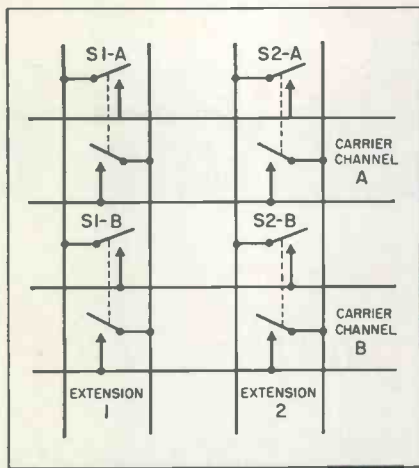


Fig. 2—A simplified schematic of a portion of a cross-bar or matrix type line concentrator.

connects it to the switchboard in the same manner. When all four carrier channels are in use, no more calls can be accommodated over the microwave link until a channel is freed.

To place a call, the operator plugs her calling plug into the appropriate switchboard jack. Automatically, connection is made to the line selector through one of the unused carrier channels. A coded signal automatically causes the line connector to connect that carrier channel to the line leading to the called telephone.

A line concentrator may be of one of many forms. Fig. 2 is an oversimplified schematic of a portion of a line concentrator which is of the cross-bar or matrix type. When relay contacts S1-A are closed, the line leading to ext. 1 is connected to carrier channel A. When S1-B is closed, ext. 1 is connected to channel B. When S2-A is closed ext. 2 is connected to channel A, and when S2-B is closed ext. 2 is connected to B. To provide interconnection, on demand, of 40 extension circuits to four carrier channels, the matrix would consist schematically of 40 vertical pairs of conductors and four pairs of horizontal conductors.

### Tone Channels

To the system shown in Fig. 1, a large number of tone channels may be added without affecting the four voice carrier channels. The carrier channels usually transmit and receive on frequencies above 10 Kc. Hence, there is 10 Kc of useful

band space below the carriers. Using commercially available telegraph carrier equipment (tone transmitters and receivers), up to 18 different tones may be transmitted in the space required by one voice channel (3 Kc).

Each tone channel may serve a different function. Only one tone channel is required to send a teletypewriter message. One tone channel may be used for monitoring or controlling up to 256 different functions when using an alarm and control system. For serial transmission of data, only one tone channel is required. For faster, parallel data transmission, one tone channel is required for each bit to be transmitted at the same time.

It should now be obvious that a relatively simple microwave system will meet the requirements of most business users.

### Transmitter/Receiver Operation

For the 10,550-10,700 Mc and 12,-200-12,700 Mc bands the microwave transmitter may consist of a klystron oscillator, frequency regulator and modulator, as shown in (Continued on page 70)

Fig. 3—Block diagram of a 10,550-10,700 Mc microwave transmitter.

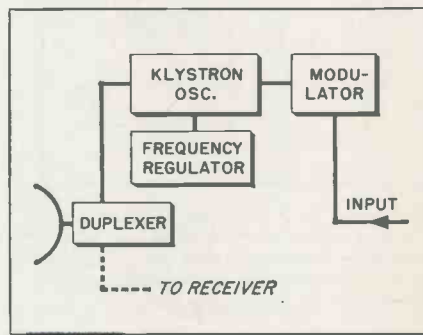
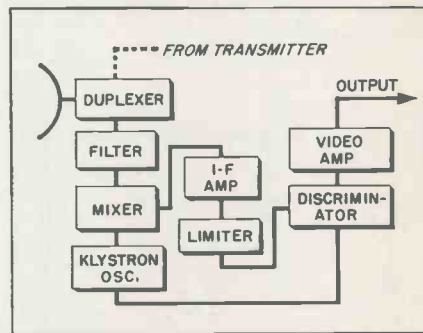


Fig. 4—Block diagram of a microwave receiver using a superheterodyne circuit.



# Locating Elusive TV Filter Problems

## Marginal Electrolytic Faults

### In TV Circuits

### Can Trip Experts

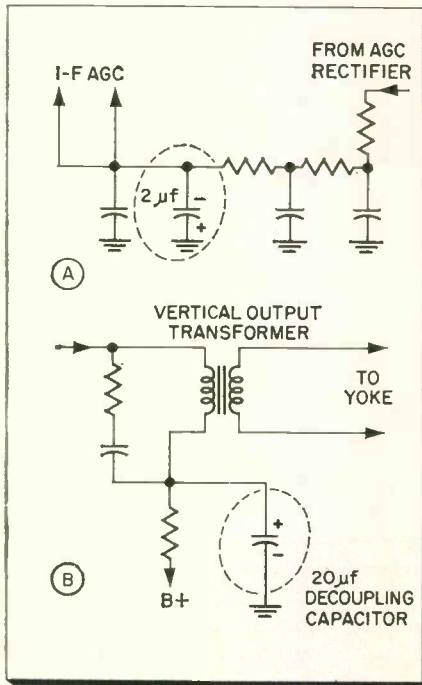


Fig. 1 (A)—A defective electrolytic filter in the agc line of some TV's can cause sub-standard operation of the entire set. (B)—A defective vertical decoupling capacitor may allow vertical sawtooth waves to feed into B+ lines—causing poor reception.

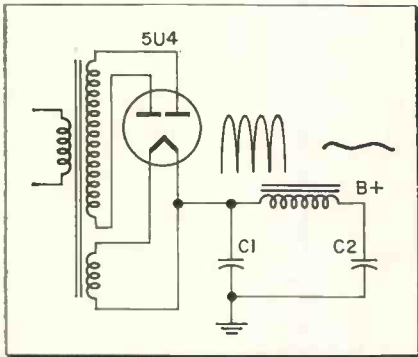
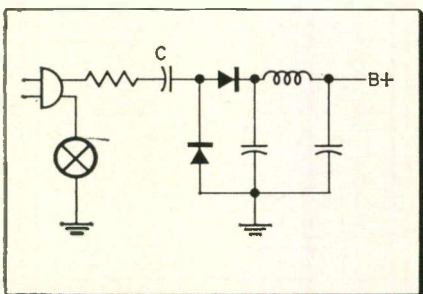


Fig. 2—Output of a full-wave rectifier at C-1 in a pi-type filter is a pulsating d-c voltage as shown by waveform seen on scope. The a-c ripple is reduced to a negligible amount by choke and C-2 smoothing action.

Fig. 3—When a high value "booster" type capacitor (C) dries out while operating in a solid-state voltage doubler power supply, its capacitance is reduced. B+ voltage to TV is reduced accordingly.



FRANK A. SALERNO

• Capacitors, including electrolytic types, cause more TV failures than any other component, except tubes.

And many TV technicians check electrolytic capacitors in a television receiver only after all other tests fail to reveal the symptom's cause.

Also, many marginally operating receivers have been returned to customers when replacement of an aging electrolytic would have eliminated the set's idiosyncrasies. Customers are frequently astonished by the degree of improvement resulting from capacitor replacements.

Electrolytic capacitors are used to filter, bypass, and decouple. They frequently perform all three of these closely related functions.

For example, a 2  $\mu$ f agc-line electrolytic capacitor may serve to "filter" a-c ripple, "bypass" a small amount of unwanted composite video signal to ground—at the same time "decouple" the agc section from associated circuitry. (See Fig. 1A.)

Again, a 20  $\mu$ f vertical "decoupling" electrolytic "bypasses" vertical sawtooth waves to ground—preventing these pulses from feeding back into the set's entire B+ supply—to disrupt the set's normal operation. (See Fig. 1B.)

Life spans of individual electrolytic capacitors can vary widely. A defective capacitor may easily be

found in a 2-month-old receiver. Other capacitors may be in excellent condition at the end of 5 or even 10 years.

Excessive ambient heat tends to shorten an electrolytic capacitor's life. Slight manufacturing imperfections, normal chemical reactions, and other factors may also contribute to a short life for an electrolytic capacitor.

Electrolytic capacitors generally deteriorate slowly. And the job of pinpointing marginal capacitor defects often appears difficult.

When electrolytic capacitors age, dry out, or develop dielectric leakage, they naturally become less efficient in performing normal functions. The TV set's reception depreciates accordingly. But the technician who understands the nature and peculiarities of electrolytics should have no difficulty in quickly locating a defective unit.

### Power Supply Filters

Power supply filters are important components in every TV set. A simplified pi type filtered power supply is shown in Fig. 2. Output of the 5U4 tube, before filtering, is a pulsating d-c voltage. As the voltage rises and falls, C-1 and C-2 charge and discharge accordingly.

After the initial charge, when voltage is first applied to the circuit, combined action of the choke and filters cause a discharge to begin in C-2, just as the next charge



pulse arrives. This action results in a constant and steady charge across C-2. Hence, an almost pure d-c B+ voltage is obtained. Only negligible a-c ripple appears in the output voltage.

When these filter capacitors grow older and dry out and become leaky, capacity becomes lower and they also fail to charge to full capacity. A lower-than-normal fluctuating d-c output results. This may show up as a slightly smaller picture, hum bars in the raster, or general deterioration in the set's operation. Under these circumstances the technician would be wise to investigate the condition of a set's power supply filters.

Filters that leak between sections in a multi-section unit can also cause puzzling symptoms. If leakage occurs between C-1 and C-2 (Fig. 2), for example, the comparatively high ripple voltage normally appearing across C-1 will be imposed across C-2. If a good capacitor is bridged across C-1 and C-2 in turn, while operating in-circuit, little change will be noted. Observed results may prompt the technician to search elsewhere for the trouble. C-1 and C-2 should be removed from the circuit entirely before substituting new filters. Previously mentioned power supply filters generally range in value from 30 to 100  $\mu$ f.

Electrolytics employed in solid-state voltage doubler rectifier circuits (See Fig. 3) may have capacitance values ranging up to 200  $\mu$ f. When these capacitors dry out, their capacities are greatly reduced, and B+ voltages can drop very low. Symptoms are generally similar to those caused by a weak rectifier tube.

Another electrolytic filter problem frequently arises in the audio output tube's cathode area. Here two electrolytics are used in many sets, connected front-to-back, as a voltage divider system for obtaining 135 to 150 volts B+ for supplying various other sections. Defective capacitors here can cause some very confusing symptoms. For instance, a failure in this area can result in no sound and no picture, or perfect sound with video entirely absent. Capacitors in this area generally range from 40 to 60  $\mu$ f.

### Electrolytics In Other Circuits

Filter capacitors are frequently used to develop a fixed bias in lieu of regular resistance networks; or as ripple filters across resistive bias networks.

The author remembers one problem which developed in the B- line of an old DuMont RA109 TV. A leaky electrolytic caused a delicate shift in the 6AL5 horizontal afc's operating voltages. The defective electrolytic, considerably removed from the trouble-area, was finally discovered after a number of unpleasant hours wasted searching for the trouble in the horizontal afc and sync circuits.

An open agc filter, or one that has lost its ability to charge, will often cause degenerative feedback in the i-f system, i-f sync clipping, and with attending poor sync action. This can show up as poor vertical lock and/or picture pulling. This type symptom often appears in older sets, for example, the RCA KCS 47 series. When the agc filter becomes defective the vertical sync pulses are clipped on strong channels only—resulting in

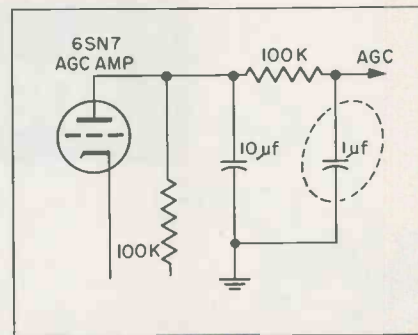


Fig. 4—Addition of a 1  $\mu$ f electrolytic capacitor to the agc line in a Starret TV eliminated the set's poor vertical hold.

some channels rolling and others not. Picture pulling generally shows up as the capacitor deteriorates still further.

Another case history recalled was a Starret TV receiver which had an occasional loss of vertical hold on one or two channels—a trouble extremely difficult to pinpoint only because of its inconsistency. A 1  $\mu$ f electrolytic capacitor was placed  
(Continued on page 45)

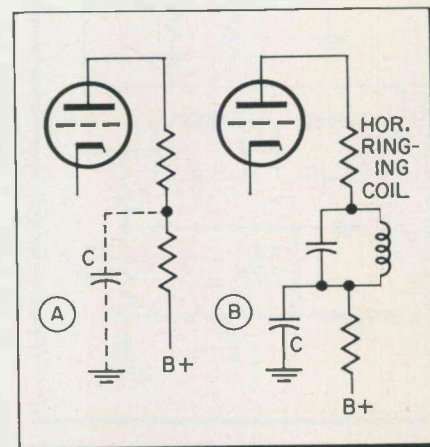
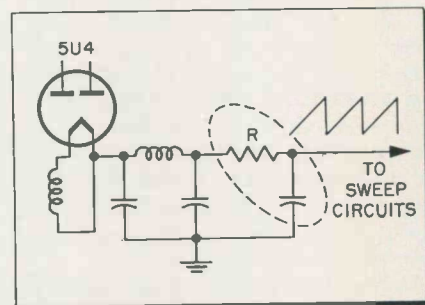


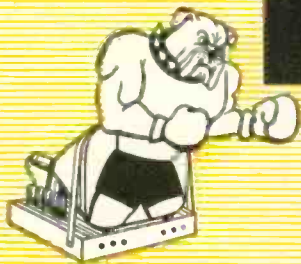
Fig. 5 (A)—If by-pass capacitor C opens or is removed from the circuit, stage gain will be drastically reduced. (B)—Similar degenerative effects will cause horizontal oscillator failure if C opens.

### CHART I

Capacitor Inventory List		
Value	Voltage rating	Circuit used
2 $\mu$ f	25	Sound discriminators Cathode bypass Plate decoupling All purpose Power Supplies
4 "	50	
8 " & 20	450	
40 "	450	
80 "	450	
80 "	150	Voltage Doublers
120 "	200	
200 "	350	
50/30	150	
40/40	150	Radios
40/40/20	150	

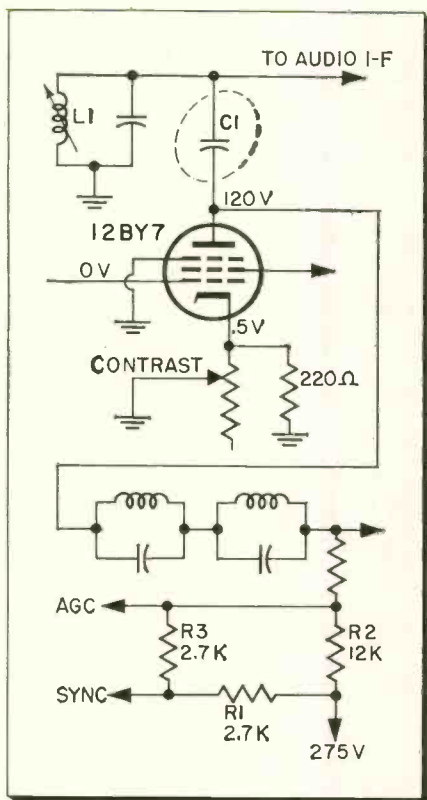
Fig. 6—When C opens up, high a-c currents may cause R to overheat or burn up.





# "Tough Dog"

## Corner



Although sound appeared normal on this TV, video was absent because audio coupling capacitor was shorting to ground through coil—reducing video output plate voltage.

### Leaky Audio Capacitor Kills Picture

I was recently called to service a Westinghouse TV model H935T21 having sound but no picture. Turning the set on proved the customer's complaint to be correct. Only raster and sound was present. The usual tube substitutions were made—i-f, video output and agc—but when this did not restore video the set was removed to the shop for further repair. Prior to taking the set out I did notice a very weak picture on one channel.

At the shop a visual inspection of the agc and video output circuits

did not reveal any charred resistors or broken leads. A scope check showed good video up to the video output grid—then nothing! When the vertical gain of the scope was turned up there was some video present, however. A VTVM measurement showed voltage at the video amplifier's plate was way off. It read 15 instead of the 120 volts indicated on the schematic. Ohmmeter checks of R-1, R-2, and R-3 cleared them of any suspicion.

Looking over the manufacturers schematic, I noted that if the audio coupling capacitor, C-1, was leaking through L-1 to ground, this could do it.

When I clipped one lead of C-1, killing the sound, the picture popped in. An ohmmeter check showed this capacitor to be shorted. After replacing it with a good one, the set worked normal.—Peter A. Liker, Joliet, Illinois.

### Open VBO Xformer Causes Faulty Blanking

A Philco TV (chassis D201) came into the shop with a full raster but the picture was over-run with vertical retrace lines.

After checking voltages, which were close to normal, and replacing a few slightly leaky capacitors in the vertical circuit, I decided to check vertical waveforms with the oscilloscope.

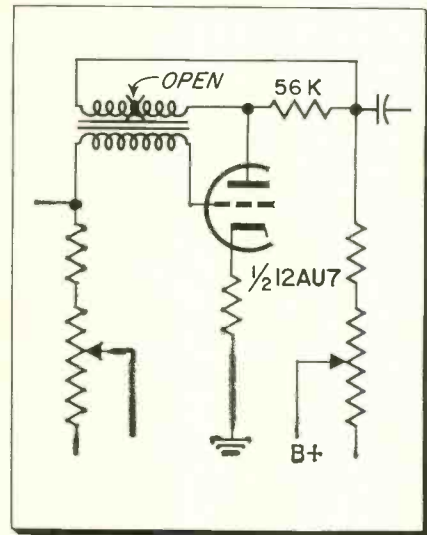
The waveform at the blocking oscillator grid was about correct so I moved to the output stage. Here, the waveform at the grid of the output was pretty close, but its amplitude appeared to be a little low. The usual high peak spike needed for proper retrace blanking appeared to be absent.

After substituting new tubes proved fruitless, I decided to meas-

ure the resistance of the VBO's windings. The grid side of the transformer checked OK and according to manufacturers specifications. However, the plate side read open. How was I getting deflection if this was open? A close look at the schematic showed how this was possible.

The 56K resistor was normal, allowing proper B+ to the tube's plate, and inductive coupling through the winding afforded enough feedback to sustain oscillation. Naturally, after replacing the defective transformer the trouble was eliminated.—Whitner C. Beall, Longview, Texas.

Although picture height was correct, screen was covered with retrace lines. Replacement of open blocking oscillator transformer corrected defective retrace blanking.



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9-13-1	9-26-3	9-41-10	9-50-3	9-58-3	9-66-1	9-72-2	9-92-1	9-110-3	9-112-9	9-117-6
9-17-1	9-26-4	9-41-11	9-51-1	9-58-4	9-66-2	9-72-3	9-96-1	9-110-4	9-113-1	9-118-1
9-18-1	9-26-5	9-43-1	9-52-1	9-59-1	9-66-3	9-73-1	9-98-1	9-111-1	9-113-2	9-120-1
9-18-2	9-27-1	9-45-1	9-53-1	9-61-1	9-66-4	9-73-2	9-100-1	9-111-2	9-114-1	9-C2-1
9-19-1	9-28-1	9-46-1	9-54-1	9-61-2	9-67-1	9-73-3	9-102-1	9-111-3	9-115-1	9-C3-1
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# Building Business Friendships

*Some Important Tips To Improve Business Relations*

ERNEST W. FAIR

• Have you converted your customers and suppliers to friends? Good business friends make many problems easier to handle, thus contributing to a shop owner's business success.

Building these business friendships is a difficult task to accomplish. The process is a never-ending procedure.

Every shop owner should give attention to continued possession of the traits which build business friendships.

The "how to make friends" traits presented here have been secured from case studies of successful men and from actual practice.

**Dependability:** The shop owner or service manager who can always be depended upon to do what he promises is liked by everyone. For example, don't firmly promise a customer you'll complete shop repair of his TV set to "get him off your back" when you know your schedule won't permit it. The same dependability is needed in distributor relations. Avoid promising to pay an overdue bill on a specific date when you know present funds prevent you from keeping your word.

**Never Domineer:** No one likes to be obviously dominated. Sometimes

it solves a tough problem, but often makes a lasting enemy. Avoid detailed technical discussions with a customer. He may resent your technical superiority and feel you're double-talking. Another form of personality domination that radio-TV shop owners are frequently guilty of is the continual request for extra-fast parts delivery from your distributor. Save your extra-fast delivery requests for times when you really *need* fast service.

**Avoid Sarcasm:** It's often difficult for a person in the service business to suppress a snide remark at times because customers can be extremely unreasonable. For instance, every radio-TV shop owner has had the experience of a customer who demands, requests, or begs for speedy repair of his set because he is "going on vacation," "it's for a sick relative," etc. If you accommodate him by shunting aside other work to repair his set, and he doesn't pick up his set for weeks, you're frequently tempted to issue some biting remarks to him when he finally does call for his set. Don't! Simply remember (or note on his work file card) what happened in the event he makes a similar request in the future.

**Be impersonal:** Don't probe into personal details of a person's life.

It may be resented by customers and is frequently an indication of potential gossip. By the same token, it's unwise to discuss your personal problems with customers or parts distributor personnel.

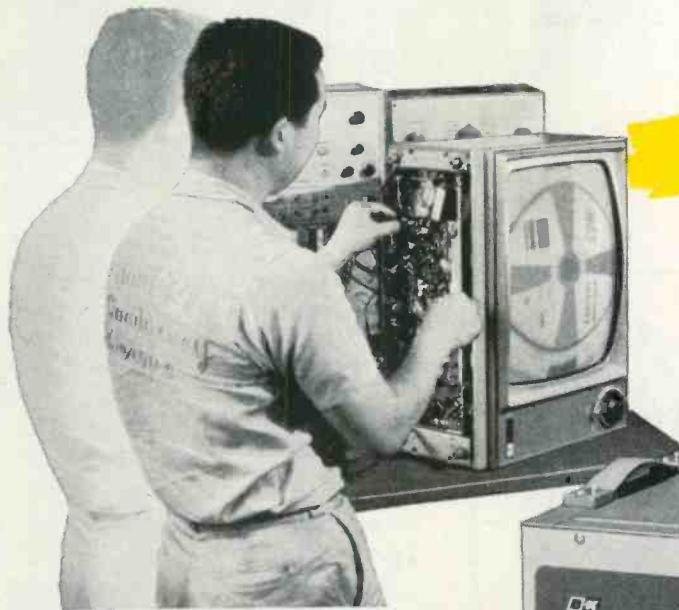
**Choose jokes with care:** Every businessman is expected to know a few jokes. If you have some business friends that are close enough to tell jokes to, be certain that they do not offer humor at the expense of personality, beliefs, physical disabilities, or religion. A joke of this nature, even though innocent, can offend a person.

**Respect your business friends:** Everyone appreciates a degree of respect, whether customer, salesman, or employee. Ridiculing or berating a person rarely assists your business. By the same token, a superior attitude may invoke resentment, too.

All of these traits are important to every shop owner or manager. They constitute a major part of his personality. They can determine his ability to have genuine business friends among his staff and the people with whom he transacts business.

Careful attention to these personal relations pointers can result in loyal customers and employees, better distributor service, and a higher community opinion of you and your business. •

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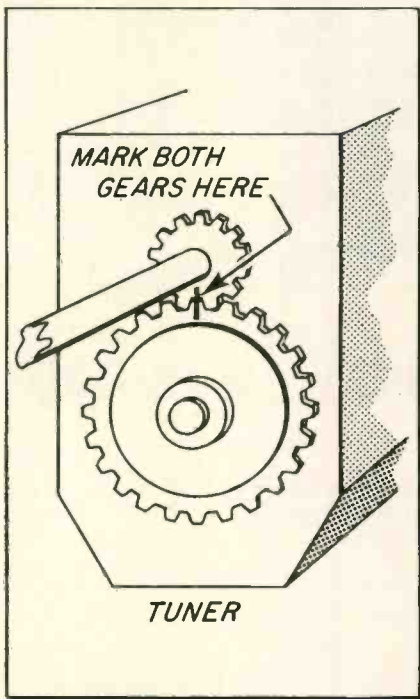


## Aligning Zenith Tuner Gears

Whenever we get a Zenith TV set in the shop for tuner repair, there is one step in our procedure which has saved us considerable time.

Many of these sets have tuners with a separate gear-driven channel selector knob-and-shaft arrangement. If these gears are not meshed in sync, considerable time can be wasted obtaining the proper mesh.

Before we remove a tuner for repair, we use a black marking pencil to indicate the proper mesh on the two gears. Then, when the tuner

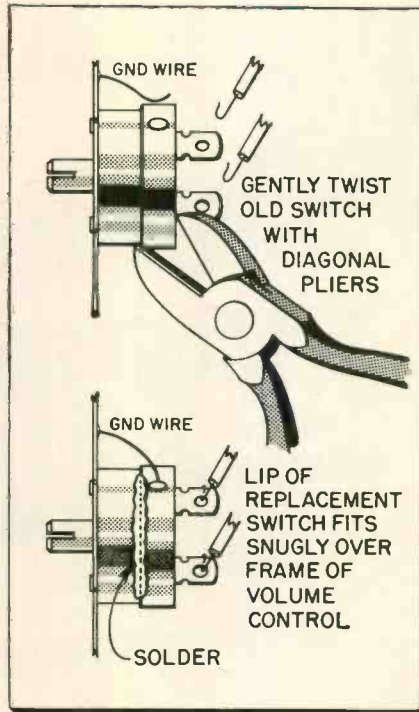


Before removing tuner for repair, a marking pencil line is made across both gear. When tuner is repaired and replaced the gears can be aligned without difficulty.

repair is finished, it is only necessary to line up the two marks to avoid time-consuming difficulties in realignment.—*Leroy Thrower, Snyder, Texas.*

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After a-c leads are removed, the defective switch is twisted off carefully with heavy diagonals. New switch is then installed, housings soldered, and leads replaced.

## Replacing GE TV On/Off Switches

Here is a shop hint that can save a serviceman about 45 minutes work. I've used this idea five times so far and no callbacks as yet!

In some GE 17T025 and 026 TV portables we have encountered power switch failures. Replacement of the volume control and switch assembly is difficult, because of the printed circuit and the clamp arrangement that holds this control.

If the existing control is a Clarostat type, merely unsolder the switch wires. Then carefully twist off the old switch with a pair of large diagonals. Place a Clarostat general replacement switch type SWE-12 over the exposed volume control area. Be sure to align switch throw-lever over the old hole. Solder the lip of the new switch to the volume control frame. Solder the wires pre-

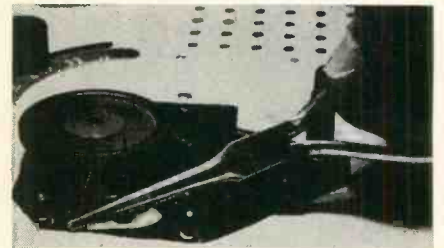
viously taken off the new switch.

The whole job is now complete and it is accomplished in about 1/4 the time it usually takes to replace the entire assembly.—*Paul F. Wing, Independence, Ohio.*

## Repairing Slow-Running Turntables

Record changer turntables frequently run slow. I have established a routine procedure in repairing these changers which has given good results.

The turntable is first removed and its drive-wheel track and drive-wheel perimeter is wiped thorough-



If no exact replacement drive-wheel spring is available, remove turns from one end of the old spring until tension is correct. Check speed of turntable with strobe.

ly with a clean cloth. There should be no oil or grease on these surfaces. The turntable is replaced and speed rechecked.

If it is still slow, and the drive-wheel rubber and motor are good, the drive-wheel tension spring has probably stretched. A new spring should then be substituted.

In the event a new exact replacement spring is not available, a turn or two of the old spring is cut off, a turn at a time, the end reshaped, and the spring replaced on the drive-wheel assembly.

Turntable speed is checked using a stroboscope until the proper speed is obtained.—*H. L. Davidson, Fort Dodge, Iowa.*

## TV Filter Problems

(Continued from page 39)

on the agc line, as shown in Fig. 4. The trouble was completely eliminated.

Many defective filter problems can be classified as degenerative. The basic purpose of bypassing a stage to ground through a filter is to insure a steady d-c voltage. For instance, if bypass capacitor C (Fig. 5) is removed from the circuit, the plate no longer receives a steady source voltage. Source voltage will vary with the signal voltage, a degenerative effect results, and stage gain will be drastically reduced. Many horizontal oscillator circuits go dead for this reason when C opens (Fig. 5B).

Other examples of degenerative feedback caused by open or otherwise defective electrolytics are in audio output and sweep output stages of TV receivers. Bypasses may be in cathode or plate circuits.

An audio stage with an unfiltered cathode, when designed to be filtered, will suffer a loss of gain as will sweep-output tubes. Vertical sweep will collapse almost completely when the output tube cathode filter opens up.

In some receivers where the horizontal output tube cathode is filtered with a 5 or 8  $\mu\text{f}$  capacitor, picture shrinkage will result if the filter component becomes defective.

And, as previously mentioned, the decoupling capacitor in the vertical output tube's plate circuit (Fig. 1B) can open up and allow a vertical output sawtooth component to feed into the B supply—upsetting normal operation in various areas of the TV.

### Locating & Testing Defective Capacitors

The best way to determine if a filter capacitor is not up to par is to substitute it with a known good one and observe results. This can be done by disconnecting the capacitor's positive terminal from the circuit and placing the new capacitor in the circuit with flexible clip leads.

The skilled technician can get a fair idea of a capacitor's condition, however, by using the high resist-

ance scale of a VOM or VTVM. The meter's negative or ground probe is clipped on the capacitor's negative terminal, and the positive probe is then touched to the positive terminal of the electrolytic. The meter pointer should jump to zero resistance, and then gradually rise to a resistance of 1 megohm or higher (if one lead of the capacitor is disconnected from the circuit). If not disconnected from the power supply circuit, it may read lower, depending upon resistance in the voltage divider across it.

If the meter needle jumps to zero on an out-of-circuit power supply capacitor and then rises to a relatively low resistance value, say 50 or 100K ohms, the capacitor is leaky. If the pointer does not jump to zero but takes only a small skip, the capacitor has lost its ability to charge. If the pointer jumps to a low resistance value and remains, the capacitor is shorted, of course.

Although some technicians jump a known-good electrolytic across an old in-circuit capacitor while the

(Continued on page 46)

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**AP18-T**

(Continued from page 45)

set is in operation, this rarely gives conclusive results. Furthermore, since the total in-circuit capacitance is approximately doubled, other problems can arise. A temporary substitution should be made only with the set turned off, and after one lead of the suspected capacitor has been disconnected from the circuit.

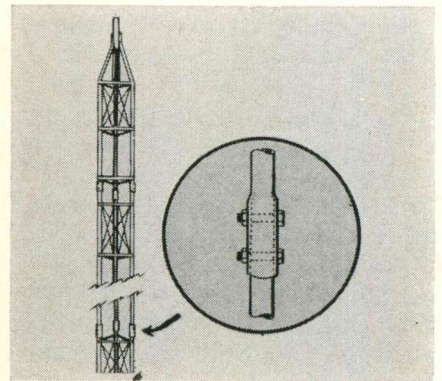
Shorted capacitors are comparatively easy to locate since one or more resistors usually burn up be-

cause of heavy current flow through them caused by the shorted filter. Remember, however, that some isolated cases of charred or overheating resistors can be attributed to open filters. An open filter can cause a high signal current to flow through a resistor because of its inability to bypass the a-c voltage to ground (See Fig. 6).

The technician should have at least the minimum supply of filters on hand to expedite repairs. Chart I lists most-needed types, excluding multisection exact replacements. •

### E-Z Way TOWERS

Model G-10 tower for TV, citizens band and 2-way radio, is designed for quick, simple installation and low maintenance. High tensile steel, 55,000 PSI is incorporated with the firm's design to provide a lightweight tower up to 60 ft. in less than 2 hours. May



be safely erected to 40 ft. without guys, or 280 ft. with 30 lb. windload guyed. X-type bracing resists twist and torque. Electric arc welded throughout. Completely hot dipped galvanized after fabrication for inside and outside protection. \$13.95 for 10 ft. section. E-Z Way Towers, Inc., 5901 E. Broadway, Tampa, Fla.

For more data, circle 9-46-2 on coupon, p. 41



FOR ALL  
BLACK & WHITE  
PICTURE TUBES

2 volt / 4 volt / 6 volt / 8 volt  
series or parallel  
electrostatic or electromagnetic

# Perma-Power

INTRODUCES THE

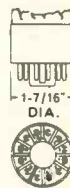
## 2-Brite

### IF THE BASE IS RIGHT THE BOOST IS RIGHT

### 7 POWER RATINGS

VOLTS	AMPS
2.34	.600
2.68	.450
4.70	.300
6.30	.300
6.30	.450
6.30	.600
8.40	.450

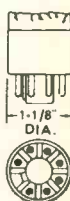
MODEL C202  
for duodecal  
base sets



MODEL C212  
for 110°  
button base  
sets  
(RCA type)



MODEL C222  
for 110° shell  
base sets  
(Sylvania-Dumont type)



A Britener with a slide switch for series or parallel wiring is nothing new—but those previously available could only be used on picture tubes with heater ratings of 6.3 volts, .600 amps. For all other heater ratings, a single-purpose auto-former has been necessary.

Now Perma-Power has developed a truly universal series/parallel Britener—one that can be used on ANY set without endangering the delicate filaments through too much boost. Only Perma-Power—the leader—offers you this convenience.

You can brighten any TV picture with Perma-Power's 2-Brite. If the base is right, the boost is right! You don't even have to take the time to consult a Britener Selector Guide. Just choose the right base style—and install with confidence.

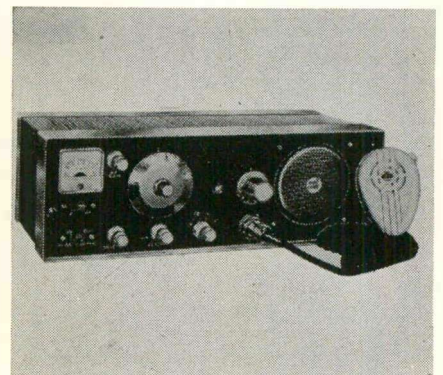
List Price \$3.75

**Perma-Power COMPANY**  
3104 N. ELSTON AVE. • CHICAGO 18, ILL.

For more data, circle 9-46-1 on coupon, p. 41

### E.C.I. CB RADIOS

Reported as the first citizens band transceiver to combine triple conversion and two i-f stages, the Courier I has practically no harmonic image or adjacent channel interference. Other features include: 12-channel transmitting; fixed and tunable drift-free receiving; built-in dial and crystal spot-

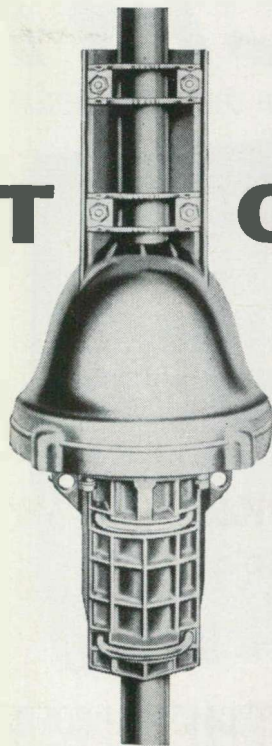


ter; built-in noise limiter; built-in squelch that is triggered by .1  $\mu$ v signal; and front panel adjustable r-f gain control. Constructed in 5 individual hand-wired segments. Metal parts, cadmium plated for marine use. \$189.50. E.C.I. Electronics Communications, Inc., 325 N. Macquesten Parkway, Mount Vernon, N. Y.

For more data, circle 9-46-3 on coupon, p. 41



# DON'T OPEN,



# EVER!

(and watch your profits and reputation soar)

The housing lock screws on Cornell-Dubilier's Radiart AR-22 antenna rotor are the last thing you'd ever want to touch on this heavy-duty beauty. Why? Because this rugged standard of the industry is backed by CDE's lifetime service warranty — a warranty that offers you a big, extra Profit-and-Reputation Builder. In fact, the AR-22 offers you three big Profit-and-Reputation Builders.

**Profit-and-Reputation Builder No. 1.** In appearance and performance, the AR-22 practically sells itself. The rotor's one-piece streamlined aluminum housing is rugged, rust-proof and it's sealed against the worst possible weather conditions. Rain, snow or ice just can't affect it. It shrugs off hurricane winds.

Your prospect has immediate confidence in the AR-22, and in you for carrying such an obviously reliable product line. If he hasn't agreed to buy yet, point out that inside the famous bell-shaped housing is an in-line precision planetary gear train and 12 heavy-duty bearings in two 6½" ball-bearing races, for smoother turning power, more dependability, longer life.

But that's just half the performance story, because the AR-22 is completely automatic! Just set the selector on its handsome control box and walk away. The antenna turns and stops precisely at the desired position — even in the most severe weather! That's the clincher... your prospect is now your customer!

On the sale price alone, you've made a handsome profit. Dealer cost of the AR-22 is \$31.95. List price to your customer is \$45.95. Your profit: \$14.00. Sweet? You said it! But that's just the beginning.

**Profit-and-Reputation Builder No. 2.** Installation of the AR-22 is a breeze, on mast, tower or platform. Installation charges are your own business, but if you

can install the AR-22 safely, quickly, neatly... need we say more?

**Profit-and-Reputation Builder No. 3.** Here's where those housing lock screws come in. Years pass. The AR-22 continues to deliver perfect, trouble-free performance. More years pass. Has CDE forgotten you? Not on your life!

One day, a phone call from your AR-22 customer. What's this? The AR-22 that you sold six, eight years ago is starting to creak a bit and will you be good enough to repair same?

Are you worried? Has technology left you behind? Do you have the right spare parts? Is there any profit in it for you?

No need to fret. CDE will take on the headaches. But you take the profit. And the reputation. Here's all you do:

Remove the rotor and ship it, with the control box, to us. Enclose a check for \$7.50. And before you can say "Cornell-Dubilier has the best darned rotor program in the world," your rotor and control box will be back in your shop, factory-rebuilt, retested, resealed.

How much can you charge your customer for this service? That's your business. But the lock screws are our business. And that's why we say, "Don't open... ever!"

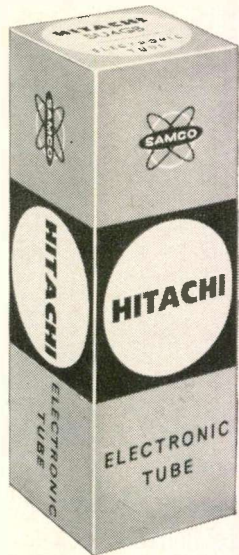
CDE makes a complete line of Profit-and-Reputation Building rotors: ham, heavy-duty automatic, heavy-duty manual, standard-duty automatic, standard-duty manual. See your CDE Radiart distributor.

**CDE** **CORNELL-DUBILIER**

CORNELL-DUBILIER ELECTRONICS, DIVISION OF FEDERAL PACIFIC ELECTRIC COMPANY, 118 E. JONES STREET, FUQUAY SPRINGS, N. C.

QUALITY is a seven-letter word and so is  
**HITACHI**

PRODUCTS OF INTERNATIONAL RENOWN...THROUGH CONTINUING RESEARCH



SELL • SERVICE • SATISFY  
 with  
**HITACHI**  
 CERTIFIED-QUALITY  
 RECEIVING TUBES

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

**MORE PROFIT PER CALL**—more satisfaction for all—these fine receiving tubes can't be beat for performance and reliability. Strict quality control to fully meet *top American standards* goes into the careful manufacture of each Hitachi tube. Yet important cost savings guarantee you extra profits. Most popular types available. And distribution is on a localized, prompt delivery basis.

See your HITACHI Distributor, or write for Catalog No. CT-400A.



Distributed throughout the U.S. by

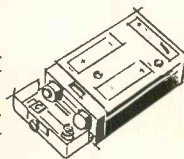
**THE SAMPSON COMPANY** (Est. 1921) ELECTRONICS DIVISION  
 2244 SOUTH WESTERN AVENUE, CHICAGO 8, ILLINOIS

For more data, circle 9-48-1 on coupon, p. 41



SELL • PROMOTE • PROFIT  
 with the Newest from  
**HITACHI**  
 TH-660 TRANSISTOR  
 SHIRT-POCKET RADIO

FEATURES EXCLUSIVE  
 "QUICK-ACTION"  
 BATTERY RELEASE



Startling reach-out reception of distant stations. Unbelievable output—100MW: Undistorted, 150MW: Maximum. Precision fine-tuning, too, and magnifier tuning dial. Radio is only 2½" x 3½" x 1½". Exclusive button-release trips open bottom of cabinet; permits the 2 inexpensive penlite batteries to drop into palm for "split-second" changing without need to remove back. Radio incorporates 6 transistors; 2 diodes plus thermistor; 2½-inch P.M. speaker; self-contained ferrite core antenna; range 535—1605 kc.

**GIFT BOXED**—Complete with batteries, 2 luxurious *glove-leather* carrying cases, earphone.

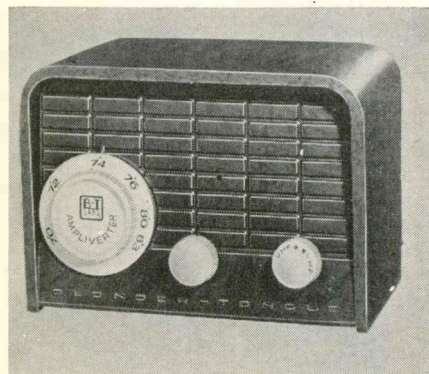
only **\$24<sup>95</sup>**

with FULL PROFIT for you!

• Other fine Hitachi 6, 7, and 8-transistor radio portables in AM and SW/AM combinations . . . from \$24.95 to \$79.95.

**BT CONVERTER-AMPLIFIERS**

The BT-70 Ampliverter is a specially designed converter-amplifier for low power translator and MPATI areas which use UHF channels 70-83. The MPATI area is one in which educational TV programs are being transmitted via Stratovision to six mid-



western states. It is expected to be a boon to TV set owners who wish to convert VHF channels 5 or 6 into UHF channels 70-83. Continuously tuneable through the full range of the tuner (which here only covers about 20% of the entire UHF channel range). Blonder-Tongue Labs., 9 Alling St., Newark 2, N. J.

For more data, circle 9-48-2 on coupon, p. 41

**EICO CB RADIOS**

A new series of citizens band transceivers feature: multi-channel operation; choice of crystal or continuous receiving; press-to-talk microphone; superheterodyne receiver with an r-f stage and 1750 kc i-f strip; and an adjustable squelch control and automatic "series-gate" noise limiter. All models



have transformer-operated silicon diode doubler power supplies for 117v a-c 60 cycles operation. Model 770, \$69.95 kit, \$99.95 wired; models 771 and 772, \$79.95 kit, \$109.95 wired. Eico Electronic Instrument Co. Inc., 33-00 Northern Blvd., Long Island City 1, N. Y.

For more data, circle 9-48-3 on coupon, p. 41

The emblem consists of a yellow, open book with the text "Find Us Fast In The Yellow Pages" written on it. A white rotary telephone is positioned in front of the book, with its cord trailing off to the left.

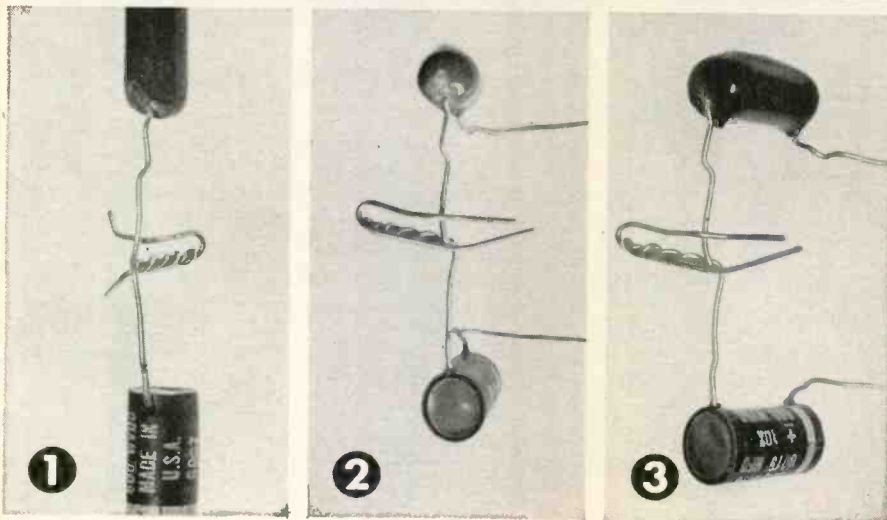
Find Us Fast  
In The  
Yellow Pages

## This emblem wants to work for you

Whenever people see this famous emblem, they're reminded to 'find it fast' in the Yellow Pages. And when you associate your business . . . your name . . . with this emblem, you're reminding prospects to find you in the Yellow Pages when they're ready to buy. So—if you're advertising in the Yellow Pages now, it's just

good sense to display this emblem in your other advertising, on your business vehicles, at your place of business. And if you aren't advertising in the Yellow Pages yet, it's high time you did. Call the Yellow Pages man at your Bell Telephone Business Office for details on how you can put this emblem to work.

Quality you can count on  
**EVERY SINGLE TIME!**



**TESTS SHOW...**

# AEROVOX BI-ELECTRIC

## Mylar\* Paper Bypass Capacitors

# ARE YOUR BEST BUY!

All Aerovox Bi-Electric bypass capacitors have a uniform, protective Polycap case from end-to-end... and the ends are process-controlled for sealed-protection. Their special design and construction eliminates end-seal cracking and chipping. These unretouched photos show what happens in an actual test when a conventional dipped bypass capacitor is tied to an Aerovox Bi-Electric unit and the two are pulled apart:

- 1 The end seals of the dipped capacitor quickly crack as soon as the two units are pulled apart while the Bi-Electric unit does not crack at either end.
- 2 When the leads are bent back into original position, the end seals of the dipped unit chip even more... the Bi-Electric unit "seals itself."
- 3 This view of the end sections shows the extensive damage to the dipped capacitor... and the full protection offered by the Aerovox Bi-Electric Polycap plastic case and special end seal.

For sealed-in performance and reliability **EVERY SINGLE TIME**... even when using the Bi-Electric unit for an axial lead installation... be sure to ask your distributor for Aerovox Bi-Electric Capacitors only.

\*Registered DuPont trademark



## AEROVOX CORPORATION

DISTRIBUTOR DIVISION

NEW BEDFORD, MASS.

For more data, circle 9-50-1 on coupon, p. 41

### Mercury TUBE TESTER ADAPTER

Model AD-4 tube tester adapter, designed to prevent tube tester obsolescence, makes it possible to test all the new tubes, such as nuvistors, 12-pin compactrons, the new 10-pin tubes, and novars. It converts present tube test-



ers, regardless of make, into a complete up-to-date model increasing its performance and value. The adapter is compact, lightweight and takes very little room in a tube caddy. \$10.95. Mercury Electronics Corp., 111 Roosevelt Ave., Mineola, N. Y.

For more data, circle 9-50-2 on coupon, p. 41

### Hallicrafters CB RADIO

"Littlefone" model CB-3, 8-channel citizens band transceiver operates at maximum legal power and has a practical range of 5 to 10 miles. Has self-contained dual power supply for operation on standard 117v a-c or on 12v d-c battery. Switching from a-c to



d-c is accomplished by changing power plugs which are included. Top cover is hinged and easily disengaged from the chassis. Also included are a mounting accessory kit, push-to-talk microphone, crystals for 1 channel and citizens band (class D) license application. \$149.50. The Hallicrafters Co., 4401 W. Fifth Ave., Chicago, Ill.

For more data, circle 9-50-3 on coupon, p. 41

# NOW! GRANTHAM SCHOOLS OFFER FIVE DYNAMIC COURSES

## F.C.C. LICENSE PREPARATION

### WHAT'S IN YOUR FUTURE?

Are you *planning* your future or just drifting into it? Now is the time to get an F.C.C. license. Now is the time to prepare for higher pay — make your future secure.

### F.C.C. LICENSE—THE KEY TO BETTER JOBS

An F.C.C. *commercial* license is your ticket to higher pay and more interesting employment. This license is Federal Government evidence of your qualifications in electronics.

### GRANTHAM TRAINING PREPARES YOU

Grantham School of Electronics specializes in quality training in communications electronics, preparing students to pass F.C.C. license examinations.

The Grantham Communications Course teaches you to understand electronic theory — teaches you the "why" of electronics.

If you already have practical experience in radio-electronics, the Grantham course can add a knowledge of theory and an F.C.C. license to that practical experience. This should qualify you for higher pay and greater job security.

This course can prepare you *quickly* to pass F.C.C. examinations because it presents the necessary principles of electronics in a simple "easy-to-grasp" manner. Each new idea is tied in with familiar ideas. Each new principle is presented first in simple, everyday language. Then after you understand the "what and why" of a certain principle, you are taught the technical language associated with that principle. You learn more electronics in less time, because we make theory easy and interesting. *NOTE: All necessary math is included in the course.*

## INDUSTRIAL ELECTRONICS

### TECHNICIANS NEEDED

Today, the need for industrial technicians is greater than ever. There is a particularly great need for technicians who are trained in electronics.

To meet this need, Grantham Schools now offer a complete course in electronics technology. When you graduate from this course, you will be qualified as an Industrial Electronics Technician—you will have a good background of theoretical knowledge and laboratory training.

### COURSE DEVELOPED FOR INDUSTRY

As a student of this course you will study subjects that have been prescribed by selected industrial people, who assisted Grantham Schools in developing this course. You will gain knowledge of industrial equipment through a planned program of theory and lab work. You will work on actual industrial control equipment!

### ADVANCED ELECTRONICS COURSE

This is an advanced industrial electronics course. This course will qualify you for electronics employment in such fields as aeronautics, computers, industrial controls, manufacturing, microwave, communications, and others. Entrance requirements include basic math, and basic electronics. You may qualify for entrance by successfully passing our entrance examination. (Note: Successful completion of the Grantham F.C.C. License Course qualifies you for entrance without examination.) Write for details.

## INSTRUMENTATION

Following completion of the Grantham Industrial Electronics course you will also be qualified for entrance into the Grantham course in Industrial Instrumentation. Write for details.

## PRE-ENGINEERING MATHEMATICS

### ARE YOU WEAK IN MATH?

Here is a course which provides all the necessary mathematical background for practically any technical course of instruction one may desire to take. It is designed specifically to qualify you for the Grantham course in Engineering Analysis. Starts out with simple arithmetic — covers logarithms, slide rule, algebra, geometry and trigonometry.

### COLLEGE LEVEL? HIGH SCHOOL LEVEL?

This is definitely a pre-engineering math course. It starts at the high school level. There are only three requirements: Intelligence, an inquiring mind, and the desire to improve yourself as a professional man.

If you are a high school graduate, you should be able to commence smoothly with Lesson 1 and advance easily through the 15 lessons which comprise this course. While doing this, you will gain new insight into familiar subjects and find yourself picking up new ideas as you go.

## ENGINEERING ANALYSIS

### A MODERN ENGINEERING COURSE

Engineering Analysis represents a space-age approach to technical education. It presents the entire field of *analysis* in a unified and practical manner. All the mathematics, graphics, applied mechanics and dynamic system analysis that the engineer needs to engage in the exacting and demanding work of our advancing technology are included.

A high school diploma or equivalent, plus completion of the Grantham Pre-Engineering Mathematics course, is required for entrance into this section of the Grantham Engineering Series.

Write for details on this modern approach to technical education.

# Grantham Schools

LOS ANGELES

KANSAS CITY

SEATTLE

WASHINGTON

### FOUR RESIDENT SCHOOLS

To better serve our many students throughout the entire country, Grantham School of Electronics maintains four Divisions — located in Hollywood, California; Kansas City, Mo.; Seattle, Wash.; and Washington, D.C. Grantham offers rapid courses in F.C.C. license preparation, either by home study or in resident classes.

LOS ANGELES • SEATTLE • KANSAS CITY • WASHINGTON

### CORRESPONDENCE OR RESIDENCE CLASSES

Grantham training is available by correspondence or in resident classes. Either way, you are trained quickly and well. Write, or mail the coupon for details on the course you select.

ACCREDITED BY THE NATIONAL HOME STUDY COUNCIL

### MAIL COUPON FOR LITERATURE

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NATIONAL HEADQUARTERS OFFICE  
1505 N. Western Ave., Hollywood 27, Calif.

11-P

Please send me full details on the course indicated below. I understand that there is no obligation and no salesman will call.

NAME \_\_\_\_\_ AGE \_\_\_\_\_

ADDRESS \_\_\_\_\_

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

Send details on:

F.C.C. License

Industrial Electronics

Instrumentation

Engineering Math

Engineering Analysis

I am interested in:  Home Study  Resident Classes

# ASSOCIATION NEWS

## California

### Apprenticeship Program

CSEA, Santa Clara Valley, reports their TV and radio service apprenticeship training program is a three-way project. It involves local service shops, local representatives of the State of California school system and the Department of Apprenticeship Standards. Among the sections of the Apprenticeship Standards code are the work stipulations found in Article VI. Using on-the-job training the apprentice receives approximately 8,000 hours training in all phases of radio-TV repair. This includes: safety practices, care of tools and electronic test equipment, radio repair, record player adjustments, repair of recorders and record players, sound system repairs, TV antenna installations and TV receiver repairing. In addition to this training he must attend school two nights per week for three hours to

complete a course in general electronics, radio theory, radio servicing, TV theory and servicing and color TV theory. After completing this intensive theoretical and practical course the apprentice will be able to take his place in the TV servicing field.

## Canada

PAIE, Montreal, reports the following officers were elected: Pres., J. C. Malette; V.P., Dave Felstein; Sec.-Treas., Raymond Lafontaine; Director, J. R. Galipeau. In addition PAIE reported that one of their members was expelled for repair practices unbecoming an organization member. This member was expelled for failing to observe sections B,D,F, and N of the Code of Ethics.

## Indiana

ITTA, Indianapolis, reports that they have placed charges against a few members who have started a "free tube check" TV service firm. The association has sent warning letters to the members in question stating that their expulsion from the association would result if they continue to support this firm. However, when this problem was pre-

sented to the board of directors of IESA, the board took no action.

RETA, Richmond reports that the following officers were elected: Pres., W. F. Barnett; V.P., Robert Reed; Sec'y, Victor Ballman; Treas., Charles H. Norman.

## Michigan

TSA, Detroit, sadly reports the passing of their esteemed former President, Karl W. Heinzman. The TV service industry has lost a keen mind and fighting leader.

## Missouri

TESA, St. Louis, has elected the following officers: Pres., William Frasure; V.P., Morton Singer; Chairman of the Board, Fred Reichman; Sec'y, Dennis Towell; Treas., Bill Thomas.

TESA, So. West Mo., reports the following officers were elected: Pres., Lee Hopkins; V.P., Ed Muhlman; Sec'y, Wayne Esterline; Treas., Ova Steeley.

## Montana

ESA, Butte, announced election of the following officers: Pres., Pat Gordon; Rec-Sec'y, Harry Carroll; Treas., Kenneth Venner; Trustees, Al Laurick and Bjarne Johnson.

## North Carolina

NCFEA reports the following officers were elected: Pres., Harold Sherrill; V.P., Charles Lackey, Jr.; Sec'y-Treas., H. L. Holbrook.

PESA, Durham, reports that the following were elected: Pres., J. J. Bralley; V.P., Rodger Winkler; Sec'y, Bobby Goss; Treas., Willie Hester.

RTS, Catawba Valley, has elected the following officers: Pres., Paul Jarret; V.P., Page Caldwell; Sec'y, Ralph Hartley; Director, Walt Stewart.

## Ohio

### CRT Labeling Law

ARTSD, Columbus, says legislation requiring replacement CRT's to be marked "new" or "used" has become law. The bill was passed at the last session of the Ohio Legislature. Set owners must be told whether the CRT's they buy contain any used parts. Similar to the New York State Law, regulations stipulate that the carton must also be marked "new" or "used." In a recent national survey of the six million CRT's replaced last year only about 20% were new tubes. Consumers in eight out of ten cases thought they were purchasing new tubes, according to the survey in-

(Continued on page 54)



Type "PCT" . . . constructed in strong red cardboard tubes, wax impregnated, one end closed, printed circuit board terminals.

Type "PCTL" . . . has insulated lead out top providing for low voltage section.

For 65 C operation . . . recommended for table and clock radios . . . individually packaged . . . guaranteed for one year.

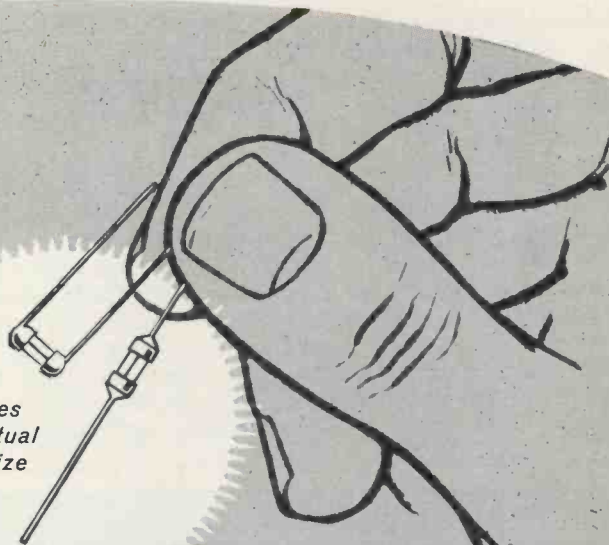
Write today for complete information.

**PLANET SALES CORPORATION**  
225 Belleville Avenue Bloomfield, New Jersey

Another outstanding development by the Makers of BUSS fuses

# TRON FUSES

Fuses actual size



Sub-miniatures — hermetically sealed Body size only .140 x .300 inches

## For Use Where Space is at a Premium

Tron fuses are so small they can easily be used as an integral part of circuit — to protect miniaturized devices — or gigantic multi-circuit electronic devices — without sacrifice of space.

Fuse elements hermetically sealed. Tron fuses may be potted or encapsulated without danger of sealing material affecting operation. They are not affected by atmospheric conditions. They are designed for installation in high shock and vibration ambients.

They are self-protecting and operate without exterior flash or venting, so they can be installed anywhere in the circuit. Likewise, they may be teamed in one capsule or replaceable unit with such components as resistors or condensers.

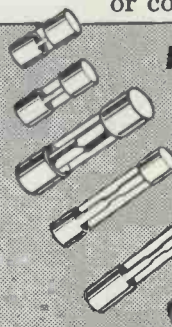
Available in ratings from 1/20 to 5 amps. for use on circuits of 125 volts or less where available fault current is not over 50 amps. Color coding indicates ampere rating and assists in final inspection of fused circuits.

Made with Axial pigtailed that are adapted to feed through automatic wire forming machines — or with right angle pigtailed conveniently spaced for assembly on printed circuit chassis.

Get the full story: —  
Write for BUSS Bulletin TRON

In the complete BUSS line, there are fuses and fuse mountings of unquestioned high quality to fit every protection need.

That's why it's more profitable to handle only BUSS fuses.



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

(Continued from page 52)  
formation. Now, according to ARTSD, the consumer will know what he buys.

Pennsylvania

### Committee Evaluates Radio-TV Training

TSA, Delaware Valley, announced that a committee from industry, organized labor, and Philadelphia technical schools, have completed evaluation of radio and TV instruction in the Philadelphia-area Technical High Schools. The

evaluation was requested by the Philadelphia Board of Public Education through its Advisory Council for Vocational Education. Purpose of the evaluation was to determine how closely the instruction in the three schools was meeting industry needs in the Delaware Valley. A similar evaluation was made 10 years ago. Among other things, the committee's report stated: "The many levels and types of technicians required make it possible for the technical high school to train and develop students of varying aptitudes and interests . . . No dif-

ferentiation between electronics technician and radio and television service repairman should be made in the technical high school regular day program." The committee also recommended that every student should have proper tools, testing equipment and working materials, including the following minimum: multimeter, VTVM, Audio Generator, Oscilloscope, and R-F Generator. The committee generally approved the present course.

### Wisconsin

TESA, Milwaukee, reports it has adopted 14 points contained in NATESA's directive list of suggestions to help clarify association advertising practices. The points have been incorporated in TESA's Constitution and Bylaws. To help eliminate unethical advertising practices, fourteen "sore-spots" in advertising have been covered. Among these are: deception practices (misleading advertising claims); price (what the house call will cost); credit (all ads so stating must include statement that normal finance company requirements must be met); service time (ads no longer will state 24 hour service, one hour service, etc); titles (terms such as "engineers" will not appear unless a graduate engineer is actually doing the work); authorized service (unless letters of authorization are in possession of the firm, this claim must be eliminated).

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



**CB-3**  
*littlefone*  
Transceiver... \$149.50

Only Hallicrafters offers 8-channel convenience and all these quality performance features. **The transmitter** . . . output circuit matches 50 ohm antenna systems. Standardized CR23/U crystals (3rd overtone, series resonant) readily available. Output amplifier adjustable for max. legal input. 100% modulation on positive peaks. Series-tuned 2nd harmonic trap for excellent TV suppression.

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

...now you can sell

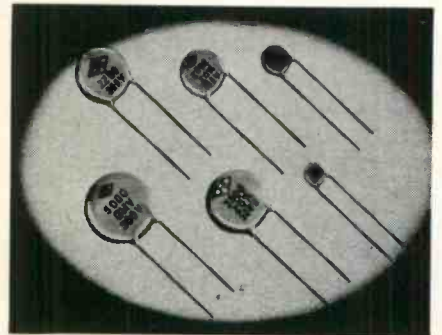
**h hallicrafters**

Chicago 24, Illinois

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

### Centralab CAPACITORS

A new group of stable "K" and semi-stable "K" disc capacitors are reported to afford excellent stability through an extended temperature range of -55°C to 85°C. Working voltage, 500v d-c. Power factor, 2% maximum at 1 kc.



Type CE, available in values from 150  $\mu\text{f}$  to 1000  $\mu\text{f}$ , 10%, \$0.18 in small quantities to \$0.068 in larger quantities. Type CF, range in value from 1200  $\mu\text{f}$  to 10,000  $\mu\text{f}$ , 10%, \$0.18 to \$.24 in small quantities, \$0.068 to \$0.09 in quantities up to 1,000 depending on capacity. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 9-54-2 on coupon, p. 41

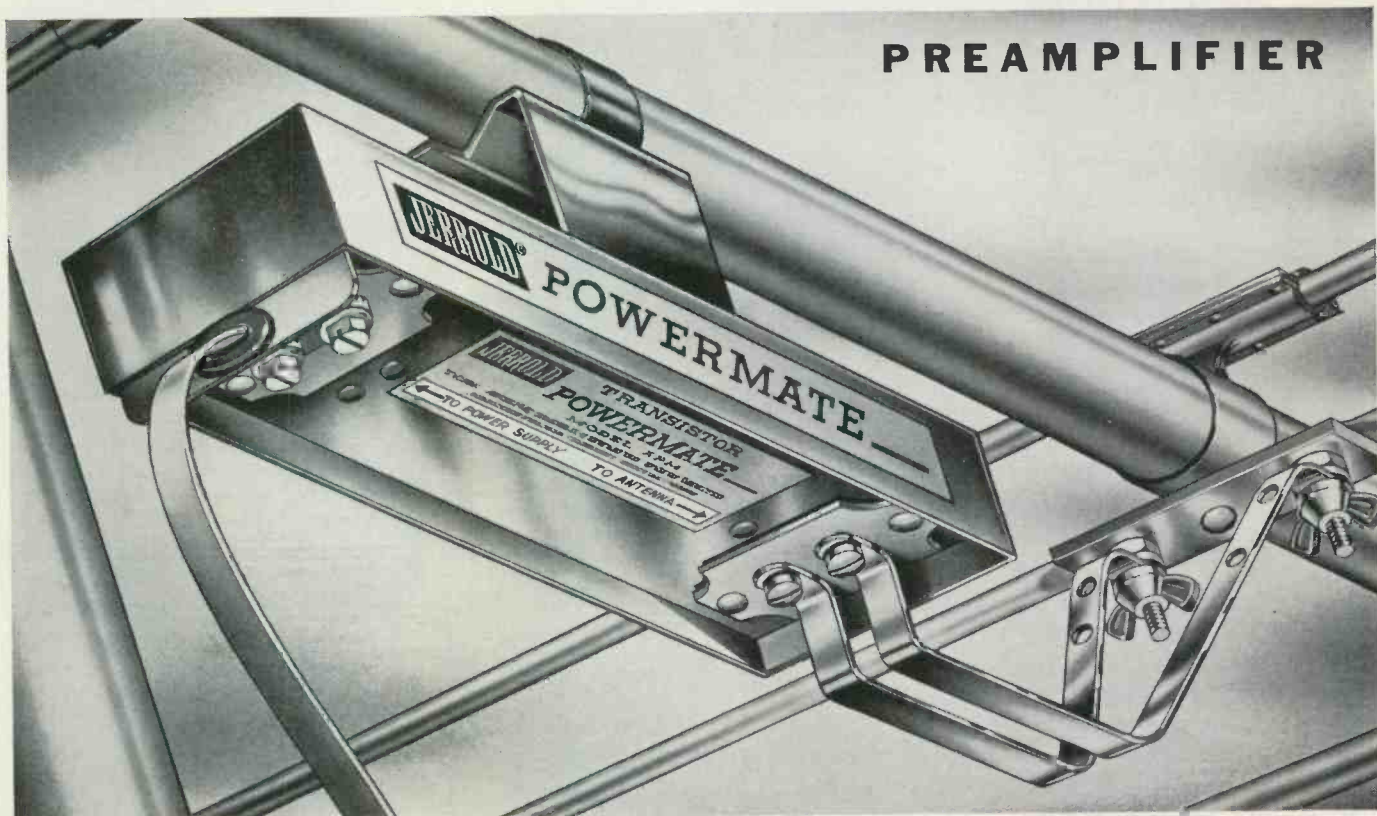


Introducing the perfect mate for any TV/FM antenna

**NEW**  
**JERROLD**<sup>®</sup>

**TRANSISTOR  
POWERMATE**

**PREAMPLIFIER**



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

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

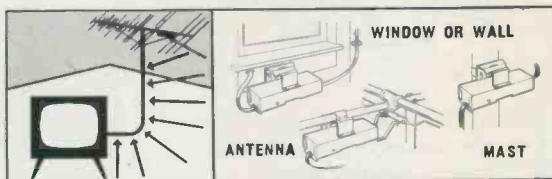
And look at this gain: An average of 13.9db at Channel 13 and 18.25db at Channel 2—by far the highest in the business! This remarkable gain gives any antenna system the lowest System Noise Figure obtainable—the key to better pictures.

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

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

**JERROLD**<sup>®</sup> **ELECTRONICS CORPORATION**  
Distributor Sales Division, Dept. IDS-178  
The Jerrold Building, Philadelphia 32, Pa.

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



**MOUNT IT AND FORGET IT**

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

**REMOTE  
A-C POWER  
SUPPLY**

installs on or near receiver, draws less current than an electric clock. No polarity nuisance when attaching to lead, no danger of transistor damage.



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

# QUICK PROFITS!

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

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

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

SET 1 SET 2  
MOSLEY PC-2  
2 SET ANTENNA  
COUPLER  
MADE IN U.S.A.  
ANT

TV FM  
BLACK AND WHITE OR COLOR

Low Loss Printed Circuit  
Positive Full-Proof Connections  
Performance Engineered

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

SET 1 SET 2  
MOSLEY PC-2  
2 SET ANTENNA  
COUPLER  
MADE IN U.S.A.  
ANT

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BLACK AND WHITE OR COLOR

Low Loss Printed Circuit  
Positive Full-Proof Connections  
Performance Engineered

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

SET 1 SET 2  
MOSLEY PC-2  
2 SET ANTENNA  
COUPLER  
MADE IN U.S.A.  
ANT

TV FM  
BLACK AND WHITE OR COLOR

Low Loss Printed Circuit  
Positive Full-Proof Connections  
Performance Engineered

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

SET 1 SET 2  
MOSLEY PC-2  
2 SET ANTENNA  
COUPLER  
MADE IN U.S.A.  
ANT

TV FM  
BLACK AND WHITE OR COLOR

Low Loss Printed Circuit  
Positive Full-Proof Connections  
Performance Engineered

You'll enjoy installing the new PC-2 two-set coupler because your work and time will command a better price. These neat new couplers, with a compactly engineered printed circuit design, provide high inter-set isolation and low forward loss - result more satisfied customers. PC-2 Dealer Net, \$1.42 each and Suggested List, \$2.37 each. Pick up one of these handy cards at your Mosley distributor or write.

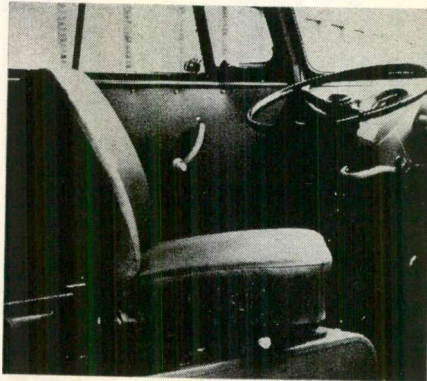


4610 NORTH LINDBERGH BLVD.  
BRIDGETON, MISSOURI

For more data, circle 9-56-1 on coupon, p. 41

## Volkswagen TRUCKS

A swivel seat, available as optional equipment, gives drivers access to the 170-cubic-foot load compartments of the firm's panel trucks. Operator fatigue is reduced by eliminating the need for leaving the cab through the street-side door and stepping into traffic while making deliveries. The

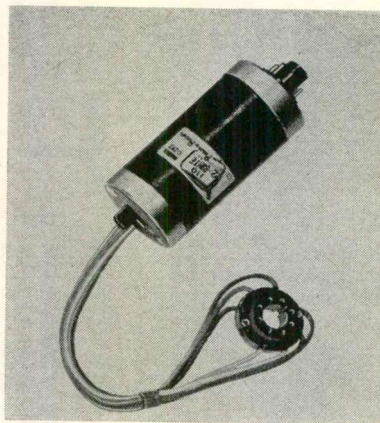


swivel seat enables the driver to step into the load compartment from his cab. Also, trucks equipped with single swivel seats up front carry extremely long cargoes such as extension ladders. Volkswagen of America, Englewood Cliffs, N. J.

For more data, circle 9-56-3 on coupon, p. 41

## Perma-Power TUBE BRITENERS

The new 2-Brite handles 2.34v, 2.68v, 4.70v, 6.30v, and 8.40v black-and-white picture tubes at all three current ratings. Can be used on series or parallel wired sets, with electrostatic or electro-magnetic focus connections. Automatically delivers a



50% power boost, so there is no danger of too much boost. Three base styles are: model C-202, fits standard (duodecal) base sets; C-212, fits 110° button base sets; C-222, fits 110° shell base sets. \$3.75. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill. For more data, circle 9-56-4 on coupon, p. 41

### CITIZEN BAND CLASS "D" CRYSTALS

All 22 Frequencies in Stock  
3rd overtone, .005% tolerance—to meet all F C C requirements. Hermetically sealed HC6/U holders. 1/2" pin spacing .050 pins available, add 15c per crystal.

**\$2.95 EACH**

The following Class "D" Citizen Band frequencies in stock (frequencies listed in megacycles): 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225.

Matched crystal sets for all CB units. . . \$5.90 per set. Specify make and model numbers.

RADIO CONTROL CRYSTALS IN HC6/U HOLDERS

Specify frequency. 1/2" pin spacing .050 pin diameter .05 (.093 pin diameter, add 15c) . . . \$2.95 ea.

### FUNDAMENTAL FREQ. SEALED CRYSTALS

in HC6/U holders  
From 1400 KC to 2000 KC .005% Tolerance . . . \$4.95 ea.  
From 2000 KC to 10,000 KC any frequency .005% Tolerance . . . \$3.50 ea.

### SEALED OVERTONE CRYSTALS

Supplied in metal HC6/U holders  
Pin spacing .486, diameter .050  
15 to 30 MC .005 Tolerance . . . \$3.85 ea.  
30 to 45 MC .005 Tolerance . . . \$4.10 ea.  
45 to 60 MC .005 Tolerance . . . \$4.50 ea.



### QUARTZ CRYSTALS FOR EVERY SERVICE

All crystals made from Grade "A" imported quartz—ground and etched to exact frequencies. Unconditionally guaranteed! Supplied in:

FT-243 holders MC-7 holders  
Pin spacing 1/2" Pin spacing  
Pin diameter 3/4" Pin diameter .093

Cria/ar Holders FT-171 holders  
Pin Spacing 1/2" Pin spacing  
Pin Diameter .125 3/4" Banana pins

### MADE TO ORDER CRYSTALS

1001 KC to 2600 KC:  
.005% tolerance . . . \$4.50 ea.  
2601 KC to 9000 KC:  
.005% tolerance . . . \$2.50 ea.  
9001 KC to 11,000 KC:  
.005% tolerance . . . \$3.00 ea.  
Specify holder wanted

### Amateur, Novice, Technician Band Crystals

.01% Tolerance . . . \$1.50 ea.—80 crystals (3701-3749 KC), 40 meters (7152-7198 KC), 15 meters (7034-7082 KC), 6 meters (8335-8650 KC) within 1 KC

FT-241 Lattice Crystals in all frequencies from 370 KC to 540 KC (all except 455 KC and 500 KC) 50c ea.

Pin spacing 1/2" Pin diameter .093  
Matched pairs ± 15 cycles \$2.50 per pair  
200 KC Crystals, \$2.00 ea.; 455 KC Crystals, \$1.25 ea.; 500 KC Crystals, \$1.25 ea.; 100 KC Frequency Standard Crystals in HC6/U holders \$4.50 ea.; Socket for FT-243 crystal 15c ea.; Dual socket for FT-243 crystals, 15c ea.; Sockets for MC-7 and FT-171 crystals 25c ea.; Ceramic socket for HC6/U crystals 20c ea.

Write for new free catalog #961 complete with oscillator circuits

### YOUR PARTS DEALER HAS TEXAS CRYSTALS

See big red display . . . if he doesn't stock them, send us his name and order from our Florida plant.

Now! Engineering samples and small quantities for prototypes now made either at Chicago or at Ft. Myers Plant. 24 Hour Service.

IN CHICAGO, PHONE GLADSTONE 3-3555

RUSH YOUR ORDER TO OUR NEW PLANT  
Use coupon below for 1st Class shipment.

### TEXAS CRYSTALS

Dept. T-91, 1000 CRYSTAL DRIVE, FORT MYERS, FLORIDA

For extra fast service, phone WE 6-2100

ATTACH THIS COUPON TO YOUR ORDER FOR SHIPMENT VIA 1ST CLASS MAIL AT NO EXTRA COST

TERMS: All items subject to prior sale and change of price without notice. All crystal orders must be accompanied by check, cash or M.O. with PAYMENT IN FULL.  
Dept. T-91

For more data, circle 9-56-2 on coupon, p. 41  
ELECTRONIC TECHNICIAN • September, 1961

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

# PHILCO for 1962

advances the frontiers of TV performance  
with new VHF-UHF

## MEMORY-MATIC TUNER

### Just set and forget!

You merely adjust the fine tuning *once* for each channel; after that, you never need touch it again. It's all automatic—each channel is permanently locked for best picture and sound.



Easiest,  
Simplest Automatic  
Fine Tuning Ever Developed



#### NOT ONE ... BUT TWO LADDER GRID TUBES

Unmatched sensitivity and amplifying power to pull in weak signals, thanks to the use of *two* advance design Ladder Grid Tubes, instead of the usual one. Also, greater *reserve* sensitivity means longer peak performance under all conditions.

The Philco Memory-Matic Tuner with *DUAL* Ladder Grid Tubes again advances the frontiers of television performance. It outdates anything known today, the greatest combination of sensitivity and reliability ever built into a tuner. It's just another reason why more dealers like selling Philco TV! Talk to your Philco Distributor!

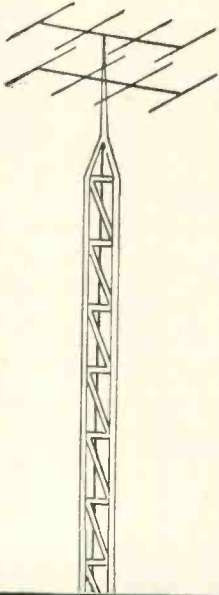
PHILCO'S ON THE MOVE!

**GO WITH**

# PHILCO



*Famous for Quality the World Over*

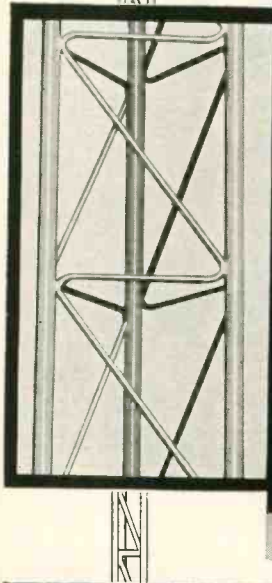


## THE MOST FAMOUS LINE OF TOWERS IN THE WORLD ARE ROHN!

*Here are the features that make them the largest selling and most accepted tower for television, radio, industrial and communications uses:*

- **ZIG-ZAG CONSTRUCTION**—proven zig-zag design means sturdiness and dependability that is truly outstanding. Tower sections are completely assembled and electric welded throughout for maximum strength and greater economy in erection.
- **HOT DIPPED GALVANIZED AFTER FABRICATION**—Entire tower sections are completely zinc coated after fabrication for the finest outer protection possible. Being galvanized after fabrication means no uncoated bolt holes, weld spots or seam to rust. All ROHN Towers last far longer and have less maintenance than competitive towers because of this feature.
- **HIGHEST QUALITY MATERIAL USED**—only highest quality laboratory-certified steel tubing is used (not pipe). Quality steel plus heavy gauges combine to give far greater strength than competitive towers.
- **COMPLETE LINE FOR WHATEVER YOUR NEEDS**—Fully self-supporting towers are available to 170 feet or lower; heavy duty guyed towers available up to 500 feet. Whatever your needs, check ROHN.
- **UNEXCELLED ENGINEERING**—all ROHN Towers are engineered to meet the most rigid requirements as outlined by all major communications equipment manufacturers and electronic industry associations.
- **UNIVERSAL ACCEPTANCE**—Hundreds of thousands of Rohn Towers are in use all over the world. They have withstood the "test of time"—the only true test as to the superiority of a tower. So why settle for less than the BEST? Insist on the largest selling tower in the world—ROHN.

For your needs and for all allied tower accessories, contact your local ROHN salesman or write direct for full information.



SEND THE HANDY COUPON INDICATING YOUR NEEDS

# ROHN

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BOX 2000  
PEORIA, ILLINOIS

ROHN Manufacturing Company  
Box 2000  
Peoria, Illinois

Send me complete literature on the following ROHN Products:

- TV Towers                       Amateur Towers  
 Communication Towers       ROHN Accessories

Name \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

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

For more data, circle 9-58-1 on coupon, p. 41

## MERCURY TV TUNER SERVICE

890-A River Ave., Bronx 51, N.Y.

"Largest in the East"

### VHF-UHF TUNERS

7 Months Warranty

Price Includes Labor & Minor Parts

TUBES & MAJOR PARTS  
AT NET PRICES

ALL MAKES  
ONE PRICE!

**\$9.50**

When Shipping Tuner: Include Tubes,  
Shields and Damaged Parts.

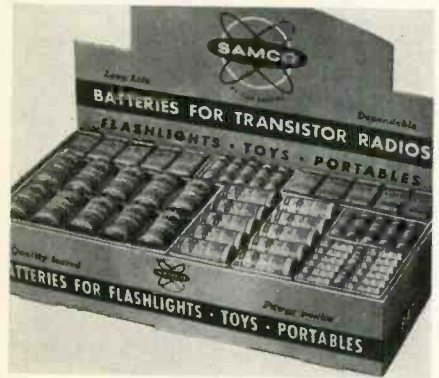
Give Model Number and State Complaint

PACK WELL AND INSURE  
24 HOURS ON POPULAR TYPES

For more data, circle 9-58-2 on coupon, p. 41

## Samco TRANSISTOR BATTERIES

A compact transistor battery self-display carton contains a total of 116 batteries, and includes an assortment of the seven most popular battery types for use in transistor portable radios, flashlights, appliances, etc.



This point-of-purchase self-displayer, designed to save counter space and facilitate battery selection, is part of a "Profit-Pak" merchandising program which includes battery information and cross reference guide, and window streamers. \$45.15. Sampson Co., 2244 S. Western Ave., Chicago 8, Ill.  
For more data, circle 9-58-3 on coupon, p. 41

## Montgomery CLEANING COMPOUNDS

SWISH Aerosol ELEKTROKLEEN is now available with a removable extension tube for cleaning hard-to-reach places, and to provide a pinpoint spray for cleaning miniaturized components. The polypropylene tube is sufficiently flexible to permit



spraying around corners and into small areas. SWISH Aerosol, used without the extension tube, provides a long range, drenching spray. The extension tube is offered at no increase in cost, a case of the compound—twelve 16 oz. cans—sells for \$15.60. Trial orders for one can, \$1.30. Montgomery Chemical Co., Jenkintown, Pa.

For more data, circle 9-58-4 on coupon, p. 41

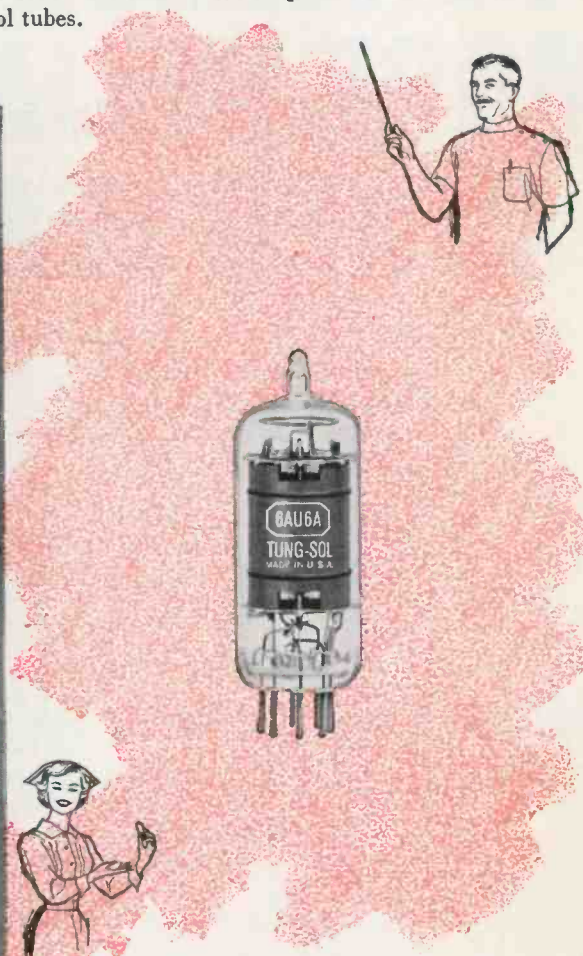
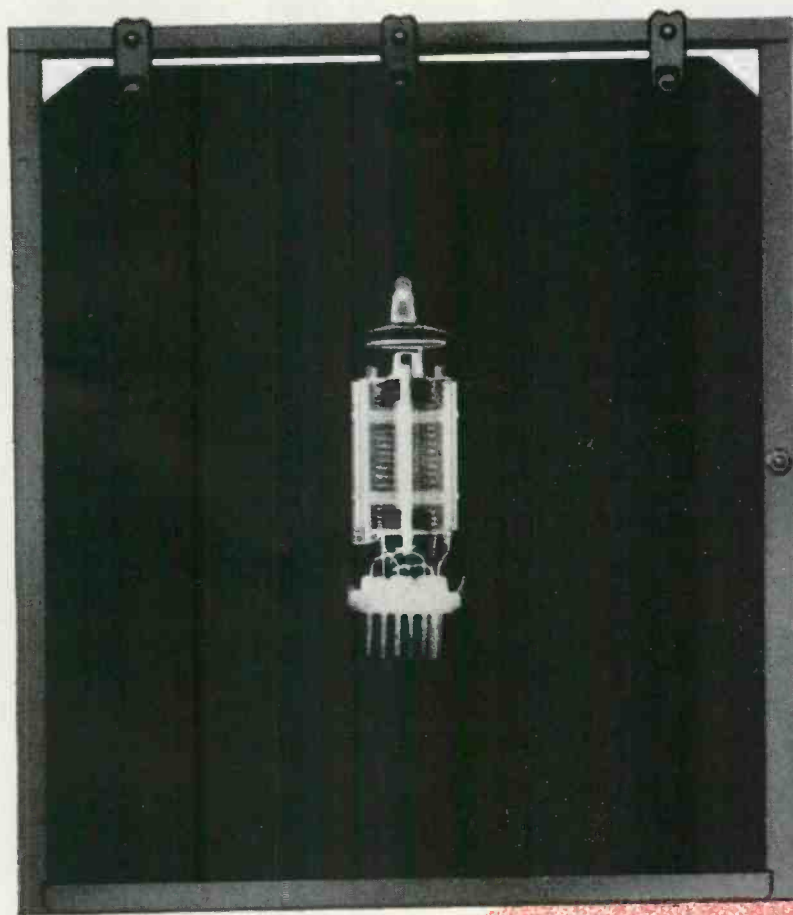
## ABSENCE OF "GRID EMISSION" AND GAS DEMONSTRATES GOOD HEALTH OF TUNG-SOL IF AMPLIFIER TUBES

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

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

### GOOD MEDICINE FOR PROFITS

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



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

- 104; 6AG5; 3AU6; 4AU6; 6AU6A; 12AU6; 3BA6; 4BA6; 6BA6; 12BA6; 3BC5; 4BC5; 6BC5; 6BH6; 6BJ6; 3CB6; 4CB6; 6CB6; 3BZ6; 4BZ6; 6BZ6; 12BZ6; 3DK6; 4DK6; 6DK6; 12AC6; 12BL6; 12AF6; 12EK6; 12EZ6; 18GD6A; 18FW6A



the first name to ask for when ordering



**TUNG-SOL®**  
**IF AMPLIFIER TUBES**

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

**Proved:**

# GENERAL ELECTRIC TV IS MORE RELIABLE THAN ANY OTHER LEADING BRAND

**PROOF**—A recent study of 5050 TV sets under service contract showed that General Electric TV needed 20% less service than the second best of the leading television brands.\*

**PROOF**—The same study also showed that the average of other brands required 63% more service (factory faults requiring service inside set) than General Electric.\*

\*This study covers the first 90 days of use of new TV sets purchased in 1960. All sets included were under service contract to the Planet Electronics Corp., a prominent independent service company in New York City. The leading brands of television receivers were included. The results were tabulated and reported by Audits & Surveys Company, Inc., a leading research organization. If you wish additional information on this survey, write to General Electric Company, Room 112, Building #5, Electronics Park, Syracuse, N. Y.

**What this means to you:** Facts prove that once a General Electric television set is fixed, it stays fixed! Fewer repeat calls mean more free time for you to make more calls to new customers. Fewer repeat calls mean fewer irate set owners. Fewer repeat calls mean more customer satisfaction and an enhanced reputation for you. The word spreads about the quality of your work. Your reputation grows and so does your business.

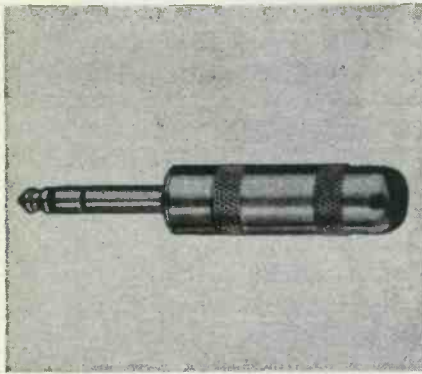
*Progress Is Our Most Important Product*

GENERAL  ELECTRIC

TELEVISION RECEIVER DEPARTMENT, SYRACUSE, NEW YORK

## RCA RECEIVING TUBES

Added to the new family of all-glass base novar receiving tubes are: 6BC3, 17BH3, and 22BH3. They are half-wave vacuum rectifier tubes, with a pin-circle diameter of 0.687", designed for use as damper diodes in horizontal-deflection circuits of TV receivers. They feature: maximum peak inverse plate voltage rating of 5500v; maximum d-c plate current rating of 180 milliamperes; maximum peak plate current rating of 1100 milliamperes; and special heater-cathode insulation which can withstand negative peak pulses up to 5500v with d-c component up to 900v. RCA Electron Tube Div., Harrison, N. J.



## Switchcraft PLUGS

The Littel Plug is now available in a three-conductor plug with a .206" diameter on applications where it is desirable to polarize. Often used as microphone input in magnetic recorders. Part #S-260 has black plastic handle, screw type terminals. Part #S-290 has shielded handle. Both are interchangeable with plug SC#480 (PJ-068) where MIL specs are not needed nor applicable; and both mate with S-128 Extension Jax and S-11 Littel Jax. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.

For more data, circle 9-61-2 on coupon, p. 41

## Omega TUBES

A complete line of radio, TV, and high fidelity electronic tubes are reported of high quality, fully tested to meet all specifications and manufactured by the Toshiba Co. of Japan. Warranty policy, guarantees tubes for 18 months and each is dated by month and year; tube failure reimburses buyer on a pro-rated basis with a 10¢ per month charge for use. Vacudyne Associates Inc., 397 7th Ave., Brooklyn 15, N. Y.

For more data, circle 9-61-3 on coupon, p. 41

## Seco ATTENUATOR/LOAD BANK

Announced is model 511A Attenuator, a combination power attenuator and non-inductive resistance load bank. The attenuator is of typical "T" pad design and is particularly useful where a power amplifier is being used to drive a second amplifier having

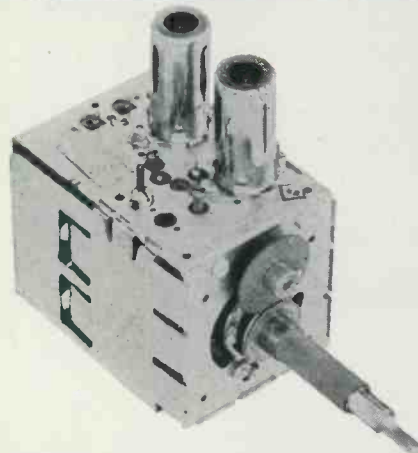


lower power drive requirements. Maximum power dissipation rating at the input connector is 50 watts. To use as an attenuator, the switch is put in the "EXT" position. To use as a dummy load, the switch is put in the "INT" position. Seco Electronics Inc., 5015 Penn Ave. South, Minneapolis 19, Minn.

For more data, circle 9-61-4 on coupon, p. 41

## Tarzian offers

# FAST, DEPENDABLE TUNER REPAIR SERVICE



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

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

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

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



SERVICE MANAGER • TUNER DIVISION • DEPT. 2B

## SARKES TARZIAN INC

east hillside drive • bloomington, indiana  
edison 2-7251

MANUFACTURERS OF TUNERS . . . SEMICONDUCTORS . . . AIR TRIMMERS . . . FM RADIOS . . . AM-FM RADIOS . . . AUDIO TAPE . . . BROADCAST EQUIPMENT and SHISH-KABOB GRILLES

# ALL MAKES

ONLY  
**\$8.50**  
INCLUDING

# ALL PARTS and LABOR

# 24-HOUR SERVICE 6-MONTH WARRANTY

Tuners Repaired on  
Approved, Open Accounts

See your distributor, or  
use this address for fast,  
factory repair service

## Transistor Radio Defects

(Continued from page 33)

illator coil with a 1 megohm resistor.

On the other hand, a dead oscillator is difficult to check using standard techniques. The set may seem "alive," and the i-f stages may respond to signal injection tests and alignment, but the set fails to pick up stations, or pulls in only one

station at the low-end of the broadcast band. In a tube-operated receiver, the conventional test is to check for grid bias across the oscillator grid-leak resistor, using a d-c VTVM. Since a tube oscillator is a class C amplifier, the presence of a reasonable bias voltage indicates that the oscillator is "working." Most transistor oscillators are class A amplifiers, however, and their d-c bias values may remain the same whether the oscillator is functioning or not.

Several techniques may be used

to check a suspected local oscillator. An r-f voltmeter or a broadband 'scope can be used to check for an r-f voltage. This may be between 0.07 and 0.25 volts on the converter base.

Another technique permits a rough check of oscillator frequency. A tuned signal tracer, if available, may be used. Also, another receiver can be used to pick up the local oscillator signal, or a grid dip meter (as shown in Fig. 2) may be used.

If a receiver is used for this test, first set the receiver under test to a frequency where its local oscillator signal falls within the AM broadcast band. For example, if the i-f is 455 Kc, tuning the receiver under test to 600 Kc should set its local oscillator to 600 plus 455 or 1055 Kc. If the oscillator is working, its signal can be picked up by the test receiver at approximately this point on the dial. The signal may be heard as a squeal, hiss, or other sound and can be identified easily by re-tuning one of the receivers.

Remember that the toughest dogs can be tamed if tackled properly, and if you take care to avoid repetitious tests which give misleading results. •



KNOWLEDGE

is better than guesswork...

## and **STANCOR** takes the guesswork out of TRANSFORMER REPLACEMENTS

When you use Stancor exact replacements, you *know* that you have a transformer that duplicates in every way the original manufacturer's electrical and physical specifications.

What's more, you know in advance that you'll be able to use a Stancor unit, because Stancor offers virtually complete coverage on flybacks and yokes . . . and the Stancor TV Guide, the most detailed in the industry, gives you exact information on the right transformer to use.

Contact your Stancor distributor for information on how to get your copy of the Stancor TV Guide.

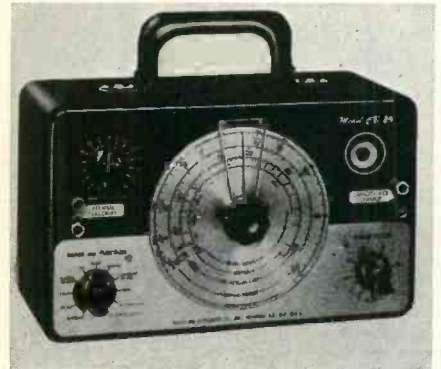
*Take all the guesswork out of transformer replacements—  
always specify Stancor.*

**STANCOR**  
ELECTRONICS, INC.

Formerly Chicago Standard Transformer Corporation • 3501 West Addison Street • Chicago 18, Illinois

### Precision BRIDGES

Model CB-26 resistance-capacity-ratio bridge employs a versatile a-c bridge circuit for reliable measurement of mica, paper and electrolytic capacitor leakage. Also a special low voltage bridge for measurement of miniature electrolytics. Leakage tests, made at rated voltages with 17 d-c



voltages available, ranging from 3v to 500v. Provides 4 capacitance ranges covering 10  $\mu\text{mfd}$  to 2000  $\mu\text{mfd}$ ; 4 resistance ranges from 0.5 ohm to 200 megohms. Ratio tests determine transformer turns ratio and reactance or resistance ratio, range of 0.5 to 1 and 20 to 1. \$79.95. Precision Apparatus Co., 70-31 84th St., Glendale 27, N. Y.

For more data, circle 9-62-2 on coupon, p. 41



## RCA *MERCURY* RADIO BATTERIES

**GUARANTEED**  
AGAINST DAMAGE FROM LEAKAGE



The Radio Corporation of America guarantees to repair your radio or replace it with one of comparable value (at RCA's option) and supply the appropriate battery complement without charge, if ever damaged by leakage of an RCA mercury radio battery. If RCA mercury radio batteries should ever leak and damage your radio set, send radio with batteries, transportation collect to:

RCA BATTERY DEPARTMENT  
415 South Fifth Street, Harrison, New Jersey



The Most Trusted Name in Electronics



## Step up to Bigger Profits

with RCA Mercury Batteries  
now **GUARANTEED** against  
damage from leakage in any radio



RCA's new guarantee on its Mercury Batteries now makes it easier than ever for you to sell this high-profit line of batteries.

With their long-life, fade-free performance and unbeatable reliability, Mercury Batteries have always been the most economical battery buy on the market. NOW—RCA's guarantee makes them an even wiser purchase for your customers.

Get the most out of the booming market in transistor radios by displaying and promoting famous RCA Mercury Batteries—now guaranteed against damage from leakage in any radio set.

Contact your Authorized RCA Distributor for the new battery promotional material featuring this RCA guarantee.



The Most Trusted Name in Electronics

# ATR

## 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.

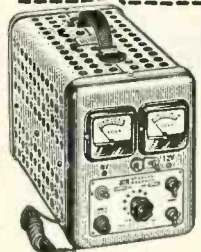
In your own car or boat!

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 Disciode 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

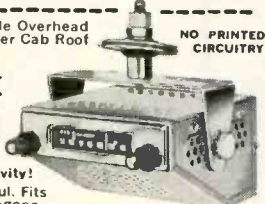
Vibrator-Operated with Tune Control

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 5 1/2" wide. Shipping weight, radio set, 7 lbs. Model K-1279—12 for 12V Dealer Net Price. . . \$33.57

Model K-1279—6 for 6V Dealer Net Price. . . \$33.57

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

### ATR TRUCK KARADIO



Excellent Tone, Volume, and Sensitivity!

Compact, yet powerful. Fits all trucks, station wagons, most cars and boats. Just drill a 3/8 inch hole in roof and suspend the one-piece unit (aerial, chassis and speaker) in minutes. Watertight mounting assembly holds antenna upright. Yoke-type bracket lets you tilt radio to any angle.

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

Model TR-1279—12A for 12V Dealer Net Price \$41.96

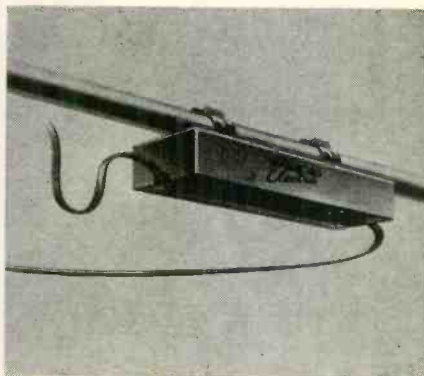
Model TR-1279—6A for 6V Dealer Net Price \$41.96

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

**ATR ELECTRONICS, INC.**  
Formerly: American Television & Radio Co.  
Quality Products Since 1931  
ST. PAUL 1, MINNESOTA—U.S.A.

### TACO ANTENNAS

T-Bird Electra, an all-new transistorized TV antenna amplifier system, incorporates the 100% rust-proof T-Bird antenna, a transistorized antenna-mounted amplifier, and a power supply used with 117v house current. Available in three models for various

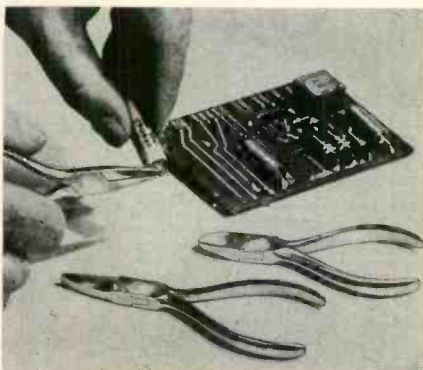


signal-strength areas. Reported to increase gain more than 1000%, over non-powered models, and to permit reduction of antenna height up to 80% for most installations. Built-in splitting network allows connection of two TV receivers or TV and FM without necessary couplers. Technical Appliance Corp., Sherburne, N. Y.

For more data, circle 9-64-3 on coupon, p. 41

### X-acto PLIERS

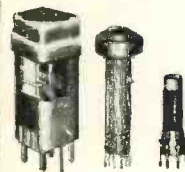
Royal Swedish precision-made pliers, manufactured in Sweden of highest quality tool steel according to rigid X-acto specifications are available in the following nose shapes: long, diagonal cutting, flat, snipe and combination types. Chrome plated, highly polished



ished and are also available with plastic cushion grip handles. All are 4 3/4" long with the exception of the diagonal cutting tool which is 4 1/4" long. \$3.25 to \$4.00. With plastic handles, slightly higher. Handicraft Tools, Inc., Div. X-acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y.

For more data, circle 9-64-4 on coupon, p. 41

### Exact Replacements for Original Equipment



The following special parts have been manufactured as exact replacements for the set manufacturers shown, so as to assure top performance.

Cat. No.	Use	O.E.M. Part No.
<b>Admiral</b>		
1471-A	Sound Take-Off	72B185-2
1472-A	Sound Take-Off	72C132-19
6332	Horiz. Osc.	94C17-4
7701	455 KC I.F.	72 B 31,2

<b>Bendix</b>		
6501	Auto Radio I.F.	2090237-1
6502	Auto Radio I.F.	2090237-2
6503	Auto Radio I.F.	2090237-3
6504	Auto Radio I.F.	2090237-4
6505	Auto Radio I.F.	2090237-5
6506	Auto Radio I.F.	2090239-1
6507	Auto Radio I.F.	2090239-2
6508	Auto Radio I.F.	2090239-3

<b>Crosley</b>		
7101	2nd Sound I.F.	157856-1

<b>General Electric and Hotpoint</b>		
12-C11	Home Radio	RTL-143 and 163
12-C13	Home Radio	RTL-172
6206-PC	TV Ratio Det.	RTD-026 (WT56X38)
6207-PC	TV Ratio Det.	RTD-025 (WT56X37)
6208-PC	TV Ratio Det.	RTD-020
6209-G1	TV Ratio Det.	RTD-024 (WT 56X36)

<b>Hallcrafters</b>		
1482 IFT	Sound I.F. and Trap	51B1996
7101	2nd Sound I.F.	51A1859

<b>Philco</b>		
6209-P1	TV Disc.	32-4721
6209-P2	TV Disc.	32-4689-1, 2
6209-P3	TV Disc.	32-4735-1, 2

<b>R.C.A.</b>		
1483 IF	Sound I.F.	76437
1484 RD	Sound Ratio Detector	102692
1485 RD	Sound Ratio Detector	102644
1486 RD	Sound Ratio Detector	102253
1487 RD	Sound Ratio Detector	100364
1488 RD	Sound Ratio Detector	79141
1489 RD	Sound Ratio Detector	101219
6333	Horiz. Osc.	103103

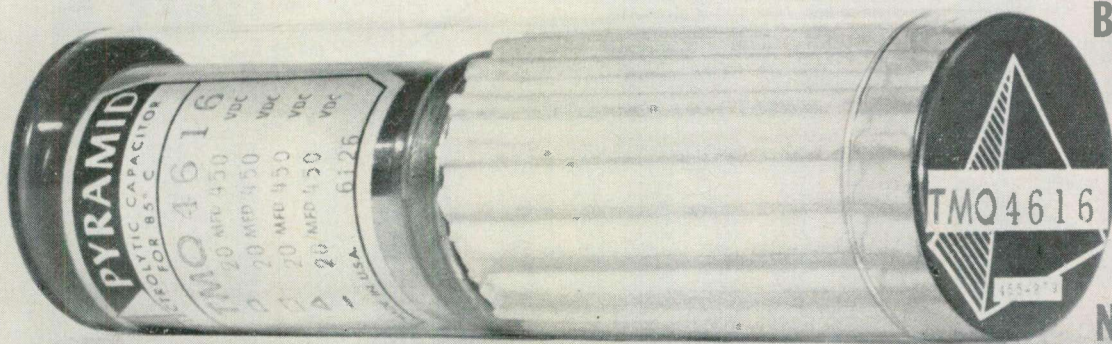
<b>Westinghouse</b>		
12-C14	Home Radio I.F.	235V025H-11, 2 (V157661)
68 Osc	Home Radio Osc.	230V039H-01 (V15764-1)
6204-W3	TV I.F.	V12128-1, 2, 3



**J. W. MILLER CO.**  
5917 S. Main Street  
Los Angeles 3, California

EXPORT REPRESENTATIVE:  
Roburn Agencies, Inc., N.Y. 13, N.Y.

CANADIAN REPRESENTATIVE:  
Atlas Radio Corp., Ltd., Toronto 19, Ont.



**BEHIND THIS CAP IS A COUPON WORTH UP TO \$2.00 ■ EVERY PYRAMID TWIST-PRONG ELECTROLYTIC YOU BUY FROM NOW TO DECEMBER 31,**

**WILL HAVE A COUPON WRAPPED IN IT THAT'S WORTH UP TO \$2.00! IT'S OUR WAY OF CELEBRATING WITH YOU THE MERGER OF PYRAMID WITH MICAMOLD TO FORM THE GENERAL INSTRUMENT CAPACITOR DIVISION ■ JUST GO TO YOUR PYRAMID DISTRIBUTOR, PICK THE TWIST-PRONG VU-PAKS YOU NEED FROM HIS CAPAC-O-MAT RACK, UNROLL THE WRAPPER AND CASH IN THE COUPON. COUPONS RANGE IN VALUE FROM 5c TO \$2—AND EVERY VU-PAK HAS ONE! BUT THAT'S NOT ALL. YOU GET A RELIABLE, PYRAMID ELECTROLYTIC THAT MEETS EVERY REQUIREMENT YOU SET FOR A TWIST-PRONG, SO YOU'RE A WINNER TWO WAYS. SEE YOUR DISTRIBUTOR TODAY. GENERAL INSTRUMENT CAPACITOR DIV., GENERAL INSTRUMENT CORP., DARLINGTON, S.C.**

### Waldom SCREWS

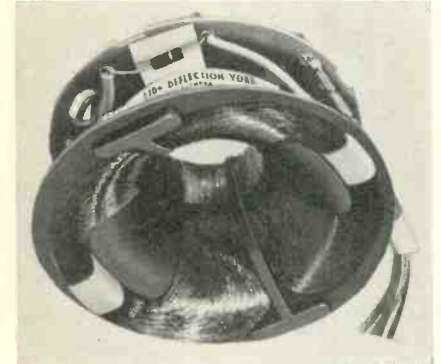
Washer-head sheet metal screw assortment is available. Just introduced is a Skru-Box assortment of 8 sizes of the slotted hex-head type of washer-head sheet metal screws, type A, individually compartmented in a handy clear plastic hinged box. All screws are cadmium-plated to prevent rust, and include sizes No. 6 x 1/4", No. 6 x 3/8", No. 6 x 1/2", No. 6 x 5/8", No. 8 x 1/4", No. 8 x 1/2", and No. 8 x 5/8". \$1.59. Waldom Electronics, Inc., 4625 W. 53rd St., Chicago, Ill.

For more data, circle 9-66-2 on coupon, p. 41



### Stancor YOKES

Four exact replacement deflection yokes, supplied with network components already wired in, are: DY-37A, 90°, replaces Emerson parts 708313, 708322, and 708332, in over 100 models and chassis; DY-38A, 100°, replaces Emerson parts 708330 and 708334 in 129 models and chassis; DY-39A, 90°,



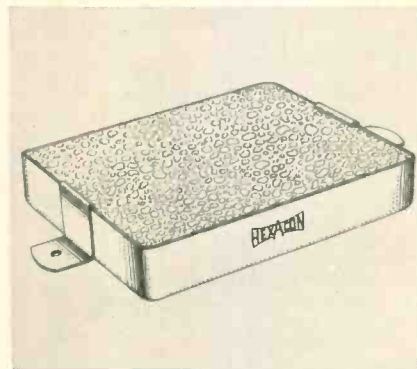
exact replacement for 20 Zenith part numbers and used in over 1300 Zenith models and chassis; and DY-40A, 110°, replaces General Electric and Hotpoint parts RLD-080, WT76X27, and WT76X28, used in 350 models and chassis. Stancor Electronics Inc., 3501 W. Addison St., Chicago 18, Ill.

For more data, circle 9-66-4 on coupon, p. 41

### Hexacon TOOLS

A new soldering tip cleaning sponge saves time and extends soldering iron tip life. Eliminates tip wear caused by use of abrasives. Eliminates contamination caused by use of wiping rags. Cleans while tip is hot without removing protective solder. Fine porosity makes it ideal for cleaning small diameter tips. Pure cellulose sponge contains no damaging acids. Hexacon Electric Co., 180 W. Clay Ave., Roselle Park, N. J.

For more data, circle 9-66-3 on coupon, p. 41



# TRU-VAC

## FREE

UP TO 100  
1-YR. GUARANTEED  
TRU-VAC TUBES  
TO QUANTITY BUYERS!

Now quantity buyers get a FREE assortment of individually-boxed, regular stock TRU-VAC tubes with each order.

PLACE YOUR ORDER TODAY!  
GET UP TO 100 TUBES FREE!  
Here's how this FREE offer works!

15 FREE TUBES	With Order of	\$25
25 FREE TUBES	With Order of	\$50
50 FREE TUBES	With Order of	\$100
100 FREE TUBES	With Order of	\$500

LOOK! 1,000 USED TV'S  
Costly, famous make console models with little or no tube replacement! Require only minor adjustment. Perfect for resale, or as your own second set! 16", 17" and 19" screens none smaller! Sets shipped FOB, Harrison, N.J. **\$16<sup>95</sup>** As Is

## 1-yr. guaranteed Radio & TV Tubes

Factory Used or Factory Second Tubes! TRU-VAC will replace FREE any tube that becomes defective in use within 1 year from date of purchase!

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

Partial Listing Only . . . Thousands More Tubes in Stock!

SPECIAL! 6S17GT . . . 30¢ 6W4GT . . . 30¢

0Y4	3B6	5U8	6AU6GT	6BQ6GT	6CU6	6SF7	7A7	7X7	12BQ6	14B6	50B5
0Z4	3RZ6	5V4G	6AU8	6BQ7	6D6	6SG7	7A8	7Y4	12BR7	14Q7	50C5
1A7GT	3CB6	5V6GT	6AV5GT	6BR8	6DE6	6SH7	7B4	7Z4	12BY7	19AU4GT	50L6
1B3GT	3Q4	5X8	6AV6	6BS8	6D66GT	6SJ7	7B5	12A8	12CA5	19B6GG	56
1H5GT	3S4	5Y3	6AW8	6SY5G	6DF6	6SK7	7B6	12A85	12CA5	19J6	80
1L4	3V4	6A6	6AX4GT	6BZ6	6E5	6SL7	7B7	12A05	12F5	19T8	84/824
1L6	4B07A	6AB4	6AX5GT	6RZ7	6F5	6S07	7B8	12A76	12F8	24A	11273
1NSGT	4BS8	6A74	6B5	6C4	6F6	6SR7	7C4	12A77	12K5	2526GT	
1S5	4BZ7	6A4GT	6RA6	6CA8	6H6	6T4	7C5	12A26	12K7	27	
1T4	4CB6	6AH6	6BC5	6C06G	6J4	6T8	7C6	12A26	12L6	35A5	
1U4	5AM8	6AK5	6BC8	6CF6	6J7	6U5	7C7	12A27	12Q7	35B5	
1U5	5AN8	6AL5	6BD8	6CG8	6K6GT	6V5	7E5	12AX4GT	12R5	35C5	
1V2	5AT8	6AM8	6BE6	6CH8	6K7	6V6GT	7E6	12AX7	12S7	35W4	
1X2	5AV8	6AN8	6BF5	6CL6	6N7	6W6GT	7E7	12A27	12S7	35Z5	
2AF4	5A24	6AQ5	6B6GT	6CM6	6Q7	6X4	7F7	12B4	12SK7	36	
2BN4	5B8B	6A06	6BH0	6CM7	6Q4	6X5GT	7F8	12BA6	12SN7GT	38	
2CY5	5C68	6A07	6B16	6CN7	6S7	6XR	7G7	12BA7	12S07	39/44	
3A5	5J6	6AR5	6BK5	6CR6	6S8GT	6Y6G	7H7	12BD8	12V6GT	41	
3AL5	5R4	6AS5	6BK7	6CS6	6SA7	7A4/XXL	7Q7	12B6G	12W6GT	42	
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3BC5	5U4	6AU4GT	6BN6	6CU5	6SF5	7A6	7X6	12BH7	14A7/12B7	50A5	

Sensational Offer!  
"Self Service"  
TUBE CHECKERS  
**\$37<sup>95</sup>**

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

Any Tube Not Listed Also Available at 35¢ Each!

BRAND NEW 1-YEAR GUARANTEED TV PICTURE TUBES

Below Listed prices do not include duty. Add Additional \$5.00 Deposit on tube sizes to 20"; on 21" and 24" tubes — \$7.50 Deposit refunded immediately when tube is returned prepaid. Aluminized tubes — \$4.00 extra.

Picture tubes shipped to continental USA and Canada — All tubes P.O.B., Harrison, N.J.

10BP4	7.99	16S14	11.99	17I14	16.99	201P4	17.99	21A1P4	17.99	21A1P4	17.49	21XP4	17.49
12I14	10.49	16LP4	12.19	17I14	16.99	21A1P4	18.99	21A1P4	18.79	21P14	18.39	21Y14	18.39
14B7CP4	11.99	16M14	11.99	17G14	13.99	21A1P4	18.99	21A1P4	18.79	21P14	18.39	21Y14	18.39
16A134	16.09	17AVP4	15.49	17I14	16.99	21A1P4	18.39	21A1P4	17.99	21S114	22.39	24CP4	27.79
16DP4	18.19	17B14	18.49	18A1P4	18.39	21A1P4	18.99	21A1P4	18.79	21V14	18.39	24CP4	27.79
16IP4	16.09	17CP4	16.99	20C14	16.99	21A1P4	18.99	21A1P4	18.79	21V14	18.39	24CP4	27.79
16I1P4	12.19	17CP4	17.89	20I1P4	15.89	21A1P4	18.99	21A1P4	18.79	21V14	17.49	24I14	29.79

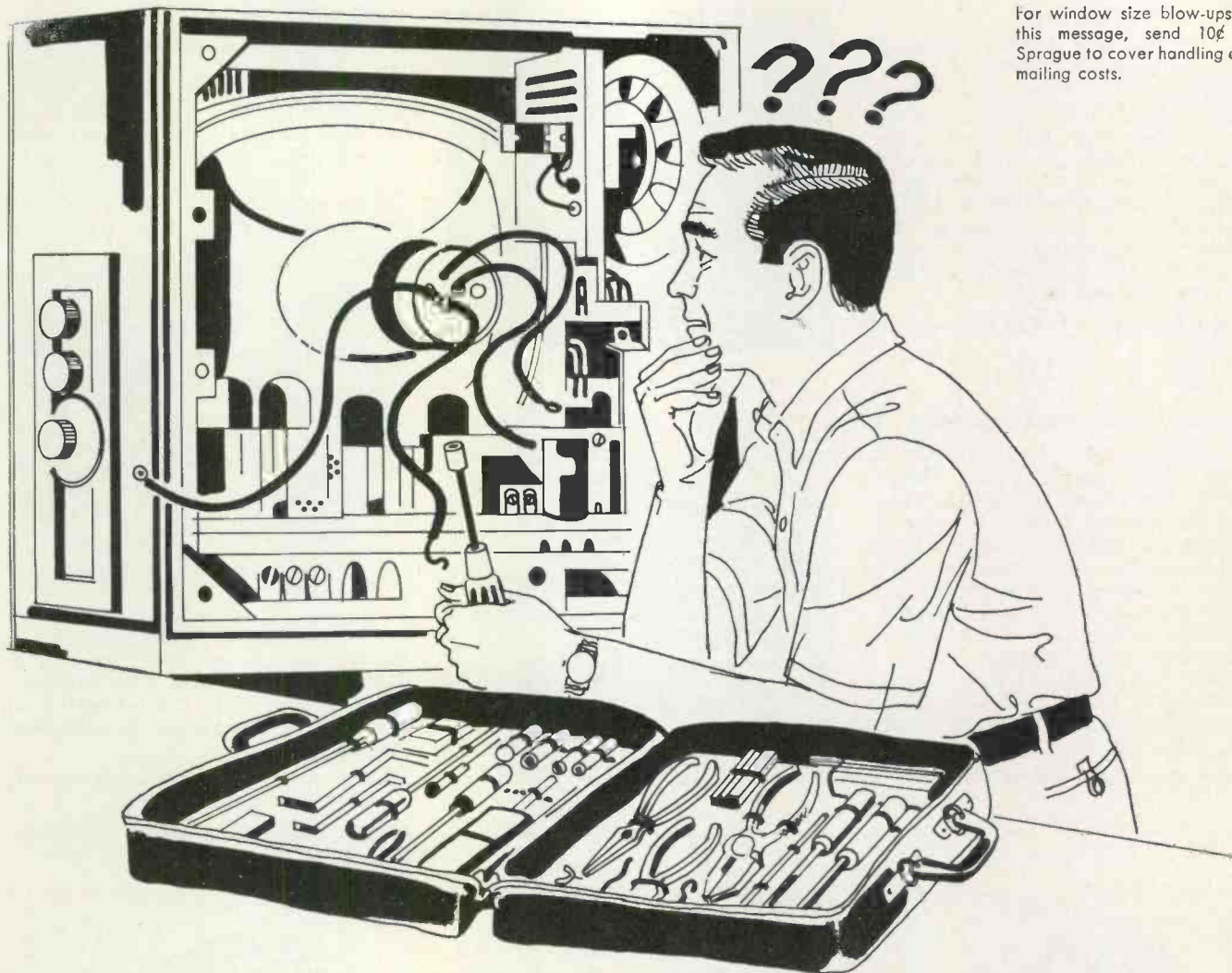
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Money cheerfully refunded within five (5) days, if not completely satisfied!

TRU-VAC (R) PAYS YOUR POSTAGE—On orders of \$5 or more in USA and Territories. Send approximate postage on Canadian and foreign orders. Any order less than \$5 requires the handling charge. Send 25¢. in C.O.D.'s. All orders subject to prior sale. Complying with Federal regulations, the following statement appears in all TRU-VAC advertisements. Tubes appearing in this ad may be FACTORY SECOND or USED tubes and are clearly marked.

# TRU-VAC

Harrison Avenue • Box 107 • Harrison, N. J. Humboldt 4-9770



For window size blow-ups of this message, send 10¢ to Sprague to cover handling and mailing costs.

## **It takes MORE than TOOLS to be a TV Technician!**

Just what IS the difference between the "screwdriver mechanic" and the expert TV-Radio Technician?

NOT expensive tools and test equipment—although they ARE essential.

TRAINING is the first big difference. The tinkerer guesses, but the expert technician KNOWS—because he spent years in the study of electronic theory and its application to television techniques.

EXPERIENCE is the next big difference. The professional TV specialist has repaired hundreds—perhaps thousands—of sets. He knows the complexities and the variations in circuits. He is familiar with the hundreds of parts which make up the "innards" of each type of TV. He can diagnose trouble and cure it quickly and safely.

PROGRESSIVENESS is another big difference. The expert TV Technician continually spends countless hours and hundreds of dollars on manuals, keeping up to date on new developments, new circuits, and new troubleshooting techniques. When trouble develops, he knows what to do about it.

Well-meaning, but poorly informed "screwdriver mechanics" and "do-it-yourself-ers," frequently unable to accurately diagnose TV trouble, often "butcher" a set to the point where it can be dangerous as well as expensive.

DON'T RISK YOUR SAFETY OR NEEDLESS EXTRA EXPENSE—CALL AN EXPERT TECHNICIAN AT THE FIRST SIGN OF TROUBLE! HIS FEE IS YOUR INVESTMENT IN SAFETY AND SATISFACTION.

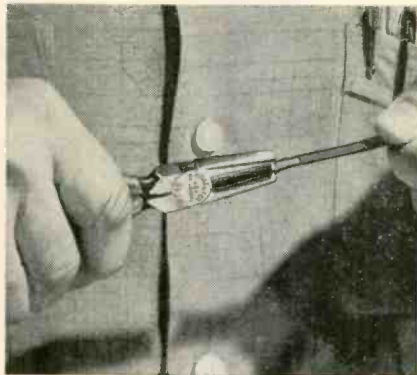
**THIS MESSAGE WAS PREPARED BY SPRAGUE PRODUCTS COMPANY,  
DISTRIBUTORS' SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASSACHUSETTS FOR . . .**

**YOUR NEIGHBORHOOD TV-RADIO TECHNICIAN**

### Krauter PLIERS

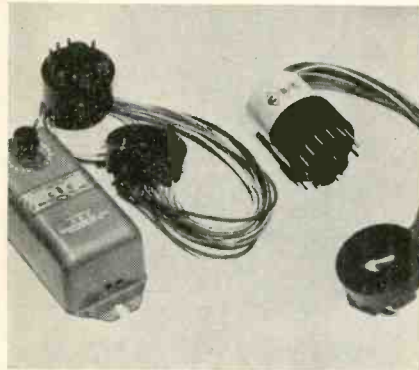
One of the most difficult and time consuming jobs in TV servicing, stripping TV twin lead wire, is made easy with the new CG5627 plier. Cutting edges of the unique right angle jaws are placed between the twin lead, so the stranding will not be cut. One quick jerk on the pliers strips off all insulation neatly. Can also be used as end cutting resistor pliers. Colorful cushion grip handles. Krauter & Co., 585 18th Ave., Newark, N. J.

For more data, circle 9-68-2 on coupon, p. 41



### CBC TUBE BRIGHTENERS

Announced are two color picture tube brighteners for new color TV receivers. Model CB-2 deluxe brightener, enclosed in a brown metal hamertone case, has a heavy-duty transformer with a variable voltage control. It allows the user to set the brightener voltage at the exact amount needed to bring the tube to its normal



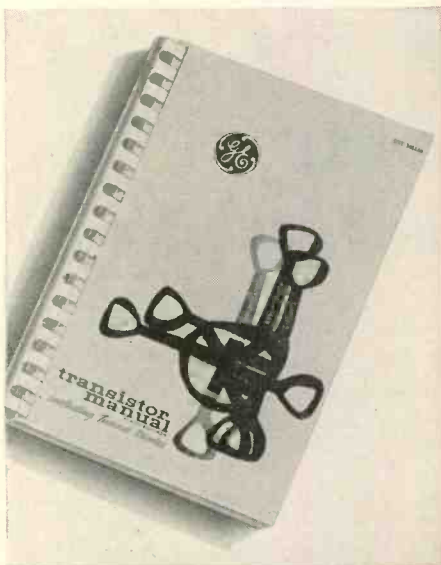
brightness, without exceeding the voltage requirements. Model CB-1 is an economically priced brightener for a color picture tube with a fixed voltage output. Dept. ET, CBC Electronics Co., 2601 N. Howard St., Philadelphia 33, Pa.

For more data, circle 9-68-4 on coupon, p. 41

### Pearce-Simpson 2-WAY RADIOS

Developed to offer small boat owners premium performance, the new Marathon 30 has the following specifications: transmitter power, 30 watts; channels, 5, pre-tuned, crystal controlled, plus broadcast reception; frequency tolerance, .005% (with the firm's crystals); frequency range, 2000 kc to 3000 kc; modulators, 100% max.; ship's supply voltage, 12v d-c; cabinet, unbreakable implex; size, 9½"W, 13"D, 5¾"H; weight, 11 lbs. Pearce-Simpson, Inc., 1385 N.W. 27th Ave., Miami 35, Fla.

For more data, circle 9-68-3 on coupon, p. 41



#### Transistor Manual

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

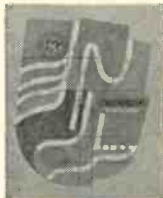
#### Tunnel Diode Manual

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

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General Electric Co., Semiconductor Products Department, Section 22J103, Electronics Park, Syracuse, New York.

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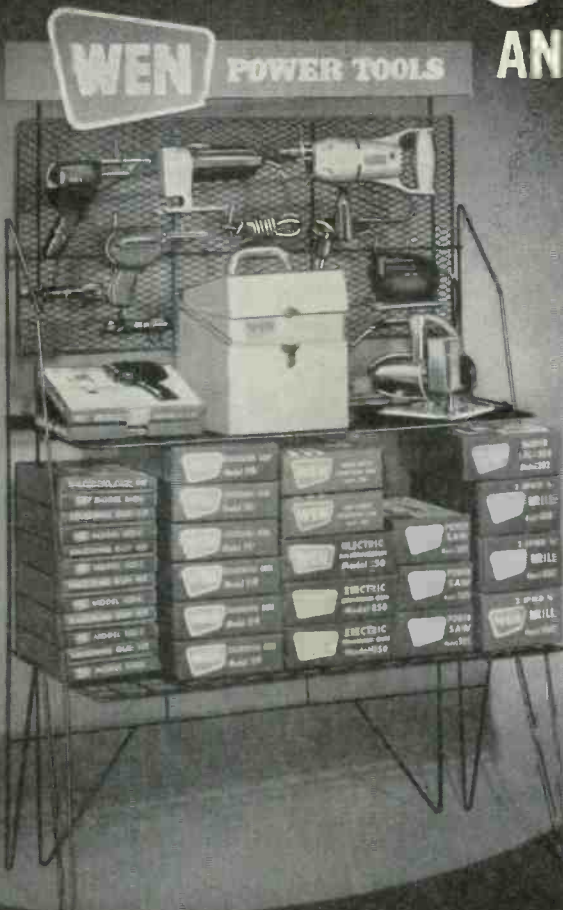
- G-E Transistor Manual. I enclose \$1.00 (no stamps, please)  
 G-E Tunnel Diode Manual. I enclose \$1.00  
 1961 G-E Semiconductor Full Line Bulletin. Free.

Name \_\_\_\_\_

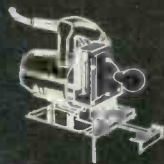
Address \_\_\_\_\_

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

# STOP AND SHOP



Look for this convenient display at your Electronic Parts Distributor (listed in the column at right). A full assortment of famous WEN power tools awaits your inspection. Step up to WEN quality—factory guaranteed to perform to professional standards.



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Lightweight and extremely versatile! Easily cuts 2 x 4's and fine scrollwork in any shape. Cuts wood, steel, wallboard, plastic, leather—anything normal, cut with any saw. Powerful UL Approved motor. \$26.95.



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No other drill like it! Big 3/4" geared chuck—2 speeds. Change from 1800 RPM (heavy duty) to 3000 RPM (delicate work) in seconds. 2 ball thrust bearings... oversize ball bearings. Drill, cut, sand, grind, wire brush, mix paint—you name it. Most versatile tool in your workshop. \$29.95.



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FINEST  
SANDERS**



Choose from 3 models—all straight-line fine-finish types... all with plenty of power. Perfect for 3-finishing and new wood work. Never a scratch to mar a good surface. 14,400 strokes per minute by sanding surfaces up to 21 sq. in. \$13.95 to \$19.95.

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- Long Beach, Larry Lynde
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- Radio Products Sales, Inc.
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- North Hollywood Arrow Sales, Inc.
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- Oakland, Brill Audio Products
- Oxnard, Warsco Sales Co.
- Paramount, Elwyn W. Ley Co.
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- Riverside, Electronic Emporium Corp.
- Sacramento, Lombard's Electronics
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- Oak Park, Melvin Electronics, Inc.
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- Radio Distributing Co.
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- Sioux City, Duke's Radio Co.
- Molstad Distributing Co.
- Ottumwa, York Radio and Television
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- Lafayette, Electro Technical Labs
- Lake Charles, Wholesale Radio Equipment, Inc.
- New Orleans, Walther Bros. Co., Inc.
- Radio Parts Inc.
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- MASS., Lawrence, Alco Electronics
- MD., Baltimore, Revacto of Maryland, Inc.
- Silver Spring, Silver Spring Electronic Supply
- MICH., Detroit, Electronic Parts Co.
- MISS., Greenville, Delta Electronics Supplies, Inc.
- Pascagoula, Mays Electronics Supply
- MO., Hannibal, York Radio and Television
- Jefferson City, York Radio and Television
- Joplin, Russell Belden Electric Co.
- Kansas City, Walters Radio Supply, Inc.
- NEBR., Omaha, Omaha Electronics Co.
- N.H., Laconia, Laconia Electric Co.
- Nashua, Gate City Electric Co.
- N.Y., Albany, Seiden Sound, Inc.
- Binghamton, Stank Electronics, Inc.
- Bronx, W. Bergman Co., Inc.
- Buffalo, W. Bergman Co., Inc.
- Radio Equipment Corp.
- Hempstead, Standard Parts Corp.
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- Syracuse, Morris Electronics of Syracuse, Inc.
- Utica, Associated Electronics Supply
- OHIO, Akron, The Sun Radio Co.
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## Business Microwave Systems

(Continued from page 37)

the block diagram Fig. 3. The klystron normally oscillates at the assigned carrier frequency, and is held at that frequency by an electronic or electro-mechanical afc system. When the modulating signals (carriers and tones) are fed to the modulator input, this composite signal varies the carrier frequency of the oscillator to produce an FM signal. This is done electronically by applying the modulator signal to one of the elements of the klystron.

The duplexer permits use of the same antenna for transmitting and receiving. It provides easy passage of the signal from the transmitter to the antenna, but opposes the flow of this signal to the receiver.

The microwave receiver employs a superheterodyne circuit, as shown in block diagram Fig. 4. The incoming signal is amplified by the antenna by the amount of its power

gain and is fed through the duplexer and a filter to the mixer, which may be a crystal detector. This signal is mixed with a signal generated by the local oscillator klystron. The resulting i-f beat is amplified, limited and demodulated as in any conventional FM receiver. The bandwidth of the i-f amplifier must be broad to accommodate the intercepted broadband signal. The local oscillator is kept on frequency by an afc circuit. The demodulated output is fed to the receivers of the carrier terminals and to the tone receivers.

Different techniques for achieving the same end results are employed by various equipment manufacturers.

The technician who is to service microwave equipment must become familiar with wave guide, klystron tubes, cavities and ferrite isolators. Otherwise, the same basic circuits are used as in other electronic equipment. Specialized test equipment is required to facilitate measurement of transmitter frequency and power output.

In these two bands, power output

is limited to 5 watts, much more than actually needed or delivered by commercially available equipment. In pulsed systems, the peak power output may be as high as 25 watts. Transmitter center frequency must be kept within  $\pm 0.05\%$  of the assigned frequency. This means that the center frequency of a transmitter operating on 12,500 Mc must be held within  $\pm 6.25$  Mc.

To meet the anticipated demand for business microwave systems, broadband equipment, capable of handling several hundred voice channels, is already being offered by at least four manufacturers. Soon to be on the market are "compact" business microwave systems with smaller channel capacity, which will be lower in cost. •

Special Section

**STEREO 1962**

Starts on page 75

# SO SAFE!



won't damage glass tubing  
let alone wire or cable!

**ARROW STAPLE GUNS** can't damage wire or cable because driving blade automatically stops staple at right height! That's why Arrow Staple Guns are proved safer on jobs all over the country. And Arrow staples have tremendous holding power because they're rosin-coated, have diverging points that lock into wood.

**T-25** (shown) for wires up to  $\frac{1}{4}$ " in diameter. (Hi-Fi wire, radiant heating, bell, thermostat, telephone, inter-com, etc.) tapered striking edge gets into tight corners. Uses  $\frac{3}{8}$ ",  $\frac{1}{2}$ ", and  $\frac{5}{8}$ " staples, List \$15  
**T-25B** For burglar alarm wiring. Drives staples flush . . . List \$15  
**T-75** For non-metallic sheathed cable, Romex cable or any other object (such as copper tubing) up to  $\frac{1}{2}$ " in diameter. Uses  $\frac{3}{8}$ ",  $\frac{1}{2}$ ", and  $\frac{5}{8}$ " Arrow staples . . . . . List \$15

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For more data, circle 9-70-1 on coupon, p. 41

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For more data, circle 9-70-2 on coupon, p. 41

**ELECTRONIC TECHNICIAN • September, 1961**





## TO LEARN ABOUT THE 1962 ALL-TRANSISTOR CAR RADIOS AT THE DELCO RADIO NEW PRODUCT CLINIC

Very soon now the Delco Radio New Product Clinic will be in your area. It offers you and your employees the opportunity to become familiar with the all-new, all-transistor radios for the 1962 General Motors cars. ■ The Delco Training Course offered includes a wealth of information—transistor fundamentals plus the testing and servicing of 1962 Delco Radio all-transistor circuits. It requires only two hours and is tuition-free. ■ The date this clinic will appear in your area is an important one! Circle it on the list below, and make it a "must"—because this course will mean extra profits for you, especially when servicing the all-transistor radios for the 1962 models. We look forward to seeing you. Contact your Delco electronics parts supplier for further information.

### DELCO RADIO ELECTRONICS SCHOOL SCHEDULE

School Dates	CITY	School Dates	CITY	School Dates	CITY	School Dates	CITY
Sept. 11	Indianapolis, Ind.	Oct. 2	Union, N. J. Toledo, Ohio	Oct. 16	Portland, Ore. Amarillo, Tex.	Nov. 1	Rochester, N. Y. Mason City, Iowa
Sept. 18	Harrisburg, Pa. Grand Rapids, Mich. South Bend, Ind. Denver, Colo. Shreveport, La.		Birmingham, Ala. Milwaukee, Wis. Los Angeles, Cal. San Antonio, Tex.	Oct. 18	Boston, Mass. Columbus, Ohio Chattanooga, Tenn. Moorhead, Minn. Seattle, Wash. Oklahoma City, Okla.	Nov. 6	Syracuse, N. Y. Jacksonville, Fla.
Sept. 20	Philadelphia, Pa. Marion, Ind. Nashville, Tenn. Chicago, Ill. Cheyenne, Wyo. Dallas, Tex.	Oct. 4	Tarrytown, N. Y. Detroit, Mich. Atlanta, Ga. Green Bay, Wis. San Diego, Cal. Corpus Christi, Tex.	Oct. 23	Youngstown, Ohio Charlotte, N. C. Sioux Falls, S. D. Spokane, Wash. Wichita, Kan.	Nov. 8	Albany, N. Y. Tampa, Fla. Long Beach, Cal. El Paso, Tex.
Sept. 25	Wilkes-Barre, Pa. Louisville, Ky. Memphis, Tenn. Davenport, Iowa Salt Lake City, Utah Houston, Tex.	Oct. 9	Hempstead, L. I., N. Y. Fresno, Cal. Midland, Tex.	Oct. 25	Pittsburgh, Pa. Durham, N. C. Omaha, Neb. Kansas City, Kan.	Nov. 13	Dayton, O. Miami, Fla. Decatur, Ill. Tucson, Ariz.
Sept. 27	Cincinnati, Ohio Little Rock, Ark. Madison, Wis. Beaumont, Tex.	Oct. 11	Wallingford, Conn. San Francisco, Cal. Lubbock, Tex.	Oct. 30	Buffalo, N. Y. Altoona, Pa. Greenville, S. C. Des Moines, Iowa	Nov. 15	Huntington, W. Va. St. Louis, Mo. Sacramento, Cal. Phoenix, Ariz.
		Oct. 16	Providence, R. I. Cleveland, Ohio Minneapolis, Minn.			Nov. 16	Mobile, Ala.
						Nov. 20	New Orleans, La.
						Nov. 27	Washington, D. C.
						Nov. 29	Richmond, Va.

### Brand new! Delco's electronically filtered power supply



Every car radio service shop needs this new Delco power supply! Plugs into 110-volt outlet, converts power to 6 or 12 volts to facilitate bench servicing without batteries. Features: Output 0-8V DC, 0-16V DC ■ Rating 8a at 6V, 5a at 12V ■ Maximum instantaneous current 20a ■ Maximum ripple .01% ■ No LC filter, instant response ■ Light, portable ■ Rugged—3 Delco power transistors ■ Best for transistor radios ■ Also operates "Wonder Bar" tuners at 12 volts.

**DELCO**  
DEPENDABILITY  
**RADIO**  
RELIABILITY

Division of General Motors,  
Kokomo, Indiana

SEE IT DEMONSTRATED AT YOUR LOCAL DELCO SERVICE SCHOOL!

## Oscilloscope

(Continued from page 35)

control set at zero, the trace is positioned exactly in the center of the screen. The gain control is then advanced toward maximum. If the horizontal amplifier is not distorting the trace will spread out equally on both sides of the center line. If the amplifier is distorting, one side will spread faster than the other. When it is determined the amplifier is distorting, the same signal tracing procedure employed for the vertical amplifier may be used to locate the defective component.

In addition to the sections already mentioned, most 'scopes also contain a blanking amplifier and a sync amplifier. However, when a defect appears in either of these amplifiers it is quite evident where the defect lies. Voltage and resistance measurements will quickly disclose the trouble. •

### G-E TUBE CADDY

The first plastic service case, reported to be the toughest in the industry, is made of "Royalite" plastic and has no covering to wear, rip or tear. Weight, about 8 lbs., said to be about 4 lbs. lighter than most cases of comparable capacity. Has two hinged top sections, fitted with "egg-crate" type separators, which hold a total of 152 miniature and 90 octal "GT" type tubes. Snap-down curtains cover each section and feature pockets for tools, etc. Base compartment holds 65 large glass type tubes or a VOM and other relatively large tools. Size, 22"L, 15"H, 9"W. General Electric Co., Electronic Components Div., Owensboro, Ky.

For more data, circle 9-72-3 on coupon, p. 41

### B&K TUBE INFORMATION SERVICE

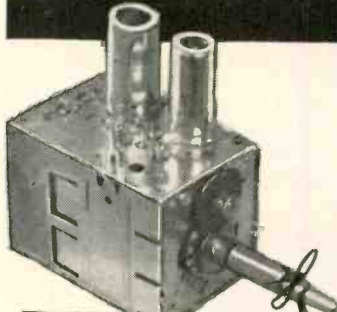
To keep owners of B&K cathode rejuvenator testers completely current, the firm announces a twice-yearly picture tube chart information service covering past and present B&K CRT models. These new charts, complete in themselves, cover all picture tube types commonly used in TV receivers including new types as information becomes available. The charts are mailed in May and November. The charge is \$1.00 for a one year subscription, cash in advance. Subscriptions with payment should be sent to B&K Mfg. Co., 1801 W. Belle Plaine Ave., Chicago 13, Ill.

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## TV TUNER OVERHAUL

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48 Hours most Others

### VHF TUNERS • UHF TUNERS • UV Combinations\*

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

### NOW ALSO IN THE EAST

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



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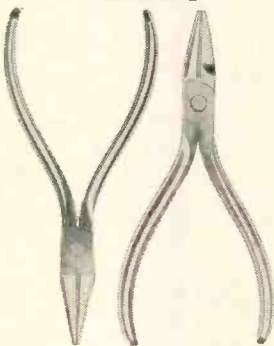
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3BN6	1.20	6AW8A	1.42	6DT6	.86	12DQ6B	1.70
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3CB6	.90	6BA5	.80	6J6	1.12	12SK7	1.42
3DT6	.88	6BC5	.94	6K6GT	.94	12SN7GTA	1.08
3V4	.94	6BQ6A	2.60	6SA4	.82	12SQ7	1.32
4BQ7A	1.60	6BH6	1.08	6SK7	1.42	25BQ6GTB	1.84
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5CB3	.82	6BN6	1.00	6U8A	1.32	35W4	.56
5CL8A	1.26	6BN6	1.20	6V6GT	.86	35Z6GT	.74
5U4GB	.84	6BQ6A	1.74	6W4GT	.96	59C5	.86
5X3	1.30	6BZ6	1.36	6W6GT	1.12	50L6GT	.96
5Y3GT	.70	6BZ6	.90	6X5GT	.82	117Z3	1.00
6AB4	.86	6BZ7	1.40	6X8A	1.26		
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## New Books

**STEREOPHONIC SOUND.** By Norman H. Crowhurst. Published by John F. Rider Publisher, Inc. 144 pages, soft cover. \$2.90.

This is the second up-dated edition of a volume originally written in 1957 when stereo was in its infancy. As in the earlier edition, the text begins with the basics of binaural listening. Included in this coverage are topics on learning to hear, selective hearing, reverberation and realistic sound, to mention a few. The writer explains stereo sound fundamentals, how sound waves travel, what transients are and why they are needed. Systems for home installations are then outlined. These include two and three channel stereo systems, stereosonic, the M-S system, and the coded single-channel stereo system. Operation of stereophonic radio, disc recording, tape and many other possible applications of stereo are examined. The two chapters presenting stereo systems for the home and practical home stereo will clear up a large amount of the present distortion, confusion, and fantasy existing in the minds of many audiophiles, students, technicians and prospective stereo purchasers. Written by one of the world's outstanding audio authorities, this guide to stereo should interest all persons concerned with the electronic theory and practical aspects of this comparatively new entertainment medium.

**ELECTRICAL PRINCIPLES OF ELECTRONICS.** By Angelo C. Gillis. Published by McGraw-Hill Book Co., Inc. 534 pages, hard cover. \$10.00.

Fundamental laws and principles of d-c and a-c electricity, component and circuit characteristics, are thoroughly covered in this book. The first chapter on "Principles of Electron Physics," lays a firm foundation for a better understanding of following chapter content. Factors affecting d-c current flow, series, parallel and complex d-c circuits are fully explored. Principles of magnetism, and characteristics of inductance and capacitance are analyzed. Electrical measuring instrument fundamentals are reviewed. Alternating current and a-c circuits are approached smoothly through a generous analysis of sine wave characteristics. Series and parallel circuits with sine-wave inputs, and series and parallel circuit fundamentals are discussed. Resonant and non resonant transformers, attenuators and pads, are covered in subsequent chapters. Passive filter networks, waveform analysis of various circuits, including series-RC, series-RL, and combined networks, are explored in a comprehensive manner. Problems appear at

(Continued on page 74)

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TRANSISTOR & AUTO RADIOS

# RIDER BOOKS

**CITIZENS BAND RADIO** by Allen Lytel. The tremendous amount of Citizens Band equipment now being used by the public spells a profitable market for the service technician. This book is an excellent introduction to citizens band radio equipment for the technician who must repair and maintain it. It provides all the information that will make you thoroughly familiar with CB. Early chapters describe the historical development of citizens band radio, its applications, classifications and types of CB equipment. FCC Rules and Regulations are discussed. Design features of different types of transmitting and receiving equipment are compared, with emphasis on single-channel and multi-channel transceivers and receivers. Portable units, kits and standard transceivers, antennas and power supplies are covered. Separate chapters are devoted to the installation and repair of citizens band radio equipment. #273, \$3.90.

**REPAIRING TRANSISTOR RADIOS** by S. Libes (Dir. Technical Publ., Bogen-Presto). Provides practical procedures which you can apply to faster troubleshooting and to finding those elusive "dog troubles." Basic theory is presented in a way that you will understand easily, quickly. Operation and service of the latest transistorized circuit designs are covered. All new ideas about transistors as used in current transistor radios are explained. Also included are the latest design practices in transistor portables, AM, multi-band, imported, all-transistor, auto-hybrid and FM radio receivers. High power transistorized P.A. power amplifiers and high fidelity applications covered. #270, \$3.50.

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(Continued from page 73)

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**TV REPAIR SIMPLIFIED.** By Jess E. Dines. Published by Arco Publishing Co., Inc., 480 Lexington Ave., N. Y. C. 144 pages, hard cover. \$2.50.

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# STEREO STEREO 1962

- **TECHNICAL ARTICLES**

Stereo Records • Phono Cartridges • Stereo Tape

Stereo Amplifiers • Changers/Turntables

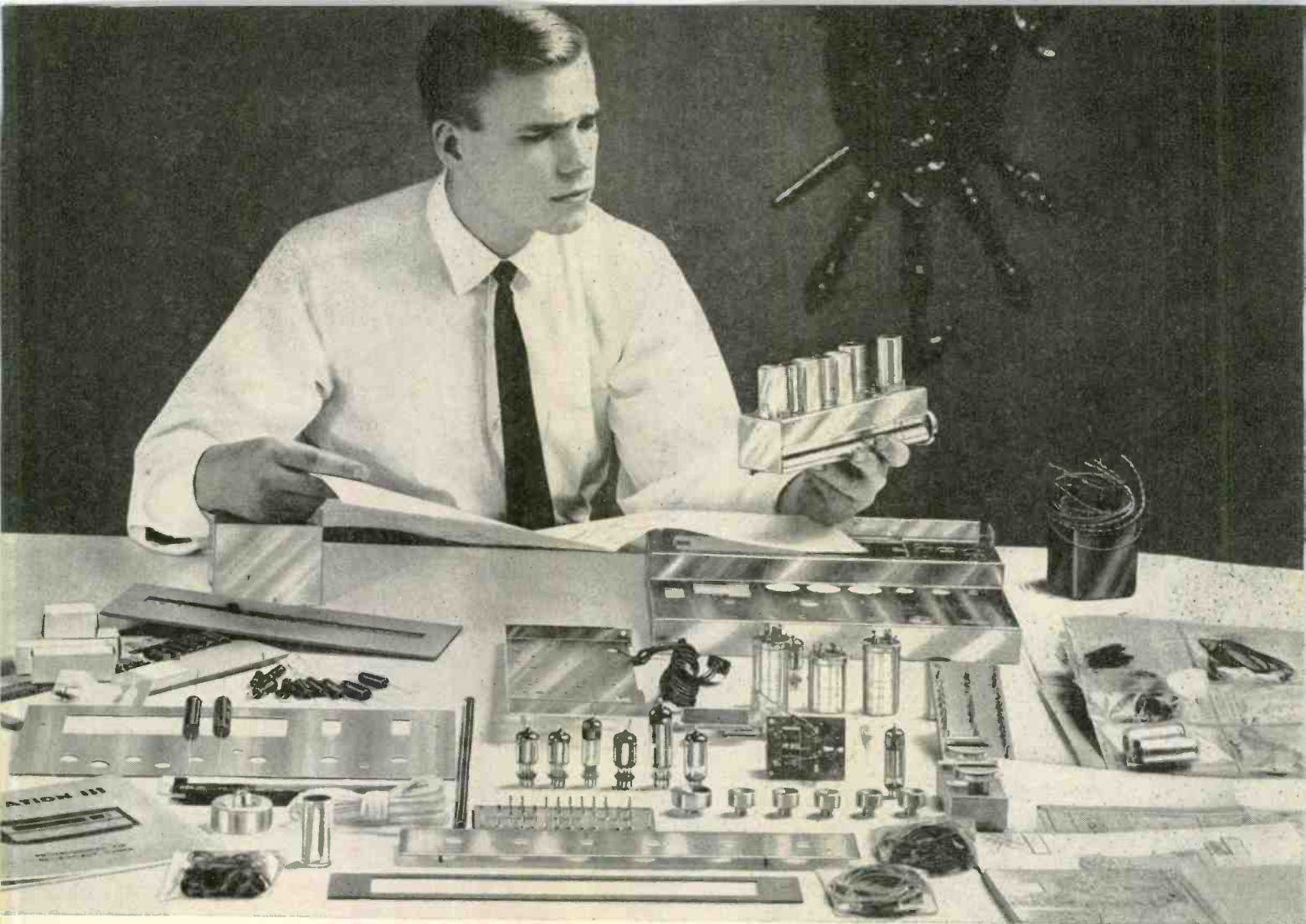
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# STEREO 1962

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**ALBERT J. FORMAN**  
*Editor*

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# How Stereo Components Work

• It may seem oversimplified to say that stereo sound production is achieved by just doubling monophonic components, but, essentially, this is how it's accomplished. Two individual channels are employed whose separate audio waves combine in the listening area to simulate varied sound point sources. Thus, the "live" feeling projected by stereo equipment is, in reality, a psycho-acoustic phenomenon.

Sure there are differences between one-channel and two-channel equipment. But they are generally surface differences, such as added controls to simplify operation combining two amplifiers on one chassis with a common power supply, etc. While they add to convenience, lower price, and fidelity—all essential ingredients—the *major* difference between mono and stereo equipment is in their source equipment: phono cartridge, tape heads, and FM multiplex.

## STEREO RECORDS

Just as source equipment differs, source material also differs. This isn't surprising since both complement each other.

The most popular stereo source material is the stereo record. Though it appears identical to a "regular" hi-fi disc, the *stereo* hi-fi disc is decidedly different. The difference is in the record grooves.

Whereas mono record grooves' center lines shift (causing the phono cartridge needle to move laterally), stereo grooves' center lines shift *and* have varied groove widths (causing a phono needle to move vertically. A combination of both causes a diagonal vertical-lateral motion).

The basis of the single-needle, single-cartridge stereo disc system is the vertical-lateral motion it lends to the phono needle. The

movement is in a diagonal 45° plane, as opposed to a mono record's lateral 180°.

The left channel modulation is impressed on the inner wall of the record groove, as viewed by the user; the outer wall holds the right channel information. Thus, the amount of the left wall's thickness will cause the phono needle to be pushed up towards the right or down towards the left. Conversely, the right wall's thickness results in an up towards the left or down towards the right motion.

The stylus tip is *always* touching both groove walls and in the groove's center. Though a left wall and right wall of a record groove has been described, both channels are obviously recorded at the same time. The stylus' immediate position is determined by the combined left and right groove wall areas. Similarly, both channels are played

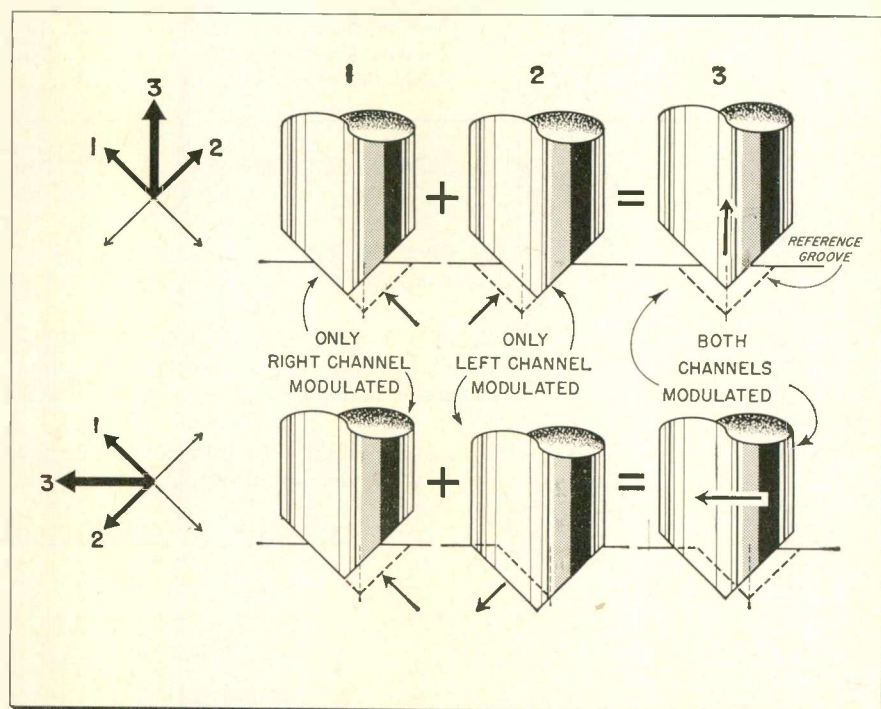
back by the cartridge at the same time.

When the left wall and right wall are equally thicker than their reference thicknesses, a phono stylus is pushed up. The actual position of the stylus is determined by the vector forces exerted by the combination of the left and right walls of a groove. Here the stylus is pinched upwards. Expanded groove walls make the stylus fall lower than usual.

Equal combination forces can make the stylus move laterally, too, either towards the right or left.

It's unlikely that wall forces will always be equal, however. Frequently, one channel is stronger than another, which will shift the sound source to either left or right. As you can imagine, an almost infinite number of resultant forces can occur, resulting in sounds that seemingly originate in different

The immediate position of a phono needle tracing a stereo record groove is determined by a resultant force. This force is a result of left and right groove forces combining. Thus, the actual instantaneous position of a stylus is the #3 position shown here.





areas of the listening room. Therefore, the instantaneous position of a phono needle will vary.

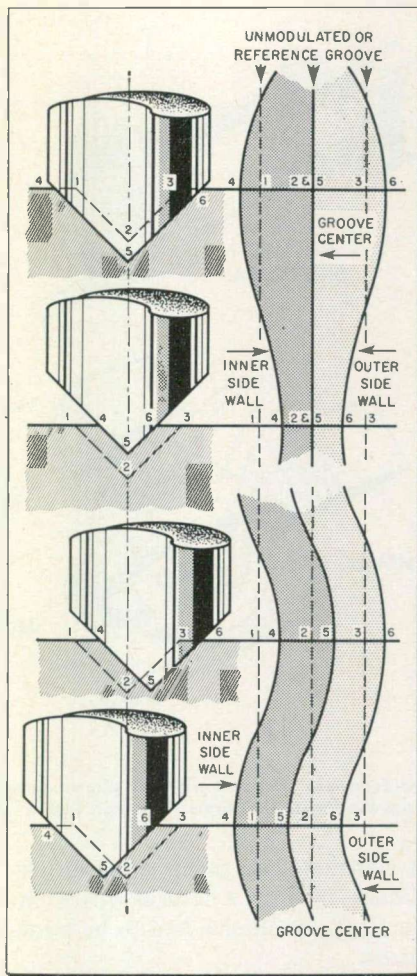
The signal generated by the position of a phono needle is transmitted to its cartridge elements. This intelligence is transmitted to a cartridge's two internal elements simultaneously, not separately. Reiterating, the stylus moves due to a combination of two signals which form the shape and relative position of both side walls. Don't confuse this as meaning two independent signals forming two independent sidewalls. If this were the case, the phono stylus would be hanging in mid-air while touching one wall and not the other. Obviously, this is not the case.

### PHONO CARTRIDGES

A stereo cartridge is actually two cartridges in a single cartridge shell with a common needle. While it's easy for most people to understand two amplifiers on a single chassis with common (ganged) controls, the stereo cartridge principle still remains a bit fuzzy. Perhaps this is due to the mechanical aspect of phono cartridges.

Understanding the basics of stereo groove operation previously discussed, you have a headstart on understanding cartridge operation. A stereo cartridge's stylus is displaced according to the pressure exerted upon it by the stereo record's grooves. This stylus movement is transferred to the cartridge's internal elements where it is converted into electrical signals. Here is where the combined forces are separated into two individual signals. The two separate channel electrical signals are transmitted to their respective preamp or amplifier inputs and remain separate until they leave the speakers in the form of mechanical energy.

Perhaps a good rule to remember is: channels combine for mechanical forces and separate for electrical forces. Thus, a cartridge stylus' position is dictated by the combined mechanical pressures of a stereo groove's walls. The resultant forces on each of the two elements inside a cartridge are instantaneous ones, which may be different or the same, depending upon the immediate stylus position. The cartridge elements' outputs, however,

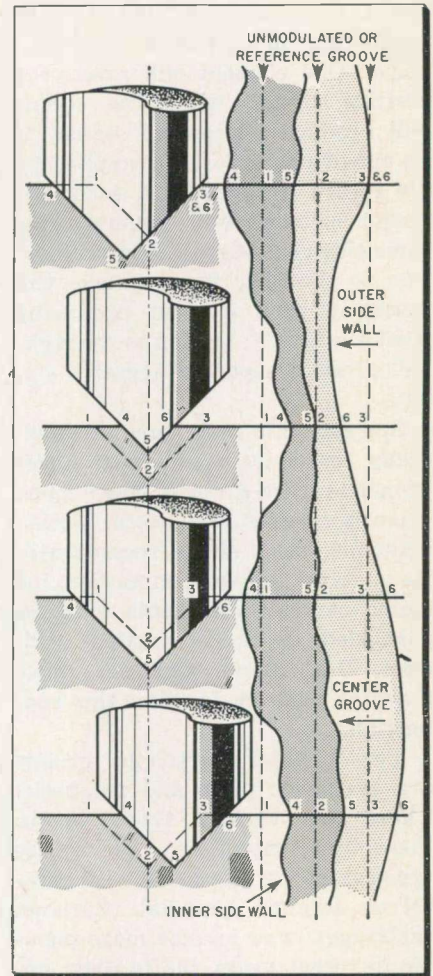


Expanded grooves (grooves cut wider than the reference width) make a stylus fall; pinched grooves make a stylus rise. The straight center line in the first two drawings indicate no lateral motion. The next two drawings' curved line indicates lateral motion. Stylus here doesn't move up or down because groove reference width is maintained.

consist of decidedly *separate* electrical impulses.

As you can see, phono cartridges are converters. That is, mechanical energy is converted to electrical energy. The groove pressure causing stylus displacement, and therefore pressure or position of the cartridge's internal elements, can be an in-phase or out-of-phase force. An up or down stylus position will result from in-phase force; a left or right position will result from out-of-phase force.

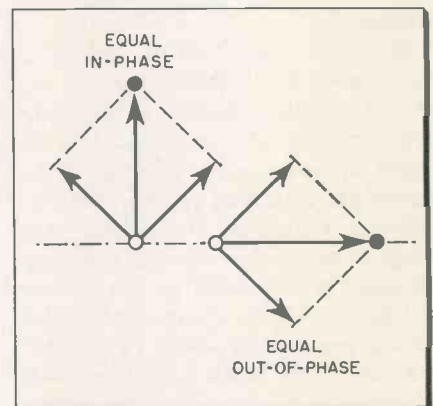
The electrical phase of signals generated by these mechanical forces are opposite to their mechanical force phases. This is accomplished because vertical groove modulation incurs more problems than horizontal groove modulation. Therefore, the leads of one of the record groove cutter coils are reversed, resulting in a lateral cut when forces are in-phase. Inverting



When simultaneous signals from each groove wall creates lateral and vertical forces, their combined effect establishes the phono needle's immediate position. Side wall forces vary from instant-to-instant. Thus, a needle's position will also vary from instant-to-instant in a normally complex groove. The first drawing here shows a stylus displaced down-to-the-left.

the electrical signals reinstates the correct polarity. For example, upward motion of a stylus, which is an in-phase mechanical force, will

Equal in-phase mechanical forces move a stylus up or down. Out-of-phase forces, on the other hand, move a stylus left or right. To overcome inherent problems of vertical motion, however, in-phase forces are reproduced by a cartridge with lateral motion.



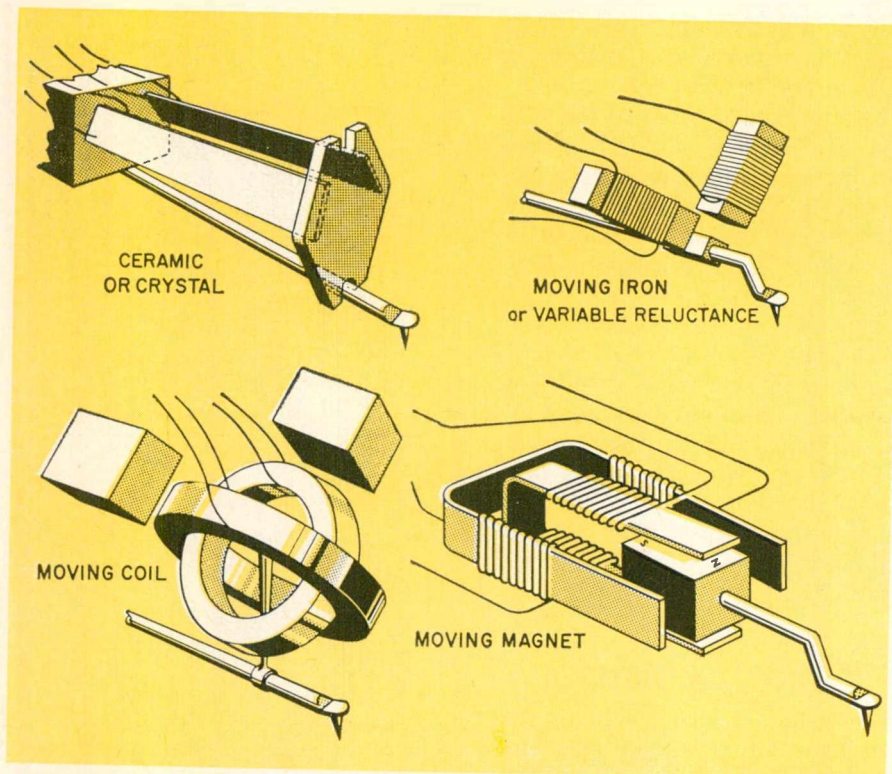
result in each cartridge element producing a different electrical phase. One element will produce a positive signal, while the second will produce a negative signal. If an out-of-phase force is applied by the record groove walls, each cartridge element will generate the same electrical signal. A lateral motion to the left, for instance, will result in each element producing positive signals; motion to the right will produce separate negative signals.

Stereophonic cartridges can generally reproduce sound from stereo or mono record grooves. Since mono grooves operate on a lateral motion principle, while stereo records utilize a lateral and vertical motion, the stereo cartridge elements must be paralleled to cancel vertical voltages. Most stereo amplifiers have a switch position to effect this connection.

Two popular cartridge groups are available: piezo and magnetic. There are various types within these two groupings. The piezo type cartridges are made with crystal or ceramic material. Ceramic cartridges have become more popular in recent years due to their imperviousness to moisture and wider and flatter frequency response. Their high voltage outputs don't require preamplifiers. Consequently they are widely used with lower cost stereo phonographs. Magnetic cartridges, however, still reign the cartridge roost for stereo high fidelity components. Some ceramic manufacturers include magnetic adapters to permit using these piezo cartridges in magnetic inputs.

Magnetic cartridges are made in three different types: moving iron (variable reluctance), which was the first magnetic cartridge introduced in the middle 1940's, moving coil, and moving magnet cartridges.

By their very nature, magnetic cartridges lend themselves to excellent quality control during manufacture. Thus, operational differences between same models produced are minimal. Another advantage of magnetic cartridges over piezo types is in their higher compliance, which results in lighter tracking weight. Stereo cartridge-stylus assemblies must be compliant in both lateral and vertical directions. Monophonic cartridges,



The four most popular types of phono cartridges are shown here—one piezo type and three magnetic types. The former has high output voltage. Thus, it doesn't require a preamplifier.

in contrast, had to have high compliance in only a lateral direction. Vertical compliance had to be minimized.

Other differences exist between stereo and mono cartridges. Stereo needles (or styli) are not the same size as mono needles. Their diameter is smaller; 0.7 mil diameters are the most popular. Needles with 0.5 mil are made also. However, smaller styli incur unusually light tracking requirements.

Diamond styli have been big sellers in the past few years. Obviously, the public has been made aware of a diamond's permanency when compared with other "jewels" like sapphire. Unfortunately, many people are unaware that diamonds, too, wear out after a while, albeit much slower than other substances.

## STEREO TAPE

Tape is an important factor in the stereo equipment market even though it's still chasing records for the consumer's dollars.

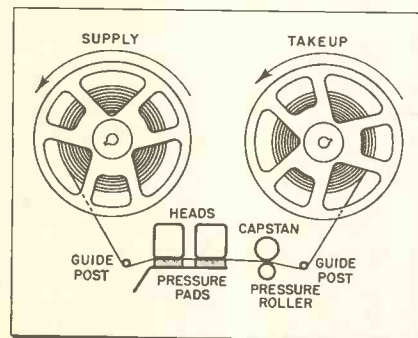
The impact of stereophonic sound first hit the public through tape record/playback equipment. In fact, two-track stereo tape units gained amazing sales momentum in a short period of time until sales were stifled by the introduction of stereo records.

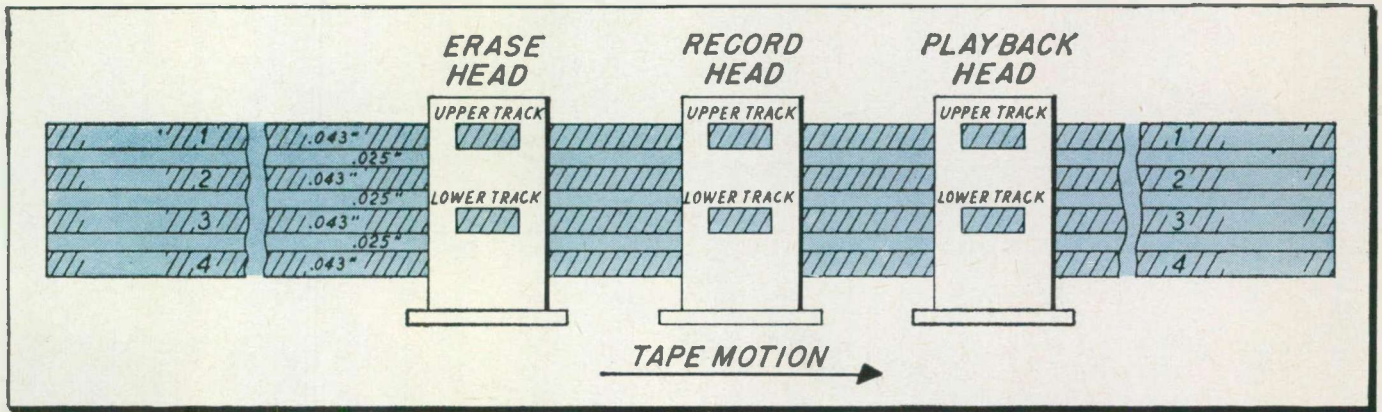
Two-track pre-recorded tape prices were too high to successfully compete with stereo record prices. In 1959, however, development of four-track tape heads and four-track pre-recorded tape manufacture brought about a resurgence of the tape recorder. Tape prices were roughly cut in half by this innovation.

Whereas two track tape carried both stereo channels on the width of the tape, four-track tape carries two two-track channels on the same width. Consequently, the cost of tape is cut in half and the amount of music on a tape is doubled.

Four-track tape heads have two gaps to record or playback two separate channels. So do two-track tape heads. But four-track head widths are smaller. Thus, two *addi-*

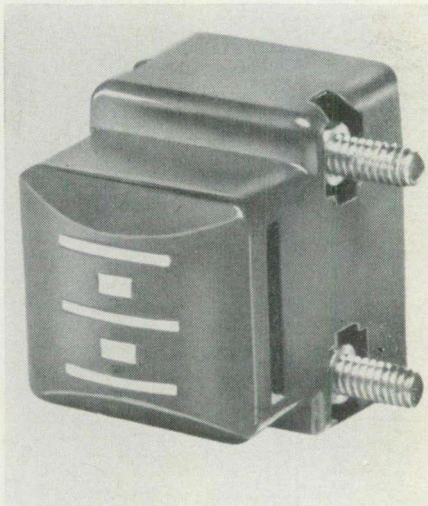
Reel-to-reel tape transport is shown here.





Double playing time is achieved with 4-track tape. When tape is reversed, tracks 4 & 2 are reproduced instead of 1 & 3.

tional channels can move between the tape heads without being played. When the tape is turned over, the two previously unused channels exchange positions with the tape tracks that were in line



A Sonotone RH-4 record/playback tape head.

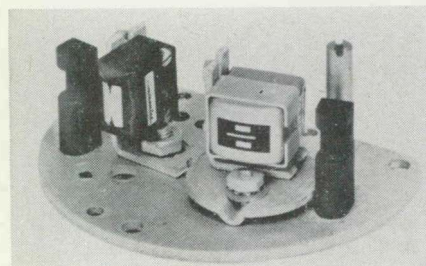
with the gaps. Now they are in line with the head's gaps while the other two tracks move between the gaps. Simple, but it saved the tape market.

Mechanical and electronic equipment used with four-track tape is the same as for two-track tape. This obviously opens up a nice conversion market since there are many two-track sets around to convert to four-track. A strong inducement for the customer to have this done is the double playing time he can get, on the same length of two-track tape, and at much lower pre-recorded tape prices. Conversion kits are available to change over the two-track sets to four-track.

Cartridge tapes and equipment have not been commercially suc-

cessful thus far. Reel-to-reel home tape equipment is still used. Popular speeds are  $7\frac{1}{2}$  and  $3\frac{3}{4}$  ips, with  $1\frac{7}{8}$  ips coming up strong as a non-high fidelity contender.

Tape is not contentedly remaining a secondary unit in a hi-fi system. Tape manufacturers have many things going for them to make tape equipment a primary hi-fi source material device like record equipment. Four-track pre-recorded tape libraries are rapidly expanding. Consequently, tape equipment owners have a much wider selection of source material to choose from. The adoption and broadcasting of FM stereo radio should make the stereo recording facility of tape recorders even more important than it was in the past



Nortronics' R-67 4-track conversion kit.

since owners can now tape stereo records.

Tape manufacturers, however, are approaching the sales market from another angle, too. They are producing tape *players*. That is, tape equipment without a record facility. This step brings down the tape equipment cost within breathing range of record playing equipment in many instances. Some more refined and costlier tape players (though prices are considerably

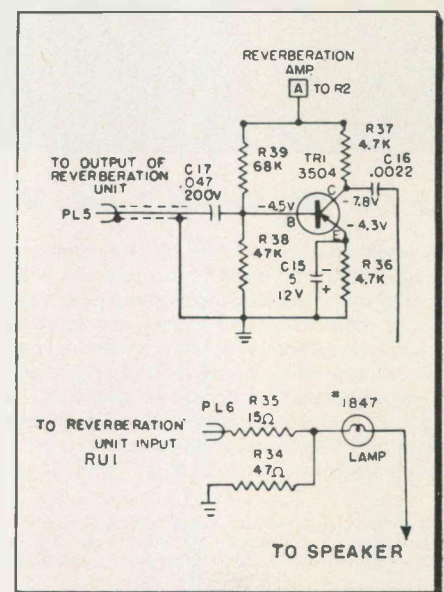
less than play-record units) include provisions for adding record facilities. Thus, tape promises to give records a stronger sales fight.

## STEREO AMPLIFIERS

The introduction of stereophonic sound reproduction has not caused many significant design changes in amplifier or pre-amplifier circuitry.

More switches and controls specifically designed to aid stereo playing; integrating twin amplifier and preamps on one chassis; and the normal course of improvements and new components sum up stereo amp compared to mono amps. Many American tube counterparts of foreign tubes that served especially well in hi-fi sets have been manufactured. Some of these tubes have two numbers, such as ECC 83/12-AX7, EL 84/6BQ5. The first number

Westinghouse uses transistor circuitry in their phono's reverberation system.





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is the foreign manufacturer's one; the second is the American standard stock number.

Most of the controls added for stereo sets are obvious. For example, a balance control is generally included to permit the user to equalize output between each channel's speaker systems. A function switch is generally incorporated with typical switch settings such as: Stereo A, Stereo B, Stereo A+B, Mono Reverse (to reverse channel A and B feed), and sometimes a Phase switch to allow phasing speakers. Some pre-amps also include "Blend" controls. This control takes part of each channel's signal and combines them for a center speaker channel to prevent a "hole-in-the-middle" effect.

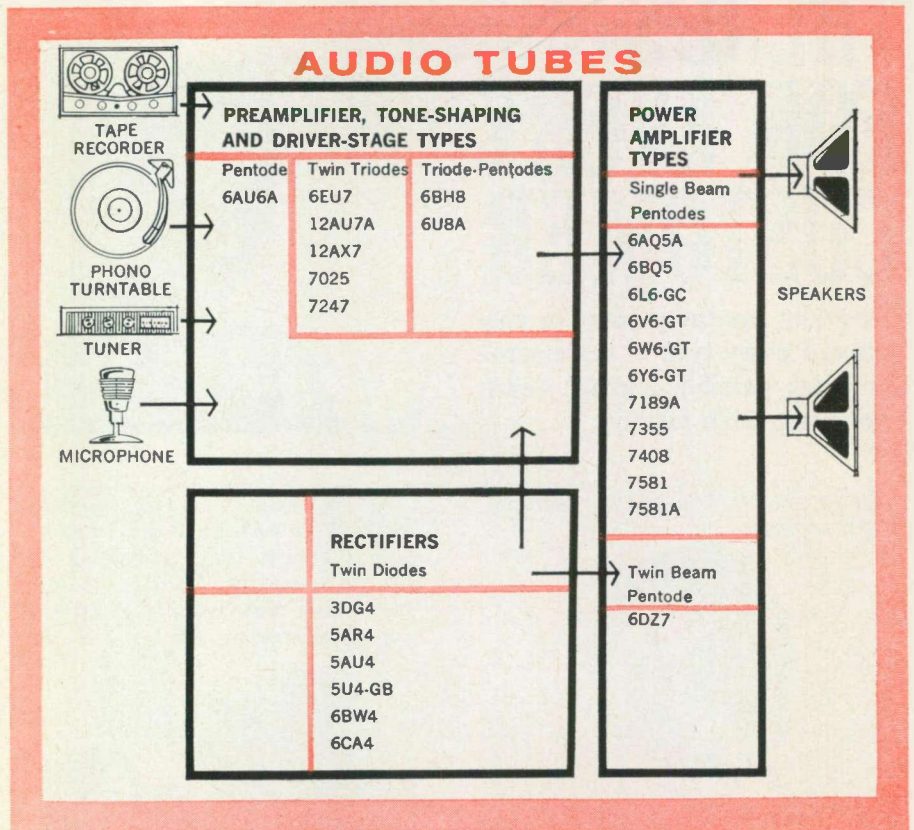
Some novel developments have been introduced, primarily by package phono manufacturers. One of these is reverberation. This innovation uses an electromechanical device that operates in conjunction with supplementary electronic circuits. It permits stereo set users to delay a portion of one of the channel's signals so that its final sound output, together with the other channel's output, produces an echo effect.

In essence, developing a greater echo effect than originally recorded simulates a larger room because the further sound travels the greater the time delay.

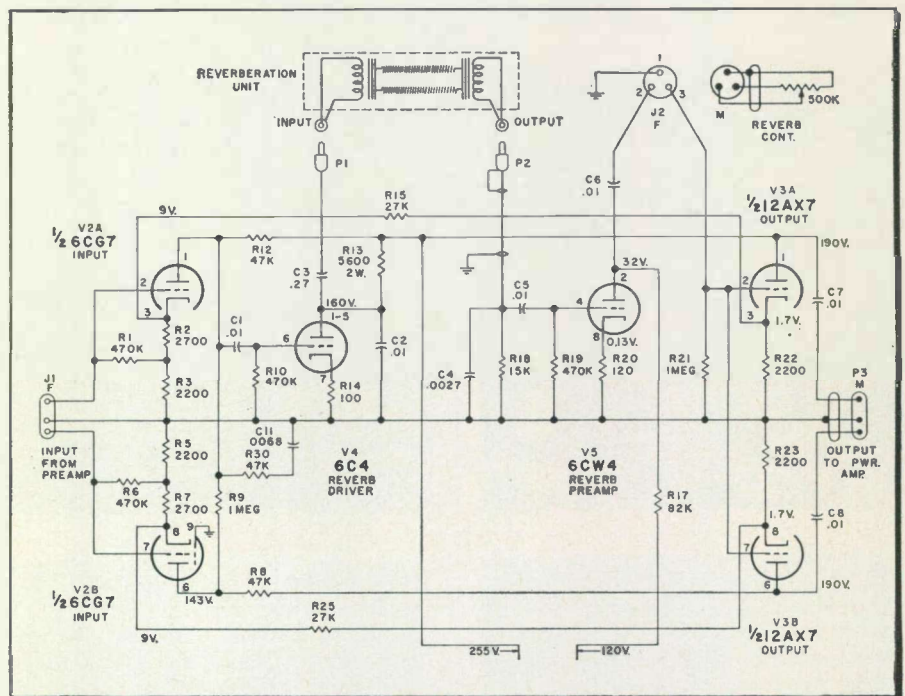
The electro-mechanical sound reverberation unit consists essentially of two ferrite rod transducers and two spring-like delay lines. Mechanical rotation of the springs is created by the driver (input) transducer when a voltage is impressed on its field coil. A more sensitive pickup (output) transducer responds to the rotational motions which pass down the springs. Special design prevents external vibrations from affecting the system.

The driver transducer's impedance is approximately 1500 ohms at 1000 cps. D-c resistance is near 180 ohms. Impedance of the pickup transducer is about 2200 ohms at 100 cps. D-c resistance is also near 180 ohms.

Damping or decay time from inception of the original signal level to 60 db down, is about 2 seconds at 200 cps. A pulse travels the full length of the long spring in 0.037 seconds and through the short



Some popular audio tubes used in preamplifier and amplifier circuits.



RCA's reverb amplifier uses a 6CW4 nuvistor tube to receive pickup coil's output.

spring in 0.029 seconds. Reflections (echos) continue up and down the springs, and gradually die out when reduced 60 db.

A certain amount of the sum signal is fed to the sound reverberation driver from the mixer preamplifier.

The sound reverberation tube actuates the reverberation unit. A second amplifier is required after the unit because of attenuation. Input to this second amplifier can be varied with a manual gain control.

The delayed sum signal at the

# THERE'S ONE FOR EVERY CUSTOMER

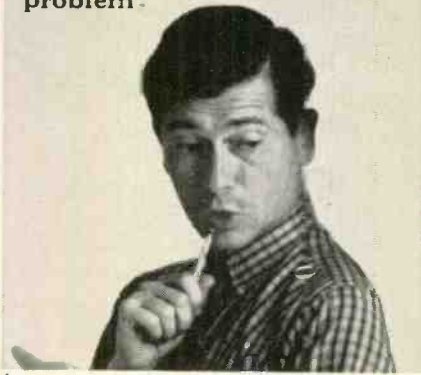
University has the product to help you sell every type of customer—for every possible purpose (even underwater high fidelity).

Lady customer with a decorating flair?



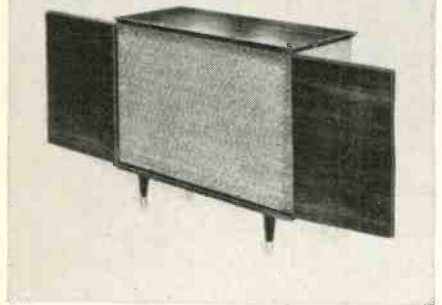
3

For instance. Got a hi-fi enthusiast who's got a space problem?



1

Show him the TMS-2 single cabinet stereo speaker system. Problem solved.



2

Let her see how the Medallion XII offers 5 different grille styles that snap on or off in seconds. (While you're at it, let her husband listen to its amazing sound.) Sold!



4

Is there a customer willing to pay for really big sound, but doesn't want a monster cabinet? Just give him a peek at the new Classic Mark II 3-way speaker system—only 35" wide. That's all the selling you'll have to do.



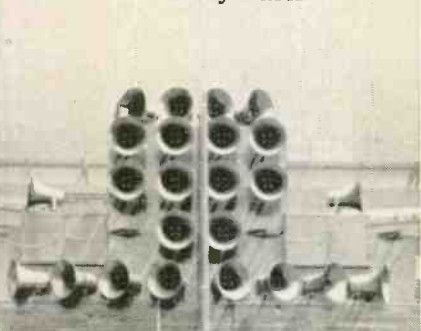
5

Are there patio or pool owners that demand outdoor hi-fi? Show them the University LC Series. They'll be so pleased with the price and the performance they'll invite you to their next barbecue.



6

Got a ball park that needs a super-powered public address system? Try the 4A4 like they did at Comiskey Park.



7

Is there a bridge that needs a total traffic communications system? The Cobraflex trumpet system used on the George Washington Bridge might just be the answer.



8

How about underwater speaker installations? University's got em. Or explosion-proof speakers? Those, too. And sound columns and paging speakers—and well, just too many to mention in this space.



9

We did say microphones? Of course. Dynamic Modular Microphones—with total interchangeability between any basic microphone and all adapters. Ask about them.

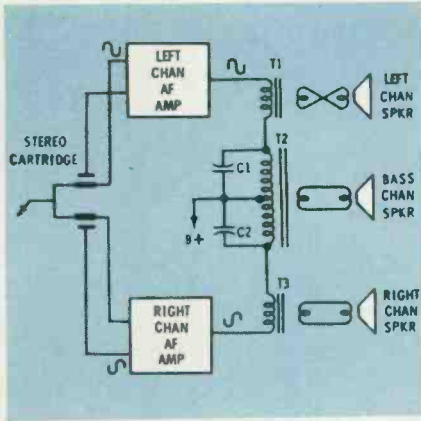


10

As a matter of fact, ask about *all* the University products—stereo speaker systems, hi-fi speakers, outdoor speakers, public address speakers, microphones. There's one for every budget, every customer. Your customer.



University Loudspeakers, Inc., White Plains, N.Y.  
A Division of Ling-Temco Electronics, Inc.



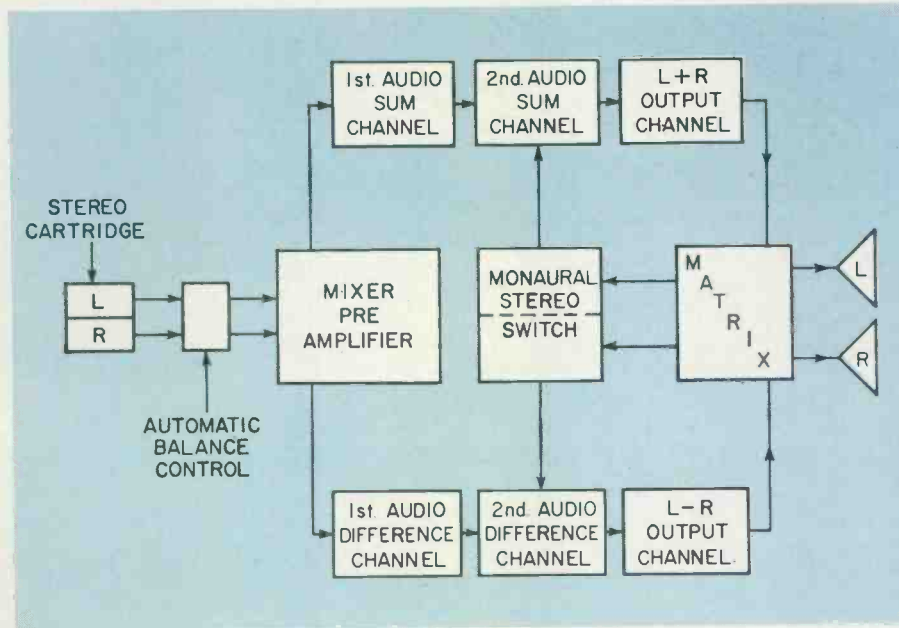
Motorola's multi-channel stereo system transfers both channels' under-400 cps frequencies to a center channel speaker. Operates push-pull for base frequencies.

this facility in stereo sets without this feature.

Package manufacturers, the ones that produce sets ranging from portable phonos to elaborate console stereo models, have introduced other innovations that a service technician may bump into. For example, third channel speakers have been integrated into sets; so have remote control units. Also, audio output stages, called "simplex" circuits among other names, achieve push-pull output with only one tube in-

stead of two tubes. For stereo, this would mean two tubes instead of four tubes.

Yet another innovation by a package manufacturer includes a sum and difference system with a matrix to lower the output of one channel 10 db in the important stereo illusion frequency range of 200 to 5,000 cps and raise the other channel 5 db. In this manner, a 15 db difference is obtained between the two channels to accent the most outstanding stereo illusion frequencies.



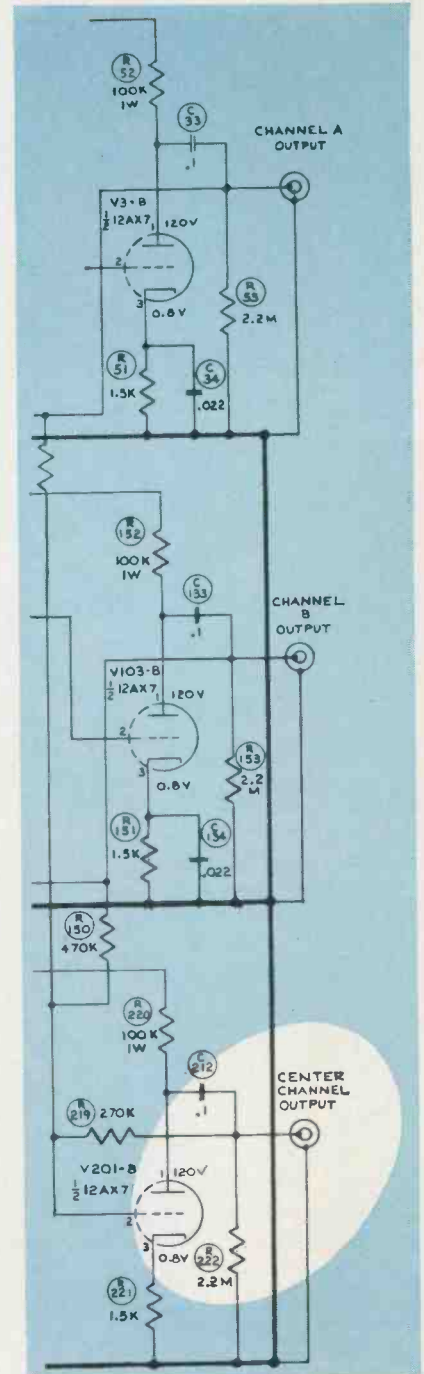
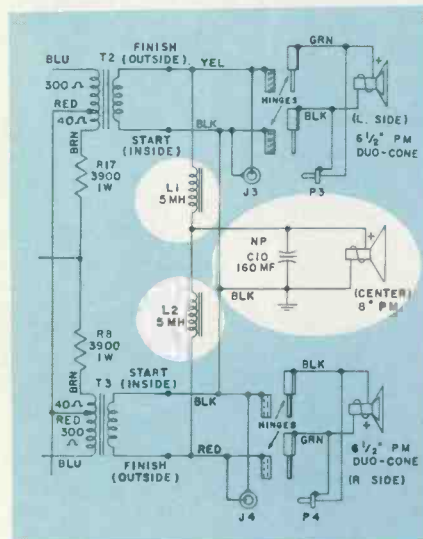
Zenith's "extended stereo system" effects a 15 db output difference between channels for 200-5,000 cps frequencies. (L + R lowered 10 db. L - R raised 5 db.)

second sound reverberation amplifier's output is now fed to the reverberation mixer's grid. At the same time the difference signal from the mixer preamplifier is fed to the reverberation mixer's cathode. The two signals, difference and delayed sum signal, are combined and fed to the first audio difference channel.

Though the electro-mechanical assembly of reverberation systems are essentially the same at this writing (a development of the Hammond Organ Co.) the complementing electronic circuitry may differ, depending upon the manufacturer. (At least one company, however, center taps the reverb unit's input transducer to obtain a monophonic signal for its center channel speaker.)

In addition to integrated reverb units, many manufacturers offer add-on reverb units to incorporate

RCA portable phono uses side speakers to reproduce middle-high frequencies. Low signals are passed by chokes to center speaker. Capacitor C10 further filters highs.



An H.H. Scott stereo hi-fi preamplifier incorporates a center channel speaker output.

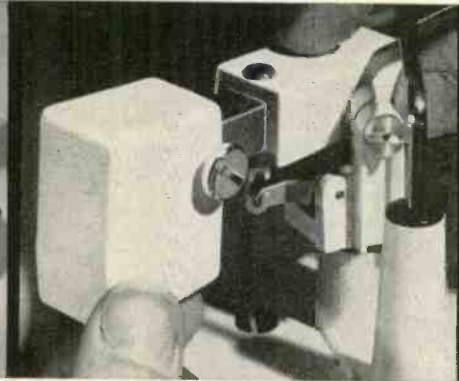
Here very simply is why  
 Garrard's LABORATORY SERIES Type A  
 Automatic Turntable  
 has become America's  
 number one record player  
 in only nine months



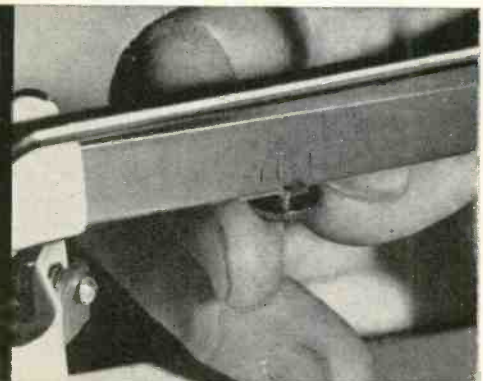
Garrard has combined a dynamically balanced tone arm; a heavy, full-size turntable; a laboratory-balanced precision motor... plus the convenience of the world's finest automatic record-changer (to be used when desired). Each is a precision device comparable to professional equipment of the kind which, up to now, would have had to be bought separately.



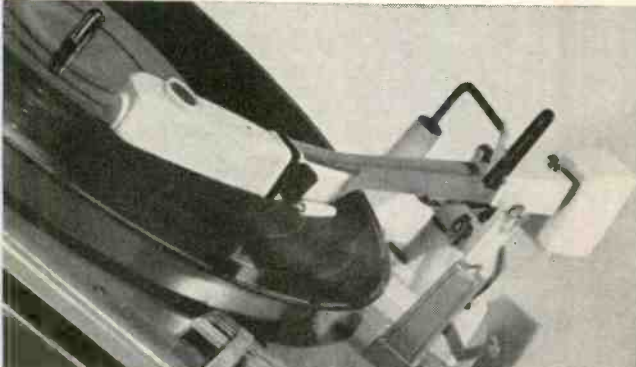
Garrard's Type A Automatic Turntable gives you a true dynamically-balanced tone arm, with the extremely important, heavy adjustable counterweight.



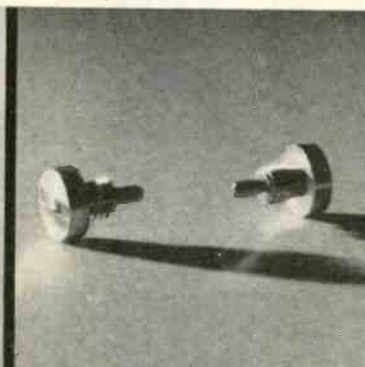
Thus, to adjust the stylus tracking force, you simply move the counterweight until the arm is in perfect balance, at zero pressure.



Then, the scale built into the arm enables you to set the lightest tracking force prescribed for any cartridge, even those labeled "professional."



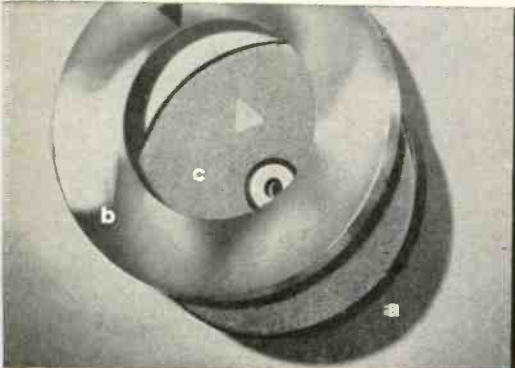
Once balanced and set, the Type A tone arm will track perfectly each side of the stereo groove, even if the record player is intentionally tilted or the record warped.



Perfect performance also requires minimum swing friction... guaranteed by the pair of needle pivots holding the arm.



Another important feature is Type A's non-magnetic turntable... heavy-cast, full-sized, and balanced. Weight: 6 lbs.



Turntable is an exclusive sandwich design, (a) drive turntable inside; (b) heavy, polished, cast metal turntable outside and (c) a resilient foam barrier between.



Driving heart of the Type A is Garrard's Laboratory Series motor with top and bottom shielded by specially designed plates, eliminating any possibility of magnetic hum.



Garrard's exclusive pusher platform record changing mechanism is foolproof... gives the Type A the tremendous convenience of automatic play.

An extravagant concept, yes... but the price of the Garrard Type A Automatic Turntable is exceedingly modest... only \$79.50. For literature, write Dept. GM551, Garrard Sales Corp., Port Washington, New York.

**Garrard**  
 world's finest



## CHANGERS/TURNABLES

Mechanical devices to rotate records haven't basically changed with the introduction of stereophonic records. Motive devices are still the same: record changers, record players and turntables.

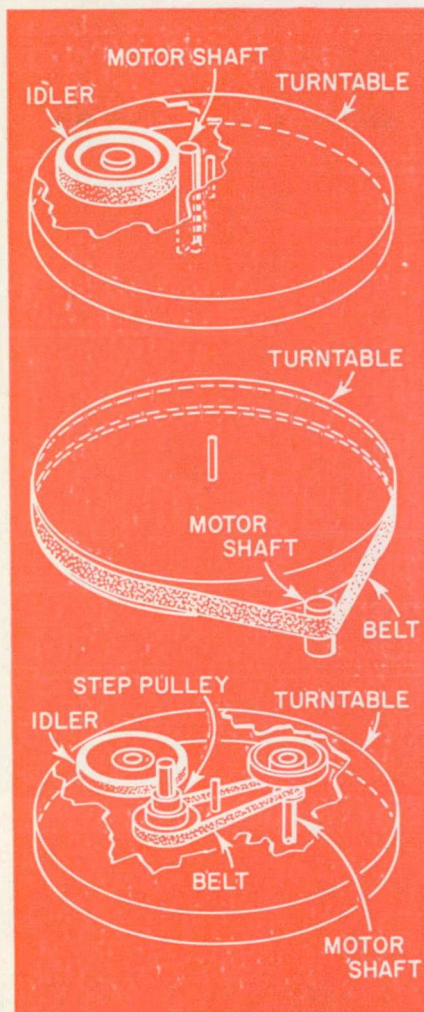
Belt-driven turntable units have become very popular the past few years. They minimize rumble effects transmitted by the motor. However, they don't offer convenient speed changes from 33 $\frac{1}{3}$  to 45 rpm and the like. This isn't as important as it once was, though, since LP discs are the main sources for high fidelity music nowadays. The 45 rpm discs are primarily sold to teenagers.

Record changers generally utilize drive wheels or drive wheel-belt combinations to rotate their turntables. Other variations exist to transfer a motor's rotating power to turntables, too. One player, that is, a type of turntable with a pre-mounted tone arm, uses a gum-like rubber on the motor's shaft which directly turns the turntable.

Record changers offer the convenience of not getting up to change records. The changer manufacturers, however, have equipped their units, in most instances, with manual position controls. Thus, users can use the changers as single play devices if they wish. The result of a single disc playing, as with turntables, is to optimize the rotating speed, cartridge-stylus angle in the record groove, and tracking weight. Since turntables are used solely with single records, they offer lighter tracking weight, and therefore less record wear, than changers can.

Turntables also employ better motors at times. For instance, some turntables offer, at a higher price, hysteresis motors. These motors are especially accurate because their accuracy depends upon the line frequency instead of fairly constant voltage. Some lower priced turntables utilize synchronous motors which are, in effect, clock motors. Combining light aluminum turntables with single disc playing gives smooth speed.

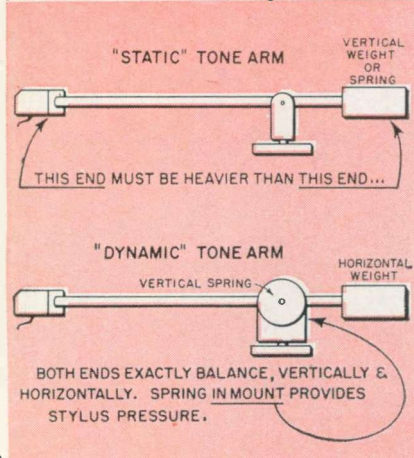
Owners of turntables can often select individual tone arms to support their cartridges. Tone arms are important components. Their job is to transport the phono car-



Some popular drive methods used to transfer motor rotation to record turntables.

tridge-stylus assembly along its merry way in record grooves without contributing anything vocal. They must maintain the cartridge perpendicular in an accurate arc across the record face with minimum friction and with a constant tracking force. Inexpensive changers employ simple springs to pull up the back end of an arm (the

Excellent tracking ability of dynamic-balanced tone arms is due to balancing in two planes.



front end is heavier) until the desired tracking force is obtained. Better changer arms utilize coil springs to secure the same end. Springs lose their resiliency after awhile and may adversely affect record wear if not detected. Separate turntable arms overcame this problem by employing adjustable counterweights at the arm's rear.

The latest tone arm innovation on the market is the dynamically balanced arm. This arm was developed to counteract vibrations that cause cartridges to skip grooves, perhaps chipping the record. A rear counterweight is adjusted on this arm until the arm is balanced on its fulcrum. Then, a spring in the mount is adjusted to provide stylus pressure.

In view of the foregoing, it may be seen that the arm remains balanced whichever way it is turned since the gravitational pull on both ends of the arm will always remain the same. Further, the spring applying the tracking force to maintain the stylus in the record groove (without the spring the stylus would not touch the record) is not influenced by any changes in position. The stylus would continue to track even if the turntable was tilted.

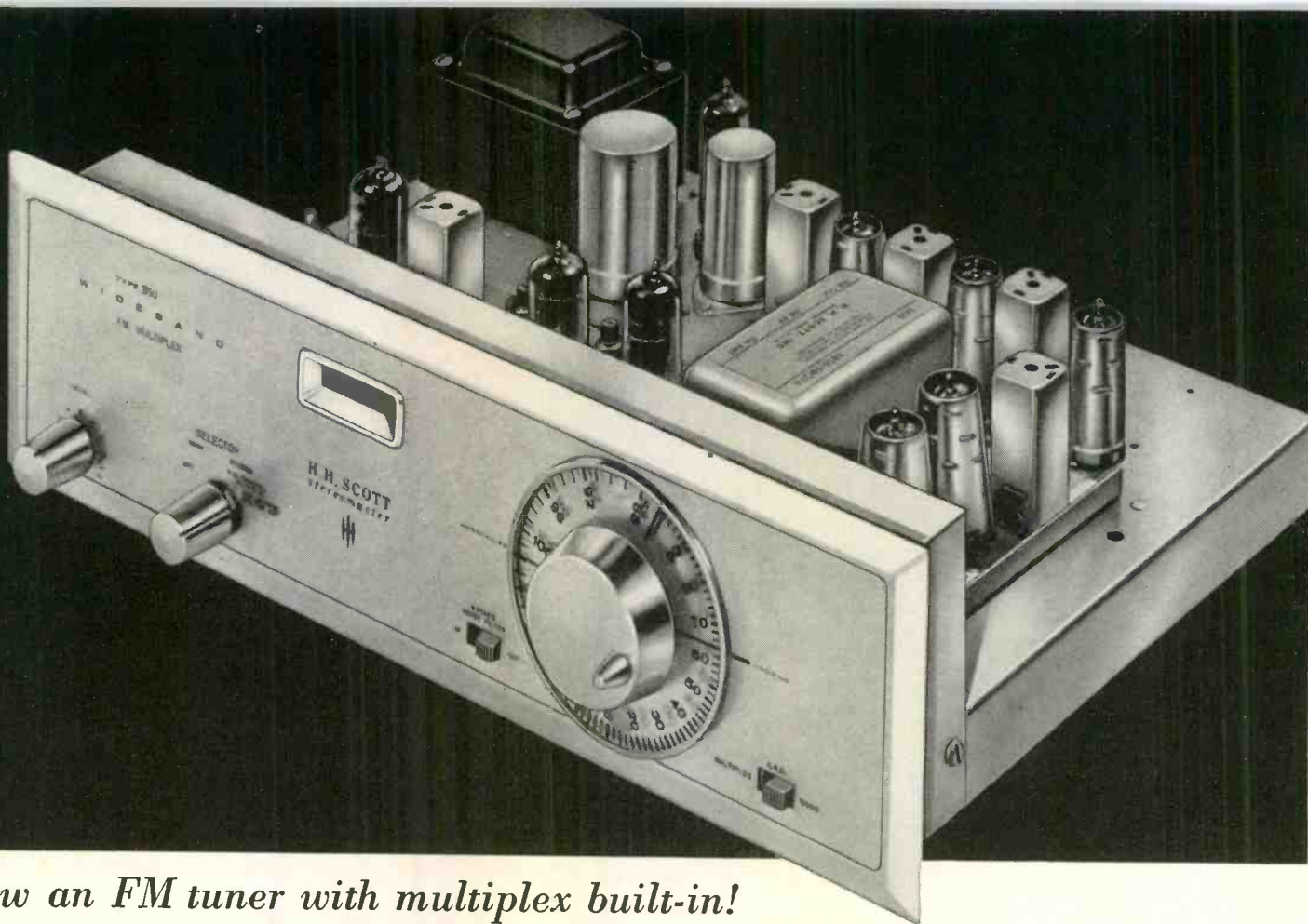
## FM STEREO BROADCAST

On June 1 both General Electric and Zenith Companies, whose proposed FM stereo systems were approved by the FCC, transmitted programs using the new FM stereo system. Other broadcast stations followed suit. A recent survey indicates that more than 41% of FM broadcasters plan to transmit stereo programs in the future.

Stereo receiver manufacturers were not idle. FM multiplex adapters to convert present mono FM tuners were announced before June 1, the authorized broadcast date. FM stereo tuners and receivers are also available. The new stereo sets must naturally be employed with stereo amplifiers and two speaker systems to produce stereo sound.

The new stereo multiplex system does not interfere with existing monophonic FM set reception. Present sets receive and play FM programs just as before. They won't play stereo, of course, unless equipped to do so. The stereo FM

(Continued on page 103)



Now an FM tuner with multiplex built-in!

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

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

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

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

IF's and detector give the new 350 a remarkable *usable* sensitivity of 2.5  $\mu\text{v}$  measured by stringent IHFM standards . . . one of the best measurements of a tuner's ability to effectively receive weak multiplex signals.

If you are considering a new tuner, or addition of an adaptor to a conventional narrow-band tuner, you owe it to yourself to first listen to the new H. H. Scott Model 350 Wide-Band FM Multiplex Stereo Tuner. Its superiority in sound quality . . . its ability to receive weak multiplex signals . . . its complete freedom from drift . . . are so dramatically different that you will not want to settle for less.

#### Important Technical Information

Usable (IHFM) Sensitivity: 2.5  $\mu\text{v}$ . 10 tubes, 11 diodes. Famous H. H. Scott silver plated front end. Tuning meter. Performance matches FCC transmission specifications. Can receive either monophonic or stereo multiplex programs. Special circuitry for perfect stereo tape recording. Dimensions in handsome accessory case 15½"W x 5¼"H x 13¼"D. Matches styling of all H. H. Scott amplifiers. \$199.95, East of the Rockies.

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

## Wide-Band Multiplex Adaptor



#### Important News for H. H. Scott Tuner Owners

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

### H. H. SCOTT

H. H. Scott, Inc. Dept. 140-09  
111 Powdermill Rd., Maynard, Mass.

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

Name \_\_\_\_\_

Address \_\_\_\_\_

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

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



H. H. Scott's Model 830 Multiplex Stereo Generator provides a composite stereo signal. It operates in conjunction with an FM signal generator, audio oscillator and scope.

# A Technical View of FM Multiplex

## Sum & Difference Method Of Approved Stereo Broadcasting System Is Analyzed

• A number of questions have arisen regarding FM stereocasting since the Federal Communications Commission's approval of stereo broadcasting standards.

While engineering details and standards are clearly outlined in FCC Docket 13506, practicing technicians have posed questions indicating the need for translating some of these details into simpler language. Furthermore, certain misapprehensions have arisen

which require clarification.

For example, the FCC has only spelled out the form of signals to be transmitted, together with standard tolerances. It has not specified any particular method of achieving the signal forms or technical standards.

The FM multiplex systems proposed by General Electric and Zenith, which were essentially the same, were approved for adoption. It should be pointed out that a spe-

cific transmitter or receiver circuit does not have to be employed to achieve desired transmission and receiver results. Circuit variations can and will exist. This shouldn't be too surprising since circuit design innovations are old hat in the electronics industry. Even Major Armstrong's original FM receiver's limiter circuit was shelved by many manufacturers for the ratio detector circuit.

(Continued on page 91)

Fig. 1—Block diagram of essential transmitter components employed in G-E system for multiplex transmission of FM stereo and SCA services.

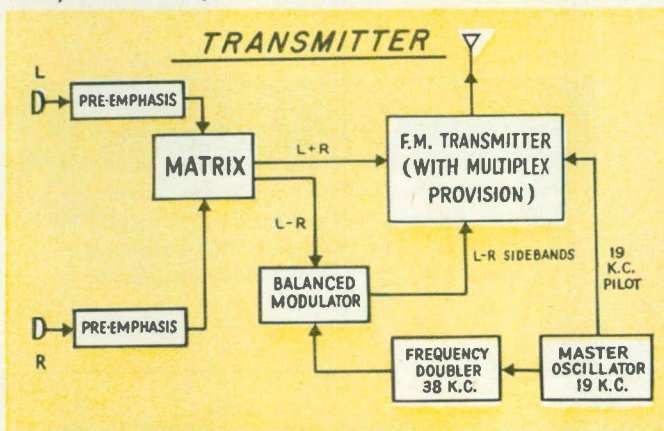
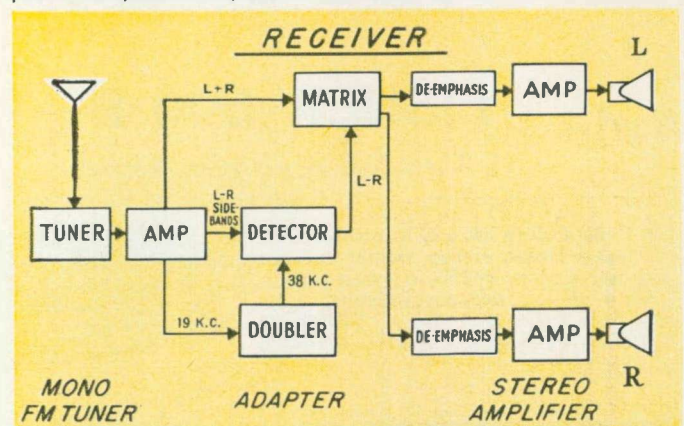


Fig. 2—Block diagram of mono tuner, adaptor, and dual amplifier/speaker components required for reception of FM stereo broadcasts.





THE FINEST OF COMPONENTS COMBINED ON A BEAUTIFULLY ENGINEERED CHASSIS DESIGNED FOR PERFECT INSTALLATION IN MINUTES

*Everything You Need, On One Magnificent Chassis*

# FISHER 800-B

*65-Watt AM-FM-Multiplex Receiver*

The best of everything—AM and FM-Multiplex Tuners for every existing type of broadcast (mono or stereo), a Stereo Master Audio Control Center of grand organ flexibility and *simplicity*, a stereo amplifier capable of producing 65-watts of pure, undistorted power—all these have been joined on one gleaming chassis whose capabilities belie its easy-to-install size. And the 800-B features Stereo Beam, the Fisher invention that tells you *instantly*

whether or not the FM station is broadcasting in Stereo Multiplex. No need to consult program listings in the paper, or trot between the two speaker systems to know what is going on. There is no easier way to install a complete stereo system in your home—simply add two speaker systems and a turntable and you can look forward to virtually unlimited years of musical enjoyment. **\$429.50**  
*Fine Cabinets Available In Walnut or Mahogany* **\$24.95**

## FISHER 500-B

*65-Watt FM-Multiplex Receiver*

■ Outstanding FM and Multiplex with STEREO BEAM, stereo master control center and powerful, 65-watt amplifier—all on *one* magnificent, easy-to-install chassis. **\$359.50**  
*Walnut, Mahogany Cabinets, \$24.95*



### USE THIS COUPON

FISHER RADIO CORP. • L. I. CITY 1, N. Y.

Please send the FREE literature on the following:

- Specifications on the FISHER 500-B and 800-B
- Complete Catalogues on FISHER equipment
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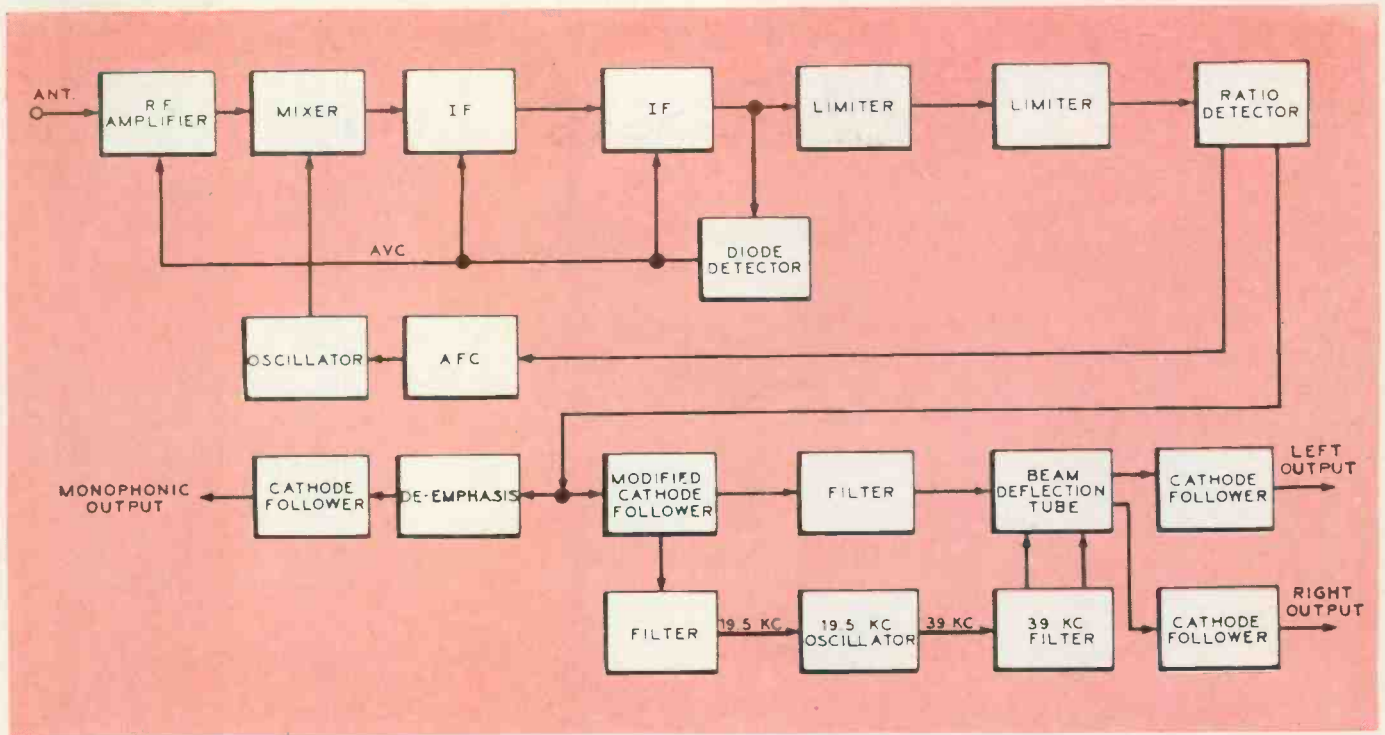


Fig. 3—Zenith's stereophonic FM receiver block diagram showing essential components.

(Continued from page 89)

Perhaps it would be helpful to recall that the National Stereophonic Radio Committee presented seven different FM Stereophonic broadcasting systems for FCC study. An additional system was proposed to the FCC by the Philco Corporation. Two of these eight systems were subsequently withdrawn by their respective proponents.

The FCC eliminated five of the six remaining systems, one by one, on the basis of analysis of actual field data. It should be noted, also, that the commission gave careful consideration to some 250 FM stations who already held multiplex Subsidiary Communications Authorizations (SCA's) for background music and other services. It was determined that approximately 200 of these stations were already providing these services on authorized subcarrier frequencies.

#### The FM Stereo System

Transmission of high-fidelity stereophonic sound over a range from 50 to 15,000 cycles through an FM broadcast transmitter is achieved with the equipment shown in the block diagram, Fig. 1. Separation of the two channels, according to FCC specifications, should be not less than 29.7 db.

A primary feature of the system is sum and difference matrixing.

The main carrier frequency modulation is represented by the sum. The difference signal is transmitted as suppressed carrier amplitude modulation of an ultrasonic subcarrier.

Recovery of the carrier is facilitated at the receiver (Figs. 2 and 3) by transmission of a pilot signal at half subcarrier frequency—or 19 kc.

Left and right stereophonic signals are preemphasized separately at the transmitter before being fed to the matrix where the sum (L+R) and difference (L-R) are produced. (The Zenith system reverses the preemphasis order, with matrixing before preemphasis.)

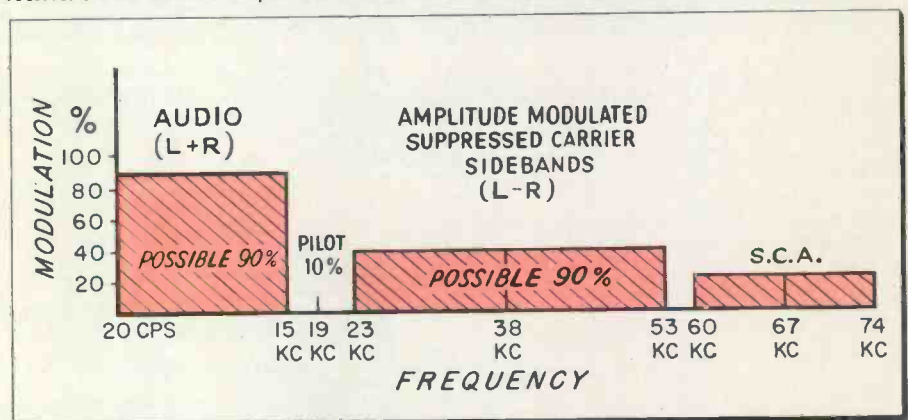
The sum signals are fed directly

to the FM modulator. The difference signal, however, is fed to a balanced modulator where proportional sidebands are generated above and below the subcarrier frequency of 38 kc. The carrier is automatically suppressed. A 19 kc oscillator's output is doubled to produce the carrier input to the balanced modulator. A parallel output from the 19 kc oscillator is fed into the FM modulator to create a pilot carrier.

If it is not already clear to everyone at this time it should be pointed out that the L+R signal from the FM station will produce a regular aural program on non stereo receivers. The L-R sidebands and pilot signal which are above the

(Continued on page 93)

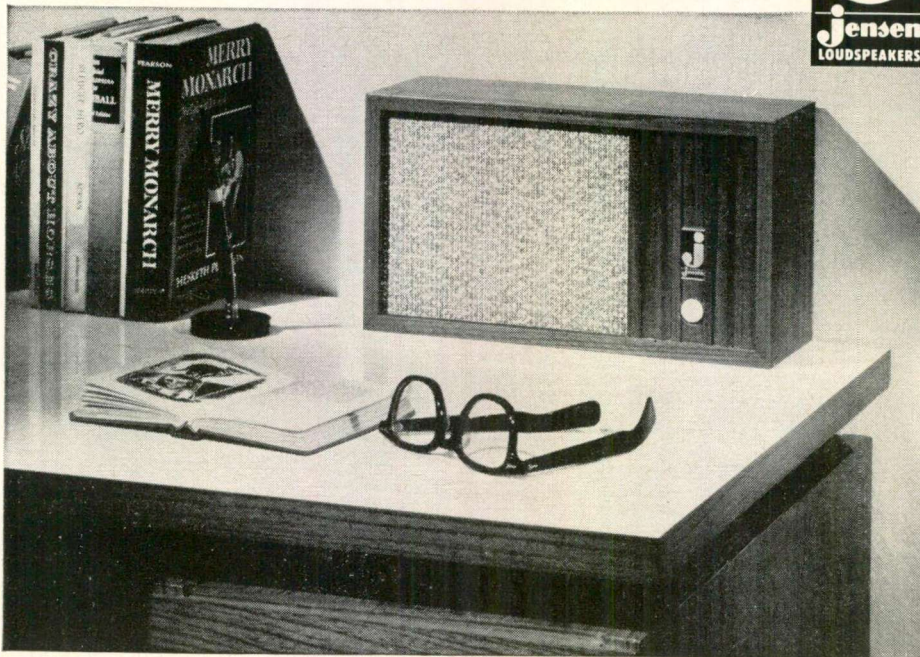
Fig. 4—Frequency spectrum of signals from an FM multiplex transmitter as they appear at a receiver's discriminator output. The 38 kc carrier is shown suppressed.



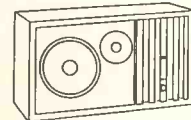
# So Compact...



# X-10



A startling achievement—an ultra-compact (7 $\frac{1}{4}$ " H, 13" W, 4 $\frac{5}{8}$ " D) 2-speaker system capable of sound you'd expect from a much larger unit. Volume control on front. Perfect for FM Multiplex, very low cost stereo, other-room extensions.



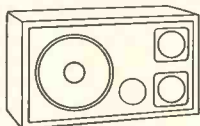
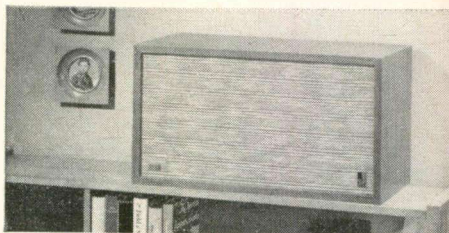
**X-10** 2-speaker 2-way system for use with amplifier having 4, 8, or 16 ohm output. Power rating 6 watts. Adequate room sound with 1 watt to speaker.  
In Oiled Walnut.....\$29.75

# So Big in Sound...

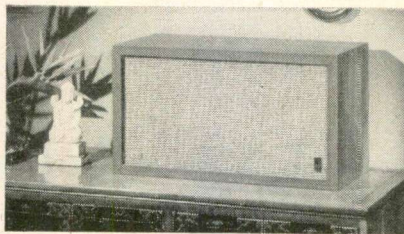


# TF-2 TF-3

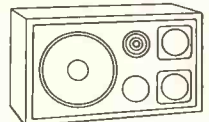
Strikingly beautiful compact bookshelf systems—perfect for every stereo or mono hi-fi need. Recent "blindfold" tests by audio experts proved a preference for the TF-3 and TF-2 over "rated" systems costing much more. Make your own careful comparison. You will be delighted with such big sound in small space.



**TF-2** 3-speaker 2-way system. Full size Flexair\* woofer for distortion-free bass response, plus two special direct radiator tweeters giving extended smooth highs. 13 $\frac{1}{2}$ " H, 23 $\frac{3}{4}$ " W, 11 $\frac{1}{8}$ " D.  
In Oiled Walnut.....\$79.50  
Unfinished Hardwood.....\$64.50



**TF-3** 4-speaker 3-way system. Covers full frequency range with Flexair\* woofer in Bass-Superflex\* enclosure, two coloration-free midrange units, and the sensational Sono-Dome\* Ultra-Tweeter. 13 $\frac{1}{2}$ " H, 23 $\frac{3}{4}$ " W, 11 $\frac{1}{8}$ " D.  
In Oiled Walnut.....\$99.50  
Decorator Styling.....\$109.50



Unfinished Hardwood.....\$79.50



**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.

\*T.M. Reg.

range of normal hearing would not be heard in the monophonic receiver, however. These signals are decoded in the stereophonic receiver to produce the L-R signal.

This decoding takes place with filtering and doubling of the 19 kc pilot signal to recover the 38 kc carrier. The carrier is then mixed with the filtered sidebands to form an AM modulated signal. The AM modulated signal is detected to obtain the L-R signals for the matrix. After passing through separate deemphasis networks, matrix outputs then become the original left and right stereophonic signals.

Signals from an FM multiplex transmitter (appearing at a receiver's discriminator output) are shown in Fig. 4. What would normally be the monophonic 50 to 15,000 cycle audio program, is represented by the left block. Although the SCA signal carrier is shown at 67 kc, with deviation of  $\pm 6$  kc, new FCC regulations permit simultaneous SCA from an FM transmitter over the range from 53 to 75 kc.

Just above the monophonic signal and composed of a 23 to 38 kc lower sideband and a 38 to 53 kc upper sideband, is the stereophonic signal. The 38 kc carrier is shown suppressed here with only the 19 kc pilot carrier shown.

Note that the system permits 90% deviation on the main channel and subchannel, with 10% in each case reserved for use on the pilot carrier. As shown on the diagram the 19 kc pilot falls in an open portion of the discriminator's output, with the L+R audio 4 kc below, and the L-R lower sideband 4 kc above. This permits the use of relatively uncomplicated filter circuits for isolating the pilot signal in the receiver before doubling and recovery of the subcarrier.

By employing an AM instead of FM subcarrier, full stereophonic bandwidth is made possible. In addition, a simple one tube adaptor is feasible. The AM subcarrier also facilitates SCA transmissions.

#### Sum & Difference Matrixing

Since the sum of two variables (L+R) is high when their difference is low (L-R), and vice versa, an interleaving effect exists between the main channel and generated sidebands on the subchan-

nel. The sideband envelope produced by the L-R signal is directly proportional to L-R. Thus, the relationship between a sum of two variables and their difference is maintained and the main channel and the subchannel will interleave. This is clearly illustrated in Fig. 5.

The L signal input is represented by (a) as shown, and (b) is an imaginary square wave pulse on R for illustration. The pulses added to the sine wave represents L+R, as shown at (c). The sine wave minus the pulses is shown at (d). The L-R subcarrier sidebands are represented by (e). The composite signal (f) (minus the pilot for illustration) consisting of L+R and the L-R sidebands would be the signal fed to the FM modulator. Note its peak amplitude is not greater than that of L+R or the L-R sidebands. Note the depres-

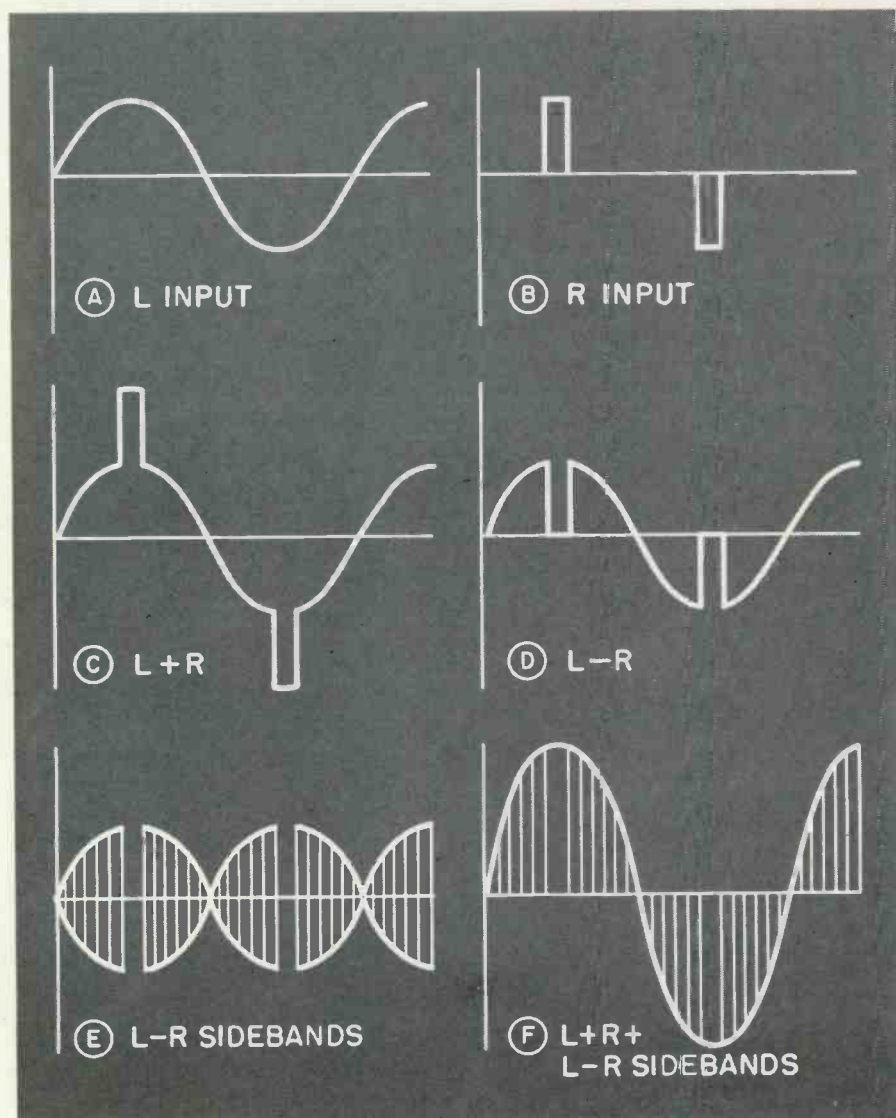
sion caused by -R, the pulse, in the L-R sidebands. Observe also a simultaneous peak caused by R, the pulse on the L+R signal. When these add to form the composite, the L+R peak fills the L-R sideband depression.

#### Multiplex Adaptor

Although adaptors may vary in the number of tubes and associated circuitry employed, it is possible to use a one tube adaptor with a monophonic tuner to receive stereosound—to be fed into stereo amplifiers.

While it is too early to summarize differences of opinion regarding conversions of monophonic FM sets to stereophonic FM sets, it's interesting to note that some hedging  
(Continued on page 115)

Fig. 5—Interleaving effect between main channel and generated sidebands is achieved through sum and difference matrixing (see text explanation).



# The **GOOD** (and the **BAD**) of Factory-Authorized Hi-Fi Service Agencies



A Long Island, N. Y. agency, Sono-Vision Services, Inc., displays highly accurate test equipment for hi-fi set repairs.

• Many manufacturers are contracting independent service companies to do their warranty repair work. In fact, one major radio-TV-phono manufacturer is calling for open bids from interested service companies who wish to do their warranty work (see this issue's *Tuning In The Picture*).

This represents an important trend in the electronics industry.

Service is an excellent sales tool. Consequently, manufacturers are competing with each other for better service programs. To back up their service warranty, usually 90 days free parts and service in the event of a factory defect, they're contracting existing service businesses around the country. Thus, their customers, dealers, and distributors are assured fast, competent repairs.

## How An Agency Operates

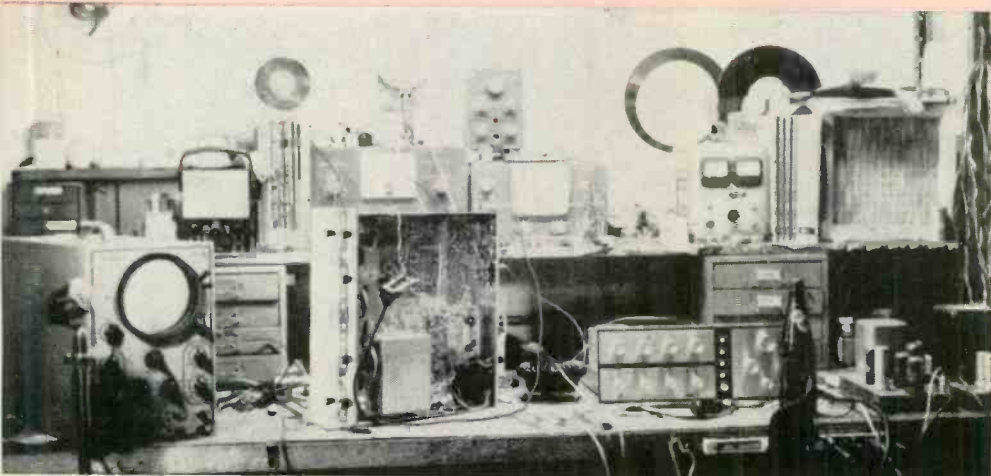
Service companies must normally sign a contract with a manufacturer before they are authorized to do their warranty repairs. The contract usually details the agency's and manufacturer's obligations.

Many contract variations exist, but most include: a list of flat-rate payments per type of set repaired during the warranty period (portable record changer @ \$3.00, tape recorder @ \$5.00, etc.); a parts kit that must be purchased by an agency; a termination notice clause, generally 30 days, which often includes refunds for parts purchased from the manufacturer if the agreement is terminated by either party.

Each manufacturer usually employs a different system to make



The store front of a large Brooklyn, New York hi-fi service agency, Audio-Visual Equipment Co., and one of their shop benches (below).







Authorized Factory Service Co., New York, N. Y., employs a large counter area to efficiently accommodate customers. This is typical for hi-fi agencies because most work is brought to their shops.



their service program operate smoothly. Therefore, if an agency contracts to do warranty work for 10 different manufacturers, a not unusual number, he may have to follow 10 different procedures. One manufacturer, for example, may require that an agency verify a customer's claim for a free warranty repair by checking the customer's sales slip; another company provides customer's with warranty cards which must be checked by agencies; still another company may have their distributors send customers' warranty cards to agencies in their areas for filing and subsequent verification when a customer brings in a defective set, etc.

There are other procedures that differ. For instance, some manufacturers require that agencies return every defective part they replace. Others limit defective parts

returns to major components such as speakers, tubes, transformers, and controls.

And then there's "paperwork." Agencies must fill out reports to enable manufacturers to administer their service programs. Manufacturers generally supply agencies with report forms that must be completed and mailed to them (or their distributors) periodically. These forms differ from manufacturer to manufacturer in layout, type and information required. Some companies supply forms with carbon inserts for copies; others don't. Warranty repair payments and parts replacements to agencies are compiled from these forms.

The foregoing briefly describes the surface operation of authorized factory service agencies. Closer inspection naturally reveals many other facets.

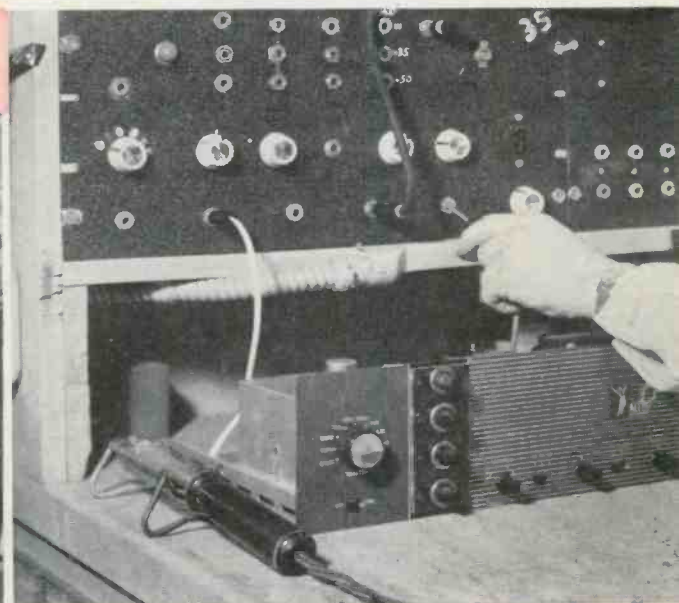
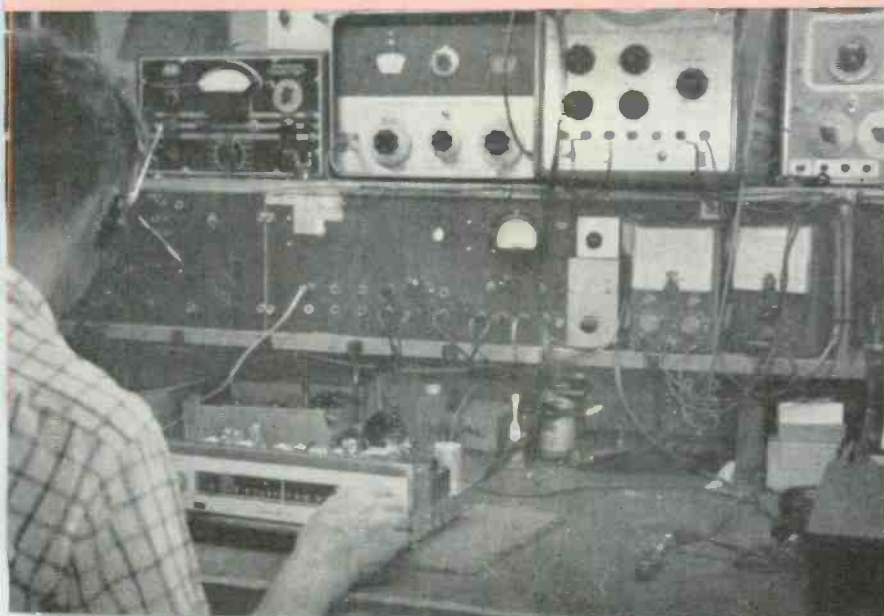
### Good vs. Bad

As you might expect in any business agreement, there are advantages and disadvantages. This is also true of factory-authorized service programs.

We pointed out how manufacturers utilize service agencies to increase sales of their products. Agencies also adopt the role of parts distributors for manufacturers. They sell mechanical changer and tape recorder parts to non-authorized service companies, as well as special electronic parts and es-cutechons. In this manner, agencies earn a parts profit.

Agencies are paid for repairing manufacturers' sets in the warranty period. However, all authorized hi-fi service agencies surveyed firmly stated that they do *not* make a  
(Continued on page 114)

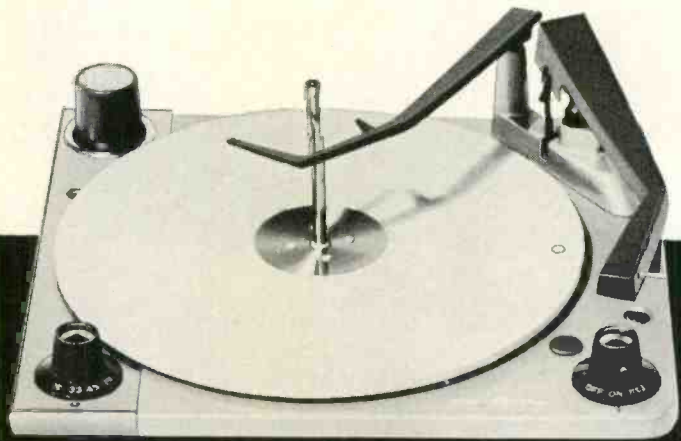
Sigma Electric Co., New York, N. Y., uses panel jacks on test benches to provide technicians with quick, accurate test signals & substitute load resistors. Varied test instruments, including c d distortion meter, are in evidence here.



# HIGH-QUALITY...HIGH-FIDELITY

## V-M COMPONENTS

### V-M Deluxe 'Stere-O-Matic'® 4-Speed Automatic Record Changer MODEL 1571



Shown with accessory 45 rpm spindle adaptor in handy baseplate spindle well.

*transcription-turntable performance... automatic changer convenience!*



**V-M Stereophonic High-Fidelity Accessory Amplifier—Model 1428** • Precision-built AC operated audio amplifier • Built-in pre-amplifier • Integral controls • Dual-Channel, push-pull output of 30 watts (peak), 15 watts (peak) per channel • Five stereo inputs • ..\$129.95 List



**V-M High-Fidelity FM-AM Component Radio Tuner—Model 1416** • FM-AM with AFC • Provision for FM multiplex stereo reception • Armstrong FM circuit with limiter • Foster-Seeley discriminator • Superheterodyne AM circuit with 3-gang condenser • .....\$119.95 List

The V-M Deluxe 'Stere-O-Matic' offers many functional, selling features. As a V-M dealer, you enjoy greater profits. Your customers benefit by listening to many hours of flawless musical pleasure. The precision internal mechanism and professional styling are evidence of the inherent Quality of all V-M products.

- Ideal for any custom Hi-Fi installation!
- **Diamond Needle** assures hundreds of hours of lasting pleasure.
- **Extra-Long, Dynamically-Balanced, Non-resonant Tone Arm With Finger-Lift** reduces the possibility of uneven needle pressure on the walls of the record groove; affords easy, precise placement of tone arm.
- **Professionally Massive 11" Transcription-Type Turntable** affords perfect balance, practically eliminates microphonic tendencies!
- **Automatic Manual-Play** feature returns tone arm to rest post automatically after single record play!
- **Micro-Precision Turntable Bearing System** for closer running clearance of oilite bearings plus an almost frictionless TEFLON thrust bearing.
- **V-M Styling** pleases everyone with its sparkling, functional appeal.
- **V-M Model 1571** ..... \$50.00\* List

Available with 4-pole motor and plug-in tone arm head for individual cartridge selection as **Model 1572** ..... \$50.00\* List



High-Impact Plastic Base affords complete ease of mounting installation. Fits V-M Deluxe 'Stere-O-Matic' Record Changer models 1571, 1572, standard 'Stere-O-Matic' model 1551, and V-M Custom turntable model 1580.  
**V-M Model 1438** ..... \$5.95 List

\*Slightly Higher West

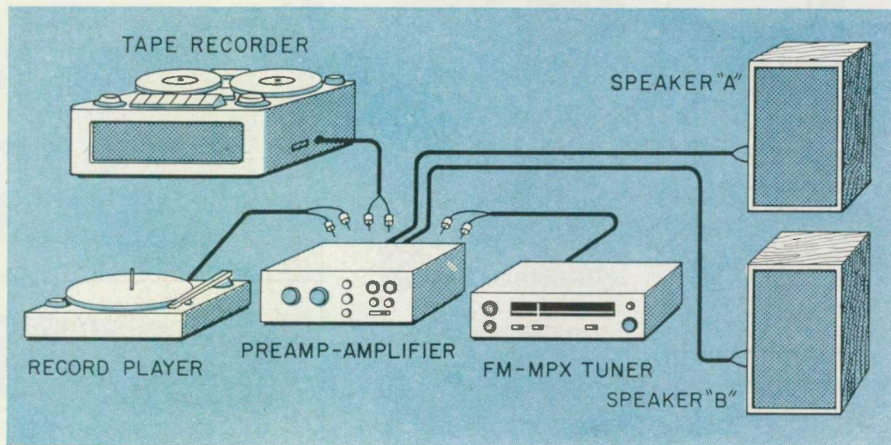
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PRODUCTS OF 'SOUND' QUALITY  
FOR SOUND PROFITS!**

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V-M CORPORATION • BENTON HARBOR, MICHIGAN

**KNOWN FOR THE FINEST IN RECORD CHANGERS, PHONOGRAPHS AND TAPE RECORDERS**

# Hi-Fi Installation Methods



MANNIE HOROWITZ

• Just because stereophonic audio equipment has two separate channels doesn't mean that technicians face twice as many repair problems. Some added problems do exist. They're primarily limited to peculiarities of the stereo system, however, such as assuring proper balance between two channels.

Installing a stereo system, as opposed to repairing one, presents more substantial challenges to a technician's know-how. Installation work can be divided into two areas: (1) Customer asks service dealer to "hook up" components he purchased. (2) . . . "hook up" components after he unsuccessfully tried to do it.

Any installation job's problems depend upon the number and type of components in the system. Whatever the case, however, a technician should try to examine each component's operating manual before going to the customer's house. Doing this will enable a technician to work efficiently in a customer's home.

## Typical Installation

Assuming a technician must connect components together that include a turntable or record changer, tape recorder, FM tuner, integrated stereo preamp-amplifier, and two

speaker systems, what work would he normally face?

Much of a technician's efforts will depend upon the connection material and amount of assembling accomplished by the manufacturers of the products he's working with. For example, it's often necessary to accomplish a few "assembly" steps when taking a brand new record changer or turntable out of a carton. The turntable may have to be inserted, the cartridge may have to be connected and secured to the tone arm, the changer or turntable may have to be placed on a changer base with its accompanying shock absorbers, "C" washers, etc. These may seem like minor inconveniences, but they're time consumers if you're unfamiliar with the particular unit.

## Record Changer

Whatever prior record player assembling steps are taken, which may include mounting a tone arm on a turntable (follow manufacturer's instructions precisely here), one of the final steps is connecting the phono cartridge. Since magnetic cartridges are more popular than ceramics, it'll probably be the former type that must be connected. Most hi-fi sets use plug-in tone arm heads.

Thus, after connecting the cartridge according to manufacturer's instructions, the leads must be in-

serted into the proper preamplifier input jacks. Many record players incorporate shielded leads that are attached to the cartridge's pins through the length of the tone arm. Some units, however, terminate the cartridge to tone arm cables to a binding post. If this is the case, a technician must solder extension cables to the strip's connections.

Two separate pin jacks are generally needed at the ends of the shielded phono wire to plug directly into the preamp inputs, usually the "Mag" inputs. A preamp sometimes has a "Low Mag" and a "High Mag" input. In this case the output voltage of the cartridge would determine which set of inputs to use. If a ceramic cartridge is used, a ceramic input should be used. If this input isn't included with a preamp, an equalized network must be used if the cartridge is being plugged directly into a magnetic input (some ceramic cartridge manufacturers provide "networks" for use with magnetic inputs).

The preamp's input load resistors should approximate the resistance recommended for the cartridge's best performance. If the load resistors are incorrect, they should be changed to ones with the correct values. (Ceramic cartridges frequently require 3 Meg resistors, while magnetic types generally re-

*(Continued on page 99)*

## Harman-Kardon Enters The Sound Field Because...

...the sound industry is on the threshold of an exciting new era of growth. However, the ever-expanding use of sound places new demands upon the operational capabilities of equipment. It calls for new and higher standards of performance. The continued progress of our industry should not be impeded by equipment that is the result of old habits and customs; by equipment that simply does not measure up to the needs of the day and does not consider in toto the soundman's point of view.

The popular priced Commander Series is the first of a line of commercial and industrial sound products to be introduced by Harman-Kardon. In subsequent months additional lines will be presented. This equipment is the result of a new and refreshing approach to practical application requirements. Harman-Kardon brings to the sound field the full resources of a dynamic, successful organization, plus a superb engineering staff steeped in many years of experience in commercial and industrial sound. It is no accident that the Commander Series is in fact "deluxe" equipment at a popular price. This reflects the modern and highly efficient production techniques that have long been used to manufacture equally outstanding values found in Harman-Kardon high fidelity products. They also reflect the remarkable level of performance demonstrated by H-K's universally acclaimed Citation line. As you can see, the ingredients of quality, dependability, and a maintenance of high level of performance—so important in sound work—are not new to us at Harman-Kardon.

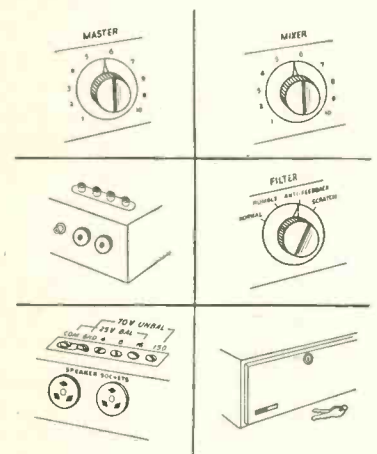
We urge you to carefully consider the new Harman-Kardon commercial and industrial sound equipment. Talk it over with your distributor or write to us for the full story. You'll quickly discover why the new Commander Series will do more, do it better, and for longer.



## A SOUND APPROACH to Commercial and Industrial Application... THE NEW COMMANDER SERIES BY HARMAN-KARDON

Flexible. Versatile. Dependable. That's the new Harman-Kardon Commander Series of amplifiers and systems for commercial and industrial sound use. They're ruggedly constructed for continuous duty. They include deluxe features at popular prices. They're designed and manufactured by Harman-Kardon—noted for the quality, reliability and superb performance standards of its high fidelity products, including the highly acclaimed Citation Kits. *In short:* the new Commander Series is built by soundmen—FOR soundmen. Here are some of the exclusive features that make these the best instruments you can buy for the price.

**MASTER VOLUME CONTROL:** Enables total amplifier output to be varied without disturbing other control settings. **MIXER CONTROL:** Convenient ONE KNOB control permits fading and blending of signal from two channels, in any desired amount. (DA-35, DA-100) **MULTIPLE INPUTS:** All at the rear—allow for an unusually high degree of installation and operational flexibility. **ANTI-FEEDBACK FILTER:** Equalizes frequencies most sensitive to generation of feedback "howl" without reducing articulation—thus achieving maximum power output under difficult acoustical conditions. (DA-12) **25 AND 70 VOLT OUTPUTS:** Provides two constant voltage systems—70 and the newer 25 volt balanced system—for optimum flexibility and economy in speaker installation. **LOCKING COVERS:** Unique feature on units in this price class—designed to prevent tampering or accidental change of precise control settings. **PLUS:** Magnetic Cartridge Input; Tape Recorder Output; Independent Power Switches; and many other deluxe features.



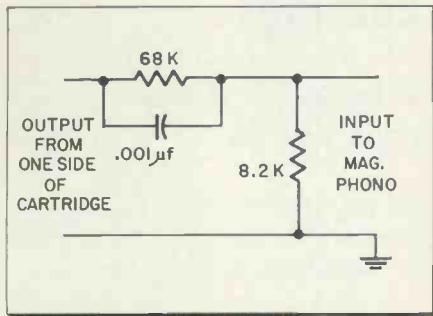
The Commander Series shown above includes the following: Model DA-12, 12 Watt PA Amplifier—\$75.00 List; Model DA-35, 35 Watt PA Amplifier—\$119.95 List; Model DA-100, 100 Watt PA Amplifier—\$187.50 List; Model DPR-7, Combination Mixer/Preamplifier—\$75.00 List; Model PT-1, Phonograph Top—\$37.50 List; Model LC-1 and LC-2, Locking Panel Covers: Model LC-1—\$8.50 List, Model LC-2—\$9.00 List.

For informative catalog on complete Commander Series write Desk 9G.

Commercial Sound Division

**harman kardon**

Harman-Kardon, Inc.  
Plainview, N. Y.



Sound will be distorted if a piezo cartridge is inserted into a preamplifier's magnetic input without using an equalizing network similar to that shown here.

(Continued from page 97)  
quire much lower values like 47K or so.)

Cartridge leads to preamp inputs should be as short as possible; from three to six feet is usual. The two separate cartridge leads must be plugged into separate left and right inputs. A technician can determine if the correct inputs are being used by playing a test record that includes a left channel and right channel test. If the leads are incorrectly inserted, simply reverse them at the preamp input jacks.

Tone arm weight should be accurately checked according to the cartridge manufacturer's specifications. All tone arms include tracking force adjustment means to correctly set the optimum tracking pressure. Another important installation step is the turntable leveling procedure. A spirit level is useful here to be sure that turntable tilt isn't present.

The changer's (or turntable's) motor may be powered by plugging its power lead into a switched receptacle on the amplifier. It's often necessary to ground the phono motor's casing to eliminate hum.

### Tape & Tuner

Tape recorders are sold in two forms: with and without playback preamplifiers. If the unit is a tape deck without preamps, the two separate cables from the tape heads should be plugged into the preamp's "Tape" equalized inputs. If the tape unit *does* include playback preamps (portable tape recorders usually do include preamps), the cables should be inserted into high level inputs of a preamp such as the "Aux" inputs. You'll overload the amplifier if you plug leads from a tape's

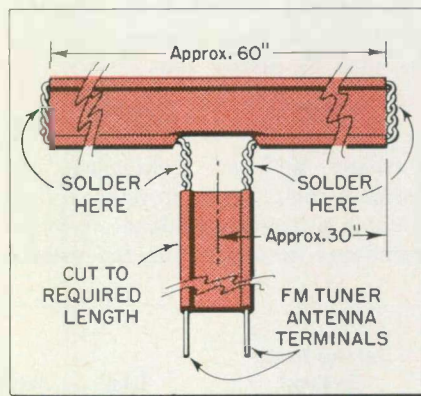
playback amps to a preamp's equalized tape inputs. This will result in distortion or too much bass output.

Some preamps have tape outputs. The output signals can't be applied directly to record heads. Signals to be tapped by the tape recorder must be fed to the tape's record preamplifiers, where it is mixed with a bias oscillator, before being applied across the record heads.

Unless cathode follower circuits are provided, connections from the tape unit to the preamp must be reasonably short.

A hi-fi tuner is another popular component used in a system. A hi-fi tuner's discriminator output is terminated in an output jack. The output is applied to a preamp's "Tuner" input, which is a high level input. In the case of an FM multiplex tuner, separate leads—one multiplex and the other channel—are plugged into separate preamp "Tuner" inputs.

Again, connecting cables should be kept short unless cathode follower circuits are provided that permit long leads. Long leads without cathode followers will defeat the hi-fi of a component because it will be more susceptible to hum pickup and high frequencies will be attenuated.



A folded dipole antenna for an FM receiver can be made out of 300-ohm wire.

To achieve the best signal pickup, an antenna is needed. Hi-fi AM tuners usually incorporate ferrite core antennas directly on the set. FM tuners, however, need different antennas. A folded dipole antenna can be made up out of regular 300-ohm twin lead wire and tacked to a cabinet wall or shelf. An outdoor FM antenna would, of course, be more ideal since it would pick up more stations and provide a better signal-to-noise ratio. Outdoor an-

tennas is a much neglected phase of hi-fi.

### Speakers

The outputs from stereo amplifiers are connected to their respective speaker systems with rubber-covered lamp lead wire and, sometimes, 300-ohm wire. As long as the speaker impedances are matched to the amplifier output transformer impedances, matching problems rarely occur.

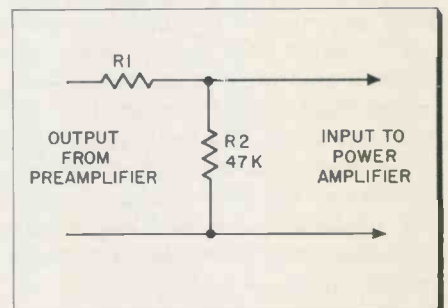
If a balancing problem exists due to employing two speakers whose efficiencies greatly differ, and the balancing controls have a limited adjustment range, it may be necessary to devise a "dropping" circuit. One solution is to insert a resistor in series with a lead of the more efficient speaker. This is a poor solution, however, because speaker damping is reduced. A better method to equalize speaker outputs is to add a resistor in series with one balance control. Adding the right resistor, after experimenting, will permit balancing the speaker outputs. However, the relative range of the balance controls will not be correct.

To effect speaker balancing and not upset the tracking of two balance controls, a voltage divider network between one preamplifier and one power amplifier can be made. The output from the preamp can be taken across a 47K resistor. A resistor in series with one of the output leads can be experimentally selected to obtain equal output from both speakers. This is only done with ease if separate preamps are being used.

Individual speaker systems should be placed at least six feet apart to achieve the best stereo effect. However, too wide a separation

(Continued on page 113)

If two speakers with extreme efficiency differences are used, some balance controls can't equalize their outputs. This can be overcome by using an attenuator circuit, shown here, to decrease one's channel output.



## Infrared Wireless Telephone

• A line-of-sight infrared transmitting and receiving telephone system, the "Intraphone," has been developed by Infrared Industries, Inc., Waltham, Mass.

The illustrated hand-held self-powered transceiver phone unit is about the size of a home type movie camera. It can be used for short-range voice conversations between two or more points when similar



Transistorized wireless two-way telephone-like unit employs sensitive infrared detector.

units are "aimed" at each other within a line-of-sight distance.

Physically resembling a dual-lens reflex camera, the transmit-receiver unit employs one "lens" as the infrared transmitter and the other as the receiver. The solid-state transistorized device is powered by ordinary flashlight batteries, and can be used to carry on conversations through closed windows or even around corners by using mirrors, according to a manufacturer's spokesman.

Unlike conventional two-way short range radio, the instrument is not subject to FCC regulations and does not require a license to operate. It can be used by surveyors and construction workers in areas where radio "walkie-talkie" creates an explosion hazard. The unit will be initially marketed through a limited number of electronic supply houses for about \$20 before being made available nationally through other retail outlets. •

## TV Service Earnings

### Dept. Of Labor Examines Atlanta & Dallas TV Service Employees' Earnings & Fringe Benefits

• The Bureau of Labor Statistics undertook two regional pilot studies in 1959 to determine earnings and benefit characteristics of employees of TV-radio service dealers in Atlanta, Ga. and Dallas, Texas. Only independently owned electronic repair shops employing fulltime technicians were included in the samples. The following findings summarize the conditions found in these two areas:

#### Earnings

▶ Individual earnings for technicians ranged from \$60 to over \$130 per week, with over half receiving \$70-100 per week.

▶ Combination (bench and outside) technicians are the highest paid group, followed by bench men and then outside men. Outside men are generally less experienced than bench or combination men and tend to be newer employees.

▶ A majority of technicians are paid regular weekly salaries, with many others working under bonus arrangements based on value of parts installed or on labor charges. Very few are paid on hourly rate.

#### Training

▶ About 80% of technicians had learned their trade through formal training in trade, vocational or correspondence schools, while the balance

had only on-the-job training. Pay for the latter averages about \$10 less than for technicians formally trained.

#### Benefits

▶ The typical work week is five and one-half or six days.

▶ Few firms have formal policies for overtime compensation, however, some firms pay a flat sum or extra pay at the regular rate for overtime and a few others give employees equal time off if overtime work is necessary.

▶ Most workers receive paid holiday and vacation benefits. Five holidays a year and one week of paid vacation after a year of service are the most common practice, though variations do exist.

▶ Year-end or Christmas bonuses varying from \$10 or \$25 to a week's pay are received by about one-fourth of employees in Atlanta and over half in Dallas. These are generally not considered a formal obligation by the employer. About a fifth of workers in Dallas were in firms paying a yearly profit-sharing bonus.

▶ Two out of three firms in Atlanta and one out of three in Dallas provided health or insurance benefits paid for entirely or in part by the employer. None had pension arrangements other than Social Security. •

Average Weekly Earnings*	Total	Bench Men	Outside Men	Combination Men	Helpers
Atlanta	\$89.50	\$91.50	\$74.50	\$94.50	\$37.00
Dallas	83.50	81.50	75.50	92.00	41.50
<b>Percent of Workers by Occupation</b>					
<b>Atlanta</b>					
Under \$50	—	—	—	—	89%
\$50-74	26%	27%	56%	10%	11
\$75-99	40	40	33	43	—
\$100-124	29	21	11	47	—
\$125 and Over	5	12	—	—	—
	100%	100%	100%	100%	100%
<b>Dallas</b>					
Under \$50	—	—	—	—	75%
\$50-74	25%	33%	33%	14%	25
\$75-99	54	45	67	51	—
\$100-124	15	22	—	21	—
\$125 and Over	6	—	—	14	—
	100%	100%	100%	100%	100%

\*Scheduled normal workweek

# Comments on New Stereo Developments

Noted Audio Expert Briefly Presents  
His Views On Stereo's Latest Innovations

NORMAN H. CROWHURST

• Over the last couple of decades the rapidity of progress in high fidelity has become accepted as a matter of course. But we really are reaching the area of diminishing returns—technologically. From force of habit people greet us with “What’s new?” and periodically inquire about some “fantastic” new development about which some vague news has leaked out. What I believe the future really holds for stereo is consolidation and stabilization.

**Reverberation**—This is, perhaps, the latest hi-fi stereo innovation. It’s not really new. Only the Hammond unit as a basis for doing it is new. Reverberation, to contribute something worthwhile, must be good, with quality equal to the original sound. The other day we were singing as we carried an empty garbage can, and were surprised at the resemblance of the can’s echo to the way many reverb units sound.

Even if we eventually get reverberation units that match the fine quality of today’s hi-fi stereo components there is a limit to what they can do. Records made with echo chamber effects, for instance, will not need additional reverb. In fact, it could do with a reverberation *extractor*, if such a thing could be made. But once reverberation has been mixed and recorded with original program, there’s no known way of reducing it. The echo can only be increased by electro-mechanically delaying one channel’s signal.

**Speakers**—We hear reports about new speakers from time to time with typical superlatives. From work we have done, we know that satisfied acceptance of stereo depends on the development of speaker systems that are tailored to specific rooms in which people listen, and on proper sales follow through to help each customer get the system best suited for his listening environment and musical taste.

We do not mean there is just *one* best system for each case. But neither is there one universal system that suits every environment and taste. The truth is between these extremes. What you are prepared to pay, with your environment and taste, narrows the choice.

People who are dissatisfied with stereo generally owe that dissatisfaction to having been sold a system that may be excellent for the money, but not for their listening area. This is one important area

where the future of stereo needs stabilizing.

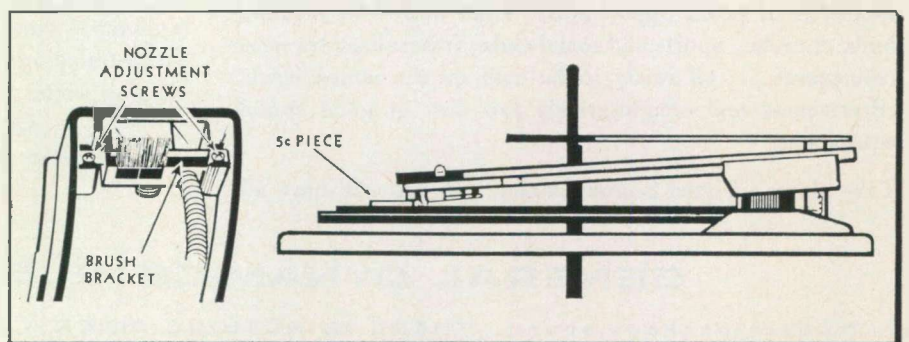
**FM Multiplex**—Some think this is the big answer. One thing sure, the small percentage of expertly recorded stereo albums has handicapped stereo’s public acceptance. Broadcast stations can, at least, audition albums before playing them. Consequently, the potential for broadcasters selecting albums with stereo effects that are good at least exists.

The system the FCC accepted is good for monophonic and stereo listeners and for the station. Also, it can accommodate SCA operation where necessary with the minimum interference or loss of quality.

Tuner manufacturers are busy getting adaptors and new MPX tuners out. Undoubtedly stations will gradually commence broadcasting stereo: most of the major metropolitan areas immediately after June 1, the rest of the country rather slowly.

(Continued on page 114)

A novel innovation to keep records clean is incorporated in a General Electric console phono changer’s arm. It’s a vacuum nozzle (with a motor-fan unit) that picks up a record’s dust while playing. Nozzle height is important for optimum vacuum. It should be the same distance away from a record’s surface as the thickness of a nickel.





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Dept. H, 1409 North Goodman Street  
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### FM Stereo Definitions

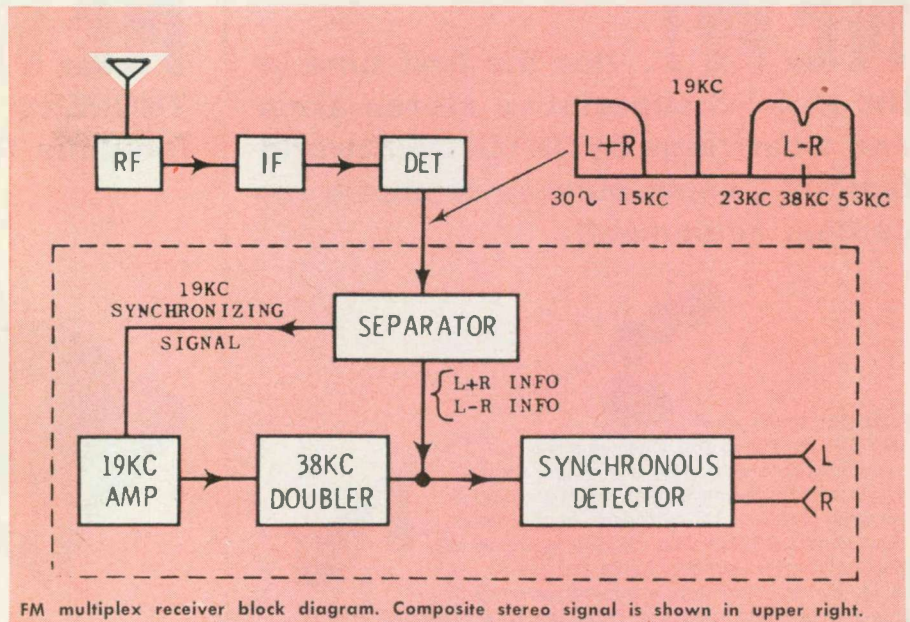
1. **FM Stereo Broadcast:** Transmission of a stereo program by a single FM broadcast station utilizing a main channel and a stereo subchannel.
2. **Main Channel:** Band of frequencies from 50 to 15,000 cps which frequency modulates the main carrier.
3. **Pilot Subcarrier:** A 19 Kc subcarrier which acts as a control signal for use in receiving FM stereo broadcasts.
4. **Stereo Subcarrier:** A subcarrier employed in FM stereo broadcasting. Its frequency is the second harmonic (38 Kc) of the pilot subcarrier frequency.
5. **Stereo Subchannel:** Band of frequencies from 23 to 53 Kc that contains the stereo subcarrier and associated sidebands.

(Continued from page 87)

tuning dial is exactly the same as mono FM tuning dials. Internally, however, there are differences.

Three signals are utilized for FM stereo transmission's composite signal: a mono signal (L+R) from 30 to 15,000 cps, a 23 to 53 Kc sideband signal (L-R) and a 19 Kc reference signal. A standard FM mono receiver will only reproduce the L+R signal; the other signals are outside the audible range.

A stereo receiver's detector signal is transferred to a filter network and matrix instead of an audio amplifier as with a mono FM receiver. The filter separates the 19 Kc signal from the left plus right and left minus right channel information (L+R and L-R). The L+R and L-R signals are applied to a demodulator; the 19 Kc signal is applied to an amplifier-doubler circuit to produce a 38 Kc carrier signal that combines with the other signals in the demodulator. (The 38 Kc signal is in phase with the transmitter's 38 Kc subcarrier signal.) The detector demodulates the signals, leaving an L+R signal and two L-R signals (sidebands). Combining these signals in a matrix circuit results in separate left and right signals that are applied to stereo amplifiers: (L+R) +



FM multiplex receiver block diagram. Composite stereo signal is shown in upper right.

(L-R) = 2L, which goes to the left amplifier-speaker; (L+R - (L-R) = 2R, which goes to the right amplifier-speaker.

If an FM station is not broadcasting stereo, the L-R signal is not present and, therefore, only the L+R signal, which is standard monophonic sound, is applied to the amplifiers' inputs. The stereo broadcasting system is described more fully in another section of this issue.

### STEREO SPEAKERS

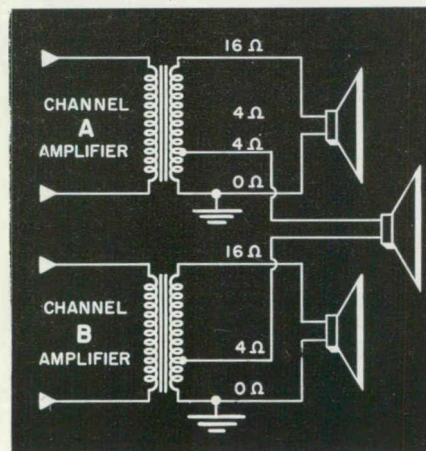
As we know, stereo sets require at least two separate speaker systems, each one generally identical to monophonic speakers. Hence, stereo speaker connection problems are the same as their mono predecessors. So are amplifier power requirements.

Third channel speakers are increasingly popular. Some component

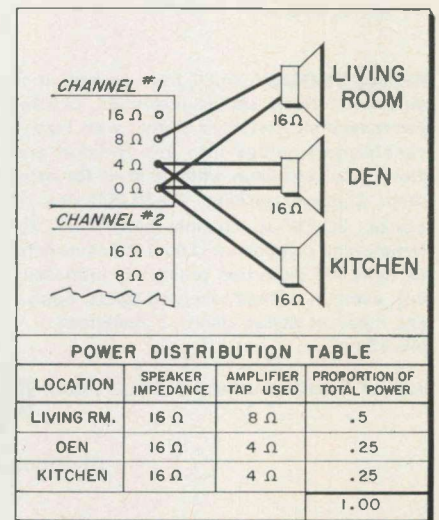
sets include outputs to add a third speaker that receives part of the left and right channels' signals to "fill in" a lack of sound. There are speaker companies that produce "satellite" type systems which include small left and right speakers and a large center speaker to carry bass frequencies. Experimentation has shown that bass frequencies below 250 cps do not contribute too much towards the stereo effect. Besides using the "big" speaker only for bass frequencies, other systems use it for center fill over the mid-range and high frequencies by taking a mix from each channel. Many believe that this aids immeasurably in eliminating the hole in the middle problem. Package manufacturers frequently use a third speaker

(Continued on page 107)

Adding a third speaker to a stereo set.



Power distribution of multi-speakers.



# NEW!

...for the first time in the U. S.! 3 superlative stereo arms and a cartridge by ORTOFON...world famous Danish makers of studio recording equipment!

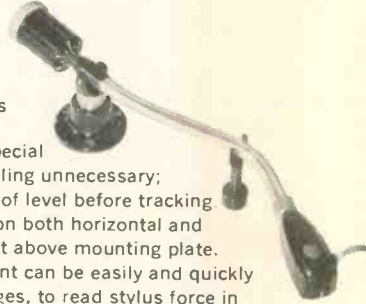
### **FINEST!** Professional

RMG309, 16" stereo arm. Often imitated, but nothing equals the original! Available with plug-in, electrodynamic Ortofon stereo cartridge or with shell to fit standard cartridges. Approximate dimensions: 12 3/16" from pivot to record center; requires 3" rear clearance. Tracks at 2 grams. Micrometer stylus force adjustment (reads directly in grams). Adjustable height over mounting plate. Statically balanced by counterweight with spring controlled stylus force (no leveling required). Rubber damping between arm and counterweight... \$59.95 net.



### **PERFECTION!** Ortofon

SMG212, 12" stereo arm. Takes Ortofon or any standard stereo cartridge. Tracks at 2 grams. Special arm shape makes turntable leveling unnecessary; turntable may be up to 30° out of level before tracking difficulties arise. Ball bearings on both horizontal and vertical pivots. Adjustable height above mounting plate. Unique counterweight adjustment can be easily and quickly calibrated, without tools or gauges, to read stylus force in grams for any cartridge... approximate dimensions: 8 3/8" pivot to record center; 3 1/4" rear clearance (maximum for heaviest cartridges)... \$29.95 net.



### **ECONOMICAL!** Ortofon

SKG212 12" stereo arm. A renowned Ortofon arm with true economy. Takes Ortofon or standard stereo cartridges. Adjustable, user-calibrated counterweight shows stylus force directly in grams (same as on SMG212 above). Approximate dimensions: 8 3/8" from pivot to record center; 3 1/4" rear clearance (maximum for heaviest cartridges). A truly superb performer... only \$19.95 net.



**MIRACULOUS!** You'll have to hear it to believe it! New, sealed-into-shell Ortofon electrodynamic stereo cartridge, with built-in transformers, plugs into any Ortofon arm above. Also available without shell for other arms. 2 gram tracking. 20-20,000 cps response. 20-25 db channel separation. Extremely high compliance: 10 x 10<sup>-6</sup> centimeter per dyne. IM distortion practically immeasurable, even on highest recorded levels. Equivalent mass at stylus point: 1 milligram... \$49.95 net.



WORLD FAMOUS STUDIO EQUIPMENT

# Ortofon

# NEW!

...3 new, 8-lb., 12" THORENS turntables now supplement fabulous TD-124!



### **MATCHLESS TD-124!**

11 lb. table with exclusive clutch... all four speeds... illuminated strobe, with variable speed control (± 3%)... completely silent dual-belt drive... Many more exclusive features. \$99.75 net. Optional base \$10.00.



### **NEW TD-121!**

Single-speed version of TD-124 brings you maximum performance with economy... standard in 33 1/3, can be set for 16, 45 or 78 rpm... 8 lb., 12" non-magnetic table. Variable speed control (± 3%)... micrometer leveling screws. \$80.00 net. Optional base \$10.00.



### **NEW TD-135!**

Four-speed transcription turntable with integral professional arm... ends installation worries... assures finest tracking. Variable speed control (± 3%)... 8 lb., 12" table... precision built motor. \$99.75 net. Optional base \$6.00.



### **NEW TD-111!**

Still more economy with superb Thorens performance! Single-speed, 8 lb., 12" non-magnetic table with precision idler-and-belt-type drive for isolation of motor vibrations. Self-lubricating bearings... variable speed control. \$60.00 net. Optional base \$10.00.

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# MANUFACTURER & PRODUCT STEREO DIRECTORY

Amplifiers, 1-channel	<b>amp-1</b>	Preamplifiers, 2-channel	<b>pre-2</b>
Amplifiers, 2-channel	<b>amp-2</b>	Records, stereo	<b>rec</b>
Amplifier-preamplifiers integrated, stereo	<b>amp-pre</b>	Speakers & Speaker Systems	<b>spk</b>
Antennas, FM	<b>ant</b>	Tape, blank	<b>tap</b>
Arms	<b>arm</b>	Tape, prerecorded stereo	<b>tap-pr</b>
Cartridges, stereo phono	<b>car</b>	Tape Recorder Accessories	<b>tap-acc</b>
Changers	<b>cha</b>	Tape Recorder Heads, stereo	<b>tap-hed</b>
Control Units, stereo	<b>cont</b>	Tape Recorders or Decks, stereo	<b>tap-rec</b>
Conversion Kits, stereo phono	<b>conv-p</b>	Tuners & Receivers,	
Conversion Kits, stereo tape recorder	<b>conv-t</b>	AM or FM "single play"	<b>tun-1</b>
Enclosures & Cabinets	<b>enc</b>	Tuners & Receivers,	
Headphones	<b>hed</b>	AM & FM "simultaneous play"	<b>tun-2</b>
Microphones	<b>mik</b>	Tuners & Receivers, multiplex equipped	<b>tun-mult</b>
Needles	<b>need</b>	Tuner multiplex adapters	<b>tun-ad</b>
Phono Systems, accessories	<b>phon-acc</b>	Turntables	<b>tur</b>
Phono Systems, stereo, complete	<b>phon-sys</b>	Kit form	<b>K</b>
Preamplifiers, 1-channel	<b>pre-1</b>	Wired	<b>W</b>

ACOUSTIC RESEARCH, INC., 24 Thorndike St., Cambridge 41, Mass.—spk; tur  
**ALDSHUR MFG. CO.**, 111 Lake Ave., Tuckahoe, N.Y.—car; need; phon-acc  
**ALLIED RADIO CORP.** (Knight), 100 N. Western Ave., Chicago 80, Ill.—amp-1; amp-2; amp-pre; arm; car; cont; enc; mik; phon-acc; phon-sys; pre-1; pre-2; spk; tap-rec; tun-1; tun-2; tun-mult; turn-ad; tur; W; K  
**AMERICAN CONCERTONE, INC.**, 9449 W. Jefferson Blvd., Culver City, Calif.—tap-acc; tap-hed; tap-rec  
**AMERICAN GELOSO ELECTRONICS, INC.**, 251 Park Ave. South, New York 10, N.Y.—mik; tap; tap-acc; tap-hed; tun-1  
**AMERICAN MICROPHONE MFG. CO.**, 400 S. Wyman St., Rockford, Ill.—car; mik  
**AMERICAN TELEVISION & RADIO CO.** (ATR ELECTRONICS), 300 E. 4th St., St Paul, Minn.—phon-acc  
**AMPEX AUDIO CO.**, 1020 Kifer Rd., Sunnyvale, Calif.—tap-rec  
**AMPLIFIER CORP. OF AMERICA**, 398 Broadway, New York 3, N.Y.—amp-1; amp-2; amp-pre; pre-1, pre-2; tap-acc; tap-rec; tun-mult; W  
**ARGOS PRODUCTS CO.**, 301 Main St., Genoa, Ill.—enc  
**ASTATIC CORP.**, Conneaut, Ohio—arm; car; mik; need; tap  
**ATLAS SOUND CORP.**, 1449 39th St., Brooklyn 18, N.Y.—spk  
**AUDIO DEVICES, INC.**, 444 Madison Ave., New York 22, N.Y.—tap; tap-acc  
**AUDIO DYNAMICS**, 1677 Cody Ave., Ridgewood 27, L.I., N.Y.—car  
**AUDIO-EMPIRE, Div., DYNA-EMPIRE, Inc.**, 1075 Stewart Ave., Garden City, L.I., N.Y.—arm; car; tur  
**AUDIO-MASTER CORP.**, 17 E. 45th St., New York 17, N.Y.—phon-sys; pre-2; tap  
**AUDIOTEX MFG. CO.**, 400 S. Wyman St., Rockford, Ill.—ant; car; mik; phon-acc  
**AUCRAT ELECTRONICS CO.**, 5024 Elm St., Skokie, Ill.—phon-sys  
**BECKER ELECTRONICS MFG. CORP.**, Horton & Rockaway Aves., Valley Stream, N.Y.—spk

**BEL CANTO STEREOPHONIC RECORDINGS**, 1977-85 McAllister Ave., Columbus 5, Ohio—rec; tap-pr  
**BELL SOUND SYSTEMS, INC.**, 555 Marion Rd., Columbus, Ohio  
**BENJAMIN ELECTRONICS SOUND CORP.**, 97-03 43rd Ave., Corona 68, N.Y.—car; cha; tur  
**BLONDER-TONGUE LABS., INC.**, 9-25 Alling St., Newark 2, N.J.  
**BOGEN-PRESTO DIV., Siegler Corp.**, P.O. Box 500, Paramus, N.J.—amp-2; amp-pre; arm; cont; enc; phon-acc; pre-2; tap-acc; tap-hed; tap-rec; tun-1; tun-2; tun-mult; tun-ad; tur; W  
**BOZAK MFG. CO., R.I.**, Box 1166, Darien, Conn.—enc; spk  
**BRITISH INDUSTRIES CORP.**, 80 Shore Rd., Port Washington, N.Y.—amp-1; amp-2; cha; cont; conv-p; hed; phon-acc; pre-1; pre-2; spk; tun-1; tur  
**BURGESS BATTERY CO.**, Freeport, Ill.—tap

**CAPITOL RECORDS INC.**, 1730 Broadway, New York, N.Y.—rec  
**CBC ELECTRONICS CO.**, 2601 N. Howard St., Philadelphia 33, Pa.—ant; phon-acc; W  
**CENTRALAB DIV., GLOBE-UNION INC.**, 900 E. Keefe Ave., Milwaukee 1, Wis.  
**CHANNEL MASTER CORP.**, Ellenville, N.Y.—amp-2; amp-pre; ant; car; cha; enc; phon-sys; spk; tun-2; tun-ad; tur; W  
**CLEVELAND ELECTRONICS, INC.**, 1974 E. 61st St., Cleveland 3, Ohio—spk  
**COLUMBIA RECORDS**, 799 7th Ave., New York, N.Y.—rec  
**CONTINENTAL MFG., INC.**, 1612 California St., Omaha 2, Neb.—amp-1; amp-2; tun-2; tun-mult; tun-ad  
**CROSBY ELECTRONICS, INC.**, 135 Eileen Way, Syosset, N.Y.—tun-mult; tun-ad; W

**DECCA DISTRIBUTING CORP.**, 51-11 Queens Blvd., Woodside, N.Y.—rec  
**DEWALD RADIO Div. United Scientific Labs.**, 35-15 37th Ave., Long Island City 1, N.Y.  
**DUKANE CORP.**, North 11th Ave., St. Charles, Ill.—spk

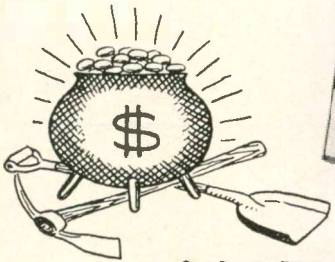
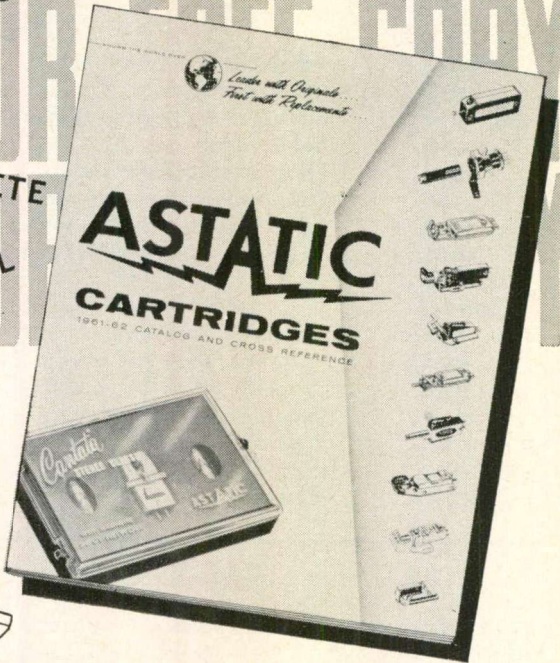
**DUOTONE CO., INC.**, Locust St., Keyport N.J.—car; need; phon-acc; tap  
**DYNACO INC.**, 3912 Powelton Ave., Philadelphia 4, Pa.—amp-1; amp-2; arm; car; cont; mik; pre-1; pre-2; tun-1; tun-mult; tun-ad; W; K

**ELECTRO ACOUSTIC PRODUCTS CO.**, 2135 Bueter Rd., Ft. Wayne, Ind.—cha; W  
**ELECTRON ENTERPRISES INC.**, 6917-19-21 W. Stanley Ave., Berwyn, Ill.—amp-1; amp-2; enc; phon-acc; phon-sys; tun-1  
**ELECTRONIC APPLICATIONS, INC.**, 194 Richmond Hill Ave., Stamford, Conn.—arm; car; mik; pre-1; pre-2; spk; tur  
**ELECTRONIC DEVELOPMENT ASSOC.**, 126 E. 46th St., New York 17, N.Y.—phon-sys; spk; tun-mult; W; K  
**ELECTRONIC INSTRUMENT CO. (EICO)**, 33-00 Northern Blvd., Long Island City 1, N.Y.—amp-pre; spk; tun-2; W; K  
**ELECTRO-SONIC LABS, INC.**, 627 Broadway, New York 12, N.Y.—arm; car; mik; phon-acc; tur  
**ELECTRO-VOICE, INC.**, Buchanan, Mich.—car; enc; mik; need; spk  
**ERCONA CORP.**, 16 W. 46th St., New York 36, N.Y.—enc; mik; rec; spk; tap-acc; tap-hed; tap-rec  
**ERIC ELECTRONICS CORP.**, 1823 Colorado Ave., Santa Monica, Calif.—amp-1; amp-2; amp-pre; tun-1; tun-2; tun-mult; tun-ad; W

**FAIRCHILD RECORDING EQUIPMENT CORP.**, 10-40 45th Ave., Long Island City 1, N.Y.  
**FANON ELECTRONIC INDUSTRIES INC.**, 439 Frelinghuysen Ave., Newark 14, N.J.—amp-1; amp-2; conv-p; phon-sys; W  
**FEDERATED INDUSTRIES, INC.**, 999 Anita St., Antioch, Ill.—spk  
**FEN-TONE CORP.**, 106 5th Ave., New York 11, N.Y.—amp-1; amp-2; amp-pre; arm; car; mik; need; phon-acc; pre-1; pre-2; tap-acc; tap-rec; tun-1; tun-2  
**FERRODYNAMICS CORP.**, Gregg St. & Route 17, Lodi, N.J.—tap; tap-pr  
**FIDELITONE MICROWAVE, INC.**, 6415 N. Ravenswood, Chicago 26, Ill.—conv-t; need; phon-acc; tap; tap-hed

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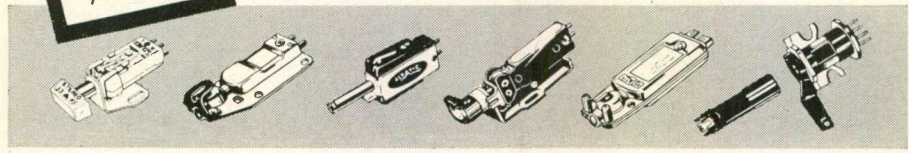
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FISHER BERKELEY CORP., 4224 Holden St., Emeryville 8, Calif.  
FISHER RADIO CORP., 21-21 44th Dr., Long Island City 1, N.Y.—amp-2; amp-pre; cont; phon-sys; pre-1; pre-2; spk; tap-rec; tun-1; tun-2; tun-mult; tun-ad; tur

GARRARD—See British Industries  
GENERAL CEMENT MFG. CO., 400 S. Wyman St., Rockford, Ill.—phon-acc  
GENERAL ELECTRIC CO., Audio Products, 2200 N. 22nd St., Decatur, Ill.—amp-pre; car; need; spk; tun-ad  
GENERAL ELECTRIC CO., Syracuse, N.Y.—phon-sys  
GLASER-STEERS CORP., 155 Oraton St., Newark 4, N.J.—cha; phon-acc  
GRAY MFG. CO., 16 Arbor St., Hartford 1, Conn.—arm; tur; W; K  
GREENTREE ELECTRONICS CORP., 1122 S. La Cienega Blvd., Los Angeles 35, Calif.—tap

HARMAN-KARDON INC., Plainview, L.I., N.Y.—amp-pre; tun-ad; tun-mult  
HARTLEY PRODUCTS CO., 519 E. 162nd St., New York 51, N.Y.—enc; spk  
HEATH CO., Hilltop Rd., Benton Harbor, Mich.—amp-1; amp-2; amp-pre; cha; enc; phon-sys; pre-1; pre-2; spk; tap-acc; tap-rec; tun-1; tun-2; tun-ad; tur; W; K

INTERNATIONAL PRODUCTS CO., 1289 S. La Brea Ave., Los Angeles 19, Calif.—tap-rec

JENSEN INDUSTRIES, INC., 7333 W. Harrison St., Forest Park, Ill.—car; need  
JENSEN MFG. CO., 6601 S. Laramie Ave., Chicago 38, Ill.—hed; spk  
JERROLD ELECTRONICS CORP., Jerrold Building, 15th & Lehigh, Philadelphia 32, Pa.—ant; phon-acc; amp (FM)

KARG LABS., 162 Ely Ave., South Norwalk, Conn.—tun-1; tun-mult; tun-ad; W

KARLSON ASSOCIATES, INC., 433 Hempstead Ave., West Hempstead, L.I., N.Y.—enc; spk; W; K  
KLIPSCH & ASSOCIATES, INC., P.O., Box 96, Hope, Ark.—spk

LAFAYETTE RADIO, 165-08 Liberty Ave., Jamaica 33, N.Y.—amp-1; amp-2; amp-pre; ant; arm; car; cha; cont; conv-p; conv-t; enc; mik; need; phon-acc; phon-sys; pre-2; rec; spk; tap; tap-pr; tap-acc; tap-hed; tap-rec; tun-1, tun-2; tun-mult; tun-ad; tur; K; W  
LANSING SOUND, INC., JAMES B., 3249 Casitas Ave., Los Angeles 39, Calif.—enc; spk

LESA OF AMERICA TRADING & MFG. CORP., 11 W. 42nd St., New York 36, N.Y.—arm; car; mik; need; phon-acc; phon-sys; tur; W

LING-ALTEC ELECTRONICS INC., 1515 S. Manchester, Anaheim, Calif.—spk  
LIVINGSTON AUDIO PRODUCTS CORP., 147 Roseland Ave., Caldwell, N.J.—tap-pr  
LONDON RECORDS, INC., 539 W. 25th St., New York 1, N.Y.—rec  
LOWELL MFG. CO., 3030 Laclede Station Rd., St. Louis 17, Mo.—enc

McINTOSH LABS., INC., 2 Chambers St., Binghamton, N.Y.—amp-1  
MAIER CO., P.O. Box 126, Wellington, Ohio—spk  
MARANTZ CO., INC., 25-14 Broadway, Astoria, L.I., N.Y.—amp-1; amp-2; pre-1; pre-2; W

MERCURY RECORD CORP., 35 E. Wacker Dr., Chicago 1, Ill.—rec  
MICHIGAN MAGNETICS, INC., West 3rd St., Vermontville, Mich.—tap-hed  
MICROTRAN CO., 145 E. Mineola Ave., Valley Stream, L.I., N.Y.—tap-acc  
MINNESOTA MINING & MFG. CO., 900 Bush Ave., St. Paul 6, Minn.—tap  
MONARCH ELECTRONICS INTERNATIONAL, INC., 7035 Laurel Canyon Blvd., North Hollywood, Calif.—amp-1; amp-2; amp-pre; arm; car; enc; mik; phon-acc; pre-1; spk; tap; tap-acc; tun-1; tun-2; tur; W  
MOTOROLA INC., 9401 W. Grand Ave., Franklin Park, Ill.—phon-sys  
MP ENGINEERING CO., Fairfield 3, Conn.—amp-1; amp-2; amp-pre; cont; enc; phon-sys; pre-1; pre-2

NESHAMINY ELECTRONIC CORP., 382 Easton Rd., Neshaminy, Pa.—spk  
NEWCOMB AUDIO PRODUCTS CO., 6824 Lexington Ave., Hollywood 38, Calif.—amp-1; amp-2; tap-rec  
NORTH AMERICAN PHILIPS CO., High Fidelity Prods. Div., 230 Duffy Ave., Hicksville, N.Y.—car; cha; mik; spk; tap-rec; tur; W  
NORTONICS CO., 1015 S. 6th St., Minneapolis 4, Minn.—amp-1; conv-t; tap-acc; tap-hed; W

OXFORD COMPONENTS Div. Oxford Electric Corp., 3911 S. Michigan Ave., Chicago 53, Ill.—spk

PACO ELECTRONICS CO., 70-31 84th St., Glendale 27, N.Y.—amp-2; amp-pre; spk; tun-1; tun-2; tun-mult; tun-ad; W; K  
PENTRON CORP., 277 S. Tripp Ave., Chicago 24, Ill.—tap-rec  
PERMO INC., 6415 Ravenswood Ave., Chicago 26, Ill.  
PERMOFLUX CORP., 4101 San Fernando Rd., Glendale 4, Calif.—amp-2; conv-p; hed; mik; spk  
PFANSTIEHL CHEMICAL CORP., 104 Lakeview Ave., Waukegan, Ill.—need  
PHILCO CORP., C & Tioga Sts., Philadelphia 34, Pa.—phon-sys  
PHILMORE MFG. CO., 130-01 Jamaica Ave., Richmond Hill 18, N.Y.—arm; car; hed; spk; tap-rec  
PICKERING & CO., Sunnyside Blvd., Plainview, L.I., N.Y.—arm; car; conv-p; need; tur; W  
PILOT RADIO CORP., 37-06 36th St., Long Island City 1, N.Y.—amp-2; amp-pre; phon-sys; spk; tun-2; tun-mult; tun-ad  
PRO-TEX REEL BAND CO., 2108 Payne Ave., Cleveland 14, Ohio—tap-acc

QUAM-NICHOLS CO., 234 E. Marguette Rd., Chicago 37, Ill.—spk

RADIO CORP. OF AMERICA, Front & Cooper Sts., Camden, N.J.—phon-sys; tap; tap-pre  
RCA VICTOR CORP., 155 E. 24th St., New York, N.Y.—rec  
REEVES SOUNDRAFT CORP., Green Pasture Rd., Danbury, Conn.—tap  
REGENCY ELECTRONICS, INC., 7900 Pendleton Pike, Indianapolis 26, Ind.  
REITER CO., F., 3340 Bonnie Hill Dr., Hollywood 28, Calif.—tap-acc  
REK-O-KUT CO., INC., 38-19 108th St., Corona 68, N.Y.—tur  
REVERE CAMERA CO., 320 E. 21st St., Chicago 16, Ill.—amp-1; tap-acc; tap-rec  
RIVERSIDE RECORDS, 235 W. 46th St., New York 36, N.Y.—rec  
ROBERTS ELECTRONICS, INC., 5920 Bowcroft St., Los Angeles 16, Calif.—tap-rec

ROBINS INDUSTRIES CORP., 36-27 Prince St., Flushing 54, N.Y.—phon-acc; tap-acc; tap-hed  
ROCKBAR CORP., 650 Halstead Ave., Mamaroneck, N.Y.—cha; enc; spk; tur; W  
RYE SOUND CORP., 145 Elm St., Mamaroneck, N.Y.—hed; tap-acc

SARGENT-RAYMENT CO., 4926 E. 12th St., Oakland 1, Calif.—amp-1; amp-2; amp-pre; cont; tun-1; tun-2; tun-mult; tun-ad; W  
SCOPE ELECTRONICS CORP., (E.M.I.) 10 Columbus Circle, New York 19, N.Y.—amp-2; amp-pre; arm; pre-2; spk; W  
SCOTT, INC., H. H., 111 Powder Mill Rd., Maynard, Mass.—amp-2; amp-pre; arm; car; pre-2; spk; tun-1; tun-2; tun-mult; tun-ad  
SCOTT INSTRUMENT LABS., 17 E. 48th St., New York 17, N.Y.—tap-pr; tap-acc  
SHERWOOD ELECTRONIC LABS., 4300 N. California Ave., Chicago 18, Ill.—amp-1; amp-2; amp-pre; tun-1; tun-2; tun-mult; tun-ad; W  
SHURE BROTHERS INC., 222 Hartrey Ave., Evanston, Ill.—arm; car; conv-t; mik; need; phon-acc; pre-2; tap-hed  
SMITH LABS., A. BERNARD, Photo-Sonic Div., 2969 Ludlow Rd., Cleveland 20, Ohio—car; mik; need  
SMOLIN LABS., Woodbrook Dr., Springfield, Conn.—tap-rec; W  
SONOTONE CORP., Elmsford, N.Y.—arm; car; mik; need; spk; tap-hed  
STROMBERG-CARLSON CO., 1400 N. Goodman, Rochester, N.Y.—amp-2; spk; tun-2  
SUPEREX ELECTRONICS CORP., 4-6 Radford Pl., Yonkers, N.Y.—hed  
SUPERSCOPE INC., 8150 Vineland Ave., Sun Valley, Calif.—mik; pre-2; tap-acc; tap-rec; W  
SWITCHCRAFT, INC., 5555 N. Elston Ave., Chicago 30, Ill.—cont; phon-acc  
SYMPHONIC RADIO & ELECTRONIC CORP., Coliseum Tower, 10 Columbus Circle, N. New York 19, N.Y.—phon-sys

TANDBERG OF AMERICA, INC., 8 Third Ave., Pelham, N.Y.—tap-rec  
TANNOY (America) Ltd., P.O. Box 177, East Norwich, L.I., N.Y.—spk  
TELECTROSONIC CORP., 35-18 37th St., Long Island City 1, N.Y.—tap-rec  
TELEX, INC., 1633 Eustis Ave., St. Paul 1, Minn.—hed  
TETRAD CORP., 62 St. Marys Ave., Yonkers 2, N.Y.—need  
THORENS CO., Thorens Bldg., New Hyde Park, N.Y.—arm; cha; tur  
TIME RECORDS INC., 2 W. 45th St., New York 36, N.Y.—rec; tap-pr  
TRANSIS-TRONICS (TEC), 1601 Olympic Blvd., Santa Monica, Calif.—amp-1; amp-2; amp-pre; pre-1; pre-2; tun-1; tun-mult; tun-ad; W; K  
TRITON ELECTRONICS INC., 62-05 30th Ave., Woodside 77, N.Y.—tap  
TURNER CO., 909 17th St., N.E., Cedar Rapids, Iowa—mik

UNITED ARTISTS RECORDS, 729 7th Ave., New York 19, N.Y.—rec  
UNITED AUDIO PRODUCTS, 12 W. 18th St., New York 3, N.Y.—cha  
UNIVERSITY LOUDSPEAKERS INC., 80 S. Kensico Ave., White Plains, N.Y.—enc; mik; spk; W; K  
UTAH RADIO & ELECTRONICS CORP., 1123 E. Franklin St., Huntington, Ind.—spk

VIDAIRE ELECTRONICS MFG. CORP., 365 Babylon Turnpike, Roosevelt, N.Y.—phon-acc  
VIKING OF MINNESOTA, 9600 Aldrich Ave. South, Minneapolis 20, Minn.

V-M CORP., Box 659, Benton Harbor, Mich.—amp-2; amp-pre; cha; phon-sys; tap-rec; tun-1; W

WABER ELECTRONICS, INC., Hancock & Somers Sts., Philadelphia 38, Pa.—amp-2; ant; enc; phon-acc  
WALCO ELECTRONICS, 60 Franklin St., East Orange, N.J.—need  
WATERS-CONLEY & CO., 17 E. Chestnut St., Chicago 11, Ill.  
WEATHERS INDUSTRIES, 66 E. Gloucester Pike, Barrington, N.J.—car  
WEBCOR INC., 5610 W. Bloomingdale Ave., Chicago 39, Ill.—cha; phon-sys; tap-rec  
WEBSTER ELECTRIC CO., 1900 Clark St., Racine, Wis.  
WESTINGHOUSE ELECTRIC CORP., High Fidelity Dept., Metuchen, N.J.—phon-sys  
WOLLENSAK OPTICAL CO., 320 E. 21st St., Chicago 16, Ill.—tap-acc; tap-rec

ZENITH RADIO CORP., 6001 Dickens Ave., Chicago 39, Ill.—phon-sys

## Stereo Speakers

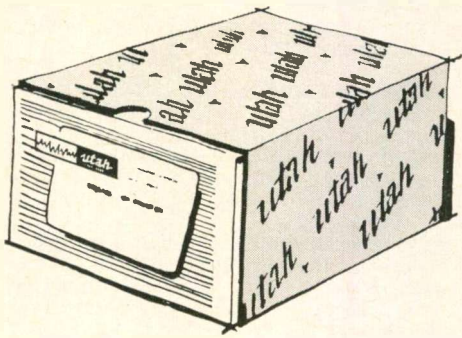
(Continued from page 103)

which is integrated into the output circuit. The third speaker sometimes has two voice coils; one for each channel being tapped. Other three-channel stereo sets connect a third speaker directly to each channel and choke coils to filter middle and high frequencies.

Matching speaker impedances to the correct amplifier output transformer taps remains the same. The big stereo speaker problem is where to place the speakers to achieve the best stereo effect in a particular listening area. Placement depends on the size and shape of a listening area, furnishings in a room, and speaker coverage available (two or three separate speakers, additional wide dispersion, high frequency speakers, etc.). Unfortunately, this is an area where much experimentation must be done.

Some manufacturers offer directional versatility by allowing a mid-range speaker or speakers to be rotated on its mounting so that the sound emanating from it can be directed to the desired area. Another system promotes diffusion of sound through use of open enclosure backs, giving a big-phase radiation that reportedly creates a stereo illusion of unusual spaciousness.

Other companies, recognizing the varied directional needs because of vast differences of listening areas, include movable speaker enclosure doors that accomplish diffusion of sound by a bounce effect from the



# WHY PACK ONLY ONE SPEAKER TO A BOX?

A speaker is a delicate precision-built instrument which should be protected from dust and physical abuse.

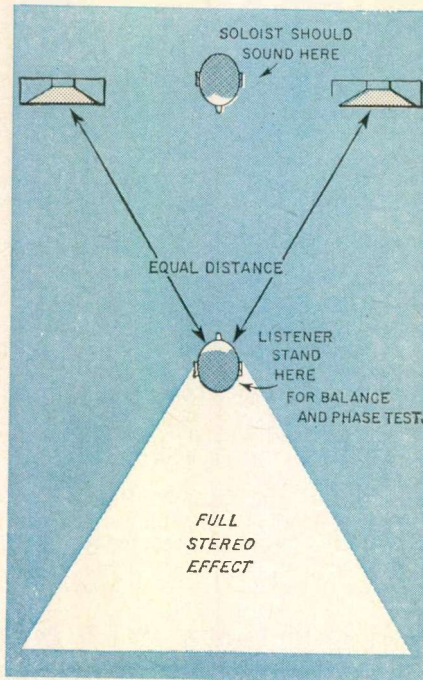
By single-packing speakers in custom-fitted reshippable cartons, Utah actually saves the distributor time and money. There's no need for repacking. Clearly labeled, single-packed speakers make inventory control easy for both the distributor and serviceman.

Most important, Utah can guarantee factory tested performance of every speaker on delivery. This adds up to customer satisfaction all down the line.

Utah believes everyone benefits from single-packing—consumer, serviceman, distributor—and the electronics industry.

room walls. The position of the doors varies the sound pattern of each channel. One company, using this technique, claims improved deflection results by beaming the speakers to each side of the enclosure, thereby producing a primary bounce effect and preventing the higher frequency sounds from being beamed directly to the listener. The stereo sound seems to come from a source behind the walls.

In general, the livelier the room, that is, the less acoustic absorption

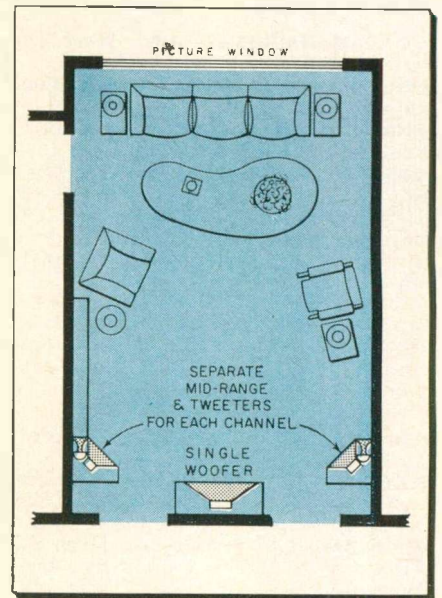


A monophonic record should be "heard" at the center of two stereo speakers.

material such as drapes, rugs, etc., the more diffusion is needed to create the illusion of depth and breadth. Well damped rooms, with wall-to-wall carpet, heavy furnishings, etc., can use some directionality so that the true stereo effect may be realized.

It should be mentioned here that stereo has prompted the introduction of "bookshelf" speakers. The reasons are obvious: many people haven't the room to place *two* big speaker systems.

Bookshelf speakers are being offered in many varieties. One thing they all have in common is small size. While some units are single speaker affairs, others are complete small systems. Many offer excellent sound (a number do not) and some even provide clean, thumping bass frequencies, although at a sac-



Here's one solution to a difficult wall space problem for stereo speaker placement.

rifice in speaker efficiency. New speaker designs such as the acoustic suspension development, high compliance cones, improved voice coils and enclosure damping methods allow many small units to surpass the "behemoths" of yesteryear.

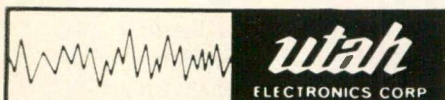
## Monarch STEREO RECEIVER

Model STA-260 combines a 60-watt stereo amplifier, independent AM and FM tuners, and unlimited control facilities on a single chassis. Features include: TRF on both AM and FM; Foster-Seely discriminator circuit; visual tuning indicators on both AM



and FM; third channel output; d-c preamp filaments; and multiplex provisions. Inputs for each channel include 2 for magnetic phono or tape head, 1 for multiples adaptor and 1 auxiliary. \$249.95. Monarch Electronics International, Inc., 7035 Laurel Canyon Blvd., North Hollywood, Calif.

For more data, circle 9-108-2 on coupon, p. 41

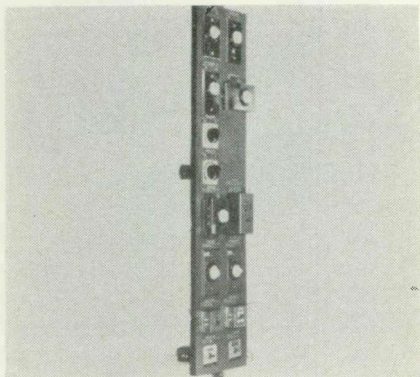


HUNTINGTON, INDIANA

For more data, circle 9-108-1 on coupon, p. 41

### Audiotex DEMONSTRATORS

The "Audio Control Demonstrator," reported as an unusual type of "bread-board demonstrator," is designed to help the audio-high fidelity-stereo dealer sell more controls by visual performance. The unit is a working display of 15 mounted controls and the customer can handle the controls, turning the switches on and off and

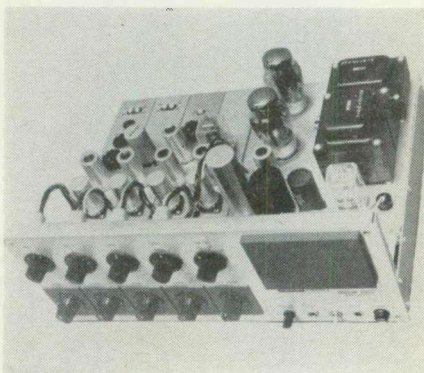


watching them operate an auxiliary spotlight. Packaged in the new demonstrator: spotlight; remote power control; power off; speaker selector switches and volume controls; and switchboxes. Known as Deal No. 49-030, the demonstrator can be mounted on a wall or on a regular floor display. Audiotex Mfg. Co. 400 S. Wyman St., Rockford, Ill.

For more data, circle 9-109-2 on coupon, p. 41

### Harman-Kardon AMPLIFIERS

The 60-watt Moduline amplifier, with four modules, is part of a new line of commercial sound equipment introduced. The front-panel plate may be used for a VU meter or monitor speaker. In addition to the deluxe Moduline series, consisting of basic 30, 60



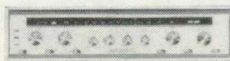
and 120 watt amplifiers, also introduced is the popular-priced Commander series, not shown, of 12, 35 and 100 watt amplifiers, each with master volume and fader/mixer controls. Harman-Kardon, Inc., Plainview, L.I., N. Y.

For more data, circle 9-109-3 on coupon, p. 41

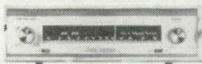
# SHERWOOD

only for those who want the ultimate in

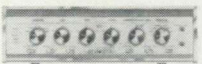
## FM Stereo Broadcast Reception and Stereo Record Reproduction



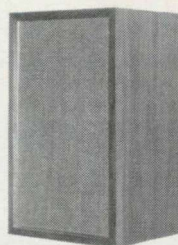
S-8000 FM/MX 64 Watt Stereo Receiver  
16 1/4" x 4" x 14" deep. \$299.50



S-3000 IV FM/MX Stereo Tuner  
14" x 4" x 10 1/2" deep. \$160.00



S-5000 II 80 Watt Stereo Amplifier  
14" x 4" x 12 1/2" deep. \$199.50



Ravinia Model SR3 3-way  
26" x 15" x 13 1/4" deep.  
Speaker System \$139.50

Correlaire Walnut Hi Fi Furniture



With FM Stereo broadcasting (multiplex) an established reality, Sherwood proudly offers every component you need for superb stereo reception. Sherwood stereo amplifiers and tuners are pre-eminent in the field, and now—in the S-8000 Receiver—the ultimate in compact reception quality is achieved. The exciting new Ravinia Model SR3 3-speaker system features extremely low intermodulation distortion and unusually flat frequency response. Cabinet is hand-rubbed walnut. The perfect setting for hi fi components is Sherwood's Correlaire contemporary furniture modules—in hand-rubbed Walnut and Pecan. Sherwood Electronic Laboratories, Inc., 4300 N. California Ave., Chicago 18, Illinois.

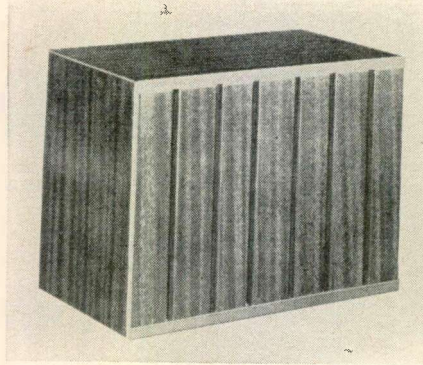
For complete technical details, write Dept.



## Utah SPEAKERS

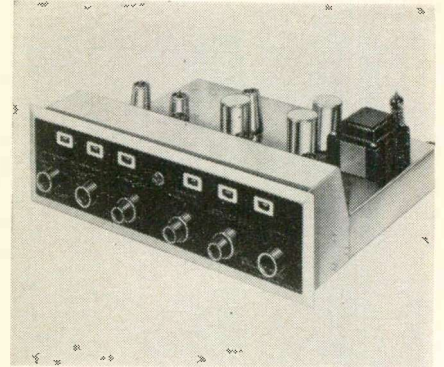
Announced is a compact speaker measuring only 8 x 10¼ x 6¾". The SH-3 features a random-width wood-paneling design to eliminate the need for grill cloth. The almost-invisible slots help load the 6 x 9" speaker. Screw terminals on the back cover facilitate easy connection to existing music systems. Available in blond, mahogany or walnut finishes. Can be used on a bookshelf or hung on a wall. Utah Electronics Corp., Huntington, Ind.

For more data, circle 9-110-2 on coupon, p. 41



## Scott PREAMPLIFIERS

The LC-21 preamplifier kit, shown, is flexibly designed for professional or home use. Contains five pairs of stereo inputs, derived center channel output and stereo tape recorder outputs. Front panel has 14 separate controls. Distortion, less than 0.1% at 2.5v out-



put. Frequency response, 8-50,000 cps, ± 1 db. 15½"W x 5¼"H x 13¼"D. \$88.95, East of the Rockies. Also, not shown, the LK-150 stereo power amplifier kit, rated at 65 watts per channel. IHFM power band ranges from below 19 cps to more than 25,000 cps. \$169.95, East of the Rockies. H. H. Scott Inc. 111 Powdermill Rd., Maynard, Mass.

For more data, circle 9-110-3 on coupon, p. 41

## Heath MULTIPLEX CONVERTER

Heathkit Ac-11 multiplex converter, designed especially for the new FCC FM multiplex system, is easy to use with a minimum of controls. Has separation control for maximum stereo effect; cathode follower outputs for in-

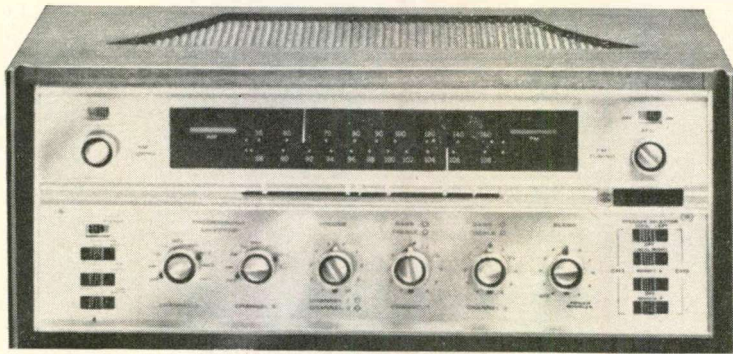


stallation versatility; built-in power supply; and slim black metal cabinet. Frequency response, 50 cps to 15 kc with built-in de-emphasis. Features cathode follower outputs for both A & B channels. Includes 3 connecting audio cables (1 input, 2 output). Kit, \$32.50. Wired \$56.25. Heath Co., Benton Harbor, Mich.

For more data, circle 9-110-4 on coupon, p. 41

# NEW FROM BOGEN !

## outdates and outperforms the field



RP40A with Built-in Multiplex

## THE DISTINGUISHED SOUNDSPAN™ RECEIVER

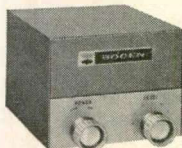
BOGEN's 30 year leadership in sound engineering has never been more evident. This year's receiver and tuner line with built-in multiplex proves it. Take the RP40A SoundSpan Stereo Receiver... BOGEN's finest. Fresh, clean, sparkling sound powered by a 44 watt amplifier... extraordinary sensitivity in the FM/AM Tuner with built-in multiplex. This completely integrated unit offers the utmost in control-flexibility and quality performance. Add to this the bonus benefit of SoundSpan—the revolutionary development that lets you hear any two different sound sources in different parts of the house simultaneously—plus functionally beautiful design, and you have the RP40A—\$399.95.\* Write today for the all-new BOGEN Stereo Hi-Fi Catalog.

### ALSO IN THE SOUND SPAN FAMILY

TP60 SoundSpan Stereo Tuner, with Built-In Multiplex. Maximum sensitivity, stability and the finest overall performance. Perfect companion to the AP60. \$269.95\*

### AP60 SOUNDSPAN STEREO AMPLIFIER

A powerful 66 watt control-center providing the utmost in flexible control. \$249.95\*



### PX60 MULTIPLEX ADAPTER

Designed especially for pre-multiplex BOGEN equipment but excellent for any good quality receiver or tuner. Self-powered with external connections. Complete with Seville textured metal cage. \$69.50\*

\* Prices slightly higher in West

61-8

# BOGEN-PRESTO

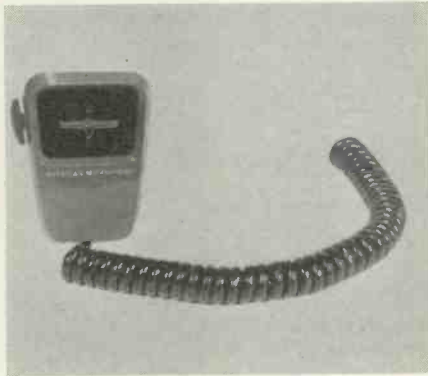
Desk ET 9 - Paramus, N. J. • A DIVISION OF THE SIEGLER CORPORATION





## American CB MICROPHONES

Model B-213 AC citizens band ceramic microphone features a high impact polystyrene case and modern straight line styling. Frequency response, 50-8000 cps. Output level, -58 db. Has push-to-talk DPST switch that is wired for relay operation, and 11' coiled cord that extends to 5 ft. The

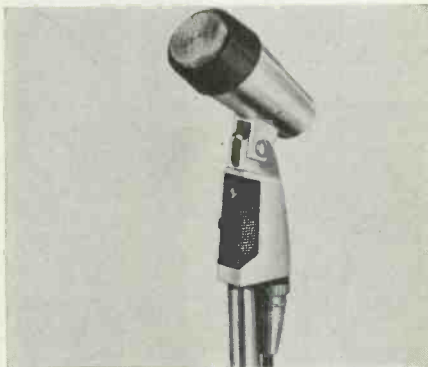


new microphone is said to be the lightest, smallest ceramic element model on the market. \$16.75. Also, not shown, B-213C, \$13.75, does not have the switch; and X-213 AC, \$16.75, identical except for having a crystal element instead of ceramic. American Microphone Mfg. Co. 412 S. Wyman St., Rockford, Ill.

For more data, circle 9-111-2 on coupon, p. 41

## Shure MICROPHONES

Model 540S Sonodyne II, compact omnidirectional microphone features variable frequency response which allows the user to tailor the unit to the application. It has a high output dynamic element. Frequency response,



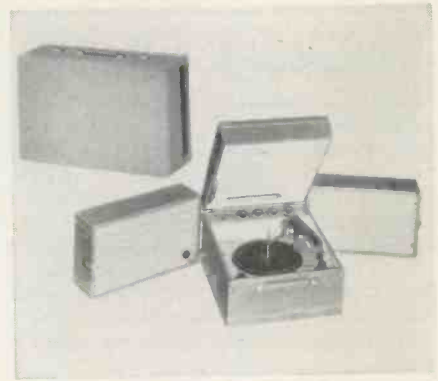
60-10,000 cps. \$49.95. Also, not shown, model 546 Unidyne III, primarily developed for the broadcast market but reported ideal for PA installation and recording. Features include vibration isolation. Frequency response, 50-15,000 cps. \$135.00. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

For more data, circle 9-111-3 on coupon, p. 41

## V-M STEREO PHONOGRAPHS

Highlighted in a new 7-model line is model 316. It combines power, stereo separation, versatility and styling. Features include: 2.15 oz. speaker magnets; four 6" acoustically balanced speakers; and Stere-O-Matic record changer with stereo cartridge and diamond needle. \$159.95. Remaining models range in price from \$29.95 to \$129.95. Also announced: 11 consoles with tuner and recorder. Price range, \$129.95 to \$1125. V-M Corp., 226 Pilestone St., Benton Harbor, Mich.

For more data, circle 9-111-4 on coupon, p. 41



*new  
advances  
in loudspeaker  
design*

JBL's ability to control precision in manufacture coupled with JBL's aptitude for controlling efficiency in loudspeaker performance have led to the unique Linear-Efficiency transducer. L-E speakers are long-linear-excursion drivers that will reproduce solid, fundamental bass even though mounted in acoustical enclosures with the compact dimensions required for most stereo installations. With an unprecedented degree of efficiency for this type of speaker, they require only moderate power to reach realistic listening levels.



## NEW 15" LINEAR-EFFICIENCY LOW FREQUENCY DRIVER JBL LE15A

Regarded as an "impossible" assignment right up to the moment a working prototype was produced, the LE15A cone can travel linearly  $\frac{3}{4}$ "—a remarkable achievement when it is realized that voice coil diameter is 4" and coil-gap tolerances are held to a few thousandths of an inch! Resonant frequency is 20 cps. Frame is rigid cast aluminum.

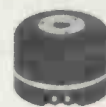
## NEW ACOUSTICAL LENS AND HORN



JBL HL91

A new configuration for a slant-plate acoustical lens results in the smoothest distribution yet attained in lenses for home listening. Sound from 500 cycles on up is projected in a 120° horizontal x 45° vertical pattern.

## NEW L-E HIGH FREQUENCY DRIVERS



JBL LE75

Designed for 500 cycle crossover for use with the LE15A, the new LE75 is a high precision instrument with a silver impedance compensating ring—forming a system with incomparably smooth, flat response.



JBL-LE85

Somewhat larger than the LE75, the LE85 is a laboratory standard driver reproducing frequencies from 500 cps. to beyond limits of audibility with an ever-fresh transparency, handles transients with consummate mastery.

Products of JAMES B. LANSING SOUND, INC., are marketed by JBL INTERNATIONAL, Los Angeles 39, California

## Catalogs & Bulletins

**STEREO TAPE:** New 24-page catalog covers stereophonic two and four track recorded tapes. Livingston Audio Products Corp., 147 Roseland Ave., Caldwell, N. J.

For more data, circle 9-112-2 on coupon, p. 41

**HI-FI CABLES:** New Unitized hi-fi cable line, covered in literature, permits 1600 cable combinations with only 16 items. Two introductory deals are offered. C-B-C Electronics Co., 2601 N. Howard St., Philadelphia 33, Pa.

For more data, circle 9-112-3 on coupon, p. 41

**HI-FI AUDIO TUBES:** Bulletin ETD-2622, 12 pages, covers audio tubes designed specifically for hi-fi. Included are specifications on current line of 26 amplifier, preamplifier and rectifier tubes. General Electric Receiving Tube Dept., Owensboro, Ky.

For more data, circle 9-112-4 on coupon, p. 41

**HI-FI COMPONENTS:** Colorful, illustrated brochure covers hi-fi components: stereo units, tuners, amplifiers; monaural tuners, amplifiers; flexiform speakers; speaker systems; tape recorders; and tape. Prices included. Monarch Electronics International, Inc., 7035 Laurel Canyon Blvd., North Hollywood, Calif.

For more data, circle 9-112-5 on coupon, p. 41

**CB RADIOS:** A colorful new sales literature kit covers the firm's complete line, including the R-2700 citizens band receiver and S-Nine transmitter for base station operation; and the Mobilair model transceiver. Browning Labs., Laconia, N. H.

For more data, circle 9-112-6 on coupon, p. 41

**STEREO HI-FI EQUIPMENT:** New 1962 catalog #620, 340 pages, includes featured items of the firm's equipment in kit form and completely assembled, as well as the latest stereo hi-fi components of all major manufacturers. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y.

For more data, circle 9-112-7 on coupon, p. 41

**TAPE RECORDING HEADS:** A new guide lists replacement heads for tape recorders made by 38 U.S. manufacturers. Reported to list for the first time replacement heads for Revere and Wollensak recorders. 16 pages. Robins Industries Corp., 46-27 Prince St., Flushing, N.Y.

For more data, circle 9-112-8 on coupon, p. 41

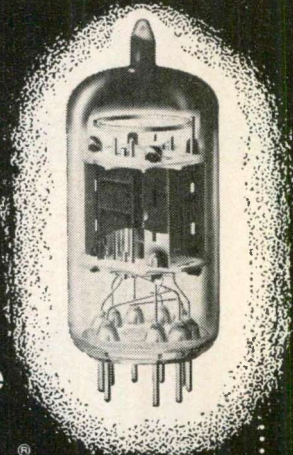
**TELEPHONE INTERCOM SYSTEMS:** Literature available covers: (1) Fanon Fone, model 1010, multi-channel dial telephone system. Does not require a switchboard. (2) Full Masco line of telephone intercom systems. Fanon Electronic Industries, Inc., 439 Frelinghuysen Ave., Newark 12, N. J.

For more data, circle 9-112-9 on coupon, p. 41

**TAPE RECORDERS & TAPES:** Illustrated bulletin for consumers, 12 pages, tells how to select magnetic tape recorders and tapes. Copies can be obtained from the National Better Business Bureau, Inc., 230 Park Ave., New York 17, N. Y.

**TECHNICIAN'S HANDBOOK:** New enlarged edition of the Technician's Handbook on electron tubes and semiconductors has 550 pages. Includes complete reference chart on picture tubes. Receiving, industrial, hi-fi, special purpose and foreign tubes are covered. Price, \$1.95. Order direct from CBS Electronics Publications, 100 Endicott St., Danvers, Mass.

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**Amperex<sup>®</sup> 12AX7/ECC83**

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- Contact potential 0.8v Max. for lower distortion in input stage
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Introduced by Amperex in 1955, the 12AX7/ECC83 easily outperformed all competing tubes of its type. Amperex continued development, made further improvements and refinements. The result is good news for the designer. For, in its present Amperex version, the 12AX7/ECC83 is a rugged, super-uniform twin-triode, purged, for all practical purposes of hum and microphonics and available at fully competitive prices.

Applications engineering assistance and detailed data are always available to equipment manufacturers. Write: Amperex Electronic Corporation, Special Purpose Tube Division, 230 Duffy Avenue, Hicksville, Long Island, New York.

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6BM8/ECL82: Triode-pentode, 8 w., push-pull

8 w., push-pull

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12AU7/ECC82 } hum, noise and

12AX7/ECC83 } microphonics

6BL8/ECF80: High gain, triode-pentode, low hum, noise and microphonics

RECTIFIERS

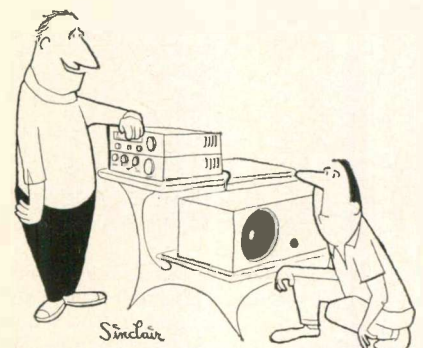
6V4/EZ80: Indirectly heated, 90 mA

6CA4/EZ81: Indirectly heated, 150 mA

5AR4/GZ34: Indirectly heated, 250 mA

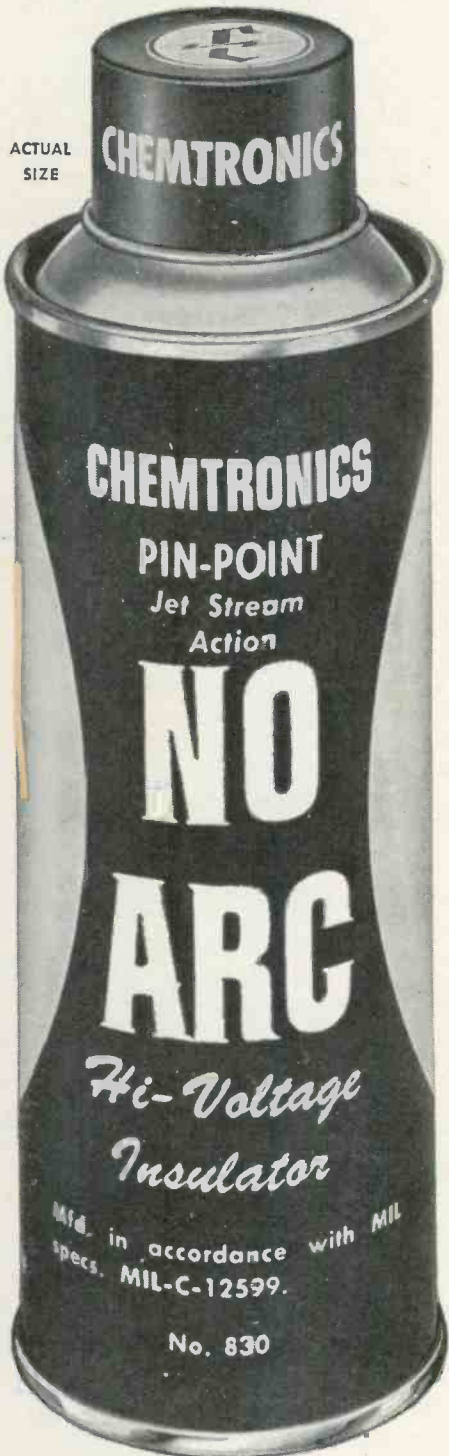


about hi-fi tubes  
for hi-fi circuitry



"That, my friend, is a low-efficiency, high compliance woofer with an extremely large cone movement. So stand back or you'll get klobbered!"

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## Hi Fi Installation Methods

(Continued from page 99)

between speakers may result in an obvious "hole in the middle." Experimenting with speaker locations is the only way to determine the best position.

Be sure that the speakers are properly phased. If not, bass will be shallow. Some preamplifiers provide phase switches. If not, you'll have to reverse connections of one speaker while testing for proper speaker phase. A simple test can be effected by playing a record with deep bass notes. The sound should be louder in the in-phase position than the out-of-phase position. Reversing one speaker's leads will result in less bass if this position is the out-of-phase one.

The final part of any installation is checking out the system with source material, whether record, tape, broadcast; or all three if they're being installed. If the pre-amp has separate input level controls, they should be adjusted so that sound level is the same when switching from one source to another.

Double check your connections to make sure they're firmly connected, mechanically and electrically. If the cables resemble a rat's nest, arrange them so they're neat. You don't want to fight your way through a maze of tangled wires in the event you service the system at a later date. If hum seems excessive try moving some connecting cables about, especially if low level signal ones are near power lines. Ground loops can be difficult to isolate so, once they're eliminated, secure cables to prevent innocent movement during cleaning or dusting chores of a housewife.

Inspect the amplifier after it has been working awhile to see if it is too hot. Excessive heat can shorten an amplifier's life as well as damaging a closeby object. Thus, be sure that adequate power amplifier ventilation is provided.

And an especially important last item—patiently explain how to operate the system to your customer before leaving the home. It may save a second home call. ●

The  
**FIRST**  
and the  
**FINEST!**



**FISHER**  
**500-B**  
65-Watt  
FM-Multiplex  
Receiver

■ The sensational new FISHER 500-B is a powerful 65-watt receiver designed for maximum performance, maximum flexibility. It is equipped with the exclusive FISHER STEREO BEAM, the Fisher invention that instantly tells you whether an FM station is broadcasting in Multiplex. The 500-B incorporates a complete Stereo Master Audio Control, a high-sensitivity FM tuner (vital for Multiplex), a 65-watt stereo amplifier, and an advanced design Multiplex tuner with STEREO BEAM—everything on one compact chassis. Simply add a pair of speakers and a turntable for a complete stereo high fidelity system. \$359.50

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## RELY ON ROBINS M/M RECORDING AND ERASE HEADS

To service, upgrade  
or convert-to-stereo  
recorders made by  
these manufacturers:

Viking ■ Pentron ■ Wilcox Gay  
■ Telectro ■ RCA ■ Revere ■  
Knight ■ Heath ■ Ekotape ■  
Bell ■ Columbia ■ Ampro ■  
Silvertone ■ Montgomery Ward  
■ Masco ■ Packard Bell ■  
Olympic ■ Mitchell ■ Magnetic  
Recording Industry ■ Philco ■  
Capitol ■ Bell & Howell ■ Air  
Castle ■ Amplifier Corp. ■  
Sonograph ■ Symphonic ■  
Stereophonic ■ also plus heads  
for Wollensak and Revere models  
—38 U. S. manufacturers—200  
individual models.

Replace, upgrade, convert with these precision recording and erase heads. In most cases these heads, manufactured by Michigan Magnetics, are the original equipment supplied with the recorders.

Available at your Robins distributor. **FREE**—Robins M/M Tape Recording Head and Reference Guide, write:

### ROBINS INDUSTRIES CORP.

Flushing 56, N. Y.

## Hi-Fi Service Agencies

(Continued from page 95)

profit from repairing sets in warranty. Successful agencies only make a profit when owners bring in their sets for repair *after* the warranty period expires. Here the owner pays for service and parts. This is, in essence, why service companies sign up with manufacturers to do their warranty repairs.

A steady flow of new customers are introduced to an agency through their manufacturer ties: Customers are drawn to service shops by their "authorized" associations. They are sent to agencies for in-warranty repair by manufacturers, distributors and dealers. Agencies are listed in the telephone yellow pages as authorized service companies (under the manufacturers' trade name). Also, agencies are introduced to sales dealers who send them additional repair work.

Additional "good" results because a service company is factory-authorized. Their parts replacement profits (out-of-warranty) is greater because they can purchase parts at a lower cost than non-authorized service companies can. Agencies receive service information and hints regularly from the respective manufacturers they represent.

How about the unfavorable features of service agency work? Some gripes were elicited from service agencies throughout the country, too. One of the major ones included the unprofitable payment structure for warranty work. (A bad run of tough dogs could result in an agency incurring a loss that can't be made up by out-of-warranty repairs.) Another frequent complaint centered around factories or their distributors siding with customers when there's a conflict. For example, a factory may extend a customer's warranty period or authorize repair of a unit when it doesn't meet warranty terms, such as customer inflicted damage of a set. In such instances, an agency can be pressed to repair the set under warranty, which usually means a loss for the agency.

Many other pro's and con's of doing service work for manufac-

turers were volunteered by agencies around the country. Some were minor grievances; others were suggestions for improving service, such as manufacturers should standardize report forms, factory agencies should form an association to achieve stronger negotiation leverage with manufacturers, etc.

However, agencies were essentially satisfied with their factory agreements. They can always issue contract termination notice to a factory when they're dissatisfied with an arrangement, of course. Similarly, a manufacturer can terminate a contract with a factory if they desire. Consequently, both parties are kept on their toes. •

## New Stereo Developments

(Continued from page 101)

Technically, multiplex transmission will be a tremendous advance from AM/FM variety. Thus, FM multiplex is a step forward that has to be consolidated.

**Stereo Tape**—Over a decade ago, the phonograph industry had what was called "the battle of the speeds." That was nothing to what has hit tape in the last few years: not only speeds, but tracks; and to top that, reels or cartridges, and if cartridges, whose?

From what we've seen—and we believe we've seen them all—the technically most promising one is the CBS/3M development. This enables small tape cartridges, with recorded quality superior to disc, to be stacked and played in a changer that requires no special care in handling. The improved quality per square inch of tape means cost will compete very favorably with disc, too. The tape carries three tracks (potentially; only two at first) on tape .015" (as against the present .025") playing at 1 7/8" speed. The quality is really there, in spite of expectations to the contrary.

**Stereo Records**—In the stereo disc department there have been a number of small developments which may better the future of stereo in their own way. Probably

the most significant is the dynamically balanced pickup arm. Ever since microgrooves came in and pickups were designed to track at forces of a few grams, the big problem was susceptibility to extraneous vibrations; a person walking across the room could make the needle jump a groove. To prevent this, the tracking force had to be increased.

The dynamically balanced arm has solved this problem. Any vibration is transmitted to the whole arm assembly, not just one end of it, so it moves as an entity with the record and everything else, without interfering with the playing. Some dynamic arms have been demonstrated playing upside down, which they will do, if you stop the record falling off the table.

A similar purpose is served by one company's anti-skate device. This stops the stylus from being dragged to the center of the record if it jumps a groove. At the same time, by offsetting the side-drag that causes skating, it prevents forms of distortion for which the same side-drag is responsible.

What about the relatively new RCA anti-static material? It works. If it has any detrimental effects, they have not had time to show up, but we see no reason for there to be any.

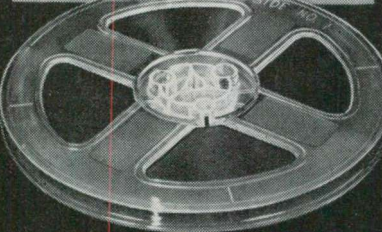
In this short space we have not covered everything that's going on in the stereo field. More new innovations will come, but the main thing to look for is consolidation and stabilization of what has already been developed. •

## FM Multiplex

(Continued from page 93)

comments concerning the utilization of multiplex adaptors have been forwarded. It is generally agreed at this time that some reception problems could occur when using adaptors (see ET June 1961). However, using a reputable manufacturer's adaptor for the manufacturer's own mono FM set should provide excellent FM stereo results. General multiplex adaptor units may or may not be satisfactory, depending upon the tuner being converted. •

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**RCA RED SEAL SOUND TAPE**



The same tape used for all  
**RCA Victor master recordings.**

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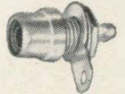
FOR TECHNICIANS, SERVICE MEN,  
HI-FI, STEREO HOBBYISTS

**SWITCHCRAFT**  
Everyday Necessities

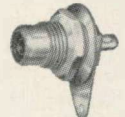
### 2 NEW PHONO JAX

- Eliminate rivet mounting.
- Convenient replacement for old style Jacks.

No. 3501FP—Lock Nut back of panel, requires only 1/4" hole.



No. 3501FR—For front of panel mounting, where necessary to assemble Jack through the panel from the back due to lack of space.



### NEW PHONO PLUG

No. 3502—Removable handle—exposed terminals. Nickel plated brass body and handle. Can be used in multiples even where Jacks are on 3/16" centers.



### NEW PHONO EXTENSION JAX

No. 3503—Removable handle. Cable clamp. Shielded. Nickel plated brass.



Write for catalog A-401.

**SWITCHCRAFT**  
INC.

5583 N. Elston Ave. Chicago 30, Ill.  
Canadian Rep.: Atlas Radio Corp., Ltd.  
50 Wingold Ave. Toronto

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## The LUXO MAGNIFIER

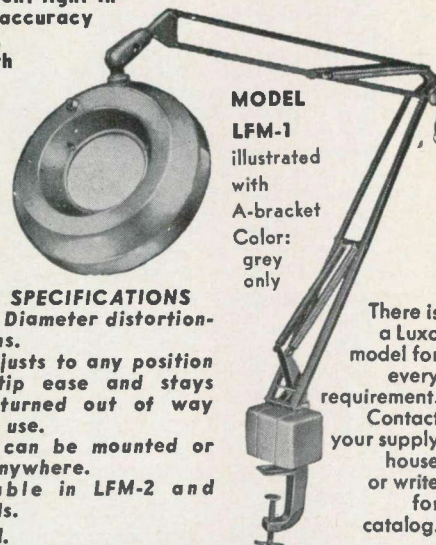
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The Luxo Magnifying Lamp's large magnification and cool fluorescent light increases visual accuracy during assembly, when working with printed circuits, or reading small parts numbers.

It is ideal  
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A-bracket  
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# Audio NEWS LETTER

GENERAL ELECTRIC packages informative 7" LP with all stereo consoles.

ELECTRO-VOICE names C. E. Seaman field marketing manager, a new post.

MAGNECORD's booklet, "207 Ways to Use a Tape Recorder," is free on request from the company at P.O. Box 7509, Tulsa, Okla.

SHURE offers prize of 20 cartridges worth \$690 to each of 17 distributors who have most successfully promoted firm's "Limited Edition" recording.

INSTITUTE OF HIGH FIDELITY MANUFACTURERS moved Aug. 1 to 516 Fifth Ave., New York 36, N.Y. Phone is MURRAY Hill 2-5131.

UTAH's new SH-3 remote speaker, 8 x 10 1/4 x 6 3/4", features a random-width wood-paneling design to eliminate the need for grill cloth. Almost invisible slots help load the 6 x 9" speaker.

JENSEN MFG. offers new brochure-LX covering model X10 ultra-compact 2-way speaker system. Designed to add stereo to other rooms in the home.

PENTRON announces its "880" complete stereo system in one case. Tape recorder plays 1/4 and 1/2 track tapes. 28 lbs. 14" x 7 1/4" x 14 1/2". \$369.95.

DUOTONE announces a new 3-piece cleaning kit for phono records. Includes anti-static detergent, wiping pad and needle brush. \$1.50 list.

ROBINS INDUSTRIES has doubled their facilities in moving to their new place, a 2-story building, at 15-58 127th Street, Flushing 56, N.Y.

SWITCHCRAFT announces audio accessories merchandiser M-120 for display of interconnecting cords and adapters. Requires only 2.8 sq. ft.

PICK-UP IN RETAIL PHONO SALES for May brought 5-month figure closer to last year. Factory sales didn't fare as well, reports EIA. RETAIL: Jan.-May 1961, 1,112,047 stereo, 350,177 mono; Jan.-May 1960, 1,258,417 stereo; 396,362 mono. FACTORY: Jan.-May 1961, 939,914 stereo, 300,433 mono; Jan.-May 1960, 1,197,103 stereo, 342,068 mono.

FIDELITONE's new counter merchandiser holds up to 240 needle packages. Has removable glass top with safety latch. Muted gold finish.

MERCURY ELECTRONICS introduces line of speaker systems. CR-1 Crescendo 3-way measures 24" x 12" x 12", 25-18,500 cps, lists @ \$79.95. MA-1 Maestro 2-way, 21" x 11" x 9 1/2", 30-16,500 cps, lists @ \$59.50.

MONARCH ELECTRONICS INTERNATIONAL announces the 200-A stereo amplifier @ \$179.95. It has transistorized preamp, 15 tubes, 32-watt amplifier. Also, the MAT-120 AM-FM mono receiver, 12 watts, @ \$109.95.

GLASER-STEERS introduces two changers. GS-4100 is \$45 with stereo cartridge. Improved GS-77 with 11" turntable lists @ \$59.50 less cartridge and base. Rigid lucite cover lists @ \$9.75.

V-M CORP. 1962 line of portable phonos comprises 7 models, @ \$29.95 to \$159.95. Model 316 features 2.15 oz. speaker magnets, four 6" speakers, "Stere-O-Matic" 4-speed changer. 11 consoles range from \$159.95 to \$1125, latter with tuner and recorder.

SONOTONE's two new series of record/reproduce tape heads are: RH-2 for mono halftrack @ \$10. At speed of 7.5 ips, -10 db at 10,000 cps, output 3.0 mv at 1,000 cps. EH-2 erase head, \$9; and RH-4 to operate with 4-track stereo tape system @ \$28.50.

UNIVERSITY LOUDSPEAKERS introduces models 70 and 71 dynamic omni mikes @ \$29.95 & \$34.95, respectively. Negligible loss is reported up to 14 kc. Also released are models 404L and 403L omni lavalier mikes.

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

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

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

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

The DU-12 and DC-5, Atlas' renowned DeCor projectors, are styled to harmonize with any decor, modern or traditional. Send for free catalog to Dept. ET-8

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

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

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

### Quam-Nichols SPEAKERS

Announced are three new speakers utilizing heavy 10-oz. ceramic (barium ferrite) magnets. Also two new 25v line transformers. The new speakers, the 52C10 and the 8C10PA, designed for highly efficient performance, are reported to provide shallow construction not available in conventional units. The depth of the 8C10PA permits mounting between standard wall studding. The two transformers, TCL-25 and TDL25 have been added to the firm's line to meet the growing demand resulting from many municipal code changes. Quam-Nichols Co., Marquette Rd. & Prairie Ave., Chicago 16, Ill.

For more data, circle 9-116-2 on coupon, p. 41

### Superex STEREO-PHONES

Model ST-M is reported as the only stereo-phone set with a separate woofer and tweeter in each phone. Has carefully balanced response from 20-20,000 cycles; complete stereo channel separation; adjustable cross-over network controls for each channel; 8-16 ohms impedance; and overload surge protection. It is easily adaptable for monaural listening with supplied adapters. \$29.95. Superex Electronics Corp., 4 Radford Place, Yonkers, N. Y.

For more data, circle 9-117-4 on coupon, p. 41



### Fisher STEREO AMPLIFIERS

Features of model X-101-B 52-watt stereo master audio control-amplifier include: 26 watts of music power per channel; 19 front-panel controls and switches; center channel speaker output; exclusive internal switching system for tape monitoring and playback; facilities for Space-expander; 14 inputs; 3 speaker outputs; 4 outputs for associated components. 15 1/8" W x 10 7/8" D x 4 1/8" H. Weight, 21 1/2 lbs. \$189.50. Slightly higher in the Far West. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.

For more data, circle 9-117-5 on coupon, p. 41



### STEP UP TO A STANTON



... before you decide on a new stereo pickup - do yourself - your family - your friends this service: Listen to your favorite stereo or mono record, reproduced with all of the leading stereo pickups. Check stylus pressure and tracking (for record wear) and, most of all - the quality of music reproduction. Only in this way can you really know the worth of the STANTON Stereo Fluxvalve\* - with its wonderfully practical, easily replaceable V-GUARD stylus.

\*Covered under U.S. Patent No. 2,917,590  
SERIES: 380-381-198-199  
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Send for your complimentary copy of Tech-Specs - a handy guide for planning a stereo high fidelity system... write Dept. T-91

FOR THOSE WHO CAN HEAR THE DIFFERENCE



PICKERING & CO., INC., PLAINVIEW, NEW YORK

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ELECTRONIC TECHNICIAN • September, 1961

### Channel Master STEREO RECORD CHANGER

Model 6655 4-speed stereo record changer features a "Pause-O-Matic" turntable which automatically comes to a gentle stop during the change cycle, and starts spinning again only after the next record has been lowered. Also features the "Speed Sentry" which employs a highly sensitive "magic index finger" to automatically feel out



the difference between 10" and 12" LP's and 7" 45's (with center insert). Plays both stereo and monaural records and 10 records may be intermixed. Has a shielded 4-pole motor. \$74.95, includes a magnetic stereo cartridge with a diamond stylus. Channel Master Corp., Ellenville, N. Y.

For more data, circle 9-117-6 on coupon, p. 41

# WAIT...

# WHAT ABOUT THE NEEDLE?

A Duotone needle, of course. You just repaired that phonograph. It's as good as new. Except... did you remember to recommend a Duotone needle?

Like almost everybody else that customer of yours probably hasn't changed the stylus since he bought the phonograph. Tell him how a worn needle ruins expensive records, and tell him to buy a Duotone diamond needle. You'll make easy profits through easy sales.

Write for Free 1961 Duotone Needle Wall Chart. See your DUOTONE Distributor for Duotone needles.

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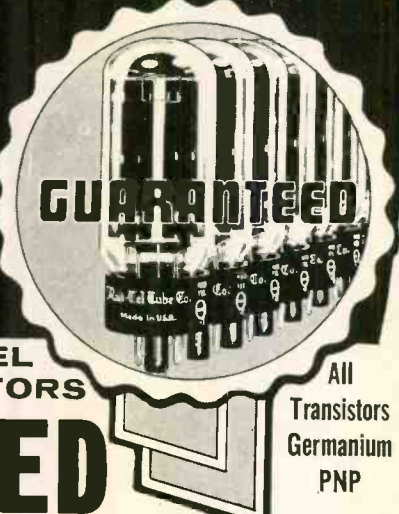
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**500 MA SILICON RECTIFIER** Epoxy construction, size of 1-watt resistor  
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**30c** lots of 20  
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	1AX2	.62		6BC5	.61		12AF3	.73
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	1G3	.79		6BC8	.97		12AJ6	.46
	1J3	.79		6BD6	.51		12AL5	.45
	1K3	.79		6BE6	.55		12AL8	.95
	1R5	.62		6BF6	.44		12AQ5	.52
	1S5	.51		6BG6	1.66		12AT6	.43
	1T4	.58		6BH6	.65		12AT7	.76
	1U4	.57		6BH8	.87		12AU6	.50
	1U5	.50		6BJ6	.62		12AU7	.61
	1X2	.82		6BK7	.85		12AV5	.97
	2AF4	.96		6BL7	1.00		12AV6	.41
	2CY5	.71		6BN4	.57		12AV7	.75
	2EA5	.70		6BN6	.74		12AX4	.67
	3AL5	.42		6BQ5	.65		12AX7	.63
	3AU6	.51		6BQ6GT	1.05		12AZ7	.86
	3AV6	.41		6BQ7	1.00		12B4	.63
	3BA6	.51		6BR8	.78		12BA6	.50
	3BC5	.54		6BU8	.70		12BD6	.50
	3BE6	.52		6BY6	.54		12BE6	.53
	3BN6	.76		6BZ6	.55		12BF6	.44
	3BU8	.78		6BZ7	1.01		12BH7	.77
	3BY6	.55		6C4	.43		12BL6	.56
	3BZ6	.55		6CB6	.55		12BQ6	1.06
	3CB6	.54		6CD6	1.42		12BZ7	.77
	3CF6	.60		6CF6	.64		12BZ7	.75
	3CS6	.52		6CG7	.61		12C5	.56
	3DG4	.85		6CG8	.77		12CN5	.56
	3DK6	.60		6CM7	.66		12CR6	.54
	3DT6	.50		6CN7	.65		12CU5	.58
	3S4	.61		6CR6	.51		12CU6	1.06
	3V4	.58		6CS6	.57		12DE8	.75
	4BC8	.96		6CU5	.58		12DL8	.85
	4BQ7	1.01		6CU6	1.08		12DQ6	1.04
	4BS8	.98		6CY5	.71		12DS7	.79
	4BZ6	.58		6CY7	.71		12DW8	.89
	4BZ7	.96		6DA4	.68		12DZ6	.56
	4CB6	.56		6DB5	.69		12ED5	.62
	4CS6	.61		6DE6	.58		12EL6	.50
	4CY5	.71		6DG6	.59		12EG6	.54
	4DE6	.62		6DQ6	1.10		12EZ6	.53
	4DT6	.55		6D75	.76		12F8	.66
	5AM8	.79		6DT6	.53		12FM6	.45
	5AN8	.86		6DT8	.94		12K5	.65
	5AQ5	.52		6EA8	.79		12SK7GT	.74
	5AT8	.80		6EM7	.91		12SN7	.67
	5BK7A	.82		6EU8	.79		12SQ7M	.78
	5BQ7	.97		6GH8	.79		12U7	.62
	5BR8	.79		6H6GT	.58		12V6GT	.53
	5CG8	.76					12W6	.69
	5CL8	.76		6J5GT	.51		12X4	.38
	5EA8	.80		6J6	.67		17AX4	.67
	5EU8	.80		6K6	.63		17BQ6	1.09
	5J6	.68		6S4	.51		17C5	.58
	5T8	.81		6SA7GT	.76		17CA5	.62
	5U4	.60		6SK7	.74		17D4	.69
	5U8	.81		6SL7	.80		17DQ6	1.06
	5V6	.56		6SN7	.65		17L6	.58
	5X8	.78		6SQ7	.73		17W6	.70
	5Y3	.46		6T4	.99		19AU4	.83
	6AB4	.46		6U8	.83		19BG6	1.39
	6AC7	.96		6V6GT	.54		19T8	.80
	6AF3	.73		6W4	.60		21EX6	1.49
	6AF4	.97		6W6	.71		25BQ6	1.11
	6AG5	.68		6X4	.39		25C5	.53
	6AH6	.99		6X5GT	.53		25CA5	.59
	6AK5	.95		6X8	.80		25CD6	1.44
	6AL5	.47		7AU7	.61		25CU6	1.11
	6AM8	.78		7A8	.68		25DN6	1.42
	6AQ5	.53		7B6	.69		25EH5	.55
	6AR5	.55		7Y4	.69		25L6	.57
	6AS5	.60		8AU8	.83		25W4	.68
	6AT6	.43		8AW8	.93		25Z6	.66
	6AT8	.79		8BQ5	.60		35C5	.51
	6AU4	.82		8CG7	.62		35L6	.57
	6AU6	.52		8CX8	.93		35W4	.42
	6AU7	.61		8EB8	.94		35Z5GT	.60
	6AU8	.87		11CY7	.75		50B5	.60
	6AV6	.41		12A4	.60		50C5	.53
	6AW8	.90		12AB5	.55		50DC4	.37
	6AX4	.66		12AC6	.49		50EH5	.55
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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.

there is  
no margin  
for error  
when striving for  
the ultimate  
in stereo  
sound  
re-creation

incomparable *Stereo Dynamic* ... by **SHURE**

HI-FI PHONO CARTRIDGES

Tiny though it is, the cartridge can make or break a stereo system. For this breath-takingly precise miniaturized electric generator (that's really what it is) carries the full burden of translating the miles-long undulating stereo record groove

into usable electrical impulses... without adding or subtracting a whit from what the recording engineer created. Knowing this keeps Shure quality standards inflexible.

Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois.

select the unit equal to your music system from the premier family of stereo sound reproducers



**STANDARD M8D**  
A superb blend of  
quality and economy.  
\$16<sup>50</sup>



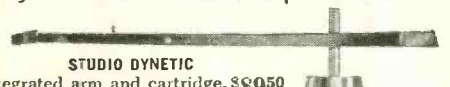
**CUSTOM M7/N21D**  
Widely acclaimed;  
moderately priced.  
\$36<sup>75</sup>



**PROFESSIONAL M3/N21D**  
Overwhelming choice  
of the critics.  
\$47<sup>25</sup>



**LABORATORY STANDARD**  
Individually calibrated,  
limited quantity.  
Model M3LS \$75<sup>00</sup>



**STUDIO DYNETIC**  
Integrated arm and cartridge. \$89<sup>50</sup>  
Cannot scratch records.

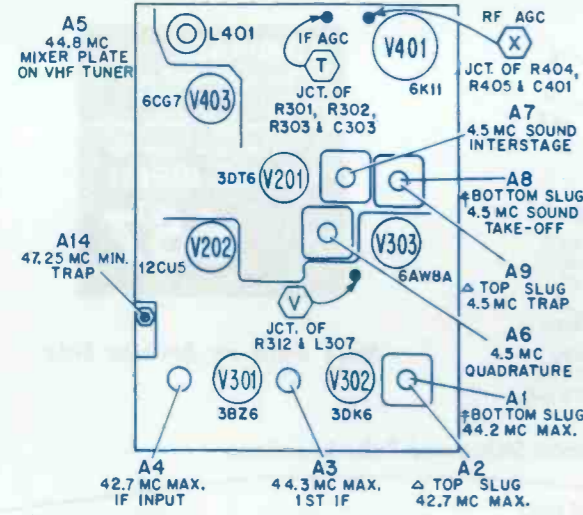


**PROFESSIONAL INDEPENDENT TONE ARM**  
For any quality cartridge \$29<sup>95</sup>  
... stereo or mono.

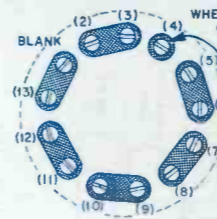
SHURE PERFORMANCE depends on a SHURE replacement **STYLUS** / ... Look for "Precision Manufactured by Shure"

For more data, circle 9-120-1 on coupon, p. 41

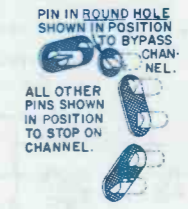
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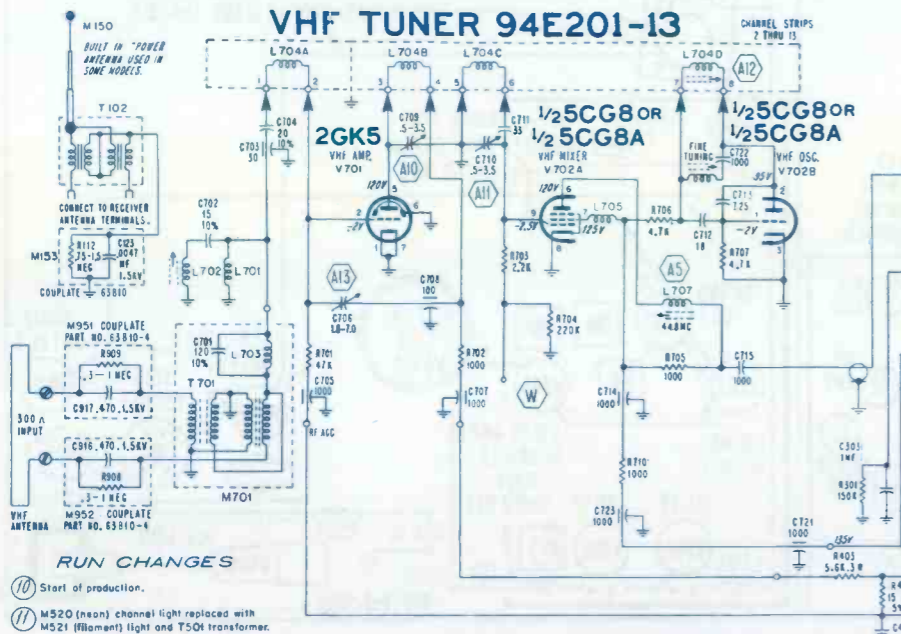
Etched Circuit Board Showing Test Point Locations and IF Alignment Data.



Channel Indexing Pins Adjustment Positions Shown.

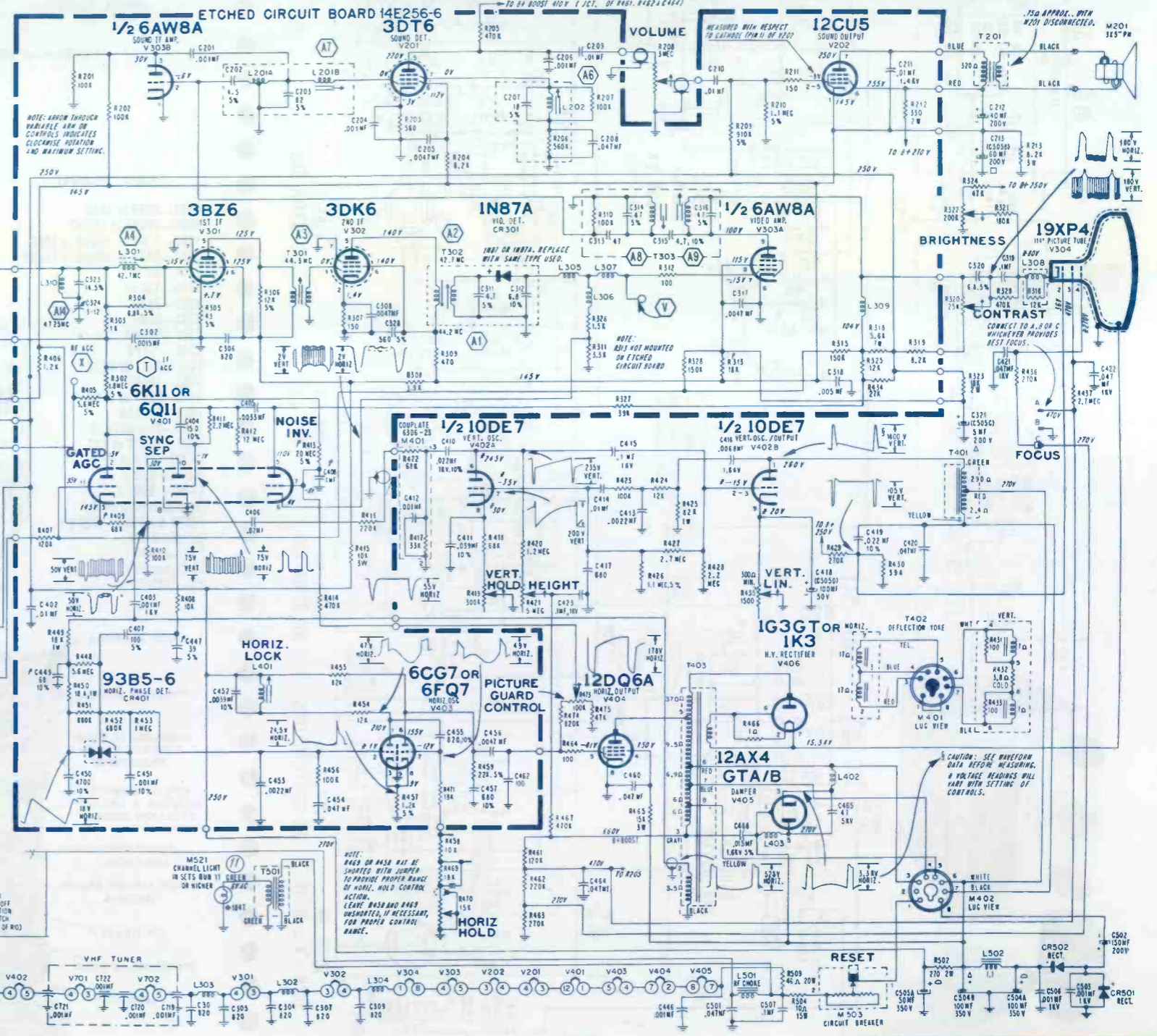
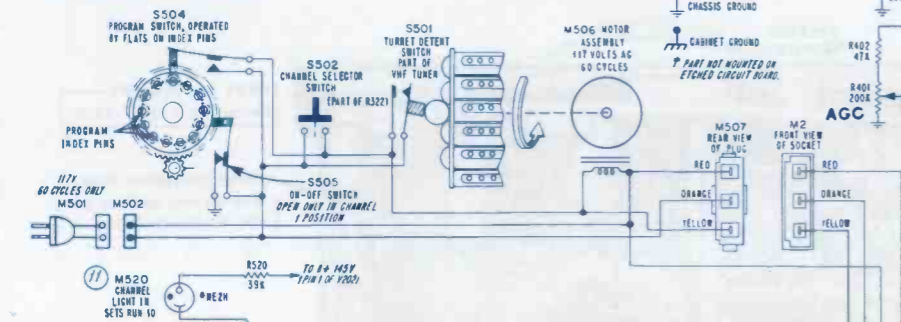


Channel Indexing Pins Adjustment Positions Shown.



**RUN CHANGES**

- (I) Start of production.
- (II) M520 (non) channel light replaced with M521 (filament) light and T501 transformer.

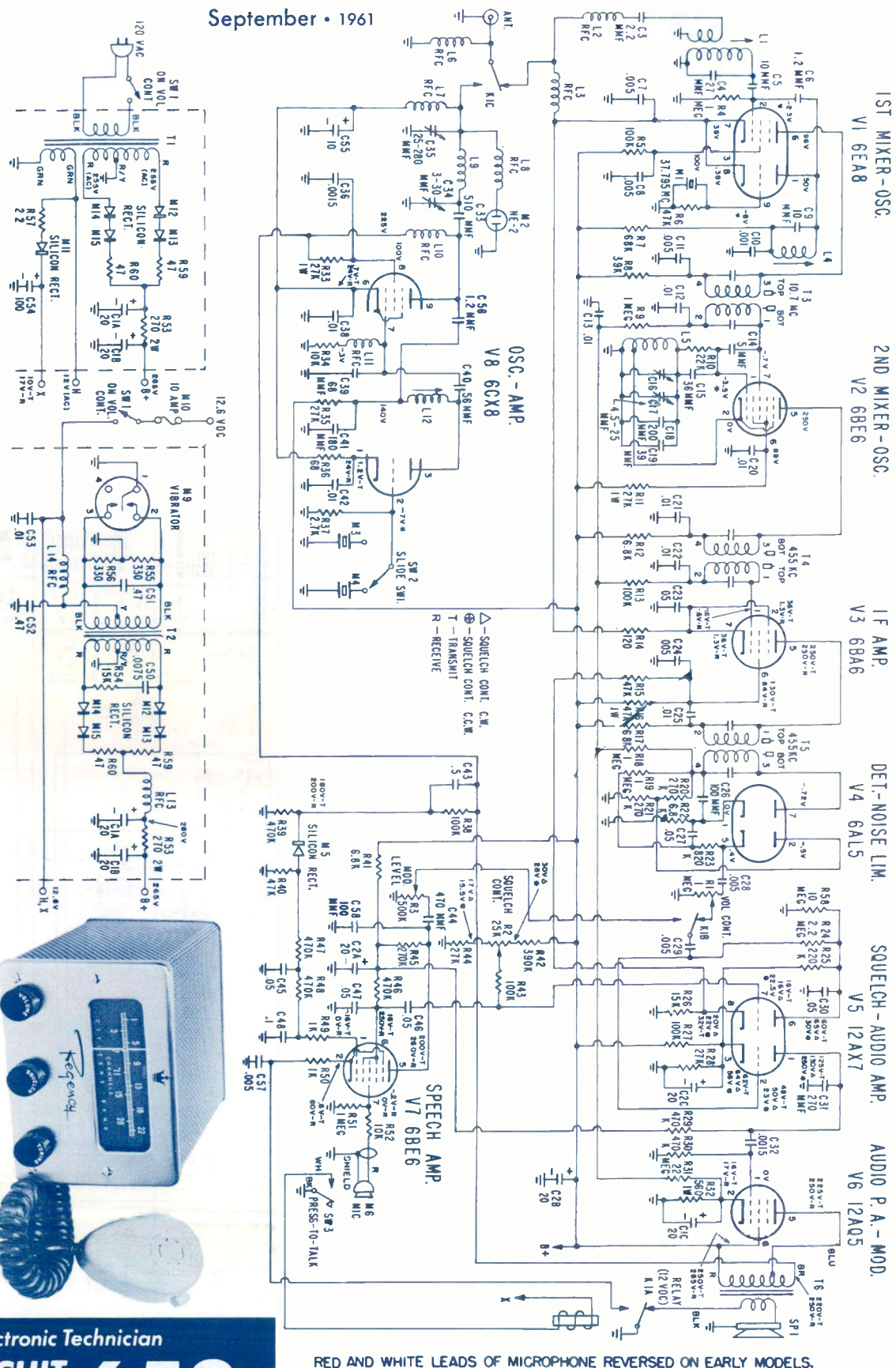


**CAUTION: SEE WAVEFORM DATA BEFORE MEASURING. VOLTAGE READINGS WILL VARY WITH SETTING OF CONTROLS.**

Special Full-Width SPRING BINDER Holds 24 Groups of ELECTRONIC TECHNICIAN'S CIRCUIT DIGESTS Available @ \$2.95

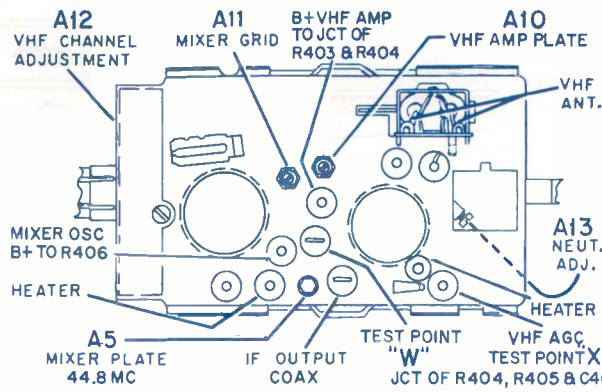
More Data on Reverse Side

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RED AND WHITE LEADS OF MICROPHONE REVERSED ON EARLY MODELS.

More Data on Reverse Side

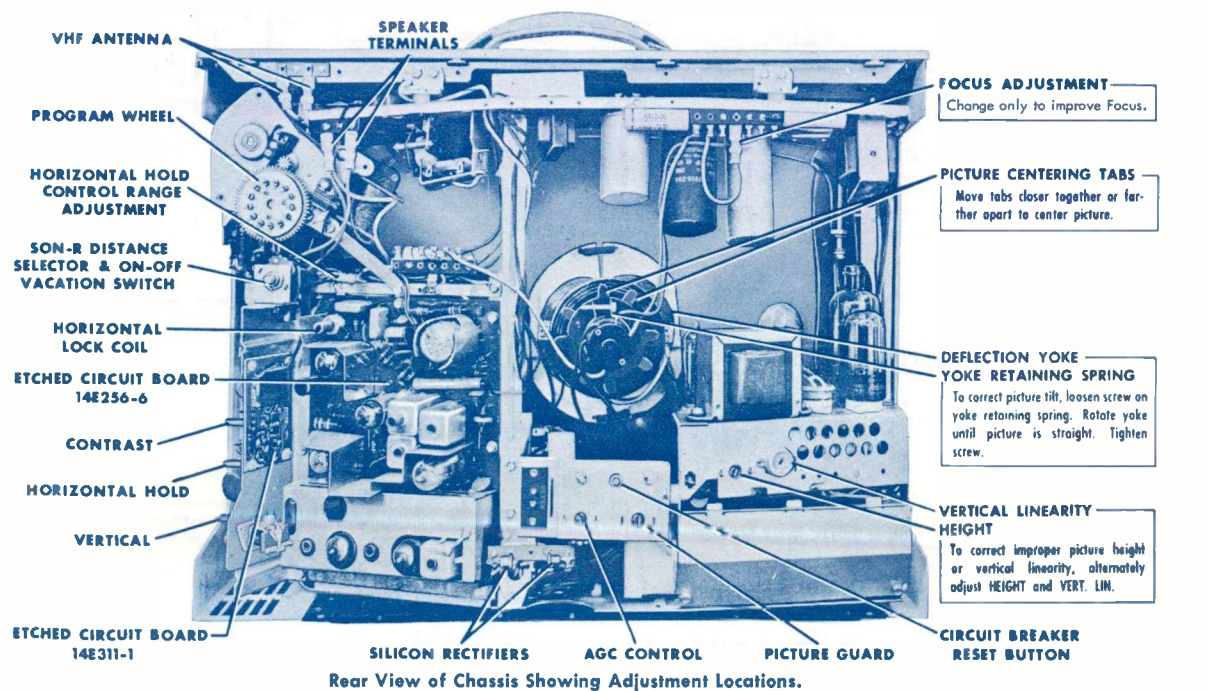
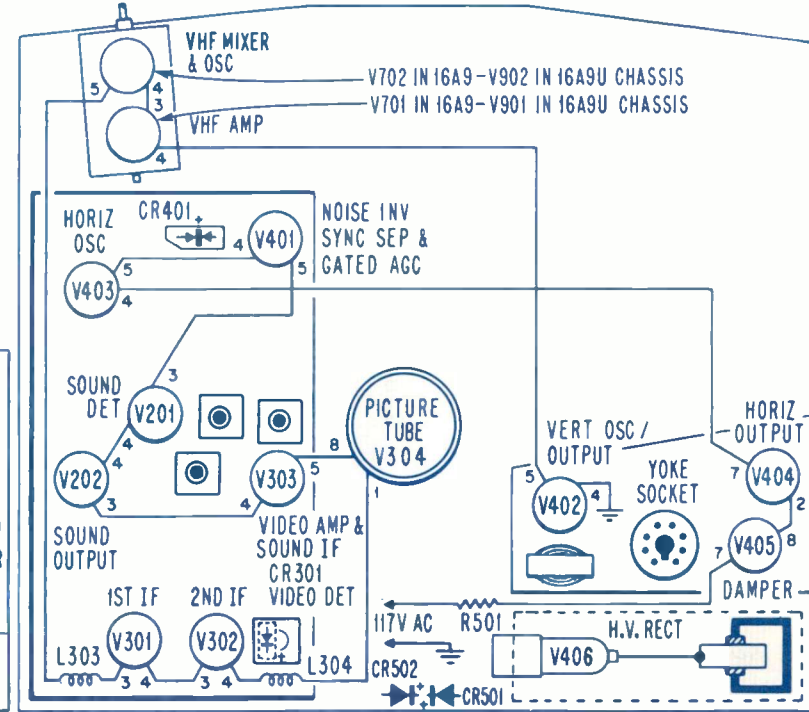


Top View of VHF Tuner

16A9, 16A9U

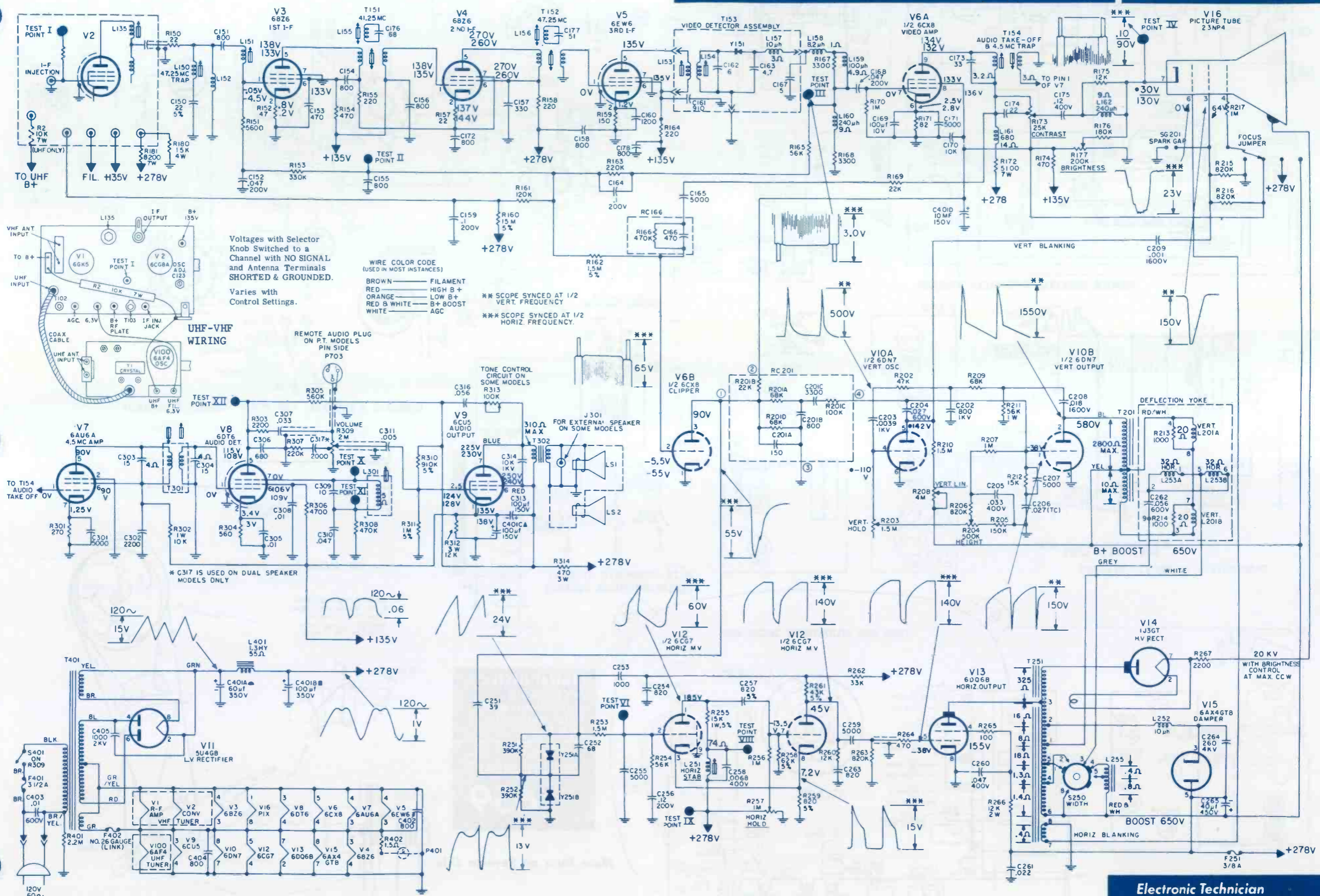
- V701—2GK5 in 16A9
- V901—2FQ5A in 16A9U
- V702—5CG8 or 5CG8A in 16A9
- V902—5CG8 or 5CG8A in 16A9U
- V201—3DT6
- V202—12CU5
- V301—3BZ6
- V302—3DK6
- V303—6AW8A
- V304—19XP4
- V401—6K11 or 6Q11
- V402—10DE7
- V403—6CG7 or 6FQ7
- V404—12DQ6A
- V405—12AX46TA/B
- V406—1G3GT or 1K3
- CR301—1N87A (Crystal Diode)
- CR401—93B5-6 (Dual Selenium Diode)
- CR501 & CR502—93B12-1 (Silicon Diode)
- CR1—93B24-1
- Q1 through Q3—57D1-69
- Q4—5701-70

Heater String and Tube Locations



Rear View of Chassis Showing Adjustment Locations.

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Voltages with Selector Knob Switched to a Channel with NO SIGNAL and Antenna Terminals SHORTED & GROUNDED. Varies with Control Settings.

WIRE COLOR CODE (USED IN MOST INSTANCES)

- BROWN — FILAMENT
- RED — HIGH B+
- ORANGE — LOW B+
- RED & WHITE — B+ BOOST
- WHITE — AGC

\*\* SCOPE SYNCED AT 1/2 VERT. FREQUENCY  
\*\*\* SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY.

UHF-VHF WIRING

REMOTE AUDIO PLUG ON P.T. MODELS PIN SIDE P703

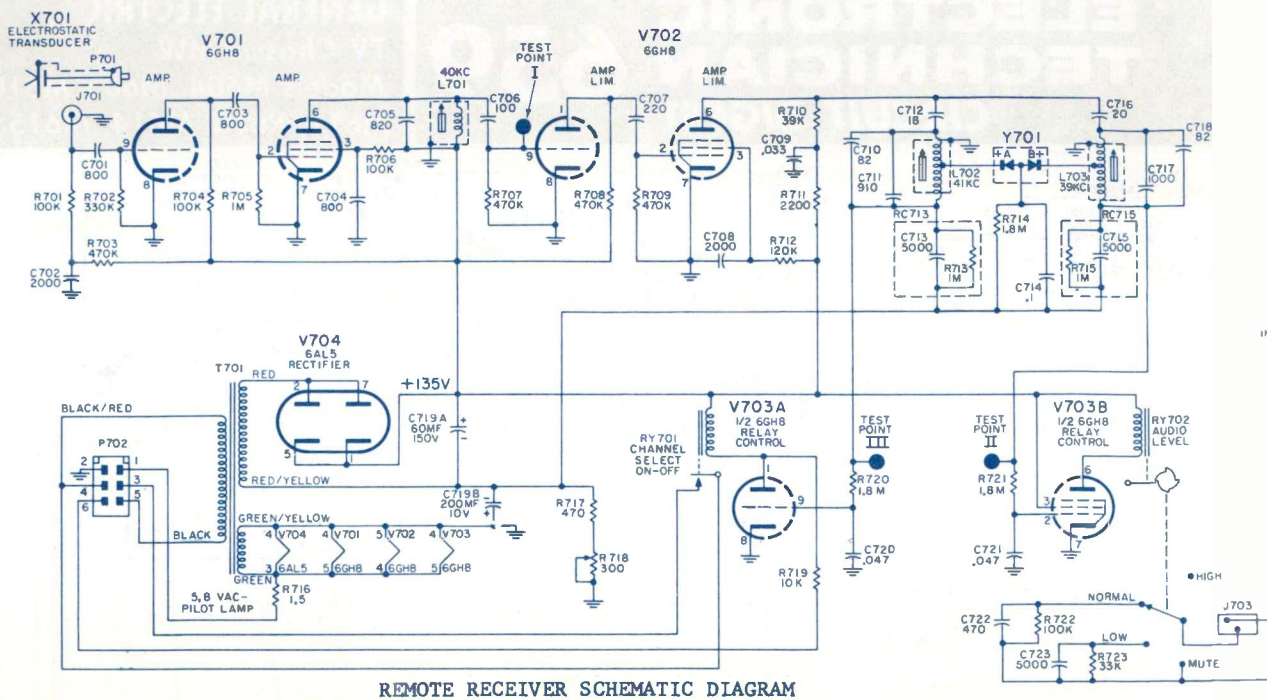
TONE CONTROL CIRCUIT ON SOME MODELS

FOR EXTERNAL SPEAKER ON SOME MODELS

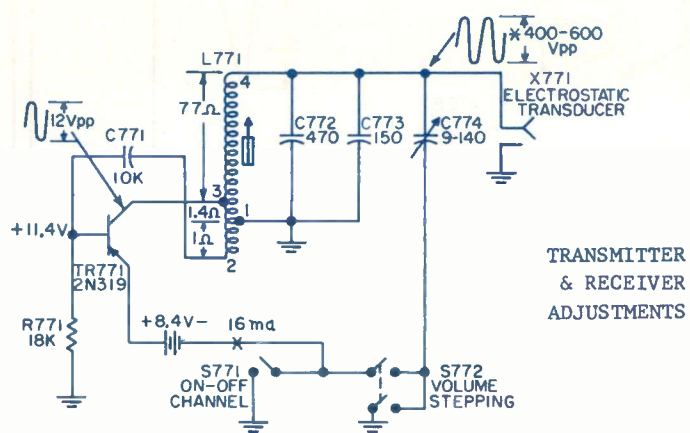
\* C317 IS USED ON DUAL SPEAKER MODELS ONLY

WITH BRIGHTNESS CONTROL AT MAX. CCW

More Data on Reverse Side

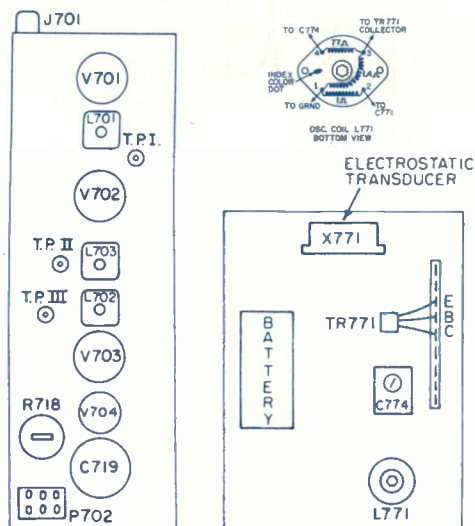


REMOTE RECEIVER SCHEMATIC DIAGRAM

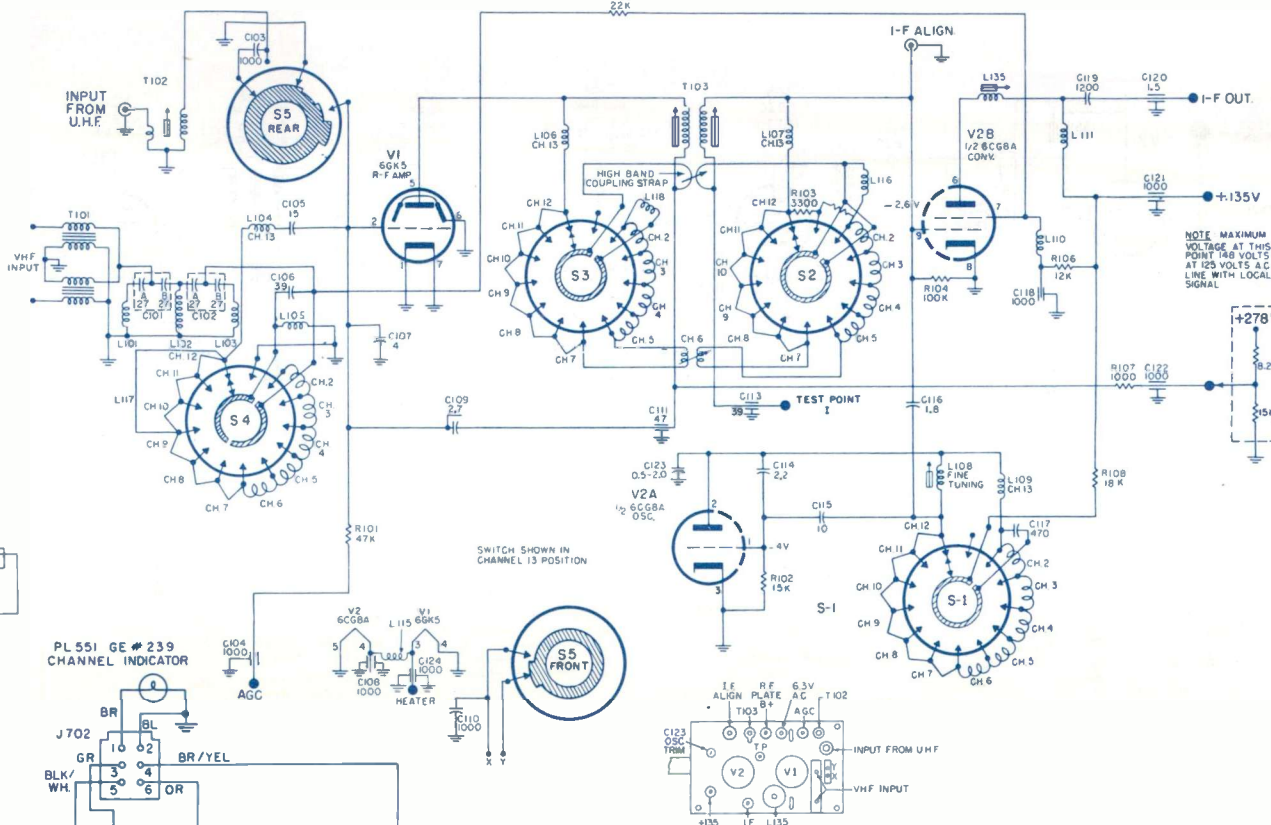


TRANSMITTER SCHEMATIC DIAGRAM

TRANSMITTER & RECEIVER ADJUSTMENTS



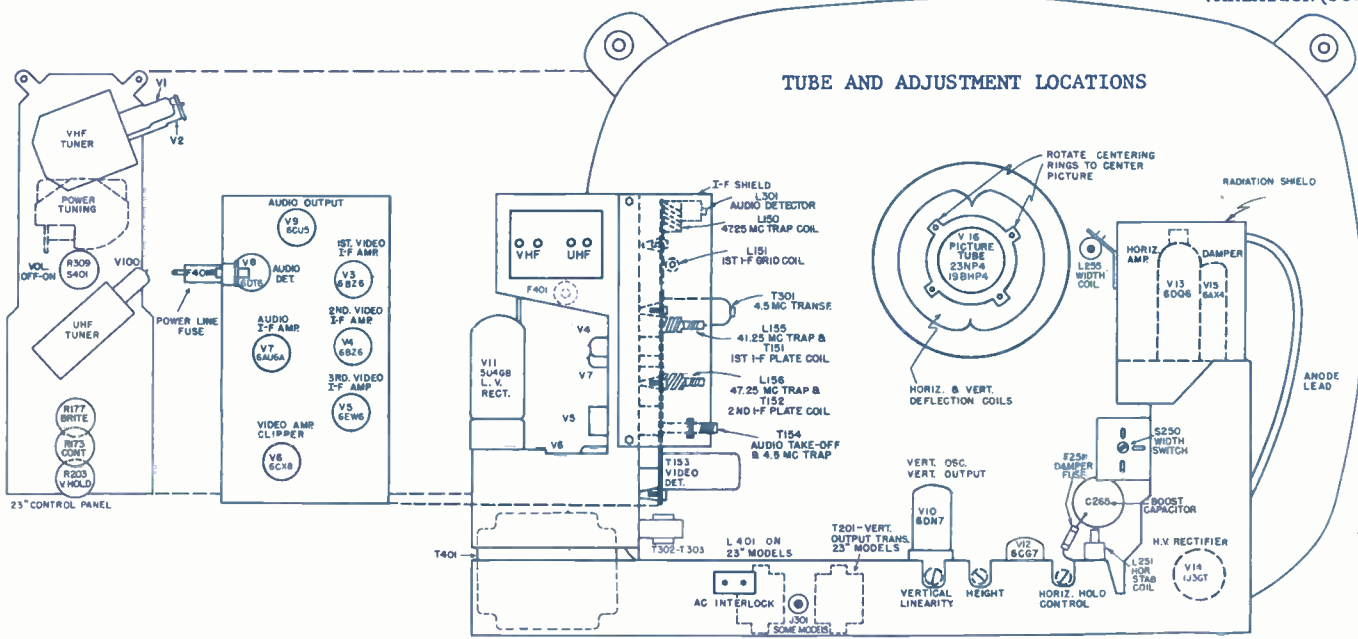
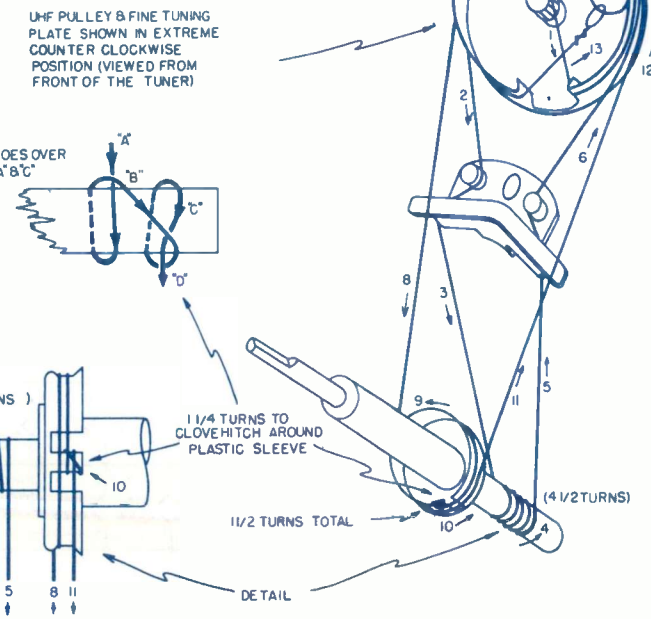
MAIN SCHEMATIC DIAGRAM VARIATION (POWER TUNING)



ET86X115 & ET86X117 VHF TUNER SCHEMATIC DIAGRAM



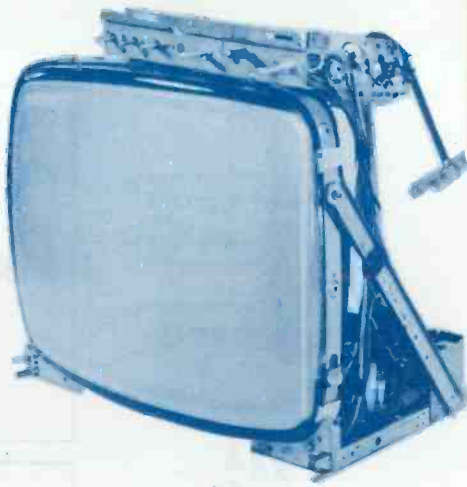
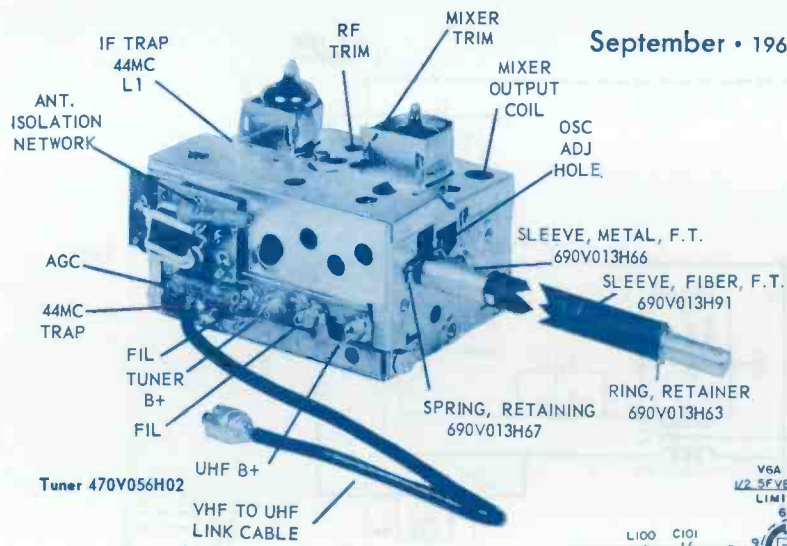
UHF TUNER DIAL STRINGING



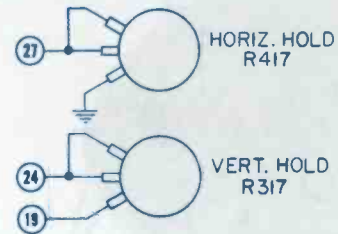
**GENERAL ELECTRIC**  
**TV Chassis MW**  
 Models M604, M605,  
 M610, M611, R610,  
 M614, M615

*Electronic Technician*  
**CIRCUIT DIGEST**  
**659**

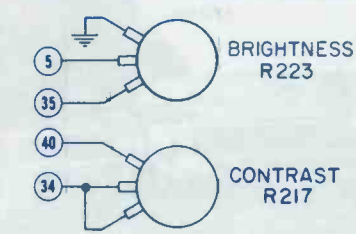
More Data on Reverse Side



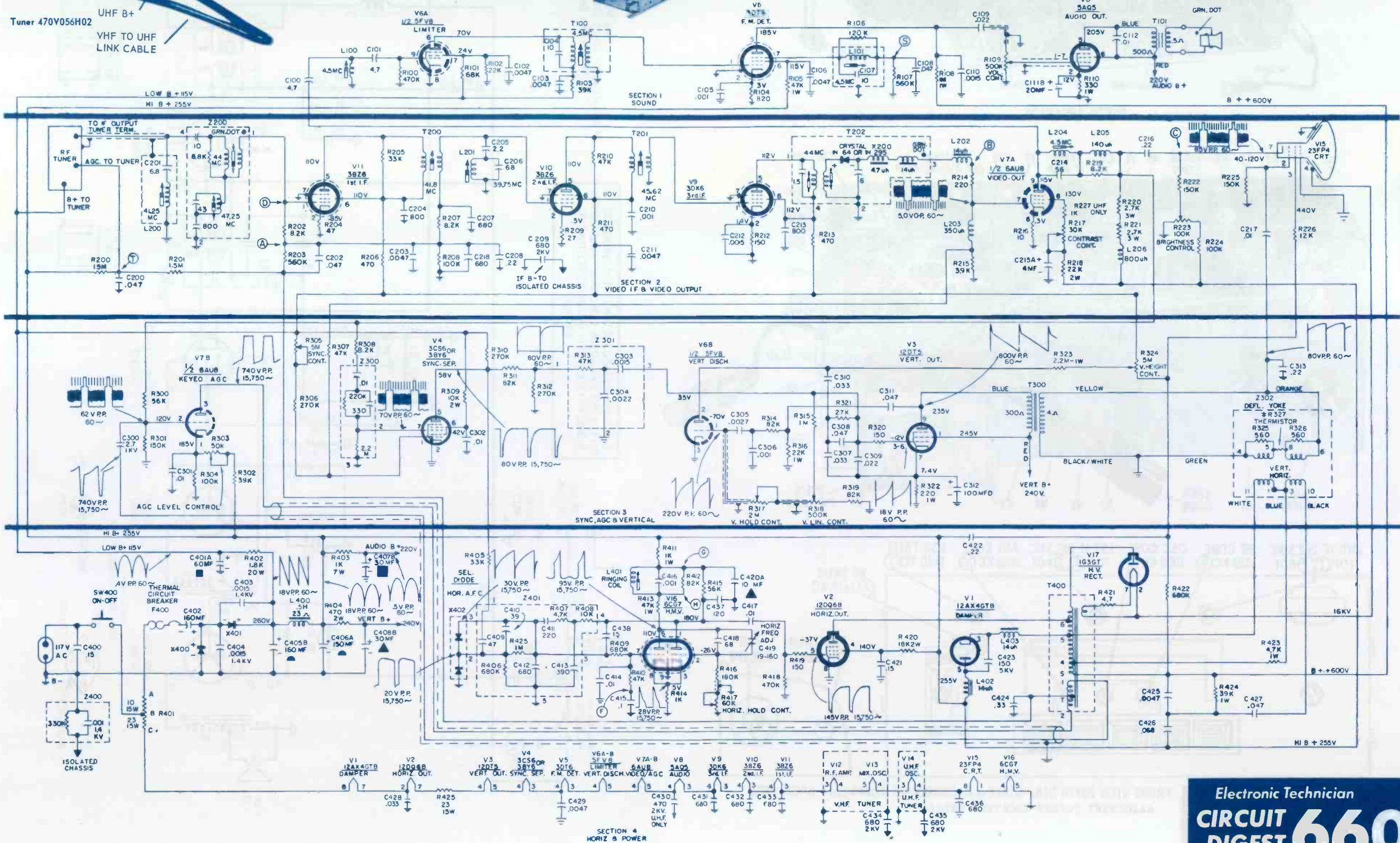
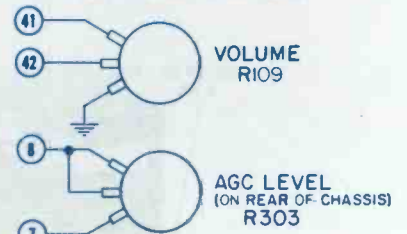
### KEY TO PC BOARD LAYOUT

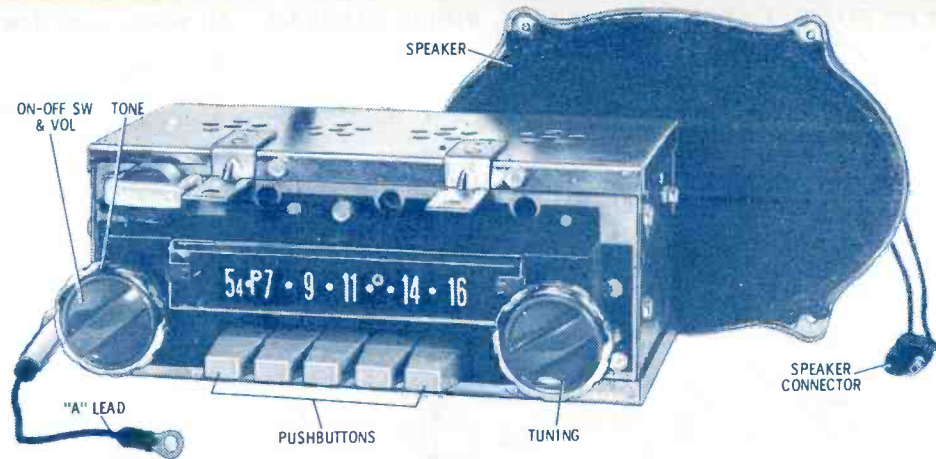


### CONTROL WIRING DIAGRAM

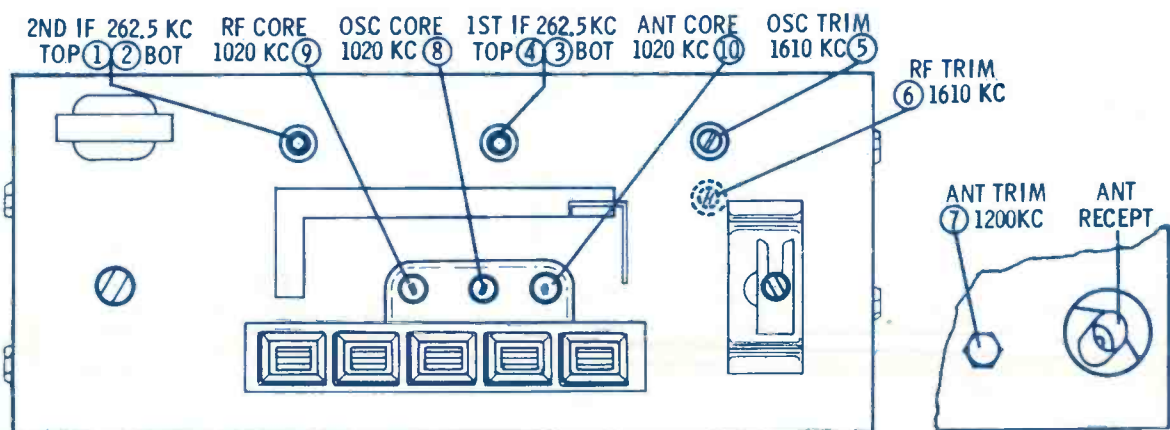
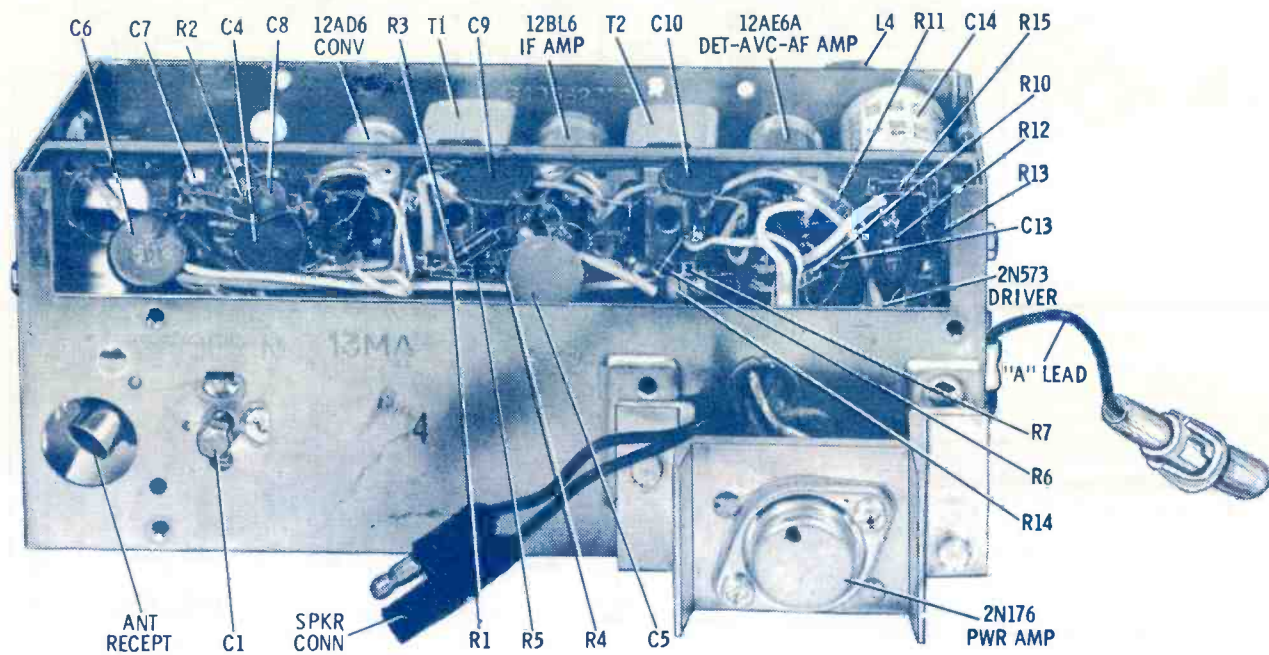


### All views seen from rear.

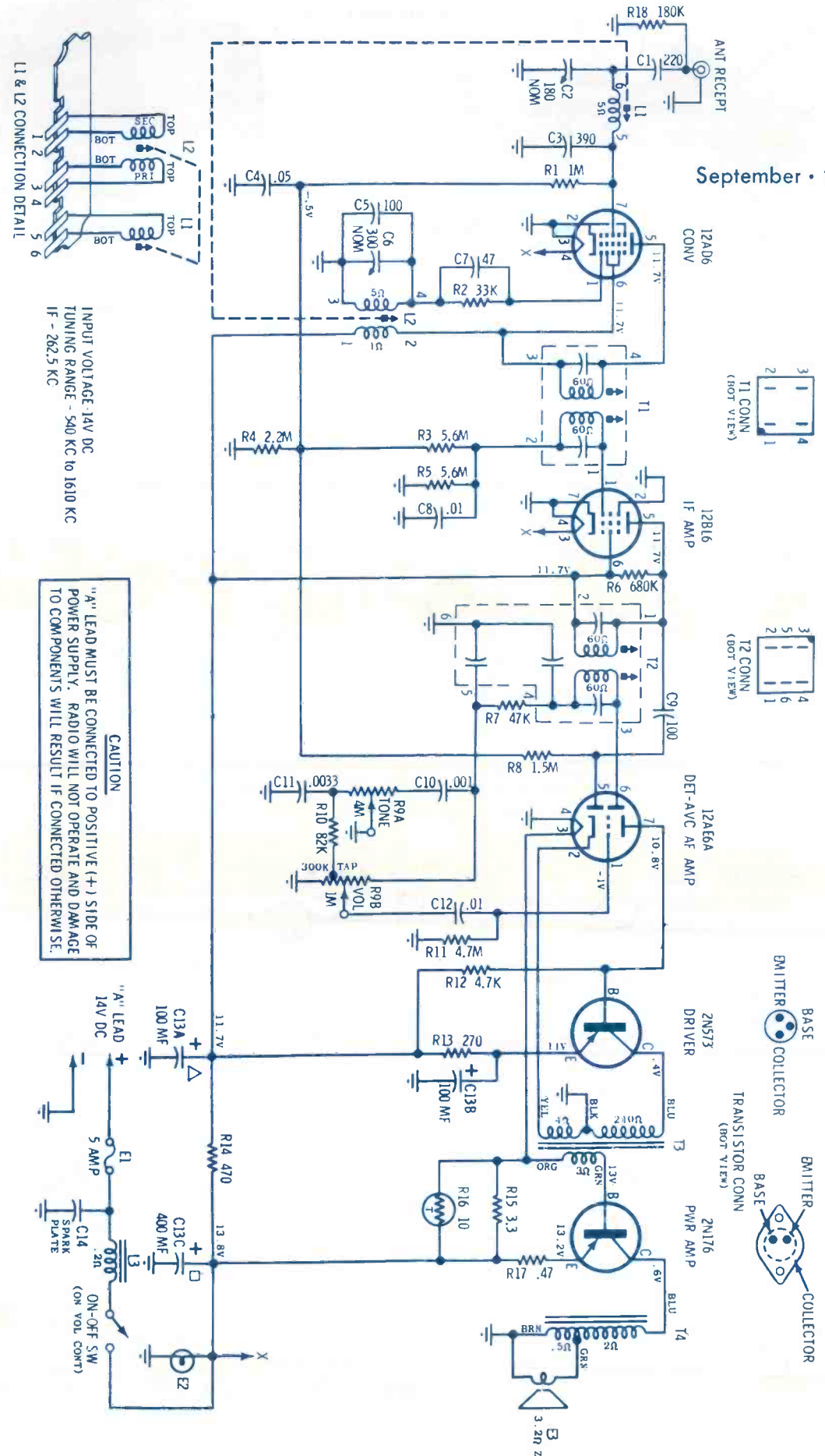




PARTS LOCATION



FRONT VIEW (WITH DIAL SCALE & BACKGROUND REMOVED) BACK VIEW  
ALIGNMENT POINTS LOCATION DETAIL



INPUT VOLTAGE 14V DC  
TUNING RANGE - 540 KC to 1610 KC  
IF - 262.5 KC

CAUTION  
"A" LEAD MUST BE CONNECTED TO POSITIVE (+) SIDE OF POWER SUPPLY. RADIO WILL NOT OPERATE AND DAMAGE TO COMPONENTS WILL RESULT IF CONNECTED OTHERWISE.



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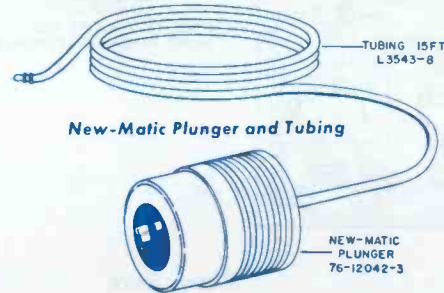
#### CRITICAL LEAD DRESS

##### To Prevent Corona:

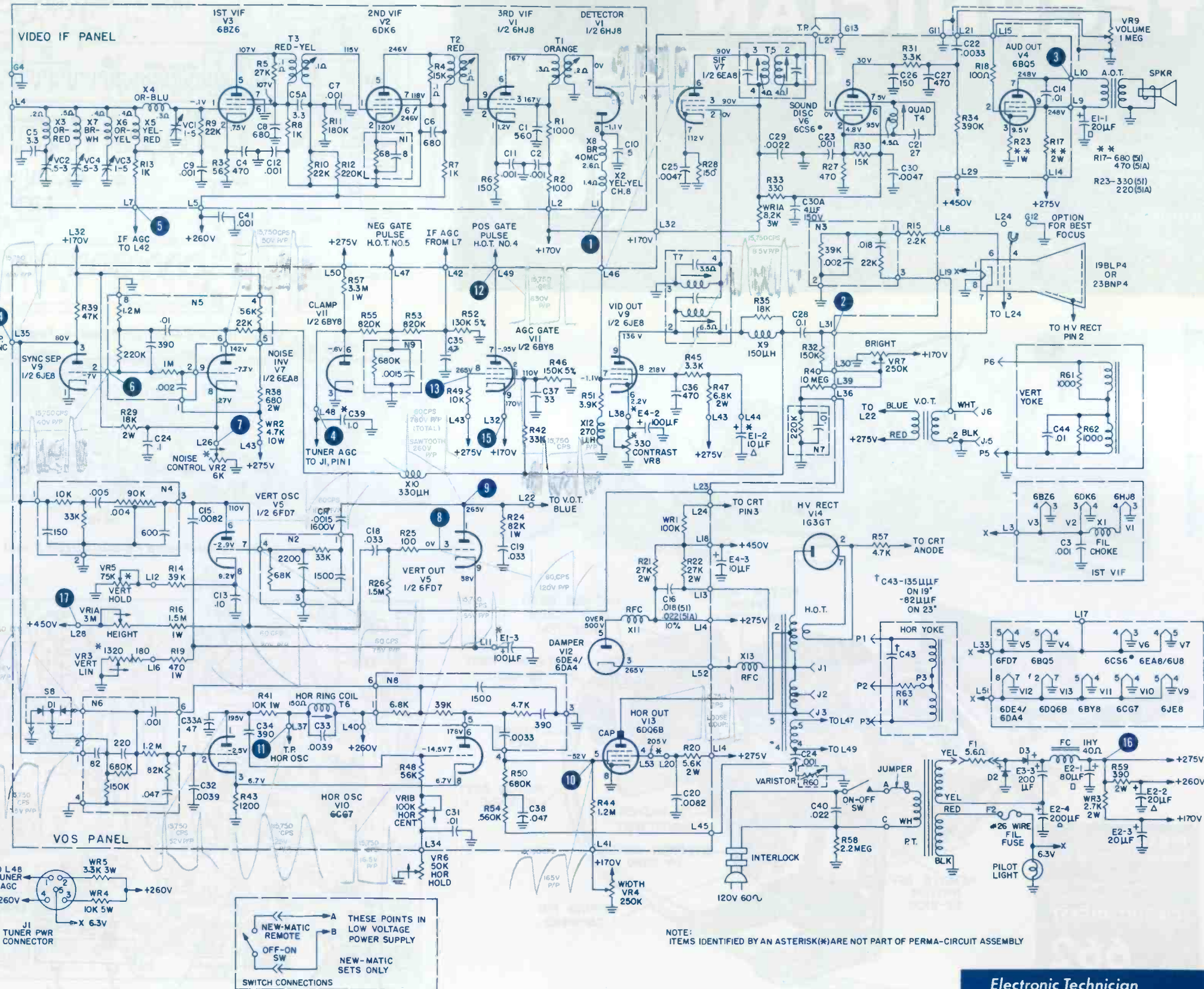
1. V-14 socket must be free of solder points and sharp wire ends.
2. Lead from V-14 cap must be at least 1/8" from any metal of H.V. Cage.
3. Filament leads from H.O.T. to V-14 must have slack (if any) dress down toward base away from glass bulb of IG3 tube.
4. All leads from H.O.T. coil to Y.S. must be free of each other and dress away from any metal parts.
5. Lead from V-13 cap must be dressed at least 1/8" away from H.O.T. winding.
6. Leads from Y.S. 3 and 6 and brown damper lead must be dressed under lugs CL17, CL18 and CL20 away from winding of H.O.T.
7. Leads from lugs 3, 4, and 5 on H.O.T. panel must dress under CL19 and away from winding of H.O.T.
8. All leads must be dressed clear of L52 and V12-3.
9. Leads from V-13 and V-14 caps must be at least 1/8" apart.

##### To Prevent Pickup:

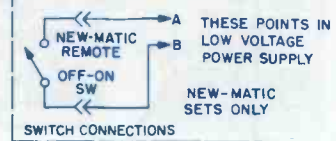
1. Tuner power cable must dress under CL8, CL9 and CL10.
2. Bare portion of I-F link to tuner must be clamped under dress lug CL13 provided at end of I-F shield.
3. Green C.W. from L1 to L46 should be free from all other leads and away from subbase.
4. Leads from VR9-4 and 5 must be twisted together for approximately 8 twists in length from VR9-4 and 5, to CL12.
5. Yellow CRTS lead should be free from all other leads.



TUBE	1	2	3	4	5	6	7	8	9
V1 6HJ8	120K	10K	10K	10K	10K	10K	10K	10K	10K
V2 6DK6	95K	115K	15K	15K	15K	15K	15K	15K	15K
V3 6BZ6	68K	470	470	470	470	470	470	470	470
V4 6CQ5	15K	110K	110K	110K	110K	110K	110K	110K	110K
V5 6FD7	15K	110K	110K	110K	110K	110K	110K	110K	110K
V6 6C56	30	470	470	470	470	470	470	470	470
V7 6EA8	33K	70	70	70	70	70	70	70	70
V9 6JE8	Gnd.	1.3M	24K	24K	24K	24K	24K	24K	24K
V10 6C07	14K	1.2M	1K	1K	1K	1K	1K	1K	1K
V11 6BT8	32K	7K	7K	7K	7K	7K	7K	7K	7K
V12 6D84									
V13 6DQ8									



NOTE: ITEMS IDENTIFIED BY AN ASTERISK(\*) ARE NOT PART OF PERMA-CIRCUIT ASSEMBLY



More Data on Reverse Side

# ELECTRONIC TECHNICIAN

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## CIRCUIT DIGESTS

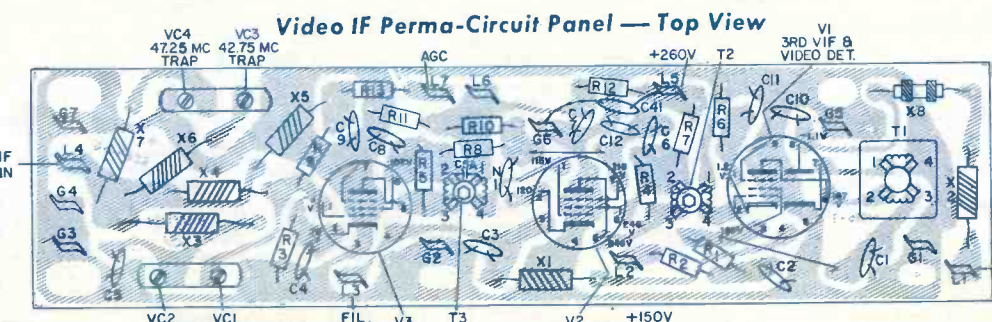
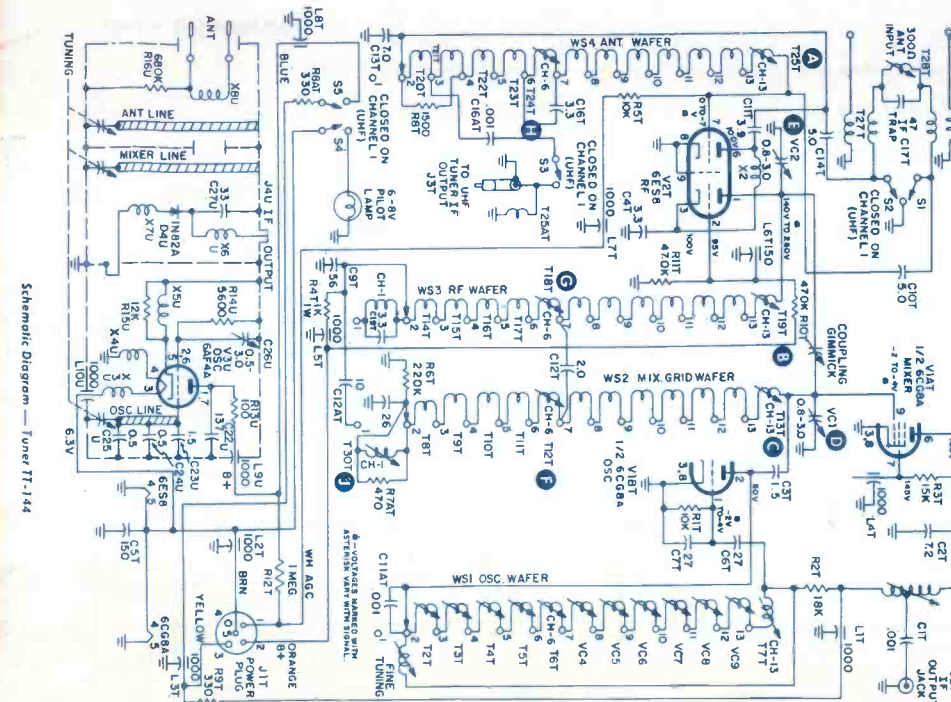
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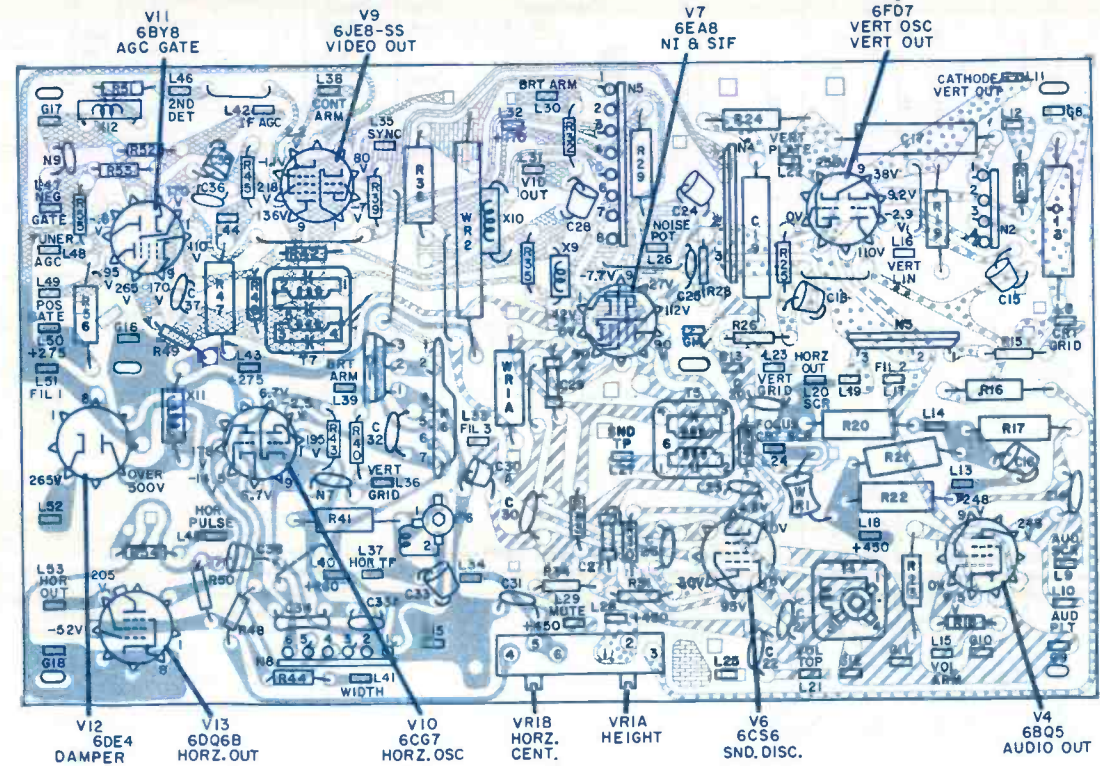


**PHILCO**  
TV Chassis 12N50 Series

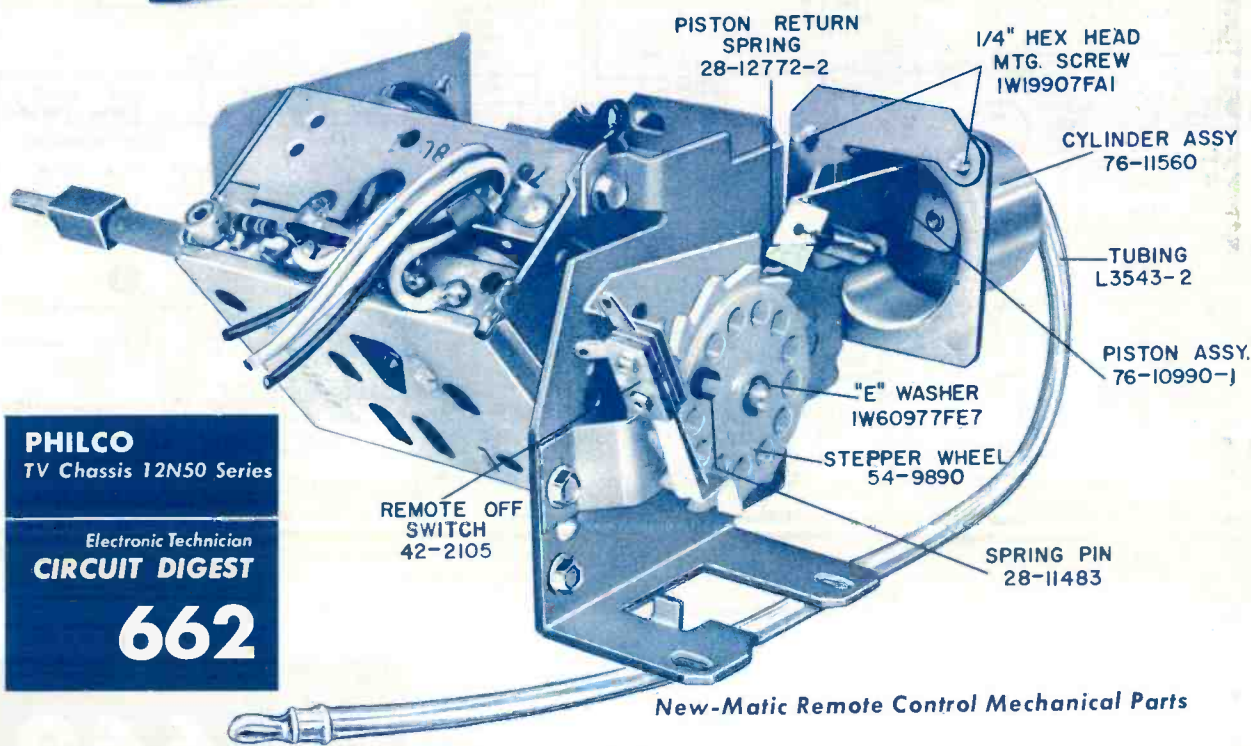
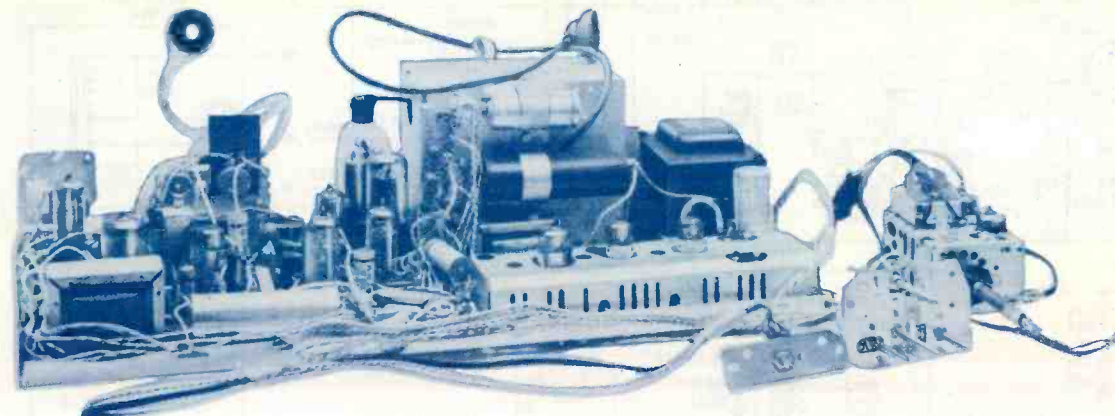
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- LEGEND FOR PERMA-CIRCUIT PANELS
- HORIZONTAL CIRCUITS
  - SOUND IF DETECTOR AND AUDIO CIRCUITS
  - VIDEO AND AGC CIRCUITS
  - VERTICAL CIRCUITS
  - SYNC SEPARATOR AND NOISE INVERTER CIRCUITS

Video-Oscillator-Sound Perma-Circuit Panel - Top View



More Data  
on Reverse Side



New-Matic Remote Control Mechanical Parts

**PHILCO**  
TV Chassis 12N50 Series

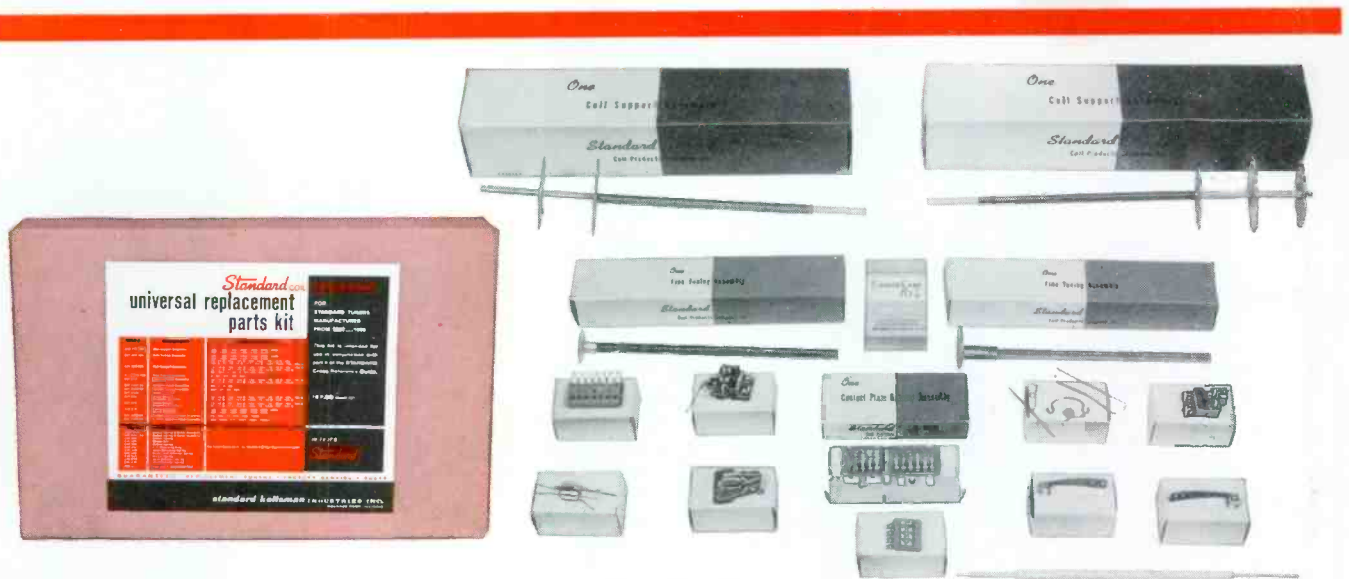
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More Data on Reverse Side

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