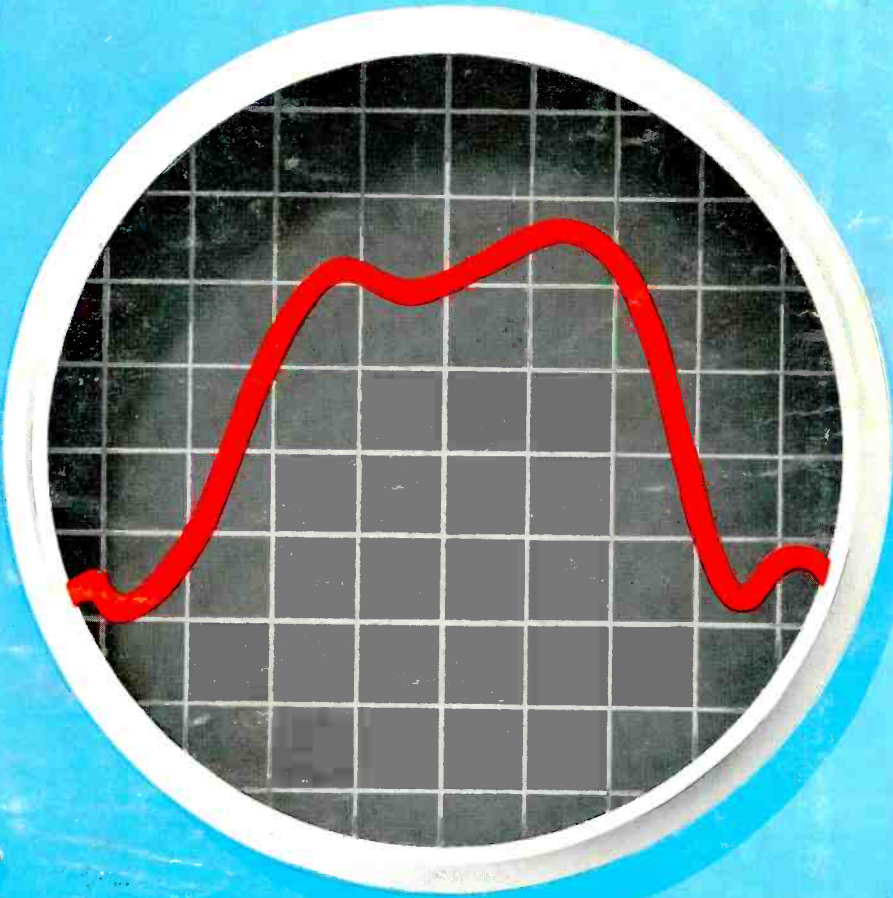


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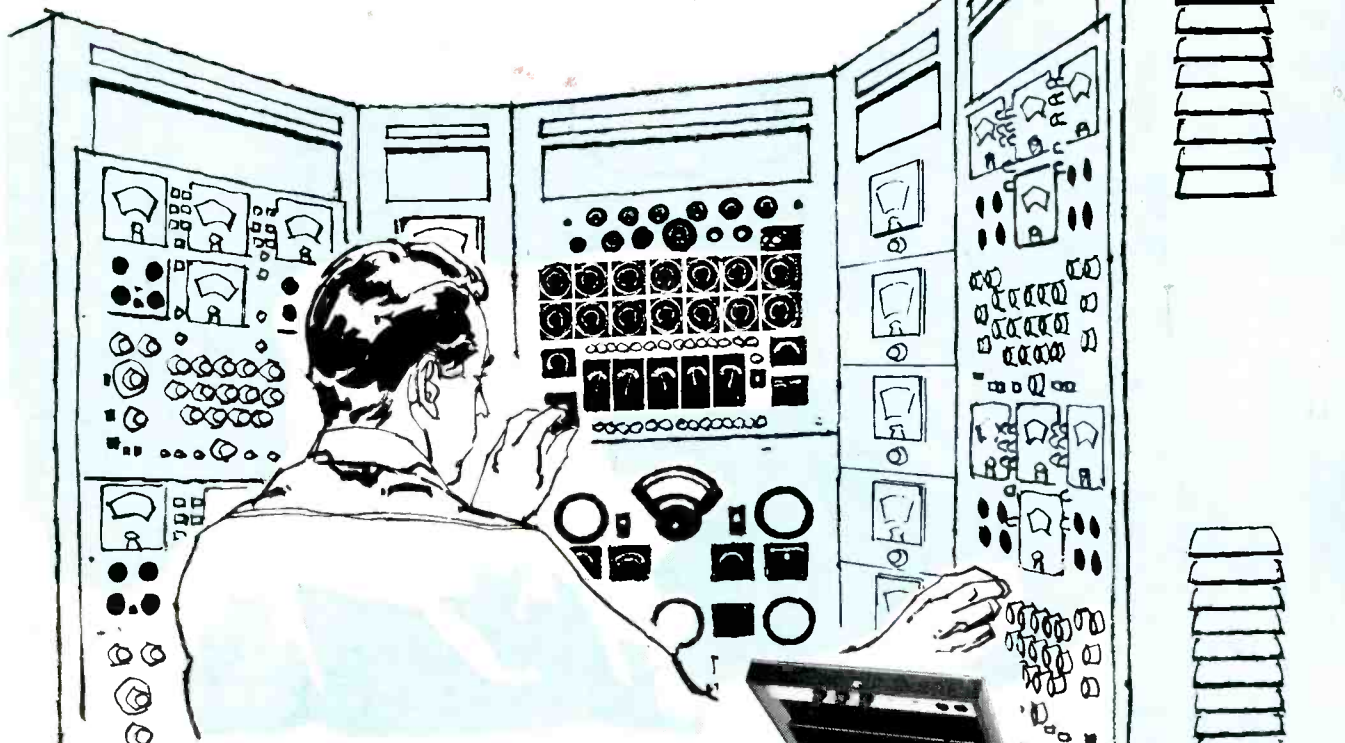
ALSO IN THIS ISSUE

- "SKY GAZING" EXPLAINS PROBLEMS
- THE CITIZENS BAND SERVICE BUSINESS
- E. T. CHECKS LATEST TEST INSTRUMENTS

60¢

APRIL 1962

Heathkit® develops continuing tube testing data program for all customers



SMALL ANNUAL FEE PROVIDES ROLL CHART DATA FOR ALL NEW TUBES

The unique tube test data console shown above was developed by Heath engineers for the express purpose of providing accurate, up-to-date roll-chart information on all new tube types as they are developed. With this new service all Heathkit tube checker owners can receive, automatically, latest test data on new tube types . . . eliminating obsolescence . . . assuring latest test facilities for all service operations. Arrangements have been made with tube manufacturers for necessary samples and data on new tube types which will then be compiled and transferred to roll-chart information for all Heathkit tube checkers. Subscribers will receive a supplement every three months and a new roll-chart incorporating this data at the end of the year. Availability of this service is another of the many advantages you enjoy with dependable Heathkit test instruments!

ANY TUBE CHECKER OWNER IS ELIGIBLE TO SUBSCRIBE TO THIS SERVICE

Subscription rates are \$2.50 per year on TT-1A type testers, \$1.50 per year for IT-21 and TC type checkers. If you own a Heathkit tube checker, send model no. of your checker along with your remittance . . . proper supplements and roll-chart will be sent automatically.

TWO NEW IMPROVED HEATHKIT MODELS OFFER FIRST YEAR'S DATA FREE

Heathkit IT-21 TUBE CHECKER

—Tests all tube types including new compactron, nuvistor, novar and 10-pin miniatures. Tests tubes for quality, shorts, leakage, open elements, and continuity. Individual tube element switches. "Bad-?-Good" meter scale. 11 lbs.

No money down, \$5 mo. . . \$44.95



Heathkit TT-1A Gm TUBE TESTER—Professional quality throughout! Indicates Gm to 24,000; micromhos. Constant-current heater supplies. Ultra-sensitive grid current test. Direct reading ohmmeter leakage test. Built-in adapter for testing new compactron, nuvistor, novar & 10-pin miniatures. Built-in switch operated calibration circuit. 32 lbs. No money down, \$14 mo. **\$149.95**

ADAPTER KIT TTA-1-1: converts earlier model TT-1 to TT-1A. Includes new cabinet, sockets, selector switches, and necessary tube test data. 13 lbs. **\$19.95**



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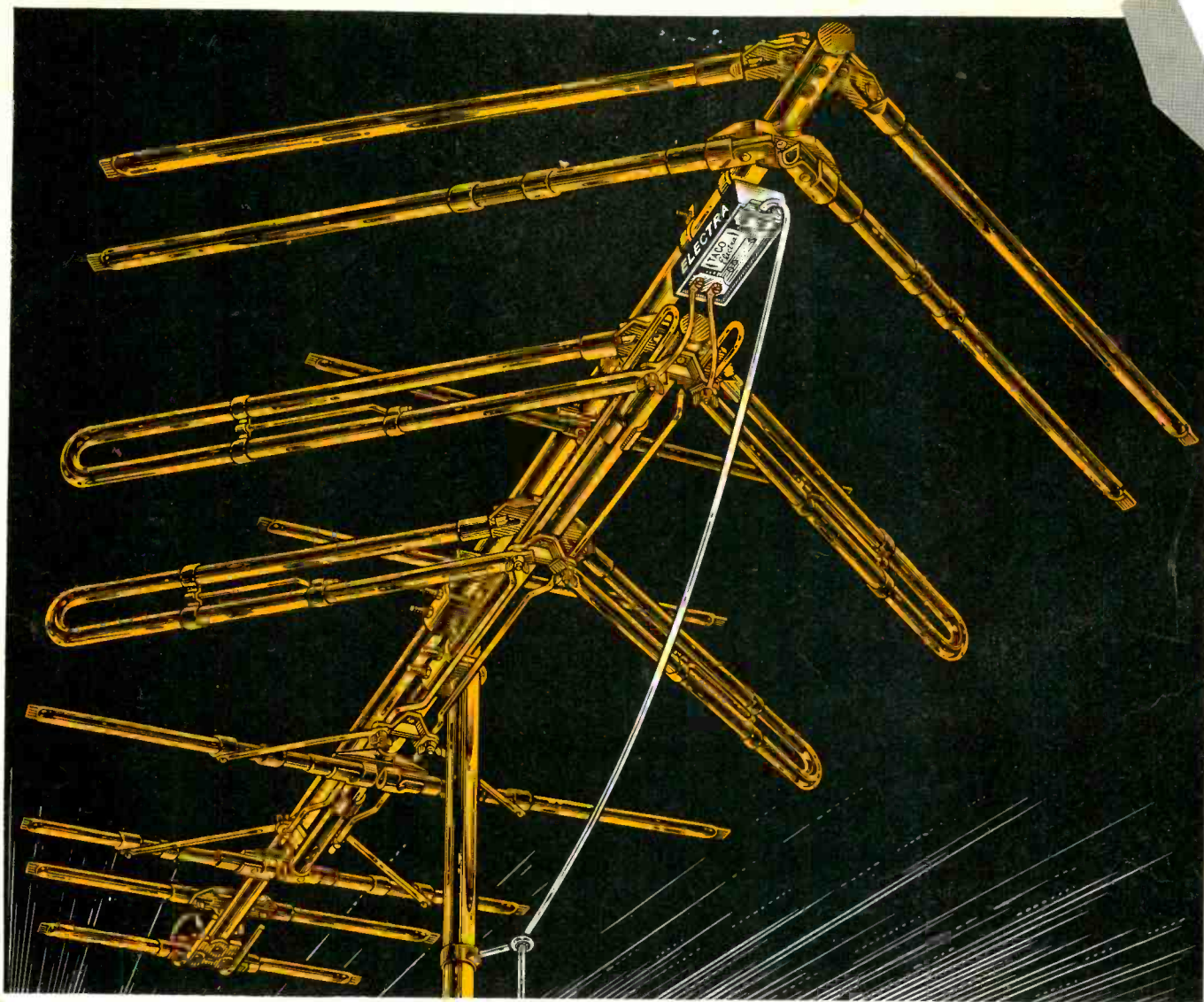
Benton Harbor 24, Michigan

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For more details, circle 40 on page 56



HOTTEST

Servicemen and distributors everywhere are talking about the hottest-performing electronic antenna around—the TACO T-BIRD ELECTRA.

And you know what started them talking... color TV. Color reception is the ultimate test of an antenna today, and here the T-BIRD ELECTRA's superior design separates the men from the boys. No friction noise, no signal flutter, a rifle-sharp forward lobe, flat response on all channels—and the best transistor preamplifier in the business (Jerrold-designed)... a few of the reasons why T-BIRD ELECTRAS (model for model) are *the world's most powerful electronic antennas*. Every element is extra rugged and put there to *work*, not just look pretty.

Only TACO, of all leading TV antenna manufacturers, has deep experience in designing satellite-tracking and defense antennas, as well as the best electronic know-how in the business. It's this combination that's making T-BIRD ELECTRA the hottest antenna news today. Add to this the new promotional concept that TACO offers you, and you have a line that can't be beat. Hot tip: GO TACO.

Shown above: T-BIRD ELECTRA Model G-990-8, list price \$107.20. Other T-BIRD ELECTRAS as low as \$78.80. Unpowered T-BIRD antennas list from \$28.30 to \$65.05.

TACO **T-BIRD** ELECTRA

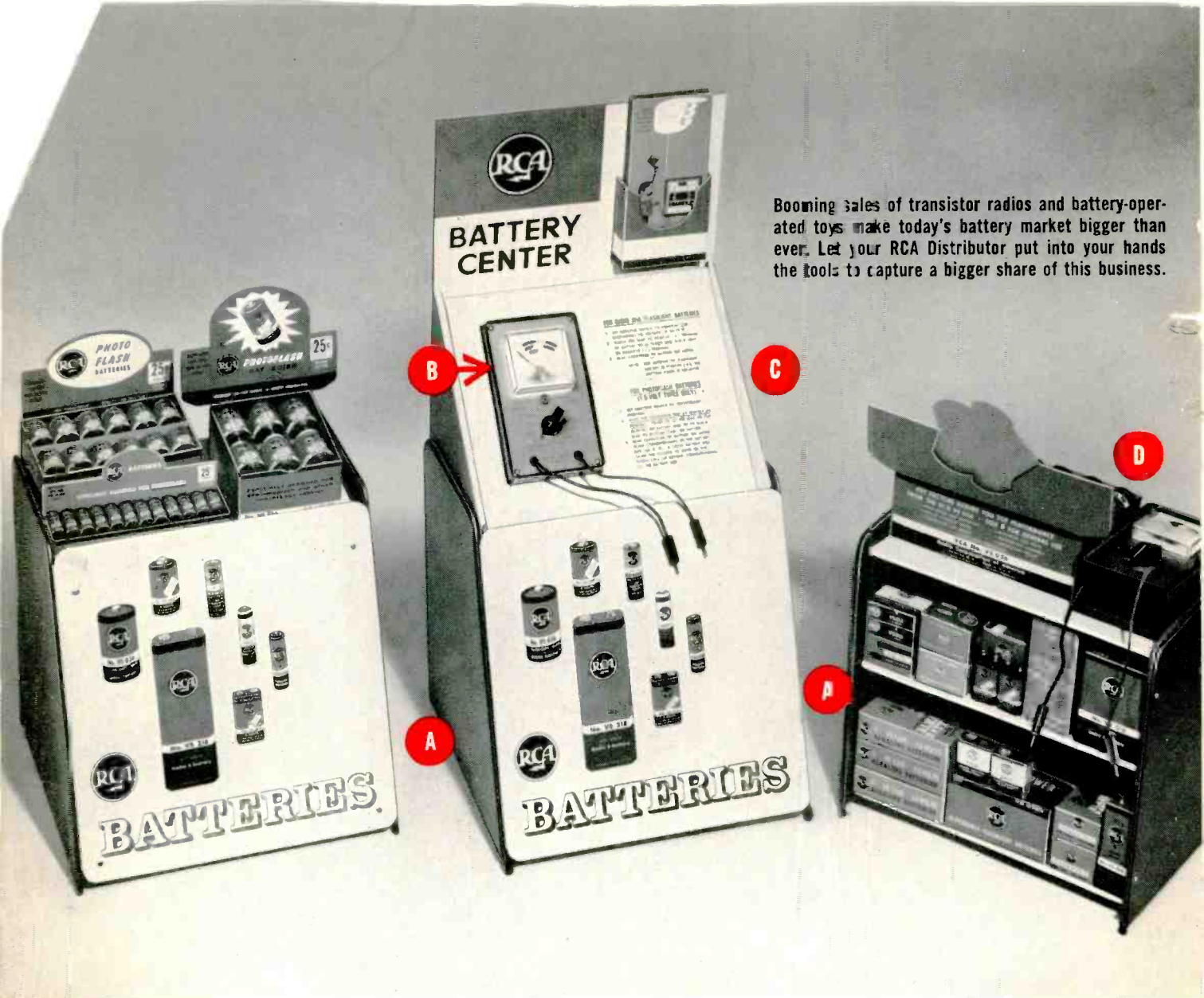
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For more details, circle 70 on page 56



Booming sales of transistor radios and battery-operated toys make today's battery market bigger than ever. Let your RCA Distributor put into your hands the tools to capture a bigger share of this business.

Capture a Bigger Share Of Today's Bigger Battery Market

Here are the new RCA dealer aids to help you increase your battery business.

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Plus Colorful, Attention-Getting Sales Promotional Aids...



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RCA ELECTRON TUBE DIVISION, HARRISON, N.J.



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WORLD'S LARGEST ELECTRONIC TRADE MAGAZINE

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April • 1962

Vol. 75 • No. 4

FRONT COVER

Many complaints which you receive every day from TV customers can be traced directly to i-f misalignment problems. The cause of "smoary" or "fuzzy" pictures or "bugs" in the sound will frequently be revealed when an accurate overall i-f response check is made. If you don't already know all the fail-safe alignment techniques employed by successful TV bench-men — professional equipment set-ups, step-by-step time saving alignment procedures — then read the article beginning on page 34 of this issue.

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CIRCUIT DIGESTS PRECEDING BACK COVER

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 HOFFMAN: Transistor Radio Chassis BP-318—
 Model P708
 MAGNAVOX: F-M Multiplex Adaptor Chassis 70-01
 19P7-1, -2, -3
 RCA: TV Chassis KCS130YAB-YAC
 SYLVANIA: TV Chassis 558-1, -2 Model 19L17 Series



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For more details circle 17 on page 56

EDITOR'S MEMO



Hardly a day goes by that doesn't see a proposal by politicians to "protect the public."

It is beyond dispute that the public needs a reasonable amount of protection. There should be—and there are—laws to prevent fraud, short weight scales, harmful ingredients, etc. After all, society should deter and punish the crooked and the immoral.

However, some self-proclaimed protectors of the public good go to the extreme of wanting to treat the public as if it were a group of idiot children. It appalls me to see how little trust in the people's good sense various politicians and consumer organization leaders show. To me the essence of democracy is faith in the popular will and its ability to make sound judgments over the long run. There is need for education, but not for restrictions which curtail free choice.

There are some government officials who oppose promotion of appliance discount selling prices compared to list prices. Misleading they say. Well, I've yet to run across a consumer who didn't know that a TV set or washing machine sells for list price in some places, and at a discount in other places.

Similarly, some groups pressured the government into requiring that pork hams with more than 10% water added be called imitation hams. The U. S. Court of Appeals reversed the government on this recently. After all, while it may be right to require labeling of the amount of water, it's certainly not right to call the ham imitation.

The public has a way of making up its own mind, hidden persuaders notwithstanding. Take the sour-pickled plum approach, for example. It holds a moral for the electronic and other industries.

Chewing gum manufacturers have been frustrated in their efforts to sell their product to the Japanese. The people have not taken to it. So some bright fellow thought up the idea of putting out a sour-pickled plum flavor. Japanese old-timers have used these plums for many years as a remedy for bodily aches.

What was the result of this crafty approach to selling chewing gum? Results, zero. The Japanese evidently just don't take to the sticky wads.

And those sticks of sour-pickled plum gum didn't sell either. Most of the senior citizens who like the plums have false teeth.

Al Forman

ELECTRONIC TECHNICIAN



CAN YOU SOLVE THIS MYSTERY?

(Using the clues below, identify the Company that offers you the industry's best service)

Service technicians—and set manufacturers, as well—use this company's capacitors oftener than any other brand.

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WHO ARE WE? If you still don't know the answer, read the initial letter of each of the sentences above. This is the name that stands for the most complete and best quality line of capacitors, unsurpassed service help, continued technical assistance—and less call-backs for our friends, the service technicians.

For more details, circle 66 on page 56

Sylvania

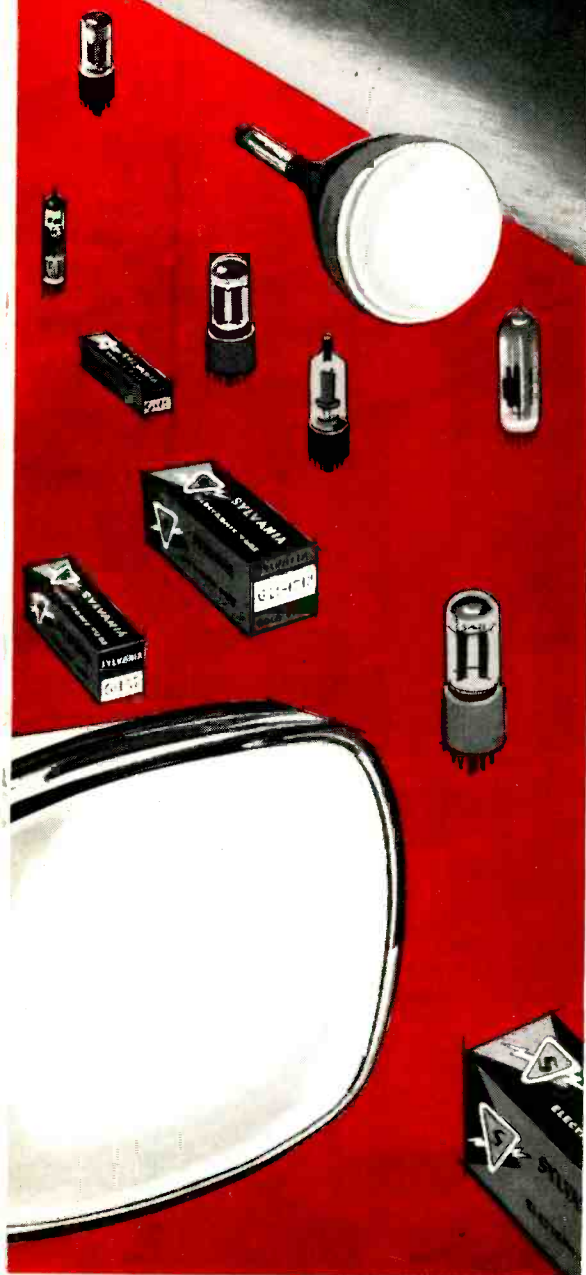
...completeness that assures
...quality that



Never say "Tubes"—say "Sylvania"!

Tubes

delivery!
assures profits!



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Sylvania was a pioneer in the manufacture of commercially produced picture tubes. That kind of experience builds profit protection into every 1962 SILVER SCREEN 85—top performance, maximum assurance against callback. And, when you specify Sylvania for that replacement job, you are sure to get delivery...because SYLVANIA has the *comprehensive* line... SYLVANIA DISTRIBUTORS are wherever there is TV!

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...for Black & White TV...Sophisticated manufacturing techniques and processes have made Sylvania a preferred supplier of tubes for TV. Developments such as Sarong Cathode and Strap Frame Grid *plus* extensive automation in production assure that replacement tubes are...in every way...as good as the original.

...for TV Tuners...Sylvania-originated, the 6GK5 brings new advances to the state of the electron tube art. This new tube type, as manufactured by Sylvania, features Strap Frame Grid constructions and high Gm, provides high gain and low noise in rf amplifier-service in TV front-ends. When replacing a 6GK5, specify *Sylvania*—universally accepted by manufacturers of TV sets. Sylvania 6GK5 also replaces the popular 6FQ5, 6FQ5A and the 6FY5.

...for AM-FM Radio...Whether servicing an AC-DC table radio, a fine Hi-Fi tuner or one of the latest Multiplex units, make Sylvania your number one choice. Take, for examples of outstanding quality, the new 17C9 and 6JK8. Both are Sylvania-originated and provide superior performance in standard tuner and in multiplex circuitry.

...for Hi-Fi and Phono...One of the pioneers in tubes for audio amplifier service, Sylvania has led with old faithfuls like the 6L6, 6V6 and 6AQ5 and the new high-performance Sylvania 6GM5 and Sylvania 7591. Automated production techniques and final test procedures maintain precision, assure high quality. A Sylvania replacement tube is the best way to make old equipment perform like new again. Electronic Tubes Division, Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

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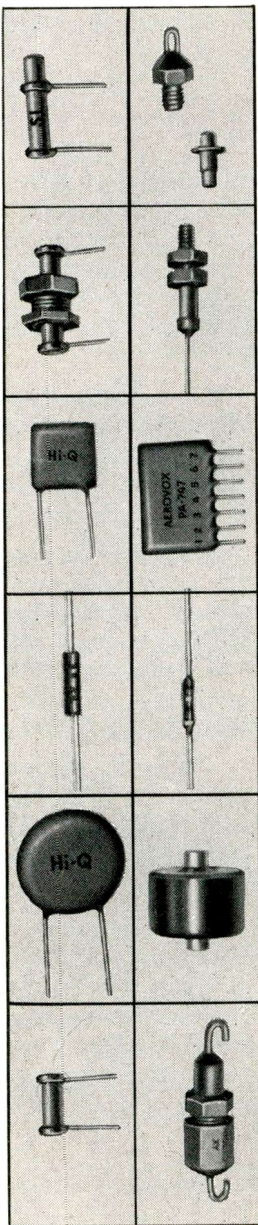
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Disk Stand-Off Capacitors for industrial applications with critical space requirements.

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For more details, circle 10 on page 66

LETTERS TO THE EDITOR

Tube Hum No Ho-Hum
Editor, ELECTRONIC TECHNICIAN:

I believe your article on "How To Diagnose TV Picture Hum Symptoms" of your December issue is in error. Mr. Hobbs claims that if you pull a video i-f or tuner tube with cathode to heater leakage the hum bar will disappear. This should tell you that this particular tube is leaky.

I say this is wrong. Regardless of which i-f tube or tuner tube you pull the hum bar will disappear. Without r-f or i-f signal these stages cannot pass 60 cycle. There must be r-f to be modulated by the 60 cycles.

However, pulling any i-f tube will isolate it to the i-f stages or tuner. If the bar stops you can bet it's in the video amplifier.

If varying the contrast control changes the intensity of the bar, it eliminates the possibility of a defective pix tube.

Likewise, switching the set to a weak channel and varying the fine tuning and noting a change in intensity of hum bar will pinpoint the fault to the r-f or tuner.

Tuning the set to an off channel and varying the fine tuning and noting the change in intensity (with brightness turned down and contrast up) would isolate it to the tuner.

Thanks for these articles on TV troubleshooting.

JOSEPH S. DORSCH
Pittsburgh, Pennsylvania

• *We did indeed slip up. The paragraph in question reads as follows in the original manuscript, but a phrase was accidentally dropped out during re-typing. The parenthesized phrase makes the statement correct: "Another rapid method used by technicians to locate a leaking tube, in parallel heater circuits, is to remove each tube—one by one—beginning with the r-f tube in the tuner. When the defective tube is removed, (and replaced with a known good tube), the black bar will no longer appear on the raster."*

Incidentally, in weak and medium strength signal areas, any i-f tube that is pulled will make the bar disappear. However, in certain very strong signal areas, there is enough coupling that the bar continues to be displayed on the raster even when an i-f tube is pulled!
—Ed.

UHF for ETV
Editor, ELECTRONIC TECHNICIAN:

Your January article on UHF converter installation by Mr. Lon Canton, Blonder-Tongue Labs Inc., was very timely for service technicians in the Washington, D. C. area. Educational

ELECTRONIC TECHNICIAN

There's

NEW POWER

**in Westinghouse
tubes!**



NEW PROFITS TOO, TURN PAGE FOR DETAILS



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A profit-sharing plan for dealers! It's another industry first from Westinghouse . . . designed to make Gold Star receiving and picture tubes the most profitable line you carry! It's simple and easy for you to cash in . . . and best of all, you can start participating in Westinghouse profits right now.

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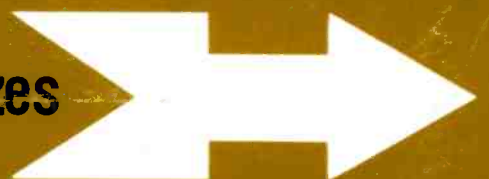
Here's how you cash in. When you collect the amount of points you need for the Profitab Prize you select, just mail the Golden Profitabs to: Profitabs, Westinghouse Electric Corp., Box 154, Dayton, Ohio. That's all you have to do.

New Gold Star Packaging. You'll notice Golden Profitabs are part of a brand-new Westinghouse Gold Star package. Modern, eye-catching, it's boldly designed to boost your sales. The distinctive new gold and black look also reflects the unsurpassed quality of Gold Star tubes.

Don't delay . . . start saving Profitabs right away! Remember, in pioneering new benefits for you as well as better products for your customers, *you can be sure . . . if it's* **Westinghouse**



Turn page for prizes



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Save your Golden Profitabs . . . and here's just a sample of what you can earn without paying a cent! Columbia bicycles . . . Hamilton watches . . . Scott outboard motors . . . Jacobsen power lawn mowers . . . Westinghouse air conditioners . . . Winchester 30-30 Carbines . . . Burgess Radar Lites . . . and scores of other attractive items! For your copy of the Profitab Merchandise Catalog, send a post card with your name and address to: Profitabs, Westinghouse Electric Corp., Box 154, Dayton, Ohio.



There's
**NEW
POWER**
in Westinghouse
tubes!

Westinghouse

LETTERS TO THE EDITOR

UHF TV station WETA-TV, Channel 26 has been on the air since September 28th and converter installation information is very helpful.

Charles A. Prohaska
Chief Engineer

WETA-TV
Washington, D. C.

No Color Converters

Editor, ELECTRONIC TECHNICIAN:

I'd like to inquire about the col-R-tel color television converter. I have a 14 inch B & W television having the specifications needed to use the converter. If you still have any available I would like to have the information concerning the following questions:

Is the converter made for RCA color programming and if not, can it be tuned to receive it? Are there any dealers in the Allentown area who have the converter in stock? What is the price for the converter and all parts needed for its installation?

William Weller

Allentown, Pennsylvania

• *To the best of our knowledge, the col-R-tel converter for displaying color TV on black and white sets is no longer in production. We know of no source where it is currently available.—Ed.*

ET Copies in Hospitals

Editor, ELECTRONIC TECHNICIAN:

I would like to congratulate Mr. Garvin for his suggestion to Mr. Fritz in the Letters to the Editor section. I agree with him that an excellent way to dispose of back issues of ELECTRONIC TECHNICIAN would be to give them to hospitals where they might help somebody. I consider ET as a technical library, and have found myself going back to several articles for additional information.

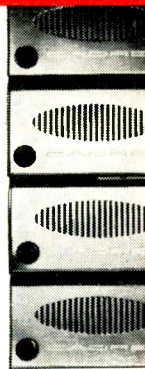
Sam Testa, Jr.

Mobile, Alabama

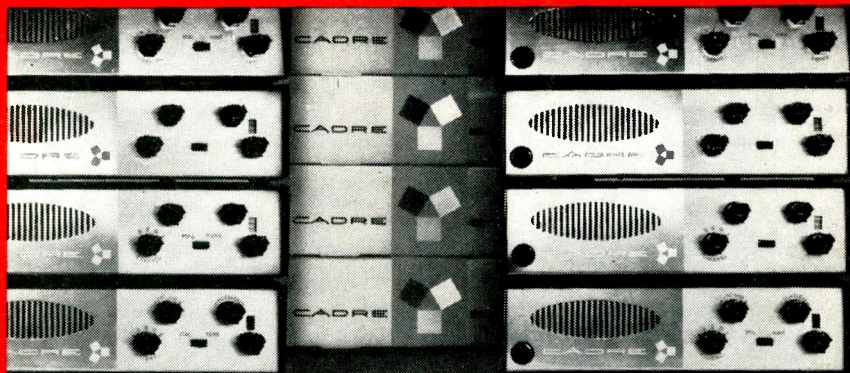
Editor, ELECTRONIC TECHNICIAN:

On page 16, of your November 1961 issue, under the heading of "Disposal of Back Issues," Mr. Garvin suggested that Mr. Fritz, who had asked for an outlet for 10 years of your back issues, should donate his magazines to a veterans' hospital or to a penal rehabilitation center?????

To get right down to a matter, which Mr. Garvin may have overlooked, since he went on to state that he takes all of



we couldn't supply enough then...



but we're ready for you now!

The Cadre 5-watt Citizens Band Transceiver was the only fully transistorized unit on the market when we introduced it 8 months ago. Events proved that those who really needed Citizens Band Communication preferred to buy the most reliable unit available, even at a premium price.

We couldn't meet the demand. Not only did we underestimate the size of the "quality" market, but each and every unit had to be put through rigorous quality control and slow, painstaking inspection...including tests under field conditions to assure trouble-free, dependable performance in any locale and despite climate and shock environment.

Today—after 8 months—production has caught up.

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LETTERS TO THE EDITOR

his back issues of your publication to the hospitals in his area, is there any better way to dispose of back issues? Has Mr. Garvin, and a lot of our fellow servicemen ever gone into the matter of facing the real truth in this matter? Do we, as servicemen, want your issues in the hands of the retail trade, where several of your advertisers are cutting the retail price on such items as receiving tubes, etc.? Do we want the retail trade to be able to buy such material at up to 60% discount merely by visiting some veteran's hospital? Who would benefit? I do not agree with Mr. Garvin, when he makes the statement in his letter, "After all, what better way to dispose of these wonderful magazines than giving them to someone they might help,"—yes, help people, who have no right to a wholesale price source. If anyone has any back issues of your magazine, which he would like to unload—I'll buy them, to get them off the "free-load" list.

Walter J. Williams

St. Clair, Michigan

Article Index

Editor, ELECTRONIC TECHNICIAN:

As a subscriber to ELECTRONIC TECHNICIAN, a journal which I enjoy very much, I would like to offer the following suggestion regarding the Annual Cumulative Article Index, published in December. This is a very valuable record—and to get the most out of said journal, I file the Cumulative Article Indexes in a separate binder so that I can quickly refer to them and through them learn where to look for all the data that has been published during the years on a given subject. In the Dec. 1961 issue of ET, I find that I must sacrifice either a part of said Index or part of a very good article on Audio Power. I respectfully suggest that such Indexes be assigned pages on which there will be nothing else.

James A. Howe

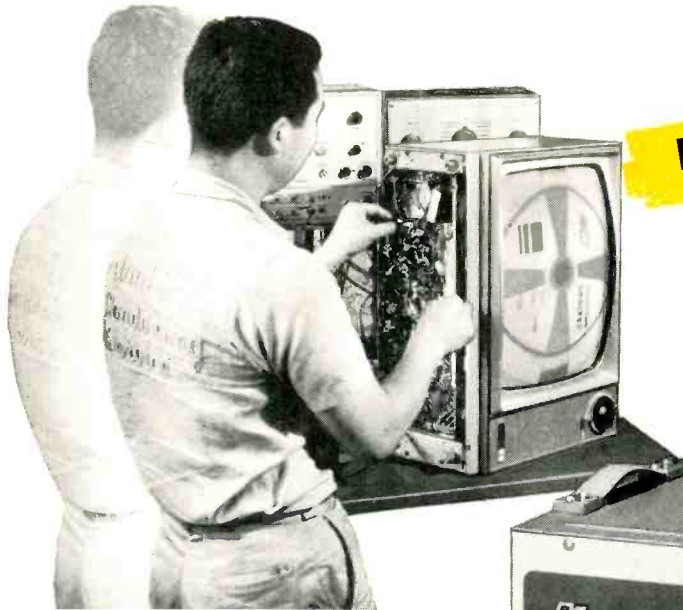
Wood-Ridge, New Jersey



"Haven't found your part but I just found my glasses . . ."

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Fix "Tough Dogs" Fast!

Save Half Your Time!

Step Up Your Profit!

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for Black & White and Color



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

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

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

Model 1076, Net, \$29995

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TUNING IN

FATAL ELECTRIC SHOCK CURE developed by electronics engineer earns Edison Medal. Dr. William B. Kouwenhoven, Professor Emeritus of Electrical Engineering at the Johns Hopkins University, is credited with developing a portable device, the heart "Defibrillator," which restores normal heart action to individuals who receive otherwise fatal electric shocks. In a paper presented before the AIEE, Dr. Kouwenhoven describes how electric shock "may upset the rhythm of the heart and throw it into ventricular fibrillation. When this occurs, the muscle fibers of the heart lose their coordinate action, the pulse disappears and circulation ceases. In man, ventricular fibrillation is almost invariably fatal." The only known, effective way of stopping fibrillation, the paper points out, is to send sufficient electric current (1 to 2 amperes) through the heart to contract it. The device weighs 45 pounds and derives power from a power pack and system of capacitors. The unit was developed and tested over a period of years.

A CLOSED-CIRCUIT TV microwave link is used by a hospitalized Long Island, New York mother to

TEXAS RADIO HAM RECEIVES CITATION



Robert T. Herndon, W5URW, Port Lavaca, Texas, received a special citation from the Edison Radio Amateur Award committee for his work during Hurricane Carla and for 10 days following the storm. Herndon directed 90 percent of the communications during the 10 days. His station was the only communications link when the storm reached its peak and armed forces radio was disabled.



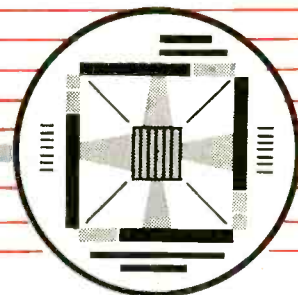
"It's Ohm's law, lady. It states when I am in here you have to go out there."

watch her three children at home 5 miles away. The father, an executive of Micro-Link Corp., obtained permission from the hospital to install the system. The FCC assigned call letters KFZXEZ to the hospital for operation on TV channel 6. Transmitting and receiving units are self-contained packages weighing about 30 pounds each.

TWO-WAY CITIZENS BAND RADIOS will be optional equipment on all 1962 Ford, Mercury and Lincoln passenger cars and Ford trucks. The company plans to promote Raytheon's Ray-Tel CB equipment through its national network of 8,000 dealers to provide two-way communications for the business and professional man between his base of operations and vehicles. The equipment can also provide a more convenient link between the family car and its household. Dealers' orders will be filled by Raytheon's Uni-market which combines automated order processing with jet-freight overnight delivery to any Ford dealer.

EIA reports that a spurt in radio production in December moved the 12-month total for last year 247,328 sets ahead of output during 1961, and a relatively good final month for television boosted 1961's production total 469,451 units above the previous year's.

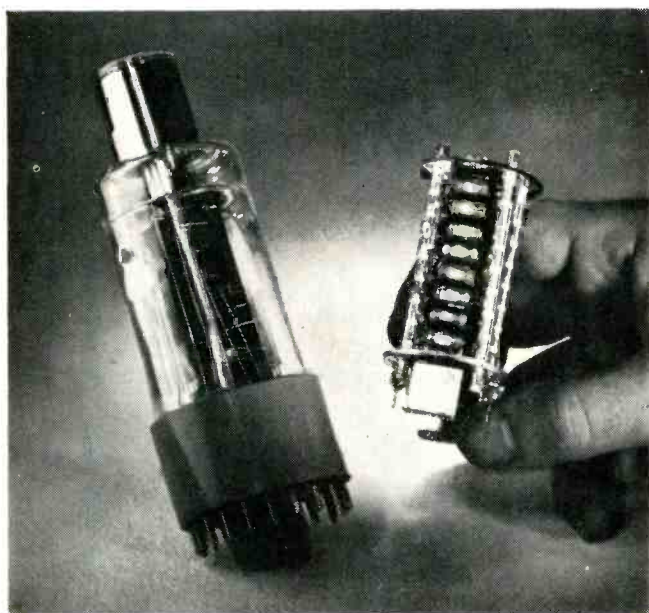
THE PICTURE



The December output of 1,845,206 radios was the second highest monthly total for 1961, and brought year-end production to 17,373,846. In 1960, 17,126,518 sets were produced. Production of 580,262 TV receivers in December raised total output last year to 6,177,797, against 5,708,346 produced in 1960.

BUILT-IN HOME SOUND SYSTEM-INTERCOMS will be manufactured by General Electric and marketed directly to builders through the company's major appliances contract sales operation. The all-transistor equipment includes an a-m radio chassis which uses seven transistors and two diodes, and printed circuits. Services include room to room communication, speaking or listening from master or remote unit; monitor listening from any station to all others in the system. Each indoor remote unit has its own volume control and talk switch. They can be turned off for privacy but the outside remote can be turned off only at the master station.

'WAY-OUT' ELECTRON TUBE



A tube for outer space has been developed by ITT Industrial Laboratories in Fort Wayne, Indiana. Called the "tubeless tube," the unit has no envelope to keep out air. Since space is void of air, an additional vacuum around the tube is not necessary. Technically, the tube is known as a windowless multiplier phototube. Advantages claimed for the tube are increased sensitivity and smaller size. The new tube is compared to a photomultiplier (left).

CALENDAR OF COMING EVENTS

- Apr. 11-13: S. W. IRE Conference and Electronics Show, (SWIRECO), Region 6, Rice Hotel, Houston, Texas.
- Apr. 29-30: 91st Convention, the Society of Motion Picture and Television Engineers, Ambassador Hotel, Los Angeles, Calif.
- May 21-24: 1962 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- May 23-25: 38th Annual EIA Convention, Pick-Congress Hotel, Chicago, Ill.
- May 23-26: Annual Meeting, Acoustical Society of America, (AIP), Hotel New Yorker, New York, N. Y.
- June 18-19: Chicago Spring Conference on Broadcast and TV Receivers, (PGBTR) Chicago Section, O'Hare Inn, Chicago, Ill.

ESSENTIAL TO SURVIVAL of the small business man is his proposed bill "Federal Fair Competitive Practices," says Senator William Proxmire of Wisconsin. Addressing 600 retailers at a recent Des Moines fair trade rally he explained that passage of the bill would not mean an end to competition, nor to competitive pricing. Benefits would be available only to manufacturers of items in direct competition with other similar items, and the small business man would not find his competitor selling at cost because his financial operation permits him to destroy his competitor.

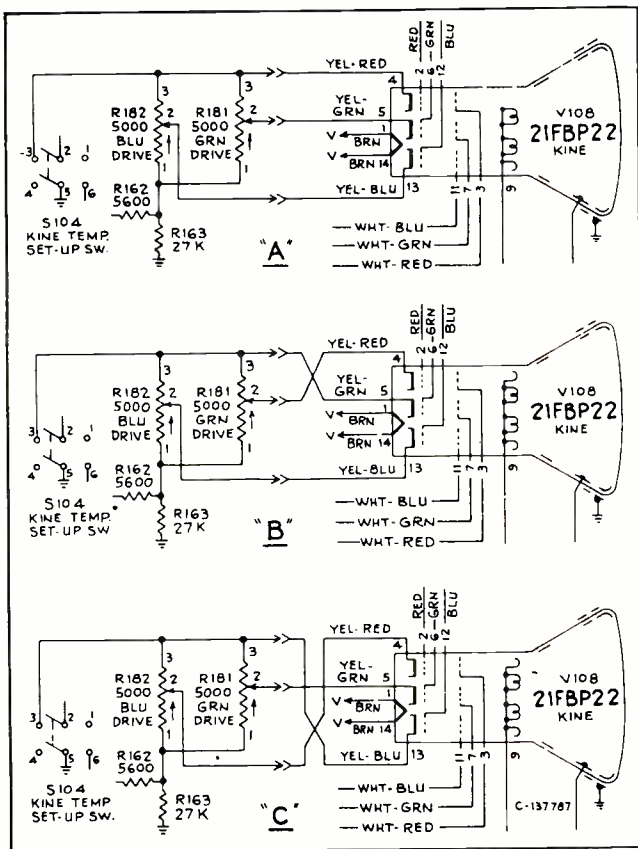
NAB'S TV BOARD OF DIRECTORS has directed the NAB staff to study the advisability of advocating legislation which would empower the FCC to restrict community antenna TV (CATV) operations which duplicate local TV service. The Board took its unanimous action at the request of the NAB CATV-Repeater Committee. The resolution noted that one objective of the CATV Committee is the settling of "conflicts between local TV broadcast stations and those community antenna TV systems whose operation tends to have a depressing effect on the successful and continued operation of such TV stations." The resolution also said that such conflicts can be alleviated by insuring that the programs of the local TV broadcast station will not be duplicated by community antenna systems operating within its primary market area, and it noted that the FCC has said it does not have authority to prevent such duplication.

TV MANUFACTURERS TECHNICAL DIGEST

DUMONT

Color TV Chassis C-100 and C-101—CRT Temperature Adjustment

CRT replacement in Dumont color sets may involve some wiring changes to compensate for difference in relative efficiencies of the three phosphors. Connections for the original CRT are determined at the factory for each receiver and a given CRT. The



DuMont color TV changes to correct for different phosphor efficiencies on CRT replacements. Necessary changes are for (A)—cyan; (B)—magenta; and (C)—yellow.

least efficient phosphor in the new tube may be different, however, from the one which is being replaced.

To determine the proper cathode connections for the replacement tube, perform the screen and drive control adjustments as outlined in the manufacturers instructions. If the new tube's phosphor efficiency is different from the original, the picture will appear either cyan, magenta, or yellow. The accompanying drawing shows the proper wiring to correct for each of these conditions.

These changes should not affect the settings of the

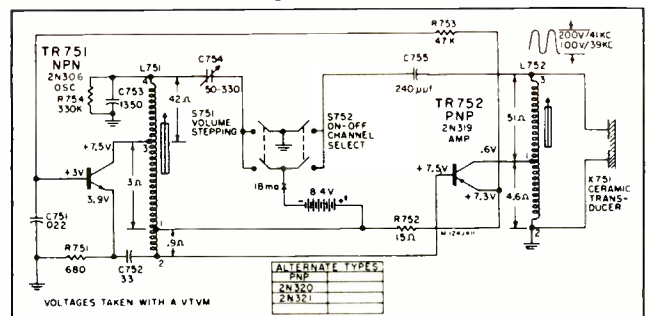
drive or screen controls, but a check is recommended to assure best possible CRT tracking.

GENERAL ELECTRIC

TV Chassis M6—Remote Control Operation

These remote control transmitters operate on high frequency sound waves. Two models are used, one with two transistors using a ceramic transducer, the other utilizing a single transistor and an electrostatic transducer. Both units perform the same functions with two control buttons: on-off, channel selection, and four levels of sound. Each control button causes oscillations of either 39 kc or 41 kc to operate their respective receiver circuits.

In the two transistor units, the oscillator energy is amplified to feed the ceramic transducer. This is not necessary in the electrostatic model. The tank circuit of the ceramic type consists of L-751, and C-753, which is tuned to 41 kc. Power is applied to the circuit when S-752 is closed. A double pole switch is used to apply power to the circuit after components are switched to prevent transistor damage. The

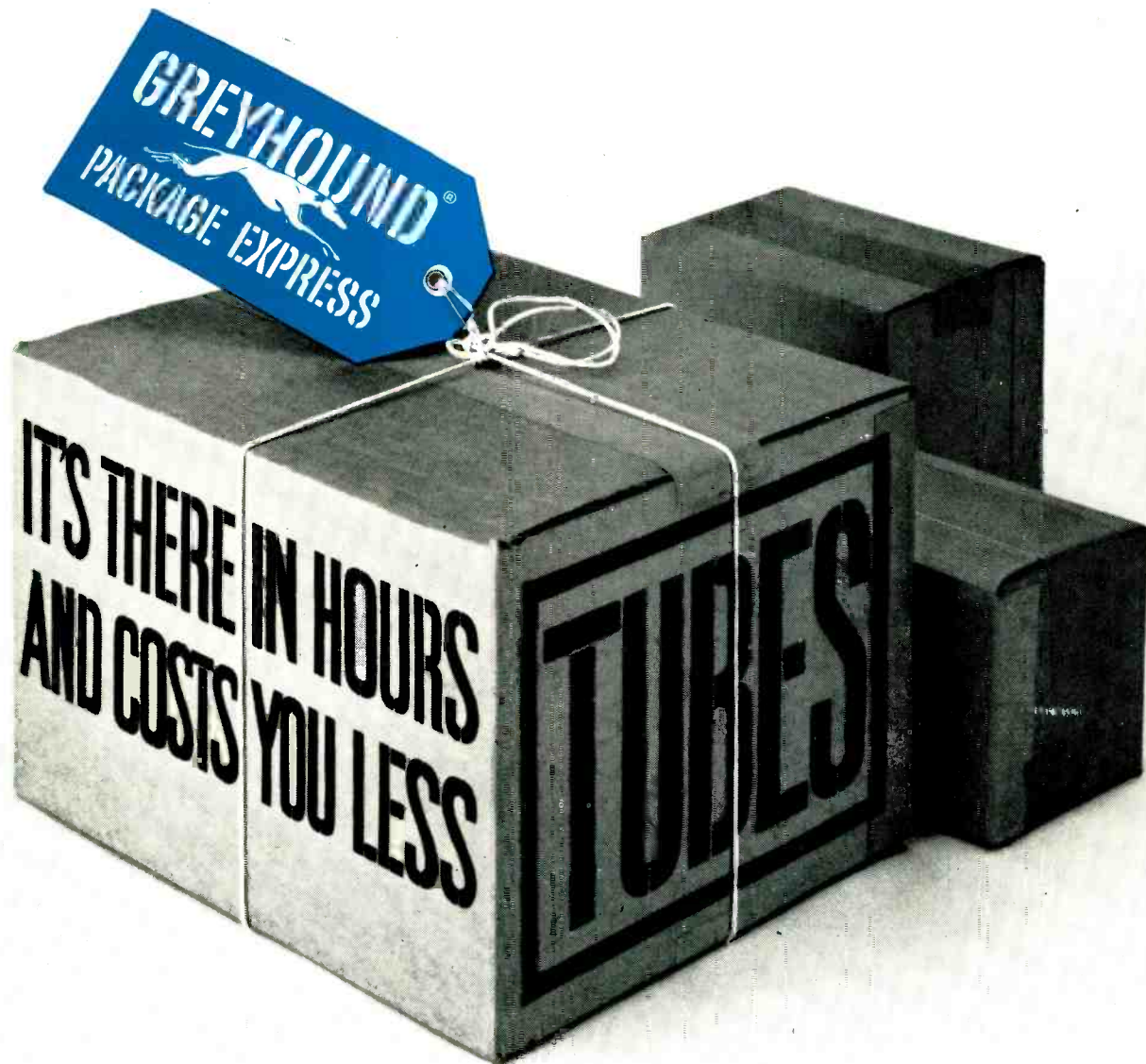


Schematic of Ceramic Transducer Transmitter used in G-E's Remote Control.

tank coil is tuned by C-753, a 1350 pf capacitor and loaded by R-754. When S-751 is pressed, C-754 is shunted into the circuit and effectively lowers the tank frequency to 39 kc.

The oscillator output is fed to a pnp buffer-amplifier which in turn feeds L-752. L-752 is connected between the base and the emitter, and the transducer is tied directly across the coil. The coil operates in two modes for proper amplification of either frequency when correctly adjusted. R-751 is a limiting protection resistor for TR-751 and provides stabilization for TR-752.

The unit is powered by a standard 8.4 volt battery and has a total current drain of 22 ma. The output stage normally uses 15 ma of this total. Operation of the electrostatic transducer type is essentially similar.



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TV MANUFACTURERS TECHNICAL DIGEST

MAGNAVOX

TV Chassis Series 35—Production Changes

The following changes are made to improve operation of the Magnalux circuit.

1. R-527 changed from 180K to 150K, 5W.
2. R-521 changed from 47K 1 w, to 33K, 2 w.
3. R-523 changed from 150K, 10 to 150K, 5.

MOTOROLA

Auto Radio 25TMXD Renault 55555—Power Transistor Replacement

When replacing a power transistor in this radio make sure an exact replacement is used. To insure proper heat dissipation, both sides of the transistor insulator should be coated with DC-4 grease (Motorola part No. 11M490487). Transistor mounting screws must also be securely and evenly tightened.

PACKARD BELL

Television Chassis No. 88-13—Production Changes

R-f tuner 10746 has been installed in some models containing chassis 88-13. It is electrically the same;

the only difference is that the 10746 has provisions for mounting the computer dial switch.

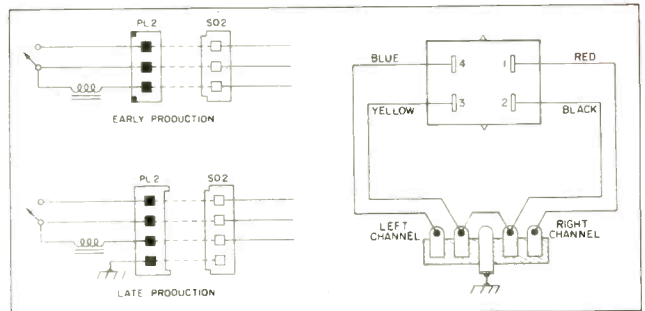
When an 88-13 chassis comes in for servicing, the values of R-13 and R-45, in the tuner, should be checked to make sure the values correspond to those given in the set.

Also the module 10709 in the horizontal oscillator circuitry of this chassis should be checked for possible shorts between the rear ends of the leads and the chassis. A piece of rubber tape or other insulation should be fastened to the bottom of the module.

The horizontal oscillator tube V8 has been changed from a 6CG7 to a 6FQ7 in the 88-13 chassis. Either tube may be used as a replacement.

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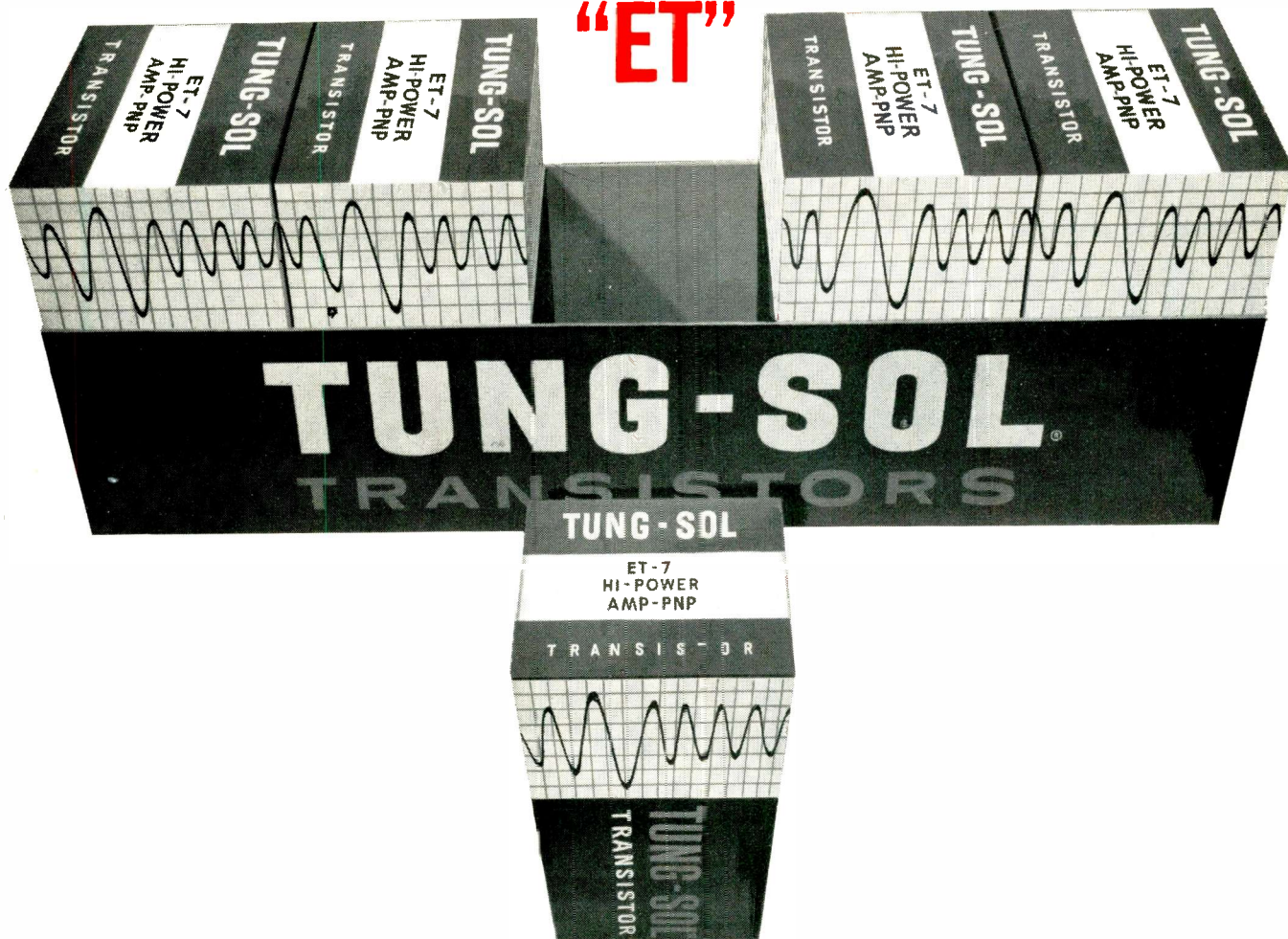
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OZ4	3R26	5V6GT	6AU6	6B06GT	6CU5	65C7	6Y6G	7N7	12B8A	12X4	41	12B8B	12X4	42	12B8C	12X4	43	12B8D	12X4	44	12B8E	12X4	45
1A7GT	3CB6	5X8	6AV7	6B07	6CU6	65D7GT	7A4/XXL	7C7	12B8F	12X4	46	12B8G	12X4	47	12B8H	12X4	48	12B8I	12X4	49	12B8J	12X4	50
1B3GT	3D4	5Y3	6AU8	6B08	6D6	65F7	7A5	757	12B8K	12X4	51	12B8L	12X4	52	12B8M	12X4	53	12B8N	12X4	54	12B8O	12X4	55
1HS5GT	354	6A6	6AV5GT	6B58	6DE6	65F7	7A6	7X6	12B8P	12X4	56	12B8Q	12X4	57	12B8R	12X4	58	12B8S	12X4	59	12B8T	12X4	60
1L4	3V4	6AB4	6AV6	65Y5G	6D6G6T	65G7	7A7	7X7	12B8U	12X4	61	12B8V	12X4	62	12B8W	12X4	63	12B8X	12X4	64	12B8Y	12X4	65
1L6	4B07A	6AC7	6AW8	6B26	6DF6	65H7	7A8	7Y4	12B8Z	12X4	66	12B9A	12X4	67	12B9B	12X4	68	12B9C	12X4	69	12B9D	12X4	70
1NS5GT	4B58	6AF4	6AX4GT	6B27	6E5	65J7	7B4	7Z4	12B9E	12X4	71	12B9F	12X4	72	12B9G	12X4	73	12B9H	12X4	74	12B9I	12X4	75
1R5	4B27	6AG5	6AX5GT	6C4	6F5	65K7	7B5	7L8	12B9J	12X4	76	12B9K	12X4	77	12B9L	12X4	78	12B9M	12X4	79	12B9N	12X4	80
1S5	4C86	6AH4GT	6B8	6CA8	6F6	65L7	7B6	7M8	12B9O	12X4	81	12B9P	12X4	82	12B9Q	12X4	83	12B9R	12X4	84	12B9S	12X4	85
1T4	5AM8	6AH6	6BA6	6CD6G	6H6	65N7GT	7B7	7P8	12B9T	12X4	86	12B9U	12X4	87	12B9V	12X4	88	12B9W	12X4	89	12B9X	12X4	90
1U4	5AN8	6AK5	6BC5	6CF6	6J4	65O7	7B8	7Y4	12B9Y	12X4	91	12B9Z	12X4	92	12C0A	12X4	93	12C0B	12X4	94	12C0C	12X4	95
1U5	5A78	6AL5	6BC8	6CG7	6J5	65P7	7C4	7Z4	12C0D	12X4	96	12C0E	12X4	97	12C0F	12X4	98	12C0G	12X4	99	12C0H	12X4	100
1V2	5AV8	6AM8	6BD6	6CG8	6J6	614	7C5	7A7	12C0I	12X4	101	12C0J	12X4	102	12C0K	12X4	103	12C0L	12X4	104	12C0M	12X4	105
1X2	5A24	6AN8	6BE6	6CH8	6J7	618	7C6	7E6	12C0N	12X4	106	12C0O	12X4	107	12C0P	12X4	108	12C0Q	12X4	109	12C0R	12X4	110
2AF4	5BR8	6AQ5	6BF5	6CL6	6K6GT	6U5	7C7	7E7	12C0S	12X4	111	12C0T	12X4	112	12C0U	12X4	113	12C0V	12X4	114	12C0W	12X4	115
2BN4	5CC8	6AQ6	6BG6G	6CM6	6K7	6U8	7E5	7E5	12C0X	12X4	116	12C0Y	12X4	117	12C0Z	12X4	118	12C1A	12X4	119	12C1B	12X4	120
2CY5	5J6	6AQ7	6BH6	6CM7	6N7	6V6GT	7E6	7E6	12C1C	12X4	121	12C1D	12X4	122	12C1E	12X4	123	12C1F	12X4	124	12C1G	12X4	125
3A5	5R4	6AR5	6BJ6	6CN7	6Q7	6W4GT	7E7	7E7	12C1H	12X4	126	12C1I	12X4	127	12C1J	12X4	128	12C1K	12X4	129	12C1L	12X4	130
3AL5	5T8	6A55	6BK5	6D8	654	6W6GT	7E7	7E7	12C1M	12X4	131	12C1N	12X4	132	12C1O	12X4	133	12C1P	12X4	134	12C1Q	12X4	135
3AU6	5U4	6AT6	6BK7	6CR6	657	6X4	7F8	7E7	12C1R	12X4	136	12C1S	12X4	137	12C1T	12X4	138	12C1U	12X4	139	12C1V	12X4	140
3BU6	5U8	6AU4GT	6BL7GT	6CS6	658GT	6X5GT	7D7	7D7	12C1W	12X4	141	12C1X	12X4	142	12C1Y	12X4	143	12C1Z	12X4	144	12C2A	12X4	145

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"ET" is your guide to the compact transistor line engineered and packaged specifically for entertainment replacement. You can make just about every radio and TV replacement from only a handful-size inventory. Eleven PNP and NPN types replace hundreds of older numbers.

Each package is plainly marked with the type of service as well as the part number to save you time in selecting the units you need. Every Tung-Sol

transistor is fully warranted. Tung-Sol takes *your* responsibility seriously and spares no effort to provide the very highest in transistor performance. So make your transistor purchases with an eye to convenience, profit and customer satisfaction. Tell your supplier you'd rather have Tung-Sol "ET" transistors. Write for the Tung-Sol Transistor Interchangeability Guide. Tung-Sol Electric Inc., Newark 4, New Jersey

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A TYPE FOR EVERY JOB

PNP TYPES

Low power

ET1 Mixer/oscillator/converter
 ET2 IF amplifier
 ET3 AF amplifier 6v.
 ET4 AF amplifier 12v.
 ET5 AF amplifier 9v.

Medium power

ET6 AF power amplifier


High power

ET7 AF high power amplifier

NPN TYPES

Low power

ET8 Mixer/oscillator/converter
 ET9 IF amplifier
 ET10 AF amplifier 9v.
 ET11 AF amplifier 12v.



For more details, circle 73 on page 56

**TV MANUFACTURERS
TECHNICAL DIGEST**

Later models of this Westinghouse phono have a 4-contact connector instead of the earlier 3-contact type. In the later models the fourth contact is not used. Wiring of the contacts are the same, with a ground tied to the fourth connector. In addition, the record changer, cartridge and styli have been changed. The accompanying drawing shows new amplok and cartridge wiring.

TRUETONE

TV Model No. 2DC1278A—Pin Cushion Effect

Receivers using the 23 inch CRTs are more subject to pin cushion and linearity problems when not properly centered. Should any difficulty be encountered with these problems, a careful check of centering should be made. Exact centering and adjustment of height and linearity controls will yield an improved picture in most cases. This check should be made prior to servicing any of these receivers.

WEBCOR

Tape Recorders, all Models—Stalled Motors

If the speed selector is inadvertently moved when the recorder is off, the capstan drive belt may become entangled in the speed change pawl of the motor pulley. On current units, this can be corrected by manually assisting the motor, or capstan to complete the speed change. New recorders will have a screwdriver slot in the motor shaft so that the change may be made more easily.

Access to this slot will be provided by a small hole in the motor ventilating grill (bottom of recorder). Instructions will be affixed to the bottom of the recorder as follows:

“Recorder may stall if speed is changed while recorder is off. To start motor, insert screwdriver through hole at right, and turn motor clockwise to complete speed change.”

MAGNAVOX

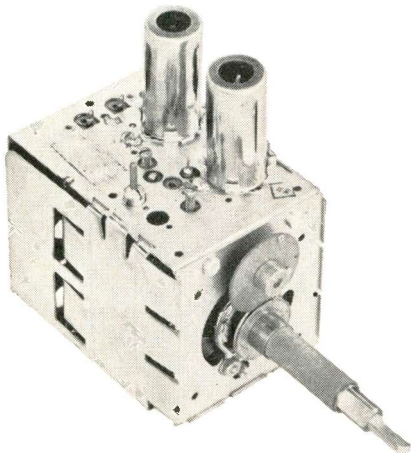
Model MV366—Lead Dress Hum

Hum in this model may be caused by lead dress of the cabling extending from the TV chassis and the control chassis which contains the tuner and the loudness, contrast and tone controls. This condition can be eliminated by removing the short wire connected from the control chassis to the volume control “ground” terminal.

Tarzian offers

**FAST, DEPENDABLE
TUNER
REPAIR SERVICE**

**ALL
MAKES**



ONLY
\$850
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

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 (except tubes which are furnished at our cost) 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

For more details, circle 61 on page 56





"2 or 3 calls a day can be directly traced to our Yellow Pages advertising," says E. Ellis, President, Crown Television Inc., Albuquerque, New Mexico. "In my opinion, for the money, there is no other form of advertising that does as good a job for us as the Yellow Pages. Newcomers in the area, for example, tell us they found us through our directory advertising. Also, there's the fact that the Yellow Pages is always handy—when people want something done, or need a product, I'm convinced they look in the Yellow Pages first."



Display this emblem. It builds your business!

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



SERVICE STATION
FOR
2-WAY RADIO

INSTALLATION
MAINTENANCE

DIAL
AL 6-6011 or AL 6-2698

CROWN

TELEVISION INC.
5001 MENAUL BLVD., N.E.

For more details, circle 11 on page 56

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A completely new RCA Institutes course with brand new opportunities for electronic technicians . . . COMMUNICATIONS ELECTRONICS.

1962 starts a new era in mobile communications when you get your FCC License. Under the skilled direction of RCA Institutes experts, you can obtain at home the technical qualifications for employment in the Communications Industry. In addition to preparing you for an FCC license, you are supplied with the training needed to service and maintain 2-way radio communications for truck and taxi fleets, police, fire, bus, railroad and other public service vehicles. You also get the technical foundation for advancement in space and aviation communication electronics. This is *not* a cram course. . . *not* a rehash of old radio lessons. Learn from RCA what it takes to get ahead in the ever-expanding field of communications.

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AUDIO NEWS LETTER

FIDELITONE discontinues recording amplifier project, reported in our letter of January 15th.

SONOTONE names Gilbert and Felix as advertising agency for the Electronic Applications Division.

TELEPROMPTER enters hi-fi components field through the purchase of Weathers Industries.

INT'L SOUND FAIR off to a good start. Initial response to first exhibitor's brochure resulted in sales of 25% of the exhibit space. Fair to be held July 25-29, Cobo Hall, Detroit.

HARTLEY's 220 MS loudspeaker has been selected by Industrial Design magazine for inclusion in their Annual Design Review. Kudos to Harold Luth, Hartley chief engineer.

CAPEHART reports major expansion plans for the firm's hi-fi stereo line. The Consumer Products Div. to be directed by Hal Weiss and Gene Gillis, succeeding Seymour Mintz who resigned effective Feb. 16, 1962.

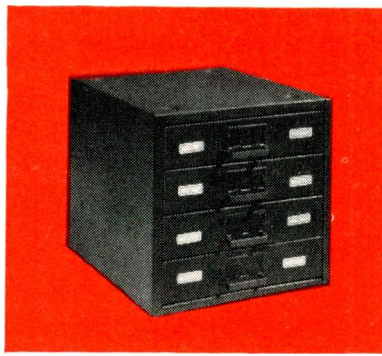
BOGEN turntables are being featured in "Adventures in Sound," a one-hour demonstration of hi-fi components being presented at more than 50 New Jersey schools, under the auspices of Educational Services, New York.

IHFEM reports that Show magazine is sponsoring the telecast of the awards dinner of the Institute of High Fidelity Manufacturers and the Audio Engineering Society on Mar. 19, at the Coconut Grove, Ambassador Hotel, Los Angeles.

MAGNAVOX portable phonographs models 1SC236-R, 1SC246R and 1SC279S now incorporates the new 500 series all-transistor, two-channel, stereo amplifier which uses 10 transistors, (5 for each channel) and provides 10 watts output.

SAMPSON announces model SFC62N tape recorder, to sell under \$100. Features include fully automatic 2-speed control (3¾ and 7½ ips) with tone control that operates on both record and playback. Frequency response, 150 to 8500 cps at 7½ ips.

SWITCHCRAFT introduces a molded stereo headphone replacement cord assembly, with molded cable strain relief and plastic covered cable. Recommended for most stereo headphones and is a direct replacement assembly for the Jensen HS-10 and Knight KN-840. \$2.95.



STA-LOC® Control Kits

now more versatile than ever

Here's the new Mallory STA-LOC Control Kit. It's better than ever now. All we did was shuffle a few parts around to really bring it up-to-date. Now you can make exact replacements for hundreds of jobs . . . TV, Hi-Fi, stereo, home and auto radio . . . singles, duals, tandems . . . even clutch controls . . . all with or without a line switch.

STA-LOC controls snap together . . . and *stay* together. Best of all, you can snap a rear section on in any of three positions . . . so you can fit those tough auto radio jobs. The whole STA-LOC system is slick. It's designed for you . . . the service technician.

There are two STA-LOC kits. The small SLD-1A covers

over 200 dual combinations, 300 tandems, and scores of singles. The big SLD-2A handles over twice as many jobs. Both kits come complete with cross reference guides and instructions. And they're inexpensive.

You'll save time, phone calls, and extra trips to your distributor. Here's a real plus . . . Your Mallory distributor has *complete* back-up stock for your STA-LOC kit . . . you can even switch it around to fit your needs exactly. Give your Mallory Distributor a call . . . let him give you the details on the best doggone control system ever made for service technicians.

STA-LOC. U.S. Patent 2,958,838.



Distributor Division, Indianapolis 6, Indiana



For more details, circle 44 on page 56



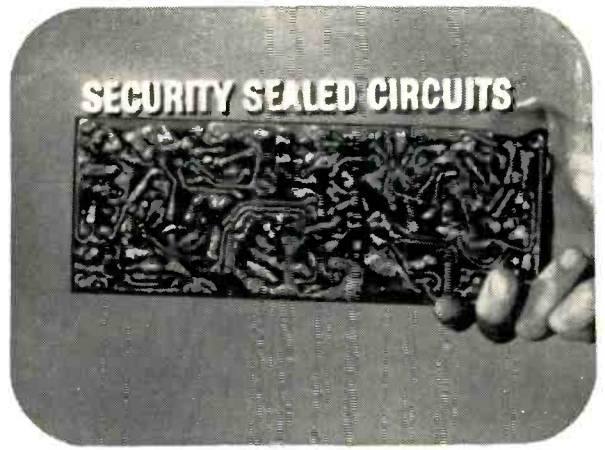
1. **ANNOUNCER:** Why do many TV servicemen buy RCA Victor New Vista Television for their own homes? Let's visit one . . .



2. **JOHN HALVERSON (Meriden Conn.):** "I work with many kinds of TV sets . . . that's why I picked RCA Victor for my home."



4. . . . gives you an amazingly clear, steady picture.



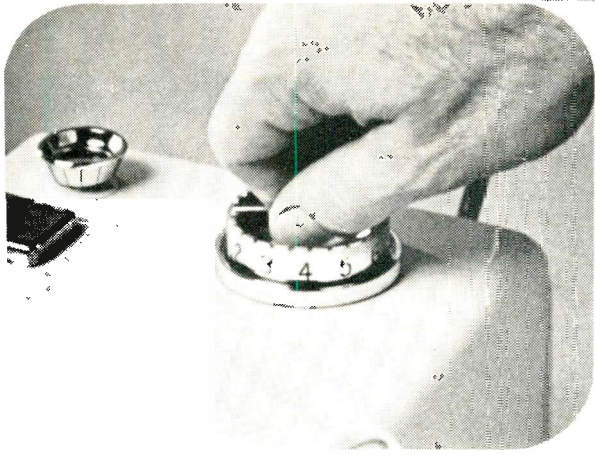
5. Second—RCA Victor has Security Sealed Circuit Boards. And John knows they're precision-crafted, and far more dependable . . .



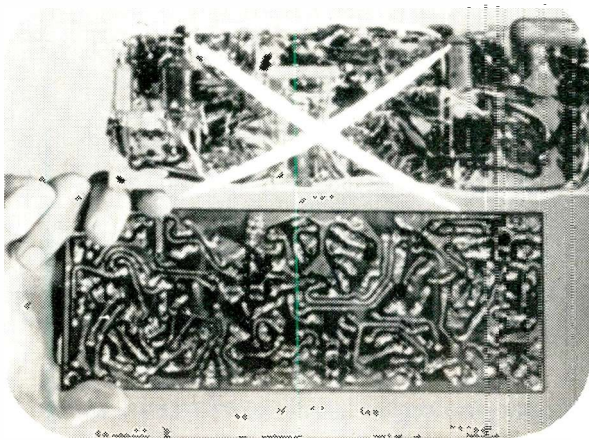
7. And third, he prefers RCA Victor TV because it's so reliable.



8. **JOHN HALVERSON:** That's right. I spend much of my time fixing other people's sets. When I get home I like to relax!



3. **ANNOUNCER:** John Halverson gives three reasons: First, RCA Victor with its powerful New Vista Tuner . . .



6. With no old-fashioned hand-wiring to come loose or short-circuit.



9. **ANNOUNCER:** See RCA Victor New Vista Television at your dealer's this week!

This TV commercial is telling the story of RCA VICTOR performance to millions of people on the hit TV show, Walt Disney's "Wonderful World of Color" on the NBC-TV network . . . it builds public awareness of the role you play in providing dependable TV entertainment. 



The Most Trusted Name in Television

Tmk(s)®

Get Extra Value at No Extra Cost

with this RCA WV-38A (K) VOLT-OHM-MILLIAMMETER KIT

Now you can get a professional-caliber V-O-M in kit form. Enjoy the self-satisfaction and sensible savings that kit assembly offers you. No professional know-how required. Clear step-by-step directions to follow. The result: years of precision service at low cost.

Whatever your reason for choosing a V-O-M kit, there's one basic reason for making that choice an RCA WV-38A (K)...extra value at no extra cost. Want examples?

- Extra 0.25-volt and 1-volt ranges
- Frequency response of low a-c ranges is flat within 1 db to 800,000 cycles
- Spring clips on handle for extra carrying convenience
- Jacks below switches keep leads out of way
- DB scale clearly marked: no squinting
- Easy-to-read meter measures 5" wide
- Non-breakable, sealed plastic window
- Red test lead has probe and slip-on alligator clip for added versatility

ONLY **\$29.95***

RCA WV-38A available factory-wired
and calibrated: \$43.95*

Attractive, scuff-resistant laminated-vinyl carrying case, \$4.95* extra

OTHER OUTSTANDING RCA KIT VALUES

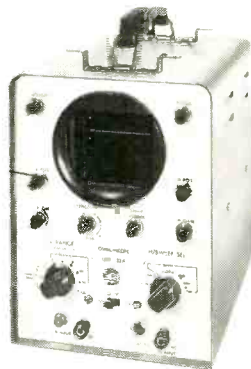


RCA WV-77E (K) VOLTOHMYST® KIT

Famous VoltOhmyst® quality and performance at a low price! Special test features include: separate 1.5-volt rms and 4-volt peak-to-peak scales for accurate low AC measurements. Tests AC and DC voltages to 1500 volts; resistance from 0.2 ohm to 1000 megohms. Complete with ultra-slim probes, long flexible leads, special holder on handle to store leads.

ONLY **\$29.95***

RCA WV-77E available factory-wired and calibrated: \$43.95*

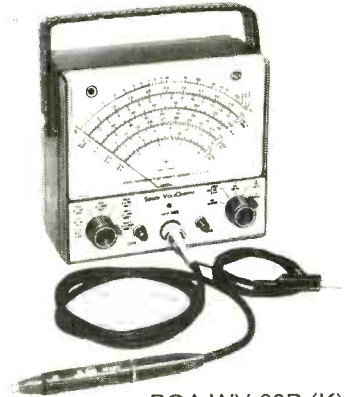


RCA WO-33A (K) SUPER-PORTABLE OSCILLOSCOPE KIT

Here is a rugged, compact oscilloscope that weighs only 14 pounds. Easily portable for in-the-home or shop troubleshooting. Ideal for servicing black-and-white and color TV, radio, hi-fi components, tape recorders, etc. Ample gain and bandwidth for the toughest jobs. 3" graph-scale screen and internal calibrating voltage source for direct reading of peak-to-peak voltage.

ONLY **\$79.95***

RCA WO-33A available factory-wired and calibrated: \$129.95*



RCA WV-98B (K) SENIOR VOLTOHMYST® KIT

A real money and time saver...now available in kit form! The etched-circuit-board and AC/DC ohms probe are pre-assembled. Separate color-coded scales measure DC voltages, 0 to 1500 volts; AC voltages, 0 to 1500 volts rms or 4200 volts peak-to-peak. Resistance from 0.2 ohm to 1000 megohms. 200-microampere meter movement with less than 1% tracking error. Precision multiplier resistors accurate to $\pm 1\%$.

ONLY **\$62.50***

RCA WV-98B available factory-wired and calibrated: \$79.50*

Call your Authorized
RCA Test Equipment Distributor



The Most Trusted Name in Electronics

*User Price (Optional)

RCA Electron Tube Division Harrison, N. J.

Get Going With Color TV

Do the following remarks sound familiar to you? "Not perfected . . . too expensive . . . it'll be years until there's an engineering breakthrough . . . the big outfits will take over service."

It may sound like someone talking about color TV a year or two ago. Actually, these quotations are among those we remember from 1946-1948 when the subject was *black-and-white* TV.

What bad guessers the pessimists turned out to be. B&W TV was as "perfected" as most complex home equipment, gave great entertainment value, underwent refinements instead of breakthroughs, and independent service dealers took over almost all of the service industry.

Color TV is in an even better position than B&W was right after World War II. Mass production is in swing. Much refinement has taken place. Servicing is available across the country.

Is color viewing any good? You bet it is. We've been checking the reception and find that color programs are usually excellent. Even more impressive is the fact that B&W programs are displayed very well on color sets.

So what's holding color back? Well, without getting into the stumbling of past years, color is coming along . . . at last. An RCA marketing vice president predicts color TV retail sales will approach a half million this year.

Despite the fact that color will be a boon for our industry, a new dimension of entertainment for the public, and a stimulus to merchandising generally, there are "drag factors" at work.

First is the limited amount of color TV programming. Customers are bound to hesitate when color programs are not plentiful. The parties at fault are the broadcasters. NBC has done a fair job. CBS has done a poor job. And the ABC network, as well as most individual stations, have done just about nothing. Zero!

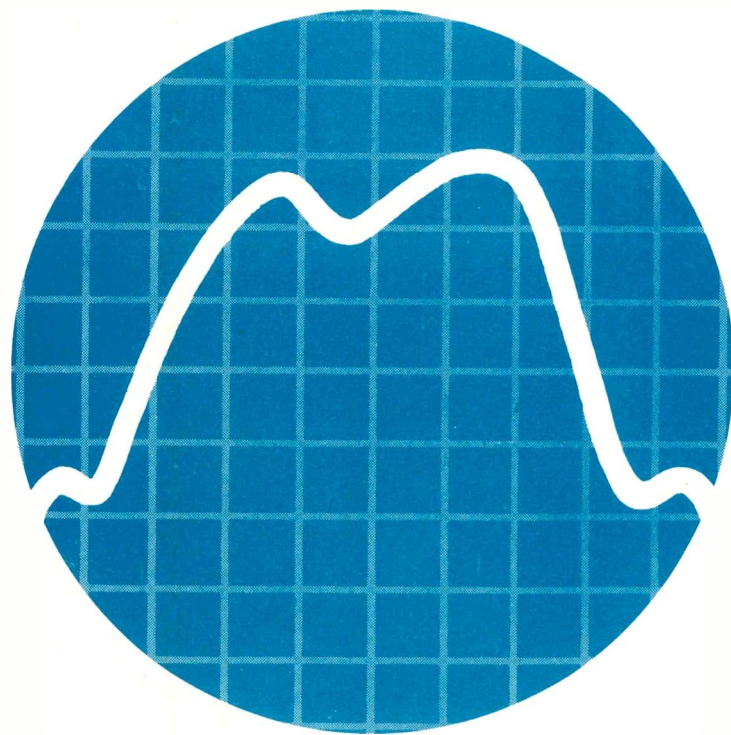
This inactivity is the reason that the chairman of the National Appliance Radio & Television Dealers Association has asked the FCC to find out why stations and networks refuse to invest some of their "fabulous profits" in color. NARDA asks if broadcasters holding extremely profitable licenses from the U. S. government have an obligation to invest some of those profits to advance the art which is the source of their income. NARDA believes that they do . . . and so do we.

Another drag on color is the unwarranted opposition of supposed experts. Consumers Union is a case in point. In November 1961 and again in February 1962 they came out against color. Their stand probably influences readers who don't own color sets, but here is what CU readers who own color sets have to say: "Color television is wonderfully natural . . . as near perfection as it is possible to get . . . it is such an improvement over black and white . . . color may not be 100% of what CU would like it to be, but it is here now and works beautifully . . . naturally the price is higher, you are getting more."

With several manufacturers and different designs now competing in the color TV market place, consumers can make a free choice. We trust that continuing engineering refinements and increased promotional efforts will be made.

TV service dealers, the electronic specialists who have personal contact with the public, should get into color TV work and support it vigorously. The expansion of color can bring a surge of prosperity. More second sets in the home. More antenna installations. More replacement business. Furthermore, color circuits and instrument requirements are just enough more complex than B&W, that most do-it-yourselfers will hesitate.

Viewed another way, you'd *better* get into color if you don't want a growing segment of the service business to gravitate toward your competitors.



Trouble symptoms,
test set-up
and alignment procedures

PROFESSIONAL

by Vic Bell
Technical Editor

■ Service technicians are finding more TV sets that need intermediate frequency checks and alignments than ever before. Most of the 56-million TV sets now in operation are another year older, and normal component aging can cause out-of-tolerance conditions which require slight i-f adjustments to restore sound and picture quality. In addition, alignment checks are a frequent necessity in the every-day process of isolating, pinpointing, and eliminating many complaints.

When customers complain of "smeary" or "fuzzy" pictures, or "buzz" in the sound, it's difficult to immediately diagnose the cause as aging or defective i-f components, or the effects of do-it-yourself "tinkering." Don't try to pinpoint the exact trouble until a series of tests have been made and these tests can reveal meaningful information only when the technician has a basic understanding of TV i-f circuit functions, when an optimum test equipment set-up is available, and when this equipment is integrated properly and used effectively.

I-F Characteristics and Trouble Symptoms

Today's complete video amplifier generally employs two or three i-f stages, a detector stage, and one or two final amplifier stages. The i-f section's primary function is to amplify the weak modulated composite video signals supplied by the set's tuner, pass the f-m sound signals, and provide TV channel selectivity. The composite video signals are demodulated by the detector and further amplified by one or two additional stages before passing to the picture tube. The sound, of course, goes through a conversion process in the video detector, is "trapped" off and sent through its own f-m detector and audio circuitry to the speaker. A typical intercarrier i-f and video amplifier schematic, with three i-f stages, is shown in Fig. 1. We are concerned here only with the i-f stages.

Both sound and video must pass through intercarrier video i-f amplifiers. Since both carriers are separated 4.5 mc, the amplifier must be designed with a band-pass at least this wide. Although the frequency modulated sound occupies only an insignificant portion of the pass-band, the a-m modulated composite video information may extend from approximately 30 cycles to above 4 mc. Thus, the i-f amplifier must be capable of passing this band of frequencies, without distortion, and provide proper amplification of all frequencies throughout the video spectrum. If these

requirements are not met, then trouble develops.

Trouble symptoms can show up as weak vertical or horizontal sync; as "ghosts" which vary their horizontal image spacing when the set's fine tuning control is adjusted; as fuzzy pictures with loss of fine detail; as blacks smearing over grays or whites; as white areas trailing after black areas and as a general reduction in picture and sound quality.

Although these trouble symptoms can be caused by i-f misalignment, identical or closely comparable symptoms can be the result of defects in the i-f, detector, or final amplifier stages. Moreover, some closely related symptoms can be caused by defects in the tuner area. A check of the TV set's i-f alignment, however, can be a major step in the process of isolating the trouble.

Test Equipment Set-Up

Equipment required for i-f checks and alignments include a sweep generator, marker or variable signal generator, oscilloscope and VTVM with necessary

specialists at the alignment bench which you can duplicate with beneficial results. Considerable time and confusion can be avoided by employing these organized methods. The following steps for an over-all i-f response check are outlined.

Over-all I-F Response Check

The conventional over-all i-f response check is perhaps the most revealing test that technicians can make on improperly operating video amplifiers. Since the i-f amplifier is approximately mid-way in the video chain, it is frequently the most logical starting point in the process of isolating a defective video link. Once the test equipment and receiver has been turned on and allowed to warm up for a minimum of 20 minutes, the check can be completed in a few minutes.

Our immediate objective is to obtain an over-all response curve of the video i-f amplifier and display it on the scope for analysis. Assume we are using the instrument set-up shown in Fig. 2. The steps outlined here should be performed in the same sequence each

TV Alignment Techniques

probes, a d-c bias source, and assorted alignment tools. A full complement of laboratory quality instruments, however, will not produce satisfactory results if the equipment is not properly set up. Experienced technicians know that the over-simplified alligator-clip-lead hook-up illustrations, frequently used in books and articles dealing with alignment procedures, cannot be taken literally. In practice, more sophisticated arrangements are necessary.

A typical alignment instrument set-up is shown in Fig. 2. Many shops mount this equipment permanently on a special bench area or on a metal dolly-type table. Interconnections between each test instrument should be short lengths of coaxial cable.

Although some pieces of equipment may ground through interconnecting coaxial cables, all instruments should be additionally bonded together with a continuous length of heavy copper braid. This braid should also be connected to the TV set which is being checked, then grounded to a cold water pipe.

Any instrument not powered by a transformer, including the TV set to be checked or aligned, must be powered through an isolation transformer. These basic requirements are essential before attempting to check or align i-f amplifier stages.

In addition to a well planned and safe instrument set-up, there are certain procedures used by spe-

cialists at the alignment bench which you can duplicate with beneficial results. Considerable time and confusion can be avoided by employing these organized methods. The following steps for an over-all i-f response check are outlined.

1. (A) Remove the TV set's antenna. Short the antenna terminals directly at the tuner. (B) Connect the negative terminal of a d-c bias supply to the agc bus and the positive terminal to chassis ground. Adjust bias as specified.

2. (A) Set the sweep generator frequency to the over-all i-f band pass center as specified by the manufacturer. (B) Adjust the generator's sweep deviation control to midpoint, or as specified. (C) Set the generator output gain control to midpoint. (D) Set the marker generator output gain control to minimum. (E) Connect the sweep generator's horizontal (60 cycle) output to the scope's horizontal input.

3. (A) Either ground the grid pin of the set's converter tube, or replace the tube with a similar type which has the grid pin clipped off. Some manufacturers recommend setting the tuner on a high band channel to prevent interaction. This may work, although it usually leads to confusing interference. The oscillator may frequently be disabled if the tuner can be rotated to a point between channels.

4. (A) Connect the sweep generator's hot output lead to an ungrounded tube shield (Fig. 3) floating

over the tuner converter tube. (B) Connect the other generator lead to ground directly at the converter tube socket.

5. (A) Connect the scope's direct probe from the vertical plates across the load resistor at the video detector output, or as specified by the manufacturer.

Some semblance of the waveform in Fig. 4A should now be seen on the scope. Adjustment of the gain controls on both the scope and the sweep generator will be necessary. Make sure the output from the sweep generator is not too high, or the amplifier will overload and distort the waveform. Generally, the lowest generator setting which will allow a usable waveform should be used. The scope gain can then be varied for the proper amplitude.

The phasing will also need to be adjusted, which becomes easy with practice. First turn the blanking control off. Adjust the phase control until a base line is present and extends entirely across the bottom of the waveform. Then switch blanking back on.

Before proceeding, make sure that the test equipment is properly bonded. Place a hand flat on the TV chassis and in turn against each test instrument and observe the waveform. If the waveform moves or changes shape, check all equipment grounds to determine which one is defective.

Though an alignment specialist can usually tell where the beginning of the sweep trace is, most technicians will find the variable marker generator helpful here. If the sweep generator does not have provisions to connect the marker, clip the marker generator's leads to a point on the receiver's chassis a few inches apart, and near the i-f strip. With the marker frequency set near the i-f frequency center, advance the gen-

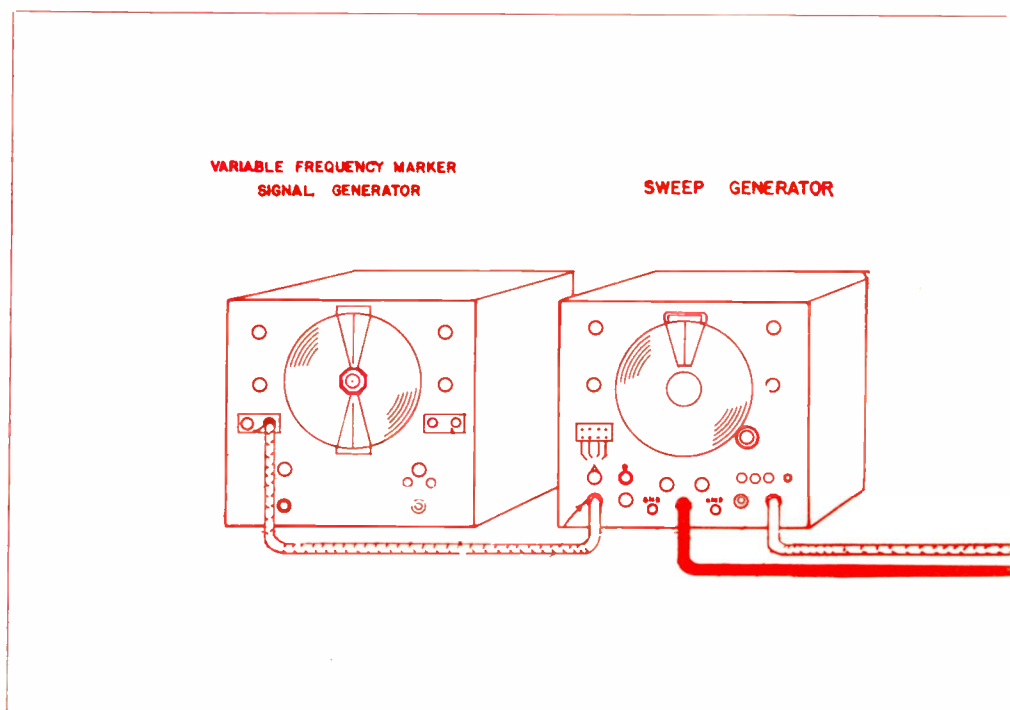
Fig. 3—Standard tube shield used for r-f injection. A small amount of masking tape is wrapped around it's base to prevent grounding.



erator's gain until the marker is visible in the response curve. Note the marker frequency and it's position on the curve: Then turn the marker's dial a small amount and note it's new position. You should be able to tell the high and low frequency side of the curve by noting the direction of "pip" travel. Make sure you are always looking at the same "pip," and not a harmonic.

Refer to the manufacturer's specifications to find recommended check points to determine the proper shape and the relative position of the response curve. The marker generator should be set to the appropriate designated frequencies and their relative positions on the response curve checked against the present of the

Fig. 2 — Test equipment set-up used for i-f alignment. Voltmeter is used to adjust traps and individual i-f stages.



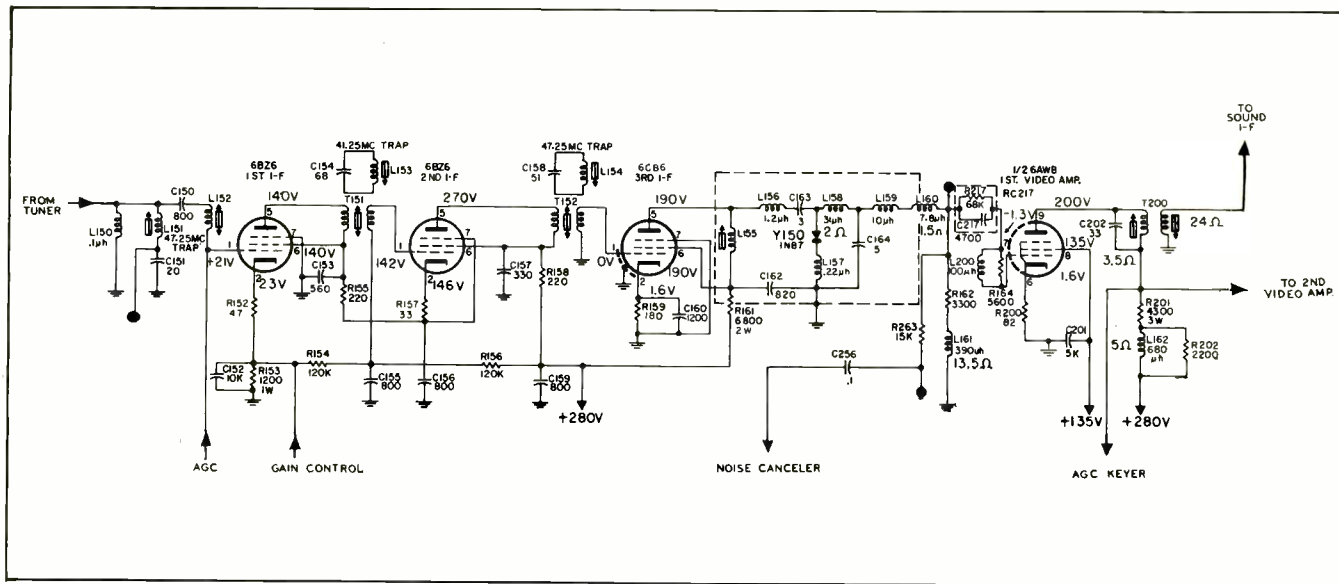


Fig. 1 — Typical three stage video i-f schematic showing one stage of video amplification. Alignment checks are made by connecting the oscilloscope across R-162, the detector load resistor.

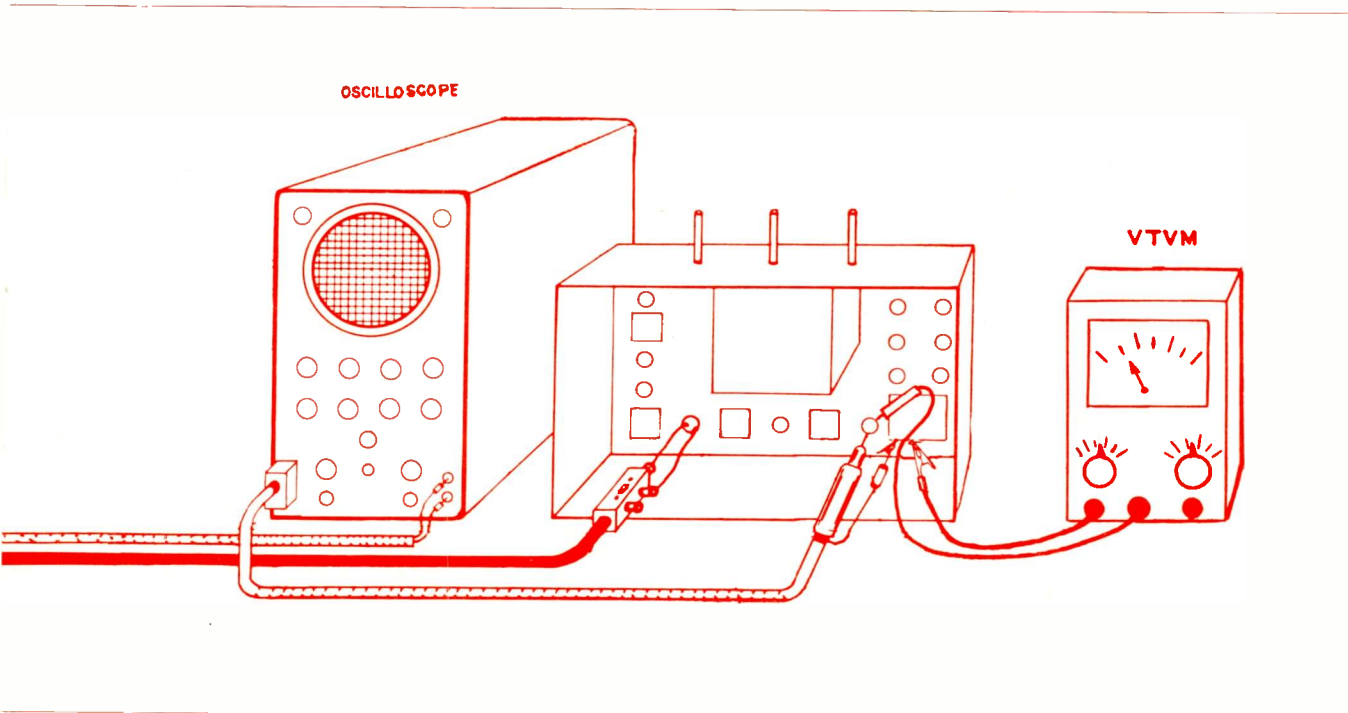
total amplitude. Tolerances are usually given; variations from these tolerances usually indicate trouble.

Alignment Techniques

Slight errors in the over-all response can be corrected by careful adjustment of each stage of the i-f strip while viewing the over-all i-f response curve. When the i-f is completely misaligned, however, the only alternative is individual stage alignment. This is ac-

complished by injecting the sweep signal directly into the stage being checked, with the scope connected to the output of the same stage. Individual alignment of each stage greatly simplifies the job, so most manufacturers include drawings of individual response curves in addition to an over-all response curve.

Certain traps must also be adjusted. This is best accomplished by using a variable signal or crystal controlled marker generator and a VTVM. When a com-



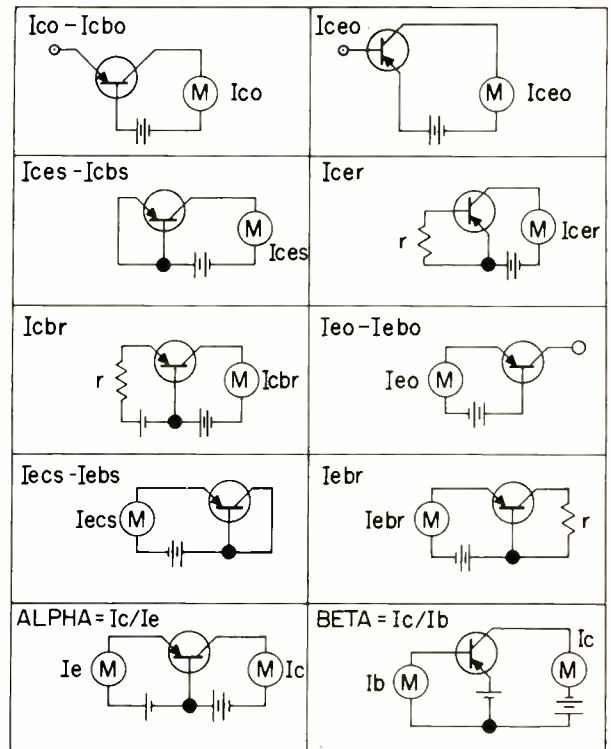
TRANSISTOR ANALYZER

Triplet Transistor Analyzer, model 3490 @ \$399.95—Increased use of semiconductor devices is forcing the TV shop owner to take a hard-look at transistor test equipment. This instrument seems to fill almost any need for transistor tests and measurements.

This flexible unit is designed to indicate a wide range of test values in volts, amperes, and ohms as specified by semiconductor manufacturers. One feature is continuous current and voltage controls. Meters are used to indicate both static and dynamic values. Damaging transients is avoided by using interlocked switching and warning light indicators.

Collector current and emitter or base current is monitored at all times. Controls provide means for plotting characteristic curves. Stand-

Simplified test circuits employed in Triplet transistor tester for various transistor measurements. The instrument can also be used to check rectifiers and diodes.



ard tests that this instrument can perform include short and leakage tests, measurement of Alpha, d-c Beta, a-c Beta, and voltage saturation.

In addition to npn and pnp type transistors, the instrument will test tetrode types. A heat sink is built

into the unit to test power transistors. Diodes and rectifier parameters can also be determined with the tester.

This elaborate instrument can no doubt satisfy the normal needs of the electronics laboratory as well as the comprehensive service shop.

CATHODE REJUVENATOR

B & K CRT Cathode Rejuvenator, model 420 @ \$54.95—This tester seems to be an answer to a lot of CRT problems. The unit

makes all the standard tests on both black and white, and color tubes. A simple accessory adaptor is used to check color tubes.

In addition to checks for shorts and emission, the unit is capable of eliminating a large percentage of inter-element shorts and in many cases bringing a tube's emission back to a usable level. The unit performs all checks on 2, 6, and 8 volt tubes as well as the new 19 and 23 inch tubes. It is provided with an easy-to-read "good-bad" meter scale.

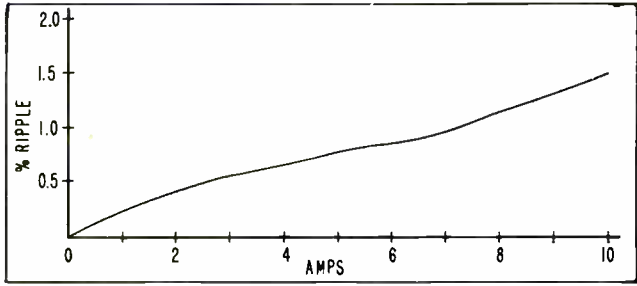
The 420 is small and light weight.

Housed in a metal case, it weighs only 5½ lbs and measures 8⅝ x 6¾ x 3⅞ inches. The manufacturer also offers a chart renewal service to keep the instrument up to date when new tube types are produced.

All operations are accomplished with only four controls. Three neon lamps located on the instrument panel show which element is shorted.

Many tips on tube testing and rejuvenation are offered by the company in their instruction booklet which is supplied with the instrument.

BATTERY ELIMINATOR

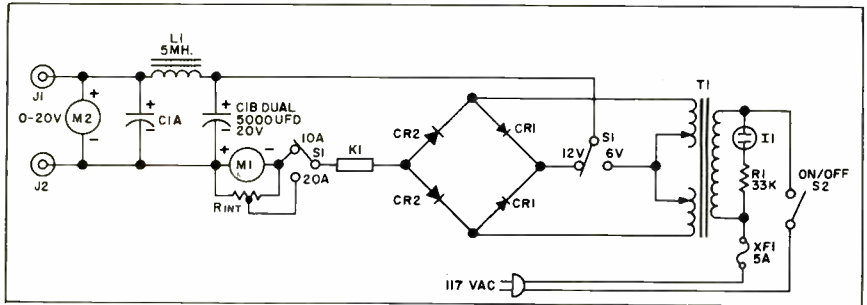


Curve showing ripple percentage vs. current drain for Eico's battery eliminator.

EICO Battery Eliminator and Charger, model 1064 @ \$52.95 wired, \$43.95 Kit—This unit appears worth investigating by anyone who does not have a comparable instrument or those who find their present battery eliminators becoming obsolete because of the low ripple demands of transistorized receiving equipment.

Two d-c output ranges are available from 0 to 8 volts and from 0 to 16 volts. Current ratings on the instrument are 10 amps continuous, or 20 amps intermittent on the low voltage range; and 6 amps continuous, or 10 amps intermittent on the high range.

An adjustable transformer provides continuous voltage variations. Current and voltage are monitored at all times on two meters. Switching

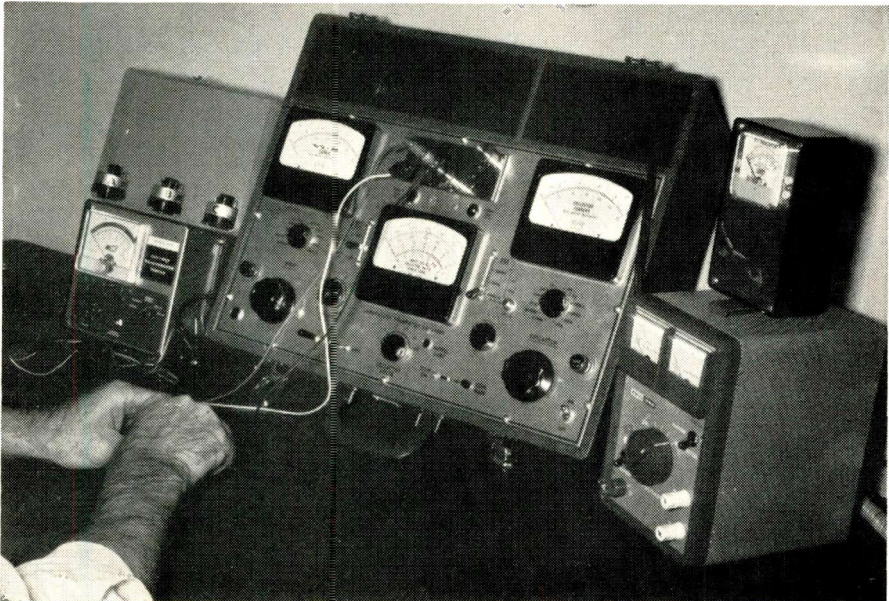


Eico's battery eliminator has a unique combination full wave and bridge type rectifier for 10 volt and 20 volt outputs.

to another range automatically selects the proper meter circuitry for the new range. The a-c ripple is said to be 0.3 percent at 2 amps and no more than 4.5 percent at 10 amps when used on the 0 to 16 volt range. The power transformer primary is fused to prevent damage which may

result from overload or shorts. The fuse post is located on the front panel for easy access.

The battery eliminator measures 8½ x 5¾ x 7½ inches; a convenient size in the continuously expanding instrument array needed for the service bench.



An ELECTRONIC TECHNICIAN editor checks a transistor on Triplett's model 3490 tester. Other test equipment checked included B&K's CRT tester (left), Seco's CRYSTalignMETER, and Eico's new Battery eliminator (right).

TESTERS

Get Your Share of The Citizens Band Service Business

■ The number of Citizens Band radios now in use has increased considerably. Many TV technicians do not or cannot service them. In fact, the typical CB user may find it difficult to get his equipment serviced.

Almost anyone capable of servicing a TV receiver can easily master CB servicing since a CB set is relatively simple compared to TV. And if you have already mastered electronic theory, it shouldn't take long to qualify for a license.

A first or second class radiotelephone operator license is required if you make any adjustments to or on a CB transmitter which can affect its conformance with FCC technical standards. If you possess a license, you can change crystals, modify transmitter circuits, and tune up the equipment when connected



Citizens Band transceiver in a pleasure boat can be used for emergency communications.

Essential requirements
include second class
radiotelephone license
and adequate test equipment

by Leo G. Sands

Illustration credit: Raytheon Co.

TABLE I
TEST EQUIPMENT FOR CB SERVICING

INSTRUMENT	SPECIFICATIONS	APPLICATION	COST
Frequency Meter	26.965-27.255 mc 0.002% accuracy or better	(1) Transmitter frequency measurement (2) Signal generator (3) Signal generator calibrator	\$225-\$2500
RF Power Meter	0-10 watts, 50 ohms impedance	(1) Transmitter power measurement (2) Transmitter modulation indicator	\$ 80-\$ 150
Oscilloscope	standard service type	Transmitter modulation measurement	\$ 75-\$ 500
Signal Generator	450 kc-30 mc	(1) Receiver alignment (2) Receiver sensitivity test	\$ 50-\$ 500
Tube Tester	standard service type	Tube testing	\$ 50-\$ 150
Vacuum tube voltmeter	standard service type	(1) AVC voltage monitoring during receiver alignment (2) Diagnosis	\$ 40-\$ 200

to a radiating antenna. You can also certify customer equipment as to its conformance with FCC technical standards.

Test Equipment

Besides a license, you will need test equipment as listed in Table I. The most essential instrument is a frequency meter capable of measuring frequencies with an error not in excess of 0.0025%, since the FCC requires CB sets to operate within 0.005% of the authorized operating frequency.

An r-f power meter is another essential instrument. Instruments which double as a dummy antenna load and power meter, as well as a bi-directional meter, are available. The first type acts as a dummy load for the transmitter being tested, and measures the amount of power dissipated in the dummy load.

The bi-directional type power meter can be used in the same manner when an external dummy load is plugged into it. In addition, the same instrument can be used for measuring antenna efficiency as well as transmitter power output.

While CB sets are supposed to be designed so that unlawful overmodulation will not occur, an oscilloscope will help you determine if your customers' CB sets are being modulated adequately. Undermodulation causes loss in transmitting range. Whenever selling a customer a new microphone, a scope will help you check out its modulation capability.

For servicing receiver sections of CB sets, you will need an r-f signal generator and a meter to measure audio output or avc voltage. While a low-priced test oscillator might get by, a high-grade signal generator will enable you to do a better job.

The signal generator should be tunable through

the Citizens Band as well as to the frequencies as low as 450 kc for i-f alignment. Its output should be adjustable to less than one microvolt so you can make receiver sensitivity checks. You can use your transmitter frequency meter to set the signal generator to the desired CB channel frequency. Don't depend on the signal generator dial, which usually is calibrated to not better than 1% accuracy. If your dial is off 1%, the signal can be off the desired frequency by 270 kc, or 10 channels.

A crystal checker is a handy device to have around the shop. The crystal is merely plugged into a typical tester and the relative activity is noted on the meter scale. The same device can also be used as a field strength meter.

Of course, you will need a tube tester, vacuum tube voltmeter and the usual hand tools.

An a-c line voltage adjusting device to check out a-c powered CB sets under various line voltage conditions is likewise desirable. By operating a set with below and above normal voltages unstable conditions and border line defects can often be detected.

For checking battery-operated sets, you need a 12-volt battery eliminator whose output under load can be varied from 10 to 15 volts to duplicate actual service conditions.

Since CB sets are compact, most customers will bring their sets to your shop for servicing. However, the trouble may be in the antenna system so you should be prepared to make service calls. Table II indicates the service tasks that can be performed in the shop, at the customer's location and on vehicles. Table III lists the most common complaints and their probable causes.

Continued on page 57

**TABLE II
SERVICE OPERATIONS**

Operation	Equipment Required	Preferably Performed at		
		Shop	Home/ Office	Vehicle
Transmitter frequency measurement	Frequency meter	x	x	x
Transmitter power measurement	RF power meter	x	x	x
Transmitter modulation measurement	Oscilloscope	x		
Receiver Alignment	Signal generator	x		
Receiver sensitivity check	Signal generator	x		
Tube replacement	Tube tester	x	x	x
Part replacement	Test meter	x		
Vibrator replacement	Test meter	x		x
Crystal replacement	Frequency meter	x	x	x
Antenna system check	RF power meter		x	x

**TABLE III
MOST COMMON TROUBLES and THEIR SYMPTOMS**

Trouble	Symptom				
	Short Transmit Range	Short Receive Range	Noisy Reception	Intermittent Operation	No Operation
Defective tube	x	x		x	x
Defective part	x	x		x	x
Off-frequency crystal	x	x	x		
Low-activity crystal	x			x	x
Inadequate antenna	x	x	x		
Shorted antenna plug	x	x	x		
Misaligned receiver		x			
Mistuned transmitter	x			x	
Improperly located antenna	x	x	x		
Low input voltage	x	x		x	x
Defective antenna switch	x	x	x	x	x
Insensitive microphone	x				
Defective vibrator	x	x			x

Understanding, Troubleshooting and Repairing

Superheterodyne Converters

Locating Radio Oscillator Defects

by Ben Allen

■ Superheterodyne radio oscillator-mixer circuits frequently present some perplexing problems to service technicians. And with portable transistor radios showing up in increasing numbers, it's time to take a look at oscillator-mixer functions, their troubles and how to correct them.

Most service shops are also repairing their share of cheap TRF transistor portables. After comparing reception quality of the two types it can easily be seen why the oscillator-mixer is used in modern radio circuits. Though the TRF sets served in the early days of radio, when the broadcast band was not crowded, their poor selectivity and uneven sensitivity caused design engineers to push them aside in favor of the modern superheterodyne receiver.

Amplifiers in TRF receivers were required to amplify radio frequencies across the entire broadcast band. Of course, the efficiency was very low, so a large number of tubes were used. A superheterodyne "converter" circuit allows one or more i-f stages which amplify a fixed band of frequencies.

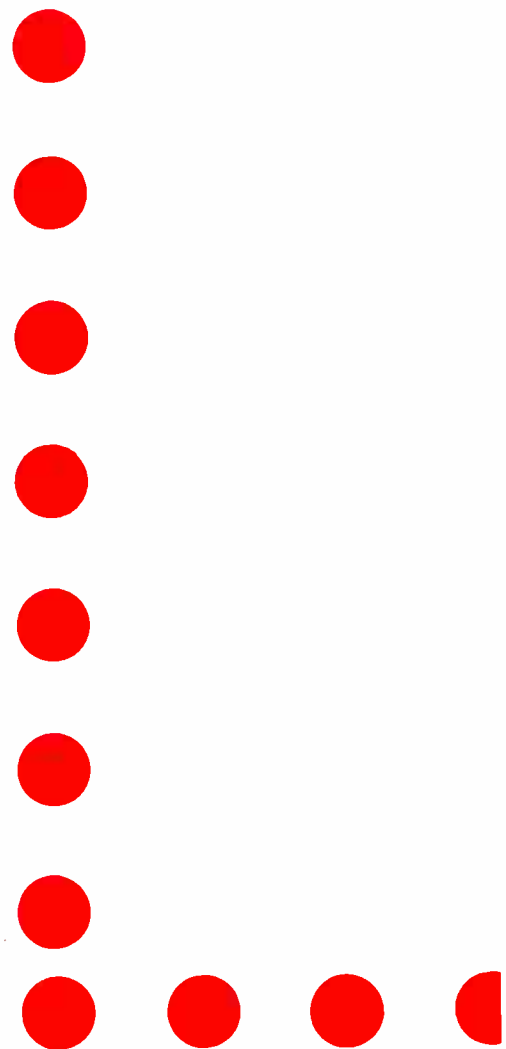
Oscillator-Mixer Operation

In the superheterodyne, a "local oscillator" frequency is mixed with the incoming r-f so that the dif-

ference frequency is always equal to the i-f. Converters work on the following principle: When two frequencies are mixed, their sum, difference, and both input frequencies are all found at the output. A constant difference frequency for the i-f is maintained by mechanically ganging the r-f and local oscillator tuning capacitors together. The local oscillator frequency always remains above the incoming r-f an amount equal to the i-f frequency. Most receivers have an i-f of 455 kc; transistor imports and auto radio i-f's sometimes vary widely. These i-f frequencies are usually 175, 262, or 456 kc.

In tube circuits there are two basic converter types. In one, the mixing takes place in a capacitance coupling prior to a triode or pentode amplifier. In the other, the pentagrid converter, both signals are mixed in the oscillator-amplifier tube. Examples of these two types are shown in Fig. 1.

Transistor radios cannot effectively use either of these circuits because the conventional transistor provides only one control element and a relatively low base impedance. Superheterodyne transistor radios employ an "autodyne" circuit. This circuit uses one transistor which serves as the mixer, oscillator, and the i-f input stage.



Autodyne converters deserve special mention because of their unique operation. A typical circuit is shown in Fig. 2. Oscillation is initiated by random noise currents in the transistor. These random currents are inductively coupled from the collector circuit to a tank coil in the emitter circuit. Oscillations are then set up at the tuned tank frequency. R-f frequencies at the converter base enter the transistor as they do in a conventional transistor amplifier. The sum, difference and both input frequencies appear at the converter output as they do in tube type circuits. Again we utilize the "difference" frequency for the i-f.

Other than tube-caused malfunctions, the most frequent converter trouble is no oscillation or oscillation at the wrong frequency (including poor tracking). Most technicians use their own procedures to find the malfunction, though an orderly method can save time.

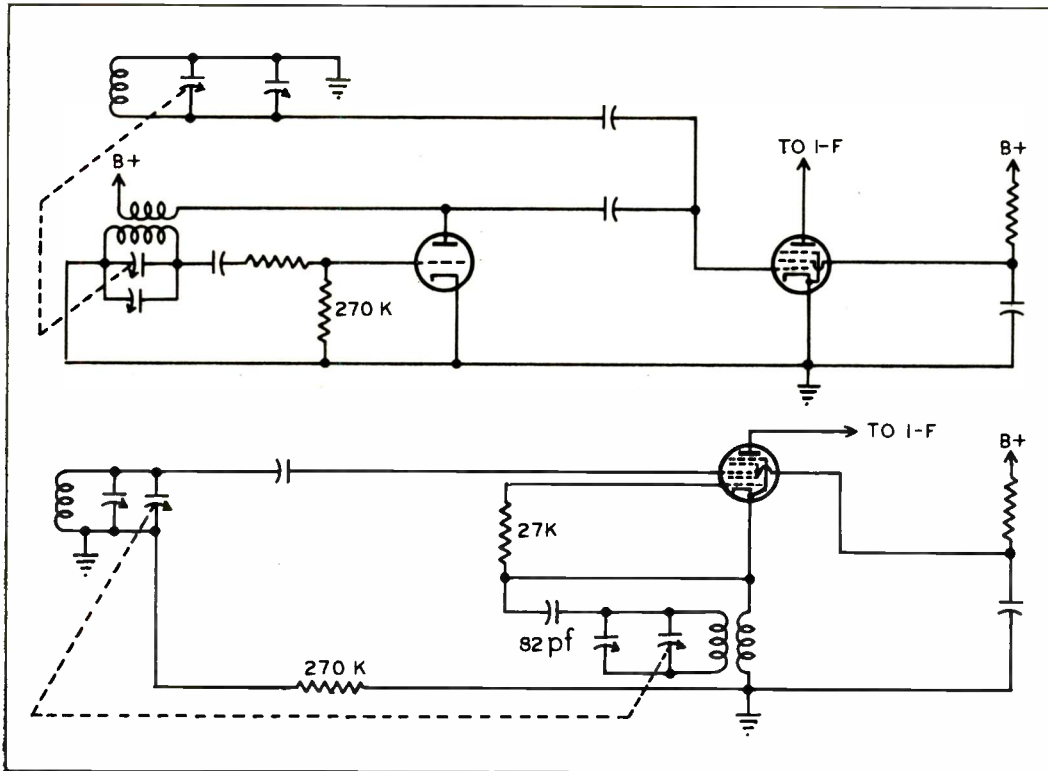


Fig 1 (A)—Capacitor mixing type converter and (B)—the pentagrid converter.



Troubleshooting

Technicians often use signal injection to check the i-f, but rarely apply these same principles to the converter stage. The first i-f through to the speaker is usually checked

out by using a tone modulated signal generator, set at the i-f frequency. A good tone at the output confirms that the set is properly operating up to the point of signal injection.

This method can also be ex-

tended to include the converter stage by changing the generator frequency. Inject a modulated r-f signal at some frequency indicated on the radio dial, at the r-f input of the mixer. If the signal is very weak or fails to come through at all,

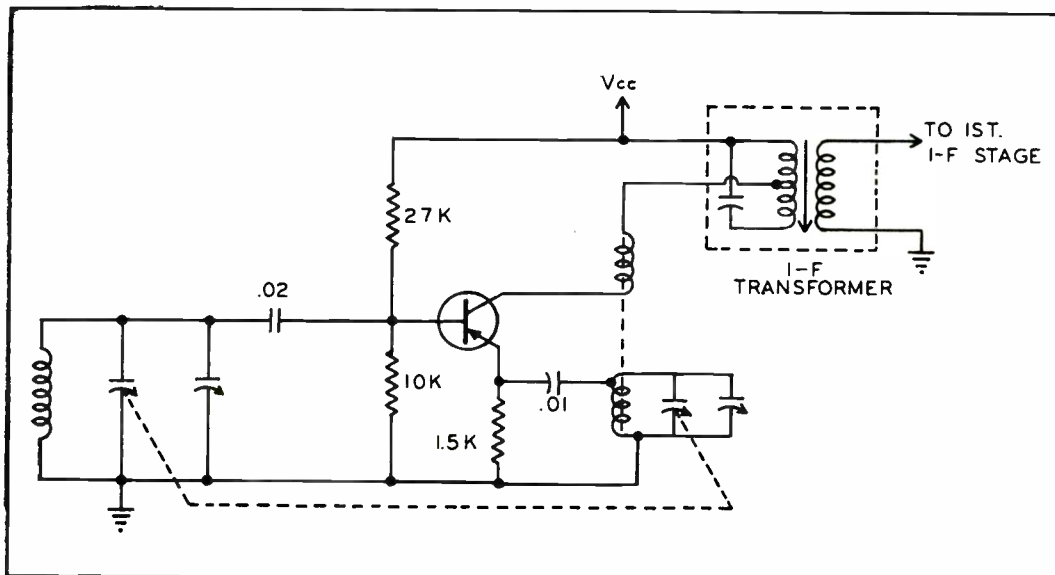


Fig. 2 — Autodyne converter circuit used in transistor superheterodyne radios. One transistor serves as oscillator and mixer.

... Locating Defects

then inject an unmodulated signal at the oscillator input of the mixer. Set the radio dial to a local station. The signal generator should be tuned to about 455 kc above the radio dial frequency. On radios which use an i-f other than 455 kc, the generator should be set to frequency equal to the sum of the dial frequency and the i-f frequency. If the oscillator has failed, tuning the generator and the radio dial around this point should bring in the station.

Voltage checks will often indicate if the oscillator is functioning. Tube type oscillators usually operate with their grids biased from -4 to -8 volts. Transistors are frequently biased by resistor-divider networks. Slight variations in manufacturers' specified voltages should be carefully checked. A sensitive a-c VTVM will usually indicate the presence of oscillation in autodyne circuits. When operating properly, 50 to 500 mv can usually be detected at the collector of the converter.

With these methods the trouble can be rapidly isolated to the converter stage or to another section of the set. Once the malfunction has been isolated to either the mixer or the oscillator section, common sense techniques will help pinpoint the exact fault.

Voltage and resistance checks will usually help the technician localize the trouble. These troubles can run the entire gamut of faults: shorted and open capacitors, defective resistors, and coils. When replacing these parts, care should be taken to make all leads and component positions conform to the original arrangement. Spurious oscillation can sometimes be caused by poor lead dress. Oscillator-mixer circuits in transistorized sets have their own peculiar problems in addition to the aforementioned faults. Components used are often small, with low voltage ratings. This is especially true in the "pock-

et portables." These components frequently break down and ruin associated components. When a component fault is found in transistor circuitry, the transistor and associated components should also be thoroughly checked. A short in a transistor, for example, could easily burn out a newly installed load resistor or coil.

Transistors sometimes fail in these transistorized radios; when one is suspected, a good tester should be employed to check it.

R-f Converter Alignment

After a repair has been made on a radio's oscillator-mixer circuit, or if the set shows evidence of having been tampered with, an alignment check is in order.

Before attempting to align the r-f-converter stages of a superheterodyne receiver, the i-f stages should be checked. In most a-m sets only peaking is required. For best results, a VTVM should be connected across the avc line, and an r-f signal of low amplitude should be fed into the input of the i-f. In small transistorized sets, it is sometimes easier to connect an a-c VTVM across the speaker terminals. Determine the i-f frequency from manufacturers' literature and adjust the r-f signal generator to that frequency. Peak the i-f transformers for maximum deflection on the VTVM. Use the lowest generator output and the most sensitive VTVM scale for this alignment.

Most converter type radios have mica trimmer capacitors on the oscillator and the r-f tuning capacitors. To adjust these trimmers, set a modulated r-f generator to about 1000 kc or turn the radio to a local station near that frequency.

If an r-f generator is used, inject the signal into the receiver by clipping the generator leads near the radio's antenna. Peak each trimmer for maximum avc or speaker vol-

ume, while rocking the radio's tuning dial slightly. Set the dial at both high and low ends of the band and check its calibration and sensitivity. It will be impossible to obtain perfect tracking, though some improvement may be made by slight readjustment of the trimmers. Although this procedure usually gives acceptable results, some radios may require more care to obtain optimum results.

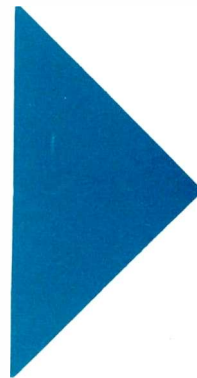
If satisfactory results are not obtained, the following procedure may be used: Connect the signal generator to a spare loop antenna and place it about six inches away and parallel to the antenna on the radio. On sets which do not employ a loop, signals may be coupled through a 500 pf capacitor to the antenna terminals. Adjust both the generator and the radio's dial to about 1400 kc. Adjust the oscillator trimmer for maximum output on the VTVM. This is a critical adjustment. Next turn both the receiver and the generator to about 600 kc; adjust the r-f trimmer for maximum output on the meter. Repeat the above steps until no increase in meter reading can be obtained.

A symptom which is sometimes confused with converter problems is "image" reproduction. Because the "difference" frequency from the converter is used in the i-f stages, broadcast signals above the local oscillator frequency could pass through the i-f stages. This possibility is minimized by using a tuned r-f stage in front of the converter. Strong stations sometimes ride through the r-f section of a radio. Only radios having r-f amplifiers will operate properly under these conditions. When an image is definitely identified, precautions should be taken to insure that the stations are not being picked up at a point in the radio beyond the r-f section. This sometimes requires shielding of the entire receiver, and employment of an external antenna.

Whistles which develop in a peak aligned radio can usually be traced to improper alignment. Radios susceptible to whistling usually require "broadbanding" or sweep alignment. ■

"SKY-GAZING"

Explains Some TV-Radio Problems



Basic reception causes of 'snow,' 'ghosts,'
'venetian blind effects' and signal fading explained

by Lambert Huncault

■ A thorough knowledge of radio propagation phenomena and related theory can be a definite practical aid to the radio and TV technician in establishing a sound customer relationship.

For example, a customer might ask why his broadcast radio barely picks up a certain station only 50 miles away, while it receives stations 500 miles away at night. Or he might ask why a certain TV channel is "snowy" or "ghostly" while his friend's set gives a clear picture. Then again, the customer may question a technician regarding frequent fading of short-wave radio programs. A technician's ability to give his customers simple, yet factual and authoritative answers to these and other closely related questions, will inspire confidence in his technical proficiency.

We normally think of all radio signals, whether AM or FM broadcasting, telecasting, etc., as waves traveling at the speed of light out-

ward in all directions from transmitter to receiver. This is an oversimplified concept.

Actually, two basic wave types are radiated by the transmitting antenna: the sky wave which travels high up in the atmosphere, and the ground wave which remains close to the earth's surface.

Ground Waves

Ground waves can arrive at the receiver via four different routes: (a) surface wave, (b) direct wave, (c) ground-reflected wave and (d) super-refracted wave.

The *surface wave* follows the earth's curvature. It is diffracted around the earth's edge. Conductivity of the earth's immediate surface (land or water), and the signal frequency will determine effective range. Low frequency surface waves lose less power than high frequencies.

Low frequency waves (standard broadcast), are propagated by this "brute force" ground wave method. High power is used and relatively short distances covered. For instance, during daylight hours, a broadcast radio will pick up "local stations" within a radius of approximately one hundred miles. The ground wave of higher fre-

quencies (short waves) of say 10 or 20 mc is too weak for communication beyond the horizon.

The *direct wave* travels in a straight line between transmitter and receiver. Thus, the receiving antenna must be within line-of-sight of the transmitting antenna, as shown in Fig. 1. Obviously, receiving antenna R cannot receive direct waves from T. This propagation method is used for short distance VHF/UHF communication, including TV and FM broadcasting.

The *ground-reflected wave* is a variation of the direct wave, arriving at the receiving antenna after reflecting off the earth's surface. This is what happens in actual practice, and is somewhat more complex than the "simple" direct wave explanation. Fig. 2 shows the ground-reflected wave (solid line) and the direct wave (dashed line), both arriving at the receiving antenna. The reflected wave suffers some absorption at the reflecting surface, and is attenuated more than the direct wave.

Furthermore, the ground-reflected wave can arrive at R either in-phase or out-of-phase, with the direct wave. This effect becomes important at higher frequencies.

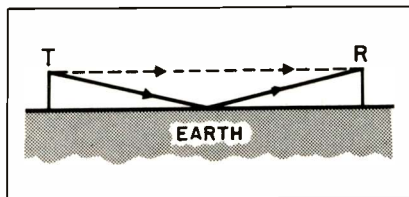


Fig. 1 — Normal VHF/UHF propagation path. Signals from T will be picked up at R only if R's antenna is within line-of-sight.

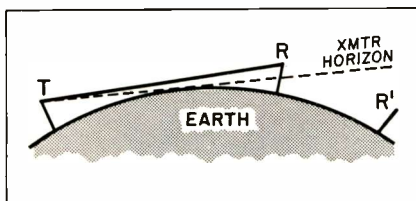


Fig. 2 — Direct waves (dashed line) and ground-reflected waves (solid line) are received at R. The reflected waves undergo some attenuation.

When in-phase, the ground-reflected wave will reinforce the direct wave and increase the signal strength at R. If the ground-reflected wave is 180° out-of-phase, it will cancel a portion of the direct-wave. Hence, the receiving antenna's location can become quite critical at VHF and UHF frequencies. Effects of this phenomenon is frequently observed when raising, lowering, relocating or slightly orienting a TV antenna. Marked differences in signal strength, and consequent variation in picture quality, is observed.

Another peculiarity noted in TV broadcasting is the problem of "ghosts" or multiple images observed on the screen. A typical situation is shown in Fig. 3. The direct wave arrives first at receiver R, producing the main image on the screen. The reflected wave, bouncing off a building or structure at A, travels a longer distance and arrives at R somewhat later, producing a second or "ghost" picture. And the "ghost" may be positive or negative, depending on the phase relationship between direct and ground-reflected wave.

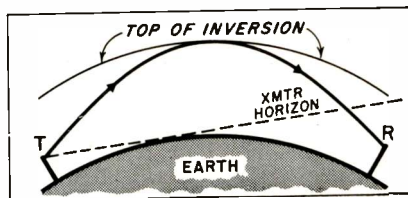


Fig. 4 — Beyond-the-horizon reception of a few hundred miles is possible on VHF/UHF signals through bending of waves by super-refraction.

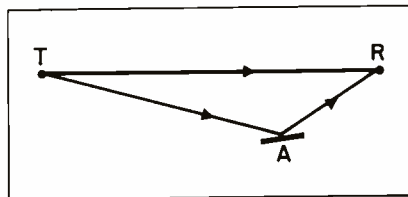


Fig. 3 — Reflected waves from A will arrive at R a few microseconds after the direct wave. This causes a double picture or "ghost."

As TV technicians know, by simply rotating the antenna or using a more directional type, this "ghost" problem can usually be alleviated. Some "ghosts," especially multiple reflections from a number of surfaces cannot be easily eliminated. This situation is likely to irritate the set owner who often blames his receiver for the "ghosts." A little time spent in giving a simple explanation of the problem will usually result in a less belligerent customer.

The super-refracted wave is one which bends downward with a curvature exceeding that of the earth. Abnormal departures in humidity and temperature close to the ground can result in atmospheric refraction. Similar conditions cause optical mirages which reveal objects existing far beyond the observer's horizon (see Fig. 4).

When temperature increases with height from the ground, a temperature inversion can cause *super-refraction*, especially if accompanied by a steep humidity gradient. These conditions can create a duct which traps radio waves and can easily propagate VHF and UHF

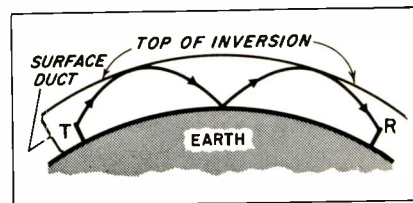


Fig. 5 — Surface ducts over sea areas frequently propagate VHF/UHF signals over longer-than-normal distances through multi-hops.

signals to distances of a few hundred miles. Multiple hop reflections within the air below the top of the inversion, are shown in Fig. 5. These surface ducts are quite common at sea, especially during summer months when warm, dry continental air masses move out over the ocean.

A particular combination of temperature and moisture conditions can also cause an elevated duct, as shown in Fig. 6. This type will form a few hundred feet above the surface. High pressure areas over continents are often accompanied by "sinking" of the air a few thousand feet above the surface. This produces heating by compression as the air subsides or sinks to lower levels, giving rise to subsidence inversions which may create ducts. These ducts can result in VHF reception over distances of 500 miles or more.

Sky Waves

As we know, the sky wave travels to various ionized layers above the atmosphere and is then reflected back to earth. Actually, this "reflection" is not similar to light reflections from a mirror, but is a curving refractive process. The amount of curve varies primarily with ion density. This area above the atmosphere is known as the ionosphere, and makes long distance radio transmission possible. If the ionization area is dense enough, radio waves will be bent sufficiently to return to earth (see Fig. 7).

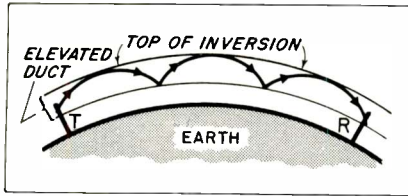


Fig. 6 — Multi-hops within elevated ducts can propagate VHF/UHF signals up to 500 miles or more.

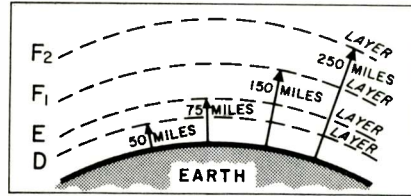


Fig. 8 — Four distinct layers of the ionosphere exist during daylight hours. Approximate heights of layers vary with solar radiation.

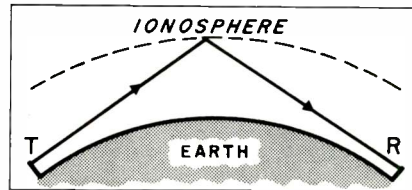


Fig. 7 — If an ionized layer is sufficiently dense, radio waves bend back to earth by refraction. This makes long distance reception possible.

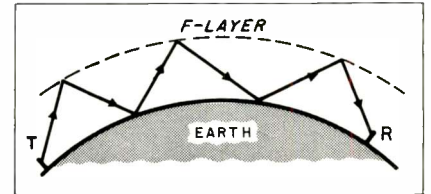


Fig. 10 — With suitable conditions and frequency, multi-hop signals can travel more than half-way around the earth.

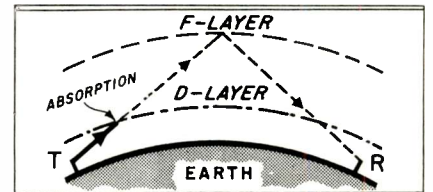


Fig. 9 — F1 and F2 ionized layers combine at night to form the F layer which reflects regular BC and higher frequencies over long distances.

The ionosphere consists of distinct layers or bands of different ion densities at different heights. There are four general layers during daylight hours, as shown in Fig. 8. These heights are approximate and vary considerably under the influence of incoming solar radiation.

Since the ionization depends primarily upon the sun's position above the horizon, one would normally expect the ionosphere to exist only during daylight hours. The recombining of electrons with ions at these heights, however, takes place at a slow rate and some ions persist throughout the night. But the D and E layers disappear completely at night. With no solar radiation present, the electrons recombine rapidly under the relatively high pressures found at this altitude.

The D layer is a highly absorbing region, especially at frequencies near 1 mc. This explains why regular broadcast band signals are restricted to relatively short distances: the sky wave is completely absorbed by the D layer. At night, however, broadcast signals can reach the F layer (the F₁ and F₂ layers combine to form a reflecting ionized F layer at night), and are reflected back to earth, reaching faraway places. It is common to hear BC stations 1,000 miles or more at night (see Fig. 9). Some HF radio signals can travel unimpeded over exceptionally long distances over combined day/night paths, especially when multi-hop propagation takes place, which is

illustrated in Fig. 10.

Solar radiation causes day/night, and summer/winter variations in the ionosphere's reflecting characteristics. During winter, with a low sun angle in the Northern Hemisphere, lower ion densities are observed.

Increasingly dense areas of the ionosphere tend to reflect progressively higher frequencies back to earth. Hence, higher frequencies for communication between two given points are generally more efficient during summer than winter, and usually better over predominantly daylight paths.

Vertically radiated signals can normally be reflected back to earth only if they do not exceed a certain critical frequency (usually a few megacycles, depending on the time of day, latitude, season, solar activity, etc.). But when signals hit the ionosphere at low angles, much higher frequencies can be reflected since less bending is required.

The aforementioned effect is illustrated in Figs. 11A and B. Communication between T and R is feasible at a frequency of 5 mc but

not at 10 mc. Most of the 10 mc signal penetrates the ionosphere and passes into outer space. But if the 10 mc signal's angle of radiation is lowered, it can be used to communicate with R, because the waves now hit the ionosphere at a more shallow angle. For this given frequency (10 mc), point R is said to be located in a zone of silence or "skip zone," a phenomenon which is well known in most commercial and amateur communications circles.

Variable ionization intensity can produce variations in critical frequency and angle. As a result, sky waves are subject to frequent fading, which becomes particularly severe at sunrise and sunset when the ionosphere undergoes marked structural changes. This variation of ionization intensity within the different layers can cause a condition where, for example, a 10 mc signal will fade less than a 25 mc signal being used simultaneously for communication between identical points.

Furthermore, during periods of high sunspot activity, when giant

Continued on page 51

General Electric reporter,
 Roland Kempton, makes the rounds with
 the independent service dealers . . .

Don Ellis saved
 30 minutes
 and \$3.75
 because
 one G-E
SERVICE-DESIGNED
 capacitor takes
 the place of 4
 ordinary types

In minutes and money, Don Ellis and George Bentley, owners of QUALITY TV, Kansas City, Mo., measure some of the advantages of stocking G-E Service-Designed capacitors. Don (shown here) put it this way, "We didn't stock can-type capacitors before because we never knew what types we'd need. Now, with just 25 or 30 capacitors in stock we meet most of our requirements, and we don't have to make special trips to pick up exact replacements. I figure this saves 30 minutes and \$3.75 per trip."


And according to George, "There have been many occasions, especially on Saturdays, when we've been able to get the set out because we've had G-E capacitors in stock. Our customers really appreciate it, and we haven't had a single call back."

Yes, it pays to stock General Electric Service-Designed capacitors. Get full details from your G-E capacitor distributor. General Electric Company, Electronic Components Division, Room 1719, Owensboro, Kentucky.

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 **ELECTRONICS**

... SKY GAZING

Continued from page 49

flares suddenly appear on the sun, high-speed solar particles extend down into lower ionosphere regions. Under these conditions,

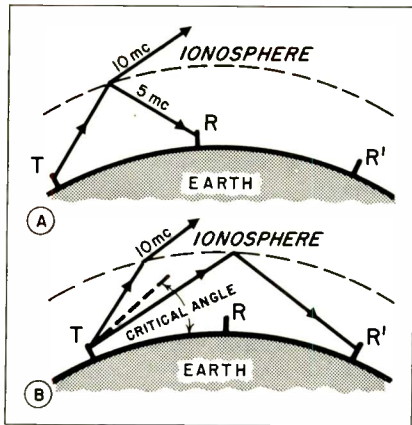


Fig. 11 (A) — At similar radiation angles, a 5mc signal reflects back to R, but the 10mc signal passes into outer space. (B) — If the 10mc signal's radiation angle is lowered, it "hops" to R1 and "skips" over "dead spot" at R.

complete radio blackouts may occur for periods of a few hours or even for days in severe cases, especially over northerly propagation paths.

In addition to the regular E layer which is understood and fairly well predictable, additional erratic ionization characteristics often occur at the same general height as the E layer. These assume the form of random ionized cloud patches, called sporadic-E (E_s) which form in this area at times. Sporadic-E can be of particular interest to TV technicians since it frequently causes problems that few technicians can adequately explain to customers.

Causes for the formation of E_s are not fully understood. It is believed that solar effects, the earth's magnetism and/or meteor-particle bombardment of the earth's atmosphere contribute to formation of E_s . Communication via sporadic-E is not reliable but is phenomenal at times. These ionized clouds can reflect frequencies higher than 100 mc and make long-distance VHF transmission possible for brief periods. Spradic-E is more prevalent during spring and summer than in winter, and is common in arctic regions at night.

Most TV technicians have ob-

served unusual cases of co-channel TV interference, appearing as "venetian-blind effect." This effect can be caused by relatively near or by distant stations. Although long distance TV reception can be attributed at times to atmospheric refraction (super-refraction ducts), reception by this means is generally limited to less than 500 miles and usually appears on channels 7 through 13, and on UHF channels.

Sporadic-E, however, frequently reflects low band VHF TV channels over distances up to 1,000 miles. Technicians should be alert to this phenomenon, as mild cases frequently result in apparent "pairing" of scanning lines on TV screens in spring and summer months. Unsuspecting technicians would be at a loss to explain the cause of this interference to complaining customers.

It may be interesting to note an actual case. A TV viewer was observing an American League baseball game from a local station. Co-channel interference became so severe that the distant station, televising a National League game, would completely override the local station at times. For a while the viewer was "sitting in" on two different games.

A thorough knowledge of the causes of propagation phenomena: fading, skip zones, ghosts, long-distance TV reception and co-channel interference, can aid the technician in solving many troublesome reception problems. In addition, of course, this knowledge can promote a more pleasant and lasting customer relationship. ■



Similar

"Yes, you might say I was one of the pioneers in reverberation systems."



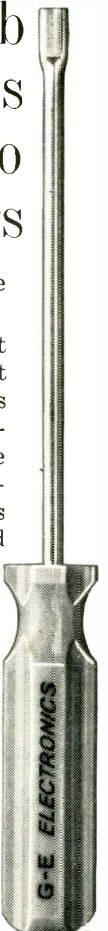
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For more details, circle 36 on page 56

TOUGH DOG CORNER



Difficult Service Jobs Described by Readers

Arcing Capacitor Causes 'Black Snow'

A Canadian Admiral 19B1X chassis developed an intermittent picture with a severe noise-in-picture condition in a customer's home. The noise appeared as short black streaks and dots on the screen, even when the picture disappeared. The 6J6 oscillator-mixer was removed and the noise re-

mained. When the first i-f was removed, however, the noise stopped. But when the first i-f, and the mixer tubes were substituted with known good tubes, the noise returned! After considering this unusual situation for a few minutes, the set was taken into the shop where a more thorough check could be made.

All voltages checked normal in

the shop. We suspected a faulty coupling capacitor (C-113). This capacitor was removed from the first i-f grid circuit and the noise cleared up. But when a new capacitor was installed the noise returned. With the 6J6 removed, we could see the noise on the scope, and it was traced back to pin 2 of the oscillator.

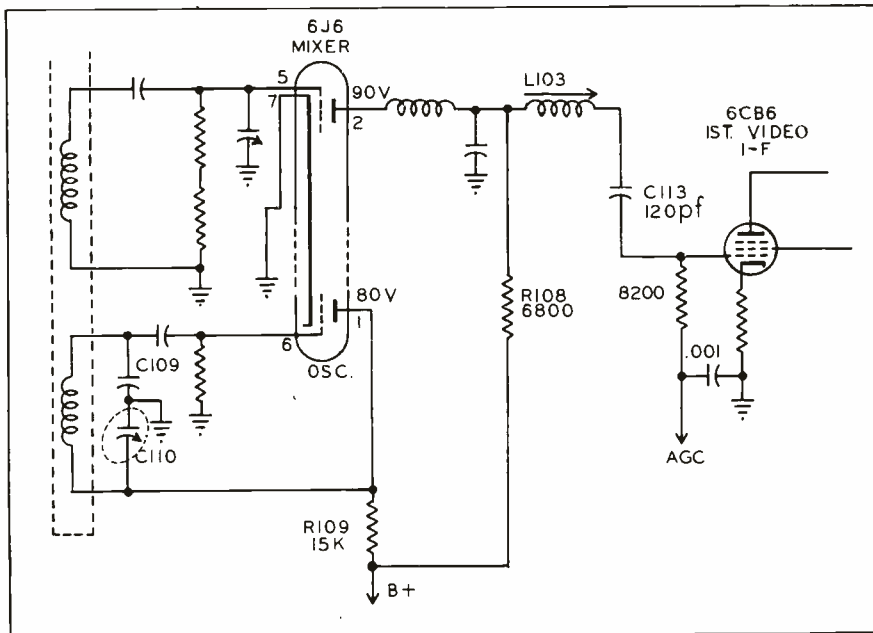
Thinking that the socket was probably at fault, we disconnected R-108 at pin 2. The noise was still present, so now we suspected that pin 1 must be arcing through the socket causing the noise to appear at pin 2. To check our theory, we disconnected pin 1 from the circuit at the junction of R-108 and R-109; this removed all noise which previously appeared at pin 2. In an attempt to prove our reasoning, R-109 was disconnected at the plate end, and 90 volts was applied to the plate from a B-battery. The noise pulses reappeared.

Just for good measure, we disconnected the lead from pin 1 to the fine tuning capacitor C-110. To our surprise the noise disappeared. We had been on the wrong track; evidently, the insulator in the fine tuning capacitor was breaking down and allowing noise to get to pin 2 even with the 6J6 out of its socket. The tuner was a turret type, so to save time we inserted a relatively large blocking capacitor (100 pf) between R-109 and C-110. This removed the B+ and stopped the elusive noise.—Lambert C. Hunealt, Windsor, Ontario.

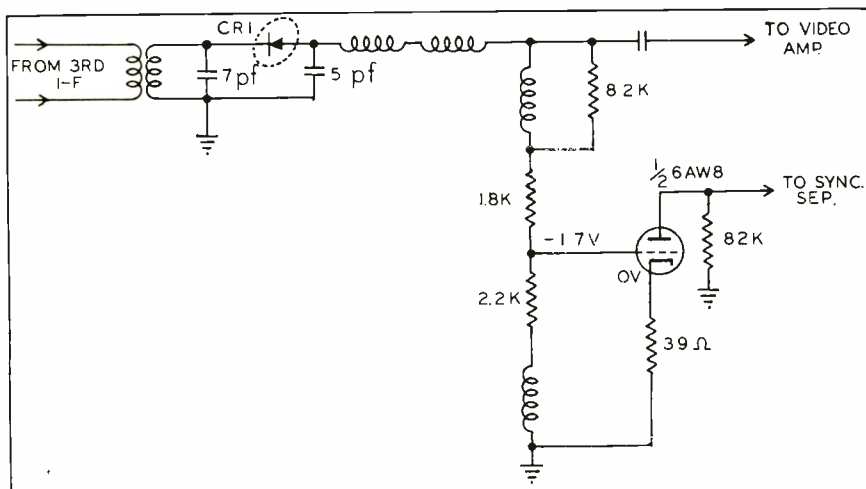
Video Detector Clips Sync

An RCA TV chassis KCS-122 BPM was brought into the shop with no sync. A substitute CRT was connected, and all sync tubes were checked. Voltages on the sync amplifier, sync separator and

Continued on page 57



Arcing capacitor caused r-f spikes at pin 2 of oscillator with tube removed.

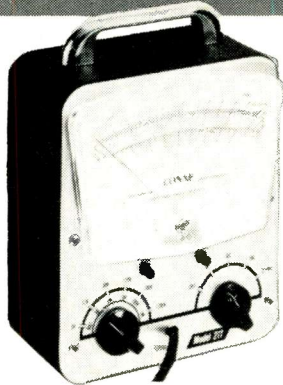


Video detector clips sync, but passes video.

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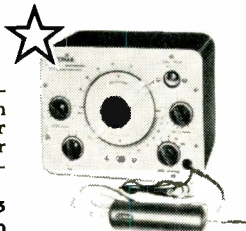
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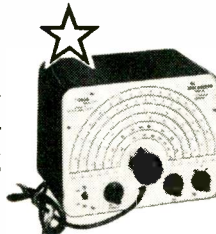
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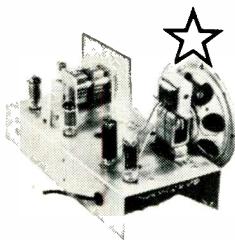
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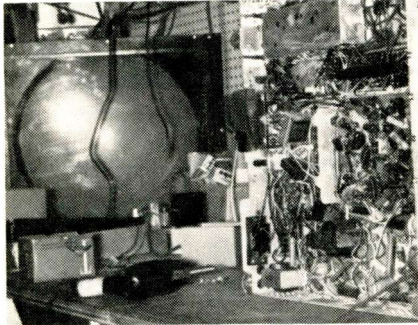
For more details, circle 24 on page 56

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Color Test Rig Saves Labor

Here is a shop-built, complete color setup that eliminates 2-man cabinet pulling jobs. One man can



Color rig shown hooked to chassis for in-shop testing.

handle the chassis. The customer's cabinet and picture tube are not needed in the shop. Either may become damaged while transporting. Besides, the customer's CRT may get magnetized, convergence adjustments may become upset, etc.

The shop rig consists of a color picture tube, yoke convergence assembly, purity ring, blue lateral magnet and suitable network. Other equipment includes an 8 in. speaker with extension leads; plug for old-type CTC-5's, 4's, etc.; high voltage leads, etc.—*Harry J. Miller, Sarasota, Fla.*

Booster Replaces Series CRT

When it's necessary to check voltages, waveforms, and sound systems on series string sets, it isn't necessary to wrestle with a CRT set-up for the TV. Just plug a CRT booster into the receiver's CRT socket to complete the heater circuit.—*H. T. Minewiser.*

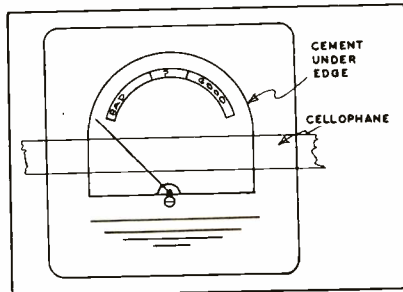
Remounting Loose Meter Glass

The glass window in many portable instruments — tube testers, VTVMs, VOMs, and others—frequently take a beating when they are transported in a technician's daily rounds.

Sometimes the face glass comes

loose or drops down on the meter's needle, causing the instrument to become inoperative. To remove the glass for remounting by taking the entire instrument apart is time consuming.

I've found a way around this by utilizing a piece of cellophane tape on the loose glass. First I place a piece of tape across the glass face. Then I apply plastic glue (model cement) to the glass edge and case mounting area with a toothpick or thin brush. After waiting a few minutes for the cement to become "tacky" I lift the glass in place gently by pulling up on the cellophane strip ends. After the glass is in its exact mounting position the two cellophane ends are pressed down against the case in an outward motion. The meter is then turned face down over a smooth



Remounting loose glass on test instrument meters is facilitated with cellophane tape. Meter disassembly becomes unnecessary.

surface and allowed to dry. The complete job is accomplished in a fraction of the time it used to take.

When the glue is completely dry the glass is secured firmly and the meter is as good as new.—*M. E. West, Lenoir, N. C.*

Pegboard Tool Shelf

Small, odd-shaped tools and parts can be conveniently stored on a small pegboard shelf mounted at a right angle to a vertical pegboard rack. The holes in the pegboard are already large enough to hold slim shank screwdrivers, alignment tools, and allen wrenches. By drilling larger holes the shelf will accom-



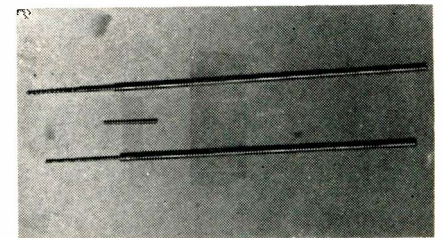
A pegboard shelf holds flashlight, tools and small parts in 35 mm film cans.

modate other items—flashlight, and 35 mm film cans for small part storage.

The shelf is secured to the rack by a simple right angle bracket or by a standard pegboard shelf bracket.—*Glen F. Stillwell, Manhattan Beach, Calif.*

Tuner Wafer Repair

Some time ago you published a shop hint describing a method of repairing loose wafers on Admiral 16AB1 tuners. With this method, unless you are a highly skilled mechanic, you stand a good chance of wrecking the entire wafer with the



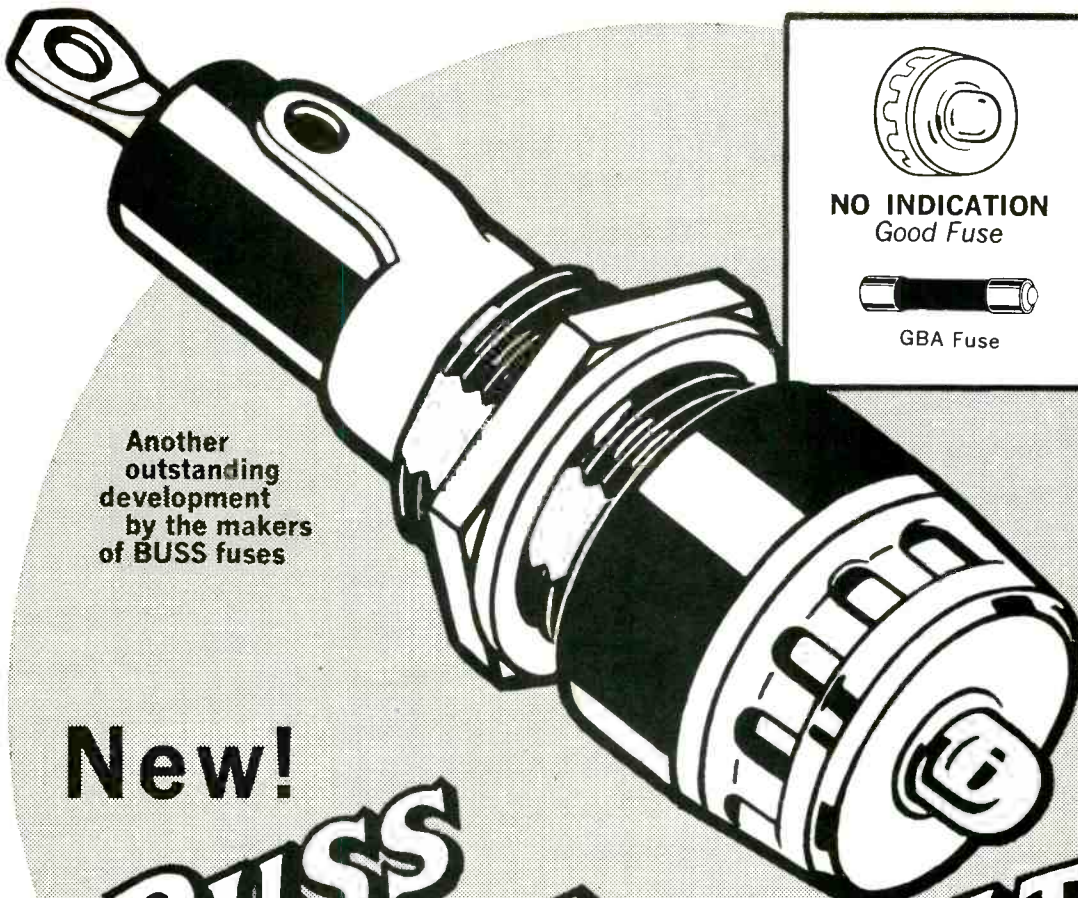
Tuner repair extensions shown with 5/0 taper pin used to secure wafers.

drill chuck. Also, cotter pins, or nails do not usually make the pre-

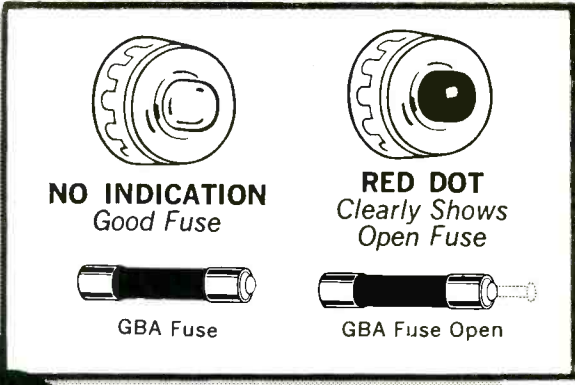
Continued on page 88

SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to Shop Hints Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.



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for all types of electrical and electronic equipment

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BUSS HLD fuseholders are for panel mounting in circuits of 125 volts or less. They take 1/4 x 1 1/4 inch BUSS

GBA fuses. Knob of holder grips fuse tightly and pulls fuse from holder when knob is removed.

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

1 Tube Testers: Literature is available describing new tube information service. The service provides data every three months for all Dyna-Quick tube testers. B&K Mfg. Co.
 - - - for more details circle 301 below

2 Antennas: Golden Crossfire antenna, covered in literature; is designed to bring primary area picture quality into difficult fringe areas. Reported perfect for either color or black and white TV; and excellent for FM reception. Channel Master Corp.
 - - - for more details circle 302 below

3 Components: A new 40-page "Service Selector" catalog describes capacitors, vibrators, rotors, decodes, test instruments, and other standard line components. In-

cludes selection data such as design features, temperature ranges, material construction, application, and price. Cornell-Dubilier Electronics.
 - - - for more details circle 303 below

4 Tuners & Receivers: Literature and complete specifications are available covering the firm's line of FM tuners and receivers. Fisher Radio Corp.
 - - - for more details circle 304 below

5 Kits: The new 1962 Heathkit catalog describes and illustrates many new kits, as well as time-tested units with new features. Heath Co.
 - - - for more details circle 305 below

6 Tuners: Literature covers model LT-700 FM stereo multiplex tuner. The FM circuitry incorpo-

rates a low noise front end with triode mixer followed by double tuned dual limiters and a wide band Foster Seeley discriminator. Lafayette Radio.
 - - - for more details circle 306 below

7 CB Radios: Model E, 5-watt citizens band radio, covered in literature, features: eight crystal controlled channels for receiver and transmitter; switch to tune in 23 channels; front-panel r-f indicator; high level class "B" push-pull modulation; heavy duty two-way power supply; and adjustable squelch. Sonar Radio Corp.
 - - - for more details circle 307 below

8 Capacitors: Offered is catalog C-614 on capacitors. Sprague Products Co.
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Note: If you have given your residence address, please enter your company name and address on this line:

CITIZENS BAND SERVICE

Continued from page 43

Getting Started

To develop a CB service business, you must let your prospective customers know about you. You can advertise in local newspapers to reach your public. A Citizens Radio Call Book, will allow you to compile a mailing list of CB licensees in your area. If you write to CB set manufacturers and dealers advising them of the availability of your services, many of them may refer their customers to you.

Besides fees for your services, you can earn additional income by selling and installing new antennas, microphones and ignition noise suppressors, as well as new crystals when customers want to change operating frequencies.

While the FCC does not require CB licensees to have their transmitter frequencies checked at regular intervals, licensees can be cited for off-frequency operation. If you have a frequency meter, you can offer a frequency checking service. You should encourage your customers to have transmitter frequencies checked at least once every 6 months. Off-frequency operation can result in deteriorated performance and FCC violation.

By setting up to service CB sets you can earn additional income and at the same time render a useful service to the CB users in your community. ■

TOUGH DOG

Continued from page 52

sync output appeared close to normal. I then proceeded to trace the sync with a scope. There was ample sync and video on the grid of the 6AW8 but nothing on the plate! This made me carefully remeasure the voltages on this tube. Although the plate voltage was slightly lower than the schematic called for and the grid voltage was a little more negative, I did not consider them sufficiently off to cut out the sync all together. I installed a new pin tube adapter just to be sure there was continuity between the socket pins and the tube but could find nothing wrong in that respect. Checks of R-4 and R-5 in the plate circuit, and the 150 v supply proved fruitless.

In desperation I put a positive bias on the amplifier grid (6AW8), and was delighted to find sync restored. All coils and resistors in the grid circuit checked out perfectly. I finally decided that the trouble had to be in the diode detector, CR1. Sure enough, substitution of a new diode restored normal operation. — Robert Barron, Avalon, N. J. ■

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For more details, circle 48 on page 56

NEW PRODUCTS

Hallcrafters CB RADIOS

"Littlefone" model CB-4, walki-talkie citizens band radio transceiver, a hand-held fully transistorized unit, supplements

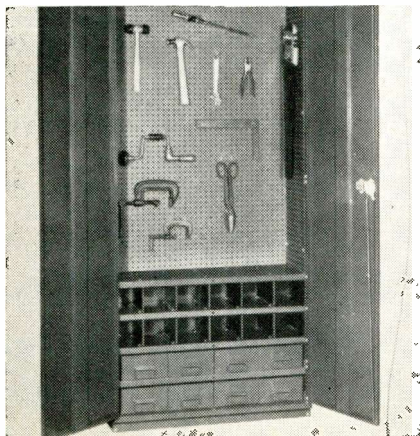


the firm's larger model CB-3. Like the CB-3, it operates in 27-mc (Class D) service and can be used between field, mobile or base stations. Power input, 100 milliwatts, receiver sensitivity, one μ v. Weight, 1- $\frac{1}{2}$ lbs. Dimensions, 8" x 3- $\frac{3}{8}$ " x 1- $\frac{7}{8}$ ". Has shatter-proof, vinyl-clad, all-metal cabinet. Plug-in crystals and transistors provide easy service accessibility and channel changeover. \$89.95. Hallcrafters Co., 4401 W. Fifth Ave., Chicago 24, Ill.

- - - for more details circle 400 on page 56

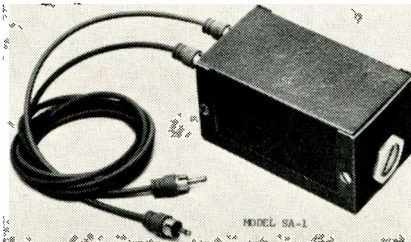
Parent CABINETS

Model 36-12-84 all steel tool cabinet is 36" wide, 12" deep, and 7'3" high; contains 12 bins each 6" wide, 12" deep and 6" high and 8 box drawers each 8 $\frac{1}{4}$ " wide x 11 $\frac{3}{4}$ " deep x 4 $\frac{5}{8}$ " high. Tool storage compartment, 3 ft. wide, 1 ft. deep and 5 foot high and fitted with $\frac{1}{4}$ " thick masonite tool board perforated on 1" centers. Parent Metal Products Co., 6801 State Rd., Philadelphia 35, Pa.



Solitron NOISE ANALYZER

Model SA-1 random noise analyzer, shown, is one of two noise instruments for checking and evaluating hi-fi audio systems and acoustical factors without the use of auxiliary instruments. Both feature the new solid state "Soundvistor" white noise diode, providing a low level source of random noise of uniform amplitude distribution of ± 3 db, 20-20,000 cps. Considerable output is available above and below these limits. Power, provided by self-contained replaceable mercury batteries. Output level, $\frac{1}{2}$ volt into 100,000 ohm load. Waveform, measured energy per 10 cps bandwidth



constant to ± 3 db. Model SA-2 random noise amplifier, not shown: output level, 1 volt into 600 ohm load; waveform measured energy per 100 cps bandwidth constant to ± 3 db. Solitron Devices, Inc., 500 Livingston St., Norwood, N. J.

- - - for more details circle 401 on page 56

Sherwood HI-FI SPEAKERS

A new medium priced 3-speaker, 3-way bookshelf hi-fi loudspeaker system,



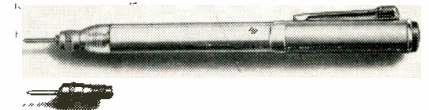
the "Ravinia," consists of one 12" high compliance woofer, one 8" cone mid-range speaker with sealed fiberglass fill backplate and one 2 $\frac{1}{2}$ " specially designed ring radiator supertweeter, also with sealed fiberglass fill backplate. Features include: frequency response within ± 2 db from 45 to 17,500 cps (essentially flat to 19,000 cps) with low IM distortion and smooth peak-free transient response for wide dynamic range and absence of coloration. Crossover points, 600 cps and 3500 cps with 12 db/octave attenuation. Dimensions, 26 $\frac{1}{4}$ "L x 15"H x 13 $\frac{1}{4}$ "D. Available in contemporary styled cabinets in 3 finishes with grille cloth matched to finish. Prices

range from \$119.50 to \$139.50. Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill.

- - - for more details circle 402 on page 56

Don Bosco SIGNAL SOURCE

"Mosquito" pen-sized, self-contained, signal generator offered in an improved version has two interchangeable probes



and utilizes a transistor oscillator powered by a single 1.5v pen light cell. Can be coupled into magnetic pick-ups and circuits without leads, and oscillates at approximately 1,000 cps with a wave containing many harmonics. Frequency, 1 kc with harmonics to 30 mc. Covers the audio, i-f, and r-f spectrum. Weight, 1 oz. Size, 5- $\frac{5}{8}$ "L, $\frac{1}{2}$ " diameter. \$9.95. Don Bosco Electronics, Inc., Littell Rd., Hanover, N. J.

- - - for more details circle 403 on page 56

DuKane SPEAKERS

New column speaker, designed for indoor PA use, consists of four elliptical speaker cones mounted one directly above the other in a common enclosure. The use of elliptical speakers, rather than round speakers, reduces vertical sound projection and greater directing of the sound beam is possible with this design with practically no reverberation or feedback to microphones. Also, more round speakers are needed within an enclosure to accomplish what four ellipticals will do. Advantages reported over conventional PA systems are: easy, low cost installation; excellent sound quality and intelligibility; and uniform sound level. DuKane Corp., St. Charles, Ill.

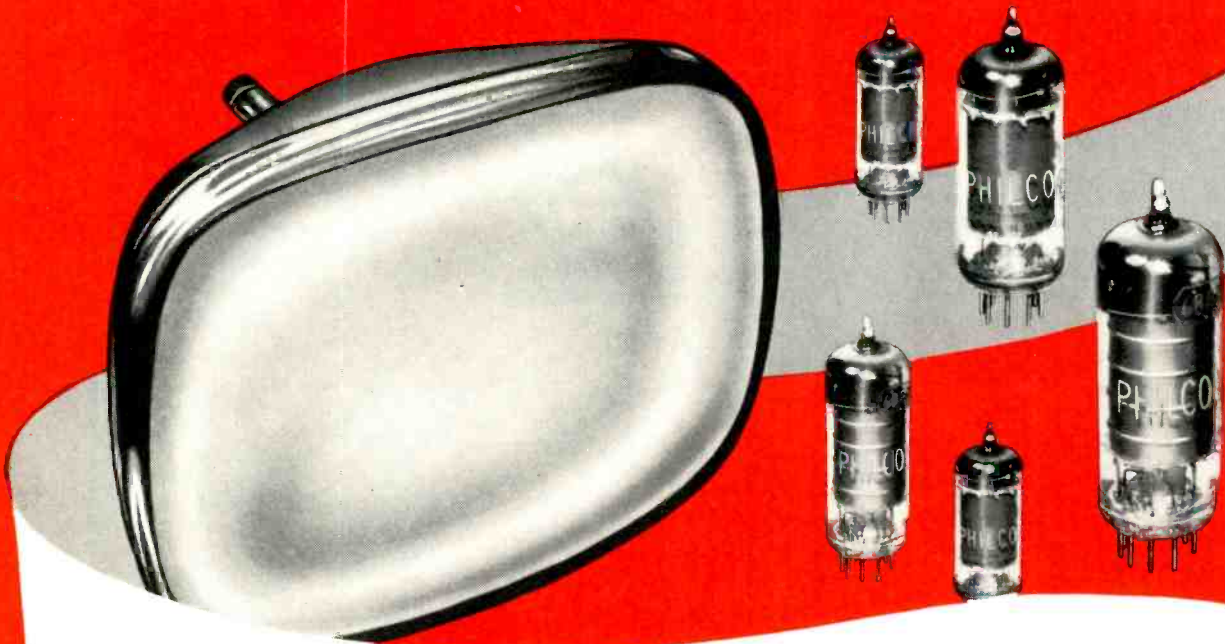
- - - for more details circle 404 on page 56

EICO STEREO PREAMPLIFIERS

Model ST84 stereo preamplifier is reported to hold all types of distortion, at all levels of all functions, to 0.05% or less. Input and mode selectors each have seven positions each for every con-



BETTER THAN EVER IN ITS 32nd YEAR



THE PHILCO PLEDGE OF QUALITY TO THE SERVICE-DEALER

When you insist on a Philco STAR BRIGHT 20/20 Picture Tube or Philco Receiving Tube, you're sure of unbeatably high quality. There are many technical reasons why—but the most fundamental reason behind the Philco Pledge of Quality is Philco's own reputation—and the fact that we consider the service technician as our most important tube customer.

Everything that Philco makes or sells reflects on the proud reputation that we have tried to build throughout the years. Your customer makes no distinction between the

Philco part or tube that you install and the original Philco instrument that she purchased. To us, the most important fact is that your customer . . . and ours . . . is satisfied.

That is why we refuse to relax the quality standards for every product, every tube, every part sold by Philco. That is one reason we believe every replacement part should meet original factory specifications. Your Philco Distributor makes it especially easy for you to use and order the right tube or part, by offering a service data program and maintaining complete stocks of Philco tubes and parts.

See Your Philco Distributor . . . He's the Best Friend and Partner Any Serviceman Could Have!

Double Protection—both Bond and Warranty

Every Philco STAR BRIGHT 20/20 Picture Tube is Bonded to be made only from new parts and materials except for the envelope which, prior to

re-use, is inspected and tested to the same standards as a new envelope. Plus the standard Philco full year Warranty on picture tubes.

PARTS & SERVICE OPERATIONS

PHILCO[®]

A SUBSIDIARY OF *Ford Motor Company*

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Additional
Service
Information?

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2nd and Westmoreland Sts., Phila. 40, Pa.

Please send me the latest Free technical information and my complimentary copy of the Philco Service-Businessman magazine.

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Address

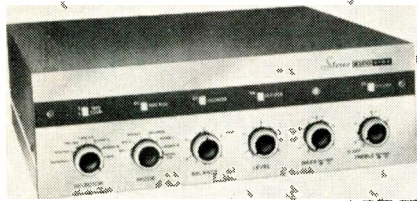
City State

Service Only Retailer with Service Dept.

Just Off the Press! New Philco Electronic Parts Catalog! Ask Your Philco Distributor for Your Copy Today!

For more details, circle 51 on page 56

NEW PRODUCTS



veivable combination of stereo or mono speakers and sources. Distortionless bass and treble tone controls for each channel provide true variable crossover con-

trol to boost or cut extremes of range without affecting midrange. Frequency response, ± 0.3 db from 5 to 25,000 cps. Harmonic distortion, from 20-20,000 cps is 0.06% at 2v out. \$89.95, wired. \$59.95, kit. Electronic Instrument Co., 3300 Northern Blvd., Long Island City, N. Y.

- - - for more details circle 405 on page 56

Amperex TUBES

Announced is type ECL86/6GW8 triode-pentode for preamplifiers and power output stages in stereo hi-fi amplifiers and TV receivers. Ideal for low cost stereo, two of the tubes are all that is needed for a complete two-channel stereo



are
Stancor
transformers

25%
BETTER

than anybody else's?

An illegitimate conclusion might be drawn from a set of strictly legitimate statistics. An impartial independent survey made in 1961 shows that more servicemen prefer Stancor transformers than any other replacement line—25% more than the next most popular brand.*

Of course, this preference does not of itself prove anything about relative quality—but it does show that a lot of professional servicemen feel that they get more for their money from Stancor.

And who are we to argue with them?

STANCOR
ELECTRONICS, INC.
(formerly Chicago Standard Transformer Corporation)

3501 WEST ADDISON STREET • CHICAGO 18, ILLINOIS

*According to Brand Name Survey, Chicago, Illinois, May, 1961. This survey has been made annually since 1954—and Stancor has come out first every time.

system, with each tube providing 4 watts audio output, class A, per channel. Using two tubes per channel, or a total of four for a complete higher power low distortion 3% stereo system, each two tubes provide 12 watts output class AB, push-pull. Triode portion, equal to one section of a 12AX7. Pentode portion, has plate dissipation rating of 9 watts and a transconductance of 10,000 micromhos. 85¢ each. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y.

- - - for more details circle 406 on page 56

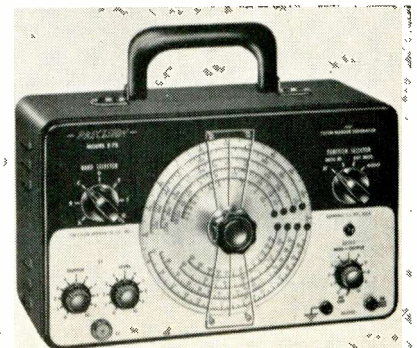
Scott TUNER KITS

A new FM stereo (multiplex) tuner kit, LT-110, will receive either new FM stereo or regular FM programs. All wires are pre-cut and pre-stripped. The multiplex section and silver plated front end are pre-wired and tested at the factory. IHFM sensitivity, conservatively rated at $2.2 \mu\text{v}$. Special filters allow off-the-air tape recording. The instruction book has full-color assembly diagrams and parts are mounted on special part-charts in the order used. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.,

- - - for more details circle 407 on page 56

Precision GENERATORS

Model E-75 r-f signal generator, designed for applications involving signal

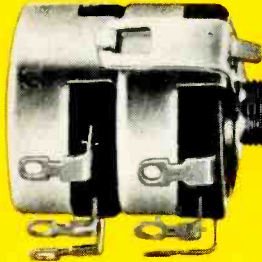




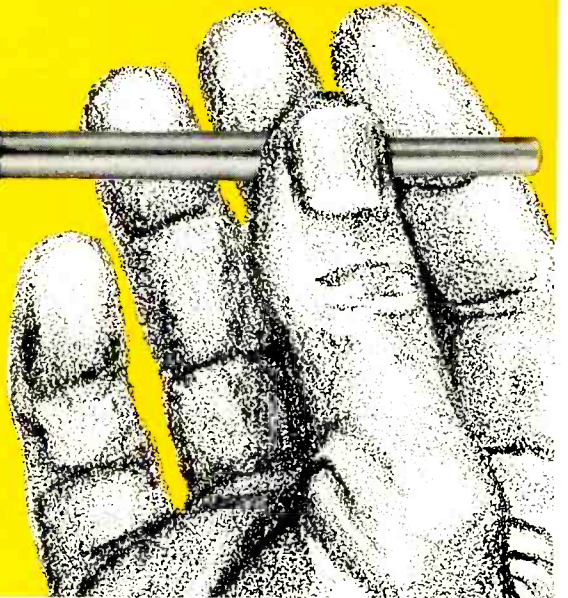
ORIGINAL
EQUIPMENT



**NO DIFFERENCE
IN QUALITY**



CLAROSTAT
REPLACEMENT



**EVERY
UNIT
IS
O.E.Q.***

**(Original Equipment Quality)*


BECAUSE...

**QUALITY
COMES
FIRST
WITH**

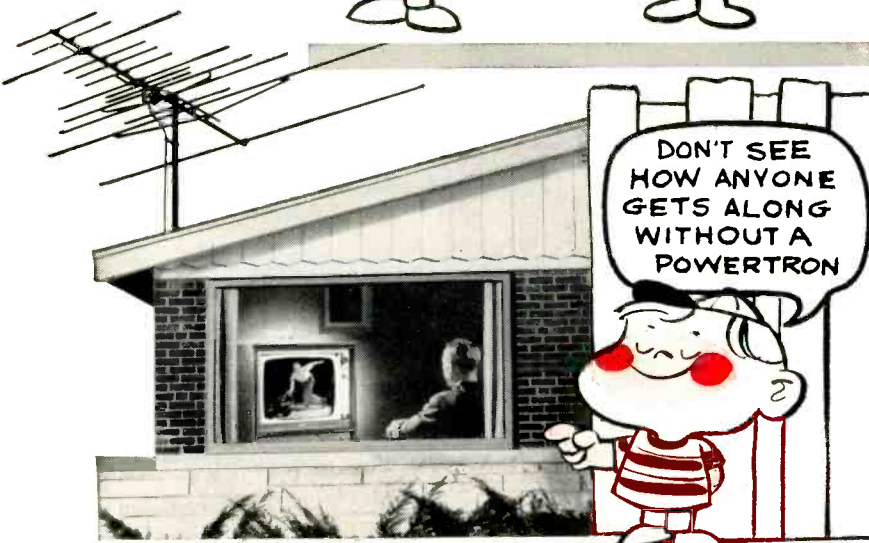
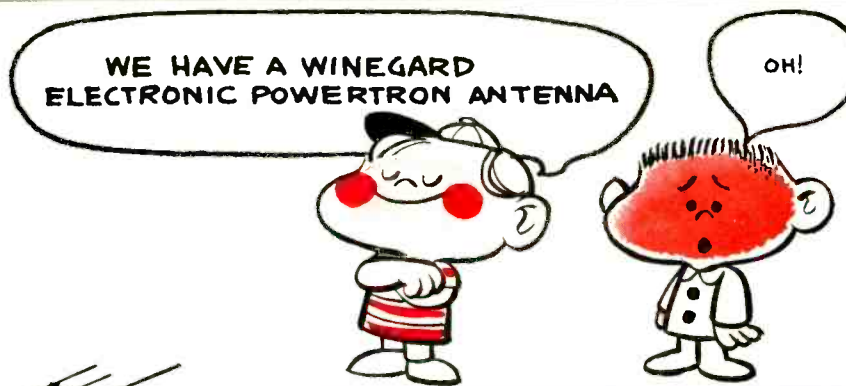
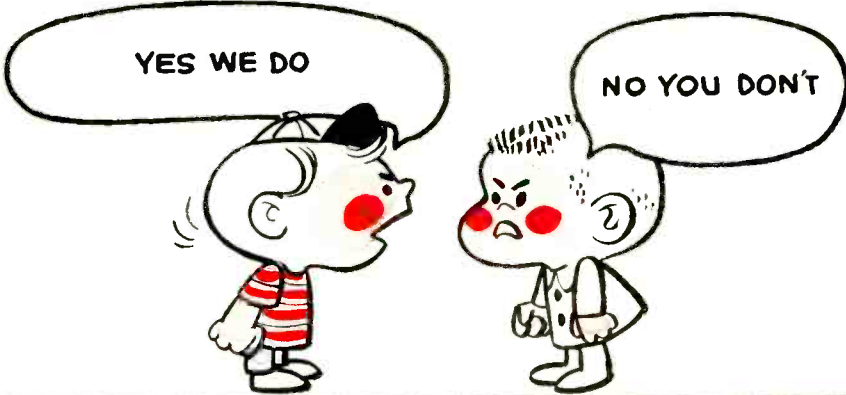
■ The same careful craftsmanship, materials and designs are used in every Clarostat control—whether for the most critical original equipment manufacturer or for replacement needs. There is only a single standard at Clarostat—the best quality possible.

■ It's a fact—replacement controls are run on the same production line, receive the same inspection and are the same quality as original equipment at Clarostat. This fact assures you of top performance every time you use a Clarostat control ...so, always ask for Clarostat quality in that well-known green box...

- A complete line of wire-wound controls meeting all replacement needs.
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- Factory-assembled RTV replacement controls to save you time and troubles.
- Uni-Tite field assembled duals—first to provide easy, fast assembly.
- Push-pull switches, sound system controls—and a host of others to fill every servicing need.

 **CLAROSTAT**

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



Winegard
ANTENNA SYSTEMS

3019-4 Kirkwood
Burlington, Iowa
For more details, circle 78 on page 56

NEW PRODUCTS

injection and marking, is announced. Wide frequency range for AM-FM and TV applications covers 160 kc to 240 mc direct reading on 8 bands, with the broadcast band completely calibrated on one band. Television i-f's, FM frequencies and other often used frequency points are specially indicated on the tuning dial. Has high signal output for single and multi-state alignment and percentage modulation is continuously variable at front panel control. R-f output, in excess of 100,000 μ v; 400 cycle audio output approximately 15v. \$49.95. Precision Apparatus Co., 70-31 84th St., Glendale 27, L. I., N. Y.
- - - for more details circle 408 on page 56

**Harman-Kardon
MIXER/PREAMPLIFIERS**

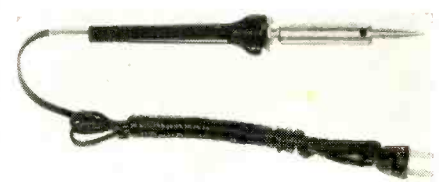
Model DPR-7 combination mixer/pre-amplifier. latest addition to the firm's Commander Series of PA equipment. is



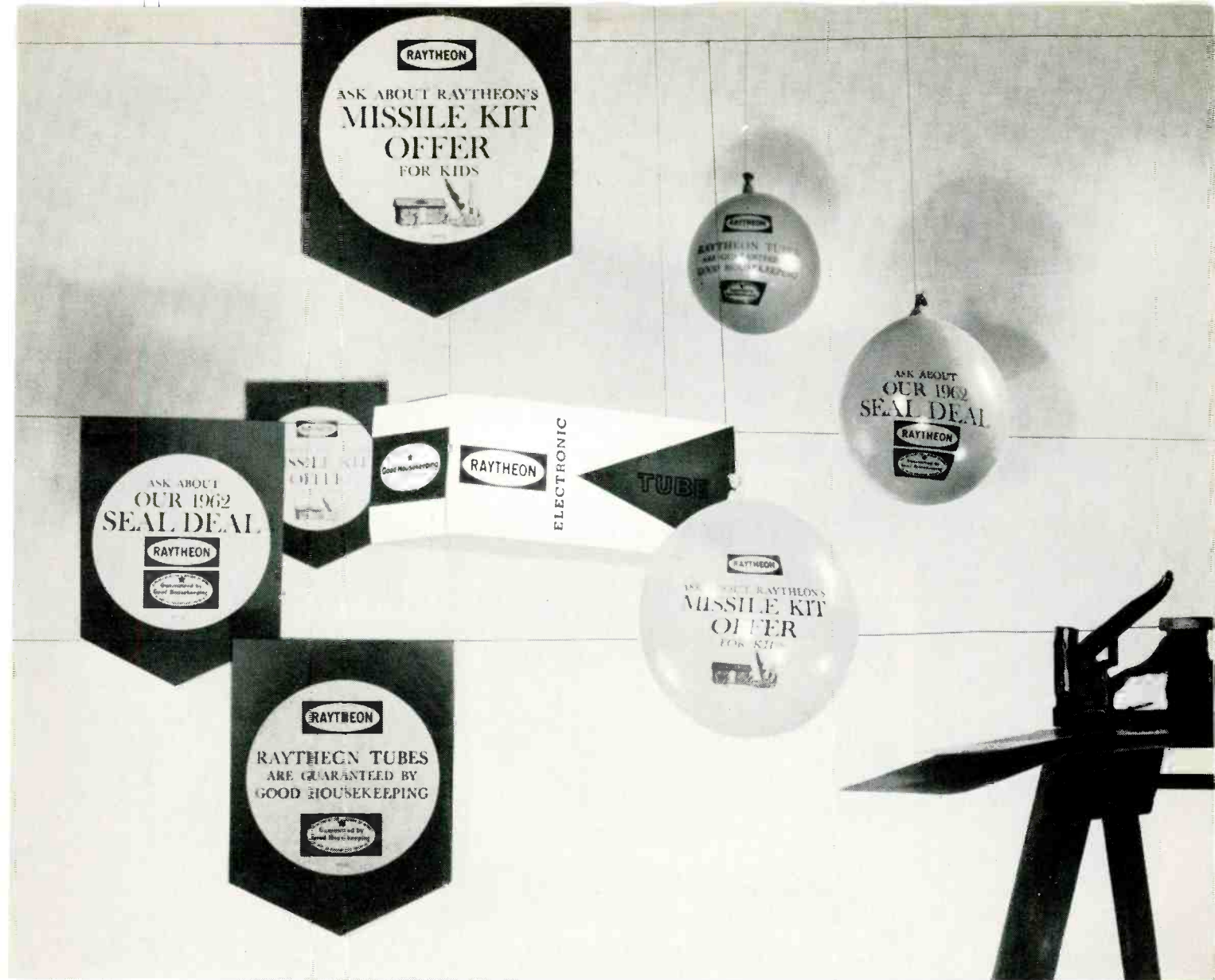
designed for use with any sound system to supply additional channels. The self-contained power supply applies d-c on all tube filaments. Has seven inputs. Channel 1 offers choice of microphone or magnetic cartridge input. Channels 2 and 3 each provide a choice of microphone or input from tuner or tape recorder and crystal or ceramic phono player. All may be controlled from the front panel. Channel 4, another microphone channel, is convertible to a master control for the entire mixer by a front panel switch. \$75.00. Harman-Kardon, Inc., Plainview, N. Y.
- - - for more details circle 409 on page 56

Wall SOLDERING IRON TIPS

A new soldering iron tip, with reported life several hundred times that of conventional tips, is made of copper with



a special coating. It is available in $\frac{1}{8}$ and $\frac{1}{4}$ inch sizes to fit the firm's 18HD, 14HD, and 14T irons; and stock is being expanded into $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{7}{8}$ -inch tips for the larger irons. P. Wall Mfg. Co., Grove City, Pa.
- - - for more details circle 410 on page 56



"Dress Up" and Cash in on Raytheon's Good Housekeeping Seal Promotion

Good Housekeeping's famous Guaranty Seal — trusted buy-signal with families all over America — is now carried on every Raytheon receiving and picture tube. And families have extra faith in the service dealer who uses Good Housekeeping-backed Raytheon tubes.

We're advertising continuously — with full-page ads — to more than 5 million Good Housekeeping readers. So get set to boost your own prestige and profits . . . by telling your customers you give them this extra protection provided by the Good Housekeeping Seal.

We've prepared a colorful, hard-hitting promotional program to help you. Wire hangers, balloons, to dress up your place of business . . . repair labels and many other eye-catching items. A complete, business building promotion! Sound good? See your Raytheon Distributor Salesman, or mail this coupon with your name and address today.

*Send Me
Details On
How I Can
Profitably
Tie In
with
Raytheon's
Seal Deal
Promotion.*

RAYTHEON, Box 777
Distributor Products Division
Westwood, Massachusetts

Name _____

Store Name _____

Address _____

City _____ Zone _____ State _____

For more details, circle 60 on page 56

DISTRIBUTOR PRODUCTS DIVISION

Westwood, Massachusetts

RAYTHEON

NEW BOOKS

radios, and 1 portable phonograph. Olympic Radio & Television, 34-01 38th Ave., Long Island City, N. Y.

--- for more details circle 411 on page 56

Olympic TV RECEIVERS

Model 7C210, 27-inch low boy black-and-white TV console features dual grilles with speakers on each side of the picture tube. Three cabinet finishes: mahogany, \$349.95; blonde or walnut, \$359.95. It heads a list of 27 "drop in" models displayed at the Chicago Furniture Market. In addition to the firm's 1962 line of radio, TV, and phonographs introduced last June, there are 13 new TV models, 7 phonograph consoles, 6

Hunter PLIERS

EREM 86 plier, available in four



sizes: 4-1/2", 4-3/4", 5", and 6", is designed primarily to make a flush cut in extremely confined areas. It will snip wire at the extreme tip of the cutter. Is handy for trimming off fine leads in printed circuit work. All sizes available with or without leaf springs. Each plier comes with EREMS turquoise cushion grip handles. R. N. Hunter Sales Co., 9851 Alburtus Ave., Santa Fe Springs, Calif.

--- for more details circle 412 on page 56

Sonotone BATTERY CELLS

Type S-113 sealed battery cell has a voltage of 1.25 v and weighs only 1.8 oz. Size, 7/8" x 1 1/8". These recharge-

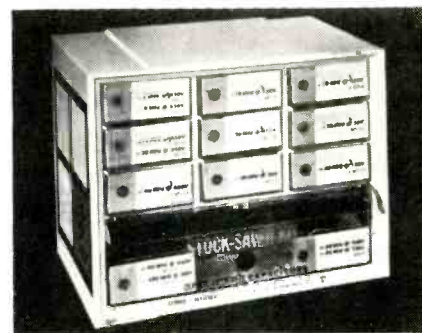


able sintered-plate, nickel cadmium sealed cells have been chosen as the power unit in the new General Electric automatic toothbrush, and also chosen by Remington Rand for its cordless shavers. This type is just one of a line of Sonotone sealed cells for portable power for hundreds of consumer and industrial devices. They can be recharged hundreds of times for years of use. Sonotone Corp., Elmsford, N. Y.

--- for more details circle 413 on page 56

G-E CAPACITORS

K-100 kit of 14 types of "service-designed" tubular electrolytic capacitors is reported to replace more than 50 types



of conventionally designed capacitors. These replacement electrolytics are manufactured in a system of "application ranges" which reduces the number of different types necessary. Kit K-100 consists of an assortment of 19 capacitors in a 10-drawer plastic parts cabinet. Capacities range from 2 to 500 μ f and voltage maximums from 50 to 475 volts. \$17.95. Electronic Components Div., General Electric Co., Owensboro, Ky.

--- for more details circle 414 on page 56

EMC TRANSISTOR ANALYZERS

Model 212 checks all transistors, high or low power, for gain, leakage, and a-c current amplifiers (oscillator check).

NEW PUSH BUTTON TUBE TESTING



with the Model 1200 MUTUAL CONDUCTANCE TUBE TESTER

- ✓ Tests for true dynamic mutual conductance (Gm)
- ✓ Tests for shorts and leakage between any tube elements
- ✓ Tests for gas and grid emission... sensitivity over 100 megohms

Here is a new high in tube testing convenience. A dynamic mutual conductance tube tester with push-button settings. The simplicity of this unique set-up method can be compared with the ease of selecting a record on a juke box. The extreme accuracy and versatility of the Model 1200 plus the many other remarkable innovations make it truly one of the most advanced mutual conductance tube testers available.

JUST CHECK THESE ADDITIONAL FEATURES

- Also tests foreign and hi-fi tubes, voltage regulators, battery type tubes, auto radio hybrid tubes, thyratrons and most industrial tube types • 28 push buttons provide complete versatility in accommodating all tube types and basing arrangements • Automatic line voltage regulation • Built-in 7-pin and 9-pin straighteners on panel • Long lasting phosphor bronze tube sockets • Handsome two-tone etched aluminum panel • The most complete tube chart conveniently located in cover • New tube listings subscription service available • Housed in handsome gray leatherette case with convenient compartment for cables • Size: 18 1/4" x 10 3/4" x 4 3/4".

Tests the new tube types including:

- NUVISTORS • NOVARS
- NEW 10-PIN TUBES
- COMPACTRONS

TREMENDOUS VALUE!
actually a 4 in 1 instrument

... also tests black and white and color picture tubes

... also tests transistors

... also tests batteries

\$119.95
Net

See your local electronics parts distributor

Mercury ELECTRONICS CORPORATION
manufacturers of quality electronic products

111 Roosevelt Avenue, Mineola, New York

IN CANADA: Wm. Cohen Ltd., 8900 Park Ave., Montreal

For more details, circle 45 on page 56

SPRINGTIME IS VALUETIME

- WITH RCA!!!

That's right! Spring's here at last...and RCA's "garden" of exciting new premiums is in full bloom! See for yourself...

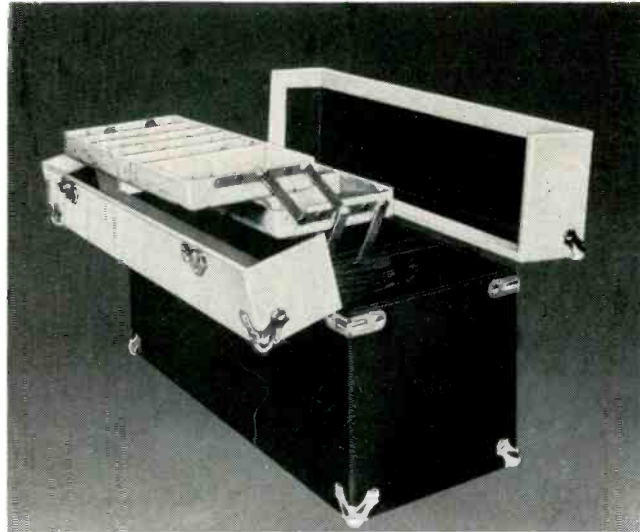


RADIO TV HI-FI

SERVICE

with **RCA tubes** 



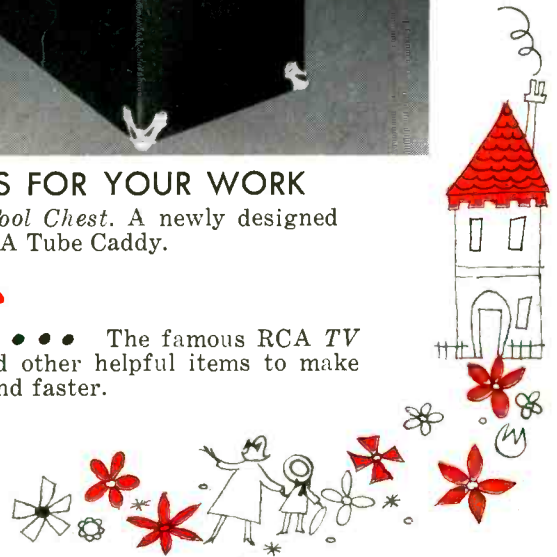


SERVICE AIDS FOR YOUR WORK
Service-Special Tool Chest. A newly designed mate for your RCA Tube Caddy.

DISPLAY MATERIAL

Outdoor and indoor signs that advertise your services to the public.

PLUS... The famous RCA TV Toter Table...and other helpful items to make your job easier and faster.



ACCESSORIES FOR OUTDOOR LIVING



Scotch Portable Charcoal Grill



Handsome, durable, lightweight *HAMPDEN OUTDOOR FURNITURE* including lawn chair and chaise lounge.

RCA ELECTRON TUBE DIVISION, HARRISON, N.J.

All these values can be yours by ordering the world's finest entertainment receiving tubes! For full details on how you can get your VALUETIME premiums, see your participating RCA Tube Distributor right away.

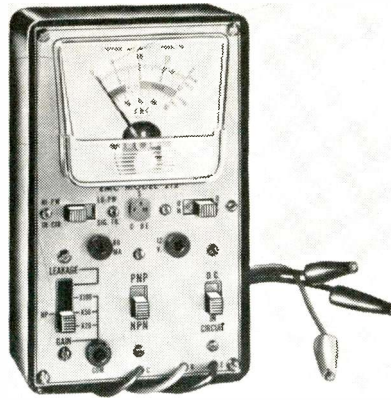


The Most Trusted Name in Electronics

NEW PRODUCTS

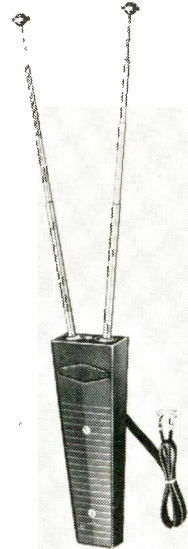
D-c current gain (BETA) check, in three ranges to 200. Leakage check made on three-colored scale. Transistors can be checked in circuit. It can be used to signal trace a-f, i-f or r-f circuits. Supplied with three external leads and socket for checking transistors; also with pair of test leads for measuring voltage and current. Wired, \$18.50. Kit, \$13.50. Electronic Measurements Corp., 625 Broadway, New York 12, N. Y.

- - - for more details circle 415 on page 56



Clear Beam ANTENNAS

Announced are six improved TV indoor antennas in the Piggy Back series. In this series, a simply installed attachment to the back of a TV set eliminates top-of-set antennas and pulls in all UHF, VHF and FM signals. Included is the "Power-Pak" Piggy Back with the Tune-A-Matic selector, reported to provide perfect tuning on color TV from any direction. Six different antennas include four-and-five-section telescopic elements

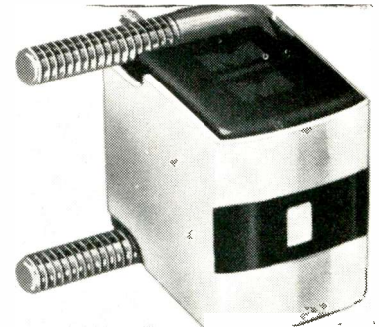


with choice of blonde or mahogany finish. Clear Beam Sales Corp., 21341 Roscoe Blvd., Canoga Park, Calif.

- - - for more details circle 416 on page 56

MM RECORDING HEADS

Model 7H17 half track mono tape recording head is reported to offer full-scale reliability despite being smaller than



any previous comparable unit. Features include 100% functional flush-face shielding which makes tape starting easier. Michigan Magnetics, Inc., Vermontville, Mich.

- - - for more details circle 417 on page 56

Olson KITS

Transistor Radio Kit, model KB-137 features 7 Raytheon transistors mounted on 2 preassembled printed circuit boards; one board contains the 4 transistor tuner, the other a 3 transistor push-pull audio amplifier. Has oversize output transformer and a 3" PM speaker. Assembly, ready for housing in hi-impact polystyrene case, takes less than one hour. Size, 7-1/2" x 4-1/4" x 2". \$16.14, less batteries.



Model 1571 Shown with Accessory 45 rpm Spindle in Base Plate Spindle Well

V-M Deluxe 'Stere-O-Matic'® 4-Speed Automatic Record Changer with Stereo Cartridge and Diamond Needle

The Sales Pace Setter For ALL Custom and Replacement Hi-Fi and Stereo Installations! Sell customers a combination of true transcription-turntable fidelity and automatic record changer convenience . . . all in *ONE* unit with this functional V-M 'Stere-O-Matic'®! The eleven-inch turntable, scientifically balanced, assures minimum rumble and wow! V-M Automatic Manual-Play function saves possible needle damage by returning the extra-long, dynamically balanced tone arm to the rest post *AUTOMATICALLY* after single record play! V-M Model 1571 \$50.00* LIST Available with 4-pole motor and plug-in tone arm head for magnetic cartridges as Model 1572 \$50.00* LIST

*Slightly Higher West.



Attractive, functional Base or pre-cut mounting board available for mounting all V-M record changers in any kind of Hi-Fi installation. Model 1438 . . . \$5.95 List.

GET THE SELLING FACTS ON THIS COMPATIBLE V-M DELUXE 'STERE-O-MATIC'® —YOU'LL PROFIT!

the Voice of Music®

V-M CORPORATION • BEAUFORT HARBOR, MICHIGAN • KNOWN FOR THE FINEST IN RECORD CHANGERS, PHONOGRAPHS AND TAPE RECORDERS

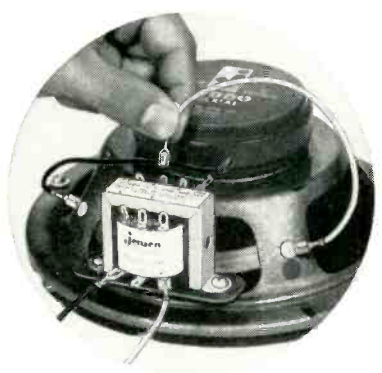
For more details, circle 75 on page 56

K-950

... 8" 2-way coaxial distributed sound loudspeaker... **MORE**

NEW

**THAN
50%
LOWER
INSTALLED
COST!**



Available with factory installed 70.7 or 25 volt transformers. KWIKON* instant connectors and tap adjustments are a cost saving feature.

It's simple arithmetic to show that with the full 110 degree coverage angle of the K-950 (compared with 90° or less for conventional types) you can use *half as many speakers, transformers, ceiling baffles . . . have less than half* the installation cost, because KWIKON* instant connectors and factory preattached transformers further cut on-the-job time importantly. And amplifier cost goes down, too, due to reduction in the number of speakers plus higher efficiency.

When the K-950 is used with conventional "90 degree" spacing, reproduction quality is substantially improved, and loudness and articulation variations with position are drastically reduced compared with the performance of simple cone speakers. †

So whether you're designing for lowest installed cost or highest quality distributed sound, investigate the advantages of the outstanding K-950. Write for Specification Sheet CSP-102 for complete technical details.

†Results of an impartial test by a world famous firm of acoustical consultants.

NO OTHER DISTRIBUTED SOUND SPEAKER HAS ALL THESE FEATURES

1. Genuine coaxial 2-way system with electrically and acoustically independent tweeter.
2. High fidelity wide range response.
3. High efficiency.
4. Widest high frequency dispersion.
5. Lowest variation of articulation with position.
6. Super-shallow depth . . . will mount in the wall.
7. SYNTOX-6* ceramic magnet (10 oz.).
8. Available with factory mounted 70.7 or 25-volt transformers.
9. Handy 10-pack is economical, easy to handle.
10. KWIKON instant connection and transformer tap adjustments.

*T.M.



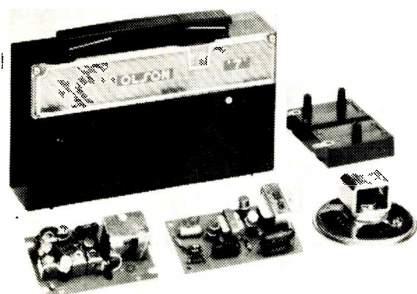
Jensen MANUFACTURING COMPANY
Division of THE MUTER COMPANY
6601 S. Laramie Avenue, Chicago 38, Illinois
In Mexico: Universal De Mexico, S.A., Mexico, D.F.

For more details, circle 42 on page 56

NEW PRODUCTS

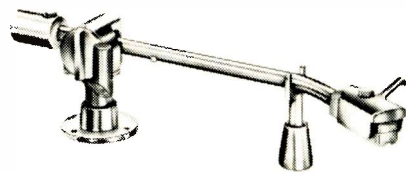
Four penlight batteries required. Olson Electronics, 260 S. Forge St., Akron 8, Ohio.

- - - for more details circle 418 on page 56



Empire PLAYBACK ARM

The Dyna Lift is a self-lifting dynamically balanced playback arm with an accurate stylus force adjustment. A calibrated knob dials any stylus force from 0-8 grams within $\pm 0.1g$. Has precision vertical and lateral ball bearing suspensions; stylus overhand adjustment; and cartridge bracket-mount permits adjustment of cartridge position in shell for low tracking error (0.65°). Fundamental resonance, 8 cycles per



second. A 5-wire circuit eliminates ground loops, separate 5th wire provides common ground for arm and turntable. Designed for plug-in installation and supplied with 4-foot shielded plug-in cable assembly. Arm including magnetic Dyna Lift \$50.00. Empire Dyna Lift, Inc., 1075 Stewart Ave., Garden City, N. Y.

- - - for more details circle 419 on page 56

Bogen INTERCOMS

TIX series transistorized intercom system is available in two models: TIX-11 master station for operation with up



to 10 other stations; and TIX 24 master for operation with up to 23 other masters or remotes. Two types of remote stations are: RIX-1 which initiates a call to one master station; and RIX-6 to initiate a call selectively to any one of six masters. Any remote can be called by any master. They pick up a voice as far as 20 feet from the unit. The series features an "Auto Respond" switch to make it possible for a called station to reply without operating a station selector or talk-listen switch or knowing the calling station's location. The system operates on one single 117v a-c power supply. Bogen-Presto Div., The Siegler Corp., P.O. Box 500, Paramus, N. J.

- - - for more details circle 420 on page 56

G-E SILICON RECTIFIER

A "universal replacement" silicon rectifier, type GE-504, for television replacement, has a 45-ampere peak surge rating. The unit is said to replace, electrically, scores of original equipment silicon, germanium and selenium rectifier types. \$1.20. General Electric Co., Owensboro, Ky.

- - - for more details circle 421 on page 56

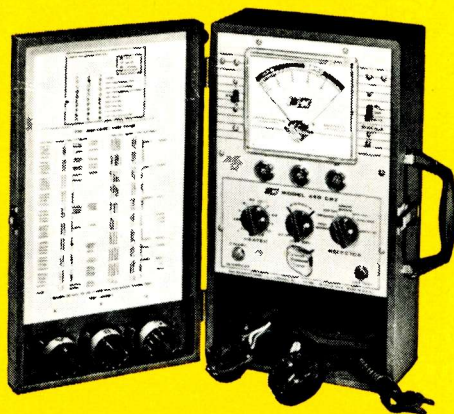
Lafayette IGNITION ANALYZER

An easy-to-use ignition analyzer, TE-40, pinpoints auto ignition troubles and provides accurate readings on its large direct-reading multi-colored meter. Can be used to localize trouble in coils, spark plugs, points, condensers etc. The VTVM section measures up to 30,000 volts. It features a special capacitance clip which

**SAVE
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MAKE
MONEY**

THE INDUSTRY'S STANDARD

Most Widely Used Today
by Professional Servicemen



FAMOUS
DELUXE



CRT 440



For Black & White and Color

"Most valuable and useful" . . . "Wouldn't be without it" . . . "Pays for itself over and over again" . . . servicemen say. Quickly checks and corrects television picture tube troubles in a few minutes right in the home without removing tube from set. Gives new life to weak or inoperative tubes. Checks for leakage, shorts, open circuits and emission. Removes inter-element shorts and leakage. Repairs open circuits and low emission. Restores emission and brightness. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new tube sales easier. Completely self-contained. Rich leatherette-covered carry-case. Net, \$74.95

TESTS AND REJUVENATES

all picture tubes at
correct filament voltage
from 1 to 12 volts

TESTS AND REJUVENATES

110° tubes and the
new 19" and 23" tubes

TESTS AND REJUVENATES

color picture tubes.
Checks each gun of
color tube separately

UP-DATE YOUR B&K CRT WITH THESE ACCESSORIES

Model C40 Adapter. For use with previous Models 400 and 350 CRT's—to test and rejuvenate TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

Model CR48 Adapter. For use with previous Models 400 and 350 CRT's—to test and rejuvenate 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

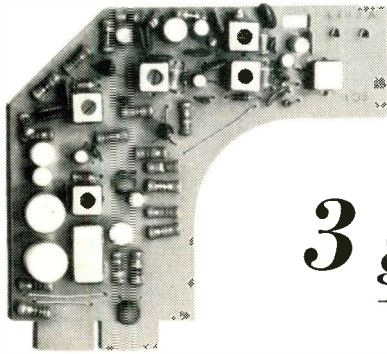
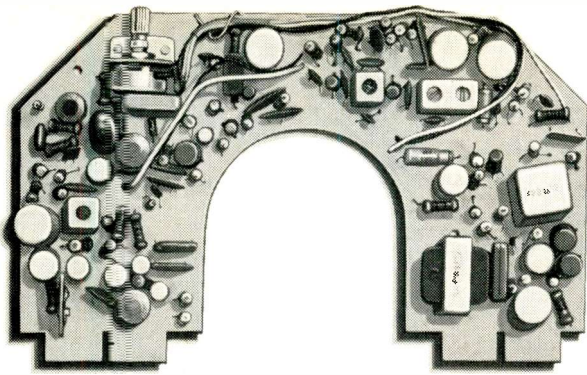
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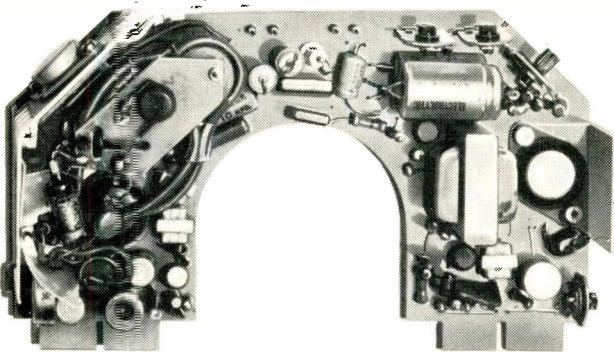
B & K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



For more details, circle 15 on page 56



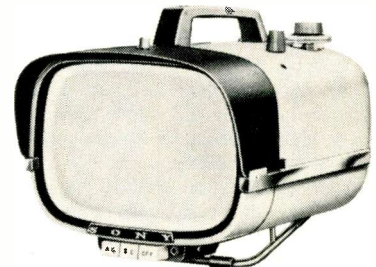
3 good reasons why...



SONY® *Research makes the Difference*

Is the Easiest TV to Service

Unlike ordinary etched circuit TV receivers, the SONY 8-301W TV is composed of 3 "snap-out" printed cards. Just about every major component in the 23 transistor, 20 diode circuit is mounted on these boards. So just imagine how easy servicing would be: Isolate the defective component; snap out the board; replace the component... and the set works as well as ever! Or, should you feel disinclined to stock a full schedule of components, you can simply mail the defective board back to SONY, and we'll do the rest, and you still make your full profit. Surprisingly simple, isn't it?



SONY CORP. OF AMERICA™

514 Broadway, New York 12, N. Y.

Regional Offices:

Central: 4959 W. Belmont Ave., Chicago 41, Ill.

Western: 627 South Towne Ave., Los Angeles 21, Calif.

SONY CORPORATION OF AMERICA 514 Broadway, New York 12, N. Y.
Gentlemen: I am interested in the SONY portable television. Please rush full details.

STORE NAME
 NAME TITLE.....
 ADDRESS
 CITYZONE.....STATE.....

For more details, circle 65 on page 56

NEW PRODUCTS



enables the operator to make high voltage measurements (including surges) without danger of shock. Power for the analyzer is derived from the 12 volt car battery and may be used on all 4, 6 and 8 cylinder engines. A resistance loading circuit allows simulation of a heavy engine load such as high speed driving. Complete ready-to-use with instructions \$39.95. Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L. I.

- - - for more details circle 422 on page 56

Webcor TAPE RECORDER

Introduced is a tape recorder reputed to be the lowest priced hi-fi recorder manufactured in the U. S. The unit is



called The Statesman and features a dual track recording at two speeds— $3\frac{3}{4}$ and $7\frac{1}{2}$ ips—and plays three inch, five inch, and seven inch reels. The fully portable unit weighs only 14 pounds, includes a hand-held wide-range microphone, roomy cord storage space, and is extremely simple to operate. A single lever performs most functions. \$79.95. Webcor Inc., 5610 W. Bloomingdale Ave., Chicago, Ill.

- - - for more details circle 423 on page 56



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 • Chicago 18, Ill.

For more details, circle 50 on page 56

Jackson SOCKET ADAPTERS

Three new socket adapters for use in checking new tubes (Nuvistors, Compactrons and Novars) with Jackson tube



tester models 648, 658 and 598 are now available. All three can be purchased in an adapter package at \$9.25, or individually. Jackson Electrical Instrument Co., 124 McDonough St., Dayton, Ohio.

- - - for more details circle 424 on page 56

Shamark BACKGROUND MUSIC SYSTEM

A completely integrated new audio distraction system for dentists, called Medi-Pak, features a 4-track tape cartridge that simultaneously plays background music for the waiting room, and stereo music and white sound for the patient, who controls the sound which he hears through earphones. Three separate series of cartridges provide music of interest to the three basic age groups: children, adolescents, and adults. The cartridges click easily into the master

What's the difference in loudspeakers that makes Quam so special?

All loudspeakers look pretty much alike, and may even sound pretty much alike—yet Quam speakers are different—in a way that's very important to you who use them!

the
difference
lies
in
**PERFORMANCE
RELIABILITY**

When it's a Quam speaker—you install it and forget it. Quam speakers are built to give long, trouble-free performance.

Quam's factory is a manufacturing plant, not merely an assembly shop. By making our own speaker parts, we can guarantee the quality of the materials that go into them. Our voice coils are centered precisely; each and every speaker is thoroughly tested; the product you get meets the standards we have insisted on for almost forty years.

Quam Quality Line speakers are enameled in gold—and while the color has no effect on performance characteristics, it symbolizes the quality and reliability that's built into every Quam speaker.

ASK FOR

QUAM

**THE QUALITY LINE—
for all your speaker needs**

QUAM-
NICHOLS
COMPANY

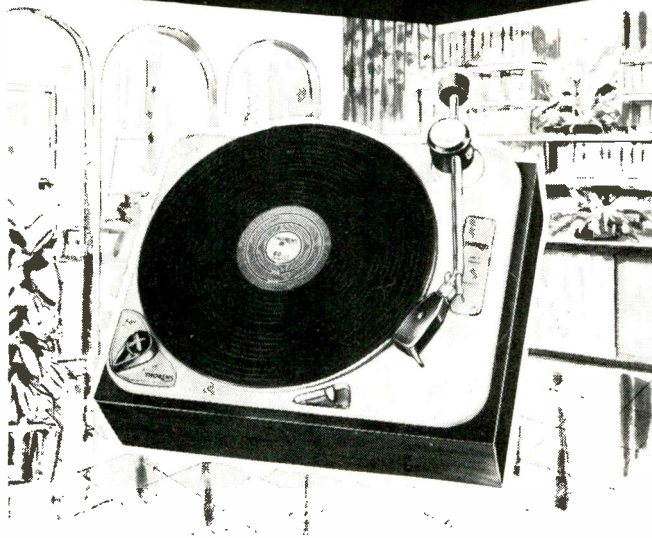
226 East Marquette Road
Chicago 37, Illinois

For more details, circle 52 on page 56

Mated to Perfection!

THORENS

**NEW STEREO TURNTABLE
WITH INTEGRATED ARM**



THORENS TD-135, COMPLETE WITH INTEGRATED ARM

For the first time, Thorens — in the new TD-135 — offers a *component-quality* arm and turntable mated with a precision that insures you perfect tracking, perfect sound . . . always . . . with a minimum of installation effort on your part.

There's no compromise whatever with quality such as you usually find in integrated turntable and arm units. THORENS TD-135 is Swiss-precision crafted throughout . . . true component high fidelity all the way. You get: A precision turntable featuring 4 speeds, all adjustable, with an 8-pound non-magnetic table . . . plus a completely new, advanced tone arm that's so good we also sell it separately (see below) for use with *any* turntable of your choice. Exceeds NAB specs for wow, rumble and flutter. Has same belt-plus-idler drive as famous TD-124. Shuts off automatically at end of record. Many, many more features than we can detail. **\$110 net**



THORENS BTD-12S, 12" PROFESSIONAL TONE ARM

Identical arm included with TD-135, but sold as separate unit. Less than 0.5°/inch tracking error. Built-in cueing device. All adjustments: vertical height; calibrated gram-force; stylus positioning slide; balancing counter-weight. Unique vertical pivot keeps stylus vertical for any height adjustment. Resonance well below audible frequencies. Interchangeable 4-pin cartridge shells. Mounted on board for THORENS TD-124, TD-121 turntables. **\$50.00 net**

See and hear the THORENS TD-135 and *ALL* the members of the "TD" family of fine turntables at your franchised dealer's today; there's one for every budget! *For additional information, write us direct.*

THORENS DIVISION

ELPA MARKETING INDUSTRIES, Inc.

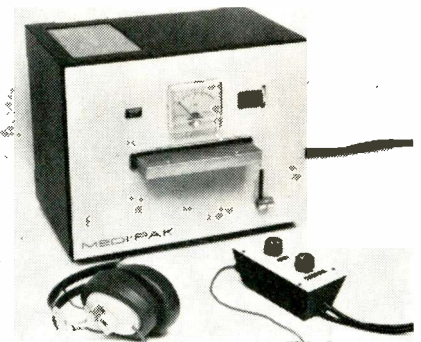
New Hyde Park, N. Y.



For more details, circle 31 on page 56

NEW PRODUCTS

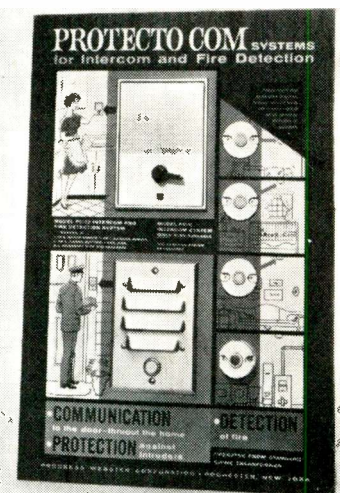
unit and each may be played continuously without re-winding or stopping. Preset master unit, measuring 16 in. x 12 in. x 12 in. may be wall mounted or placed on shelf or cabinet. A single unit wire connects self-contained waiting room speakers to the master unit. Complete unit includes transistorized transmitter, patient's hand control and headset, three continuous playing cartridges and a built-in practitioner-to-patient talk channel. Optional extras are doctor's intercom headset boom mike and foot control. Medi-Pak is sold through local dealers and distributors. Price, \$699.00. Shamark Industries, Subsidiary of Electronic Transmission Corp., 103 E. Hawthorne Ave., Valley Stream, N. Y.



--- for more details circle 425 on page 56

Progress Webster "PROTECTO-COM" DISPLAY

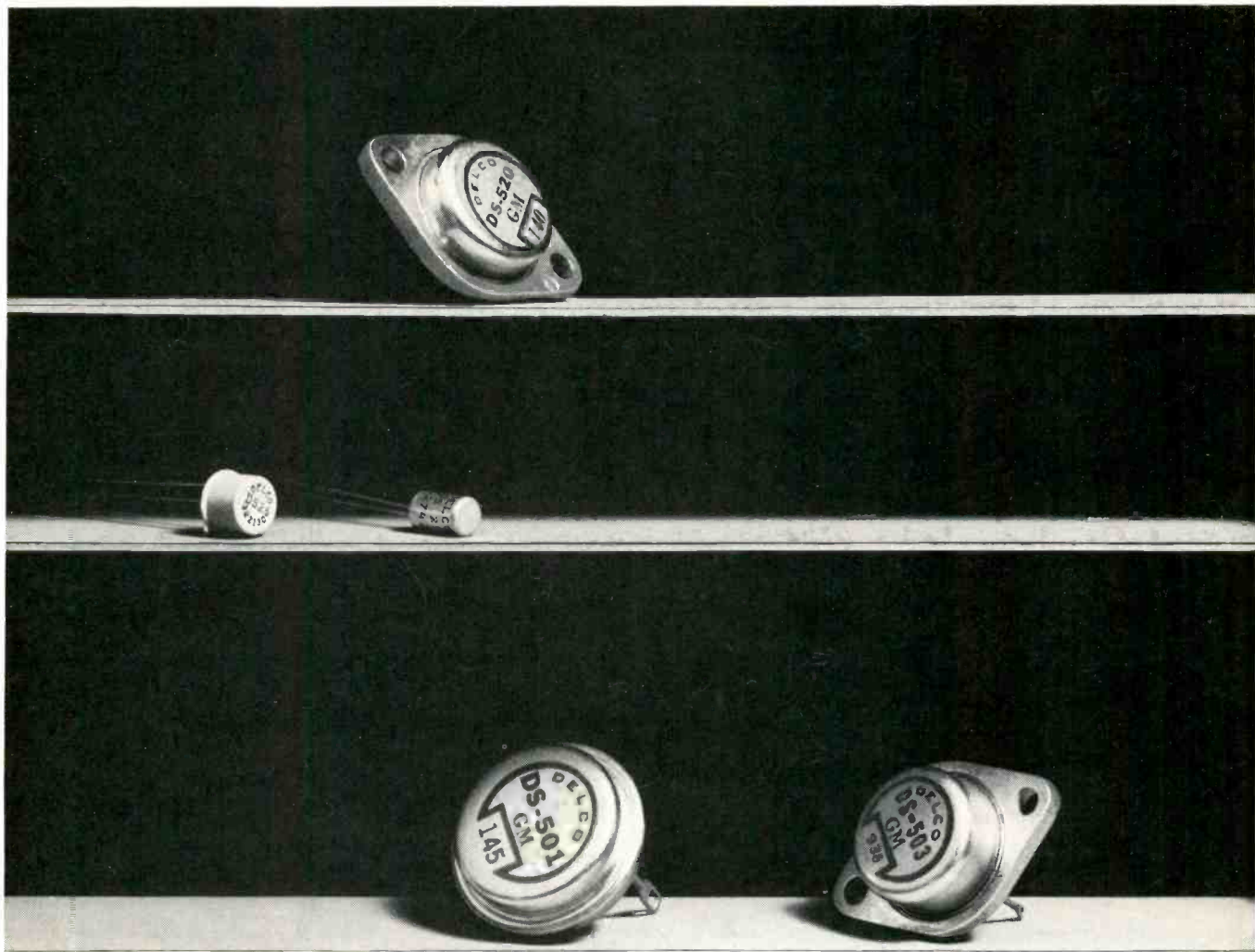
Display DK-4 for counter, shelf, or window, carries a mounting of an IR-6 or an OR-1 remote station, an FB2 thermo button and illustrates the door-answering and fire detection functions of the equipment. It is free with an order for six systems, including two PC-11 intercom systems and four PC-12 intercom and fire detection systems. IR-6 indoor remote station has separate positions for talk, listen, and off; also pushbutton to control opening of front door. PC-11 system consists of a transistor amplifier, one indoor station (IR-6) and one outdoor station (OR-1) for outer door monitoring and opening. As many indoor and outdoor stations as desired may be added separately. PC-12 system consists of the MA-13 amplifier with fire oscillator and test button, one IR-6 and one OR-1 remote, four FB-2 fire detecting thermostats, 50 feet of 6-conductor wire and 150 feet of 2-conductor wire. Additional cells may be added. No power outlet required. Operates from any existing chime transformer. Progress Webster Corp., 182 Ave. D, Rochester 21, N. Y.



--- for more details circle 426 on page 56

Standard AMPLIFIERS

Announced is a new multi-function transistorized amplifier. It handles PA, paging, background music, tone signals, point-to-point intercom and automatic alarms for fire, burglary and other electronic detection. All these functions can be combined in one of the firm's intercommunication systems. The new amplifier has been designed and field-proven by the company over the past six months, and a live micro-



**YOU'RE LOOKING AT ALL THE TRANSISTOR INVENTORY YOU NEED
TO SERVICE EVERY TRANSISTOR CAR RADIO ON THE ROAD!**

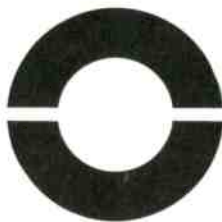
simply say **Delco**

There are millions of transistors in car radios today . . . and with just five Delco numbers in stock, you're ready to service this entire replacement market. Simply say Delco and get these advantages!

- Five transistor numbers service all PNP Transistor Auto Radios!
- Delco's DS-25 and DS-26 cover small signal transistor needs in all Delco radios!
- Delco's DS-501 and DS-503 cover audio output transistor needs in all Delco radios!
- Delco's DS-520 fits all non-Delco radios—actually improves performance (up to 1.5 watts)!
- DS-25 and DS-26 replace practically every PNP transistor used in *portable* radios!
- Application and cross reference charts are packaged with your Delco transistors!
- All these advantages are yours at a low cost!

Cash in now on the coverage you get from top-quality **Delco Radio** Automotive Radio Service Parts and Electro-Mechanical devices, distributed nationally through **United Delco**.

DELCO RADIO, Division of General Motors, Kokomo, Indiana



For more details circle 25 on page 56

R FOR "DOCTORS OF SERVICING"



THE PROFESSIONAL SERVICE MAN'S CLEANER

cleans contacts CLEANER!

Want total cleaning power that helps you do a better servicing operation 3 ways? Spray electrical contacts and switches with triple action Contact Shield. Cleans, lubricates, and safeguards, like no other cleaner can! Gives lasting protection in seconds . . . thanks to Silicone base. Independent laboratory tests prove it! Technicians approve it! Write for handy guide-book to more efficient servicing . . . Channel Master Corp., Ellenville, N.Y.

C 1962 CMC

For more details, circle 21 on page 56

For your custom stereo installations



THE FISHER 800-B

Three of the world's finest components on one chassis

1 AM-FM-Stereo Multiplex Tuner: separate tuning indicators for FM and AM; exclusive Fisher STEREO BEAM automatically shows whether an FM station is broadcasting in stereo.

2 High-Power Stereo Amplifier: 65 watts music power; special center-channel output connection for third speaker.

3 Master Audio Control-Preamplifier: complete, easy-to-use control system assures total flexibility; provisions for every type of input. **Price \$429.50***

*Walnut or Mahogany cabinet \$24.95; prices slightly higher in the Far West

USE THIS COUPON FOR DETAILED INFORMATION

Fisher Radio Corporation
21-24 44th Drive, Long Island City 1, N. Y.

Please rush the following FREE literature:

- Complete specifications on the Fisher 800-B Receiver.
- The 1962 Fisher Handbook, a 40-page illustrated reference guide and component catalogue for custom stereo installations.

Name _____

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City _____ Zone _____ State _____

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For more details, circle 33 on page 56

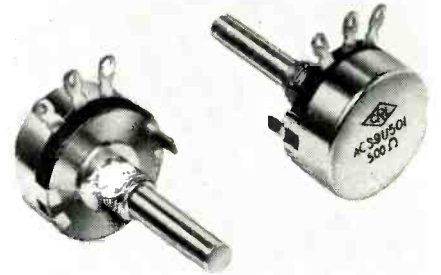
NEW PRODUCTS

phones, speakers and baffles are now being checked out for coordinate use. All components are designed to a new modular concept for reduced production and installation costs. Standard Systems Corp., 52-10 37 St., Long Island City 1, N. Y.

--- for more details circle 427 on page 56

Centralab POTENTIOMETERS

Model A hot molded carbon composition potentiometer features wide clearance between the bushing and the



collector track, completely enclosed elevated track construction, and carbon composition material used in the construction of both pick-off and collector brushes. Size, 1-3/32 in. in diameter and 5/8 in. deep. Rated at 2 watts at 70°C, 500 volts. Available in a wide range of resistances from 500 ohms to 5 megohms, linear taper, and 10K ohms to 2.5 megohms, log taper. Prices, as low as \$1.69 each depending on quantities and value. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

--- for more details circle 428 on page 56

Precision DECADE CONDENSER

Model 1904 decade condenser is designed for determination of capacitor values in all types of experimental cir-



cuitry, for use in tuned circuits, filters, r-c networks, etc. Capacitance range, from .0001 μ f to .111 μ f in steps of .0001 μ f (minimum capacity .0001 μ f plus approximately 10 Pf residual) \pm 1% accuracy. All capacitors are silvered mica with insulation resistance better



YOU CAN ADD THAT EXTRA ROOM WITH A FREE SIGNET SOUND CATALOG

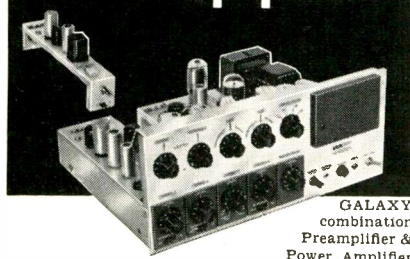
There's no doubt about it! Hundreds of other electronic technicians throughout the country are making steady, extra income by selling top quality, relatively low-cost SIGNET SOUND Equipment just in their spare time. In one year you, too, can easily earn enough extra money to add that bath or other extra room to your house. The SIGNET SOUND Catalog is all you need. ■ Here's how easily you can get started: ■ First, look around your neighborhood at all the possible prospects that could use the many complete sound reproduction packages and components contained in the SIGNET SOUND Series of STROMBERG-CARLSON® Communication Products: churches, meeting halls, sports and social clubs, bowling alleys, taverns and restaurants. Then write for your free SIGNET SOUND Catalog. It's all you need to get started. ■ Selling SIGNET SOUND won't take up a lot of your time. There's no inventory for you to stock. There's no special knowledge or background necessary to make a sale, and the installation of SIGNET SOUND is a cinch! Everything you need to make one extra income sale after another is contained right in your SIGNET SOUND Catalog! ■ Write for full details and your free SIGNET SOUND Catalog now. You'll also receive a valuable booklet that tells how easy sound equipment is to install. Write to: General Dynamics/Electronics-Rochester, Box E, 1404 N. Goodman Street, Rochester 1, N.Y.

G D

GENERAL DYNAMICS | ELECTRONICS — ROCHESTER

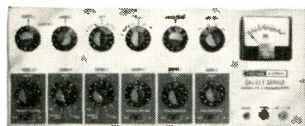
For more details, circle 35 on page 56

The quality and versatility of custom sound with the installation ease of compact package equipment



GALAXY combination Preamp & Power Amplifier

introducing the Harman-Kardon Galaxy Series



GALAXY Preamp-Mixer

More power, more features, more value!

Harman-Kardon has created a dramatic new concept in professional sound equipment—a modularized line with performance, flexibility and value unmatched in its price range. Here, for the first time, is engineered sound that precisely fits present needs, easily expands or modifies for future developments and never becomes obsolete. All this at unbelievably low cost. Choice of 40, 75, and 150 watt amplifiers and power boosters. Also 8-channel mixer-preamplifier, and a wide choice of easily installed preamp modules with multiple inputs for every type of program source—including some modules with facilities for precedence and compression operation. Get the full story of this exciting new development! Write for detailed catalog: Commercial Sound Division, Harman-Kardon, Plainview, L.I., New York.

Built by Sound Men for Sound-Men

Send free detailed catalogs: Desk 4 G

Name _____

Address _____

City _____ State _____

harman kardon

For more details, circle 39 on page 56

NEW PRODUCTS

than 100,000 megohms at 500v d-c. Voltage rating of overall unit, 350 WVDC, 500v intermittent, 1000v test. Power factor of the capacitors, .001% or better. Unit is completely shielded in a steel cabinet with an aluminum panel. All switches incorporate ceramic decks. Dimensions, 12 in. x 3½ in. x 4¼ in. \$29.95. Precision Apparatus Co., 70-31 84th St., Glendale 27, L. I., N. Y.

--- for more details circle 429 on page 56

Weller SOLDERING KIT

A new utility case, the 8250AK Heavy Duty Soldering Kit, made of rugged polypropylene, is announced.



Featured in the kit is the 250 watt heavy duty soldering gun, with twin spotlights. Included also are a smoothing tip, cutting tip, a wrench, and a supply of solder. \$14.95. Weller Electric Corp., 601 Stones Crossing Rd., Easton, Pa.

--- for more details circle 430 on page 56

EICO CAPACITOR TESTERS

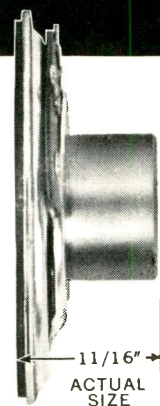


Model 955 checks capacitors in or out of circuit, including very sensitive checks for "shorts" or "opens." It measures 0.1 μ f to 50 μ f capacities at $\pm 10\%$ accuracy at any point on the dial. Capacity is read from 4 in. lucite dial after it has been adjusted to "null," in conjunction with the RC balance control which has two ranges, selected by the RC range switch: 0.6-10.5-and 7.0-infinity. Test frequency, 60 cps. Operates on a-c line voltages from 105 to 130, 60 cps, consuming 8 watts. Has line adjustment control. Dimensions, 8½ in. H, 5¾ in. W, 6 in. D. Kit, \$19.95. Wired, \$39.95. Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y.

--- for more details circle 431 on page 56

BIG LINE OF SMALL SPEAKERS

UTAH'S SEVEN BASIC "MINIATURES" FIT BOTH IMPORTED AND DOMESTIC TRANSISTOR RADIOS



Here's the solution for replacing speakers in transistor radios. With this complete line of midget speakers (American made with American parts) Utah provides a dependable source for replacements. Wafer-thin baskets, 12 ohm V.C. impedance—for performance equal or better than original speakers.

Model No.	Size	Total Diam.	Basket Depth	Total Depth
SP2T	2" Round	2"	7/16"	1 1/16"
SP22T	2 1/4" Round	2 1/4"	1/4"	3/4"
SP25A	2 1/2" Square	2 1/2" Square	1/2"	1 3/16"
SP25T	2 1/2" Round	2 1/2"	3/8"	27/32"
SP27T	2 3/4" Round	2 3/4"	1 1/2"	1 3/8"
SP27A	2 3/4" Round	2 3/4"	1 3/4"	1 3/8"
SP3T	3" Round	3"	1 1/2"	1 3/8"



HUNTINGTON, INDIANA

For more details, circle 74 on page 56

ELECTRONIC TECHNICIAN

Scott SPEAKER SYSTEM



A moderately priced 3-way wide range speaker system, Model S-4, consists of a high compliance, low resonance, 8 in. woofer and separate mid-range and high frequency drivers. It has

multiple crossover network and separate controls for the mid-range and tweeter drivers to give exceptionally natural and transparent sound. Available in oiled walnut, mahogany and unfinished pine or hardwood. It is adaptable for use on bookshelves as well as for floor placement. It measures 22 in. x 11 in. x 9 in. deep. H. H. Scott, Inc., Dept. P, 111 Powdermill Rd., Maynard, Mass.

... for more details circle 432 on page 56

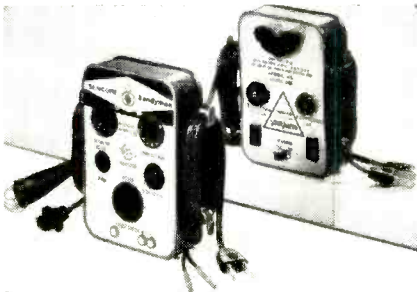
Wintronics POWER TRANSISTOR

An NPN silicon transistor amplifier weighing 1/2 oz. 1/2 cubic inch in size, called the "Beta-Pak," is designed for applications requiring high input and low output resistances. The current gain (BETA) is said to be greater than 100,000. \$49.50 each 1-9 pieces. Wintronics, Inc., Components Div., 1132 S. Prairie Ave., Dept. RP, Hawthorne, Calif.

... for more details circle 433 on page 56

Sencore TUBE CHECKER

Designed for "one stop" servicing, the Handyman, model HM119, is a filament checker, fuse checker, a-c trou-



ble light, TV cheater cord with on-and-off switch, continuity and voltage checker, dual power extension cord and pin straightener. Checks all tubes, including nuvistors, novars, compactrons and ten-pin. Also checks picture tubes. It is a neat, compact unit with cord winders on each side. Has two built-in plugs, handy for soldering irons, test equipment and other electric tools. \$9.95. Sencore, Inc., 426 S. Westgate Drive, Addison, Ill.

... for more details circle 434 on page 56

Motorola AUTO "REVERB" SYSTEM

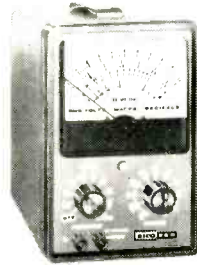
A reverberation unit, the "Vibrasonic," is designed to compensate for acoustic deficiencies in small internal areas of automobiles. The device is expected to overcome problems caused by insulated and padded car interiors, prob-



NEW VERSATILITY & COMPACTNESS in PROFESSIONAL TEST EQUIPMENT



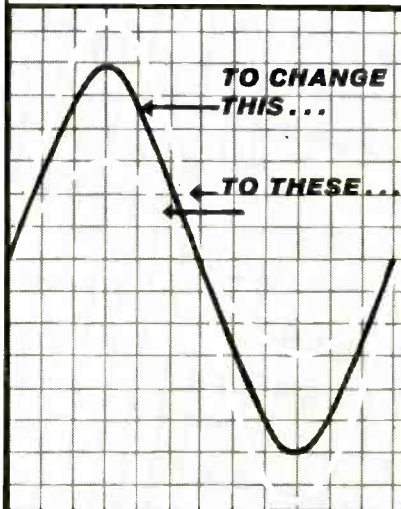
AC VOLT-WATT METER #260
Kit \$49.95 Wired \$79.95



AC voltmeter and load-compensated audio-wattmeter of unique quality and accuracy. Measures AC voltage from 1 millivolt to 1000 volts in 11 ranges, and power from .015 milliwatt to 150 watts in 7 ranges, across standard loads from 4 to 600 ohms. The instrument incorporates a tapped power resistor load (4, 8, 16, and 600 ohms) to handle up to 80 watts of power on 8 ohms, and 40 watts on other taps. It may be switched to external load up to 150 watts. The meter is automatically compensated for any load selected, internal or external, to provide a single watt scale for all loads and ranges.

VOLTMETER: Ranges: .01, .03, .1, .3, 1, 3, 10, 30, 100, 300, 1000 RMS volts. Frequency Response: ± 0 db 10c to 150kc, -3 db at 500 kc. Input Impedance: 2 megohm shunted by 15mmf. Accuracy: ± 4 %.

WATTMETER: Ranges: 15mw, 1.5mw, 15mw, 150mw, 1.5W, 15W, 150W. Frequency Response: ± 0 db 10c to 100kc. Accuracy: ± 5 %. Internal Loads: 4 (40W), 8 (80W), 16 (40W), 600 (40W). External Loads: 4, 8, 16, 600 (all to 150W).



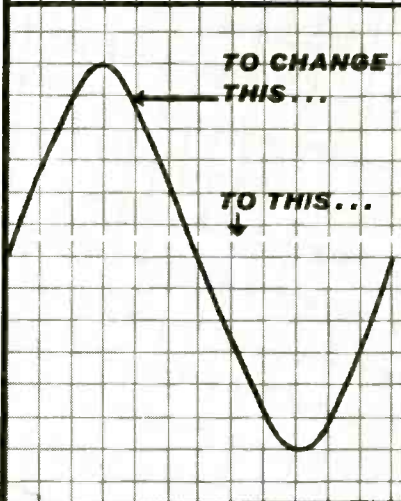
...USE THESE!



**METERED VARIABLE
AUTO-TRANSFORMER
AC BENCH SUPPLIES**

1073 (3-amp rating)
Kit \$35.95 Wired \$47.95
1078 (7 1/2-amp rating)
Kit \$42.95 Wired \$54.95

Connect to 60 cycle, 120 volt line and obtain any desired cycle voltage between 0 and 140 volts. Highly efficient variable auto-transformer of toroidal core design gives you continuously variable output, linear versus rotation, with excellent regulation and negligible waveform distortion. Model 1078 permits either 50 or 60 cycle operation.



...USE THIS!



**Extra-Low-Ripple
6- and 12-Volt
BATTERY
ELIMINATOR AND
CHARGER #1064**

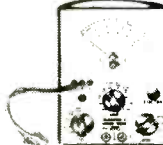
Kit \$43.95 Wired \$52.95

Connect to 60 cycle, 120 volt line and obtain highly filtered low dc voltage continuously variable over two ranges 0-8, 0-16 VDC. Heavy-duty pi-type LC filter is rated to take the full rated current output continuously (10 amps on 8V range, 6 amps on 16V range), reduces ripple as low as 0.3% at 2 amps on the 16V range. An essential instrument for servicing battery-operated equipment, including transistor or hybrid types, and an excellent battery charger.

Also New From EICO:



**AC VTVM &
AMPLIFIER
#250**
Kit \$49.95
Wired \$79.95



**TRANSISTOR
AND CIRCUIT
TESTER #680**
Kit \$25.95
Wired \$39.95



**IN-CIRCUIT
CAPACITOR
TESTER #955**
Kit \$19.95
Wired \$39.95

For complete catalog of over 106 EICO kits and wired units—hi-fi, test equipment, citizens radio, ham gear—plus name of nearest distributor, write to dept. ET-4.

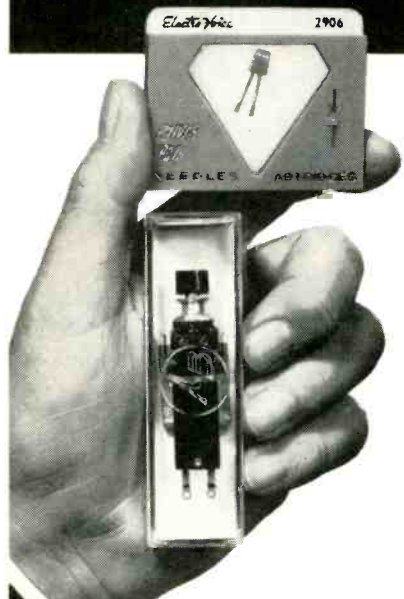


ELECTRONIC INSTRUMENT CO., INC.
3300 Northern Blvd., Long Island City 1, N. Y.

ADD 5% IN THE WEST Export Dept., Roburn Agencies Inc., 431 Greenwich St., New York 13, N. Y.

For more details, circle 26 on page 56

**THE INDUSTRY'S
ONLY COMPLETE
"LOOK-ALIKE" LINE
OF BOTH NEEDLES
AND CARTRIDGES!**



150 Exact
Replacement
Cartridges

300 Exact
Replacement
Needles

Speeds your phono service . . . assures consistent high quality and complete compatibility of needles and cartridges. Inventory and handling costs are cut to the bone. And the industry's greatest array of sales tools — cross-reference catalogs, wall charts, displays and merchandisers — is available to suit your requirements. Ask your E-V distributor, or send coupon for profitable details, today.

Electro-Voice®

ELECTRO-VOICE, INC., Dept. 427T
Buchanan, Michigan
Please send my free needle and cartridge catalogs plus name of nearest distributor.

Name _____
Address _____
City _____ State _____

For more details, circle 30 on page 56

NEW PRODUCTS

lems of wind and road noise, and add depth and dimension to auto radio music. The unit can be used with any 12 volt negative ground system car radio, AM or FM. The installation kit comes complete with rear speaker and dash control. \$29.95. Motorola Inc., 9401 W. Grand Ave., Franklin Park, Ill.

--- for more details circle 435 on page 56

Sonar CB RADIOS

Featuring 8 crystal-controlled receive and transmit channels, the new model E Sonarcom citizens band transceiver



can also tune in all 22 channels at the flip of a switch. The 8-tube receiver incorporates a noise limiter and an adjustable squelch with 8 permeability tuned high-Q circuits. Overall receiver sensitivity, $\frac{1}{2} \mu\text{v}$ for 10 db of quieting. Selectivity, 5 kc at 6 db down. Transmitter operates at a full 5-watt (FCC maximum) input. Up to 100% modulation is possible with the efficient class B modulator. Press-to-talk microphone permits one hand operation. Operates on 117v a-c and either 6 or 12v d-c. Mounting bracket allows the unit to be quickly mounted under the dash or to be dismounted for fixed station operation. Overall cabinet dimensions, 11 $\frac{1}{4}$ in. x 9 $\frac{1}{2}$ in. x 4 $\frac{3}{4}$ in. Weight, 9 lbs. Three antennas are available as accessories: a whip type antenna, ground plane, and marine. Supplied complete with microphone and universal mounting bracket. \$179.50. Sonar Radio Corp., 73 Wortman Ave., Brooklyn 7, N. Y.

--- for more details circle 436 on page 56

RCA BATTERIES

Eleven battery types, available in a new blister package designed for self-service displays, have been announced. The package includes eight types that cover 90 percent of transistor radio applications and three multi-purpose alkaline batteries. Two "Profit-Pak" assortments are available. No. 1 includes a total of 44 battery types for transistor radios. No. 2 has a total of 39 alkaline batteries in three multi-purpose types for radios, toys, photoflash and emergency lighting. Pak No. 1 \$32.24. Pak No. 2 \$19.65. Radio Corporation of America, 30 Rockefeller Plaza, New York 20, N. Y.

For information, write Department MD 552
For more details, circle 47 on page 56

For more details, circle 41 on page 56

NEWS

OF THE INDUSTRY

B & K Mfg. — MEL BYRON joins Engineering Dept. as director of new product planning.



Byron



Ranshous

Electro-Voice—WILLIAM E. RANSHOUS joins sales force as product manager for new line of replacement needles and cartridges.

United Catalog — HARRY BIRSE appointed as marketing director, new post. Promotions: CURTIS GLANVILLE as sales administration manager and DAVID RAFKIN as distributor sales manager.

Blonder-Tongue — RALPH H. G. MATHEWS, director of marketing, retired in January.

Clarostat—appoints JOHN P. DILLON as general sales manager.

J. Herbert Orr, OrrTronic Prod. Div. —RUSS MOLLOY joins staff as marketing manager.

Windsor Electronics — names JOHN DURKIN as national sales manager, new post.

Ungar Electric—appoints JERE R. DAVIS as advertising and sales promotion manager.

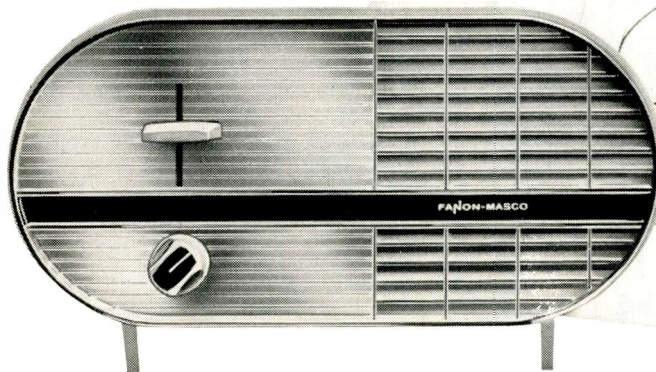
Jersey Specialty—half of their reps exceeded quotas in recently concluded sales contest, prompting JSC to plan another one in 1962.

Cleveland Electronics—new marketing division for Cletron products organized as Electronics Marketing Corp., Columbus, Ohio, headed by EARL V. SALA.

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Notify us at 1 East First Street, Duluth 2, Minn. Please include the address label from a recent issue and allow 30 days for the change.

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It's always planned. FANON-MASCO has been the acknowledged leader in the manufacture of quality intercoms for years. Not content to rest on its laurels as the number one seller FANON-MASCO keeps striving continually to make its better products even better.

That's why FANON-MASCO turned its entire line over for redesign to one of America's leading industrial designers. Results? A triumph of distinctive styling never before approached. From its clean, sculptured lines to the rich harmonies of high styling decor in beige and gold, FANON-MASCO's new intercoms are stamped with the "look of tomorrow".

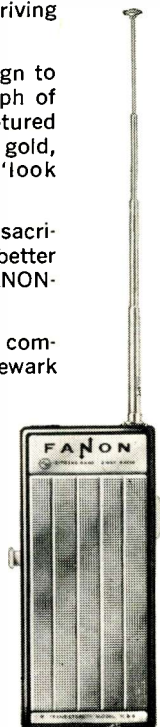
Of course, none of these improvements have been made at any sacrifice of FANON-MASCO's outstanding qualities. You still get better performance, greater reliability, and value pricing thanks to FANON-MASCO's unmatched experience, versatility, and dependability.

Yes. Leadership is no accident. We planned it that way. Write for complete information. FANON-MASCO, 439 Frelinghuysen Avenue, Newark 14, N. J., Dept. 101.



A complete line of P.A. amplifiers loaded with big extra features you'd pay much more for in any other line. Mobile and AC models available from 8 to 70 watts output. From \$57.50 List

MODEL FCB-9 Transistor Citizens Band Communicator. 2-Way radio for business, camps, boating and all sports. 2 to 6 mile range depending on terrain. Complete with ear-phone, carrying case, battery: List \$64.95 each



FANON-MASCO

439 Frelinghuysen Ave., Newark 14, N. J. ■ Export: Roburn, 431 Greenwich St., N. Y..

For more details, circle 32 on page 56

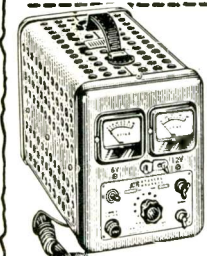
ATR PRODUCTS FOR MODERN LIVING



ATR PLUG-IN TYPE PORTABLE INVERTERS*

A.C. Household Electricity Anywhere . . . in your own car, boat or plane Operates Standard A.C. Record Players Dictating Machines Small Radios Electric Shavers Heating Pads, etc.

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



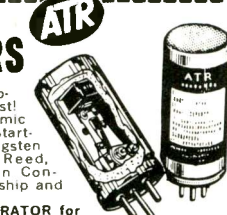
ATR "A" BATTERY ELIMINATOR

For Demonstrating and Testing Auto Radios—TRANSISTOR or VIBRATOR OPERATED!
 Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines—Equipped with Full-Wave Dry Disc-Type Rectifier, assuring noiseless, interference-free operation and extreme long life and reliability.

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

ATR AUTO-RADIO VIBRATORS

By every test ATR Auto-Radio Vibrators are best! . . . and feature Ceramic Stack Spacers, Instant Starting, Large Oversized Tungsten Contacts, Perforated Reed, plus Highest Precision Construction and Workmanship and Quiet Operation!
 There is an ATR VIBRATOR for every make of car!
 Ask your distributor for ATR's Low Priced type 1400, 6 volt 4-prong Vibrator; and 1843, 12 volt 3-prong; or 1840, 12 volt 4-prong Vibrator. THE WORLD'S FINEST!

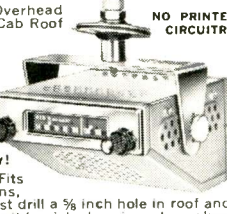


ATR CUSTOMIZED KARADIO

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

ATR TRUCK KARADIO

Airplane Style Overhead Mounting under Cab Roof
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.

For more details, circle 13 on page 56

NEWS OF THE INDUSTRY

Fanon — SALO NACHTIGALL, pres., elected to membership in Young Presidents' Organization.

Mallory, Distrib. Div.—sales staff additions: CHARLES A. ZINSER, Lakewood, Calif., office and WINSTON REID, Minneapolis, Minnesota office.

Packard Bell—30 factory-direct franchised dealers are now serving major trading area in the Midwest, East and South.

G. E., Receiving Tube Dept.—established an electronic tube processing and distribution center handling equivalent of 17,000 line items in Owensboro, Ky. ARTHUR M. EFFRON appointed district manager for Distributor Sales, Cincinnati, Ohio.

Philco, Consumer Prod. Div.—appointments: L. H. HYDE as general manager and vice pres. and JOHN BENNETT as director of advertising and sales promotion for Parts & Service Operations.

Hickok Electrical—promotes JERRY M. RHOADS from superintendent of mfg. to director of material.



Rhoads



Thorn

Jackson Electrical—appoints JOHN THORN as sales manager of Commercial Div., succeeding JAMES HAWKINS, resigned.

Zenith Radio—elects PHILIP J. WOOD, field sales manager, as vice pres. Late spring construction scheduled for new \$7,000,000 building, to be completed by summer 1963, to provide additional laboratory and production space. JAMES PASHLEY named as district sales rep for Albany, Rochester, Syracuse, N. Y., Newark, N. J. and Burlington, Vt. territory.

RCA—Receiving Tube Manual, newly revised edition, may be purchased for \$1.00 from authorized tube distributors or by sending payment to Com-

mercial Engineering, RCA Electron Tube Division, Harrison, N. J.

Sprague Electric—free copies of latest series of window posters for TV dealers and repair shops can be obtained from any distributor or directly from Sprague Products Co., Marshall St., North Adams, Mass. by sending 10c to cover handling.

Traveler Radio—will be producer of home products line for Sonora Corp. of America, new subsidiary organized by Park Radio Service, N. Y., who purchased name and trademark from T.R.

Sylvania Electric Products—Electronic Tube Div. appointments: GORDON L. FULLERTON as vice pres. and general manager-Parts Div., Warren, Pa.; WALTER A. WEISS as vice pres. and general manager-Picture Tube Operations, Seneca Falls, N. Y.; ROBERT D. CARLSON as southwestern district manager, Distributor Sales, Dallas, Texas; HUGH W. LUHR as southern regional manager-Distributor Sales, Dallas, Texas; J. R. STAPLES as East Central district manager, Distrib. Sales, Cleveland, Ohio. Appointed as distributor sales rep-Western district for Tube Sales, Omaha, Nev., is CARL A. JOHNSON and FELIX N. MILLECAN appointed as supervisor of product planning for Home Electronic Corp., Batavia, N. Y.

Wiley BOOKS

FUNDAMENTALS OF SEMICONDUCTOR AND TUBE ELECTRONICS

By H. A. ROMANOWITZ, *Univ. of Kentucky*. With this new book you need no more than high-school math to master the basics of modern electronics . . . that means theory and practice of semiconductor and tubes, plus dozens of special topics! Starts with a review of circuit theory and how to use lab instruments. The semiconductor diodes, transistors and tubes—and applications—are covered in closely related chapters. Also includes such special subjects as switching and pulse-shaping circuits, tunnel diodes, magnetic amplifiers, photoelectric control circuits, micro-miniaturization and molecular electronics. For self-study more than 300 problems and questions are included. 1962. 620 pages. \$8.25.

Send now for your on-approval copy
JOHN WILEY & SONS, Inc.
 440 Park Ave. South, New York 16

For more details, circle 77 on page 56

Stancor Electronics—names **KEN L. BURTON** as sales manager, Industrial Products.



Burton



Elcock

V-M Corp.—appoints **GREGORY W. ELCOCK** in charge of marketing for all New England states.

J. Malcolm Flora—adds **CHARLES N. HOUSER** to sales staff as contact man for electronic parts distributors throughout Michigan.

Blonder-Tongue — signs **ROCKE INTERNATIONAL**, New York, as exclusive export rep for consumer and industrial TV products.

Lafayette Radio—announces six new associate stores in Wilkes Barre, Pa.; Charlotte, Asheville and Fayetteville, N. C.; Ashland, Ky. and Macon, Ga. Plans

under way for an electronics center in Scarsdale, N. Y. in early fall.

Sylvania Home Electronics—Distributor appointments: **PEERLESS ELECTRIC SUPPLY**, Indianapolis for one eastern Ill. and 44 central Ind. counties; **AIR CONDITIONING WHOLESALE**, Newton Lower Falls, Mass., for 5 Mass. counties; **OVERLAKE DISTRIBUTORS**, Burlington, Vt., for 12 northern Vt., 2 northern N. H. and 2 northeastern N. Y. counties; **ACME COMMERCIAL CORP.**, Richmond, Va., for 6 Va. counties; **GRAYBAR ELECTRIC**, Buffalo, N. Y., for 8 western N. Y. and 3 northern Pa. counties; **TAYLOR DISTRIBUTORS**, Spokane, Wash.

for 16 Wash., 10 Idaho and 7 Montana counties.

Electronic Reps. Assoc.—'62 elections: pres.—**C. AULT**, Ault Assoc., Northern Calif. chapter; chairman of the board — **KENNETH HUGHES**, Kenneth Hughes Co., N. Y. chapter; national V. P.—**J. ROBERT NATOLI**, Allied Components, southwestern chapter; Eastern District V. P.—**MAITLAND K. SMITH**, M. K. Smith Co., Dixie chapter; Central District V. P. — **JOHN WEBSTER**, Northport Engineering, Paul Bunyan chapter and Western District V. P.—**CHARLES FETTY** Westron Sales & Eng., Southern Calif. chapter.



QUICK and LASTING

When You Use
HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

6 oz. Spray can. Also available 2 oz., 8 oz., 32 oz. containers
FREE 6" Plastic Extender With Every Can

EVER-QUIET®

Since 1949

VOLUME CONTROL AND CONTACT RESTORER

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

2 oz. Bottle & dispenser. Also available—6 oz. Spray can



CHEMICAL ELECTRONIC ENGINEERING, INC., Matawan, New Jersey
For more details, circle 22 on page 56

GENERAL ELECTRIC TRANSISTOR MANUAL

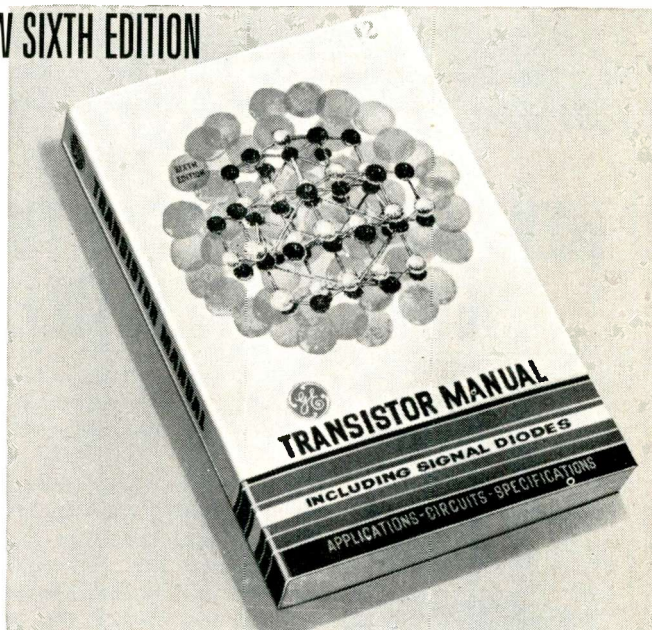
NOW OVER 400 PAGES OF CIRCUITS,
APPLICATIONS, THEORY

- **New Experimenter's chapter** . . . 17 circuits you can use to build audio amplifiers, simple or complex receivers, a transistor tester, an audible automobile signal minder (you hear your turn indicator), code practice oscillators, a tachometer, and many more
- **Expanded Hi-Fi chapter** . . . information on stereo, hi-fi amplifiers, preamplifiers, including circuits for very versatile 12 watt transistorized stereo amplifiers, matched preamps with base and treble controls, for use with ceramic or magnetic cartridge or tape deck
- **Expanded Radio Receiver chapter** . . . with circuits for AM and FM receivers and tuners
- **How to use a Transistor Spec Sheet** . . . complete explanation of how to interpret a spec sheet, most important characteristics, parameters

PLUS an expanded "Reader's List" of basic reference works on transistor theory and application, a new chapter explaining transistor reliability, expanded and updated comparison charts, outline drawings, over 1200 JEDEC types. This is the kind of reference information you just *have to have* . . . at home or on the job. See your G-E Semiconductor Products Distributor for your copy of the sixth edition of this industry classic, or send \$2.00 with the coupon.

GENERAL  **ELECTRIC**

NEW SIXTH EDITION



General Electric Company, Semiconductor Products Department
Section 154128, Electronics Park, Syracuse, New York

Please send me the new 420 page 6th Edition of the General Electric Transistor Manual. I enclose \$2.00. (No stamps, please.)

Name _____

Address _____

City _____ Zone _____ State _____

For more details, circle 37 on page 56

ASSOCIATION

NEWS

ARKANSAS

TESA, Little Rock, elected the following officers for 1962: Pres., W. T. Head; V. P., Jolly Wilson; Secy., Merrill Breeze; Treas., Harold Hicks; and Sgt.-at-Arms, Lawrence Barger.

CALIFORNIA

TSDA, San Mateo County, is planning an exhibit at the San Mateo County Fair after an absence of several years. The committee for planning the exhibit are Winston Haines, John Ritchie, Gordon Cole, R. C. Fichter, and Don Marshall. The Fair is to be held in August.

DELAWARE

TSDA, Wilmington, reports the following officers elected: Pres., Ralph Brinton; V. P., Arnold Zenker; Secy., Jim Mayhart; Treas., Gus Pohorly; and as director of publicity, Henry Dale.

FLORIDA

TESA, Miami, reports the death of their former Executive Director, and news editor, George S. Miller. Mr. Miller was among the founders of the Miami TESA organization, and is given credit for guiding the group's membership plans and the founding of TESA, Miami News.

MICHIGAN

TESA, Muskegon, formerly MARDA, has joined the ranks of NATESA. The new NATESA affiliate officers are: Pres., Mel Griesbach; Secy., Charles Ashley; and NATESA director, Ralph Warner.

NEW JERSEY

TCS, Camden, Tri-State Council of TV Service Associations, reports the following were elected to office. Pres., Tony De Franco (AETA), V. P., Wm. Jordan (TSDA Del. Co.), Secy., Arnold Zenker (TSDA Wil. Del.), and re-elected Treas., Joseph Eberhardt. Carl Weik (RSA, Trenton) was appointed as publicity director for the organization. The third annual Telerama was also discussed at the meeting, but no dates were set. Appointed as reporters for The Vanguard, TCS's official bulletin, were Bill Boyd, Henry Dale, Joseph Papovich, and Mike Toth.

RSA, Trenton, elected the following to office at their regular monthly meeting. Pres., Lou Edwards; V. P., Ralph Stigel; Secy., Michael Toth; and Treasurer, Carl Weik.

NEW YORK

NYEG, Buffalo, advises new officers elected were: Pres., Fred Ditondo; V. P., James Archibald; Treas., Clarace Thielke; Secy., Jack McDonough; Sgt.-at-Arms, Harold Lance.

PENNSYLVANIA

TSDA, Delaware County, has elected the following officers: Pres., Leon Skalish; re-elected V. P., Bill Boyd; Secy., Bill Jordan; and re-elected Treas., Harry Goodchild. It was also reported that an RCA color course is being planned. The advertising program on WPEN in conjunction with TSA of Philadelphia has shown good results for both groups.

TEXAS

TEA, Fort Worth, announced the following officers were elected: Pres., Julius T. Burke; Exec. V. P., G. M. Bettis; V. P., Tom Boyd; Secy., Don Chambers; and Treas., Jim Penny. Members voted to give power to the executive committee authority to hire and fire paid employees. Applicant screening is expected to begin in a short time.

TEA, Oak Cliff, reports almost 100% turnout for meetings of a technical nature. The chapter's most recent discussion was held with a speaker from the local Zenith distributor. The meeting was oriented around Zenith's new color set.



GLOBE ELECTRONICS

Proudly Announces

NEW PROFIT OPPORTUNITY IN THE SALES AND SERVICE OF CITIZENS BAND EQUIPMENT



Globe Electronics, the pioneer in the design, engineering and manufacture of Citizens Band and Amateur Radio transceiving equipment, announces the all new Globe Electronics and its all new Sales Program.

Long recognized for the development and production of the famous CB-100A, the CB-200 and Globe Pocketphones, Globe now is developing a complete new line of first quality transceivers, laboratory and field tested, to support this popular line. And we offer you an opportunity to capitalize on the profits that can be realized in sales to the lucrative Citizens Band and Amateur Radio Markets. A limited number of additional Distributorships, Dealerships and Service Depots are required to reach these markets. Perhaps you can qualify.

FOR FURTHER INFORMATION ON GLOBE DEALERSHIP AVAILABILITIES . . .

Write to the address below and furnish us with information as to your location, the nature of your business and the potential sales markets you can reach. Further information will be forwarded to you immediately.



GLOBE ELECTRONICS CO.
Division of GC-Textron Electronics, Inc.

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

For more details, circle 34 on page 56

REPS AND DISTRIBUTORS

Boren-Presto—appoints PAT AYLWARD & Co., Minneapolis, as factory rep for Minnesota, North & South Dakota and western Wis.

Eddie Colman & Associates—now in full operation at new location, 513 E. Washington Blvd., Los Angeles, Calif.

Electronic Publishing—appoints M. C. GROSSMAN SALES, Auburndale, Mass., as rep for New England territory.

Karet-Schulman—HAROLD J. SCHULMAN joins as a full partner in new firm, Chicago, now handling same lines previously represented by Karet-Margolin.

Lafayette Radio—manager of new store in Syosset, L. I., N. Y. is TOM VETTER.

Philco—CHARLES E. BECK, president, reassured 450 appliance dealers, at a meeting called by Brown Distributing Co., Atlanta, that the company intends to preserve and expand its system of independent dealers and distributors.

Roger Mark Corp.—rep appointments: JOHN A. ROWE & Assoc., Denver, for Colo., Wyo., Utah, Idaho, Montana, New Mexico and West. Tex.; J. & H. SALES, Los Angeles, for Ariz. Calif. and Nev. and L & H SALES, Chicago, for Ill. and Wis.

Sylvania, Home Electronics—appoints the BISTROW Co., Phoenix, as distributor in 13 southwestern Ariz. counties.

Over 15 Years
Selling Electron Tubes
Direct to You . . .
At Low, Low Prices!



BUY DIRECT FROM RAD-TEL
Save on Rad-Tel's Quality **BRAND NEW TUBES**

NOW! { Over 500 Types
Up to **75% OFF**

1-Year Guarantee • 1-Day Service

- Send For New Tube & Parts Catalog
- Send For Free Trouble Shooting Guide

SAMPLE OF RAD-TEL'S AVAILABILITY

Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
—	1B3	.79	—	6AL5	.47	—	6BZ6	.55
—	1X2B	.82	—	6AU6	.52	—	6CB6	.55
—	3CB6	.54	—	6AX4	.66	—	6CG7	.61
—	4BQ7	1.01	—	6BQ6	1.05	—	6SN7GT	.65
—	5U4	.60	—	6BQ7	1.00	—	6U8	.83
—			—			—	12AU7	.60
—			—			—	12BH7	.77
—			—			—	35W4	.42
—			—			—	35Z5	.60
—			—			—	50C5	.53

RAD-TEL TUBE CO.
Dept. ET 55 CHAMBERS ST., NEWARK 5, NEW JERSEY
TERMS: 25% deposit must accompany all orders, balance COD. Orders under \$5: add \$1 handling charge plus postage. Orders over \$5: plus postage. Approx. 8 tubes per 1 lb. Subject to prior sale. No COD's outside continental USA.

For more details, circle 59 on page 56

ALL NEW SENCORE component substitutor



MODEL RC121

All your favorite Sencore Substitution Time-Savers in One Compact Unit

A complete range of carbon resistors, wire wound power resistors, capacitors, electrolytics, and universal selenium and silicon rectifiers.

Imagine, all of these hard to locate parts at your finger tips for on the spot substitution. Say goodbye to messy, crumpled parts, unnecessary unsoldering and soldering of components for testing purposes only. Save valuable servicing time and be sure, by substituting.

NEW . . . each section operates independently with a value close enough for every substitution need. Components in each section are isolated from chassis and from the other sections. For example, a complete power supply can be constructed using the RC121 Components only.

NEW . . . dual electrolytics provided. A new circuit enables you to substitute up to 25 single electrolytic values or 9 duals. Exclusive surge protector provides protection on both singles and duals for both you and the circuit.

You save space and money. Equivalent Sencore substitution pieces purchased individually (H36, PR111, RS106, ES102) cost you \$54.00

RC121 (all hand wired, all American made) only **3995**
RC121K (Kit) 27.95

Now in stock at your Sencore Distributor. See him today!

SENCORE
ADDISON 2, ILLINOIS

For more details, circle 62 on page 56

CATALOGS AND BULLETINS

TAPE RECORDERS: Model S505 stereo recorder, covered in literature, comes in stainless steel with black knobs, meters and hardware. It is available in a large assortment of configurations, from a 2-track recorder to the "Reverse-O-Matic." American Concertone, Inc., 9449 W. Jefferson Blvd., Culver City, Calif.

- - - for more details circle 309 on page 56

INTERCOMS: A new low-cost transistorized intercom designed for two-station use, model TIB-2 "Twin Com," is described in literature. Powered by eight penlight batteries, it provides communication over distances of several hundred feet. Remote station features a lock-on for monitoring, yet the master can talk to the remote at all times. Bogen-Presto Div., The Siegler Corp., Box 500, Paramus, N. J.

- - - for more details circle 310 on page 56

TUNERS: A technical bulletin describes a new FM multiplex broadcast tuner, the 350R, a rack mounted version of the 350 consumer tuner. Sensitivity is 2.5 μ V (IHFM), 1.0 μ V with 75 ohm input and matching balun transformer. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.

- - - for more details circle 311 on page 56

TOOLS: Illustrated bulletin No. 1261 features a small size pocket clip style screwdriver, 4 1/4 in. overall length. Also covers a special terminal wrench for use on imported transistor radios. Xcelite, Inc., Orchard Park, N. Y.

- - - for more details circle 312 on page 56

INTERCOMS: A System Selector lists thirty-three types of service that can be rendered by intercom, ranging from a two-station wireless baby sitter to a one-hundred station plant or paging system, and tells how each feature may be utilized to deliver the type of intercommunication needed. Includes a compatibility chart. Talk-A-Phone Co., 5013 N. Kedzie Ave., Chicago 25, Ill.

- - - for more details circle 313 on page 56

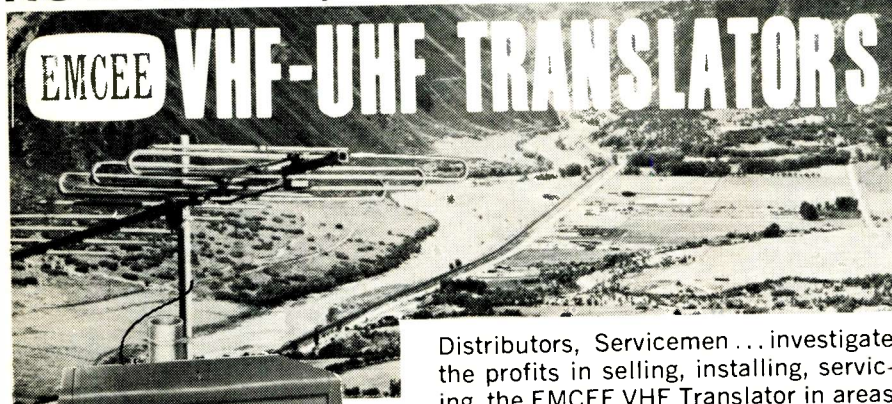
PREAMPLIFIERS: Four-page, 2-color, bulletin introduces CECO's new line of UHF ultra-low-noise preamplifiers for single reception from channels 14 through 83. General specifications and model specifications included. Community Engineering Corp., State College, Pa.

- - - for more details circle 314 on page 56

TAPE RECORDERS: Model 400 Cosmopolitan tape recorder-radio combination, covered in literature, features versatility of power source, four 1.5 v flash-light batteries and external a-c. Tape speeds, 1 7/8 and 3 3/4 ips. American Concertone, Inc., 9449 W. Jefferson Blvd., Culver City, Calif.

- - - for more details circle 315 on page 56

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For more details, circle 28 on page 56

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For more details, circle 46 on page 56

ELECTRONIC TECHNICIAN

NEW BOOKS

FM STEREO MULTIPLEXING.
By Norman H. Crowhurst. Published by John F. Rider Publisher, Inc. 282 pages, soft cover, \$1.25.

Here's a most timely book. It covers the FM stereo system of broadcasting and reception in a welcome manner. FCC standards are explained and receiver circuitry is thoroughly covered from theory to practical circuit operation. A third of the book is devoted to installation and conversion problems, alignment and performance checks, and troubleshooting procedures. Many schematics of stereo tuner sections and complete stereo FM adapters are included. This is an excellent technicians' primer for stereo FM.

RCA RECEIVING TUBE MANUAL, RC-21. Published by Electron Tube Division, Radio Corp. of America, Harrison, N. J. 480 pages, soft cover. \$1.

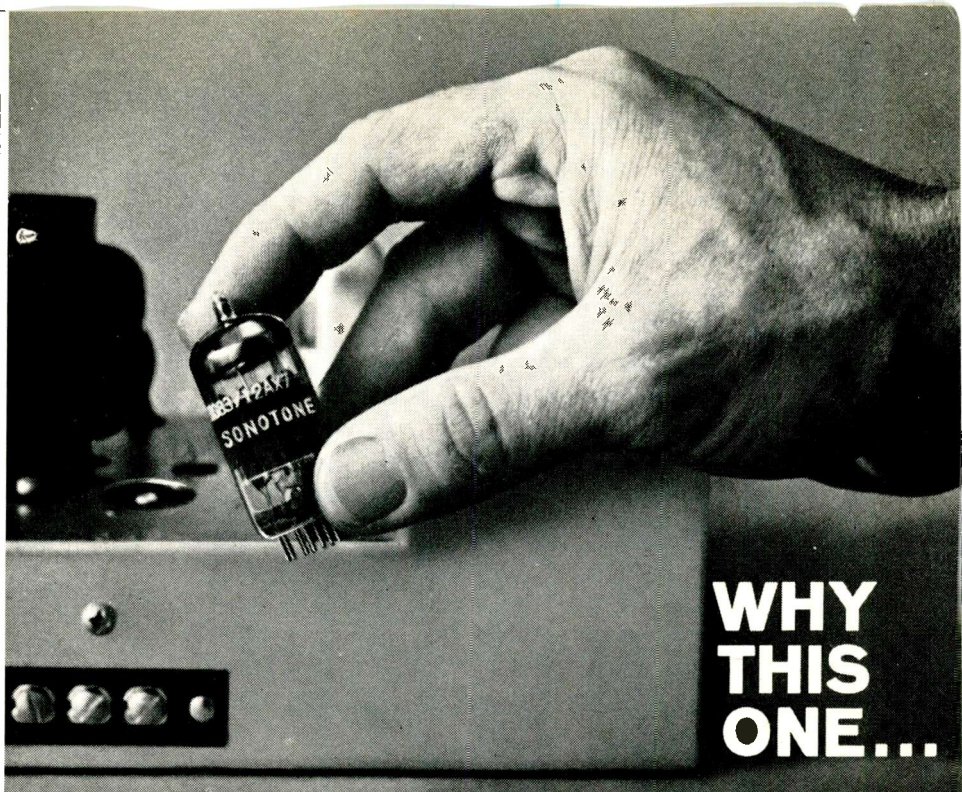
The latest edition of this popular tube manual is the fattest one yet. It has technical data on over 900 receiving tubes, including nuvistor, novar and other new tube types. Also, data on more than 100 types of black-and-white and color picture tubes. The Manual's text material on electron tube theory, installation and application is an excellent course in itself. Another popular feature, the Circuits Section, has been expanded to include 26 circuits. This respected reference manual is still one of the best buys available to radio-TV service dealers.

MASTER CARTRIDGE SUBSTITUTION GUIDEBOOK. By Jack Strong. Published by John F. Rider Publisher, Inc. 96 pages, soft cover. \$2.

Here's an especially helpful "tool" for service dealers who sell and/or service record players. It's a comprehensive reference guide

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and not just any 12AX7A?

All 12AX7A schematics look alike. And at first glance, all 12AX7A tubes also look alike. Yet, the use of a Sonotone 12AX7A tube can make a world of difference in performance.

The 12AX7A, used in signal stages for high gain, has virtually become the standard in the low level stages of audio preamp circuits where noise, hum and tube microphonics become major problems. If you examine a Sonotone 12AX7A closely, alongside another, you will see a significant difference in construction. You will notice a trident shaped, tongued structural member at the top of the tube — called a "Damper Mica." The tongue supports the two cathodes — acts like the leaf of a spring, absorbing the shock of external impact and vibration.

As a result of this unique construction, the Sonotone 12AX7A is remarkably free from microphonic tendencies. It is also sturdier and more capable of withstanding impact and vibration without physical damage or electrical malfunction.

In addition, the Sonotone 12AX7A employs a coiled heater which restricts unwanted magnetic fields in the heater cathode assembly when AC is used for the heater supply. This reduces the AC hum component to a point where it is no longer necessary to use rectified and filtered heater supplies.

Small wonder that the Sonotone 12AX7A is specified by the leading manufacturers of high fidelity amplifiers. It is their way of insuring the quality of their instruments.

The next time you replace a 12AX7A, remember that not all of them are alike. There are enough distinctive qualities in the Sonotone 12AX7A to make its choice a sure and safe one. That's the point about all Sonotone tubes—all have that extra something that spells better performance.

In addition to the high-gain 12AX7A, Sonotone also features selected quality audio output tubes—the EL34 and EL84—available in matched pairs for push-pull applications.

Next time the schematic calls for the 12AX7A, or any type of tube for home entertainment or industrial application — replace with Sonotone.

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For more details, circle 64 on page 56

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NEW BOOKS

that indicates the phonograph cartridges produced since 1930 — monophonic and stereophonic. The cartridges are listed both numerically and alphabetically with their stock numbers and substitutes. Another section of the book lists manufacturers and their cartridge numbers and respective record player models. Thus, this *complete* major cross-reference cartridge manual can eliminate the frustrations of trying to determine a proper substitute or direct replacement phono cartridge.

1962 Tube Caddy TUBE SUBSTITUTION GUIDEBOOK. By H. A. Middleton. Published by John F. Rider Publisher, Inc. 61 pages, soft cover. 90c.

This is a most useful up-to-date tube substitution manual for re-

the business-like approach

to SERVICE CHARGES and RECORD KEEPING



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ELECTRONIC TECHNICIAN

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ceiving tubes and picture tubes. It contains only direct substitutes that can be made without modifying wiring and which will yield excellent or good results, noted by E or G respectively. The manual is about 4 in. x 6 in. and is less than 1/8 in. thick; ideally suited for tube caddies.

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SHOP HINTS

Continued from page 54

cision fit which is necessary to properly secure the wafer to the shaft.

I have effected similar repairs on these tuners with some special tools. One-eighth inch diameter drill rod is used for extenders of a small bit and a taper reamer. A small hole is drilled into the end of

each extender shaft, and a drill and reamer are silver soldered into the holes. These extenders eliminate possible damage to the tuner, and the disc can be secured to the shaft with a number 5/0 taper pin. — *Emil C. Lampe, Brooklyn, N. Y.*

Now... Tomorrow and for years to come!

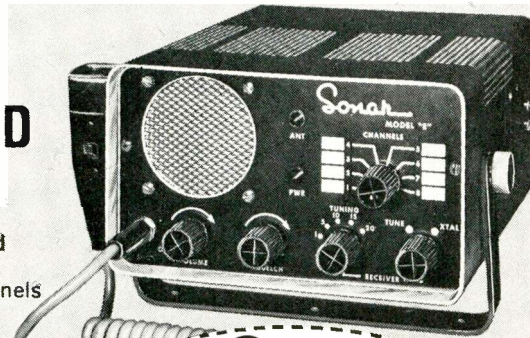
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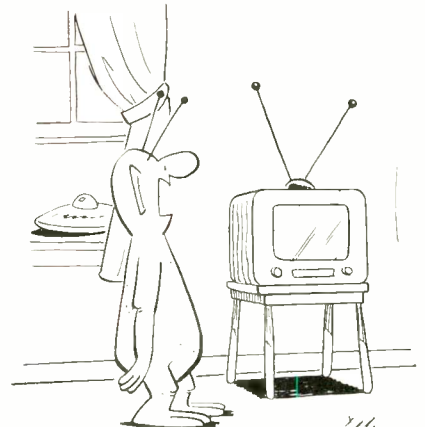
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• This appears to be an excellent method of keeping the drill chuck away from the delicate insides of TV tuners. Of course, careful use of a slow speed drill, or even a hand operated drill, can also reduce damage hazards.—Ed.



"Answer me when I'm talking to you, Earthman."

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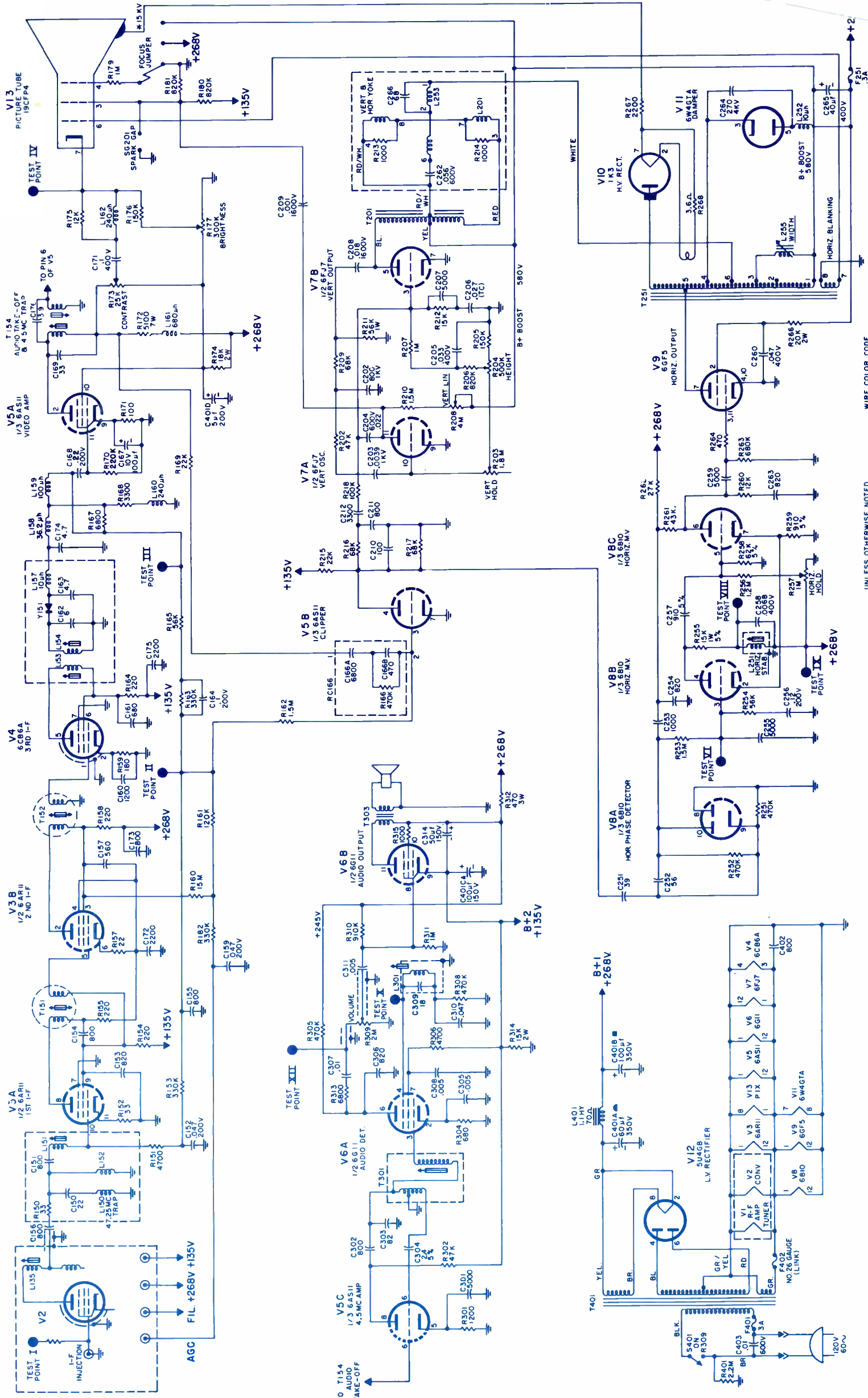
If you prize it . . . KRYLON-ize it!

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KRYLON, INC., NORRISTOWN, PA.

For more details, circle 43 on page 56

April • 1962



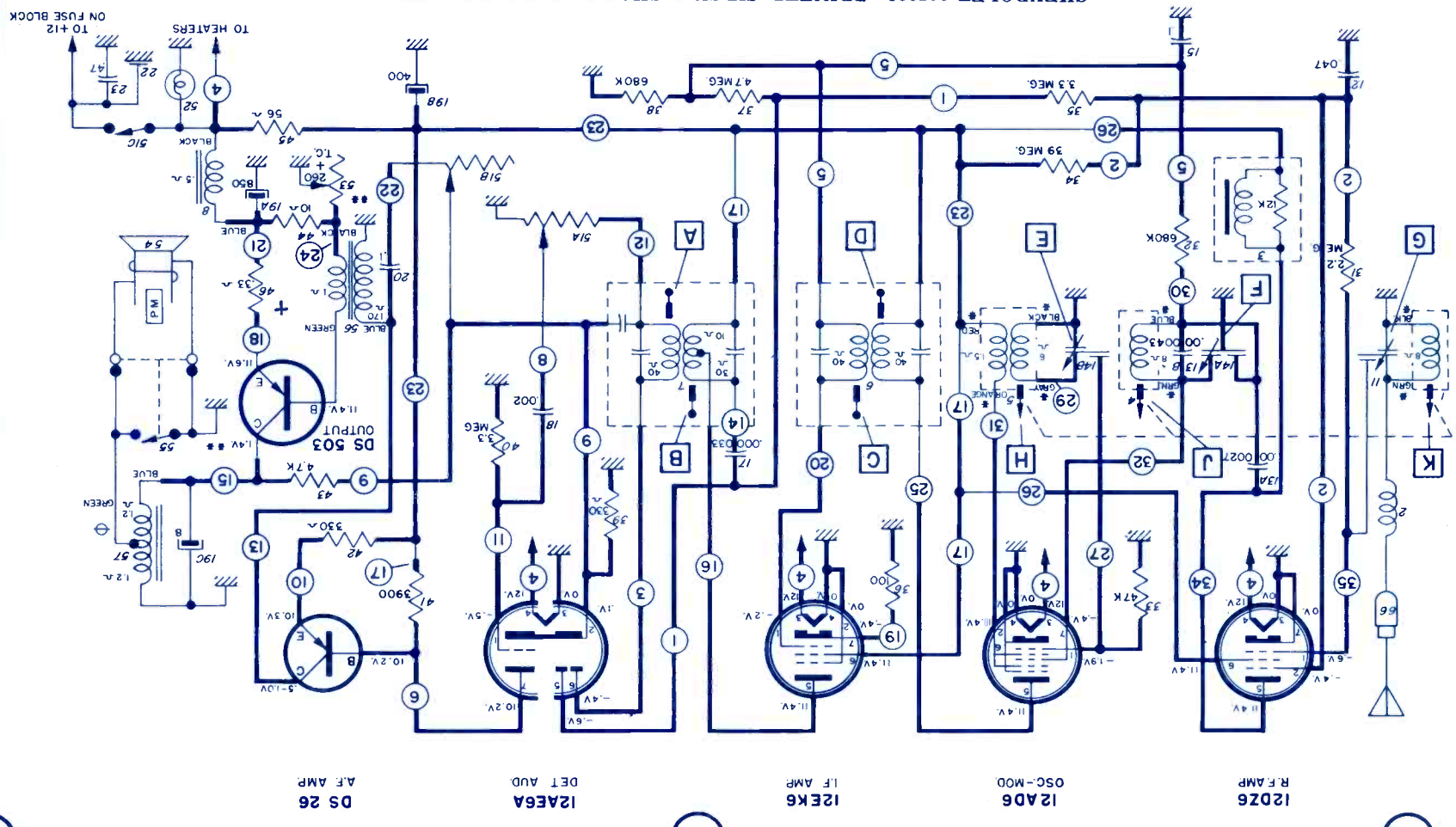
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WHITE AGC

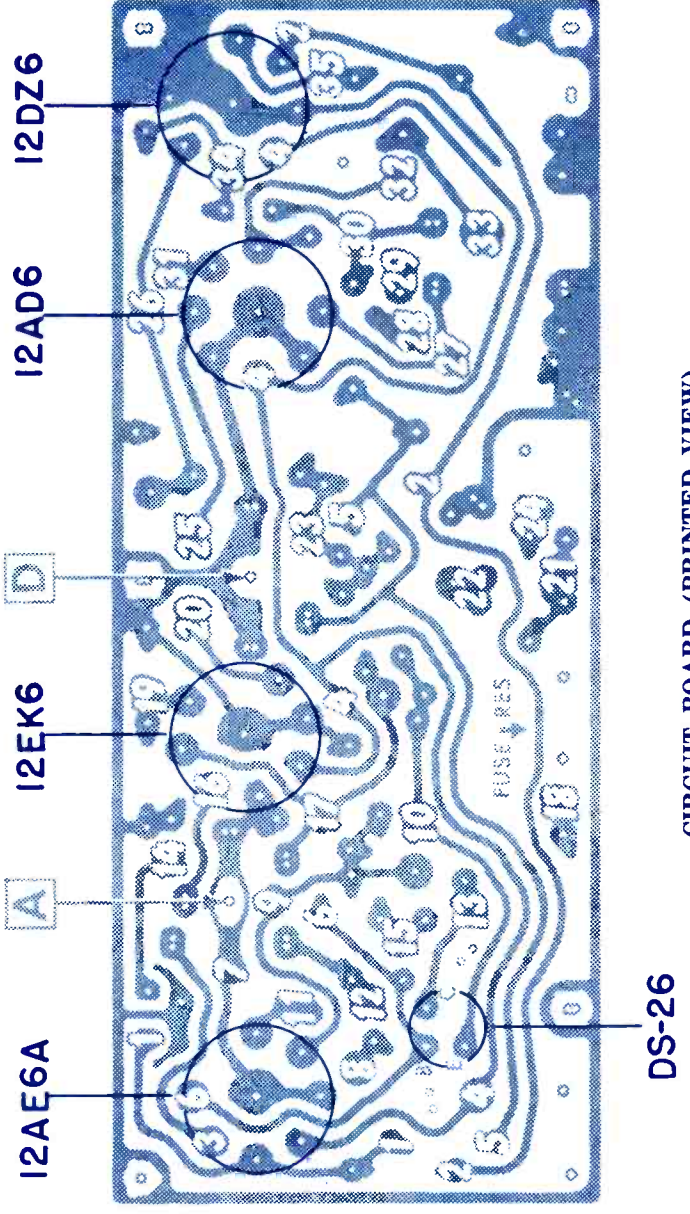
PRODUCTION CHANGE IDENTIFICATION

On chassis with code numbers below 149LX, C168 was .047μf and R170 was 1 Meg. When changing either component, both components should be checked to agree with production code.

CAUTION: COLLECTOR VOLTAGE OF DS-503 TRANSISTOR MUST BE MEASURED AT TRANSISTOR CASE (NOT HEAT RADIATOR).



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**—BEFORE MEASURING TRANSISTOR VOLTAGES, THE SHORTING TYPE SPEAKER SOCKET MUST BE OPENED AND A 4 OHM SPEAKER CONNECTED. IF TRANSISTOR IS REPLACED ADJUST BIAS POTENTIOMETER (ILLUS. 53) TO OBTAIN PROPER COLLECTOR VOLTAGE WITH 12 VOLTS INPUT TO RADIO.
†—ILLUS. 46 IS A FUSE RESISTOR FOR THE TRANSISTOR.



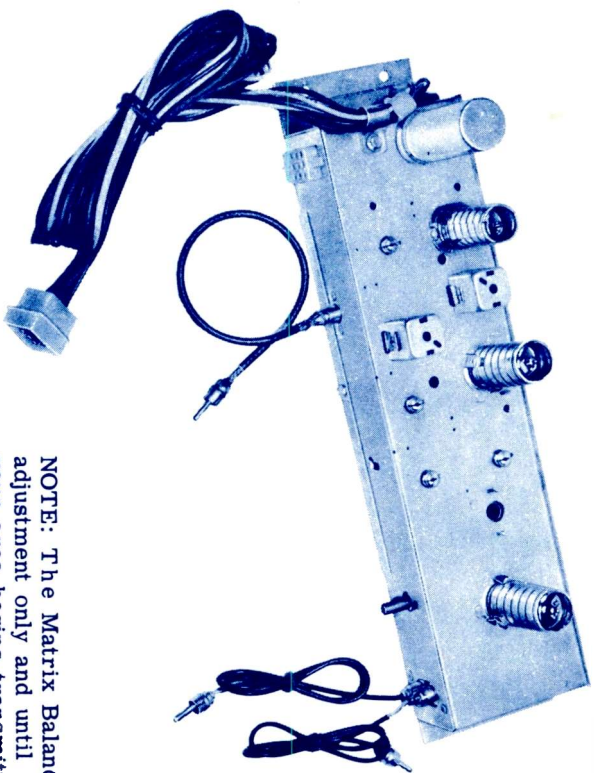
CIRCUIT BOARD (PRINTED VIEW)

SUPPLEMENT TO BULLETIN 6D-884 CHEVROLET RADIO MODEL 985332

There has been a circuit design change in subject model radio which reduces the minimum volume output. To effect this change, the values of two resistors were reduced. Should you elect to make this change on early production sets, BOTH resistors must be changed as follows:

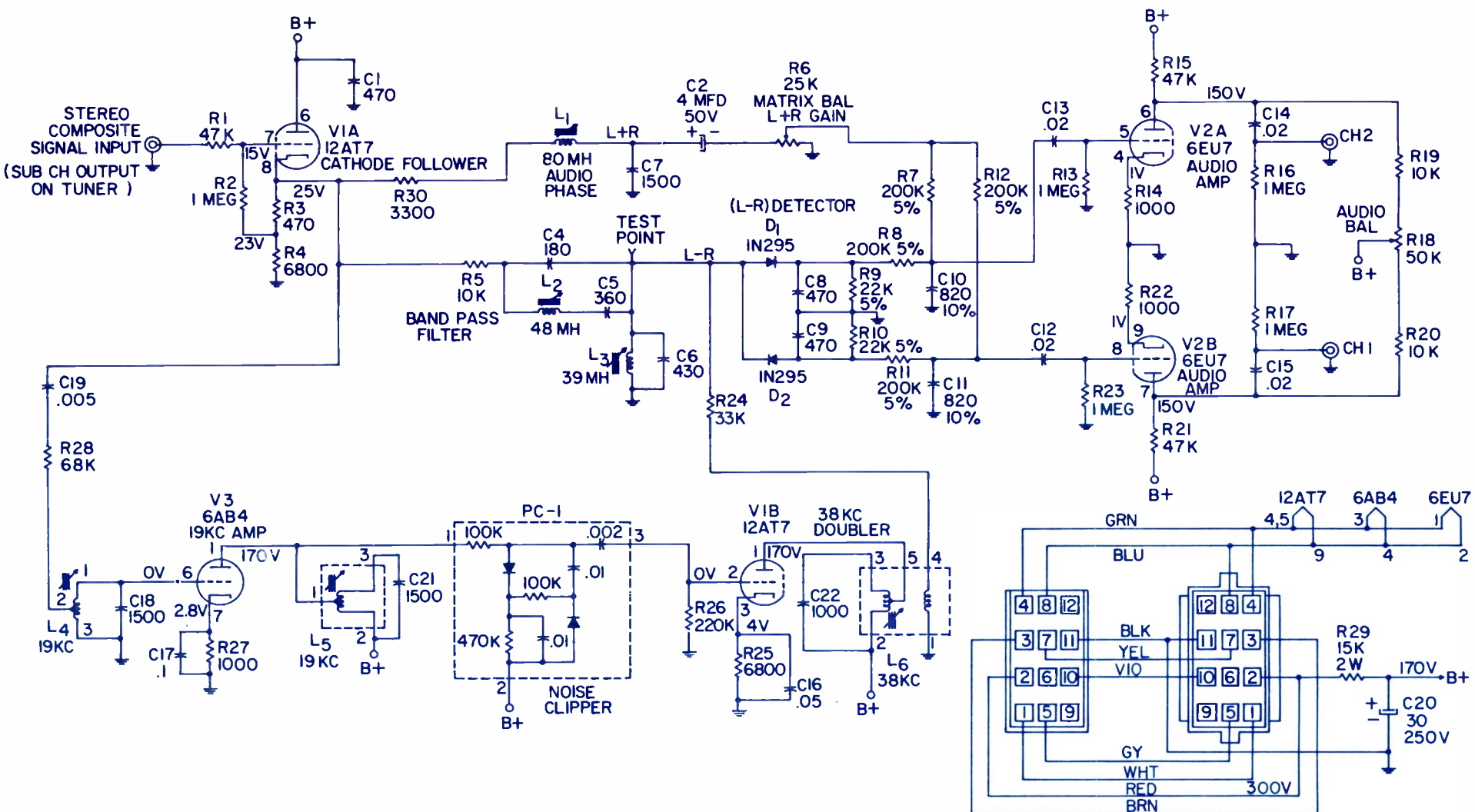
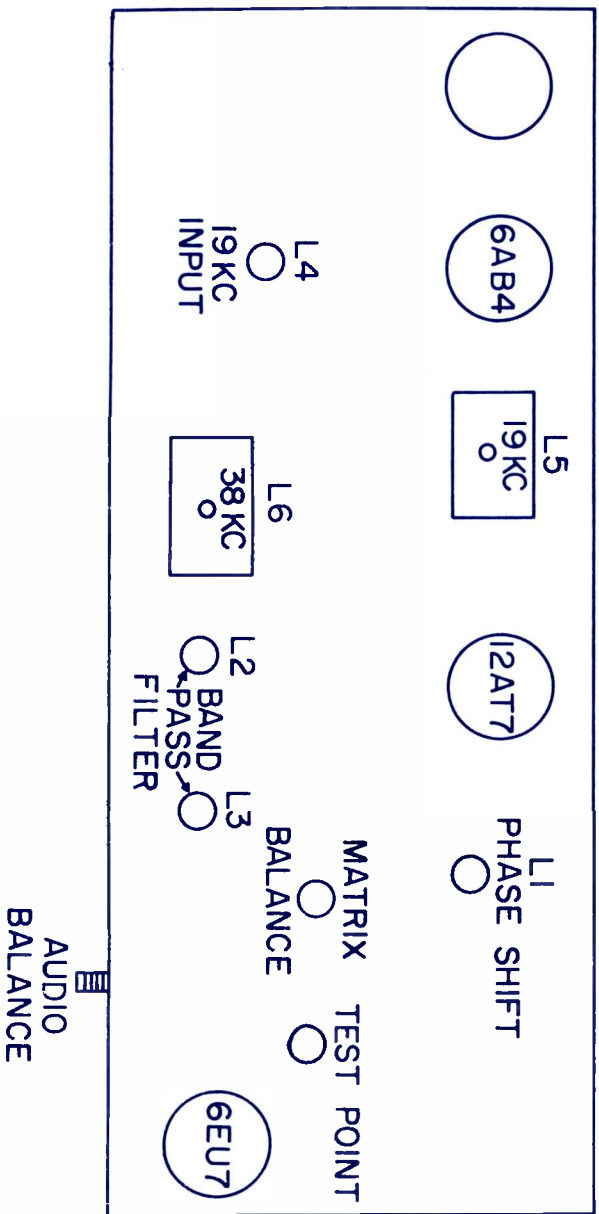
Early Production:	ILLUS. NO.	SERVICE PART NO.	DESCRIPTION
	39	1213224	Res., 330 ohm, 1/2 watt
	43	7280230	Res., 4700 ohm, 1/2 watt
Late Production Change:			
	39	1214538	Res., 33 ohm, 1/2 watt
	43	1213486	Res., 470 ohm, 1/2 watt

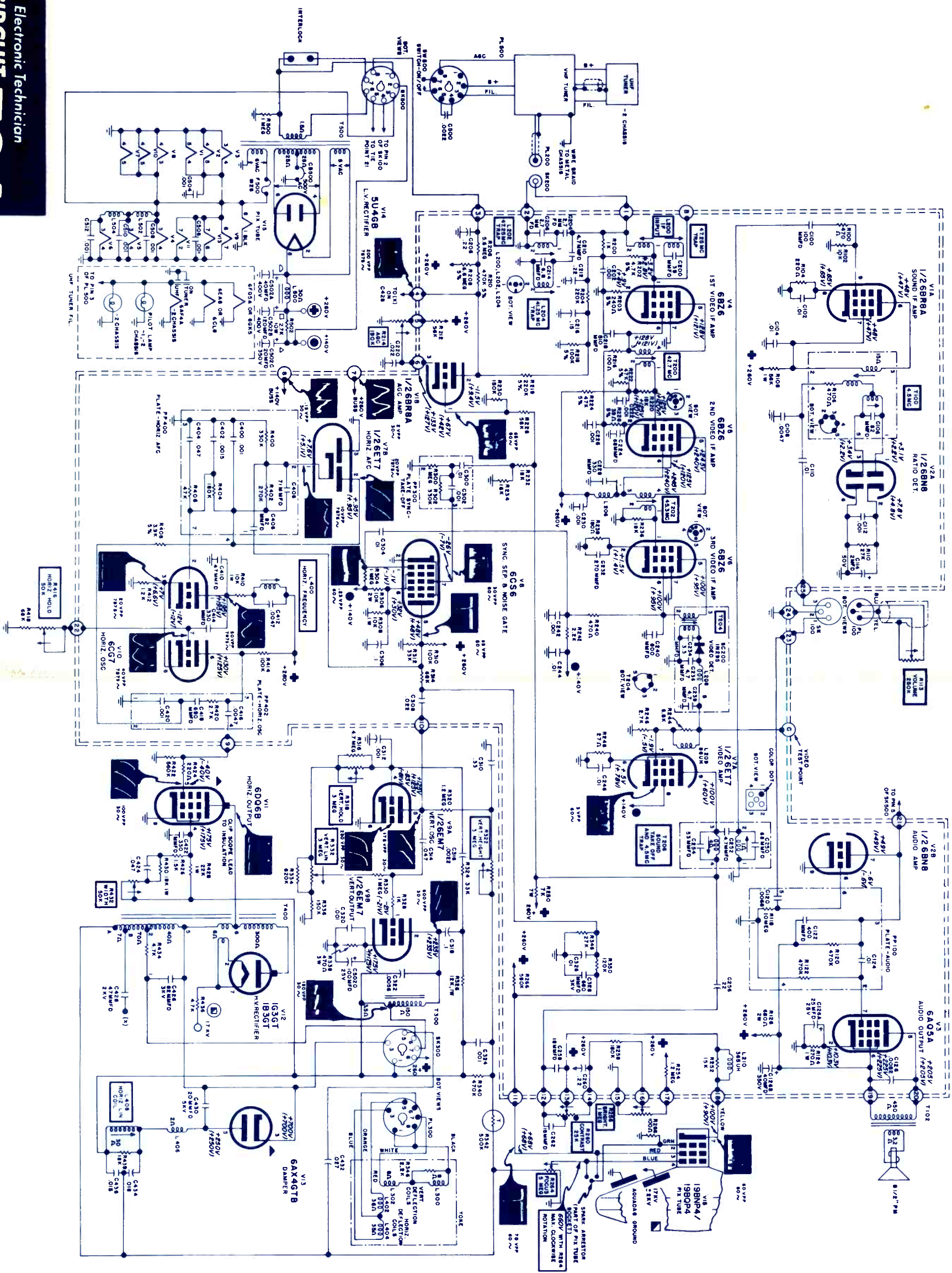
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NOTE: The Matrix Balance Control is for factory adjustment only and until such time as the station in your area begins transmitting a continuous tone test signal, or until adequate Multiplex test equipment is available, should not be adjusted. If, however, due to changing of a control or by accident, the setting of this control is disturbed, set the control for a resistance value of approximately 3500 ohms from center arm to ground. This will provide an optimum setting until such time as it can be properly adjusted.

CHASSIS LAYOUT





ELECTRONIC TECHNICIAN

Trademark

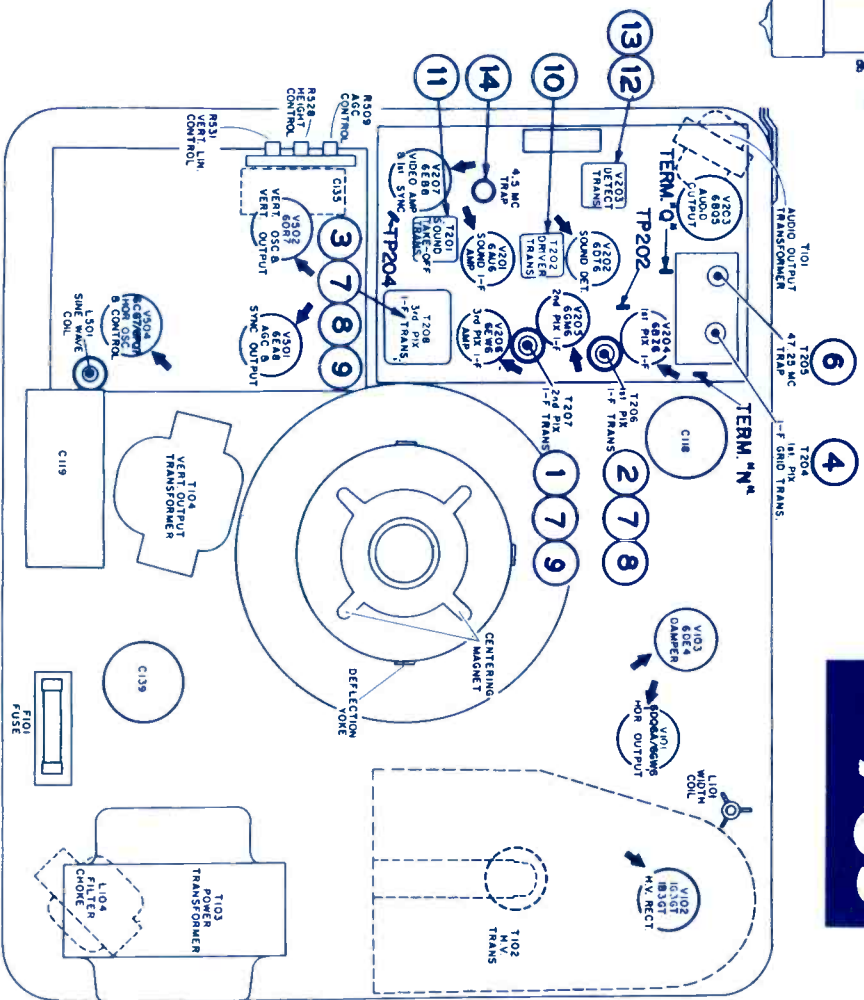
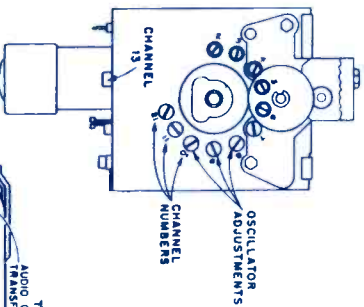
CIRCUIT DIGESTS

In This Issue (No. 116)	MAGNAVOX	702
Circuit Digest Schematic No.	Chassis 70-01	
	F-M Multiplex Adaptor	
DELCO CHEVROLET	MOTOROLA	700
Auto Radio Model 985332	TV Chassis TS 440	
	Models 19P7-1,-2,-3	
GENERAL ELECTRIC	RCA	705
TV Chassis LX	TV Chassis KCS130YAB-YAC	
HOFFMAN	SYLVANIA	704
Transistor Radio	TV Chassis 558-1,-2	
Chassis BP318—Model P708	Model 19L17 Series	

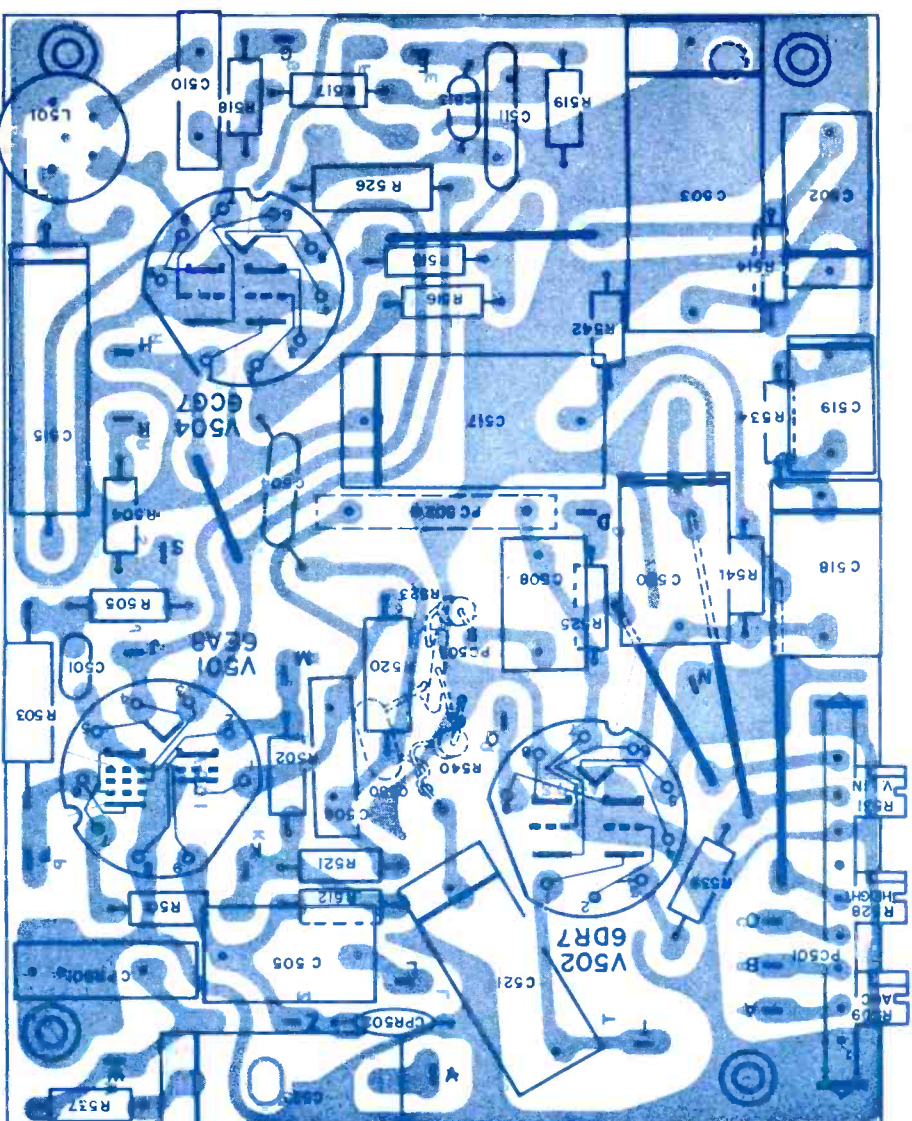


April • 1962

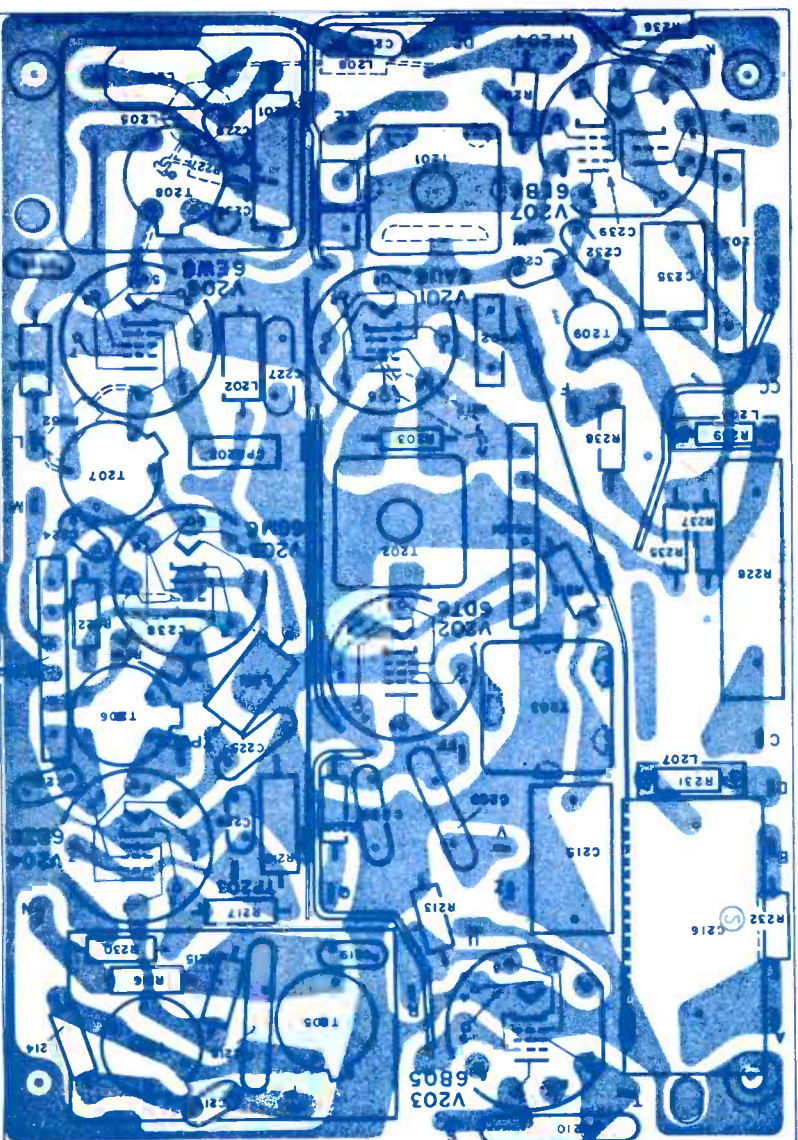
RCA
TV Chassis
KCS130YAB-YAC
Electronic Technician
CIRCUIT DIGEST
705



Chassis Rear View



PW500 Sealed Circuit Deflection Assembly
Composite Diagram



PW200 Sealed Circuit IF and Video Assembly
Composite Diagram

More Data on Reverse Side

For stronger...clearer
TV reception

Belden PERMOHM* TV Lead-in Cable



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



8225

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



8275

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



8222

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



8230

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



8226

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



8224

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

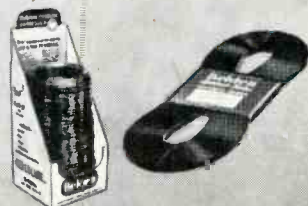
Permohm conductors are encapsulated in cellular polyethylene. This exclusive 300-ohm line design provides clearer TV reception in all areas, including areas where conditions of extreme salt spray, industrial contamination, ice, rain, or snow are experienced. It further improves fringe area pictures on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

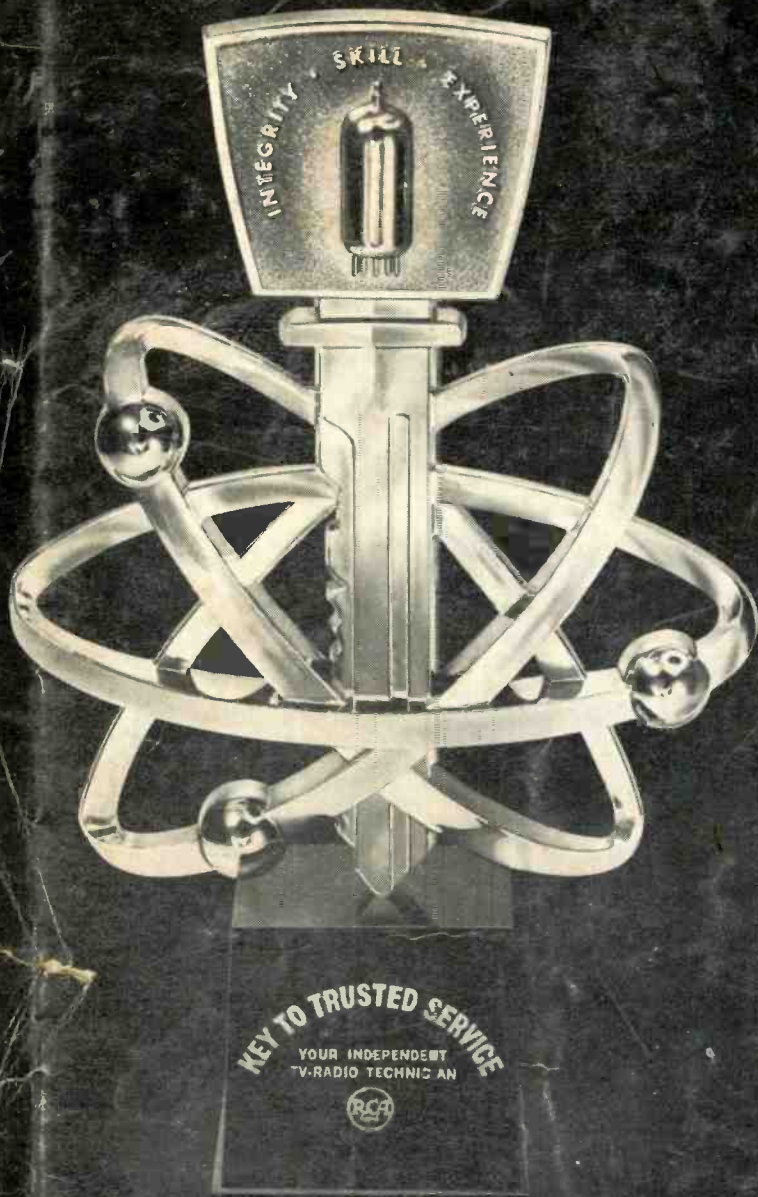
*Belden Trademark and Patent . . . U.S. Patent No. 2782251



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

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





RCA's Key to Trusted Service...

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Each day you see more and more of these *Key to Trusted Service* symbols displayed in radio-TV-HiFi service shops all over the country.

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RCA is advertising nationally in TV Guide and on Walt Disney's "Wonderful World of Color"—urging consumers to look for and patronize service shops displaying the Key statuette.

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RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



The Most Trusted Name in Electronics