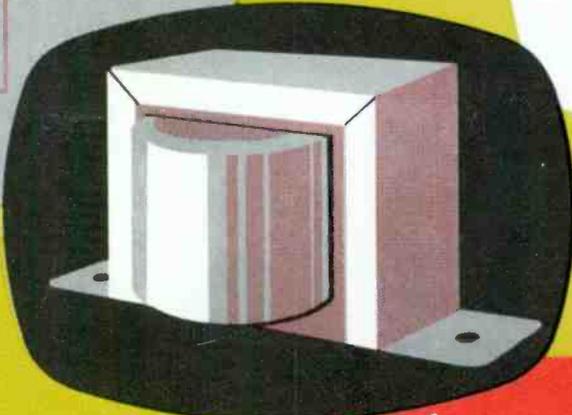
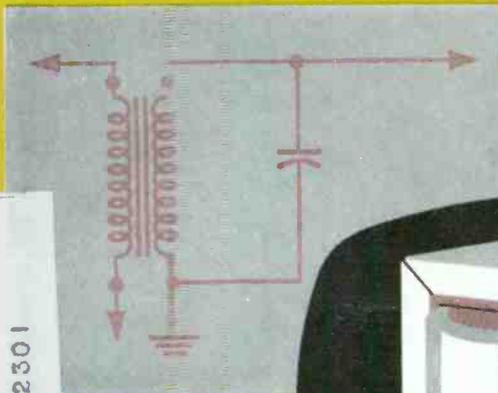
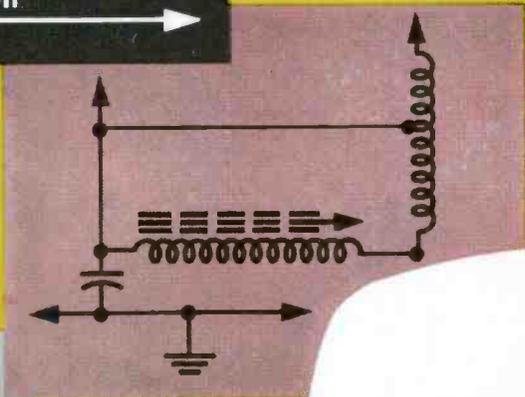
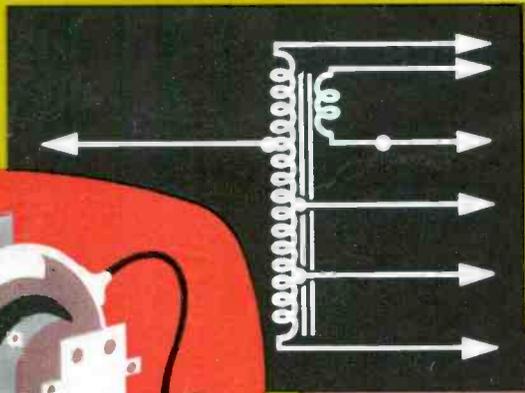
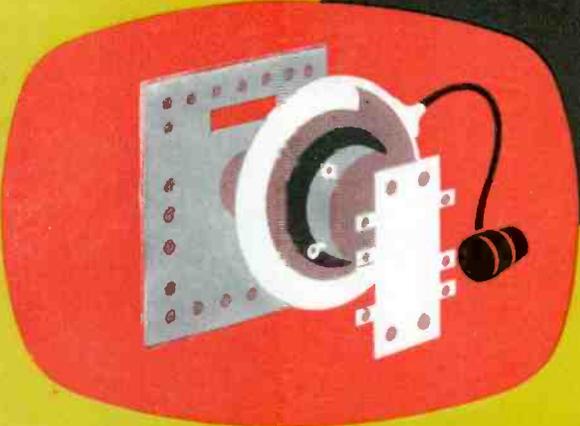


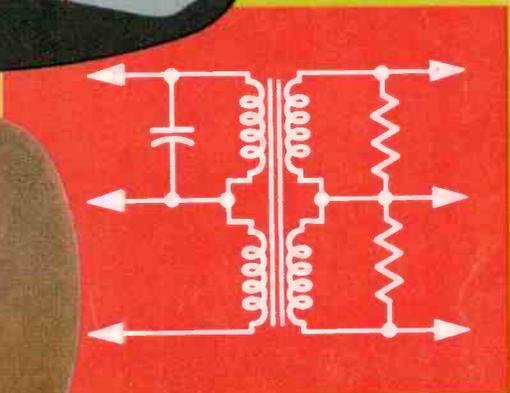
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How to Substitute
"UNAVAILABLE"

**TV
PARTS**



WALDO M. OWENS
BOX 42
JOSEPH UTAH
T11-6IN A3 9W2301

60¢

March • 1961

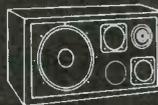
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JENSEN'S THRIFTY 4-SPEAKER
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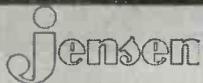


When you consider the purchase of a high fidelity speaker system be sure you look into the tremendous value of the Jensen TF-3. You can pay much more for some other recommended compact speakers... we honestly think you'll like the new Jensen TF-3 better. Hear it and compare... be your own judge and decide which is the best buy for you. Compare this 4-speaker 3-way system with its low distortion FLEXAIR* woofer... its two midrange units so smooth and free from coloration... and the sensational new SONO-DOME* Ultra-Tweeter which goes into action only above 10,000 cycles! There's a choice of genuine oiled Walnut cabinetry or the unfinished gum hardwood for painting, staining or building-in. Use a pair for an amazingly economical outstanding stereo speaker system.



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ELECTRONIC TECHNICIAN & Circuit Digests, including Service, March 1961. Vol. 73, No. 3. \$60 a copy. Published monthly by Electronic Technician, Inc. Publication Office, Concord, N. H. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone YUkon 6-4242.

Second-class postage paid at Concord, New Hampshire. Subscription rates: United States and Canada, \$5.00 for one year; \$8.00 for two years; \$10.00 for three years. Pan American and foreign countries: \$9.00 for one year; \$14.00 for two years; \$18.00 for three years. Copyright 1961 by Electronic Technician, Inc., New York. H. Reed, President, A. Forman, Executive Vice-President. Title registered in U. S. Patent Office. Reproduction or reprinting prohibited except by written authorization of publisher. Printed in U.S.A. by Runford Press, Concord, N. H.

March, 1961

FRONT COVER Aside from repairing a "dog," perhaps a technician's most frustrating moment occurs when he can't locate a replacement part at his distributor for the TV set he's repairing. Whether it's a flyback, yoke, vertical output transformer, or other coil, he can save the day for himself through intelligent use of replacement parts catalogs. The key to parts substitution and circuit modification is discussed in the article starting on page 34.



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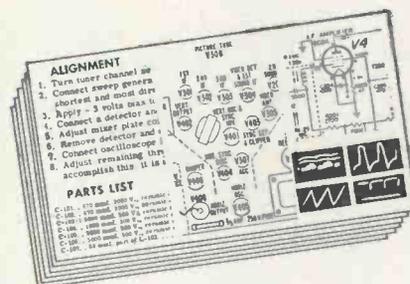
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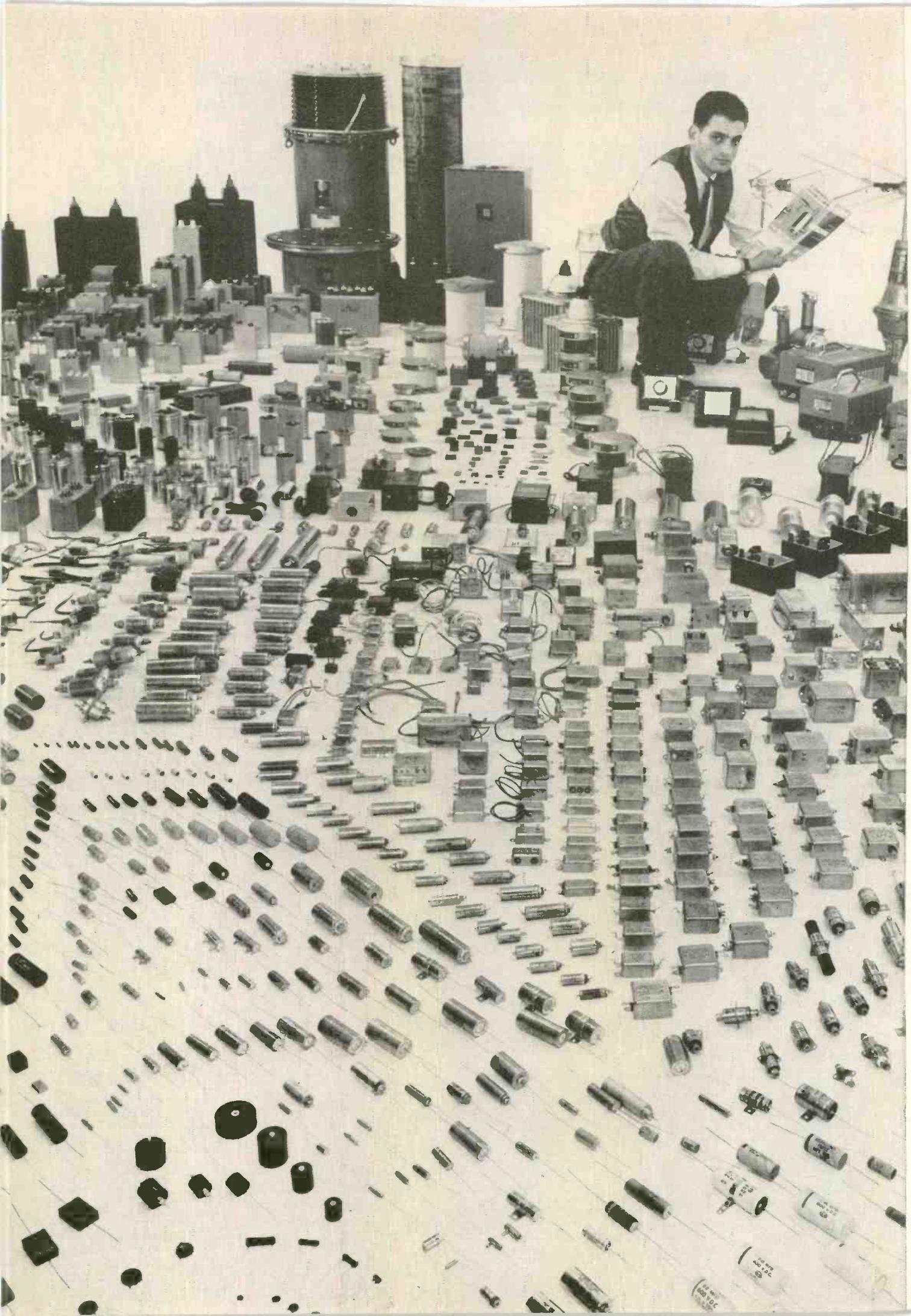
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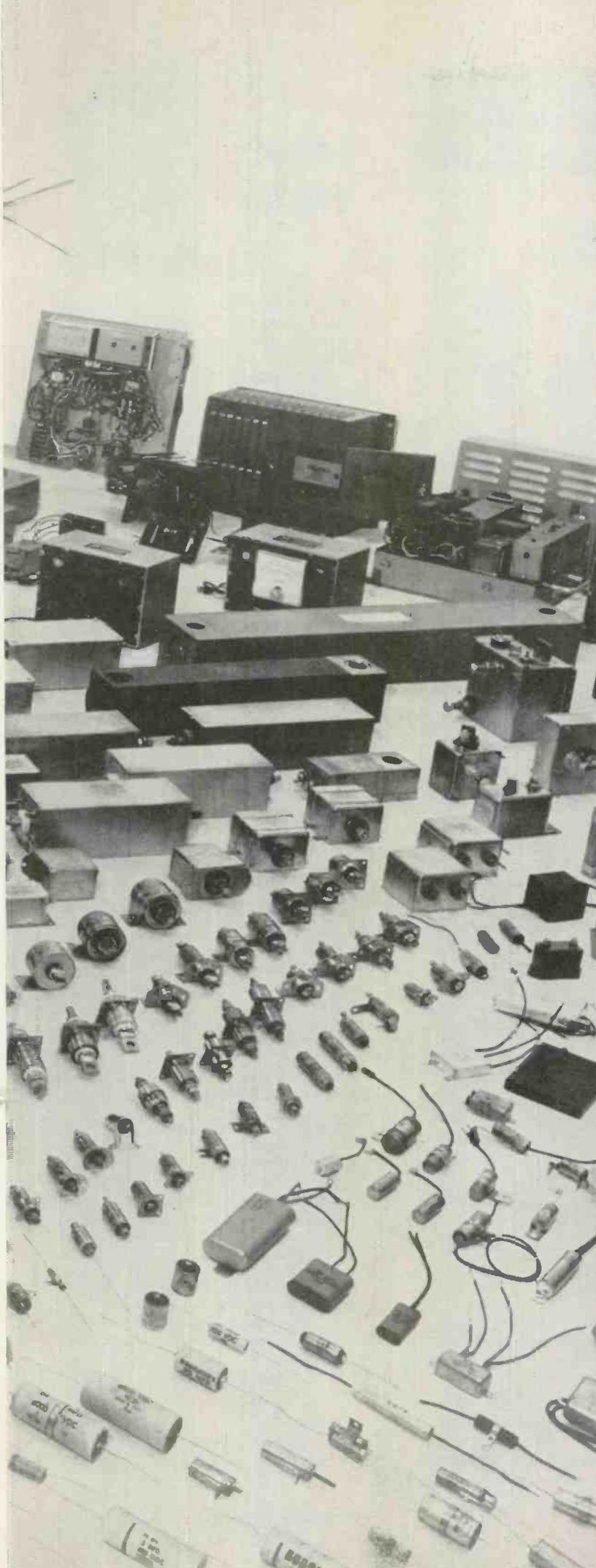
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ZENITH: "Gold Video Guard" Tuner





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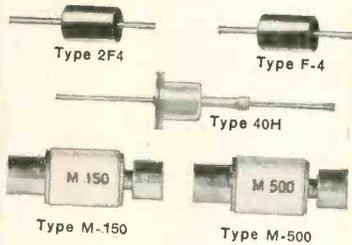
TARZIAN TUBE REPLACEMENT SILICON RECTIFIERS



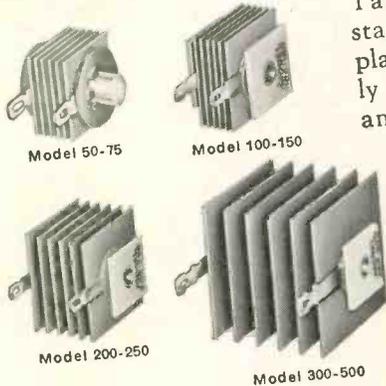
Tarzian's 9 standard models of tube replacement rectifiers are directly interchangeable with over 95% of all popular vacuum tube rectifiers. An added plus is the new Sarkes Tarzian Full Wave Silicon Rectifier (S5347), replacing 6BW4 or 12BW4 in Citizen's Band radios where maximum performance in reception quality and range is desired.

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Tarzian "Distributor Line" Rectifier Catalog

• The new "Distributor Line" Rectifier Catalog is now available on request. It contains complete details on ratings, dimensions, electrical specifications. For additional information write Section 5554A.



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For more data, circle 3-4-1 on coupon, p. 54

Editor's Memo



When the TV picture isn't being displayed properly on the CRT screen, it can have a serious effect on some viewers. For many years I've held the blissful assumption that eyestrain is the worst thing that could result from poor video and sync.

Now I've read of a report in a British medical journal that TV flicker can bring on convulsive attacks. Physicians reported five recent cases where people knelt in front of their sets to adjust the controls. Their faces were only a few inches away from the screen when the attack came.

In the words of Dr. Charles Mawdsley, senior neurologist at the Manchester Royal Infirmary, a television set, particularly a faulty one, "could provide a potent source of photic stimulation."

It has been long known that there are people susceptible to flickering lights. They can either fall into an hypnotic state or have an epilepsy type of seizure. Air Force personnel have fallen unconscious while viewing the setting sun through rotating aircraft or helicopter blades.

In ancient Rome, the writer Apuleius wrote that a seizure could be caused by the light reflecting from a rotating potter's wheel.

It is not known exactly how many people will have a fit from TV flickers, but there is evidence that a substantial part of the population is susceptible to stimulation by light flashes of certain rhythms and intensities.

Fortunately, most of the many people affected by flickering light sources do not become unconscious. That is, the impact is there, but the great majority do not fall completely under its spell.

If you should run across a TV set with flickering picture, I suggest you inform the owner immediately that failure to have it fixed immediately could have medical consequences. And if there's any fainting, brother, give that video box the once over.

Of course, there are people who will "know" that eyestrain is the worst thing that a TV picture could cause. Trance? Seizure? Never!

For any skeptic falling into this category, I can only echo Josh Billings' sentiments: "It is better not to know so much, than to know so many things that ain't so."

Al Forman

MAKE ANY TV-FM ANTENNA AN ELECTRONIC ANTENNA!



New Jerrold DE-SNOWER® Model 202 Increases Gain of Any Antenna 10 TIMES!

Out of the Jerrold laboratories, where the famous DSA-132 was born, comes the ultimate in signal preamplifiers for all channel TV (VHF) and FM reception. By combining *two* frame grid 6DJ8 dual triodes in a special low noise circuit, Jerrold's new DSA-202 develops *minimum* 20 db gain (10 times) on all TV channels and 8db (min.) on FM . . . *triple* the gain developed when using one 6DJ8. Also featured is a new lightweight iridite-aluminum weather-proof housing; no-strip twin lead terminals; and sliding access panel. All new high output remote power supply reduces a 117v AC to a safe 22 volts which goes up same cable that amplified signal comes down.

Only Jerrold assures you of proven reliability and unequalled performance based on more than a decade of designing and producing mast mounted preamplifiers . . . more Jerrold De-Snowers are in use today than all other makes combined.

See your Jerrold distributor or write for eight page booklet No. 435-286

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



Includes new power supply model 407-P. Has "on-off" switch and handy cable compensating control.



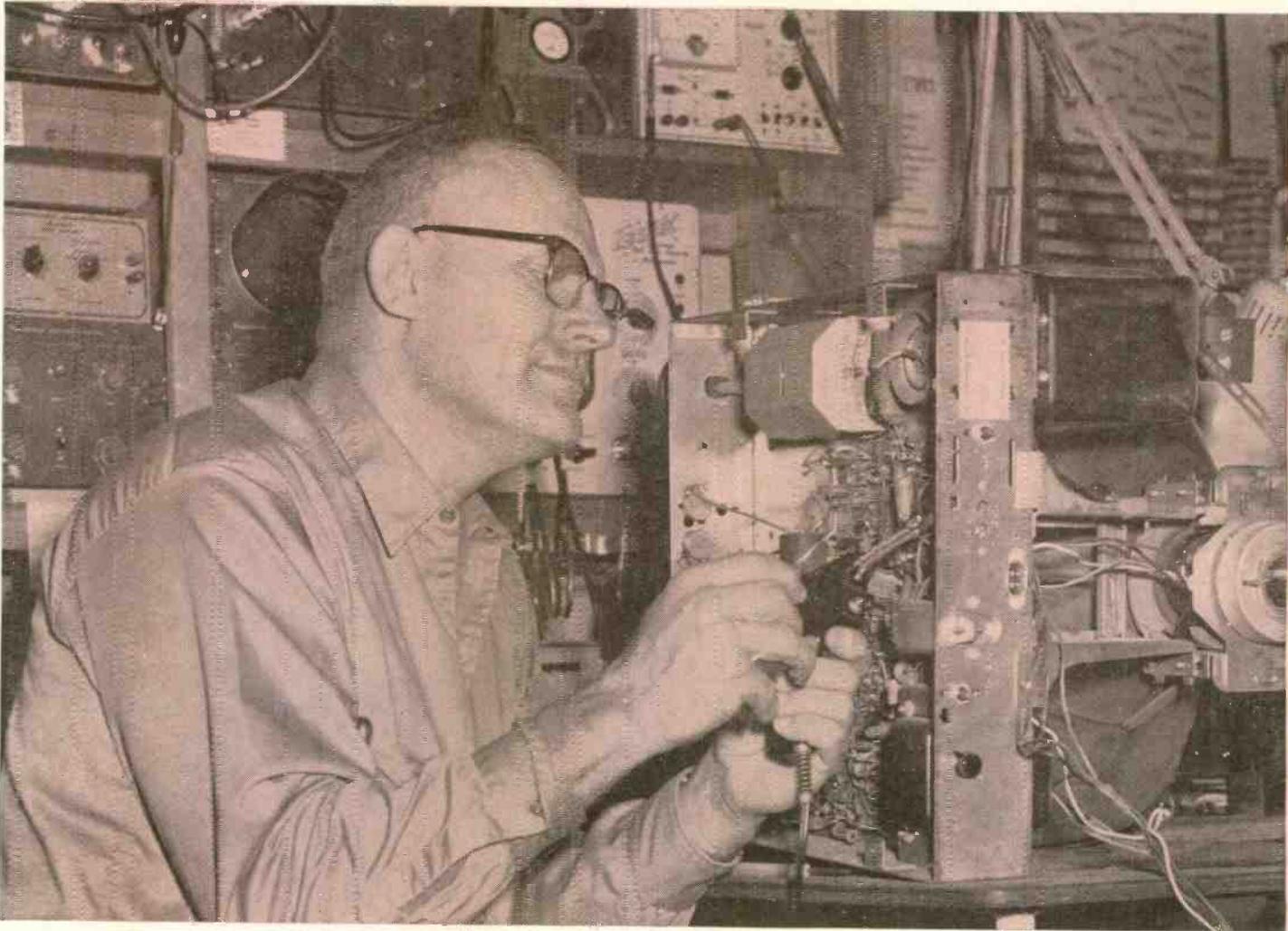
Output uses shielded coax. to eliminate antenna feed-back and interference pick-up on down-lead.

Two 6DJ8 tubes develop 20 db gain (minimum) on all TV (VHF) and FM channels.



For more data, circle 3-5-1 on coupon, p. 54

"Never a call-back with Mallory"



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TC TUBULAR ELECTROLYTICS

Economical filter capacitors. Hermetically sealed. Also special TCX type for -55°C . Twin-pack keeps leads free from kinks.



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Original 85°C capacitor, now better than ever. Etched cathode gives hum-free performance. Chassis or printed circuit mounting.



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

*U. S. Patent 2,958,838.



GOLD LABEL® VIBRATORS

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

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

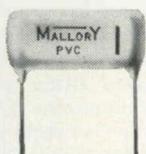
"I check every capacitor used in my work, for value tolerance and insulation leakage. I have never rejected a Mallory capacitor, and have never had a call-back due to premature failure of a Mallory capacitor in my thirty years of servicing electronic equipment."

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



Vern W. Maxwell in his shop, and (above) buying his "Voodoo cooler" Mallory kit from Woodbur D. Ryan of Bruce Electronics, Springfield, Illinois. Vern's entry in the Mallory "Cool Deal" contest won first prize for him and for Ryan.

Distributor Division, Indianapolis 6, Indiana



MALLORY PVC CAPACITORS
 New, blue Mylar** capacitors. Withstand moisture, heat, bending of leads and overloads.
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MALLORY MERCURY BATTERIES
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GEMS
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RMC DISCAPS®
 Quality standard for original equipment. In handy 3" x 5" file card package.
 ®Trademark Radio Materials Company, a Mallory division.

For more data, circle 3-7-1 on coupon, p. 54



Listen!

It's the new
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No stereo cartridge—not even the finest magnetic in the world—outperforms it!

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

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LETTERS

To the Editor

No Discount for Hobbyists

Editor, ELECTRONIC TECHNICIAN:

I would like to add a thought to Mr. William Totten's letter "Who's to Purchase" in your January 1961 issue [Mr. Totten wants to buy parts from distributors for his hobby, radio controlled aircraft.] One of my hobbies happens to be skiing. I did not run around town trying to buy the skis wholesale. What is wrong in paying the retail price for any materials needed to pursue one's hobby? I really can't see the reason for giving a "dealer discount" to a hobbyist or a ham. Isn't this just down-right chiseling?

MELVIN COHEN

Suburban Television Service Co.
Hudson Falls, N. Y.

Distributor Sales to Public

Editor, ELECTRONIC TECHNICIAN:

I am fairly new in TV servicing. I'm also a fairly new subscriber to your excellent magazine. We here in Akron have a serious customer relations problem with the general public, due to the Olson Radio Co. doing cut-throat business with the public. I do want to publicly thank the Warren Radio Co. in Akron for their excellent cooperation with the local TV technicians. They do *everything* in their power to refrain from doing business with the man on the street. They can't shake the truth out of a strange customer who claims to be a serviceman, but they do have an excellent way of compensating us TV technicians. They give the technician who happens to be in the store at the time, or next technician who comes in, the difference between the list price that Warren Radio charged the consumer purchaser and the dealer net. If all distributors would do this, then no TV technician should ever have any complaints.

HERB ACARD

Akron, Ohio

Good Filing Idea

Editor, ELECTRONIC TECHNICIAN:

I am glad to see the new monthly section, "TV Manufacturers Technical Digest," added to your magazine. I am making a card filing system for TV models and magazine articles for troubleshooting or corrections on TV sets. So when a set comes in the shop with an out of the ordinary trouble, I can check my files for tough dog data or manufacturer corrections on that particular set. It may cut down troubleshooting time considerably.

ROBERT C. OSMAN

Millington, Tenn.

(Continued on page 12)

FOIL this
**'SKULKIN'
VARMINT**

THE
OLD TUBE
RUSTLER



PHILCO announces a sensational
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ROUND-UP**

Here's your chance to get a big bounty for your old, burned out receiving tubes. Yes, turn them into cash by trading them in on new Philco tubes you use every day. We'll smash all old tubes you trade in.

PHILCO—the brand mark of **QUALITY** in receiving tubes

You can
rope in a husky

7¢ FOR
EVERY
OLD TUBE
YOU TRADE IN!

LIMITED TIME ONLY!

(March, 1961)

SEE YOUR PHILCO DISTRIBUTOR!

7 Volkswagen Panel Trucks save TV



NO SHOE HORN NEEDED! Two of Wally Lang's men find loading TV sets aboard a VW almost a pleasure. No squeezing or

crawling. Walk in-walk out. Double side doors that measure 47 inches high by 46 inches wide make the job easy.

Wally Lang, President of General Electronics, Inc., of St. Paul, Minnesota, bought his first VW Truck in 1957. He now owns 7 VWs as well as 9 other-make trucks. He reports on his experience with his busy fleet. "I think that anybody in our type of business—house-to-house TV service—is foolish not to buy Volkswagen. We can drive a VW for about $\frac{1}{3}$ the cost of our other trucks. Our VW Trucks average 10 hours a day on the job, 6 days a

week, 1,500 miles a month. With VW we get 22 miles per gallon, which is just twice what our other trucks give us. At 31.4¢ a gallon, we figure the VWs save us \$150.00 worth of gasoline a month!"

Mr. Lang went on to talk about other features of the VW Trucks. Maneuverability in congested traffic. Agility in stop-and-go driving. Parking ease. Cargo capacity. Walk-in, walk-out loading. And the dependability of VW Dealer Service.

business \$150 a month on gas alone!



© 1961 Volkswagen of America, Inc.



WORD GETS AROUND! Mr. Lang uses the Volkswagen Panel Truck's 106.7 square feet of outside display space to advantage. St. Paul residents know who he is, what he does, where to call and what his service will cost.



CAPACITY TO DO A DAY'S WORK! This picture of one of Lang's VW Panel Trucks shows how every inch of the 43 square feet of cargo floor space can be utilized. And the capacity of 170 cubic feet allows plenty of room for large TV sets, portables, tools and servicing equipment, too.

There are now over 100,000 owners of VW Trucks in the U.S. Volkswagen is the advanced truck idea that's been proven on the road for the past 11 years.

Are you ready for a VW Truck? You are if you want a truck that costs less to buy, less to operate, and less to service. The VW Panel Truck has a payload capacity of 1,830 pounds. The suggested retail price (East Coast Port of Entry) is \$1,895

(West Coast \$2,015). To help you make the right decision, talk to your Authorized VW Dealer soon. Ask for a demonstration. And get your free copy of the 60-page illustrated booklet—"The Owner's Viewpoint." It documents with facts and figures VW Truck performance and owner experience in a wide variety of businesses. It shows what *you* can expect to get from a Volkswagen too.



For more data, circle 3-11-1 on coupon, p. 54

from **EICO**... a completely new
CITIZENS BAND TRANSCEIVER

that meets
FCC regulations*



Model 760: 117 VAC
 Kit \$59.95 Wired \$89.95
 Model 761: 117 VAC & 6 VDC
 Model 762: 117 VAC & 12 VDC
 incl. mounting bracket: Kit \$69.95, Wired \$99.95

*EICO premounts, prewires, pretunes, and seals the ENTIRE transmitter oscillator circuit to conform with FCC regulations (Section 19.71 subdivision d). EICO thus gives you the transceiver in kit form that you can build and put on the air without the supervision of a Commercial Radio-Telephone Licensee!

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Everything in top-quality
TEST EQUIPMENT for Shop
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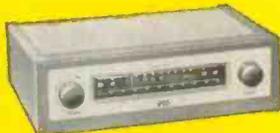
COLOR & Mono DC-5MC
 Lab & TV 5" Oscilloscope #460
 Kit \$79.95, Wired \$129.50
 3" Push-Pull Oscilloscope #425
 Kit \$44.95, Wired \$79.95



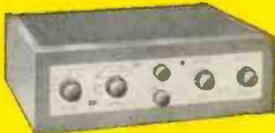
Peak-to-Peak VTVM #232
 Kit \$29.95, Wired \$49.95
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 finest quality at 1/3 the cost.



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 Includes Metal Cover and FET.
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Stereo Dual Amplifier-Preamp HF4
 Kit \$69.95, Wired \$109.95
 Includes Metal Cover.
 Stereo Dual Amplifier AF4
 Kit \$38.95, Wired \$64.95
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Write for free catalog ET-3 and name of nearest distributor.
 Most EICO distributors offer budget terms.



3300 N. Blvd., L.I.C. 1, N. Y.
 Add 5% in the West

SEE EICO AT IRE BOOTH 3509

For more data, circle 3-12-1 on coupon, p. 54

(Continued from page 8)

TV License Survey

Editor ELECTRONIC TECHNICIAN:

This TV licensing survey in your Jan. issue confirms much of our own findings, and since yours was an unbiased check, this pleases us. We are convinced that we are on the right track in supporting license where local people find need of it. As we expected, those who do TV service on a part-time basis with no real intent to make of it a life's work, but simply an opportunity to make an extra "buck," are opposed to license. This is shown in your time and earning category reports. We are pleased that in both of these categories substantial numbers want license. These undoubtedly are the part-timers who are sincerely trying to make a career of service. These the entire industry needs greatly.

Your finding that a majority of all servicers are not association members does not surprise us. It is a known fact that across the nation the part-timers numerically outnumber the actual professional servicers by as much as 20 to 1. Most (not all) of these people are not even eligible for association membership. Few associations have a sincere part timer who operates an actual business.

We were surprised to a degree with your report on the "Years in TV-Radio Work" category. Without seeing the actual survey forms, it is hard to analyze this phase. It would seem that those who have been in the business the longest are so well established that they feel they can get along strictly on their own. I am sure, for instance, that my personal service business, which has been in operation since 1921, will survive even total captive service and hordes of marginal part-timers. I would, however, be happier if I could some time in the future be able to have my sons take over a business which they could prosper in.

The slight edge against licensing in the over 1,000,000 population chart is due undoubtedly to the indicated lack of interest of technicians. It should be remembered that in these cities the business establishments are bigger and that many of the technicians are unionized, so feel their future is secure. Further, because of the shortage of good technicians, even the relatively incompetent man is in demand. It is obvious then that neither would want the status quo disturbed.

FRANK J. MOCH
 Executive Director

NATESA
 Chicago, Ill.

... Even though I voted "no" in your license poll, I'm sure no repairman is against a good licensing bill. My fear is that only an inadequate bill is the most we can expect; an adequate one would put too many "TV repairmen" out of business. Our men who believe licensing will help to remove the gyps haven't heard the other side. Are they aware licensing requirements are apt to be sufficiently low to satisfy the greater portion of those men whose only outlook in licensing is that it will (they hope) oust the amateur? Has it been brought to light why licensing will not, at all, satisfy that campaign promise receiving number one billing: "to eliminate the gypts?"

Oh, for an association of us men who collectively agree it is not the amateur who threatens our prestige, but the unethical shopowner! Those misleading statements and those false promises—even the best technician finds what a detriment they can be; but, the man who passes a too-easy exam by the skin of his teeth, he's the one who makes us look bad—particularly if he runs a business. Technical knowhow is very important and it is the lack of same which causes many men to operate unethically.

Wasn't the question, "Do you favor licensing?", not to be taken too literally? Wasn't it to mean: "Do you think those in whose hands licensing will fall, will handle it right?"

What say, "yes" voters?

OSCAR SCHECTAR

Schectar TV Service
 Pittsburgh, Pa.

Two outstanding products by the HIDDEN

500*

who plan for your future:



DIFILM[®] BLACK BEAUTY[®] CAPACITORS

molded tubular



DIFILM[®] ORANGE DROP[®] CAPACITORS

dipped tubular

TWO GREAT TUBULARS . . . TAKE YOUR CHOICE!

(±10% Capacitance Tolerance is standard at no extra cost)

- Sprague Difilm Capacitors can't be beat! Dual-dielectric construction combines the best features of both Mylar[®] polyester film and special capacitor tissue. And for additional reliability, Difilm capacitors are impregnated with Sprague's HCX[®], a solid impregnant which produces a rock-hard capacitor section—there's no wax to drip, no oil to leak!
- **BLACK BEAUTY Molded Tubulars** are actually low-cost versions of the famous Sprague high-reliability capacitors used in modern military missiles. They're engineered to withstand 105°C (221°F) temperatures . . . even in the most humid climates! And their tough, molded phenolic cases can't be damaged in handling or soldering.
- **ORANGE DROP Dipped Tubulars** are the perfect replacement for radial-lead capacitors now used by leading manufacturers of TV sets. Leads are crimped for neat mounting on printed wiring boards. Extremely small in size, they'll fit anywhere, work anywhere. And they're double-dipped in epoxy resin for extra protection against moisture.

* The "Hidden 500" are Sprague's 500 experienced researchers who staff the largest research organization in the electronic component industry and who back up the efforts of some 7,000 Sprague employees working in 14 manufacturing operations—four at North Adams, Mass.; Bennington and Barre, Vt.; Concord and Nashua, N. H.; Lansing, N. C.; Grafton, Wis.; Visalia, Calif.; two at Ponce, Puerto Rico; and Milan, Italy.

SPRAGUE[®]
THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER

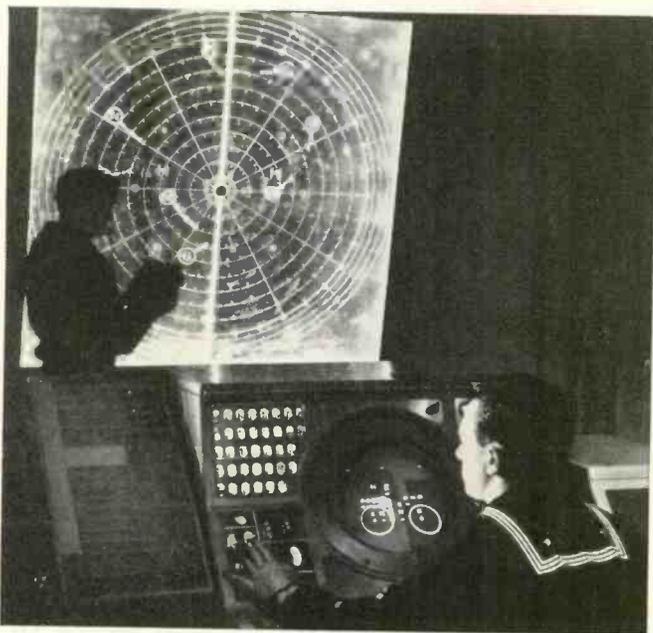
For more data, circle 3-13-1 on coupon, p. 54

Tuning In the

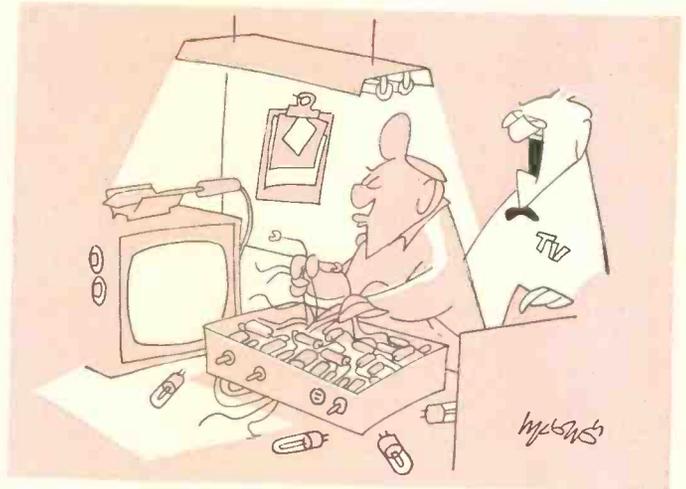
RECORD-KEEPING AND BUSINESS MANAGEMENT service will be made available to TV and radio service dealers by Raytheon's Distributor Products Div. through its franchised distributors. Simplified Tax Records, Inc., small business and tax advisory service will work directly and confidentially with each subscribing dealer, helping him to keep track of his sales and expenses. At the end of the year, the servicing firm will make out all income tax returns, both Federal and State. A single system containing all the records needed to keep track of sales and expenses will be supplied dealers, who can maintain the simplified records each day.

FIVE YEAR TV SERVICE contract is reportedly offered by a Pittsburgh discount house. Home service fee is \$2 to \$5.95, no charge for shop work. All parts and picture tube are guaranteed for five years. This arrangement applies only to products sold by the discounteer. The company is said to have complied with a Better Business Bureau request that reserve funds be posted to insure continuance of the service if the store should go out of business.

DATA DISPLAY—1961 STYLE



The old, slow grease-pencil method of plotting aircraft at top contrasts with new Hughes display console in foreground. Navy radarman examines positions of airborne, surface and submarine targets on detector-tracker.



"Did I hear you say knit one—pearl two?"

LIGHTNING, as we know, will most likely strike more than once, since it is always attracted to the highest object in an area. The Lightning Protection Institute reports that upward of 4% of lightning-fire and damage losses involve TV sets and their antennas. Projected over the national figure of \$120 Million due to lightning losses annually, TV-involved lightning losses come to an electrifying \$4,800,000. Normal TV installations are insufficiently grounded, says the Institute. Even a grounded antenna does not protect the house proper. The Underwriters' Laboratories code states: "Radio and television masts of metal, regardless of location on building, shall be bonded with standard conductor and fittings to the main conductor of the lightning protective system. It is also recommended that a lightning arrester be installed on the lead-in wire, tape or cable."

COMMUNITY ANTENNA SYSTEM industry, which brings TV to homes in fringe areas, is now experiencing an expansion unparalleled since the inception of the industry 12 years ago, reports Jerrold Electronics. Sales of the company's equipment and construction of community antenna systems are running 50% higher than last year. Currently there are more than 800 such systems throughout the U.S., serving more than 700,000 homes in 42 states.

TV "LIGHT METER" has been installed by Magnavox on four of its 27-inch models, another step toward a completely automatic TV set. Developed by the Magnavox Electronic Research Labs., the new sodium resistor light meter acts as a self-setting electric camera, measuring the room light and automatically resetting the brightness and contrast of the picture.

Picture



LICENSING ORDINANCE for TV service dealers in Kansas City, Mo., is the subject of a bitter court battle. A "class action" by The Electronics Association of Missouri members for the benefit of all affected by the law seeks to have it declared unconstitutional. The plaintiffs, 12 service dealers and four employees, state they were chosen by over 100 members of this class and by TEAM directors. City attorneys have challenged the plaintiffs' claim to represent the service class, noting that over 300 have taken the tests voluntarily. On another Kansas City front, TESA of Kansas City and 25 individuals have made motions to dismiss the 10 libel suits filed by the same people attacking the ordinance. The libel suits grew out of circulars and magazine articles concerning the licensing fight.

TV, HIGH INTENSITY X-RAYS combining to form the newest method for vibration test analysis was demonstrated by Ling Electronics and Zenith Radio Research. The new technique consists of a pulsed X-ray system which produces a one microsecond pulse of high intensity X-rays, operated in conjunction with a shaker. X-ray reproductions of the internal parts of hermetically sealed components are made observable on a TV screen, while the subject is vibrated through a frequency range of 5-5,000 cps.

BEAM OF LIGHT so intense that it can be used as a superior form of radar is being worked on by Hughes Aircraft Co., based on the use of a "laser," which is an amplifier of light that uses a rod of ruby crystal much as a maser does for boosting microwave radio signals. The device would be able to pinpoint direction of targets far more precisely than with present microwave radar beams. Theoretically, lasers should be able to throw a beam so narrowly focused that it would illuminate an area of the darkened moon only ten miles wide.

EXPORTS of electronic products from the United Kingdom to the U.S. totaled \$9.1 million in the first half of 1960, slightly below the \$9.4 million in the same period of 1959, reports the Electronic Div., Business and Defense Services Admn. Six-month's shipments of record playing mechanisms were down 20% to \$3.6 million, from \$4.5 million in the comparable 1959 period. Decreases in other exports to the U.S. were as follows: phono parts and accessories, 58%; speakers and microphones, 11%; radio receivers, 18%; and electronic and nucleonic tubes, 15%.

CALENDAR OF COMING EVENTS

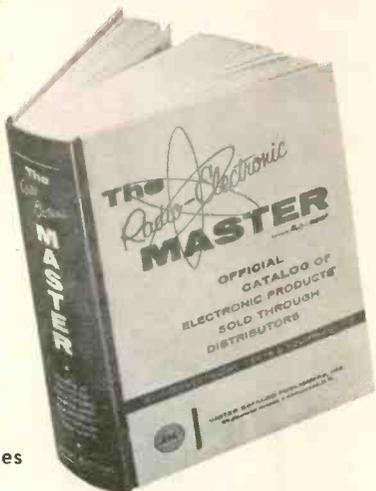
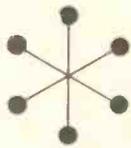
- Mar. 20-23: IRE International Convention, The Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
- Apr. 4-9: 1961 Los Angeles High Fidelity Music Show, Ambassador Hotel, Los Angeles, Calif.
- Apr. 7-9: NATESA Spring Directors Meeting, Albuquerque, New Mexico
- Apr. 19-21: 13 Annual Southwestern IRE Conference & Electronics Show, SWIRECO, New Memorial Coliseum and Baker Hotel, Dallas, Texas
- Apr. 26-28: 7th Region Technical Conference & Trade Show, Westward Ho Hotel, Phoenix, Ariz.
- May 22-24: 1961 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- May 22-24: 5th Global Communications Symposium (GLOBECOM V), Sponsored by PGCS and AIEE, Sherman Hotel, Chicago, Ill.

TOUCH TAPE electronic light and appliance switch has been put on the market by Gardiner Electronics, Phoenix, Ariz. A clear cellophane-like tape is applied on the wall wherever a switch is wanted, with the tape connected to a control box. To operate the switch, a touch of the finger on the tape will turn it on or off.

"SPEED OF LIGHT" CIRCUITRY



Four of the RCA midget tunnel diode wafers at left will perform the same computer switching job as the large circuit board shown—but 1000 times faster. The device permits electronic switching at speeds approaching 186,300 mph, the speed of light.



1600 pages



IT'S NEW. Covers all the latest products for servicing radio-TV-hi-fi and industrial equipment: • miniature and sub-miniature components • printed circuit components • silicon rectifiers • stereo equipment • automatic test equipment • citizens band, SSB and mobile ham gear, etc.



IT'S THE WORLD'S BIGGEST ELECTRONIC CATALOG. 1600 pages—more than 175,000 items—with specifications, illustrations and prices. Contains hundreds of items not found in smaller catalogs.



IT'S THE EASIEST TO USE. Quickest way to get current catalog data on the products of more than 330 manufacturers. Systematically organized in 32 product sections for rapid reference.



SAVES TIME AND MONEY FOR SERVICE TECHNICIANS. Whether you're servicing radio, TV, audio or industrial electronic equipment, you find the right part to do the job best in The MASTER. The reason: you're shopping in the electronic supermarket. The MASTER is easy to sell from because it contains list prices. It's easy to buy from because your distributor has it and all you need do is select the item you want and order by part number. No matter what product or component you require, you'll find it faster in the 1961 MASTER.

AND IT'S NOW AVAILABLE AT
YOUR LOCAL DISTRIBUTOR

1961 MASTER

\$3.95 at parts distributors
\$4.95 in Canada

FREE from your distributor: New Foreign Tube Interchangeability Guide, or write direct, enclosing 25c.

RADIO-ELECTRONIC MASTER — 60A MADISON AVE., HEMPSTEAD, N. Y.



RYE SOUND Pres. Richard Livingston appoints Charles David, ex-Bogen, as Gen. Sales Mgr.

PACO ELECTRONICS adds Model L-1 speaker system semi-kit to its hi-fi line. Size is 15-1/4" x 9-1/4" x 8-1/2". Price is \$24.95.

FANON announces Model 1010 dial telephone intercom system. 11 master phones can be used in the system. The dial phones do the switching.

ASTATIC is supplying dealers with a new stocking display at no charge with 50 needle assortment CA-301. Cabinet is 10" x 6-1/2" x 3-1/2".

SHURE has had Westminster record "The Orchestra . . . The Instruments." This fine stereo disc is available free with arms or M3D & M7D cartridges.

MARANTZ notifies dealers all equipment purchased on or after Jan. 1, 1961 will carry a full two-year guarantee covering parts (except tubes) and labor.

FAIRCHILD steps into the kit field with the 440-2K 2-speed turntable @ \$55 with pre-cut mounting board. Also, the SM-2 stereo cartridge @ \$37.50 and 500A anti-skating arm-transport @ \$28.

UTAH RADIO offers 12 x 18" counter display featuring inverted speaker mounted to show front-mounted magnet structure; to distributors on no-charge basis with order of 6 inverted speakers.

LOWELL MFG. announces "Coloramic" injection molded plastic speaker baffles: 8" speakers for recessed mounting, Models ADS80-P, CR80-P; Model L35-P is a wall intercom plate that accommodates 3-1/2" speaker.

HARMAN-KARDON announces additions to Citation kit line: Citation X loudspeaker with frequency range of 20-50,000 cps, \$250; Citation III FM tuner @ \$149.95 kit, \$229.95 factory assembled. New Award Series features A500 Stereo Amplifier, 20 watts/channel at less than 0.5% distortion, ± 1/2 db 12-35,000 cps; F500 FM/Multiplex Tuner, 0.85 µv for 20 db of quieting.



"Well let me put it another way: the next time a dealer offers you \$1.25 trade-in allowance toward a new set, take it!"

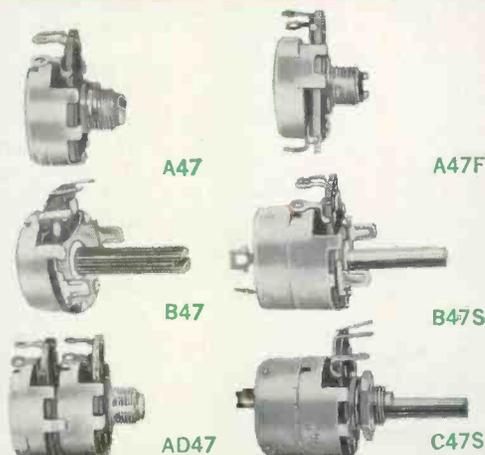
BEST

For Radio/TV Servicing

SERIES A47, B47S, C47S

CARBON

CONTROLS



The ABC's of Servicing! Series 47 carbon controls are 1/2 watt units available in all popular values and tapers for volume control, tone control, and other radio and television functions.

Ad-A-Switch feature available on all types except B47 and C47S. Pick-A-Shaft advantage available on all except B47-B47S.

A47 1/2 watt control.

A47F 1/2 watt control with taps.

B47 1/2 watt control, tab mounting, phenolic shaft for "hot" chassis.

B47S 1/2 watt control, tab mounting, with SPST switch, metal shaft. Not for "hot" chassis.

AD47 1/2 watt dual controls.

C47S 1/2 watt control with push-pull switch.

SERIES A43

WIRE-WOUND

CONTROLS



Resistance values up to 50K, 2-watt wire-wound controls meeting servicing requirements of radio and television with all popular values. Available with or without power switch. Your choice of shaft with Pick-A-Shaft feature. Clarostat also offers 3-watt Series 58 and 4-watt Series 10 wire-wound controls for heavier power requirements.

A43 2-watt control.

A43S 2-watt control with switch.

YOUR CHOICE OF SHAFT

Pick your control, then select the appropriate shaft from 13 different types!

Clarostat Pick-A-Shaft shafts snap into place for a permanent, dependable assembly. Your Clarostat distributor stocks all types. You get one FREE with every Clarostat Pick-A-Shaft control.



WRITE FOR CATALOG . . .

This is the most complete control/resistor catalog for the service trade. Also incorporates industrial products for commercial equipment servicing. Send for your local free copy today, or ask your local CLAROSTAT distributor . . .



CLAROSTAT

CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE

For more data, circle 3-17-1 on coupon, p. 54

News of the Industry

ARCO ELECTRONICS has named IRWIN K. PAUL as Asst. Sales Mgr.

ALPHA WIRE announces the appointment of MARTIN L. ROTH as Distributor Sales Mgr.

MARK MOBILE and MARK PRODUCTS CO. report the appointment of JAMES M. RYAN as Sales Mgr. of both companies.

BLONDER-TONGUE reports availability of new services and aids for master TV system distributors.

GENERAL ELECTRIC Capacitor Dept. has appointed DONALD J. HARRINGTON Mgr. of Marketing.

ELECTRONIC DEVICES has announced the appointment of ROBERT S. SCHENCK as Sales Mgr.

STANDARD KOLLSMAN announces an extension of warranty period of their TV and FM tuners to one year, effective on all units produced starting January 3, 1961.

RCA Electron Tube Div. announces the appointment of L. S. THEES to the new post of Div. Vice Pres., General Sales.

XCELITE Pres., ARCH WARDEN, has been elected member of the executive committee of Service Tools Institute to serve a two year term.

MOTOROLA Consumer Products Div. has named PAT A. CALOBRISI as Product Planning Mgr., and EDWARD J. GAIDEN, National Dir. of Service.

JERROLD ELECTRONICS dedication ceremonies for the newly expanded lab in Huntingdon Valley, Pa. were attended by national, county and local civic figures.

RAYTHEON Distributor Products Div. has announced the following appointments: ALLEN W. MERRIAM, JR., Western Zone Mgr.; CHARLES B. DOUGLAS, Central Zone Mgr.; and FREDERICK B. SIMMONS, New England District Mgr.

CHICAGO STANDARD TRANSFORMER announces three executive appointments: WILLIAM E. WILSON, Vice Pres. and Gen. Mgr.; JACK D. HALL, Vice Pres., Sales & Marketing; and KARL F. CREASE, Vice Pres. in Charge of Manufacturing.

HERMAN H. SMITH releases a home study package on multi-vibrators composed of four hi-fi records, a textbook, and a new method for grading and scoring known as the Edumator, which instantly shows the student if his answer is right.

TUNG-SOL TUBE, FINNEY ANTENNA CO. and RADIO SUPPLY CO. of Wichita conducted a three-way promotion throughout Kansas among customers of RADIO SUPPLY who made purchases of either FINCO antennas or TUNG-SOL tubes. Winning the first prize of a VOLKSWAGEN truck was EHLING RADIO & TV SERVICE CO. of Winfield, Kans.

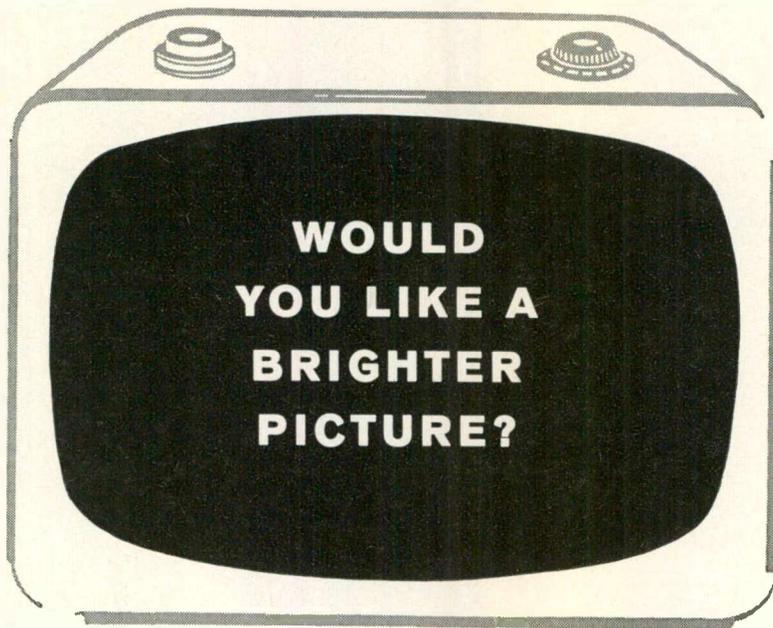
(Continued on page 22)

BOOST YOUR BRITENER SALES

with these

SIX MAGIC WORDS

from *Perma-Power*



That's a question with only one possible answer—YES. Every customer wants a better, brighter picture... but doesn't realize how easy it is to get one.

When you say you'll brighten the picture—When you quote the low cost—you've sold the customer.

Don't sell Briteners—sell Brighter Pictures!

On every service call, remember to use Perma-Power's 6 Magic Words—Would You Like A Brighter Picture? You'll sell a 12-pack of Briteners almost as fast as you can say Perma-Power!

Perma-Power

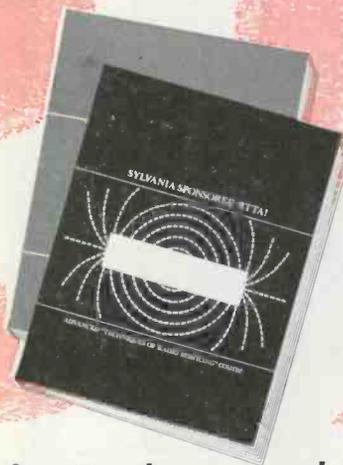
COMPANY—3104 N. Elston Ave.—Chicago 18

For more data, circle 3-18-1 on coupon, p. 54



"... You want this transistor job fixed by tonight I better get started."

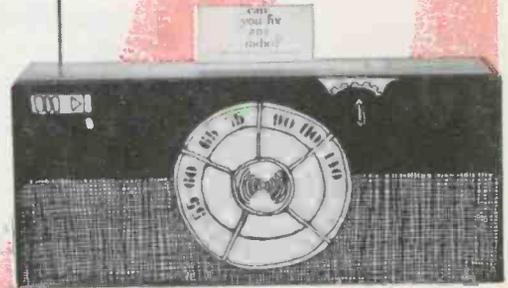
"Score" more profits



“NEW FROM SYLVANIA & RTTA!”

“TECHNIQUES OF RADIO SERVICING” COURSE

“STUDY AT HOME!” 12 LESSON COURSE FROM RTTA



Enroll in the Sylvania “advanced radio repair course”

Radio is “booming.” Sales hit a ten-year high in 1960 . . . over 10 million! You can “zero in” on extra servicing profits by signing up for the Sylvania sponsored RTTA “Advanced Techniques of Radio Servicing Course.”

This new Sylvania 12-lesson *home study* course covers all the latest servicing techniques on the tremendous variety of radios your present customers own and expect you to service. Shows you how to complete repairs quickly, efficiently, profitably. Gives you the latest dope on everything from transistor circuits to citizen band radio. Look at the subjects covered:

- working with transistors
- transistor circuits
- repairing auto radios
- servicing AM receivers
- servicing AM & FM tuners
- servicing foreign radios
- servicing mobile receivers
- testing transistors
- servicing transistor radios
- installing auto radios
- servicing FM receivers
- servicing communications receivers
- marine radio repair
- servicing citizen band radio

It's easy to enroll. Your Sylvania tube distributor has all the details. Call him today. And when you order tubes be sure to specify Sylvania Silver Screen 85 picture tubes and Sylvania quality receiving tubes.

Electronic Tubes Division, Sylvania Electric Products Inc., 1740 Broadway, New York 19, New York.

SYLVANIA

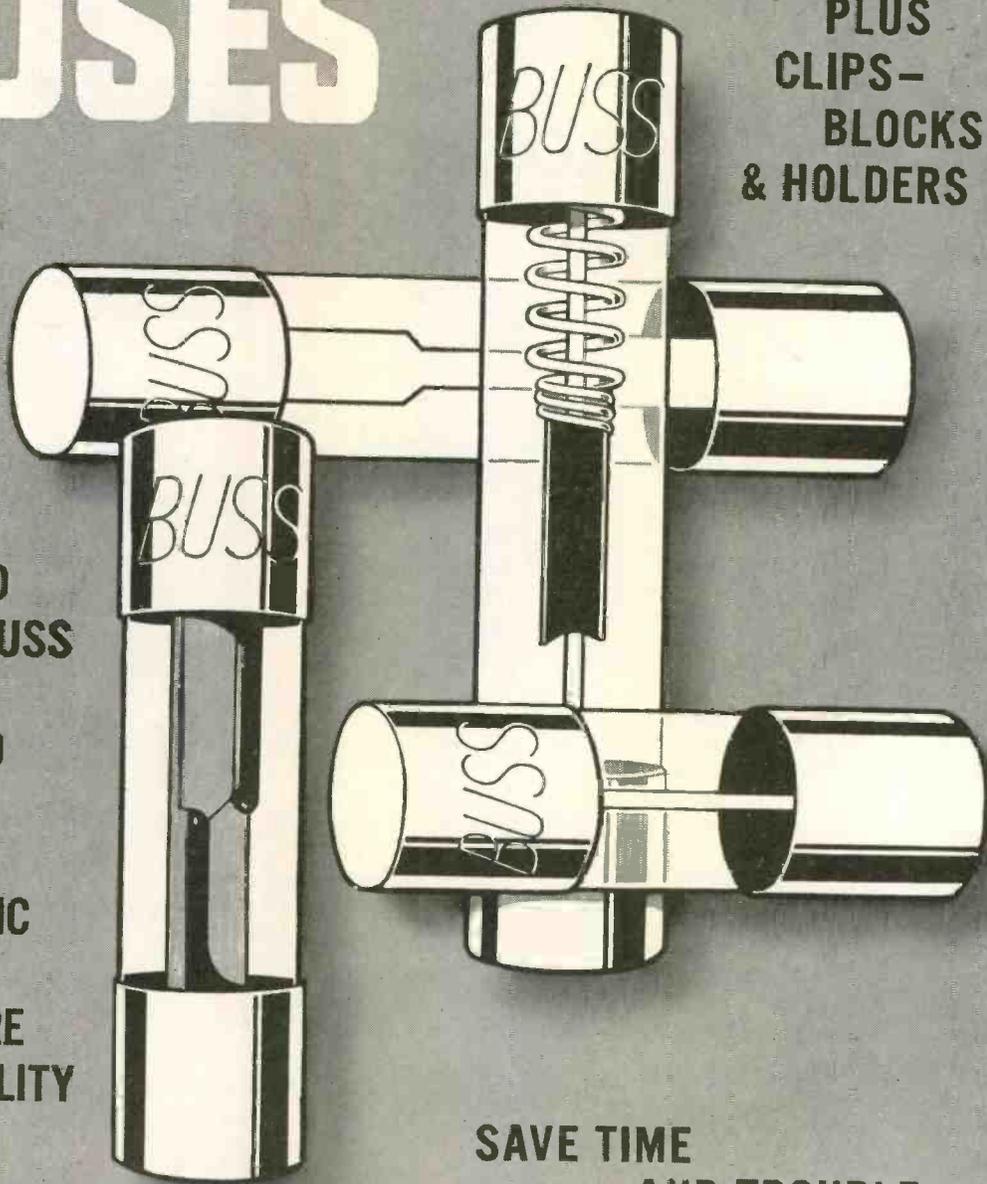
SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS



BUSS FUSES

PLUS
CLIPS—
BLOCKS—
& HOLDERS



EACH AND
EVERY BUSS
FUSE IS
TESTED
IN A
SENSITIVE
ELECTRONIC
DEVICE
TO ASSURE
DEPENDABILITY

SAVE TIME
AND TROUBLE...

by standardizing on BUSS fuses. There's a right fuse for every need in the complete line. Write for the BUSS bulletin on small dimension fuses (Form SFB) to get full data for your files.

Bussmann Mfg. Division McGraw-Edison Co.
University at Jefferson, St. Louis 7, Mo.

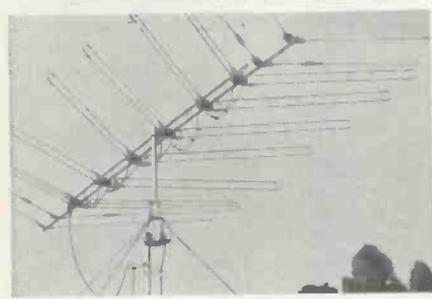
CHANNEL MASTER

harps on one theme: PERFORMANCE!



To make the most, feature the best — sky-high quality products by Channel Master. Channel Master moves the goods because it delivers the goods. It's the brand that gives you those heaven-sent little "extras". Top quality and top performance for your customers — maximum volume and profits—you get the best of both. Just follow your "growth line" — Channel Master.

CHANNEL MASTER
SUPER 10 T-W ANTENNA



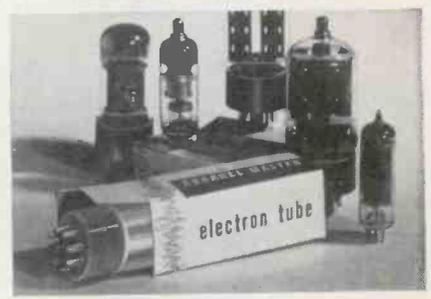
The most powerful super-fringe antenna yet developed. Based on Channel Master's unique Traveling Wave principle, it has 10 elements and offers up to **78% more power** for picture-poor homes.

CHANNEL MASTER
TENN-A-LINER ROTATORS



The only automatic rotator that can be aimed within **one degree** of the required direction. Unsurpassed accuracy, plus great repeatability and easier, quieter operation.

CHANNEL MASTER
PREMIUM QUALITY TUBES

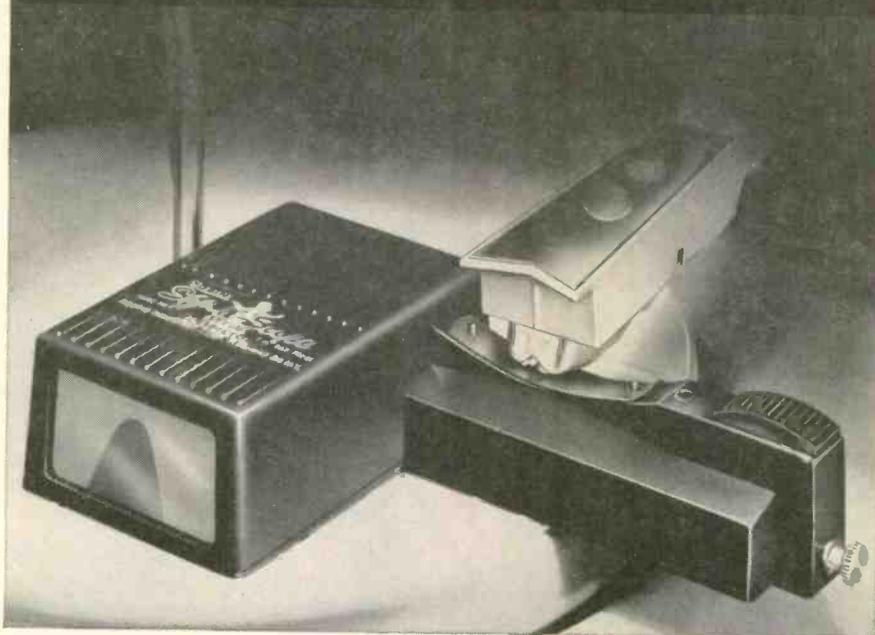


America's fastest growing line! Longer-lasting, uniformly dependable, with minimum call-backs. No other tube make offers greater opportunity for profits than these fully proved performers.



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

...first truly reliable method
for checking stylus wear!



NEW ROBINS SYL-A-SCOPE

opens door to extra replacement stylus profits

PRECISE. Based on same principle as optical comparison equipment used by industry for quality control of miniature precision parts. It shows every detail of the stylus.

FAST. Place the tone arm on the rest with the stylus resting in the aperture provided—(in most record players there's no need to remove cartridge or stylus) switch on the SYL-A-SCOPE and see every detail of the stylus illuminated on the screen. You can examine the stylus for wear or damage in an instant.

PORTABLE. Fits in your tube caddy. Battery-Operated. Lightweight too! There's a bench model also with a line cord for use in the shop.

BUILDS CONFIDENCE AND GOOD WILL. The image of your customer's stylus is so clear that he will instantly recognize the need for replacing it. And, he will appreciate your interest in protecting his records from damage caused by a worn stylus.

... and it's PROFITABLE. The SYL-A-SCOPE gives you the opportunity to rack up big replacement sales.

TWO MODELS—ONE FOR THE SHOP—ONE FOR HOME CALLS

Model SG-33 the "Audiophile"—Designed to fit your tube caddy. Portable, battery-operated unit provides a clear, sharp image on illuminated screen. List \$6.75. (less batteries)



*Patents pending

Model SG-66 the "Professional"—Designed for bench or shop use. Compact unit with line cord operates on 110-120 volts AC. Provides a clear sharp image on its large illuminated screen. A precision optical tool. List \$19.95

See the new Robins Syl-A-Scope at your distributor. Write for 1961 catalog of record and tape care accessories, recording heads and replacement parts.

ROBINS INDUSTRIES
36-27 Prince St., Flushing 54, New York
Export: Telesco Int'l, New York 16, N. Y.
Canada: E. S. Gould Sales, Montreal 1, Quebec



For more data, circle 3-22-1 on coupon, p. 54

(Continued from page 18)

WESTINGHOUSE Electronic Tube Div. announces the appointment of JOHN R. FOX as Pacific Coast Regional Mgr. and WILLIAM E. COHAN as Mgr. of Industrial Distributor Sales, a newly created post.

JFD announces the following appointments: WILLIAM BELLENKES, Western Regional Sales Mgr.; GEORGE KASE, Eastern Regional Sales Mgr.; FRED L. STRAUSS, Sales Mgr. in the metropolitan N.Y. area; "SARGE" BARKETT, District Sales Engineer for north central states; JOHN NEENAN, District Sales Engineer, New England; and DAVID TAUB, Distributor Sales Supervisor.

SYLVANIA makes available a new 12-lesson correspondence course, "Advanced Techniques of Radio Servicing," through distributors. Published by the RADIO-TELEVISION TRAINING ASSOC., the course covers automobile radios, AM/FM receivers, transistorized radios, marine radio equipment, foreign-manufactured and short wave receivers. GEORGE P. LYON has been named Marketing Administrator for the Home Electronics Div.

Reps & Distributors

HENRY LAVIN ASSOC. has been joined by DONALD F. BOWEN as sales engineer.

AMPEREX announces the appointment of the R. W. FARRIS CO., INC. as distributor sales rep. for Kans., Mo., Ia. and parts of Neb. and Ill.

JOHN E. FAST has named WILLIAM DREW & CO. as sales rep in eastern Pa., southern N.J., Md., Dela. and District of Columbia.

ELECTRONIC PUBLISHING CO. publishes the largest catalog in their 13 year history, prepared for RADIO PRODUCTS SALES, INC. The 356-page book contains complete listings of products sold by 185 manufacturers.

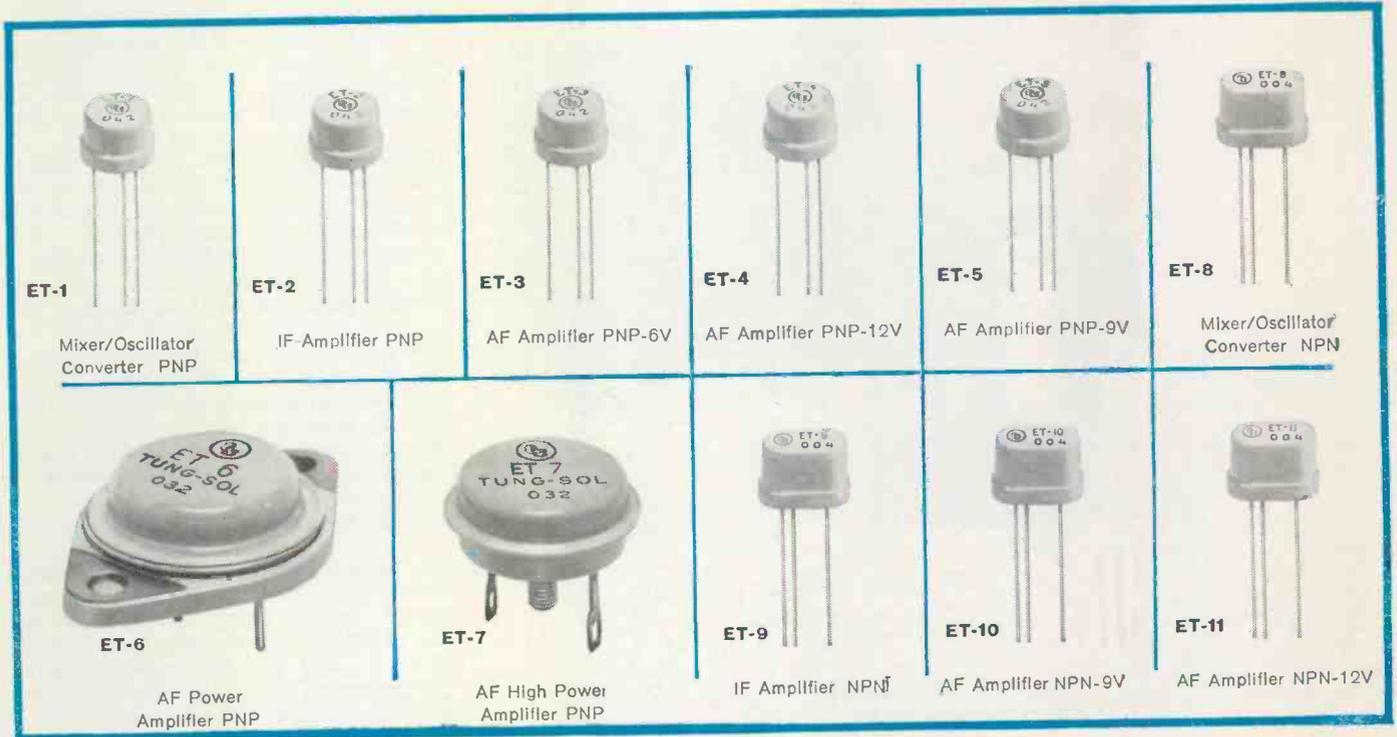
JERSEY ELECTRONIC DISTRIBUTING has announced removal of their showrooms and offices to their new building at 74-86 E. 30th St., Paterson, N.J., which offers more than two and one half times the former space.

ASTREX, INC. reports formal opening of their new, centralized headquarters at 150 Fifth Ave., N.Y.C. The 20,000 sq. ft. facility includes executive offices, four stockrooms, a quality control lab., inspection lab., and general offices.

11 DOES IT

Radio Transistor Replacements Are Quicker, Easier...

**WHEN YOU STOCK THESE
11 TUNG-SOL TRANSISTORS!**



The compact new Tung-Sol "11" transistor line meets virtually every common radio service requirement . . . obsoletes costly duplication of inventory. Just these eleven Tung-Sol transistor types provide you with the replacements needed for almost all of your radio repair work.

• The Tung-Sol "11" eliminates dead shelf space . . . cuts your inventory problems.

• The Tung-Sol "11" lowers your costs . . . reduces your inventory investment in slow-moving items.

• The Tung-Sol "11" saves labor . . . cuts service time lost by searching for the right replacement part.

• The Tung-Sol "11" builds profits . . . assures faster turnover on smaller investment . . . with fewer call-backs.



Packaged for Fast Selection

Each Tung-Sol transistor is packed in a carton which is clearly marked with both type number and application. Just pick the one marked for the right kind of service and you have the right transistor."



Priced for Profitable Service

The Tung-Sol "11" transistor line enables you to handle most radio service work with a minimum of stock. Type selection is quicker—easier. You make more profit per service hour.

Warranted for Superior Performance

Famous Tung-Sol quality-control assures optimum specified performance. Your best choice is always a Tung-Sol product.

For complete information on the Tung-Sol "11" transistor line — and full details on Tung-Sol's profit-building sales support program — contact your Tung-Sol Distributor, or write to:

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

ts TUNG-SOL[®]
TRANSISTORS

For more data, circle 3-23-1 on coupon, p. 54

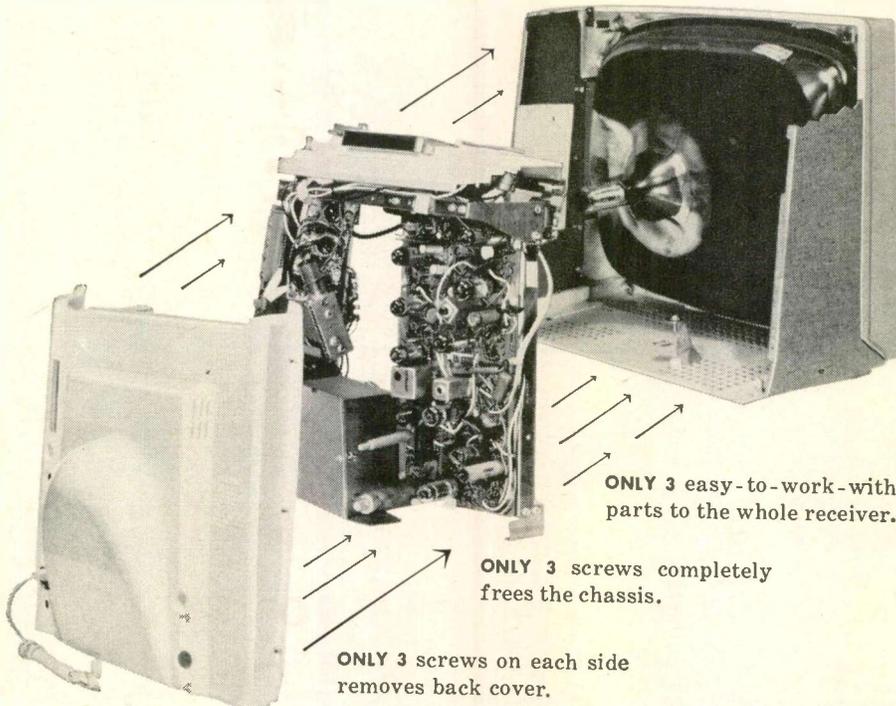


The "Big Picture"

...informative shop talks

by AL MERRIAM, *Sylvania Natl. Service Mgr.*

"All out" for easy service



It's easy to see why the new Sylvania Reflection-Free 19" TV is called the "all out" portable for quick and easy servicing.

A few spins of your screwdriver, and the whole chassis . . . complete with knobs, antenna, speaker and handle . . . slips out clean and quick as a whistle.

A few seconds, and you'll locate the trouble on the easy-to-follow road map board. You'll like the neat way the back of the board is clear of "cover clutter" so you can solder without obstructions.

Of course, the famous Sylvania Bonded Shield is a snap to remove with the special door-latch mounting clips. There are even extra mounting bosses in case these should get damaged.

SERVICE TIP OF THE MONTH

Symptom (Effect): Black specks or lines in the picture cause a corona at the flare on the horizontal coils of the deflection yoke.
Cure: A thin coating of silicon grease will correct the condition.
Sylvania Home Electronics Corp., Batavia, N. Y.

SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS

Catalogs & Bulletins

CAPACITORS: 2-color illustrated brochure outlines new capacitor merchandising programs. Mentioned are 2 new "Sportsmen's Delight" kits. Pyramid Electric Co., Darlington, S. C.

For more data, circle 3-24-1 on coupon, p. 54

CB TRANSCEIVER: Literature covers model 300 citizens band transceiver, reported to be 1/5th the size and weight of the average Class D equipment. Osborne Electronic Sales Corp., 13105 S. Crenshaw Blvd., Hawthorne, Calif.

For more data, circle 3-24-2 on coupon, p. 54

PROBE: 4-page booklet covers 5-range "Speedprobe" model V.O.M., designed for speed testing. Features include 2" insulated tapered point; 10 silver contacts; and lightweight. Lexington Mfg. Co., East Hartford, Conn.

For more data, circle 3-24-3 on coupon, p. 54

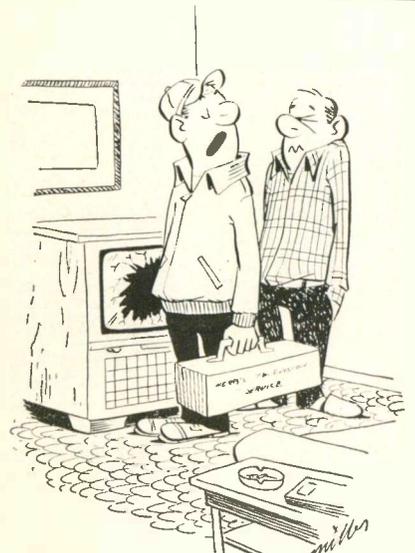
LAMPS: 4-page lamp catalog #116 covers incandescent, fluorescent, combination and magnifying lamps. Available in different lengths and colors; have brackets, bases and stands. Luxo Lamp Corp., Dock St., Port Chester, N. Y.

For more data, circle 3-24-4 on coupon, p. 54

CB TRANSCEIVERS: Literature covers Cadre 500, 5-watt, portable transceiver incorporating 15 transistors and 7 diodes. Extremely low power drain of only 2 watts makes it ideal for mobile as well as fixed operation. Also Cadre 100, 100 mw transceiver, incorporating 7 transistors and 1 diode. Operates on one crystal controlled transmit/receive channel. Provides reception on any one of the 23 citizens band channels. Shirt pocket size. Cadre Industries Corp., Box 150, Endicott, N. Y.

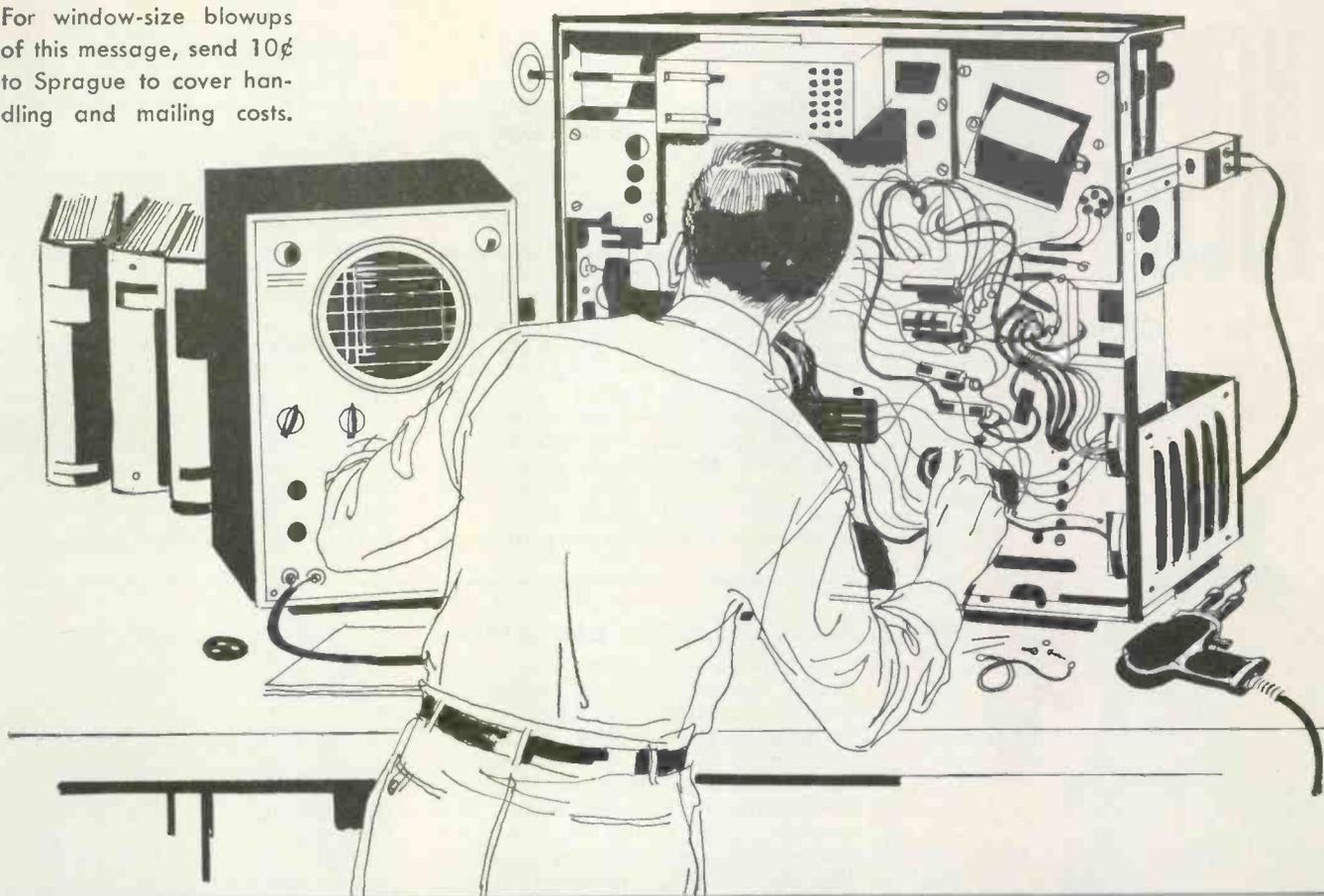
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(Continued on page 26)



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and he has to know how to fix 'em all!**

YOUR TV SET is the most complicated piece of equipment you've ever owned. It represents a considerable investment of money. It provides your family with a wealth of entertainment pleasure. You value it highly.

Nobody is more aware of these facts than your neighborhood TV-Radio technician. And because he stakes his reputation on your satisfaction, *he strives to be worthy of your trust in him.* He achieves this by years of training and practice in electronic theory and application. He equips himself with expensive but essential test equipment, tools, and service

manuals. He spends countless hours keeping up-to-date on new developments, new circuits, new trouble-shooting techniques.

His training and experience qualify him as a modern, professional expert. As such, he asks a fair, professional price for his services. Since he will not use cut-rate methods or cut-rate parts in your TV set, he cannot offer cut-rate prices. *Remember, you get only your money's worth in TV-Radio service. When you are taken in by a "bargain-type" offer, you can expect to get "bargain-type" service. BEWARE THE SERVICE BARGAIN!*

**THIS MESSAGE WAS PREPARED BY SPRAGUE PRODUCTS COMPANY,
DISTRIBUTORS' SUPPLY SUBSIDIARY OF SPRAGUE ELECTRIC CO., NORTH ADAMS, MASS., FOR**

YOUR NEIGHBORHOOD TV-RADIO TECHNICIAN

For more data, circle 3-25-1 on coupon, p. 54

NEW 4-WAY POCKET TOOL

a real "working partner"
for removing backs of TV sets
and installing antennas



1 It's a 1/4" nut driver!
Fits Parker-Kalon screws.

Genuine Xcelite
plastic handle —
shaped and
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working ease.
Equipped with
pocket clip.

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nut driver!
Ideal for
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Phillips
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Double-end blade
inserts in 7/16" hex
opening. Just push
it in or pull it out!
Patented spring
holds it firm.

4 It's a 3/16"
slotted screwdriver!



Ask to see
"No. 600"
next time you
pick up parts...

XCELITE

XCELITE, INC. • ORCHARD PARK, N.Y.
Canada: Charles W. Pointon, Ltd., Toronto, Ont.
For more data, circle 3-26-1 on coupon, p. 54

(Continued from page 24)

CITIZENS BAND: Two units, covered in literature, are: HE-29 Walkie-Talkie, 9 transistor unit weighing 18 oz.; and HE-20 deluxe citizens band 5-watt transceiver. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y.

For more data, circle 3-26-3 on coupon, p. 54

TRANSCRIPTION PLAYERS: The following literature is available covering the new Bogen VP-20 and VP-40 portable transcription players: Catalog #702, 6-page descriptive brochure; and specification sheets ES-VP-20 and ES-VP-40 providing technical information, architect's specifications, accessories, and schematic diagrams. Bogen-Presto, P. O. Box 500, Paramus, N. J.

For more data, circle 3-26-4 on coupon, p. 54

TRANSFORMERS: Specification sheets: bulletin 580 covers 3 new exact replacement flyback transformers for Admiral TV sets; bulletin 584 covers 3 new exact replacements for Sparton flybacks Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

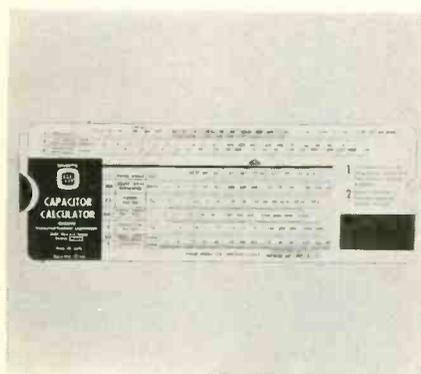
For more data, circle 3-26-5 on coupon, p. 54

COMMUNICATIONS & CB PRODUCTS: 16-page illustrated catalog, FR-61-B, features such items as new base station and mobile antennas, auto antennas, mounting hardware of all kinds, and related miscellaneous items. GC Electronics Co., 400 S. Wyman St., Rockford, Ill

For more data, circle 3-26-6 on coupon, p. 54

Ohmite CAPACITOR CALCULATOR

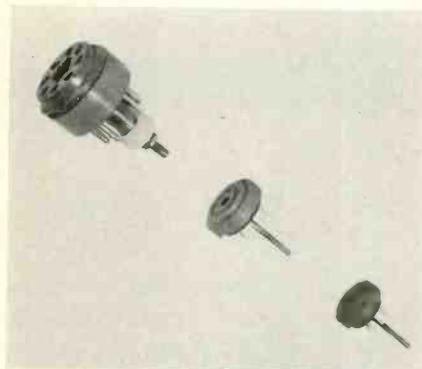
Announced is a convenient, pocket size (7" x 2 5/8") slide-rule-type calculator for solving many kinds of capacitance problems. With one setting of the slide rule, the calculator gives the solution to problems involving frequency, reactance, power factor, dissipation factor, equivalent series resistance, impedance and phase angle. Also lists all the important capacitance formulae and has a comparison chart of different types of capacitors. Price, 25¢. Send coin with your requests to Ohmite Mfg. Co., 3629 Howard St., Skokie, Ill.



Thinline TUBE SOCKET PRESERVERS

Designed to prevent permanently wired sockets on electron tube testers from wearing out, Thinline sockets plug directly into the existing sockets on the tube tester panel. The low silhouette of the socket preservers, 0.336" high for 7 and 9 pin miniature sockets and 0.7" high for octal sockets, makes them especially suitable for portable equipment. \$2.05 to \$2.80, various quantities. Forway Industries, Inc., 122 Green Ave., Woodbury, N. J.

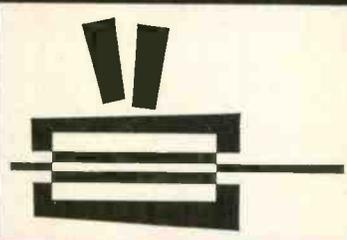
For more data, circle 3-26-7 on coupon, p. 54



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\$9.50

For more data, circle 3-26-2 on coupon, p. 54



Prove how CBS design for Total Reliability CUTS BACK YOUR CALLBACKS

Are callbacks stealing away your profits? CBS Total Reliability tubes can keep them in your pocket. Take the CBS 5U4GB, for example.

This improved CBS tube has been specifically engineered with advanced features for utmost dependability. And its extra quality and longer life will build customer confidence—important for your continued success.

Now you can prove this to yourself right on the job—at CBS Electronics' expense. For a limited time only, you get a free trial CBS 5U4GB when you buy nine. You get a full "10-pack" but you pay for only 9 tubes. Order now from your CBS Electronics distributor. Offer expires March 15.

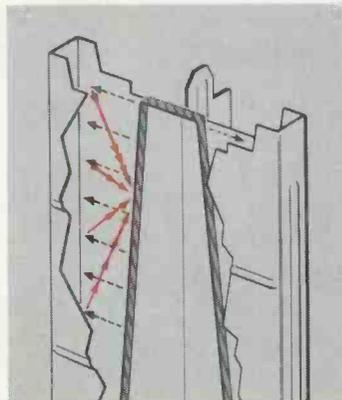
CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

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

How design for Total Reliability prevents filament failure in the improved CBS 5U4GB

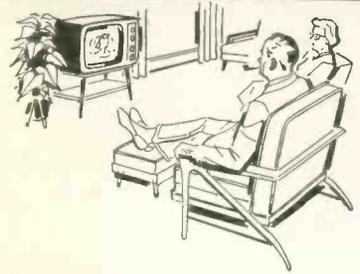


In ordinary rectifier tubes, filaments burn out when they overheat from a rise in reverse current. CBS eliminates this "back emission" in the 5U4GB with larger plates of non-emissive material that permit cooler operation and longer tube life.

CBS proved this by submitting the 5U4GB to dynamic "blast" tests that brutally cycled the tube between 4 and 6.8 volts with 800 volts plate potential. Meter readings showed "back emission" to be barely measurable—less than one ma.

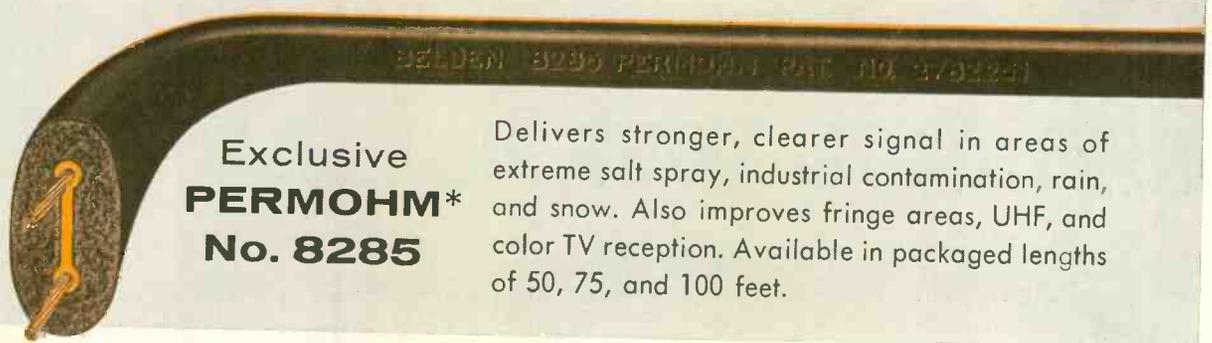
For more data, circle 3-27-1 on coupon, p. 34

New Decorator TV Lead-In Cable



For interiors only. This NEW Belden 300-ohm lead-in cable, No. 8226, replaces unsightly lead-in cable in modern homes. Its neutral color harmonizes and blends into

any room's decorative theme. Available in lengths of 25, 50, 75, and 100 feet. Packaged in pancake coils for easy handling and display.



Exclusive PERMOHM* No. 8285

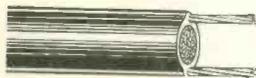
Delivers stronger, clearer signal in areas of extreme salt spray, industrial contamination, rain, and snow. Also improves fringe areas, UHF, and color TV reception. Available in packaged lengths of 50, 75, and 100 feet.



STANDARD 300-OHM LINE
—NO. 8225 Offers low losses at high frequencies. For use with TV and FM receiving antennas. 25-, 50-, 75-, and 100-foot coils; 500- and 1000-foot spools.



WELDOHM* 300-OHM LINE
—NO. 8230 2½ times flex-life and 1½ times breaking strength of ordinary lead-in. 25-, 50-, 75-, and 100-foot coils; 500- and 1000-foot spools.



CELLULINE* 300-OHM LINE
—NO. 8275 Resists abrasion, sun, and wind. Provides strong UHF and VHF TV pictures. 50-, 75-, and 100-foot coils; 500- and 1000-foot spools.



STANDARD 72-OHM LINE
—NO. 8222 For use with all types of receiving antennas at high frequencies. 100- and 500-foot spools.



STANDARD 150-OHM LINE
—NO. 8224 For receiving antennas, matching transformers, and experimental applications. 100- and 500-foot spools.

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



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

8-3-Q

his brother-... he said, "but... could be better... ked at all." ASK

freezing, causing the ice break. Engineers from the Woodward-Clyde were...

books and... forms, which were much more complicated than now. The price was \$10,000, but he bargained it down...

more... contains a variety of... tions like the following: A garden supply store was sent a suggestion calling for it "sketches" of how to improve a po...

under... Insurance Company... few weeks ago an... health policy was ac... ing \$50 a week for... weeks for \$13.90 a... which is no...

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RAYTHEON COMPANY



DISTRIBUTOR PRODUCTS DIVISION



OMNIDIRECTIONAL

ELECTRO-VOICE MODELS 636 AND 630 eliminate critical placement . . . assure remarkable fidelity. Omnidirectional from all points.

For truly uniform microphone response—for slim-trim case styling—for complete application versatility, the Electro-Voice Model 636 Dynamic is unsurpassed. Designed especially for public address and general purpose applications, the Model 636 blends easily, unobtrusively into PA stagings, eliminating placement problems and improving audience enjoyment. The baton design provides a convenient, easy-to-handle shape for hand carrying. This modern, streamlined model measures only $1\frac{1}{8}$ inches in diameter, yet provides output levels equal to microphones four times as large. *Other Features:* Exclusive E-V Acoustalloy diaphragm. Adaptable to either high or low impedance inputs; convenient ON-OFF switch for instant control; uniform response from 60 to 15,000 cps; wire mesh grille to minimize wind and breath blasts; tiltable through 90° arc toward sound source. List price (less stand). Satin Chromium Finish—\$72.50; Gold Finish—\$77.50.

Omnidirectional also describes the performance of the popular Electro-Voice Model 630 Dynamic Microphone. Designed by the same top acoustical engineering talent that developed the slim Model 636, this versatile microphone also provides optimum performance for an unusually wide range of professional, commercial, and personal applications. An exceptionally rugged instrument, the Model 630 may be mounted on a floor or desk stand or it may be hand held. List Price (less stand) \$52.50.

Complete specifications available upon request. For a trial demonstration of either of these fine, omnidirectional microphones, visit your Electro-Voice dealer—today.



MODEL 630

Electro-Voice®

Commercial Products Division
ELECTRO-VOICE, INC.

Dept. 312T, Buchanan, Michigan

ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

Keeping Records

This being the tax season, almost all of us are busy digging into personal and business records in order to complete income tax returns. If you are one of the meticulous minority who carefully documents each and every expenditure, our congratulations on your money-saving, good business practices.

However, if you are like most TV-electronic service dealers, you probably have an easy-going, even cavalier attitude toward recording income and expenses. This is costing you plenty. Not only do you fail to get an accurate picture of your profit and loss, but you are probably forgetting to make allowable deductions on your tax return.

While you can estimate certain expenses, a government auditor can demand you prove them. No proof, no allowance. And if you are caught neglect-

ing to record any income, whether intentionally or accidentally due to sloppy record keeping, heaven help you.

We suggest that if you are not doing so already, you take the following steps:

1. Have an accountant go over your bookkeeping system, arranging it to conform with good business practices.
2. Pay by check and obtain receipts whenever possible.
3. Keep a daily log in a small notebook, denoting the amount and purpose of miscellaneous expenses.

It's never too late to start a good record keeping system. Do it now. It will be like money in your pocket when the 1962 tax season rolls around.

Put It In Writing

While we're on the subject of jotting down dollar and cents figures, may we add a word of praise for the practice of putting it in writing when dealing with customers and suppliers.

Above and beyond promoting good customer relations, itemizing everything on the bill safeguards your interest. An unambiguous statement on how long you guarantee proper set performance, on the fact that only components you replaced are warranted, and similar clear notations can eliminate misunderstandings. A written confirmation of a telephoned estimate approved verbally by the cus-

tomers can set forth the conditions of the estimate . . . and help you avoid an unpleasant law suit.

The same principle applies to suppliers. When your written order specifies the product or service you desire, you'll get what you want without one of those you-said, he-said, I-said hassles.

Informal verbal orders are fine—as long as everything works out well to everyone's satisfaction. But let a difference of opinion rear its menacing head, and your main salvation is having the facts in black and white.

In short, put it in writing!

← For more data, circle 3-30-1 on coupon, p. 54

TV MANUFACTURERS

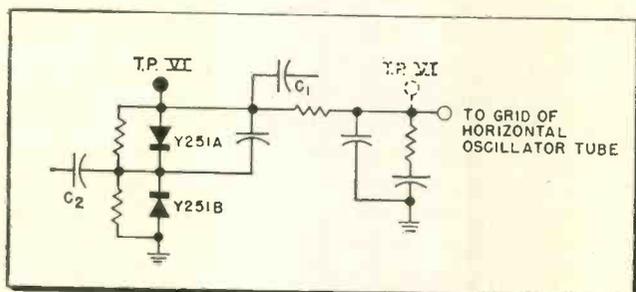
GENERAL ELECTRIC

Chassis M4, M5, M6, U4, U5— Testing Horizontal Detector Diodes

If any of these chassis exhibit symptoms of: horizontal frequency off (may be adjusted by hold control but synch is soft or absent) the fault could be a defective horizontal phase detector diode.

Before checking diodes, however, an initial check to determine whether the horizontal oscillator system is on frequency is advisable (after adjustments and changing horizontal circuit tubes, of course). This is accomplished by placing a short circuit across both diodes. Adjustment of the horizontal hold control and stabilizer coil should cause the horizontal oscillator to produce one upright picture on the screen, though not locked in synch. If an upright picture, as described, occurs, the oscillator circuit can be considered operating properly. The diodes should next be tested.

A VTVM connected to test point VI should show about -1 volt with a signal present on a normally operating receiver. If the voltage at the test point is far off, a bad diode can be suspected. If the voltage is -6 to -8 volts, diode Y251B is open; if the voltage is $+6$ to $+8$ volts, diode Y251A is open. A reading of -10 to -12 volts indicates a shorted diode Y251A. If C1 or C2 are shorted a positive voltage



Horizontal Phase Detector Diodes can be tested in the TV set utilizing General Electric's Test Point VI.

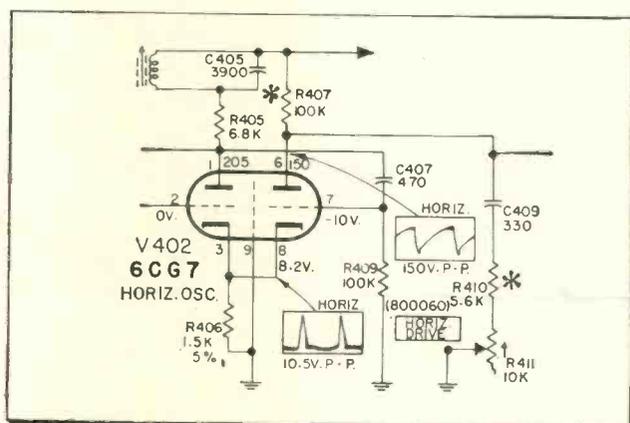
will be present. The probability of a $+6$ to $+12$ reading, however, is very small.

In some early receivers, the anode of Y251B is raised above ground by some fixed positive voltage. The described test method can still be used by subtracting the fixed voltage from readings. Simply short across the two diodes and read the voltage at the test point to determine the fixed voltage.

HOFFMAN

23" Models—Excessive Width

If you come across early model 23" TV receivers with excessive width problems, the following circuit modification will reduce raster size: Add a 0.1 or $0.15\mu\text{f}$ capacitor (600 volt) across C-416 (capacitor between pin eight of the plug and the flyback). Late model receivers have a width switch installed. This switch varies the capacitance of C-416 from $.05\mu\text{f}$ to $.22\mu\text{f}$.



To improve horizontal frequency range and extend drive control range the asterisked components have been changed.

Chassis 426—Improve Horizontal Drive & Frequency Control

To improve the range of the horizontal frequency control and to increase the effective range of the horizontal drive control (ability to vary capacitance over wider range without horizontal foldover) the following modifications were made: R-407 has been changed from 100K to 120K , and R-410 has been changed from a 5.6K resistor to 10K .

MOTOROLA

Chassis TS-432—Production Changes

(See ET Circuit Digest #558, 9/60)

... code C-01 and above, resistor R101 (390 ohms) is changed to a 1500 ohms rheostat and relocated.

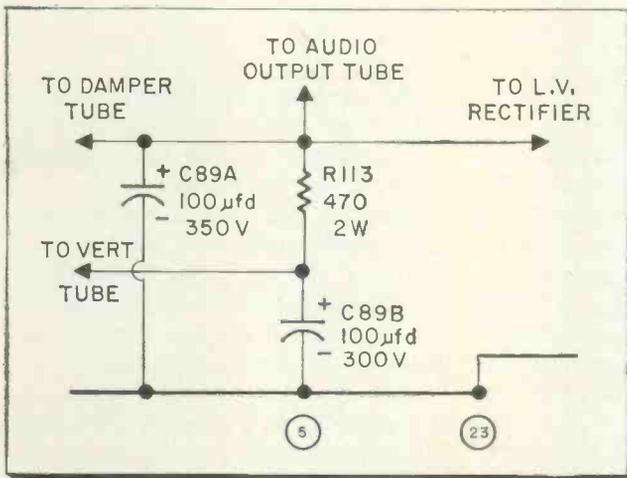
Caution: Do not adjust the Sensitivity Control without referring to the alignment instructions found in the manufacturer's manual.

TECHNICAL DIGEST

PACKARD BELL

Chassis Series 88 & 98—Resistor Burnout (See ET Circuit Digest #578 8/60)

To overcome resistance burnout due to malfunction



Resistors R104 and R113 (Packard Bell TV chassis 88 & 98, respectively) have been increased in wattage to prevent burnout.

in either the vertical or horizontal sweep system, the 470 ohms, 2 watts resistor identified in series 88 as R-104 and in series 98 as R-113, is replaced with a five watts component (same ohmage value).

PHILCO

Chassis 11N51—Run 2 Production Change (See ET Circuit Digest #577, 8/60)

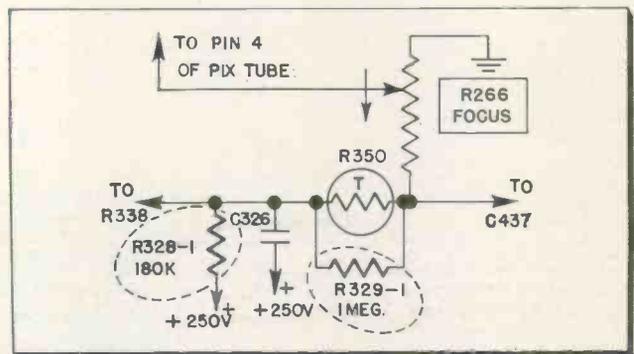
The VOS panel was changed from Run 1 to Run 2 to improve horizontal sweep. (Run 2 may be identified by a red dot.) The modification effected was changing the phase comparer resistor-condenser network N8 (part # 30-6535-1 to 30-6535-3). A few early Run 2 sets were shipped with the old network, but capacitor C1 was removed and replaced by a 1500 μf capacitor.

SYLVANIA

Chassis 546-1, -2 Code 01 & Chassis 552-1, -2, -9 Code 05—Height Control Protection (See ET Circuit Digest #604, 12/60)

To protect the height control in Chassis 546 the following modifications were accomplished: (1)

R-328 changed from 330K to 18-K and relocated. (2) R-329 changed from 820K to 1 meg and relocated. (3) R-336 changed from 2.2 meg to 1.8 meg. In



Sylvania modification (circled components) to protect the height control. Later production models include this change.

Chassis 552, the resistor R-328 from 330K to 180K, resistor R-329 from 680K to 150K and R-330 from 6.8 meg to 5.6 meg.

WESTINGHOUSE

Chassis V-2378, 2384 Series—Drive Lines & "S" Curve (See ET Circuit Digest #614 2/61)

Some of the early production V-2378 and V-2384 TV chassis developed picture trouble: picture contained faint drive lines and an "S" curve. This condition was caused by leakage within the afc package circuit, Z400 and Z401 respectively. Early versions of the afc packages were eliminated from parts stock. The same part numbers are therefore retained for the new stocks of Z400 and Z401.

ADDENDA

1. Change December, 1960 Manufacturers Technical Digest and January, 1961 Circuit Digest #609 to read: Canadian General Electric TV Chassis M575.
2. The yoke pin-cushion correction magnets indicated for Canadian G-E TV Chassis M575 in December, 1960 Digest are also used for General Electric TV Chassis M6, U5, and LW. The yoke replacement part number is WT76X31.

How To Substitute "Unavailable" TV Parts

Use Resistance Measurements To Guide You In Selecting Substitute Yokes, Flybacks, & Vertical Output Transformers

HAROLD WEST

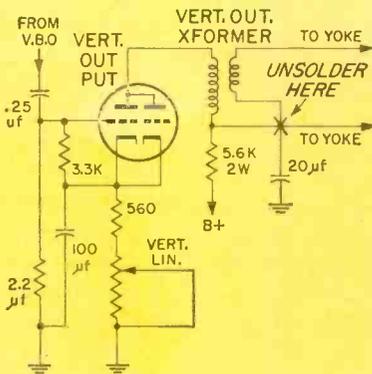
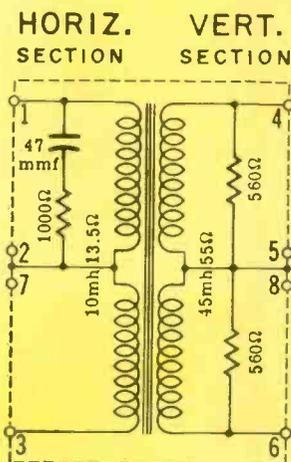


Fig. 1—Vertical output transformer in this Meck TV output circuit can be isolated for testing by unsoldering the secondary lead on the yoke return side of the transformer.

Fig. 2—Unsoldering the resistor at point 4 and the capacitor at 1 enables the technician to check $\frac{1}{2}$ of the yoke's resistance. Multiplying the figures by two, the total yoke resistance can be obtained.



• Among the saddest business moments a TV technician experiences is when a parts distributor's counterman says the replacement part is not available. Many hours of labor used to troubleshoot a TV set seems lost at this moment if the technician elects to return the set to the customer as "unrepairable." However, he can often repair the set with a little ingenuity by adapting a near-exact replacement and modifying the circuit.

Technicians differ in opinion on this point! Some would rather accept a labor loss, claiming they're not set designers! But adapting a workable replacement part isn't really that big a job. Why surrender a profit when many replacement parts manufacturers may have a near-replacement listed in their parts catalog? Surely, with Stancor, Merit, Triad, Thordarson-Meissner, and other catalogs, a vertical output transformer, yoke, flyback, linearity or width coil, can probably be found that would do the job.

Finding a V.O.T.

Situations arise where a vertical output transformer may be needed and you can't locate an exact replacement. Perhaps the set manufacturer is out of business, for example. Knowing the resistance of the secondary winding may be the key to locating a replacement part.

Using a manufacturer's catalog, as shown in Chart I, a technician may uncover a near exact substitute for an unavailable part.

Perhaps you have a vertical output transformer that has an open primary and the part is no longer available. Rather than give up repairing the set chances are you can find a workable replacement.

The first step to take when attempting to find a satisfactory replacement would be to measure the secondary resistance of the transformer. This may be accomplished by either removing the defective component from the circuit or unsoldering the yoke return side . . . then measuring the resistance, which we will assume is 0.3 ohms.

The secondary resistance is the key to locating your replacement part. As seen in Chart I, it is simple to determine that a V.O.T. with a 0.3 ohm secondary is a 44:1 ratio transformer. Consequently, another 44:1 ratio transformer would be a satisfactory replacement for the unavailable part.

Furthermore, should the resistance measurement of our hypothetical transformer read seven to 10 ohms, a 10:1 ratio transformer generally provides satisfactory results. (Slight circuit modifications may be needed for optimum vertical sweep.)

For example, let's consider the Meck TV vertical output circuit shown in Fig. 1. By unsoldering the yoke return wire on the secondary winding, this component can

CHART I

Vertical Deflection Output Transformers							
Part No.	Turns Ratio Pri./Sec.	Primary Impedance#	D.C. Res. In Ohms		Height Overall	Base Area	Mtg. Ctrs.
			Pri.	Sec.			
A-8112	10:1	18,000 Ω @ 12 DCMA	1300	10	2	1 3/4 x 3 1/4	2 1/2
A-8113	8.8:1	16,500 Ω @ 10 DCMA	700	12	2	1 3/4 x 3 1/4	2 1/2
A-8115	10:1	19,000 Ω @ 13 DCMA	600	7	3 1/16	2 1/2 x 2 1/2	1 1/2 x 2
A-8116	10:1	18,000 Ω @ 10 DCMA	525	7	3 1/16	2 1/4 x 2 1/2	1 1/2 x 1 3/4
A-8123§	11.4:1	17,000 Ω @ 20 DCMA	1200	11	2	1 3/4 x 3 1/4	2 1/2
A-8140	44:1	11,000 Ω @ 20 DCMA	400	0.3	3 1/16	2 1/2 x 2 1/2	1 1/2 x 2
A-8141§	18:1	30,000 Ω @ 10 DCMA	1650	4.5	2 1/4	3 3/4 x 2 1/2	3 1/8
A-8142	8:1	19,000 Ω @ 13 DCMA	540	10.5	2 5/8	2 1/4 x 3	2 3/8 x 1 5/8
A-8143	10:1	14,000 Ω @ 15 DCMA	625	14	2 1/4	2 1/4 x 3 5/8	3 1/8
A-8144	9:1	9,500 Ω @ 30 DCMA	540	15	2 1/4	1 3/4 x 3 5/8	3 1/8
A-8145	9:1	11,000 Ω @ 19 DCMA	540	14	2 5/8	2 1/4 x 2 1/2	—
A-8146§	6.9:1	6,000 Ω @ 15 DCMA	375	10	2	1 7/8 x 3 1/4	2 1/2
		4,700 Ω @ 50 DCMA					
A-8147§	6:1	3,200 Ω @ 40 DCMA	300	9	2	1 3/4 x 3 1/4	2 1/2
A-8148§	8:1	6,000 Ω @ 15 DCMA	375	6.5	2	1 7/8 x 3 1/4	2 1/2
		4,700 Ω @ 50 DCMA					
A-8149§	6.9:1	11,500 Ω @ 20 DCMA	330	8.5	2	1 5/8 x 3 1/4	2 1/2

COURTESY OF STANCOR

be isolated for testing. The secondary resistance should read 10 ohms and therefore a 10:1 transformer is an acceptable replacement. Consulting a Stancor catalog, for example indicates that their A-8112 is a direct replacement for the needed part. However, your distributor may not carry this transformer, necessitating a transformer that closely matches a 10:1 ratio. Using an *almost* exact replacement however, may result in slightly imperfect performance. However, this may be rectified by some minor modifications.

For instance, in this circuit if the 5.6K resistor is reduced (part feeding B+ to the height control) vertical sweep can be increased. Too large a reduction in resistance, though, may upset the vertical hold circuit. An easy way to select the best resistance is to wire in a 5K potentiometer and vary the control until sweep is adequate. Another method to increase vertical sweep is to replace the original tube (vertical output) with a higher gain replacement. (6SN7 replaced by 6BL7 or 6BX7.)

If the parts counterman can only come up with a four lead output transformer instead of the desired three lead auto-type, you only have to connect one of the primary leads to a secondary lead (use diagonal leads) to make an auto-transformer. Take the center tap off at the tie point.

Mounting the new transformer should pose no problem. The old part is usually approximately the same size and self-tapping screws will replace the original rivets. Before installing the replacement part

be sure to check the color codes of the new and old transformer. I have found that some manufacturers reverse the normal blue and red leads, using the red as the plate lead and the blue for the B+ connection.

Finding The Yoke

A common TV service problem occurs when a local parts distributor must *order* an exact replacement yoke, thereby tying up a bench repair for days or weeks. The technician often must sit by and wait until the part arrives from the manufacturer.

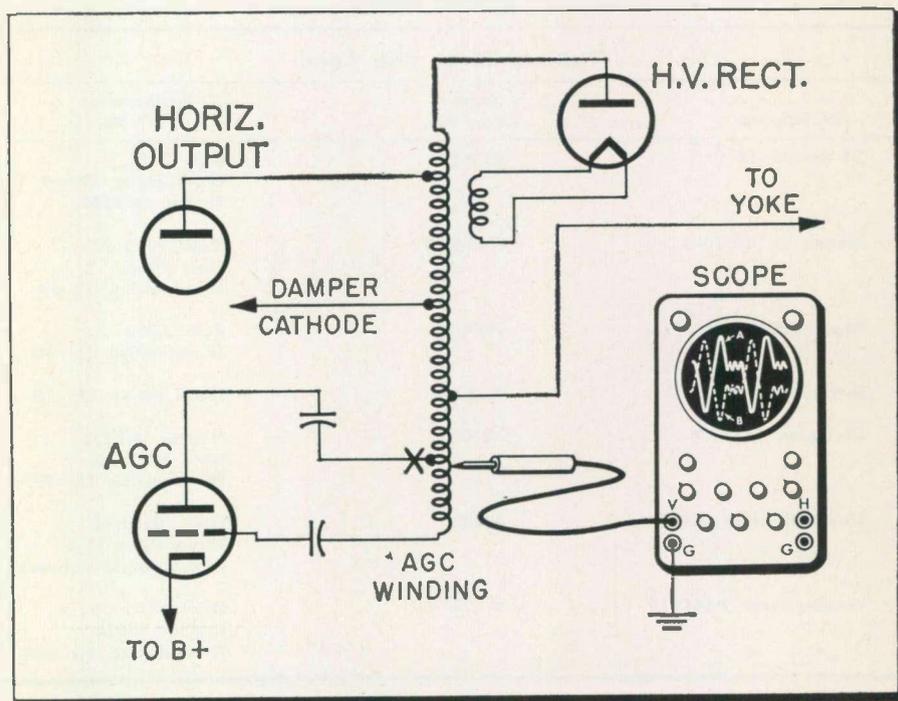
Consulting a catalog's yoke section as an example, (see Chart II,) may reduce this waiting time. The secret of replacing "unavailable" deflection yokes is in knowing how to determine the defective yoke's resistance.

Whether a yoke is shorted or opened, you can usually obtain one good winding's resistance. If the two resistors in the vertical section are unsoldered at points 4 and 6, as shown in Fig. 2, the resistance of the deflection coils can be measured. A more exact measurement is obtained by unsoldering one resistor and measuring the resistance of that winding and multiplying by two.

For the horizontal deflection windings, unsolder the capacitor at point 1 and measure the resistance between 1 & 2. Multiply this figure by two and the result is the total horizontal winding resistance. Knowing the two resistances, it is then a simple procedure to check the many available combinations and select the nearest replacement match.

Should the circuit encounter ringing balancing in the horizontal section is needed. Insert a 5K potentiometer in series with the balancing capacitor. Rotate the control unit until the ringing dis-

Fig. 3—Using an oscilloscope coupled to the flyback's agc terminals, the technician can visually check the polarity of the available pulse. An inverted pulse (A) can cause raster—no sound or video, while the proper polarity pulse (B) allows normal circuit operation.



appears. Turn off the set and disconnect the potentiometer. Measure the resistance. Then, solder an equivalent resistor in series with the capacitor.

Flybacks

Replacement flybacks may be exact electronic replacement parts needing only a wiring change at their taps. Among a number of replacement parts manufacturers I have found an adequate listing of replacement flybacks. Many of

their products are exact replacements for RCA, Motorola, Philco, Sylvania and other TV chassis. As an example, if a Sparton flyback PC70030/-1 is replaced by a Thordarson-Meissner Fly 28, the taps on the new flyback are numbered differently than the old. Original terminals 6-7-8-5-4-3 are replaced with new terminals 1-3-T-4-5-7. Changing the wiring as indicated, plus connecting the other side of the width coil to the junction of a .1 μ f capacitor & B+, completes the installation of the new flyback.

A major problem a technician encounters in flyback replacement is agc winding polarity. Using the test set up in Fig. 3, a flyback may be checked by using an oscilloscope to observe polarity of the available agc pulse. Disconnect the plate lead from the agc tube and apply the positive scope lead to the hot side of the agc winding on the flyback. Ground the negative lead from the scope and observe the polarity of the pattern. If it is inverted as in insert (A) reverse the original wires connecting to this agc winding and this will reverse agc pulse polarity.

Reconnect the plate lead of the agc tube and adjust the agc control for buzzless sound and good picture definition. Should the pulse be injected in the circuit in reverse polarity, raster, no sound or picture or sync-less pictures may be encountered. Naturally the agc control will not function properly.

Linearity & Width Coils

Technicians encounter sets with width or linearity coils that are open, changed value or shorted. In older sets pulse-width coils opened resulting in critical horizontal hold. Typical were Sylvania TV sets plagued by shorting width coils that killed the horizontal circuit. Consulting a replacement parts catalog often restored these sets to normal operation. Often a time problem is encountered and waiting for the exact replacement part from the manufacturer influences a customer about their set's repair.

Among the problems facing technicians are those similar to the one I had with a Stewart-Warner model 9127 TV set. Slugs in the width and linearity coils in this circuit (shown in Fig. 4), were both frozen and I couldn't adjust for a symmetrical pattern. I was informed locally that Hoffman TV of California had taken over this firm. Consulting them, they advised the parts requested were no longer available. Returning to my local parts distributor I explained my plight and he suggested I consult one of his catalogs. Checking part numbers (width coil—508667 and linearity coil—162190) I found that RAM parts 201R14 and 201R-12 were exact replacements. Using

(Continued on page 53)

CHART II

REPLACEMENT YOKES						
MERIT NO.	DEFL. ANGLE DEGREE	INDUCTANCE (M.H.)		D.C. RES.		REMARKS
		HOR.	VERT.	HOR.	VERT.	
MD-12	53	8	48	14	66	With Leads
MD-13	53	30	47	44	66	With Leads
MDF-70	70	10	45	13.5	50	With Leads
MDF-71	70	30	50	45	64	With Leads
MDF-82	70	19	42	30	50	With Plug
MDF-83	70	8.2	41	19.7	72	Adj. Bracket
MDF-84	70	14	29	33	60	Adj. Bracket
MDF-97	90	25	39	36	48	With Plug
MDF-99	90	19	39	25.5	44	With Plug
MDF-100	70	15	3.6	25.8	3.5	With Plug
MDF-105	90	20.5	42	26	50	With Leads
MDF-108	90	24	37	34.5	41	With Leads
MDF-110	110	30.5	32.5	72	36.5	With Leads
MDF-116	90	24	37	34.5	41	With Plug

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CHART III

Typical Shop File Card		
TV Receiver	Original Part No.	Replacement Part No.
GE Model 1710	RTO-104	Ram X051 Thord.-Meiss. Fly-49 Stancor A-8257
Magnavox CT270-C	320055-1	Merit HVO 48 Ram X066 Thord.-Meiss. Fly-59
Regal 22D19X	140-126	Ram X053 Thord.-Meiss. Fly 50
Setchel Carlson C101	T-123-9	Thord.-Meiss. Fly 76
Silvertone 1172-17	10104	Stancor A-8230 Merit HVO 26 Thord.-Meiss. Fly 59
Stewart-Warner 9108C	508675	Ram 70F10/43 Thord.-Meiss. Y-6 (Use original network)
Westinghouse H647K17	V-9904-1	Merit HVO 56 Stancor A-8237 Thord.-Meiss. Fly 158

Modernize Your Tube Checker

Easy Steps For Converting And Installing Spring-Loaded Chart Roller

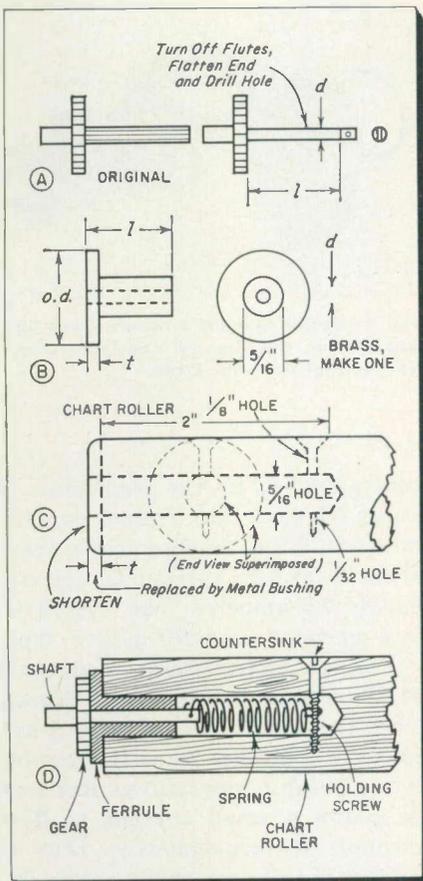


Fig. 1 (A)—Remove fluted shaft gear from one chart roller, turn off flutes on shaft, flatten shaft end with file and drill hole. (B)—Turn brass bushing to fit gear shaft and hole in end of chart roll. (C)—Cut off end of chart roll equal to thickness "t" of bushing flange. Enlarge hole in chart roll end to 5/16" to a 2" depth. (D)—Mount the assembly and tighten spring holding screw.

RONALD IVES

• General adoption of the roll chart improved and simplified the operation of tube checkers and similar instruments about fifteen years ago. A large library of specialized reference data was made available

in a small space. Since adoption of the principle, however, the number of standard vacuum tubes requiring testing has greatly increased. This expansion of tube types has resulted in unusually long roll charts.

Because chart paper has a finite thickness, the length of chart contained in one turn of the roll depends upon the amount already on the roll. Chart tension between rolls varies with the portion in use. With many roll chart mechanisms, the roll is excessively *tight* at both end settings, but *sags* at some intermediate setting, and may even tangle with the feed mechanism. This trouble is serious with many tube checkers now in use, and becomes more annoying with each printed (and longer) chart revision.

Compensation for the varying chart roll diameters at different settings can be made by spring loading one roller, using a mechanism similarly contained in the familiar window shade roller. In this mechanism, one tube checker roller is driven directly by the drive gear, and the other is coupled to the drive by a coil spring. This device keeps the chart under fairly constant tension, eliminating sagging and tangling.

Roller Modifications

Construction of a spring-loaded chart roll is quite simple, requiring a small amount of material, and a few minutes of medium precision
(Continued on page 84)

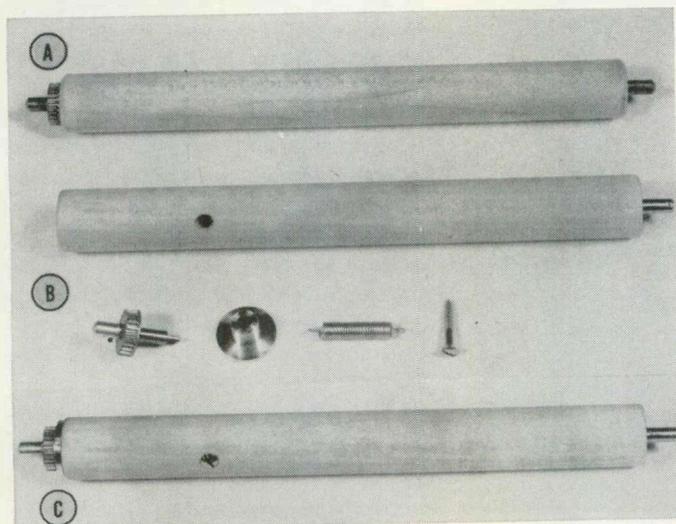
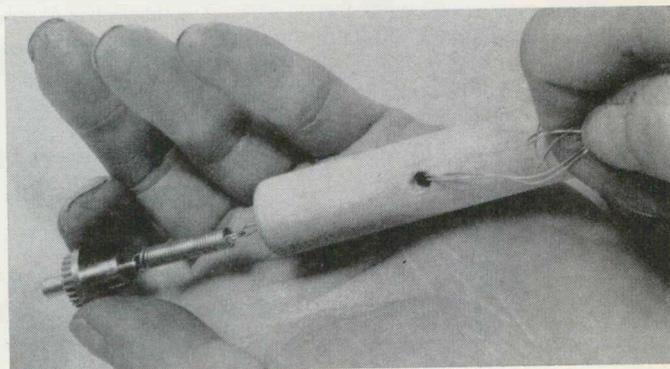


Fig. 2 (A)—Original unconverted roller. (B)—Converted roller and assembly parts. (C)—Completed spring-loaded chart roller.

Fig. 3—Installation of spring-loaded gear assembly is performed with the aid of a fine wire looped into eye of tension spring.



Transistorized Ignition Systems

G. E. SPAULDING, JR.
 Director of Research
 The Electric Autolite Company

• A transistorized ignition system has been developed for more efficient and reliable spark plug firing in high compression automobile, marine, and comparable type gasoline engines. The system is said to reduce spark plug fouling problems, pitting of distributor contacts, and improve voltage regulation of the ignition system at high engine speeds.

The general trend in automobile engine design toward increasing maximum horsepower with minimum fuel consumption has revealed the limitations of conventional ignition systems. In addition to normal carbon deposits, spark plug fouling in high compression engines is aggravated by the built-in anti-knock qualities of modern fuels required to develop higher horsepowers.

Although performance characteristics of conventional ignition systems have been improved by inclusion of ballast resistors, increasing contact dwell time, cam redesign, double breaker systems, and increased battery voltage—spark plugs continue to foul, distributor contacts pit, and capacitors fail.

The transistorized ignition system shown in Fig. 1 has a low current input with increased output to spark plug firing points. It operates directly on 6, 12, or 24 volts, and employs a power transistor and one diode. The distributor's capacitor, shown in the conventional type ignition system schematic in Fig. 2, is eliminated because the contacts break only about $\frac{1}{4}$ ampere.

Transistor Circuit

Transistorized ignition system

operation, of course, is based upon the transistor's ability to amplify current. When the distributor contacts close, a small current flowing through the emitter-base circuit will switch on the transistor—permitting a larger current to flow through the emitter-collector circuit.

Current carried by the distributor contacts compared to the cur-

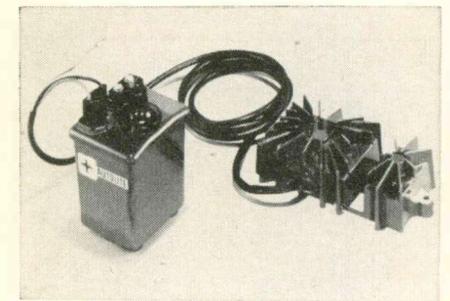


Fig. 1—Electric Autolite's transistorized ignition system, showing HV transformer, heat-sinked transistor, and diode.

rent switched by the transistor, is about 30 to 1, and contact current is about 0.250 ampere while transistor or system current is approximately 7.5 amperes. The transistor is a germanium PNP power type.

Fig. 4's emitter-to-base junction at the Diode D_1 is reverse biased when the distributor contacts S_1 are open. This insures transistor cut-off even at high temperatures. Resistor R_1 allows a small current to flow through D_1 , continuously, thus a 0.5 to 0.75 volt drop exists across D_1 .

Since the transistor base is connected to the positive side of the diode through R_2 , and the emitter is connected directly to the negative side of the diode, when the contacts are open, the base is at a potential of 0.5 to 0.75 volts positive with respect to the emitter. This guarantees transistor cut-off. The action is enhanced by keeping R_2 as low as possible—but not low enough to allow excessive current to flow through the distributor contacts.

The diode's peak inverse voltage rating is sufficiently high to prevent damage if the circuit is accidentally connected with reverse polarity. When the distributor contacts are closed, the transistor base is connected directly to the collector, allowing maximum current flow. Transistor impedance under full load approximates 0.10 ohm. Initial current now is limited by the high voltage transformer T_1 primary inductance—and ultimately by the ballast R_3 . Note the traditional capacitor across the primary contacts (S_1) has been eliminated.

Induced primary voltage of the transistorized system is approximately 60 volts—compared to about 300 volts for the conventional in-

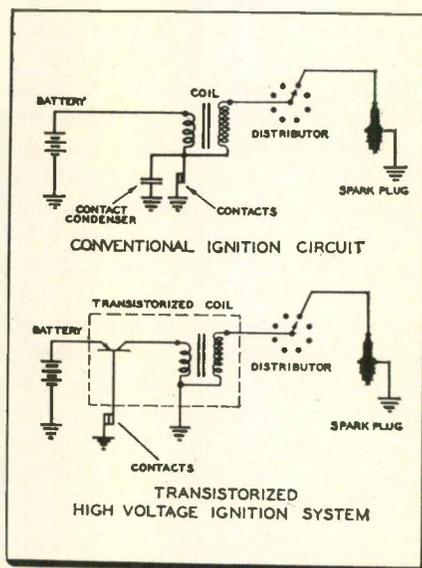
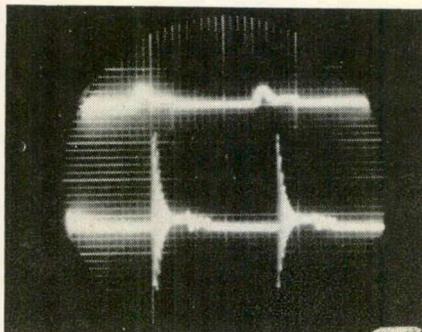


Fig. 2 (top)—Conventional ignition circuit, and (bottom) transistorized high voltage ignition system which eliminates capacitor.

Fig. 3 (top)—Voltage wave form in primary of transistorized ignition system, and (bottom) in conventional system primary.



(Continued on page 80)

SHOP HINTS



Transistor Radio "Hearing Aid"

Often, when attempting to service a transistor portable with the usual comparatively low power output found in most small portables, it becomes very difficult to hear the set over surrounding shop noises. This is especially apparent when the technician on the adjoining bench is servicing a high fidelity phono, etc.

I recommend the use of a "hearing aid" device to simplify servicing

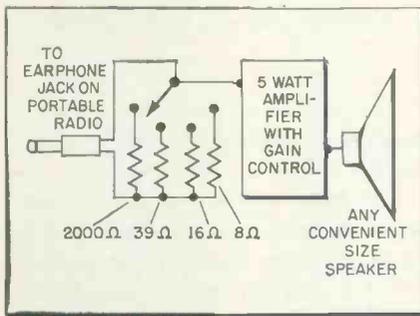


Fig. 1—Transistor radios are frequently drowned-out by other equipment playing in a repair shop. If additional volume is needed to satisfactorily service a midget under these conditions the unit's output can be amplified by plugging an amplifier into the radio's earphone jack.

ing a transistor portable in a noisy shop. Connect the output of the radio (usually through the earphone jack) into the appropriate resistive load, 8, 16, or 39 ohms, connected across the input terminals of a high-gain 5 watt phono-graph amplifier modified for the purpose (see Fig. 1). The amplifier's gain control allows the technician to make the output as loud as desired to compete with surrounding noise. It is also helpful in locating noisy and intermittent components.—Olin G. Shuler, Quincy, Illinois.

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.

What Would You Do?

You're all alone on a Saturday afternoon installing an intercom system and listening to the local football game on your transistor radio while working. Having just hooked up the 8th and last room to the new intercom system, you suddenly realize that you've got all stations connected but you don't have anybody there to help check them out. Which room is connected to what button? If you had a helper to talk to you it'd be easy. What would you do?

Solution:

Make use of the little transistor radio. Simply take it to the 1st room, set it down in front of the remote speaker and play it. Go back to the master station, push buttons until you hear the radio; mark that button "#1," or whichever room it's in. Continue moving the radio to other rooms, until all have been identified. The same process can be repeated from the master station. Lock it into "Talk" position, push the button for Room #1, and go there and listen. If you turn the radio volume up pretty high, you can usually hear the sound coming through the open door of the room by just sticking your head out into the hall.—Jack Darr, Mena, Arkansas.

Resistor-Capacitor Carrier

I do much service work in the customer's home. My problem used to be locating resistors and capacitors in my tool box. After filling my tool box with the usual tools, soldering iron, electrolytic capacitors, corona dope, volume controls, etc., I only had room for two small boxes: one for capacitors (small tubular & disc) and one for resistors (1/2, 1 & 2 watt). Each time I needed one I dumped the whole lot on a newspaper and spent a lot of time searching for the right one.

I remedied this problem by copying a popular resistor company's stock cards. Cutting a few sheets of fairly stiff cardboard to the size of 3 x 1 1/2 inches, I mounted resistors

and capacitors (up to 0.05, μ f; higher values are too big) on the cards according to their values. The components were secured to the cardboard by cutting slots in the cardboards' 3 inch side; they are held in place by bending the components' leads into the slots.—Leonard Cox, Jr., Chevy Chase, Maryland.

Instrument Face Protector

The glass protecting the meter movement of a test instrument from dust, needle bending, etc., is not a very good protective device for hard blows, any severe fall or blow can break the glass and ruin an expensive meter. I have found an excellent safety device to protect the meter of my transistor power supply when it isn't being used, as shown in Fig. 2.

For a few cents, I purchased a rubber caster cup about 2 1/4 inches square by 3/8 inches thick and



Fig. 2—Test instrument's meter face is protected by a rubber caster held in place by rubber bands.

quickly set it in place over the dial face with a couple of rubber bands when the instrument isn't being used. Other meter faces may be similarly protected by using heavy cardboard or thick foam rubber if rubber casters cannot be purchased.—H. Leeper, Canton, Ohio.

Reverberation: The New Sound Of Hi-Fi

*Operating Principles & Installation
Procedures Of Echo-Adjusting Devices*

L. M. DEZETTEL
Allied Radio Corp.

• Since its debut at the 1960 New York audio show, "reverberation" equipment has frequently made the hi-fi headlines. Chances are that you've already had a few inquiries about it from your audiophile customers.

Let's take a brief look at the subject of reverberation to see why it is currently getting so much attention from hi-fi equipment designers.

Sound Reverberation

Whether you sit in your shop or wedged into a jam-packed football stadium, any sound that you hear is actually a blend of direct, and reverberated sound. Reverberated sound, bounced at you from any solid material surrounding you and the sound source, helps to give some perspective of what you hear. If you talk while sitting blindfolded in a room, the reverberations of your own speaking voice would still give you a fair idea of the kind of room you're in.

Audio engineers have long recognized the importance of reverberation in the recording of music.

There's a ceaseless search for recording halls with good acoustic properties—the right amount of "slap" and "bounce" for the kind of program material being recorded. It's very important for a hall's or studio's acoustics to sound "right" for the music. It would be ridiculous, for instance, for a jazz disc to sound as if it had been recorded in a cathedral—and a Beethoven symphony to sound as if it were coming from a cozy night club setting.

To avoid this, major record companies keep a file on the properties of various halls available for recording sessions. Some companies even build sound studios of their own with carefully varied acoustics.

In addition, recording engineers have several electronic gimmicks at their disposal to add reverb to beef-up a "dead" sounding recording. The most famous of these is the echo chamber. And one major recording company uses an abandoned stairwell for the ultimate in echo chambering! A monitor speaker at the bottom of the stairs is fed the original program material picked up by the recording studio mikes. Another mike at the top of the stairs picks up the sound after it has bounced around the solid

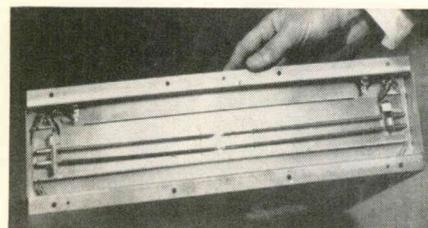


Fig. 1—Hammond Organ's type IV reverberation unit employed with Knight electronic control.

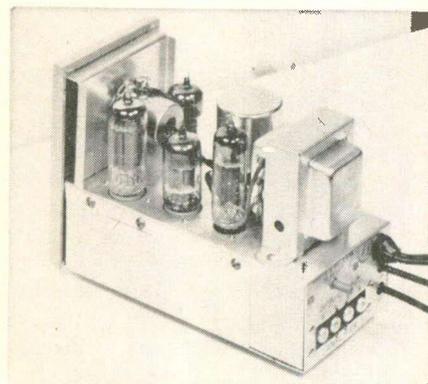


Fig. 2—KN-701 unit with cover removed.

brick stairwell walls on its way upward.

The reverberated sound is then fed to an audio console—where it is mixed in any desired proportion with the original direct sound. It's possible with this arrangement for a pop-singer to sound as if he's reaching the rafters in Madison Square Garden!

Since recording engineers have everything from custom-built sound studios to a variety of electro-mechanical and electronic echo devices, it's logical to wonder why home type reverberation units are attracting so much attention. The answer is simple: recording engineers cannot control the acoustics of the music listener's living room. Unless the listener uses ear-phones, the engineer knows the room in which a recording is played will change the overall sound effect. Most listening rooms are small and do not have enough time-delay to develop "concert hall" realism.

What's more, there's no practical way for the audiophile to constantly vary the acoustics of his living room to fit the various kinds of music radiating from his loudspeakers. And here is the reason why reverb units were designed: it provides adjustment of room echo.

Typical Unit

Reverb components, designed for addition to present hi-fi equipment, either stereo or mono, is shown in Figs. 1 & 2. The system comes in two sections and is connected at a point between the preamp and the audio output amplifier. One section is electro-mechanical (Fig. 1) which supplies reverberation. The other section (Fig. 2) is an electronic control unit for adjusting the amount of reverberation, and for mixing it with the original sound from a record, tape, or broadcast.

The reverberation section is an integrated unit composed of four shock-mounted springs arranged in two separate circuits. A ferrite magnetic transducer is located at each end of the two spring assemblies.

A signal from the preamp is fed to the electronic control section which passes the signal to the mechanical reverb section. The input transducer converts electrical signals into mechanical motion—conveying it to the two spring circuits. This mechanical motion ripples across the two springs until it reaches the opposite end where the other transducer reconverts it back to electrical pulses.

Echo effects are produced by delaying the original input signal across the two spring circuits. In addition, of course, secondary effects are obtained when the signal bounces back and forth along the springs until it finally dampens out. The stronger the control signal's drive, the longer the springs vibrate—further augmenting the echo effect.

The mechanical unit's two spring circuits have separate delay times—one being 29 and the other 37 milliseconds. The two-circuit spring arrangement is used because it is more efficient in producing the desired time delay. The different delay characteristics of each circuit prevents phase-opposition from cancelling out part of the signal—which would produce uneven frequency response.

In addition to the two springs being coupled at the center, each spring is wound in opposite directions to prevent external effects caused by vibration. For example, vibration caused by walking across

the floor when the equipment is in operation.

Although the electronic section has only one control knob, it has a complex task to perform. First, it must blend two stereo preamp signals into one—for transmission to the mechanical section. The control simultaneously regulates the overall echo effect by determining the amount of signal going to the mechanical section's input. The control section's reverberation range varies from 30 milliseconds to more than two seconds.

In addition to these functions, the control section must blend reverb and regular signals before they enter the output amplifier.

Circuit Operation

The control section's circuit has two inputs designated "A" and "B" as shown in Fig. 3. These are fed directly from a stereo preamp output. In this particular equipment, signal levels from the preamp should be kept to 1 volt or less to prevent input tube overload. If the stereo basic amplifier has input level controls, it would be a good idea to keep them wide open and make adjustments at the preamp.

Each channel's signal is fed to a section of a dual-triode 12AX7, V-1. Each triode is connected in a circuit resembling a Williamson amplifier split-load phase inverter. No attempt is made here, however, to insure a balanced output signal. Channel signals developed at each

tube cathode is fed through 22 k resistors to the cathodes of another double triode. When the reverberation level control is set at minimum, both grids of V-3 are grounded, and the tube functions as a grounded grid amplifier.

The signals coming off the plates of V-1 pass through a 1 meg isolating resistor, meeting and mixing at the grid of V-2A. One triode (V-2A) serves as the reverb section driver, and the other triode (V-2B) is connected to the reverb output.

When the level control is turned up (from ground point) the circuit is essentially unchanged as far as the cathode signals are concerned. The reverberated signal, however, now passes to the grids of V-3A and B, and appear at the plates—mixed with respective channel signals.

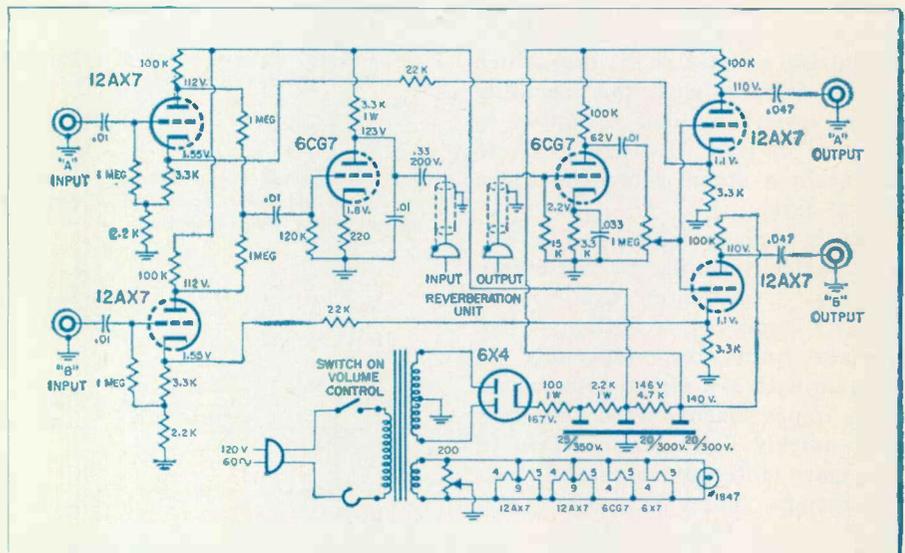
The problem of converting stereo to mono, reverberate the mono signal, mix a small percentage of it back into each stereo channel—at the same time preserve the existing channel separation—was no easy job for the engineers. Low distortion and a decent s/n ratio was another consideration.

Installation

Installing this unit in a component system is a simple job. For stereo, two standard shielded phone cables are run from the preamp outputs to the integrated control

(Continued on page 52)

Fig. 3—Schematic diagram of reverberation control unit.



Troubleshooting TV AGC Circuits

Understand, Locate & Repair AGC System Breakdowns

MICHAEL KRANTZ

• Since most television channels transmit information with different signal strengths, it was only natural to develop circuitry that would automatically adjust for these differences. Otherwise, TV set owners would have to adjust contrast when changing from one channel to another. Additionally, if the set was designed to adequately receive the weakest signals, strong signals would cause overloading.

Original agc circuits were basically similar to those employed for automatic volume control (avc) in radio receivers. Today's agc systems, of whatever type, are all modifications of the original avc technique.

AGC Systems

As we already know, agc is a system which uses the incoming signal to develop a negative d-c bias which varies directly with the incoming signal level. This bias is applied to r-f and certain i-f stage grids to maintain a stable composite video signal level.

Early agc systems used a circuit basically similar to that shown in Fig. 1. Although this system greatly improved reception, it had certain limitations—especially on signals with low signal-to-noise ratios. Improvements were necessary and quickly forthcoming. Two of the many different agc circuit configurations found in modern sets are shown in Figs. 2 & 3.

The classic pulse keyed agc sys-

tem uses one tube (or a section of a dual purpose tube) with a positive going composite video signal applied to its grid. A high level positive going horizontal sync pulse from the HV section is applied to the tube's plate. The grid is biased so that the tube conducts only on the incoming video sync pulses. The tube acts as a keyed rectifier—pro-

ducing a d-c bias which varies with sync pulse amplitude.

Since the tube can conduct only when the high level positive sync pulse appears on its plate, any noise appearing between pulses cannot affect agc operation. This system provides good agc action over a wide range of signal level variations. Its circuitry may or may not be provided with a threshold control. Modern versions generally include agc voltage division between i-f and r-f—allowing wider voltage variations to the r-f section. This is frequently called delayed action, and is common to most present day agc systems.

The so-called voltage reference or conventional type agc system probably has more circuit variations than the "pulse keyed" system. Furthermore, the two systems may even have certain common characteristics: for example, the principle of sync pulse keying—although for different reasons.

A d-c reference voltage can be obtained at the video detector output, or by employing a separate diode rectifier. A combination of the two can be used to provide separate agc for i-f and r-f—thus obtaining optimum r-f gain on weak signals and very low gain on strong signals.

AGC Troubleshooting

When a TV set's agc system goes hay-wire, the technician may be confronted with one or more symptoms, including: a dark screen, overloading, bending, snowy pictures, erratic sync, etc. When not

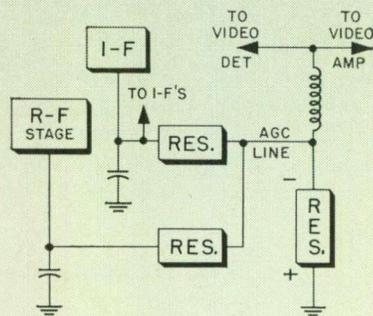
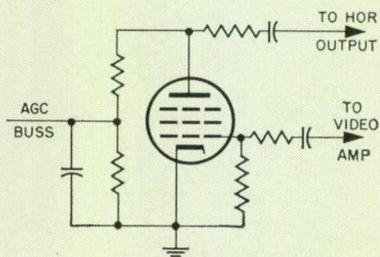


Fig. 1—Early agc system had a similarity to the avc circuit found in a-m radios.

Fig. 2—Simplified keyed agc diagram showing plate pulse for horizontal output and grid pulse for video amplifier.



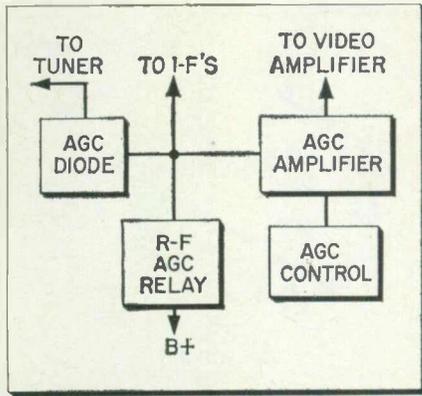


Fig. 3—In this DuMont agc system both keying and delay circuitry is used.

caused by misadjusted agc controls or defective tubes, shop repair of the customer's set is usually required.

Many technicians have developed their own private approach to ailing agc's. Although certain preliminaries may vary—most agree upon one fundamental approach: agc bias defects can best be isolated by substitution of an accurately known bias voltage to the set's agc bus line. Because past experiences have resulted in tracing *apparent* agc circuit component faults to defective r-f, i-f failures; sync separator, clipper circuit component malfunctions—or horizontal sweep and high voltage component defects, this technique assumes meaningful significance.

Whether or not the TV set resumes operation when the proper

fixed bias is applied—half of the troubleshooting job is already finished. If the set operates, the trouble is obviously in the agc system. If no change occurs after substituting bias to all normally biased grids, the trouble is elsewhere.

Most shops have a commercially available variable bias supply capable of producing from 3 to 9 volts. In the event a bias supply is not at hand, one can be quickly improvised with a 7.5 to 9 volt dry cell battery and a 10 to 20 thousand ohm carbon pot. A clip lead from the plus side of the battery and one end of the control goes to the set's B— or chassis ground. A clip lead to the pot's center arm is attached to the agc bus. The pot is varied to supply the proper bias needed for a particular TV. Of course, the set's original bias source is disconnected from the agc bus before checking the set.

A further series of bias substituting steps are also sometimes helpful in isolating agc faults. With the receiver's normal bias source connected to the bus, disconnect the i-f agc line from the bus and substitute variable bias. Next, reconnect the i-f agc and disconnect the r-f agc line, substituting bias at this point. Where two i-f tube grids are being fed agc, disconnect one at a time and substitute bias at each individual grid. These steps frequently save much time wasted in making voltage, resistance and capacitor checks.

Some technicians use a modulated r-f signal to check on agc system. The set's r-f oscillator tube is first removed and the set turned on. A VTVM is used to measure the voltage across the agc bus and ground, or B—. This voltage normally reads from 0 to about -1 volt. A modulated signal from the generator is now capacitively coupled to each i-f tube grid, as shown in Fig. 4. Agc voltage is again checked. If the negative agc voltage increases by -0.5 volt or more,

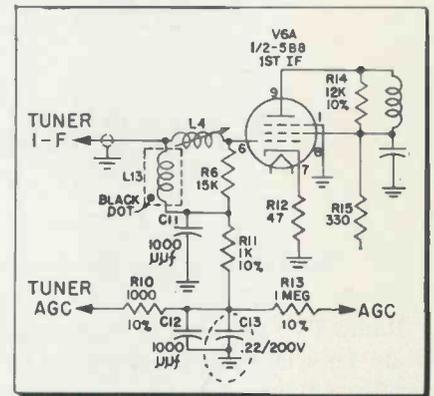
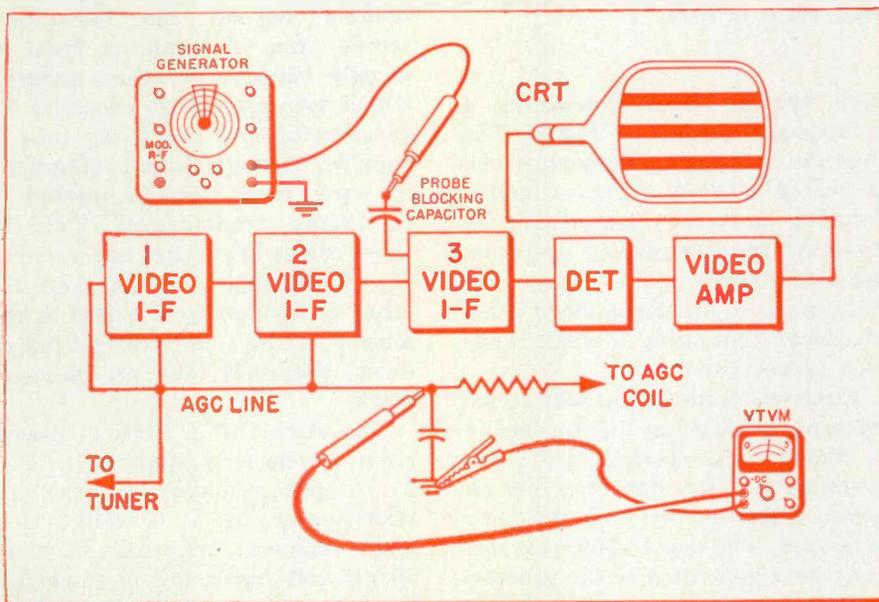


Fig. 5—A leaky capacitor in the grid of the 1st video i-f caused "overloading."

agc action would appear normal.

If no change in agc voltage is noted, and modulation bars appear on the CRT screen, an agc fault appears obvious. Begin these tests with the last i-f tube and work back to the first tube—checking the agc voltage at each step.

Fig. 4—Test set-up used to check agc circuit operation.



Case Histories

A condition of overloading was encountered in an Olympic GT, GU model TV chassis (see Fig. 5). Agc voltage is developed across a resistor in the video detector diode circuit. Substituting proper bias voltage to the first i-f tube grid brought a picture to the screen. VOM checks showed the .22 μ f agc filter connected to the agc bus leading to the grid of this tube was leaking heavily. The set resumed normal operation when the capacitor was replaced.

In the DuMont agc circuit shown in Fig. 6, a delay circuit is used to supply bias to the r-f section in the tuner. A set with this type agc sys-

(Continued on page 51)

Servicing Electro-Medical Equipment

X-Ray & Fluoroscope Repair Methods & Precautions

CHARLES MADUELL, JR.

• Radio-TV technicians have the basic knowledge and equipment to service many electronic devices used by doctors and dentists.

Simple medical instruments used in physical therapy, including infra-red and ultra-violet lamps, are as easily serviced as regular household and fluorescent lamps. Infra-red heat lamps are essentially no more complicated than a line cord, socket, switch, and a lamp or element.

Ultra-violet lamps are somewhat more complex. There are two standard types: The cold quartz device (see Fig. 1) using a quartz tube filled with mercury vapor, and wired in a neon sign, or fluorescent light type circuit. A timing switch is usually employed to turn the instrument off at the end of a treatment cycle. The second form employs a quartz tube filled with liquid mercury. This unit must be "started" by tilting the tube until the mercury arcs, after which the arc is sustained by a reasonably high voltage. This unit may have an autotransformer with taps for varying voltage across the lamp.

X-ray Equipment

Electro-medical X-ray instruments are more intricate. These devices are as varied as television and other type electronic instruments—

since different manufacturers have their own circuit ideas. The goal is similar, however: to produce X-rays by generating and directing high velocity electrons to a small target area within the X-ray tube.

Essentially, the X-ray tube is a

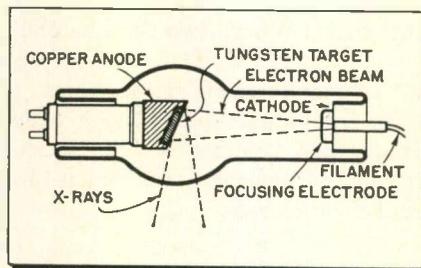


Fig. 2—X-Ray tube's anode target is tilted to direct rays at an angle.

high vacuum diode, containing a cathode and anode (see Fig 2). The cathode contains a filament which is heated to emit electrons, and a focusing cup for electrostatically directing the electrons in a narrow beam to a small area on the anode. The anode is usually a large block of copper containing a small tungsten target insert.

Electrons from the cathode strike the tungsten and lose kinetic energy in the strong electric field surrounding the tungsten atom nuclei. Some of this energy is in the form of X-rays. The copper block carries away heat generated in the process.

The simplest X-ray generator is

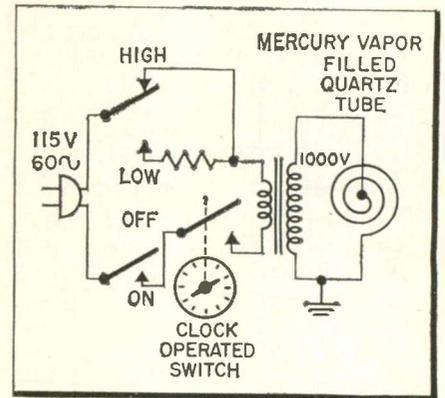


Fig. 1—Basic circuit of a typical simple cold-quartz ultra violet lamp.

probably the vertical fluoroscope. In some vertical fluoroscopes an X-ray tube is mounted in a cabinet with a fluoroscope screen in line with the target. The screen is pivoted so it can be moved toward or away from the patient. Screen and tube mount assembly is counterbalanced so that the doctor can manipulate the entire unit with ease. The tube is encased in a special lead-glass housing which directs the X-rays through the cabinet front. A small aluminum filter, 2 mm thick, is generally placed in front of the tube. Beyond this are two lead shutters arranged so the doctor can close or open them at will. These shutters are adjusted to prevent X-rays extending beyond the fluorescent screen area. The cabinet front is usually bakelite or other material which does not absorb excessive X-rays. Voltage to the X-ray tube is supplied through three spring-loaded wire "cord reels" connected to the X-ray tube filament, and the other is spring-clip attached to the anode. As the tube is moved up or down, the reels take up the wire slack.

The circuit of a vertical fluoroscope is relatively simple (see Fig. 3). A split secondary high voltage transformer and a 10 volt 3 to 8 amp filament transformer with 50,000 volt insulation is employed. The transformer is supplied from

115 volts a-c through a foot-switch timing circuit.

The HV transformer secondary is split for two reasons: (1) Center point grounding is provided—thus placing only one half of the high voltage to ground from the filament transformer, the cord reels, etc. (2) Allows the milliammeter to be placed on a panel which is at ground potential

Equipment

Since it is necessary to have a variable voltage to the X-ray tube, a tap switch is connected to an auto transformer at the a-c input. This tap switch is usually marked specifying transformer secondary voltage, but is occasionally simply marked "LOW," "MEDIUM," and "HIGH." LOW generally implies about 65 KV; MEDIUM, 75 KV; and HIGH, 85 KV—delivered across the X-ray tube. High voltage is turned on and off with a footswitch inserted in the HV transformer primary. Sometimes the footswitch is isolated through a relay, allowing a small red roomlight to be turned on when the X-rays are off, and vice versa.

Current through the X-ray tube is measured with a milliammeter in the ground leg of the transformer secondary. Fluoroscopic ratings are usually 2 to 5 MA, as dangerous radiation dosages would be produced if higher values are used.

Current through the X-ray tube is varied with a rheostat in the filament transformer primary. Filament voltage of the tube is varied and hence its electron emission and current. The rheostat is calibrated with a reference scale for resetting X-ray tube current.

New regulations require fluoroscopes to have several features not found on earlier types. One requirement is the previously mentioned aluminum filter in the tube's beam. Another is an integrating timer which prevents fluoroscopying a patient more than 5 minutes. This footswitch timer circuit cannot be actuated at the end of a cycle. The doctor must switch the timer back on before fluoroscopying another patient.

The timer is inserted in the foot-switch circuit so that the timer motor operating voltage must come from the 115 v line, through the

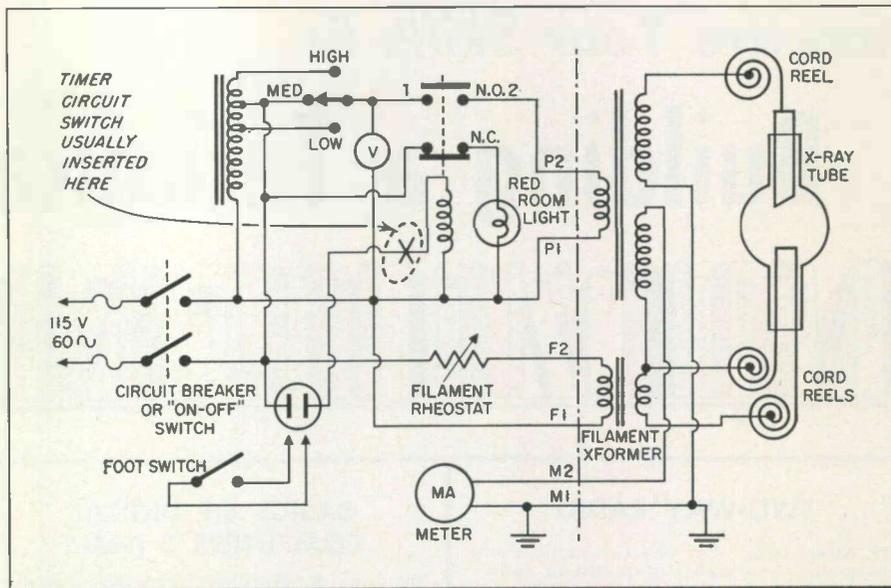


Fig. 3—Complete schematic of vertical fluoroscope, including relay-operated room light. A timer switch may be installed by breaking circuit at "X."

footswitch contacts, the timer switch contacts, to the timer motor, and hence to common. Thus, the timer must be set and the foot-switch depressed before the timer motor can operate. The timer motor does not operate when the fluoroscope is simply on "STANDBY." When the timer motor turns off the timer switch, it is no longer possible to make an exposure without resetting the timer knob manually.

In some of the earlier fluoroscope types, no relay is used, and the foot-switch is connected directly to the high voltage primary circuit at points 1 and 2 (Fig. 3), across the N.O. relay contacts instead of the relay. In this type equipment the electronic technician may be requested to install automatic room light control by simply adding the relay, and also safety modernization by adding the timer and 2 mm aluminum filter. Government regulations require both.

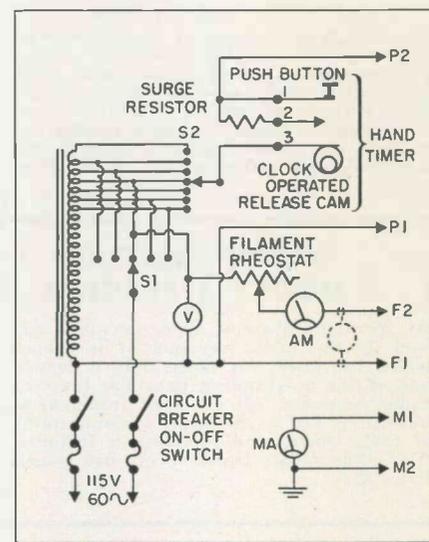
More modern instruments now enclose both the high voltage, filament transformer, and the X-ray tube in a self enclosed oil filled container. The transformer assembly is mounted on, and is counter-balanced by the fluoroscope carriage. Everything to the right of the dashed line shown in the schematic (see Fig. 3) is inside the self contained head. These instruments are said to be danger-proof and no "cage" or housing is necessary around the transformer. Cord reels

are also eliminated. Fluoroscopes have become smaller, lighter in weight, and more compact.

If the X-ray tube and transformer assembly shown in Fig. 3 is replaced with a self-enclosed type head, and a time operated foot switch is substituted, we now have the circuit employed in many small X-ray units which include portable types, hospital mobiles, dental units, and in general all instruments up to 30 milliamperes capacity. Note, the general layout has

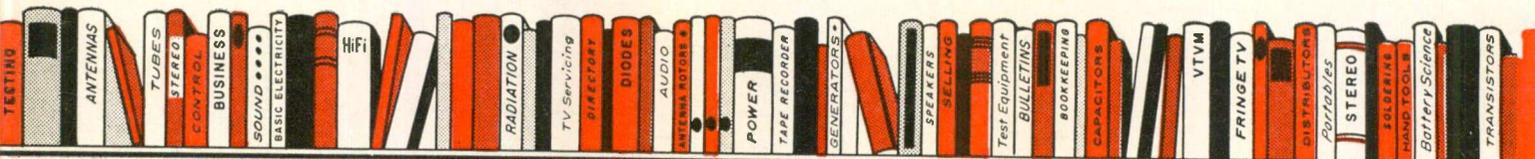
(Continued on page 69)

Fig. 4—Schematic control circuit used in most small X-Ray instruments having self contained heads. S-2 is usually omitted from dental units, while meter AM may be replaced by a voltmeter (dotted lines).



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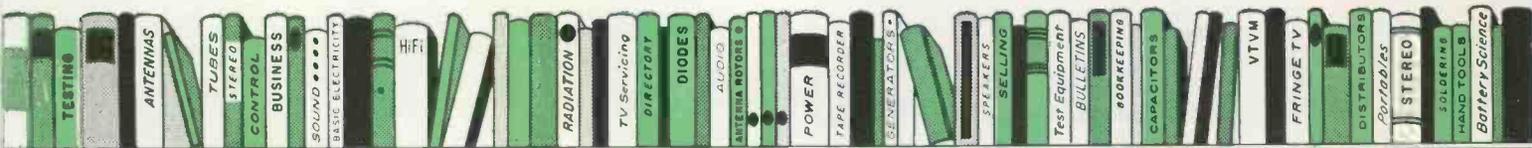
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Also See New Books on Page 82

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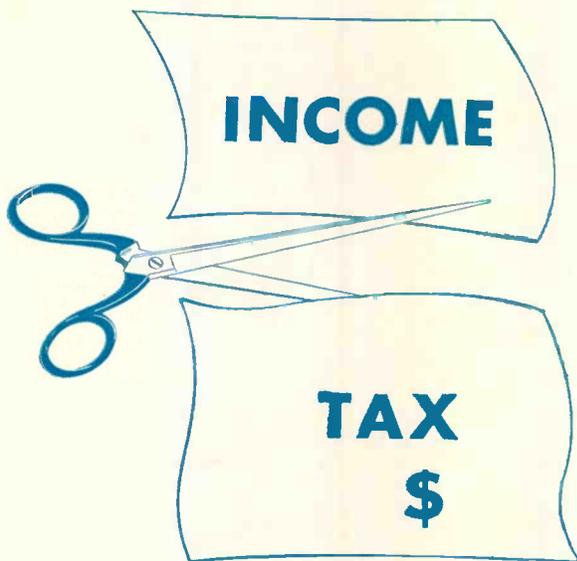
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• Even though the Supreme Court did not name the radio-TV service businesses specifically in its new tax depreciation decision, there are many implications that can either increase or decrease their income taxes. Here are some questions and answers on how this new decision will effect income tax accounting and payments.

What was the ruling made by the Supreme Court?

The Internal Revenue Service argued, and the Supreme Court upheld, that the useful life of a depreciable asset means the normal time a taxpayer uses the asset—not the asset's normal physical life.

For instance, if you normally trade-in a signal generator every four years, you would be entitled to use this as the useful life in determining your annual depreciation deduction. This applies even though the physical life of the equipment is ten or twenty years.

Does this ruling increase or decrease taxes?

It depends. If the ten-year useful life for the equipment is being used, you would have a 10% annual deduction for depreciation. Under the Supreme Court decision you would now be able to use the normal four-year base period of useful life to you, and deduct 25% each year as an expense of doing business from your income tax.

This example is based on the straight-line depreciation method (an equal deduction each year of useful life). It does not take into consideration special provisions of the accelerated depreciation methods, or the salvage value of your equipment when you sell it after four years.

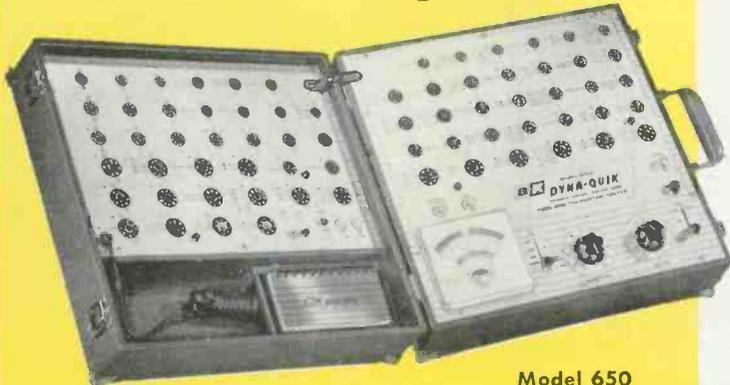
How does this decision affect the accelerated depreciation methods?

There are two basic rules that must be considered in using the accelerated depreciation methods:

1. The equipment must have an estimated useful life of at least three years and at least six years for the special 20% initial allowance deduction granted recently in the Code revision.
2. Salvage value of the depreciated equipment must be taken into consideration.

(Continued on page 66)

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SAVE COSTLY CALL-BACKS
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*Actual experience shows TV servicemen average 2 extra tube sales per call. 5 calls per day in 5 days means as much as \$50.00 more income per week.

Widely Used and Preferred by Thousands of Professional Servicemen Everywhere



Model 650 Dynamic Mutual Conductance PROFESSIONAL TUBE & TRANSISTOR TESTER

With multi-sockets and other B&K features, you can accurately quick-check most of the tubes widely used in television receivers, plus popular home and portable radio tubes. Includes spare sockets for new popular types. Tests each section of multiple tubes separately. Checks for Gm and all shorts. Makes highly sensitive grid emission and gas test. Checks for leakage and life. Shows true tube condition on "Good-Bad" scale and in micromhos. B&K patented bridge circuit. Also tests transistors.

Net, \$179⁹⁵

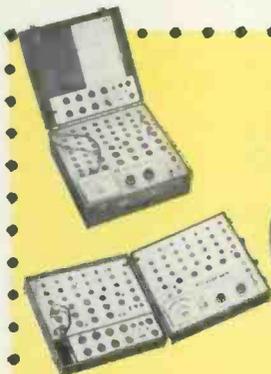
Model 550 Dynamic Mutual Conductance PROFESSIONAL TUBE TESTER

Real professional instrument for the limited budget. Provides 52 sockets to quick-check most of the TV and radio tubes usually encountered in everyday service work. Tests each section of dual-section tubes separately. Checks for Gm and all shorts. Makes highly sensitive grid emission, gas, and leakage test. Shows tube condition on "Good-Bad" scale and in micromhos. B&K patented bridge circuit.

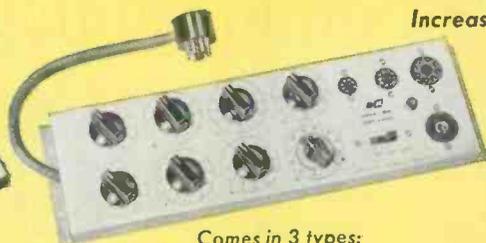
Net, \$119⁹⁵



Model 550
DYNA-QUIK



Shows how easily the new "610" fits into Models 550 and 650



Comes in 3 types:

Model 610-500 for use with Model 500 Tube Tester
Model 610-550 for use with Model 550 Tube Tester
Model 610-650 for use with Model 650 Tube Tester

NEW Model 610 ACCESSORY TEST PANEL

Increases Capacity of Model 500, 550, or 650 Dyna-Quik

TO TEST BOTH OLD AND NEW TUBE TYPES

including New TV Types, Thyratrons, Voltage Regulators, Auto Radio Hybrid Tubes, Battery Radio Tubes, European Hi-Fi Tubes, and most Industrial Types

Simply by adding Model 610 to the Dyna-Quik, you have all the advantages of fast multi-socket testing, plus freedom from obsolescence. Enables you to test all present plus future TV, radio, and other tube types. Measures genuine dynamic mutual conductance.

Net, \$49⁹⁵

NEW TUBE INFORMATION SERVICE

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



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 data, circle 3-49-1 on coupon, p. 54



You can buy that boat with a Signet Sound catalog

If you are looking for a spare-time income that will provide those extra pleasures in life that always seem just beyond reach, all you need is a Signet Sound Catalog and a sharp eye.

Take a good look around your neighborhood. There are hundreds of profit opportunities right there—in meeting halls, churches, sports and social clubs, fraternities, taverns, restaurants . . . all ready to be sold on the convenience, effectiveness and comparatively low cost of good sound equipment.

Take along a Signet Sound Catalog and you will have all

you need to make a sale. Without major time involvement, risk or investment, you can offer a complete choice . . . size and price-wise . . . of pre-planned, easy-to-install Signet Sound Packages backed by the greatest name in sound—Stromberg-Carlson. In addition to a good profit on the equipment, you can earn a good service fee for installing it. For detailed information and your copy of the Signet Sound Catalog write:

Commercial Products Division
Dept. H, 1403 North Goodman Street
Rochester 3, New York

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

For more data, circle 3-50-1 on coupon, p. 54

TV AGC Circuits

(Continued from page 43)

tem was brought into the shop with a complaint of "snowy" picture. The 6BQ7 r-f section was suspected. A check of voltages at the r-f tube's socket revealed no agc volt-

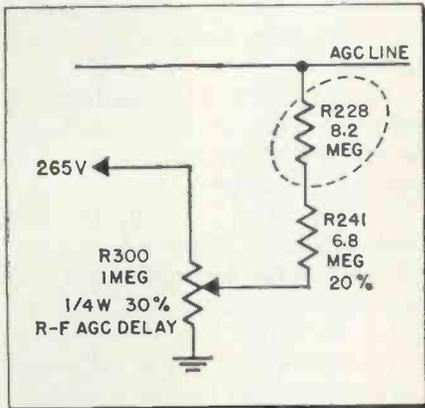


Fig. 6—Snowy pictures in a DuMont RA-370 was traced to a defective decoupling resistor in the agc delay.

age on the grid. Resistance checks in the agc delay circuit revealed the delay control was normal. The 6.8 and 8.2 meg resistors were next checked. The 8.2 meg component

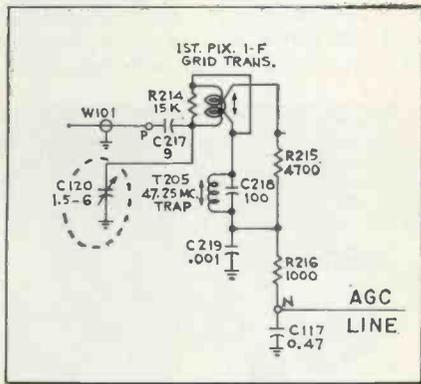


Fig. 7—No video or sound resulted when a trimmer capacitor shorted in the agc system of an RCA KCS 126 television receiver.

measured over 15 megohms! A replacement brought the set back to normal operation.

A particularly difficult problem was encountered in an RCA KCS 126 series TV. The set had raster

but no sound, and no picture. When first turned on, a small amount of smoke arose from the 1st i-f tube socket area. Agc control variation had no effect. The 1st i-f tube normally has +19 d-c volts on its grid, with +22 volts on its cathode—an effective -3 volts bias on the grid.

Substitution of bias to the agc bus had no effect on the set—indicating the fault was not strictly an agc failure.

I decided to isolate the 1st i-f in-

put stage. A grid input transformer is connected as shown in Fig. 7, and I cut all leads connecting to its primary, some picture and sound came in. This indicated the set's defect lay in one of the disconnected lines. An ohmmeter check showed that the 1.5 to 6 μ f trimmer capacitor to ground was shorting—and the 1 k resistor in the agc line was overheating. Replacement of the capacitor and resistor solved the problem. •

Solve Rough Sweep Output Problems IN MINUTES INSTEAD OF HOURS!



NEW B&K DYNA-SWEEP CIRCUIT ANALYZER

1. Provides composite synchronizing signals (negative or positive) to inject directly in each sync stage.
2. Provides plate drive signal to check complete vertical output circuit, including V.O. transformer.
3. Provides vertical yoke test signal to determine if vertical yoke windings are defective.
4. Provides horizontal plate driving signal to directly drive TV horizontal output transformer circuit.
5. Provides B+ boost indicator.
6. Provides unique high-voltage indicator.
7. Provides sensitive tests for each of the horizontal output components, including H.O. transformer and yoke. Immediately reveals their true condition, good or bad.

Quickly solves tough output servicing problems that have always plagued the TV serviceman. Provides horizontal and vertical sync and driving pulses that make it easy to check out every stage in the sync and sweep sections of a television receiver. Tracks down troubles in the horizontal and vertical output circuit, including defective output transformer and yoke. Checks for shorted turns, leakage, opens, short circuits, and continuity. Gives unique high-voltage indication. Eliminates trial and error replacements. Saves many hours of service work! Pays for itself over and over again.

Model 1070 Dyna-Sweep. Net, \$74⁹⁵

MODEL A107 DYNA-SWEEP CIRCUIT ANALYZER
for use with B&K Model 1075 Television Analyst

Functions like the Model 1070 above, but is designed as a companion unit for use only with B&K Model 1075 Television Analyst for driving source. Makes your Television Analyst more useful and valuable than ever. Net, \$54.95



See your B&K Distributor or Write for Bulletin AP17-T

B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont. • Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



For more data, circle 3-51-1 on coupon, p. 54

Where

does he buy his clothes?

(His low voltage
ceramic capacitors
are clearly from

Centralab

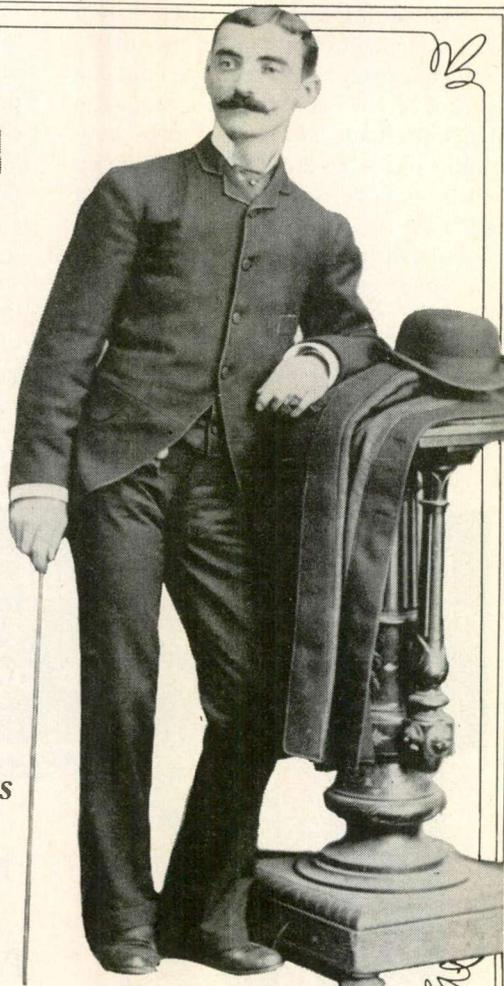
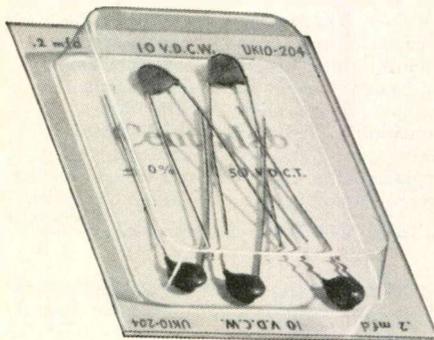


PHOTO: BETTMAN ARCHIVE

You'll look long and hard in today's men's stores to duplicate this outfit—but for ceramic capacitors for transistor circuits, there's a ready source: your CENTRALAB distributor.

There's nothing old-fashioned about CENTRALAB's ceramic capacitor line, except the quality. The styles are up to date, and there's a complete range of sizes, capacitances, and voltages, so you can rely on CENTRALAB for those "hard-to-fit" applications.

For every low voltage application, your CENTRALAB distributor has the ceramic capacitor you need. Ask him for your free copy of CENTRALAB's Catalog 31, which gives complete listings on 3 V and 10 V Ultra-Kaps®, 30 V DA Series, 75 V DDA Series, and 150 V DM and DDM Series.



D-6109 S

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CENTRALAB CANADA LIMITED—AJAX, ONTARIO

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS

PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

For more data, circle 3-52-1 on coupon, p. 54

Reverberation

(Continued from page 41)

unit's input. Two more phono cables go from the unit's outputs to the hi-fi amplifier inputs. For mono systems, either channel A or B on the unit can be used alone. Connection between the electronic and mechanical sections also require only two phono cables, and the correct jacks on both sections are clearly marked.

The complete integrated unit is self-powered, and its line cord may be plugged into a spare outlet on a preamp or amplifier.

Reverberation should be used with discretion. Like tone control, reverb has far more potential than the average audiophile can use. When the unit's level control is set to maximum position, it will reproduce sounds that appear to be coming from a cavern—rather than a concert hall. If the customer uses it with restraint, and takes time to experiment, he can improve simulation of "live" listening. •

CBS MICROPHONE KIT

Announced is a new do-it-yourself, high fidelity, ceramic microphone kit, CBS Mark III. In assembling the kit valuable knowledge is gained as to how such a microphone is constructed and how it operates. It is also possible to customize the frequency response to



meet particular requirements. The microphone is designed around a special ceramic element which develops unusually high output and is unaffected by heat or moisture. Sensitivity, 1000 cps 52 db below 1v/microbar. Recommended load, 5 megohms. Frequency response, 30-10,000 cps. CBS Electronics, Danvers, Mass.

For more data, circle 3-52-2 on coupon, p. 54

ELECTRONIC TECHNICIAN • March, 1961

"Unavailable" TV Parts

(Continued from page 36)

replacement parts restored proper picture and also improved the horizontal circuit.

Naturally, if your local distributor carries Merit, Stancor, Thordarson, Triad or other manufacturer's parts, they too may list adequate replacements.

After the technician has replaced the unavailable part, the number, original physical measurements, tap connections and corresponding part numbers useable as replacements, should be listed on a file card.

As an example, a portion of my card file system is shown in Chart III. Note that I list set model, original part number, and then as many manufacturers' replacements as possible. Its logical that the more information you have at your finger-tips, the quicker replacement parts can be found.

Bear in mind that your parts counterman and yourself can both be aided by presenting a useful replacement number when requesting merchandise. Proper repair of the set sitting on your bench frequently depends on how much information you present at the parts counter. •

Acme LAMP

Features of the new "Magniflex" lamp include: a 22-watt circline fluorescent tube, for shadow-free illumination; optically ground Crown glass double convex magnifying lens, 5" in



diameter, focal length 13", power, 3 diopters, for distortion free magnification; and 26" swinging arm. Available in four models. Acme Lite Products Co., Congers, N. Y.

For more data, circle 3-53-2 on coupon, p. 54

ELECTRONIC TECHNICIAN • March, 1961

NEW! Dynamic Beta® IN-CIRCUIT Transistor Tester



Only
\$129.50
Net

THE

HICKOK

**MODEL 890 Measures AC Beta
or out
IN-CIRCUIT...with 5% Accuracy!**

With the new Model 890, you can measure AC Beta—in circuit—with unmatched accuracy. The key to this new accuracy standard is the unique HICKOK-developed (patent-applied-for) method of neutralizing circuit impedance before tests are made. This effectively nullifies the loading effects of external circuit impedances and thereby eliminates the inaccuracies inherent in other methods.

The Model 890 also measures these other in-circuit parameters: R_{in} (transistor input resistance), Z Ohms (base-emitter circuit impedance), and I_c . Out-of-circuit measurements include AC Beta, I_c and I_{cbo} .

The Model 890 is an ideal maintenance, service and production line instrument for use in applications requiring measurement of soldered-in transistors.

Ask Your HICKOK Distributor For An **890** Demonstration!

The **HICKOK** Electrical Instrument Co.

10523 Dupont Ave. • Cleveland 8, Ohio

For more data, circle 3-53-1 on coupon, p. 54

FREE LITERATURE

To receive the literature below without charge, simply circle the number on the coupon.
Cut out and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

1 Lamps: Illustrated catalog features 30 precision-engineered models for office, plant and home use. Includes the new "Magniflex." Acme Lite Products Co.

For more data, circle 3-85-3 on coupon

2 Capacitors: "Servicemen's Capacitor Replacement Catalog," No. RC-1, lists catalog number for the capacitors, technical data, and prices. Can be wall-mounted. Astron Corp.

For more data, circle 3-54-2 on coupon

3 Test Equipment: 8-page brochure covers the firm's complete line of electronic test equipment. Illustrations, features and prices included. Electronic Measurements Corp.

For more data, circle 3-54-3 on coupon

4 Transistor Testers: Model 890 In-Circuit Transistor Tester is covered in a colorful 4-page folder. Features and technical specifications included. Hickok Electrical Instrument Co.

For more data, circle 3-54-4 on coupon

5 Stereo Components: 16-page booklet, "Guide to Custom Stereo," illustrates suggested home installations; explains stereo and high fidelity; and covers the firm's line of components. H. H. Scott.

For more data, circle 3-54-5 on coupon

6 Translator: Literature covers a new VHF translator. Includes free planning package, data sheet, installation check list, coverage calculation form. Also available is reprint of FCC rules covering translators. Electronics, Missiles & Communications, Inc.

For more data, circle 3-77-1 on coupon

7 Shop Aids: Stan Cor's Corner "Tips For The Serviceman," No. 5, describes and illustrates almost 30 service shop gadgets, ideas and short-cuts. Chicago Standard Transformer Corp.

For more data, circle 3-54-7 on coupon

8 Speakers: 16-page illustrated brochure . . . an informal guide to component high fidelity . . . covers speakers and speakers systems. University Loudspeakers.

For more data, circle 3-54-8 on coupon

9 Hand Tools: Pocket-size, 12-page booklet covers a line of hand tools including precision knife sets, the Lock-GriPlier for small assemblies, and Swedish made pliers. Handicraft Tools Div. X-Acto, Inc.

For more data, circle 3-54-9 on coupon

10 Service Products: Catalog FR-61-W, 68 pages, covers such items as phono drives, exact replacement transformers, tools, chemicals, and electronic hardware. Walsco Electronics Mfg. Co.

For more data, circle 3-54-10 on coupon

11 Antennas: Literature covers the new Powertron, announced as the world's first electronic TV receiving antenna. Winegard Co.

For more data, circle 3-54-11 on coupon

12 Test Equipment: Catalog covers a line of test equipment including serviceman's "Caddy" 20,000 ohms per volt multi tester. Alco Electronic Products.

For more data, circle 3-77-2 on coupon

CUT HERE

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

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

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3-4-1	3-26-1	3-54-5	3-66-1	3-75-3	3-83-3
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3-7-1	3-26-3	3-54-8	3-68-1	3-77-1	3-84-1
3-8-1	3-26-4	3-54-9	3-68-2	3-77-2	3-84-2
3-9-1	3-26-5	3-54-10	3-68-3	3-77-3	3-85-1
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3-21-1	3-50-1	3-58-1	3-72-3	3-80-2	3-86-5
3-22-1	3-51-1	3-58-2	3-73-1	3-81-1	3-86-6
3-23-1	3-52-1	3-58-3	3-73-2	3-81-2	3-87-1
3-24-1	3-52-2	3-59-1	3-73-3	3-81-3	3-87-2
3-24-2	3-53-1	3-61-1	3-73-4	3-81-4	3-C2-1
3-24-3	3-53-2	3-62-1	3-74-1	3-82-1	3-C3-1
3-24-4	3-54-2	3-62-2	3-74-2	3-82-2	
3-24-5	3-54-3	3-64-1	3-75-1	3-83-1	

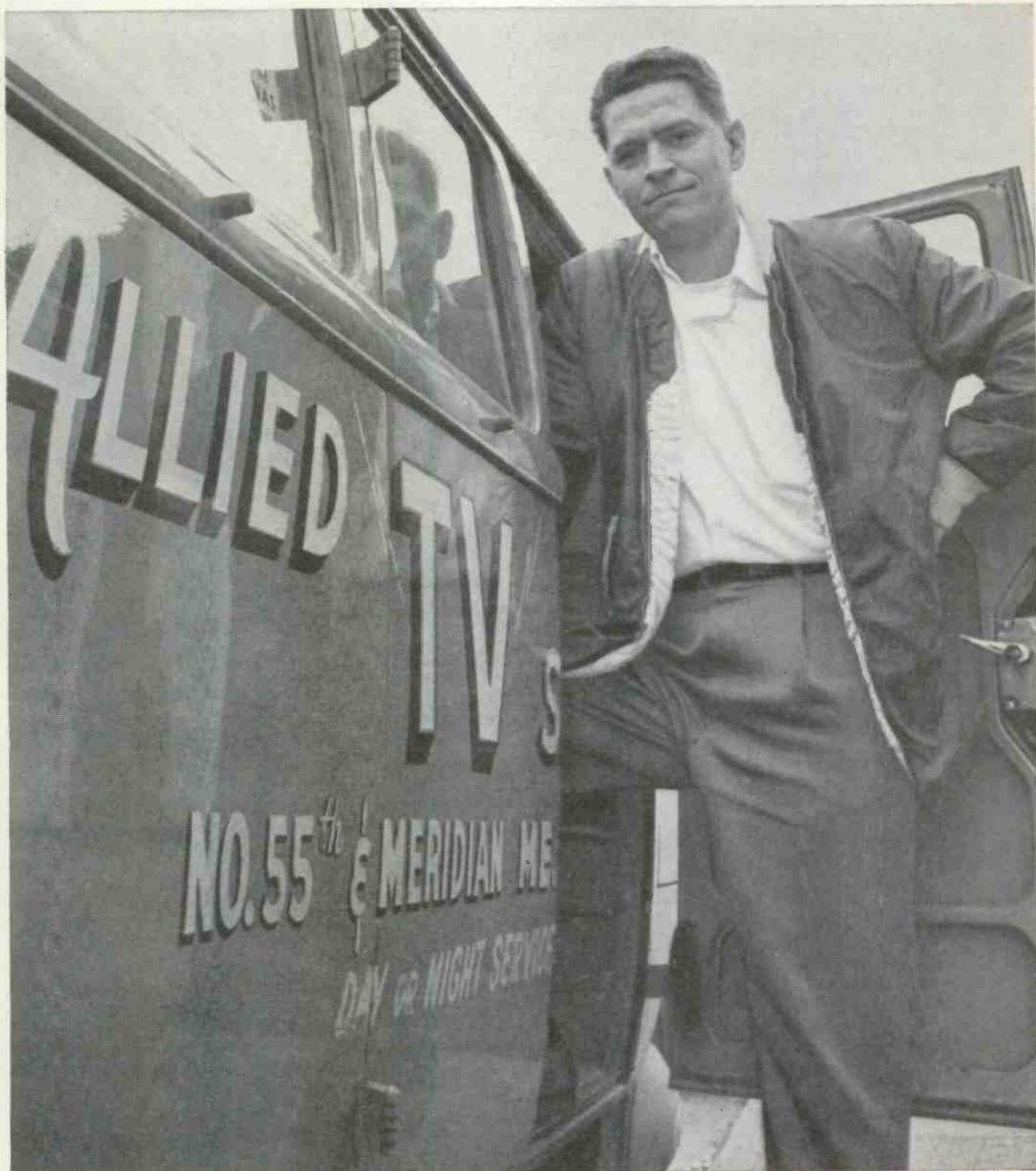
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“Advertising under 10 trade-marks in the Yellow Pages really helps our TV service business!” says R. Lyons, owner, Allied TV Sales & Service, Seattle, Washington. **“Our Yellow Pages advertising under trade-marks like RCA, Zenith, General Electric, Motorola and Philco pulls in new business and repeat business. The Yellow Pages works so well for us, it’s the only advertising we do. No other kind of advertising could help us promote our 24-hour service on a 24-hour basis!”**

NORTH END SOUTH END

TV



DAYS - NIGHTS - WEEK ENDS
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• PROMPT GUARANTEED SERVICE • TV RENTALS
 • QUALIFIED TECHNICIANS
 • EXPERT WIRELESS SERVICE
 • FREE PICKUP & DELIVERY

ALLIED TV SALES & SERVICE
3429 BIRMGHAM AVE.



Display this emblem. It builds your business!

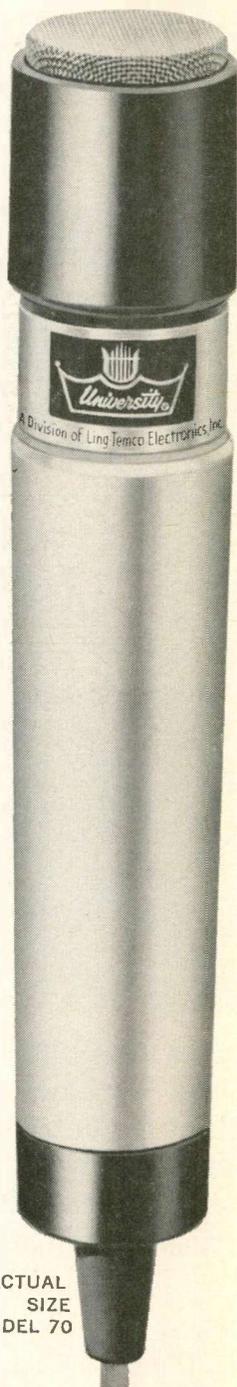
Display ad (shown reduced) runs under TELEVISION SERVICING. Call the Yellow Pages man at your Bell Telephone Business Office to plan your program.

For more data, circle 3-55-1 on coupon, p. 54

LONELY

New microphone in town looking for a home. Not one with hypercritical professional standards, nor interested in just low price—but one that wants more than a little of both. Will improve home tapes . . . upgrade a P.A. system . . . or put new life in a ham operator's rig. Offering quite a bit—a dynamic cartridge, for example . . . also, good looks, dependability, rugged construction and an honest frequency response from 50-14,000 cps. Will move in complete with slide-on stand adapter and 15' of cable for only \$29.95. Can be interviewed at authorized University sound distributor—or write for resume. **UNIVERSITY MODEL 70**, c/o Box Z-3, University Loudspeakers, Inc., 80 South Kensico Avenue, White Plains, N. Y.

OPPORTUNITY for sound engineers to learn more about University's dynamic new line of professional modular cardioids, omnidirectionals and lavaliers. Just send for new 12 page catalog with complete details. Write Box Z-3, address above.



ACTUAL
SIZE
MODEL 70

For more data, circle 3-56-1 on coupon, p. 54

B-T AMPLIFIER

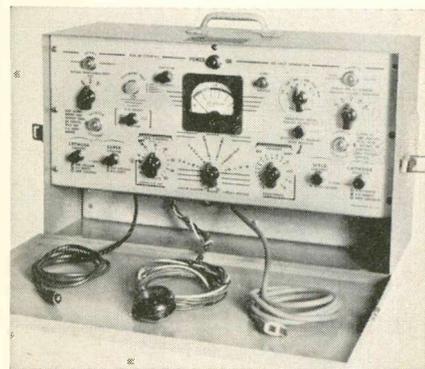
AB-3 mast-mounted broadband TV/FM amplifier incorporates amplifier model AB-3 and a remote power supply, model RP-3. May be used up to a mile from an a-c power source. Gain (average), 22 db on all VHF-TV channels and FM stations. Typical



noise figure, channels 2-6, 4 db; 7-13, 7 db; FM, 4 db. Impedance, 300 ohm input; 75 or 300 ohm output. Power required, 117v, 60 cycles; .34 ampere. It is easy to hook up. No balun needed. Choice of manual or automatic off-on switching. \$104.50. Blonder-Tongue Labs., 9 Alling St., Newark, N. J. For more data, circle 3-56-2 on coupon, p. 54

Tele-Tronics BEAMER

A new and improved portable beamer, for testing and rejuvenating faulty and weak TV tubes, tests all current models for filament condition, element continuity by mutual conductance method, shorts, leaking, emission, grid cut-off, grid control, and cathode test. Also



restores brightness by cathode sweeping, brings up old tubes by grid expansion, burns off low resistance K-G shorts, burns off high resistance interelement shorts, and welds open cathode tabs. \$189.50. Tele-Tronics Co., Ambler, Pa.

For more data, circle 3-56-3 on coupon, p. 54



New G-E Tool Toter puts tools and parts at your fingertips

No more digging for the right tool—not with this handy new G-E Service Aid. The Tool Toter. Measures just 11" x 14", 12" high. It's especially designed to go along wherever tools are needed: on the bench, on the counter, on the job or for general maintenance. Pegboard with tool holders keeps screw drivers, pliers, nut drivers, etc., clearly visible and easily removed or replaced. High-impact plastic trays hold screws, nuts, lockwashers, fuses, and other small tools or parts that are needed on-the-spot. Order your Tool Toter today—helps make service calls more profitable. Saves your time and your temper. ETR-2338 Tool Toter.

These are the three newest in the series of G-E Service Aids which can make your work more pleasant and more profitable. Useful tools especially designed by service technicians for service technicians. Get them from your General Electric tube distributor, or mail coupon to Chicago warehouse address given. Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.

Two More in the Series of G-E Service Aids

Four-Edged Wire Stripper Saves Time—Handles All Wire Sizes
Here's the easy way to strip off insulation, without nicking the wire: Press insulated wire into cutting channel—rotate wire stripper around wire and pull. Easy! 4" plastic handle. ETR-2376 Wire Stripper.

New Forked Soldering Tool Easy to Use in Tight Spots
Plastic handle makes it easy to hold and use • 6" long • Rod sealed in plastic—will not pull out • Forked tool best for removing soldered wires • ETR-2377 Soldering Tool.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

For more data, circle 3-57-1 on coupon, p. 54

GENERAL ELECTRIC COMPANY, DEPT. B
3800 N. Milwaukee Ave., Chicago 41, Illinois

Please ship, prepaid:

..... ETR-2338 Tool Toter, \$3.00 ea. or \$2.50 plus
10 G-E 6 volt series tube carton tops.

..... ETR-2377 Soldering Tool, 60¢ each.

..... ETR-2376 Wire Stripper, 50¢ each.

My check or money order is enclosed for the required amount plus any sales or use tax applicable in my area.

Name.....

Address.....

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

Quality you can count on EVERY SINGLE TIME!

In "Just What You Need" HANDY KITS

- Eliminate costly delays
- Increase your profits

Transistor Radio Electrolytic Capacitor Kit AK-510

Stock the most popular values of miniature electrolytic tubulars for repair of personal transistor radios, portable TV sets, and all space tight applications with this new Aerovox kit. Contains 18 miniature Type PTT-PWE plastic-cased units covering over 90% of all replacement requirements for transistor radios.

A \$23.65 value
for only
\$14.20



Series-String TV & AC-DC Radio Tubular Capacitor Kit AK-500

A \$13.70 value
for only
\$8.22

Designed for trouble-free repair of series-string TV and AC-DC table radios, this handy kit contains 6 Type PRS "Dandee" electrolytic tubular units in the fastest moving values. A "must" for the busy technician.

Both of these new Aerovox kits, packaged in reusable plastic boxes, are now available from your local Aerovox Distributor. See him for complete details or write direct... today.

Remember—it pays to use Aerovox!

AEROVOX CORPORATION

DISTRIBUTOR DIVISION

NEW BEDFORD, MASSACHUSETTS

For more data, circle 3-58-1 on coupon, p. 54

Eico FM/AM STEREO TUNER

Features of model ST96 include: exclusive "Eye-tronic" traveling tuning indicators; 2 completely independent sets of controls for separate FM and AM reception, or for FM/AM stereo (also for FM-Multiplex with adaptor); FM section has switched AFC, as well as AGC, stabilized low

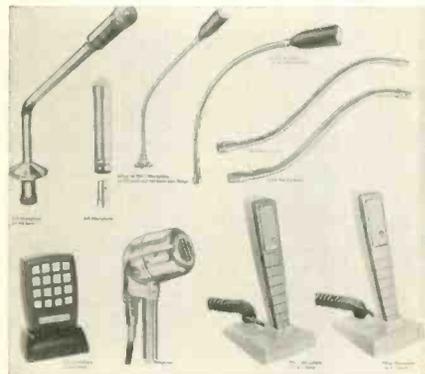


limiting threshold and broad-band ratio detector. FM frequency response, 20-15,000 cps. AM section features switched "wide" (to 14 kc) and "narrow" (to 7 kc) bandpass. AM frequency response, 20-9000 cps (wide), 20-4500 cps (narrow). Kit, \$89.95. Wired \$129.95. Eico Electronic Instrument Co., 33-00 Northern Blvd., Long Island City 1, N. Y.

For more data, circle 3-58-2 on coupon, p. 54

E-V MICROPHONES

Low-cost dynamic microphone, model 624LL, designed for language laboratory applications, features: high-level, wide-range response; completely concealed cable; readily adaptable mounting arrangement; and un-



usual ruggedness. Also included in the language lab group are 5 additional models, featuring the characteristics of model 624LL and adaptable to a variety of typical language lab and classroom uses; and unidirectional model 729LL. Electro-Voice, Inc., Buchanan, Mich

For more data, circle 3-58-3 on coupon, p. 54

**FROM GULFPORT
MISSISSIPPI:**

"Color reception is amazing. For the first time we will really be able to sell color television."

**FROM GREAT BEND
KANSAS:**

"I've tested and used about every fringe antenna. Your Powertron gives the sharpest reception I have ever seen here."

**FROM FARGO
NORTH DAKOTA:**

"It's fantastic! We're getting several stations with Powertron we've never seen before."

FIRST DEALER REPORTS ON THE WINEGARD POWERTRON

World's First Electronic TV Antenna

The Powertron antenna has caused more letters to flow into Winegard's offices than anything we have ever made. TV service-technicians who have tried one are amazed at the tremendous reception and advantages of this new antenna.

The Powertron is an all channel yagi antenna with a built-in high gain RF amplifier in one integral unit. It comes equipped with a power supply that lowers 117 V. AC to a safe 24 volts which is fed up the lead-in to the antenna. It is 5 to 9 times more powerful than any other antenna made.

With the Powertron, you can get your customers many channels they couldn't even see before. For example, in Burlington, Iowa, we easily pull in 9 channels where we used to pull in only 5 with a Color'Ceptor—our finest antenna before we developed the Powertron.

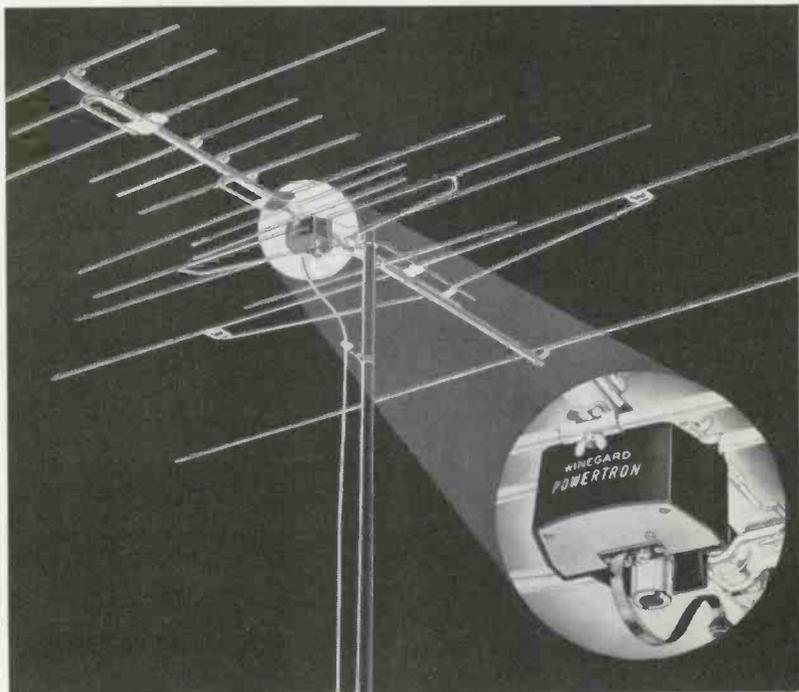
You can run 10 TV sets with a Powertron and all of them will have a better picture than you now get on one set with your present antenna.

You can make your installations 30 to 40% lower in height with a Powertron without affecting reception, in most cases.

You can remote the Powertron antenna 1/4 mile away from the TV set and get a better picture than with an ordinary antenna mounted next to the set.

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In short, this antenna is amazing. But don't take our word for it—test one and see for yourself. Ask your distributor or write today for free technical bulletin.



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Model P-44X Powertron with Pack — \$91.90 list, 21 elements. Up to 54% more gain, higher front to back ratio than Model P-44.

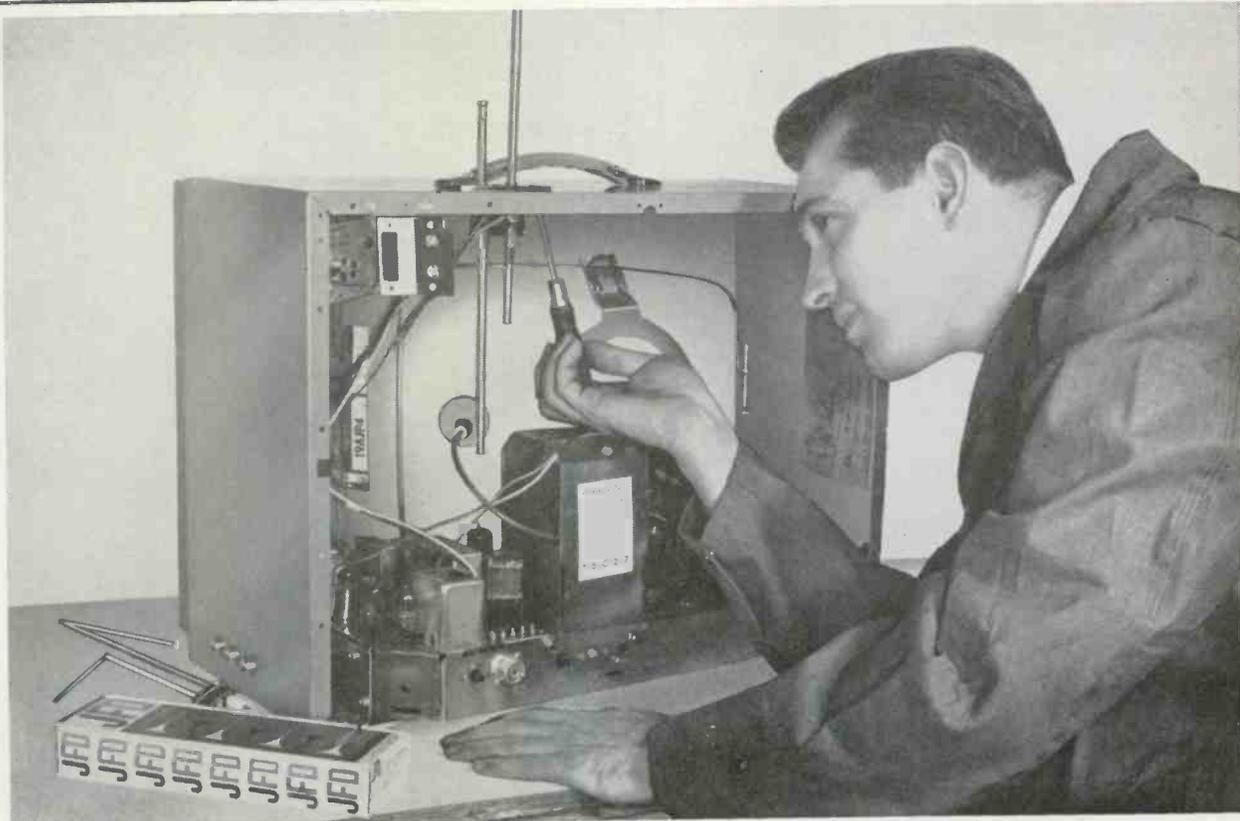
Model SP-44X Super Powertron — \$104.95 list, 30 elements. Twice the gain of Model P-44.



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THE MORAL: *Get your JFD PA500 and PA515 Exact Replacement Kits today from your JFD distributor and start earning yourself a fair share of the 3,500,000 dollar-portable antenna replacement market.* Remember, next to receiving tubes, the antennas of portable and "tote-able" sets require the most frequent replacement.

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For more data, circle 3-61-1 on coupon, p. 54

(Continued from page 60)

sisted! Checking the CRT grid (pin 2), I found it measured 425 volts.

Pin 2 of the CRT should have little or no voltage on it. Where was my voltage coming from? Tracing the grid line I found that the vertical retrace network was connected between 425 volts B+ and ground. Here must be the set's sore spot!

I then checked the capacitor (0.005 μ f capacitor between 425 volts and ground) and there it was—a dead short. Close inspection re-

vealed a heat spot on the printed component. Replacing the retrace printed circuit network restored this set's normal picture.—*John Yennetti, Pittsburgh, Pa.*

Print Board Causes Vertical Rolling

A brand new Motorola, Model 19K14, Chassis TS-435, was unpacked, and after about an hour developed intermittent vertical roll. Substitution of the vertical oscillator (8GN8) and the vertical output

(7EY6) did not correct the defect so the chassis was pulled.

All vertical components were checked and found to be good. We even replaced E-602, the vertical

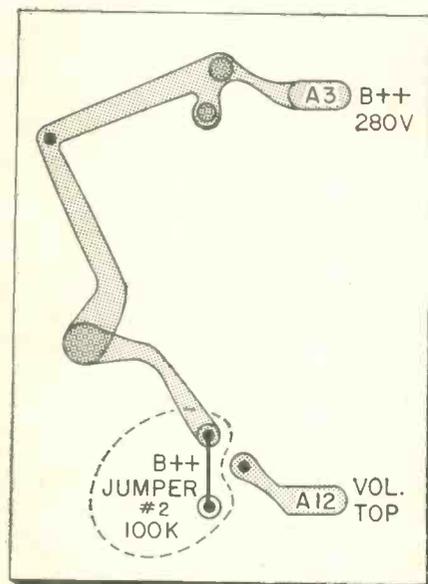


Fig. 3—A voltage drop between B++ and Jumper #2 (100K resistance) caused absence of vertical sync in a Motorola TV chassis.

module, with still no cure. The set finally broke down completely with no vertical hold at all. Voltage checks then revealed the cause of the trouble. As shown in Fig. 3, B++ jumper #2 supplies point A-3 with 280 volts through direct connections on the print board. Voltage checks revealed only 180 volts at A-3.

Connections on the board from B++ jumper #2 to point A-3 restored the set to normal operation.—*R. Turner, Coolidge, Arizona.*

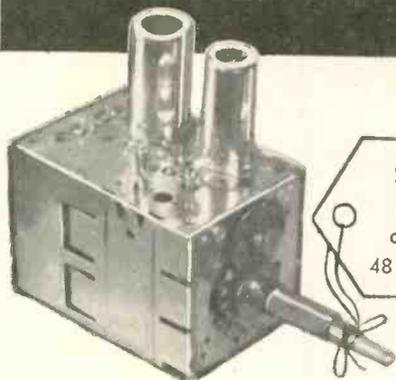
Mosley WALL OUTLETS

A new series of TV-FM wall receptacles are designed to match standard, single or double electrical outlet plates, whether made of metal or plastic. The TV-FM mating safety plug is polarized to prevent plugging into an electrical outlet, and the plug is of constant impedance design (300 ohms). Molded of low-loss polystyrene, the new FY-Outlet series features "positive action" plated brass contacts and pins. Available with or without TV rotor socket. No soldering is required. Mosley Electronics, Inc., 4610 N. Lindbergh, Bridgeton, Mo.

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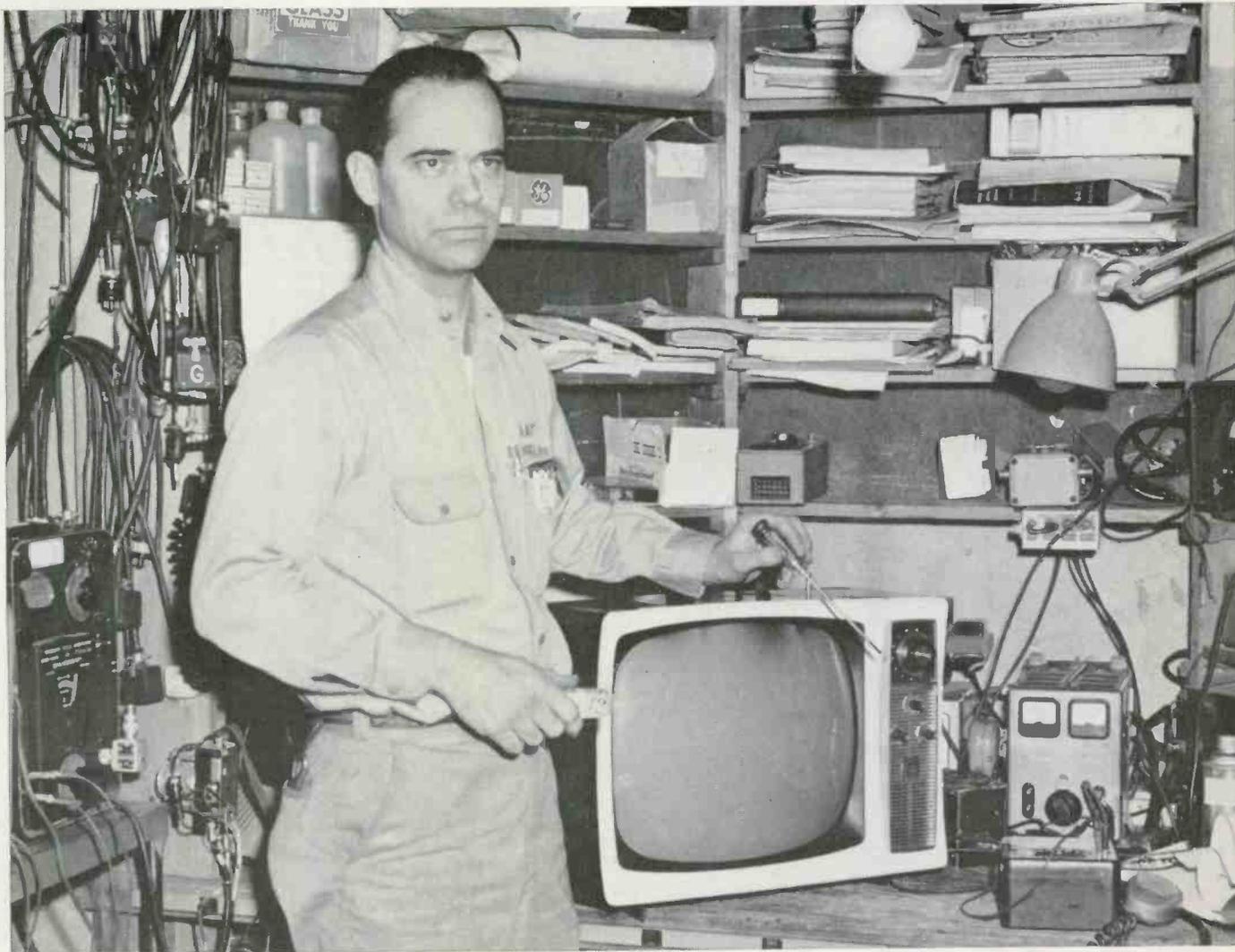
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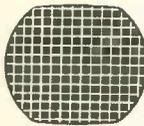
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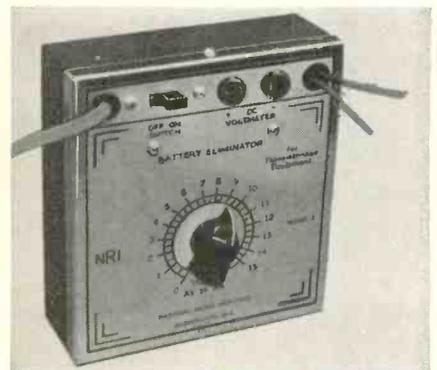
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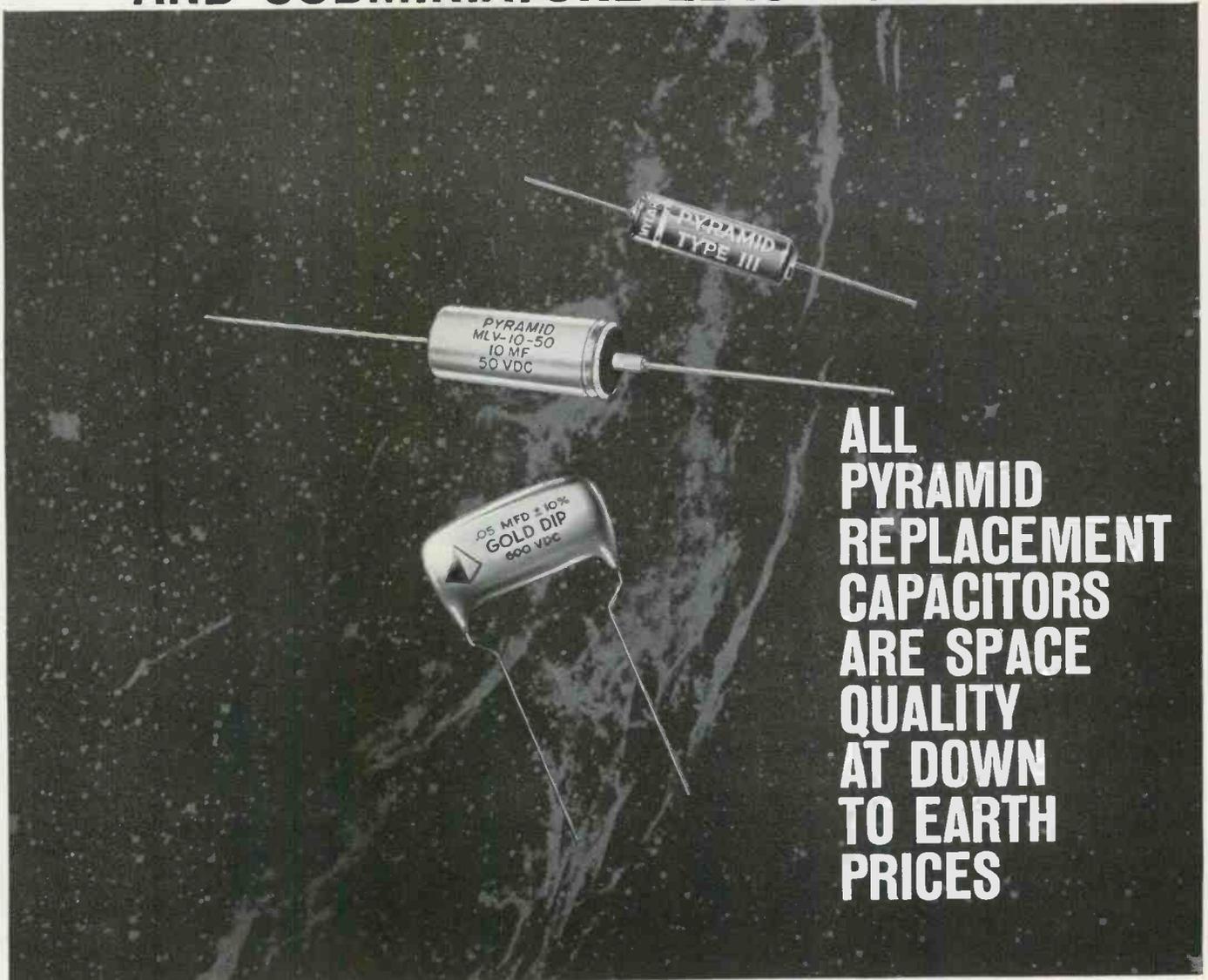
Model 2 battery eliminator for transistorized equipment is a compact power supply, designed to take the place of batteries used in transistorized portable radios and other equipment. It supplies clean, filtered d-c



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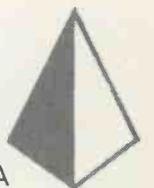
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Tax Depreciation Ruling

(Continued from page 48)

Thus, if your equipment has a physical life of ten years it would qualify for the accelerated depreciation methods. However, if your usual practice is to sell or to trade every two years, you could not qualify to apply the double-declining-balance method or the sum-of-the-digits method in calculating

your depreciation.

If your usual practice is to sell or to trade every four years, you could apply the accelerated depreciation methods, but you could not take the extra 20% deduction the first year because it does not meet the six year requirement of the Code revision.

What was the Supreme Court ruling on salvage value?

The Internal Revenue Code specifies that with the sum-of-the-digits depreciation method and the

straight-line method, the salvage value must be subtracted from the initial cost before determining the depreciation. The Code further says that the equipment may not be depreciated below salvage value with the double-declining balance method.

The Supreme Court has ruled in its decision that the purpose of depreciation is to permit the taxpayer to recover the part of the cost of the equipment he cannot recover through salvage.

How does this affect tax deductions with the double-declining-balance method?

Assume the purchase of \$10,000 worth of equipment this year that has a useful life of six years. (This permits it to qualify for the special 20% deduction and for the double-declining-balance depreciation method.) Also assume that at the end of six years the equipment will have a resale price (salvage value) of \$2,000. You would have these deductions from your income tax:

Cost of equipment	\$10,000
First-year deduction of 20%	2,000
Balance	8,000
1st year depreciation	2,667
Balance	5,333
2nd year depreciation	1,778
Balance	3,555
3rd year depreciation	1,185
Balance	2,370
4th year depreciation	790
Balance	1,560
5th year depreciation	520
Balance	1,040
6th year depreciation	347
Balance	693

Now, if at the end of six years, you sell this equipment for \$2,000 (the estimated salvage value when purchased), you would have a long-term capital gain of \$1,307. This would be taxed at the lower long-term capital gain rates.

However, the Supreme Court decision on salvage value does not permit this. *You cannot depreciate*

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below the resale price or salvage value.

Thus, in this example you could take the depreciation deductions listed for the first, second, and third years. In the fourth year, however, you could only deduct \$370 instead of the \$790. This would take your deductions down to the point of the salvage value instead of below this point. And, in the fifth and sixth years you could take no depreciation deductions on this equipment.

Can a taxpayer now using a longer life change to a shorter useful life?

Many taxpayers have been using the suggested useful life terms suggested in the Internal Revenue Service's "Bulletin". Yet, in many cases this is longer than the equipment is owned and the depreciation deductions do not recover the difference between the cost and the salvage value of the equipment when sold or traded.

On the basis of the Supreme Court decision, it would seem that you would have legal support if it is your usual practice to sell or trade before the end of the equipment's physical useful life. It may be possible to get a tax refund for past years. Check with your accountant or tax consultant about the possibility and procedure for handling this claim for a refund.

What will happen if I keep equipment longer than usual or anticipated?

From an income tax standpoint, there is probably little that will happen unless there is evidence that you were not honest in your anticipation. But, with all of the modern improvements in equipment, the chances are better that you will need to or want to sell or trade quicker to maintain your position with competition. •

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Kit AK-510 containing 18 miniature type PTT-PWE tubular electrolytic capacitors is packaged in a handy reusable plastic box. Values are reported to cover over 90% of the replacement requirements for personal transistor radios, in addition to trouble-free replacements in personal portable TV sets and all space-tight applications. The exclusive "Polycap" construction provides protection against humidity to assure maximum capacitor life. Aerovox Corp., New Bedford, Mass.

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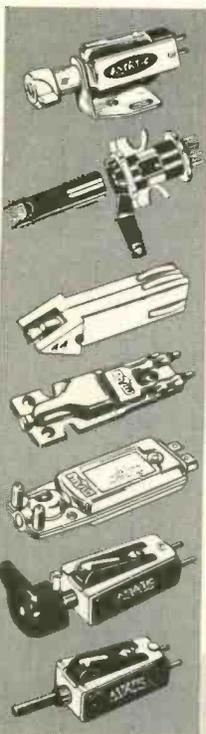
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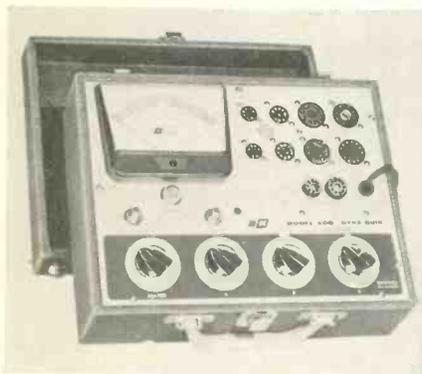


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Electro-Medical Equipment

(Continued from page 45)

been slightly changed (see Fig. 4). A-c input is introduced through a tap switch (S-2) on the auto transformer, and line voltage is selected to "match" house current conditions. "V" is usually a voltmeter with a single marking indicating when 115 volts is obtained. Switch S-1 is called "voltage compensator."

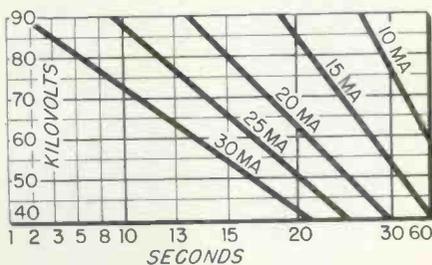


Fig. 5—Typical load line for X-Ray tubes used in dental, fluoroscopic, and portable instruments. Timing for a specific voltage and milliamperage exposure can be determined from these charts. For example, a 65 KV, 30 ma exposure can be safely maintained for only 13 seconds.

Since general purpose radiology requires a variety of kilovoltages, an additional switch is employed to select primary transformer voltages in a wider variety of steps. With one or two tap switches in this position, outputs from 30 to 85 KV is possible in steps of one or two KV. The switch knob is usually calibrated in KV, but some manufacturers use a calibrated meter, or switch the meter. The spring driven clock timer has a set of calibrated points. The initial push on the button connects leaf 1 with leaf 2 (Fig. 4), supplying power to the high voltage transformer. Further depressing the button shorts contacts 1, 2, and 3 together allowing full voltage to P-2, and at the same time the clock operated cam starts. When the set time has elapsed, the clock releases point 3 from point 2, then immediately releases point 1 and 2—opening the circuit. Dental X-ray instruments use this circuit with one minor difference: switch S-2 is omitted—dental pictures are taken at 65 KV, 10 milliamperes. Setting S-1 to "V" as shown, delivers 65 KV.

The complete X-ray tube head on

dental instruments can be moved to a variety of positions. This is achieved by placing a group of slip rings or commutators in the circuit (see points P-1, P-2, F-1, F-2, M-1, M-2 in Fig. 4). By making F-1 and P-1 common, one slip ring is omitted.

Similar circuits are frequently used in elaborate X-ray instruments up to 30 milliamperes. The circuit is also used for "grentz ray" or light duty therapy instruments, the only differences being the selec-

tion switching S-2 and the type of timer used. The timer is replaced by one calibrated in minutes, and the X-ray tube current is limited to less than 10 milliamperes. It is noted at this point that the tube-in-head arrangement is never capable of delivering more than 85 KV.

By examining the circuits shown in Figs. 3 and 4 it is easily seen that current flows through the X-ray tube only during one-half of the a-c cycle. This so called "self-rectified" circuit is used in practi-

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CLEANING ... our formulation gets contacts sparkling clean. **LUBRICATION** ... our spray leaves a lubricant as a protective coating. **NEEDLE APPLICATOR** ... the 6 inch Injectorall Needle is made of stainless steel, with a special fitting to prevent the needle from blowing out of the can.



INJECTORALL COMPANY
Brooklyn 14,
New York

Non-toxic, non-inflammable.
6 oz. spray can with needle... **\$1.95 net.**

For more data, circle 3-70-1 on coupon, p. 54

TRU-VAC 1-YEAR GUARANTEED RADIO and TV TUBES

35¢
EACH
\$33
Per 100 TUBES

Factory Used or Factory Second Tubes! TRU-VAC will replace FREE any tube that becomes defective in use within 1 year from date of purchase!

ALL TUBES INDIVIDUALLY BOXED, CODE DATED & BRANDED "TRU-VAC"

Partial Listing Only ... Thousands More Tubes in Stock!

SPECIAL!

65N7GT.....30¢	6W4GT.....30¢			
0Z4	5T8	6BR8	6SR7	12AX4GT
1A7GT	5U4	6BS8	6T4	12AX7
1B3GT	5U5	6BY5G	6T8	12AZ7
1H5GT	5V4G	6BZ6	6U5	12BA
1R5	5V6GT	6BZ7	6U8	12BA6
1S5	5X5	6C1	6V6GT	12B07
1T4	5Y3	6CA8	6W6GT	12B06
1U4	6AB4	6CB6	6X4	12BE6
1U5	6AF4	6CD6G	6X5GT	12B7
1V2	6AH5GT	6CF6	6X8	12B06
1X2	6AH6	6CG8	6Y6G	12BR7
2AF4	6AK5	6CH8	7A4/XXL	12B7
2BN4	6AL5	6CL6	7A5	12CA5
2CY5	6AM8	6CM6	7A6	12D4
3AL5	6AN8	6CM7	7B4	12F8
3BC5	6AQ5	6CM7	7B5	12K5
3BN6	6AQ6	6CQ8	7B6	12K7
3BZ6	6AQ7	6CR6	7B7	12L6
3CB6	6AR5	6CS7	7B8	12Q7
3S4	6AS5	6CU5	7C5	12R5
3V4	6AT6	6CU6	7C6	12SA7
4B07A	6AU6GT	6DE	7C7	12S7
4B5B	6AUSGT	6DE6	7E5	12SK7
4BZ7	6AUB	6DG6GT	7E6	12SN7GT
4CB6	6AV6GT	6DQ6	7E7	12SQ7
5AM8	6AV6	6E5	7F7	12V6GT
5AN8	6AW8	6H5	7F8	12W6GT
5AT8	6AX5GT	6J5	7G7	12X4
5AV8	6B5	6J6	7H7	19AU4GT
5AZ4	6BC5	6J7	7Q7	19CG6G
5CB6	6BC8	6K7	7S7	19T8
5R4	6BD6	6N7	7X6	25Z6GT
	6BE6	6Q7	7X7	35A5
	6BF5	6S4	7Y4	35B5
	6BGG	6SGT	7Z4	35C5
	6BH6	6SD7GT	12A8	35W4
	6BJ6	6SF5	12AB5	35Z5
	6BK5	6SG7	12AQ5	50A5
	6BK7	6SH7	12AT6	50B5
	6BL7GT	6SJ7	12AT7	50C5
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LOW LIST ONLY
* 2 TUBES FOR PRICE OF 1
PLUS 1c
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Buy 100 tubes for \$33; get 100
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Pick Any Types
Mix If You Wish!
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*Tru-Vac pays your postage — on orders of \$5 or more in USA & territories. Send approximate postage on Canadian and foreign orders. Orders less than \$5 require 25¢ handling charge. Send 25¢ in C.O.D.

TRU-VAC

Dept. No. T3

Harrison Avenue • Box 107 • Harrison, N. J. Humboldt 4-9770

For more data, circle 3-70-2 on coupon, p. 54

cally all X-ray generators below 100 ma—despite its inefficiency.

Service Precautions

No special precautions are required when repairing infra-red lamps, other than those normally observed with any hot element electrical device. Ultra-violet lamps require some special precautions since transformer outputs sometimes reach 1000 volts. Prolonged exposure to ultra-violet rays is also dangerous, especially to the eyes.

X-rays are dangerous! If it becomes necessary to view an X-ray tube with the current on, face it away from you, and look at the tube through a mirror. X-rays travel in straight lines, and very little X-ray energy will scatter back to the technician. But there can be scattered radiation around the room. If prolonged exposures are to be made, or the high voltage is to be left on for more than a few seconds, stand behind a leaded wall in such a manner that the X-rays would have to bounce twice before reaching you. Better still, wear a doctors' or X-ray technicians' lead rubber protective apron.

Most X-ray generators have their high voltage circuits protected by cased transformers, cables, etc., so that contact with high voltage is almost impossible. The highest voltage available in the primary circuits is usually 220 volts, but this too, can be lethal. Extreme caution is important in any event.

Protection of the X-ray tube is a further consideration. Charts designating maximum exposure time at certain power ratings are furnished by the manufacturer. (See Fig. 5). Exposures in excess of these ratings will literally melt the target—and X-ray tubes are expensive. Other charts are furnished giving heat storage ratings of X-ray tubes when making exposures in succession. Addition of all the exposures should never exceed the heat storage rating of the tube as listed on this chart.

It is highly important that all X-ray equipment be properly connected to a cold water pipe ground. This allows electrical charges to leak off and protects the patient who may be susceptible to slight electrical shock.

In damp climates the older type vertical fluoroscopes may "hiss" when the foot-switch is depressed. This hissing is corona from the cord reels. By eliminating frayed wires, sharp screw points, etc., from high voltage circuits, this annoyance can be greatly reduced.

Repair Methods

The most frequent troubles with ultra-violet generators are defective switches and wiring. Line cords deteriorate, timing and other switches simply wear out. Replacement is simple and substitutes are often available through a local radio or electrical supply jobber. Should a heating element or timing switch become defective, they will probably be available from the equipment manufacturer or his sales representative without too much trouble.

X-ray servicing requires a good quality VOM with a-c scale variations from 50 to 250 volts. An a-c ammeter is sometimes helpful, but rarely necessary. For the more advanced circuits (not usually found in a private doctor's office), a VTVM is necessary, but a standard 20,000 ohm/volt VOM is usually adequate. An oscilloscope is rarely required except for highly advanced and/or most modern X-ray instruments. No attempt should ever be made to measure HV going to the X-ray tube. This voltage is highly dangerous, and meters are not readily available for measuring it. Voltage from the transformer secondary is usually computed from the transformer turns ratio and the primary voltage. Thus, a transformer with a 100 turn primary and an 80,000 turn secondary is expected to deliver 80,000 volts to the X-ray tube for each 100 volts on the primary. This is 40,000 volts each side of ground.

The most common problems arising in self-rectified, self-contained X-ray equipment includes dirty relay contacts and timer switches. Broken wires in the cables leading from control unit to X-ray head, burned out meters, and mechanical troubles are others. Transformers rarely fail. Switches are seldom available from radio parts jobbers since these are usually heavy duty types. Service generally requires no more than cleaning the contact

surfaces, and occasionally replacing one or more contacts. The on-off switch, or circuit breaker is usually available from local electrical houses. Resistors for the filament rheostat and surge type resistors are generally available from radio parts jobbers.

Probably the most serious troubles in fluoroscopes and self contained X-ray heads is burned out X-ray tubes. Filament burnouts are usually indicated when voltage appears across P-1 and P-2 when the timer button or footswitch is

depressed—but with no X-rays being produced. A voltage measurement across F-1 and F-2 (Figs. 3 and 4) will indicate if the filament transformer is obtaining its proper voltage.

In older type vertical fluoroscopes an ohmmeter measurement across the tube's filament contacts (with the filament wires to the transformer disconnected) will show if the X-ray filament is open. This tube usually sells in the vicinity of \$100 and is available from any X-ray dealer in the nearest large

Now—24-Hour Tuner Service

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Direct Factory Service
on TUNER REPAIRS
... \$8.50**



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

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

SERVICE MANAGER • TUNER DIVISION • DEPT. 2B

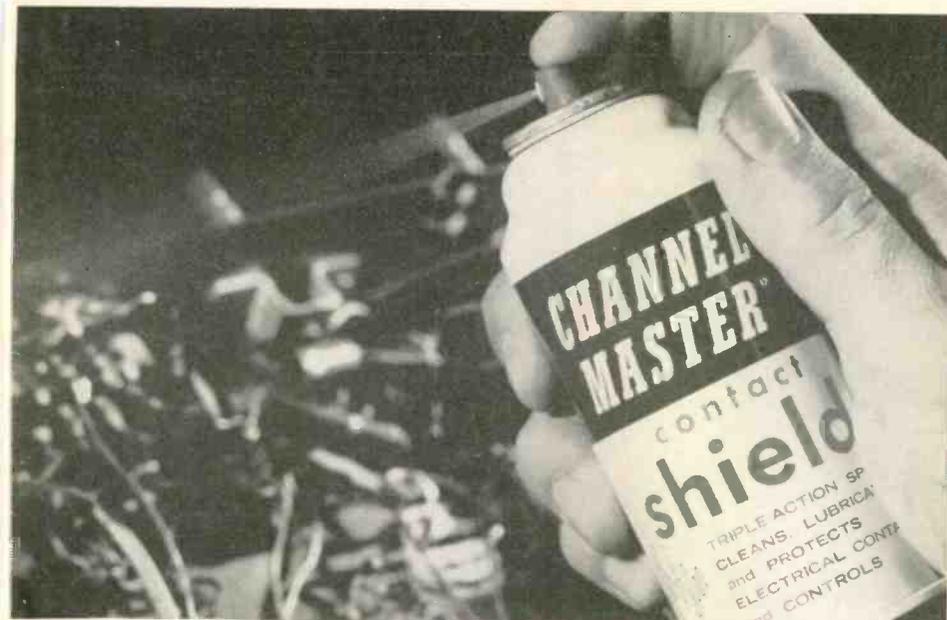


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For more data, circle 3-71-1 on coupon, p. 54



BEST OF ALL CONTACT SPRAYS

As reported by independent product-testing laboratory

Triple-action Contact Shield cleans, lubricates, and protects electrical controls and switches in seconds. Most effective, safest product of its kind as proved by laboratory tests.

CHANNEL MASTER works wonders in sight and sound
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Ellenville, New York

The Model 88 . . . A New Combination

TRANSISTOR RADIO TESTER and DYNAMIC TRANSISTOR TESTER



The Model 88 is perhaps as important a development as was the invention of the transistor itself, for during the past 5 years, millions of transistor radios and other transistor operated devices have been imported and produced in this country with no adequate provision for servicing this ever increasing output.

The Model 88 was designed specifically to test all transistors, transistor radios, transistor recorders, and other transistor devices under dynamic conditions.

AS A TRANSISTOR TESTER

The Model 88 will test all transistors including NPN and PNP, silicon, germanium and the new gallium arsenide types, without referring to characteristic data sheets. The time-saving advantage of this technique is self evident. A further benefit of this service is that it will enable you to test new transistors as they are released! The Model 88 will measure the two most important transistor characteristics needed for transistor servicing; leakage and gain (beta).

AS A TRANSISTOR RADIO TESTER

The Model 88 provides a new simplified rapid

procedure—a technique developed specifically for transistor radios and other transistor devices.

An R.F. Signal source, modulated by an audio tone is injected into the transistor receiver from the antenna through the R.F. stage, past the mixer into the I.F. Amplifier and detector stages and on to the audio amplifier. This injected signal is then followed and traced through the receiver by means of a built-in High Gain Transistorized Signal Tracer until the cause of trouble whether it be a transistor, some other component or even a break in the printed circuit is located and pin-pointed.

Only

\$38⁵⁰

Model 88 comes housed in a handsome portable case. Complete with a set of Clip-On Cables for Transistor Testing, an R.F. Diode Probe for R.F. and I.F. tracing; an Audio Probe for Amplifier Tracing and a Signal Injector Cable. Complete—nothing else to buy!

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

Try it for 10 days before you buy. If completely satisfied send \$8.50 and pay balance at rate of \$6.00 per month for 5 months. —No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.
Dept. D-872, 3849 Tenth Ave., New York 34, N. Y.
Please rush one Model 88. I agree to pay \$8.50 within 10 days after receipt and \$6.00 per month thereafter. Otherwise I may return, cancelling all further obligation.
NAME
ADDRESS
CITY ZONE STATE
All prices net, F.O.B., N.Y.C.

For more data, circle 3-72-2 on coupon, p. 54

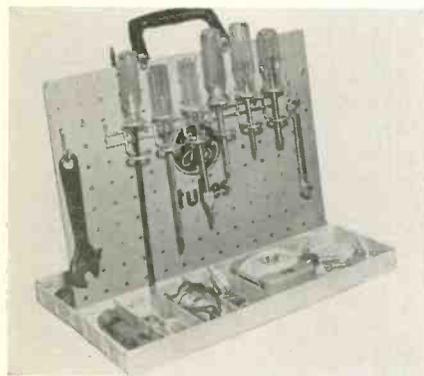
town. In the tube-transformer self enclosed unit, replacement is not so simple, and "factory rebuilt" heads are usually obtained. The tube-head is removed by an electronic technician, and shipped to the nearest X-ray dealer. They are usually equipped to service these self-contained heads, or will send them to the factory. The head contains transformer oil which is vacuum sealed with special precautions as to dirt and moisture prevention.

A defective X-ray tube may be indicated when little or No X-rays are produced, and the milliammeter fluctuates wildly. This generally means a gassy tube. To check this disconnect F-1 or F-2, removing filament voltage from the X-ray tube. Turn on the high voltage. If the MA meter still fluctuates wildly, a short may exist in the housing. If the MA meter remains at zero without fluctuating, this probably indicates a defective X-ray tube.

Occasionally a gurgling or burping noise is heard in the housing. If this occurs only when the housing is in one or another position, it indicates an air bubble in the housing. It should be returned to an X-ray dealer for repair and oil replacement. If allowed to operate in this condition an X-ray tube may be punctured or the high voltage transformer damaged. •

G-E "TOOL TOTER"

Announced is a "tool toter" designed to organize and ease the carrying of tools and other equipment during service calls. It has a two-sided



rack for tools as well as trays for components, small tools and most-used parts. The toter is also useful on the service-shop work bench. General Electric Co., Distr. Sales Operation, Owensboro, Ky.

For more data, circle 3-72-3 on coupon, p. 54

Sonarcom 2-WAY RADIO

Model CBP citizens band transceiver fits into the palm of the hand, has a 53" telescoping antenna, and can be tuned to each of the 22 channels by a single switch. It is crystal controlled, has 8 transistors, 1 diode, and is reported to operate over 100 hours on inexpensive

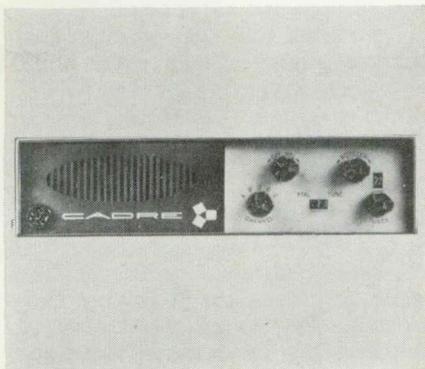


leak-proof batteries. Reported range, over 2 miles on land; increased when used over water. Size, 3"x8½" L. Weight, less than 2½ lbs. Price, complete with 1 pair of crystals, batteries and antenna, \$124.50. Sonar Radio Corp., 3050 W. 21st St., Brooklyn 24, N. Y.

For more data, circle 3-73-2 on coupon, p. 54

Cadre CB TRANSCEIVERS

Cadre 500 portable Citizens Band transceiver incorporates 15 transistors and 7 diodes and has low power drain of only 2 watts. Transmitter power input, 5 watts, 100% modulation capability; high frequency stability, 0.005%. Transceiver operates on 5 crystal-controlled transmit and



receive channels. Receiver also tuneable to all 22 channels. Has front panel squelch and automatic noise limiter. Operates from 115v a-c supply or 12v battery. Size, 11½"W, 3"H, 5¼"D. \$199.95. Also, not shown, Cadre 100 mw, 7 transistor transceiver offers ½-1 mile range. Weight, 20 oz. \$124.95. Cadre Industries Corp. Box 150, Endicott, N. Y.

For more data, circle 3-73-3 on coupon, p. 54

NOW

ONLY 12

CBS Cartridges fill 80% of your replacement needs

All you need to cover virtually every cartridge replacement is shown here: Only ten CBS-Ronette models (with mounting bracket kit) and two of the new CBS "Universals."

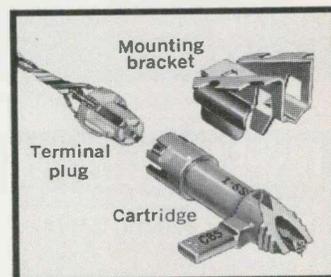
And only \$54.00* buys the complete selection. You save yourself trips to your distributor, you build customer satisfaction, and you add extra profit potential to every service call. Get into the profitable cartridge business this easy, inexpensive way. Contact your CBS Electronics distributor now.

*Suggested dealer net price



NEW CBS "UNIVERSAL" STEREO FLIPUNDER CARTRIDGE

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



CBS ELECTRONICS

Danvers, Massachusetts

A Division of
Columbia Broadcasting System, Inc.

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

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ASSOCIATION NEWS

California

CSEA, Fresno, reports the revised state license bill covering TV and appliance repairmen is expected to go before the state Legislature at Sacramento shortly.

ACTRA, Oakland, announced

election of new officers: Pres., Stephen L. Strong; 1st V.P., Hal W. McGee; 2nd V.P., Frank Lozano; Treas., Lewis E. Hall. The organization also plans to conduct a series of classes on increasing business management efficiency.

TSA, San Francisco, reports its 20 week "Double Warranty" public relations ad campaign in the local newspaper, *News Call Bulletin*, was so successful it is being renewed for an additional 32 weeks. It was said that countless telephone calls to association members resulted in a substantial business increase.

Florida

Strictly Wholesale!

TESA, Miami, made public an unusual letter from Certified Radio TV Supply, a local distributor. It said in effect: "Enclosed . . . a check for \$100.00 . . . forfeit for the Bond we placed some two years ago in the event we were to sell to an unauthorized person. This sale was . . . due entirely to the carelessness of one of our employees . . . we once again post another \$100.00 Bond effective as of this date . . . Success of Certified . . . has resulted in a great part to the good will of our dealers. We hope to retain that good will."

Illinois

NATESA, Chicago, announced its Spring Directors Meeting will be held April 8-9 at the Western Skies Motel, Albuquerque, New Mexico.

Indiana

IESA, Indianapolis, reports a public relations program of daily TV spots under way in cooperation with WFBM-TV. Advertising activities are under the direction of John F. Hurlbut, WFMB public relations manager—formerly with NBC New York.

Missouri

Oppose Extended Warranties

TESA, St. Louis, reports the following petition is being circulated throughout the metropolitan area: "We, the undersigned, are all employed in the business of servicing radio and television sets and selling replacement parts for same. We strongly object and oppose the practice of manufacturers and new set distributors of extending their parts warranties beyond the standard parts warranty period."

New York

CETA, Long Island, has elected the following officers: Pres., Al Schaw; V. P., Frank Joseph; Corr.-Sec'y, Sol Fields; Rec.-Sec'y, Hy Brandeis; Treas., John McManmon; Sgt.-at-Arms, Graham Holzhausen. The association also announced it is sponsoring a series of lectures designed to make available the latest information on TV servicing techniques for its members.

WNYEG, Buffalo, has elected the following officers: Pres., Fred DiTondo; V.P., Lester Marschall; Sec'y, Elmore Bement; Treas., Clarence Thielke; Sgt.-at-Arms, Edward Twardy. James Archibald and Jack McDonough were elected to the executive committee.



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

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

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

Write today for complete information.

PLANET SALES CORPORATION
225 Belleville Avenue Bloomfield, New Jersey

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DISPLAY YOUR NAME OR MESSAGE!

ELMHURST PRINTED TAPE CO.
110 S. YORK STREET
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PRINTED ON SCOTCH BRAND
PRESSURE SENSITIVE
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4 . . . 1/2" x 1296" rolls . . . \$14.60	DISPENSER
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	ORDER

3 lines of type any length
Additional lines \$1.00 per line
● TAPE COLORS—White, Yellow, Light Green, Light Blue
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Send check or money order (No COD's). Quantity prices on Request
Elmhurst Printed Tape Co., Dept. 4, 111 S. York St.
Elmhurst, Illinois

For more data, circle 3-74-2 on coupon, p. 54

ESFETA, Albany, at a recent meeting in the Hotel Wellington the association's president, Irving Toner, announced progress is being made in the direction of passage of the Adams-Cooke TV license bill.

North Carolina

Push License Bill

NCFEA, Durham, is working on its licensing bill for presentation to the State Legislature. The association is requesting voluntary contributions from all N.C. service technicians to aid in paying the costs of carrying the program to a successful conclusion.

Ohio

TESA, Akron, state service association of Ohio, announced its directors voted unanimously to notify manufacturers of the organization's opposition to any extended parts warranties other than the standard 90-day obligation. The association also announced its convention will be held on March 26, at the Van Cleve Hotel in Dayton.

ARTSD, Columbus, officers for 1961 are: Pres., Herman Francis; V.P., Don Wilson; Rec.-Sec'y, Walter Dirscoll, Corr.-Sec'y, Rex Rice; Treas., Don Blazer.

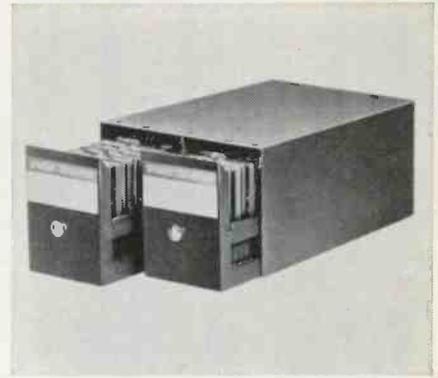
TESA, Springfield, has elected the following officers for 1961: Pres., William Elliot; V.P., Lewis DeVore; Sec'y, Roy Henderson; Treas., Jack Carpenter.

ETAT, Toledo, elected the following officers for 1961: Pres., Floyd Harper; V.P., Richard Missler; Sec.-Treas., Quentin Hannan.

Sprague CAPACITORS

Specially selected assortments of D-film Orange Drop radial-lead dipped tubular capacitors are: TK-23, consisting of 60 Orange Drops in the 10 most popular ratings in a single-drawer cabinet; TK-24, 124 Orange Drops in 13 carefully selected ratings in a two-drawer cabinet. The capacitors are packaged in Kleer-Pak plastic. The file cabinet is free with the purchase of the capacitor assortments. TK-23, \$11.70. TK-24, \$24.90. Sprague Electric Co., North Adams, Mass.

For more data, circle 3-75-3 on coupon, p. 54



ATLAS "Job Rated" P. A. SPEAKERS



There is an Atlas Speaker Ideally Suited for Every Job

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

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

The DU-12 and DC-5, Atlas' renowned DeCor projectors, are styled to harmonize with any decor, modern or traditional. Send for free catalog to Dept. ET-3

Model	HU-12N	HU-15N	HU-24N	CJ-14N	CJ-30N	CJ-44	TP-15N	TP-24N	DU-12	DC-5
POWER*	7.5 w	25 w	25 w	7.5 w	25 w	60 w	25 w	25 w	7.5 w	6 w
IMPEDANCE**	8 ohm	8 ohm	8 ohm	8 ohm	8 ohm	16 ohms	8 ohm	3 ohm	8 ohm	8 ohm
FREQUENCY	350-	250-	200-	400-	250-	150-	250-	200-	400-	120-
C.P.S.	10,000	10,000	10,000	10,000	10,000	9000	10,000	30,000	10,000	7000
LENGTH OVERALL	7 1/4 in.	8 3/4 in.	12 in.	8 in.	1 1/4 in.	23" x 13"	16 1/2 in.	23 in.	14 in.	14 in.
BELL DIAMETER	7 1/4 in.	9 3/4 in.	11 1/4 in.	9 1/2" x 5 1/2"	14" x 6"	19 in.	9 3/4 in.	11 1/4 in.	7 in.	7 in.
NET PRICE	\$16.20	\$20.10	\$22.35	\$18.00	\$24.60	\$43.50	\$31.20	\$34.50	\$19.80	\$13.20

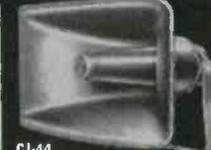
*Input range limited to frequencies above horn cutoff **All models available in 45 ohms at slightly higher prices



TP-15N TP-24N



DU-12



CJ-44

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

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"He's going to feel that in the morning."



Model 500 COMPONENT SUBSTITUTOR

One compact instrument substitutes for resistors, condensers, electrolytics, rectifiers, diodes, power resistors and bias voltage.

SAVE MONEY! No need to buy several different component substitutors . . . The Model 500 does the whole job!

PROVIDES A COMPLETE RANGE OF COMPONENTS AT YOUR FINGERTIPS FOR FAST SUBSTITUTION

SPECIFICATIONS

- Substitutes for 20 values of resistors from 33 ohms to 10 megohms
- Substitutes for 10 values of condensers from .0001 mfd. to .5 mfd.
- Substitutes for 10 values of electrolytics from 4 mfd. to 330 mfd.
- Substitutes for all power rectifiers up to 500 ma.
- Substitutes for all diodes
- Substitutes for power resistors . . . continuously variable up to 5000 ohms
- Substitutes for bias voltages . . . continuously variable up to 15 volts either polarity

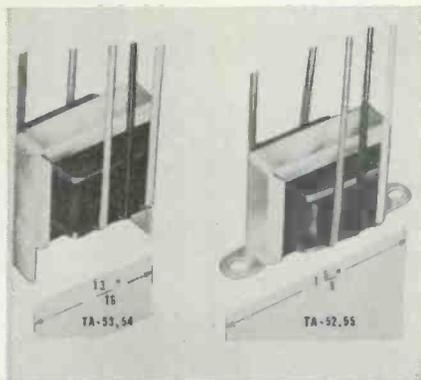
\$2995
Net

Model 500

See your electronics parts distributor!

MERCURY ELECTRONICS CORP. 77 SEARING AVENUE, MINEOLA, NEW YORK

For more data, circle 3-75-2 on coupon, p. 54



CDE CAPACITORS

"Pik-A-Pak" display rack holds 5000 capacitors, occupies less than 3 sq. ft. and is 3'x1'x7' high. It is offered free with the purchase of: 500v CDE dipped silver micars; 200, 400 and 600v PM-molded mylars; and 200, 400, 600 and 1600v DPM's or with an equivalent selection. The rack has modern styling, antique gold exterior finish, lacquered bright gold finish on interior panels, and illuminated 2-color canopy that can be used as a night light. Cornell-Dubilier Electronics Div., Federal Pacific Electric Co., 50 Ave. L, Newark 1, N. J.

For more data, circle 3-77-5 on coupon, p. 54



signed for higher power driver and output applications, range in rating from .5 watt to 10 watts. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

For more data, circle 3-77-3 on coupon, p. 54

Paco METER KIT

All-purpose grid dip meter model G-15 functions as a variable frequency oscillator covering 400 Kc to 250 Mc in 8 bands, with no skipping, and as an absorption wavemeter over these frequencies. It can be operated in one hand and has a number of secondary func-



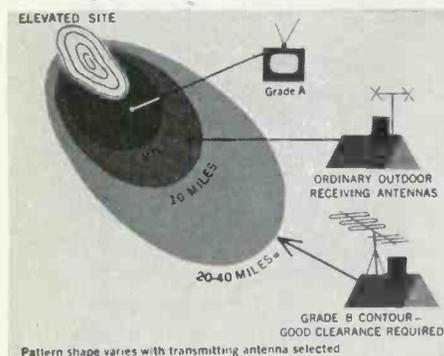
tions such as determining "Q" of L/C circuits and for "cold" alignment of filters and traps. Equipped with large, easy-to-read thumb-actuated dial. Kit, complete with set of 8 plug-in coils and assembly manual, \$31.95. Wired, \$49.94. Paco Electronics Co., 70-31 84th St., Glendale 27, L. I., N. Y.

For more data, circle 3-77-4 on coupon, p. 54

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For More Information

Circle Code Numbers on Page 54

"Wizard" TV Antenna Coupler

• The Census Bureau has recently reported that 11% of all U.S. families own two or more TV sets, and urban areas are 91% covered by television. Accordingly, master antenna systems have become increasingly important.

Multiple TV installations run the gamut from individual set antennas to mixers, amplifiers, and coaxial cable networks. One unconventional multiple installation component, called the "Wizard" coupler, makes no direct electrical or mechanical connection with the antenna line. This coupler, shown in Fig. 1, contains two coupling elements that enable the unit to employ the principle of electromagnetic coupling. There are no resistors, capacitors, or inductances in the coupler. The unit's two halves snap together on the antenna transmission line. No cutting or puncturing of antenna line (standard-type 300 ohm wire is employed) is involved.

Multiple Installations

If we were to plan a master antenna system, assuming a 14 out-

let one in an average signal strength area, the following installation steps would be typical: A single antenna should be installed at one end of the apartment building. From this antenna, a single length of 300 ohm transmission line is run to the far end of the



Fig. 1—"Wizard" television antenna coupler.

building, terminated with a 300 ohm resistor (see Fig. 2). It is now only necessary to couple the TV outlets to this main run.

Signal strength losses, such as transmission lines and couplers, will result in slightly less than 1/10th of the signal strength at the antenna reaching the final TV receiver. This means, in this par-

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ticular example, that if a minimum signal strength of 1,000 microvolts is required at the TV receiver, 10,000 microvolts will be needed at the antenna.

Computing Signal Loss

To illustrate the layout planning and computation, consider the length of the 300 ohm transmission line as, perhaps, 100 feet. This will cause the signal to drop by approximately one-fifth. The effect of the Wizard couplers on the line must now be considered. The 13 couplers preceding the last one will decrease the signal by slightly more than one-half. Finally, the attenuation through the last coupler will reduce the remaining signal to one-fourth of its value. Thus, the signal reaching the final TV receiver will be slightly less than $\frac{4}{5} \times \frac{1}{2} \times \frac{1}{4}$, which approximates 1/10th of the signal strength at the antenna.

Computing signal loss from a decibel loss viewpoint; (1) 100 feet of 300 ohm transmission line has an attenuation of 2 db for channel 13. (2) Each coupler preceding the last one has an insertion loss of $\frac{1}{2}$ db, which for 13 couplers causes a $6\frac{1}{2}$ db loss. (3) Isolation loss of the final Wizard coupler is 12 db. The total system loss in this example is therefore $20\frac{1}{2}$ db; a loss that represents a signal requirement at the antenna of approximately 10,000 microvolts to deliver 1,000 microvolts to the last TV receiver.

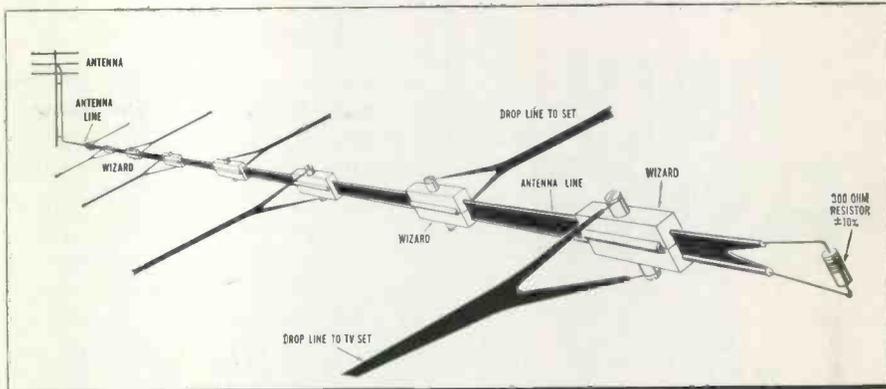


Fig. 2—Master TV antenna system employing Wizard couplers for multiple TV installation.

In low signal strength areas or with unusually large TV outlet requirements in medium-strong signal areas, it may be necessary to use a master amplifier. In this case, coaxial cable should normally be used from the master amplifier's

output, via splitters if necessary, to serve the various 300 ohm transmission lines. •

Information & illustration credit: Don G. Isham, Mgr. Service Engineering, Charles Engineering, Inc., Los Angeles, Calif.

For more data, circle 3-79-2 on coupon, p. 54

RCA VOLTOHYMST KIT

RCA WV-98B (K) kit for the firm's Senior VoltOhmyst features a pre-assembled and pre-soldered etched circuit board and a completely assembled input cable and probe, with built-in DC/AC-ohms switch, is provided. The instrument measures peak-to-peak voltages of complex waveforms, rms values, d-c voltages and resistance. Additional features include: $6\frac{1}{2}$ " wide, easy-to-read meter; separate peak-to-peak and rms-voltage scales, color coded; meter electronically protected against burnout; and other features. RCA Electron Tube Division, Harrison, N. J.



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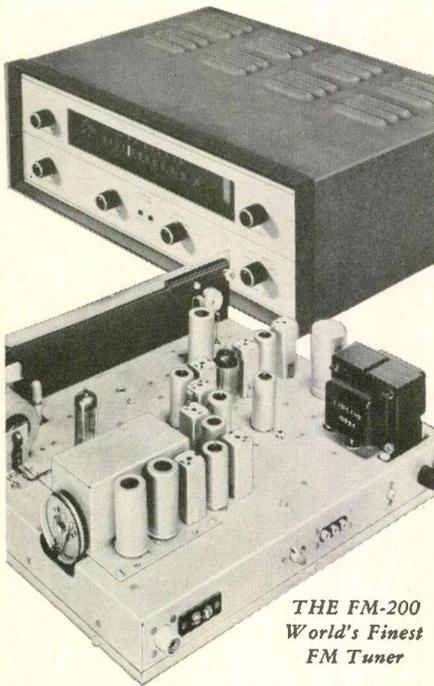
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Ignition Systems

(Continued from page 38)

duction coil primary. Voltage of the output remains relatively flat throughout the engine speed range. Characteristic voltage wave forms in the primary of transistorized and conventional ignition systems are compared in Fig. 3. Secondary wave forms of the two systems are compared in Fig. 5.

The system is designed for negative ground operation, and the spe-

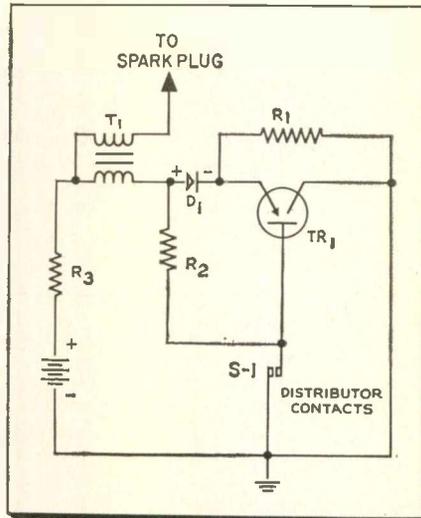


Fig. 4—Schematic of transistorized ignition system showing individual components.

cial transformer package may be located in ambient temperatures up to 350°F. The transistor with heat sink operates in ambient temperatures to 180°F. A germanium instead of silicon transistor is used in the system because of their present higher current capabilities, and lower cost.

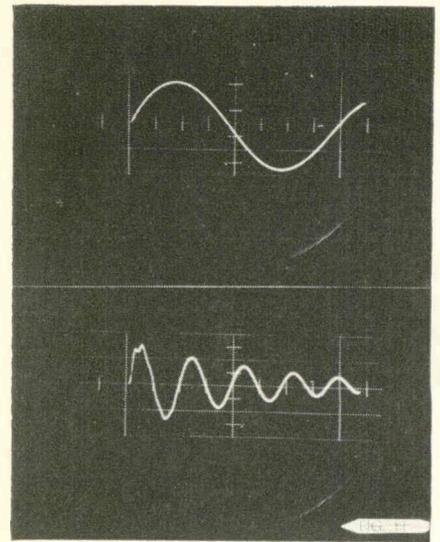


Fig. 5 (top)—Voltage wave form in secondary of transistorized ignition system, and (bottom) in conventional system secondary.

Immediate Applications

Obviously, the price of the package will be high when compared to the coil and capacitor it will replace. There are, however, certain commercial applications which can justify the added cost when over-all system reliability and longevity are prime economic factors. Some applications which appear to offer an immediate market are: (1) Stationary engines providing pumping or stand-by power for the utilities industries. (2) Stationary engines providing power for heat pumps, air conditioning units, irrigation pumps, etc. (3) Certain off-the-road and agricultural equipment, and (4) Some commercial fleet applications. •

Information credit: Paper presented at SAE annual meeting, Detroit, Michigan.



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New Books

BASICS OF ANALOG COMPUTERS. By T. D. Truitt & A. E. Rogers. Published by John F. Rider Publisher, Inc. 400 pages, hard cover. \$12.50.

A three-volume text in one binding outlines the concepts, components, and applications of analog computers. Volume I is an introduction to *Analog Computing Principles and Techniques*. Chapters cover computer building blocks and mathematics of computers, etc. Volume II describes *General Purpose Analog Computers*, including components, computer types, and function generators. Volume III discusses *Using The D-C Analog Computer*, control, programming, and specific computer applications. More than 400 drawings are effectively employed to illustrate the subject matter which is written in simple easy-to-understand language. Questions appear at the end of each chapter and may be used as a guide to self-study progress. Recommended to any technician interested in analog computers.

SERVICING TV TUNERS. By Jess E. Dines. Published by Howard W. Sams & Co., Inc. 272 pages, soft cover. \$4.95.

TV field and bench technicians can find much useful data in this book. It begins with brief but clear explanations of tuner operation, frequencies, characteristics, oscillator-mixer functions, etc., and proceeds to emphasize the importance of understanding circuit operation before practical service techniques can be developed. Grounded cathode and grid circuits; cascode, transistorized tuner types; UHF, strip and continuous—automatic fine tuning and remote controlled tuners, are thoroughly described. Text is adequately illustrated with diagrams, drawings, and photographs. About half of the text is devoted to dismantling and repair of Standard Coil, Mallory, Sarkes Tarzian, G. I., Motorola, and other type tuners. This usually neglected subject has been well covered by the author.

DICTIONARY OF ELECTRONICS. By Harley Carter. Published by Pitman Publishing Corp., 380 pages, hard cover. \$8.50.

Printed in Great Britain, this descriptive dictionary lists electrical and electronic terms, and describes a number of electric instruments employed by the technician. Some of the terminology is illustrated with drawings and diagrams. A system of cross-indexing assists the reader to locate additional related information on other pages. Abbreviations, component symbols, color codes, and conversion tables appear in a number of appendices.

INDUSTRIAL ELECTRONICS Laboratory Manual for Electronic Technicians. By Paul B. Zbar. Published by McGraw-Hill Book Co., Inc., 201 pages, soft cover. \$5.00.

This new manual, sponsored jointly by the EIA and the New York Trade School, seems ideal for a technical school lab course—which it is. The varied electronic subjects grouped under the heading "industrial electronics" are covered as building blocks. For example, Job 1 (of 39 experiments) covers "Characteristics Of A Gaseous Rectifier," while Job 2 is "Thyratron Characteristics." Thus, many major industrial groups are covered, including: relays, saturable reactors, motor control, radio control, computers, synchros, etc. The theory behind each experiment offers readers an excellent background in industrial electronics.

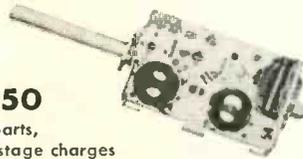
SOLAR CELL AND PHOTOCCELL HANDBOOK. By John Sasuga. Published by International Rectifier Corp. 1521 E. Grand Ave., El Segundo, Calif. 111 pages, soft cover. \$2.00.

As its title implies, this handbook discusses the basic concepts, characteristics, and applications of photovoltaic cells. Silicon, selenium, and hybrid types are reviewed. Sun or mazda light energized power supplies for radios, low milliwattage d-c motors, outdoor photographic flashbulb firing, and satellite applications are described. Photometers, camera control, photoelectric relays, infrared and

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ultraviolet, and miscellaneous applications are also included. Methods for mounting and connecting cells is covered in one chapter. Schematics, charts, and photos augment text material. Appendices include ratings, characteristics, dimensions; output illumination, and output/load resistance charts. The book could be a helpful addition to every technician's library.

MOST-OFTEN-NEEDED 1961 TV SERVICING INFORMATION. Vol. TV-18. Compiled by M. N. Beitman. Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. 192 pages, soft cover, \$3.00.

Fourteen popular TV sets are illustrated here with schematics, tube layouts, alignment data, and other pertinent servicing information. This information can prove most helpful on a TV bench.

THE STORY OF STEREO: 1881—By John Sunier. Published by Gernsback Library, Inc. 160 pages, soft cover, \$2.95; hard cover, \$5.00.

Stereophonic sound—from its beginning in 1881 to the present—is covered in this interesting book. The text emphasizes historical development of stereo with various mediums: film, tape, disc, broadcasting. It offers readers an excellent background in stereo principles for each application. Good illustrations and a complete bibliography following each chapter enhances the well written text.

TUBES AND CIRCUITS. By George J. Christ. Published by Gernsback Library, Inc. 192 pages, soft cover. \$3.45.

By relating electron tube theory directly to practical applications, this book offers meaningful possibilities to the seasoned technician as well as the student of electronics. After the first two easily understood chapters on thermionic emission basics, and tube characteristics, the remaining chapters are devoted to applications. Circuitry includes, rectifiers, amplifiers, and oscillators. Multi-purpose, gas, and photoelectric tubes and circuitry are discussed thoroughly. One chapter covers some industrial equipment applications.

***RAPID PRINTED CIRCUIT REPAIR.** By G. Warren Heath. Published by Howard W. Sams & Co., Inc. 128 pages, soft cover. \$1.95.

This book offers an intelligent presentation of printed circuits and their repair. Four chapters are included in the volume: Printed Circuits, Components, Manufacturers' Circuit-Tracing Aids and Servicing Techniques and Repairs, the latter comprising about half the book. Adequately illustrated and clearly presented, although much of the material and illustrations are familiar through manufacturers' literature and other publications.

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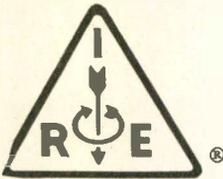
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(Continued from page 37)

lathe work. The following "spring-loading" steps are recommended: Remove the gear and shaft from one of the chart rolls, using due care to avoid bending the shaft or scarring the gear surface. Turn off the flutes on the inner end of the shaft, as shown in Fig. 1A, to any convenient diameter, preferably as large as possible. Flatten about $\frac{1}{8}$ " on both sides of the inner end of the shaft with a file, and drill a small hole about $\frac{1}{16}$ " diameter through the flat.

From any convenient material, such as brass, make a ferrule to act as a bushing between the wooden roller and the gear shaft, as illustrated in Fig. 1B. Center hole should be a smooth turning fit on the gear shaft (dimension "d" in Fig. 1A), length should be about

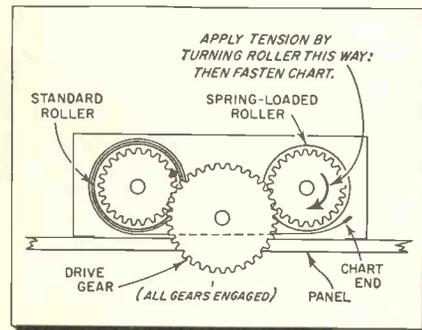


Fig. 4—Chart is placed on unmodified roller and spring-loaded gear is given one turn for each five feet of roll length. Tension is in a direction to tighten roll chart.

$\frac{1}{8}$ " less than the inner shaft length, and flange diameter should be slightly less than that of the chart roll.

Enlarge the chart roll's shaft hole to $\frac{3}{16}$ " and drill this hole to a depth of about 2". Drill a side hole near the inner end of the enlarged hole to take a spring holding screw, as shown in Fig. 1C, and opposite it drill a very small pilot hole, about $\frac{1}{32}$ ", for the screw. Cut off a thin slice of wood from the roller end to compensate for the thickness ("t") of the ferrule flange.

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ELECTRONIC TECHNICIAN • March, 1961

1/4" diameter and about 1" long. A dial-drive spring is suitable. Also obtain a flat or bevel-head holding screw, about as long as the chart roll diameter. Modified roll and parts should now appear as shown in Fig. 2B.

Insert the gear and shaft assembly into the ferrule, with the gear against the flange. Hook the coil spring through the hole in the inner end of the shaft. Thread a fine looped wire through the side hole, and then through the center hole of the roller, as shown in Fig. 3. Hook the wire loop around the inner eye of the coil spring. Push the assembly into the hole in the roller, pull the wire tight, insert the screw through the inner eye of the coil spring, remove the wire, and tighten the screw. The spring-loaded roller is now ready for installation, appearing as in Fig. 2C. A partial section of the "business end" of the modified roller is shown in Fig. 1D.

Installation in the tube checker is quite simple. Roll all of the chart onto the unmodified roller, (see Fig. 1A) with reasonable tightness. Install the spring-loaded roller, mesh the drive gears, and wind in one turn of tension for each five feet of chart length, making sure that this tension will tighten the chart in the final assembly, as shown in Fig. 5. Fasten the chart to the roller, and release the spring tension. The chart will now become taut, and should remain so at all positions. If it slacks off after some months of use, increase the tension slightly.

Using a spring-loaded roller, roll charts tend to run straight at all settings. They do not sag in the central part of the run, and do not tend to tear or pull off near the ends of the roller run. With a spring about 1" long, all charts approximately 10 feet long are held taut at all positions. When chart length is much greater, a longer spring is desirable. A chart roller having a 3" spring is suitable for a roll chart about 28 feet long. •

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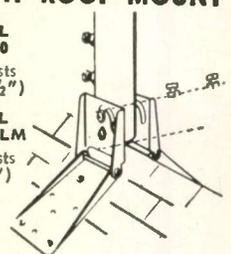
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MODEL PFM-30 LM
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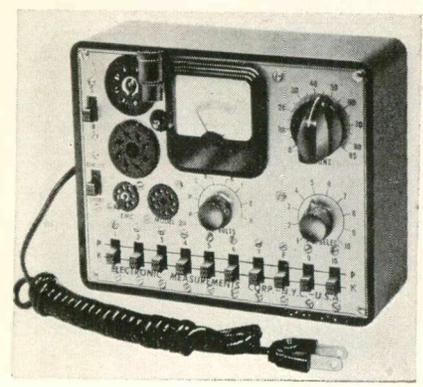
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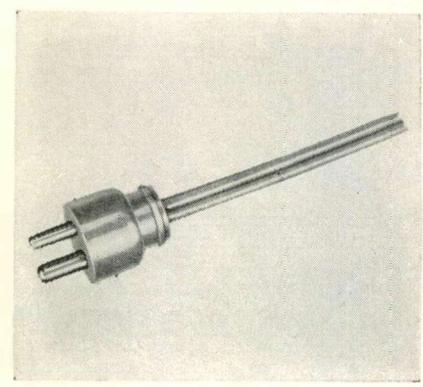
EMC TUBE TESTER

Model 211 checks each section of multi-purpose tubes separately. Checks all octal, loctal, 9-prong and miniature tubes for shorts, leakages, opens, intermittents as well as for quality. Shorts or leakages between any two tube elements can be detected. Also checks magic eye and voltage regulator tubes. Quality is indicated directly on a 2-color meter dial using the standard emission test. Size, 6¾" x 5¼" x 2¼" deep. Shipping weight, 3 lbs. Wired, \$22.90. Kit, \$14.90 Electronic Measurements Corp., 625 Broadway, New York 12, N. Y.



Switchcraft CONNECTOR PLUGS

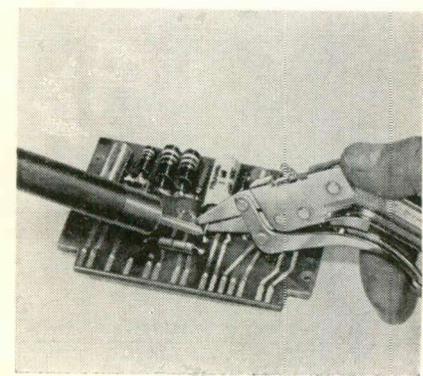
Type ST-152 molded two-prong connector plug, designed to eliminate shorts caused by broken wiring and loose plug caps and/or shells on conventional connector plugs, has small body and diameter making it ideal where space is at a premium. It is commonly used in output circuits. Special metal band, built into body to relieve cable strain. Available molded to shielded or unshielded 2-conductor cable. Can be furnished with 3 prong, 4 prong, and 5 prong connections at small additional cost. Special 6 prong plug also available. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.



For more data, circle 3-86-4 on coupon, p. 54

X-Acto PLIERS

Lock-GriPlier, shown in use as a hint sink in a soldering job, draws off enough heat to prevent injury to the condenser. Announced as a major departure from conventional plier design, its features include: special locking device on top of the 5½" tool to hold jaws closed in one-hand operation; cam-actuated case-hardened steel jaws; pistol grip construction and levered trigger to permit strong pressure with minimum physical effort. Handcraft Tools, Div. X-Acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y.



For more data, circle 3-86-5 on coupon, p. 54

Sonotone HI-FI ASSEMBLY

"Velocitone" ceramic assembly, for use in all record players, includes the firm's new "9T" stereo ceramic cartridge and 2 factory-matched equalizers. Flat response, ±½ db, from 20 to 6,000 cycles and 1 db from 20 to 17,000 cycles. The output voltage is 11 mv. High compliance, 3.5 x 10⁻⁶ cm/dyne, reduces tracking pressure to as little as 2 grams for professional tonearms and 3 grams for changers. Price, with sapphire tips, \$20.50. With diamond-sapphire combination, \$23.50. Sonotone Corp., Elmsford, N. Y.



For more data, circle 3-86-6 on coupon, p. 54

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

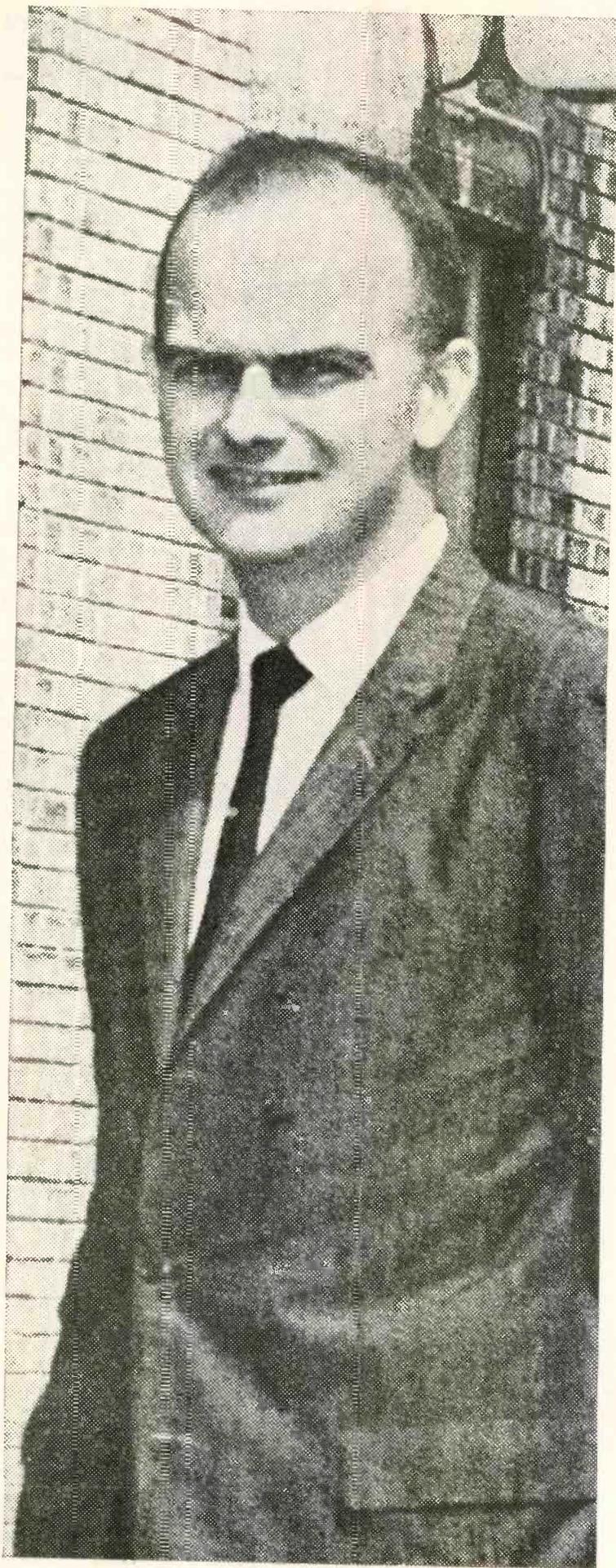


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“Our servicemen make over half of our color sales!”

Says RCA VICTOR Color TV Dealer

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“Here at Campbell TV and Radio, our nine servicemen know—and believe in—RCA Victor Color TV. Whenever they’re out on service calls, they talk Color TV to the customer, and we pay them a commission on every sale they bring in.

“The result? *Better than half of our Color TV sales are made by our own service personnel!* In particular, they are almost singlehandedly responsible for the big replacement market (Color for black-and-white) we have built up.

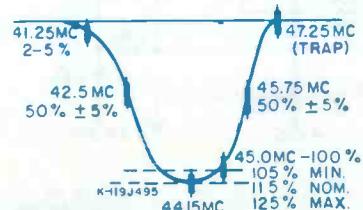
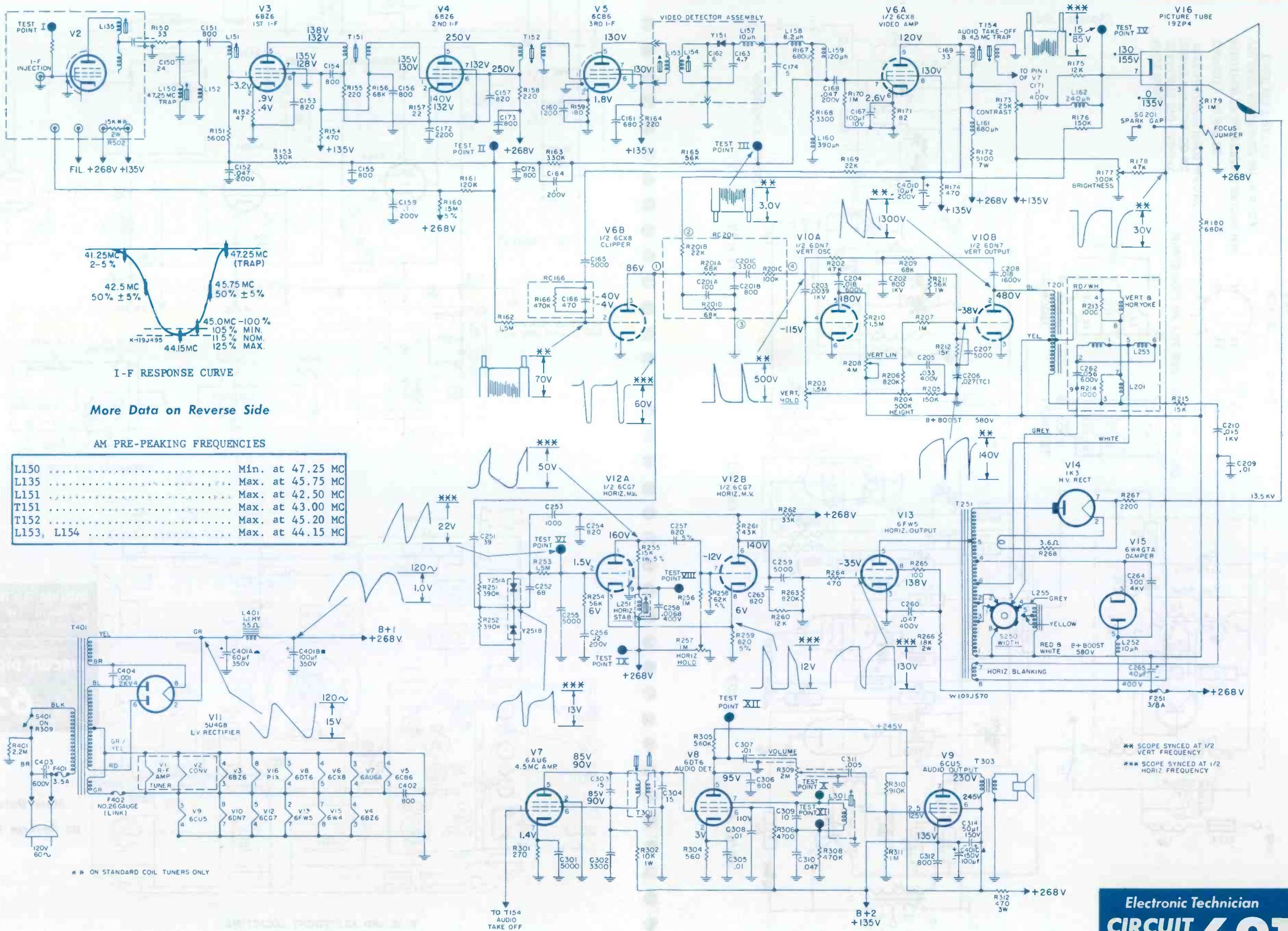
“Altogether, Color TV sales and service are adding \$50,000 annually to our billing. Best of all, *Color TV sales have stimulated other business* as well! Many related sales, especially in stereo, are a direct result of the interest in Color TV that brings customers *into* our store, and the satisfaction with Color that brings them *back!*”—*Evan Campbell, Jr., Campbell TV and Radio, Shreveport, La.*

*Put RCA VICTOR Color
in your TV profit picture!*



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I-F RESPONSE CURVE

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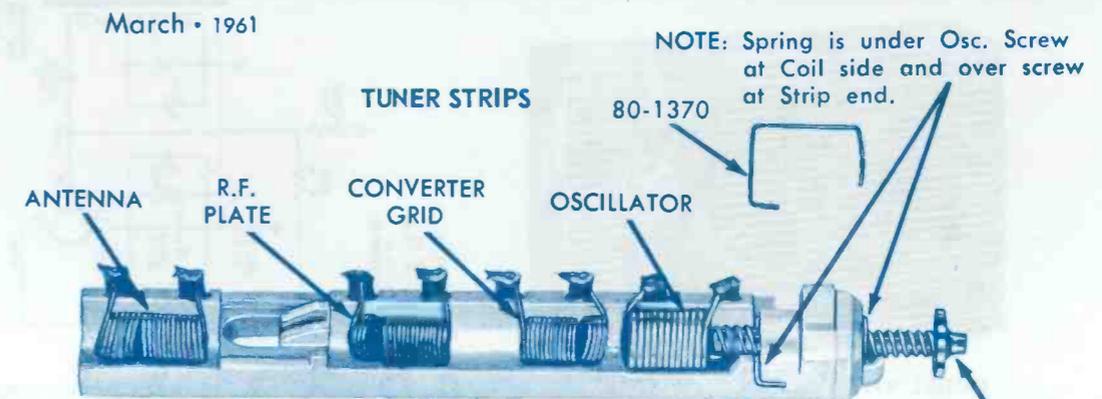
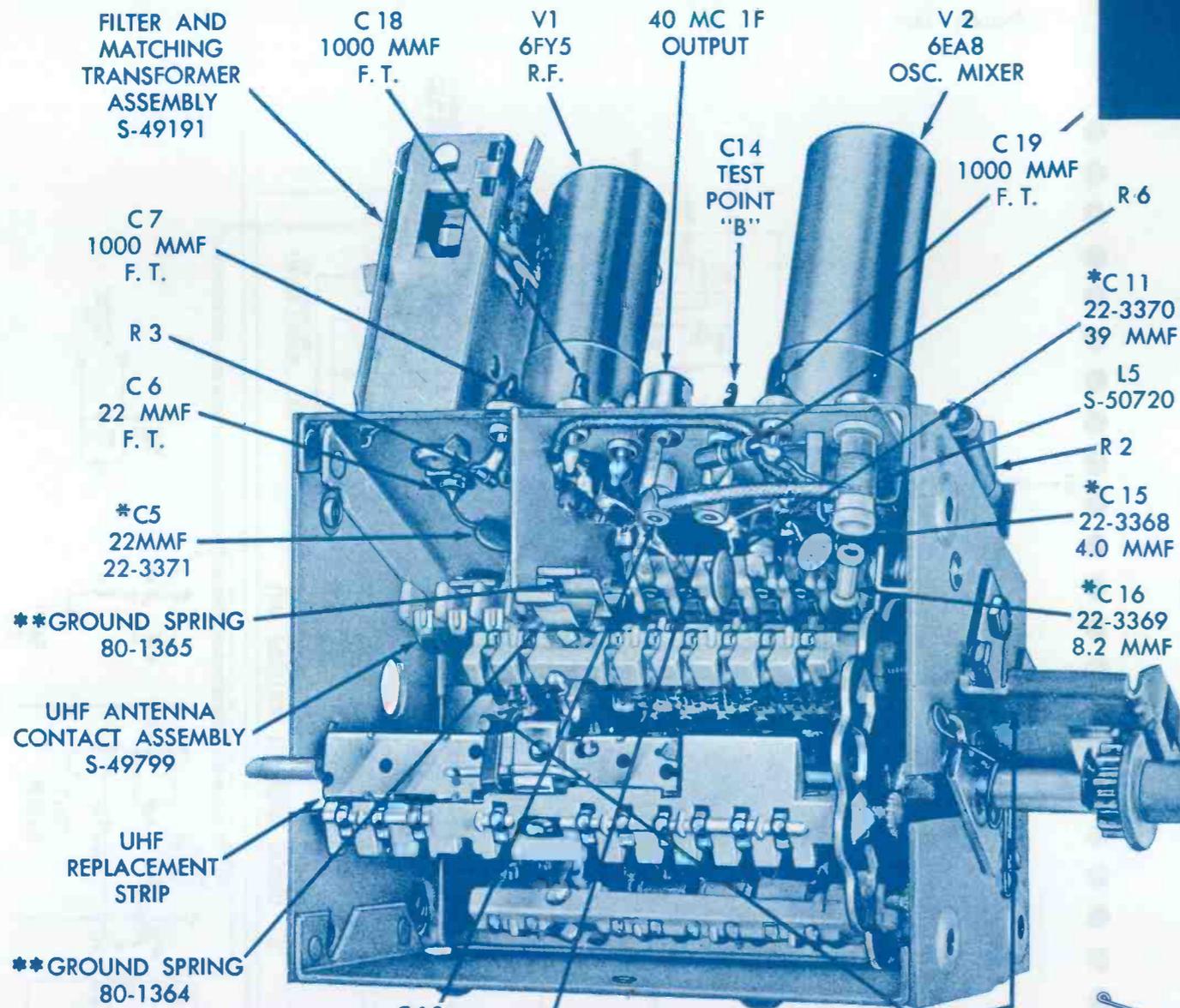
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*** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY

ELECTRONIC TECHNICIAN 623

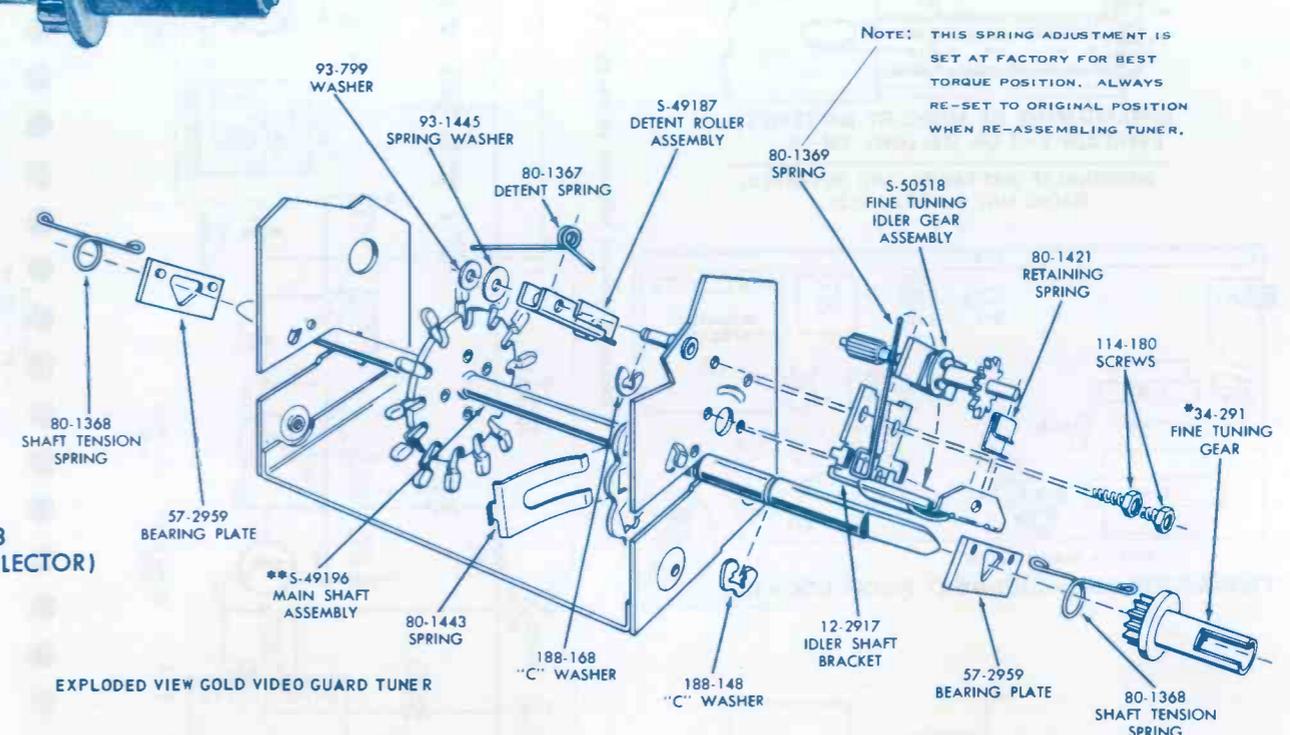
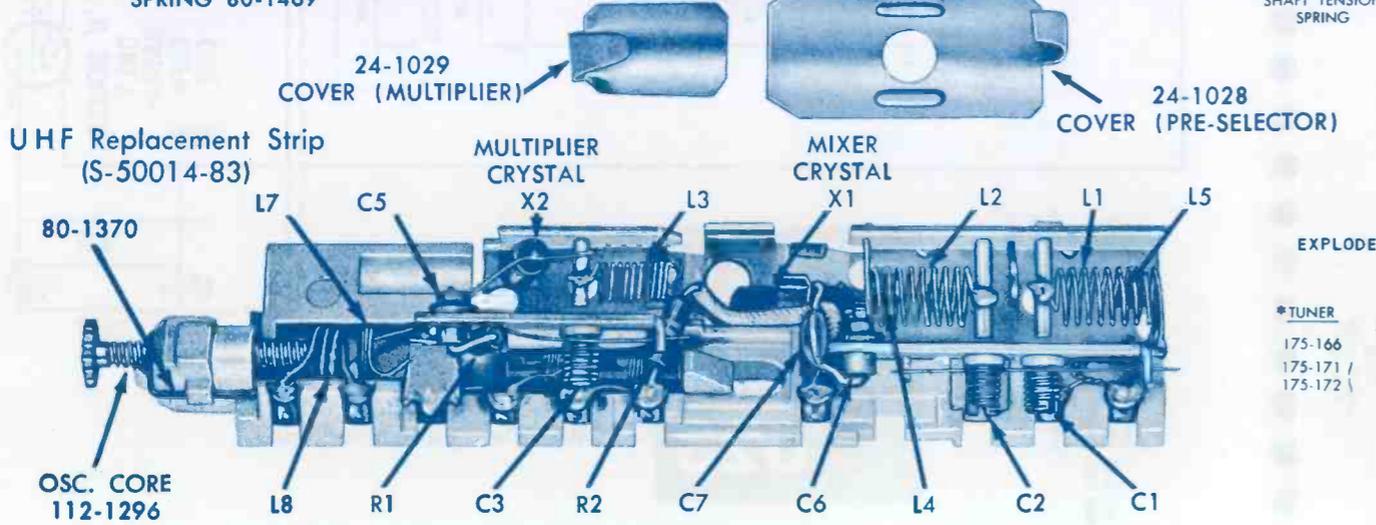
CIRCUIT DIGEST

ZENITH
"Gold Video Guard" Tuner

March • 1961



*USE ONLY ZENITH REPLACEMENT TYPE LEAD LENGTH IS IMPORTANT FOR PROPER INDUCTANCE
 **NOTE: LATER PRODUCTION UNITS USE ONE GROUND SPRING 80-1469



EXPLODED VIEW GOLD VIDEO GUARD TUNER

*TUNER	FINE TUNING GEAR ASSEMBLY	**TUNER	MAIN SHAFT ASSEMBLY
175-166	S-51242	175-166	S-51244
175-171 / 175-172	S-51283	175-171 / 175-172	S-51282
		175-304	S-52638
		175-306	S-52639

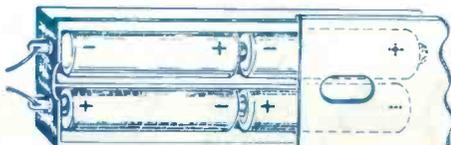
NOTE: 175-141, 175-142, 175-301, 175-302, 175-171, 175-172, 175-166, 175-304, AND 175-306 TUNERS ARE SIMILAR EXCEPT FOR MINOR MECHANICAL AND ELECTRICAL VARIATIONS

More Data on Reverse Side

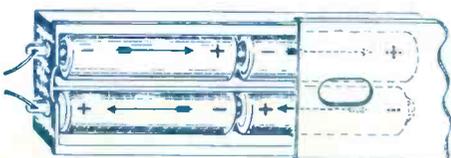


MODEL 977 "FALCON"

BATTERY POLARITY

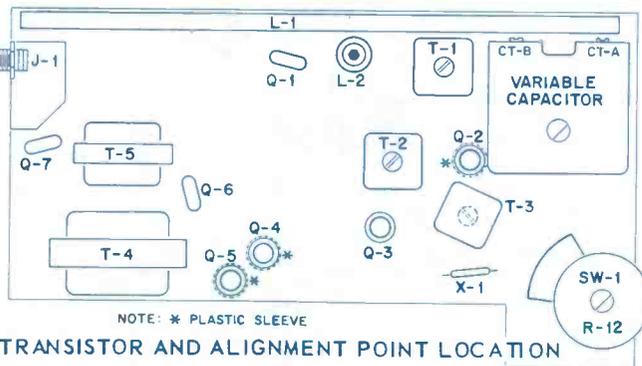


ARRANGEMENT OF LEAKPROOF PENLIGHT BATTERIES, SIZE "A-A"



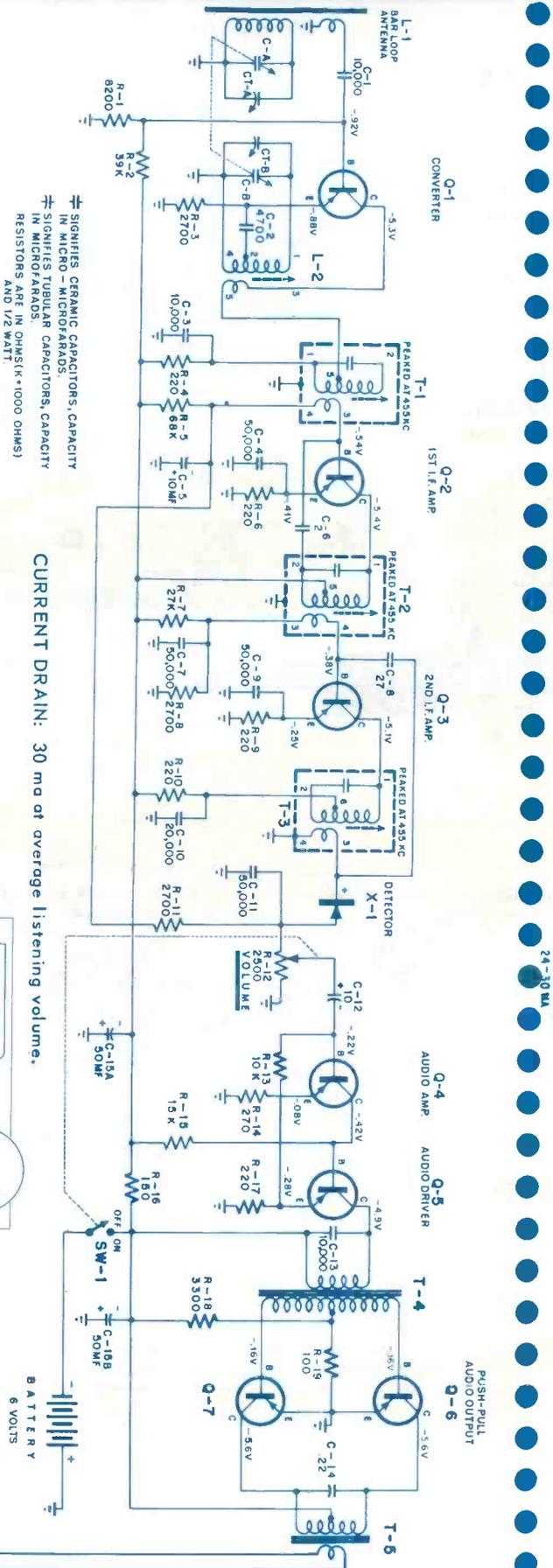
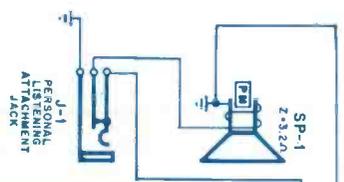
ARRANGEMENT OF MERCURY BATTERIES, EVEREADY E-9 OR MALLORY ZM-9.

WARNING: IF BATTERIES ARE REVERSED, RADIO MAY BE DAMAGED.



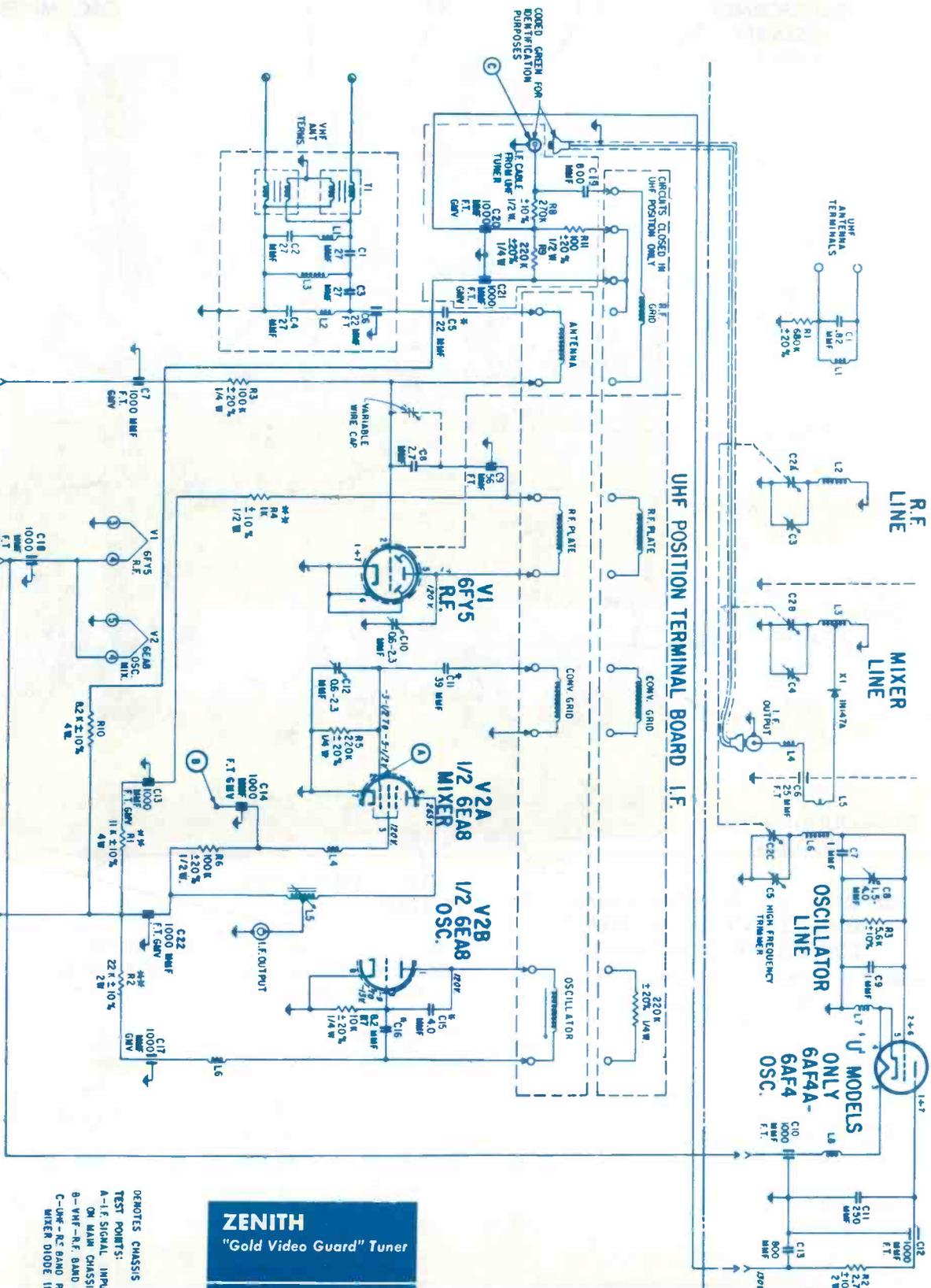
NOTE: * PLASTIC SLEEVE

TRANSISTOR AND ALIGNMENT POINT LOCATION



± SIGNIFIES CERAMIC CAPACITORS; CAPACITY IN MICRO MICROFARADS.
* SIGNIFIES TUBULAR CAPACITORS; CAPACITY IN MICROFARADS.
RESISTORS ARE IN OHMS (K=1000 OHMS) AND 1/2 WATT.

CURRENT DRAIN: 30 ma at average listening volume.

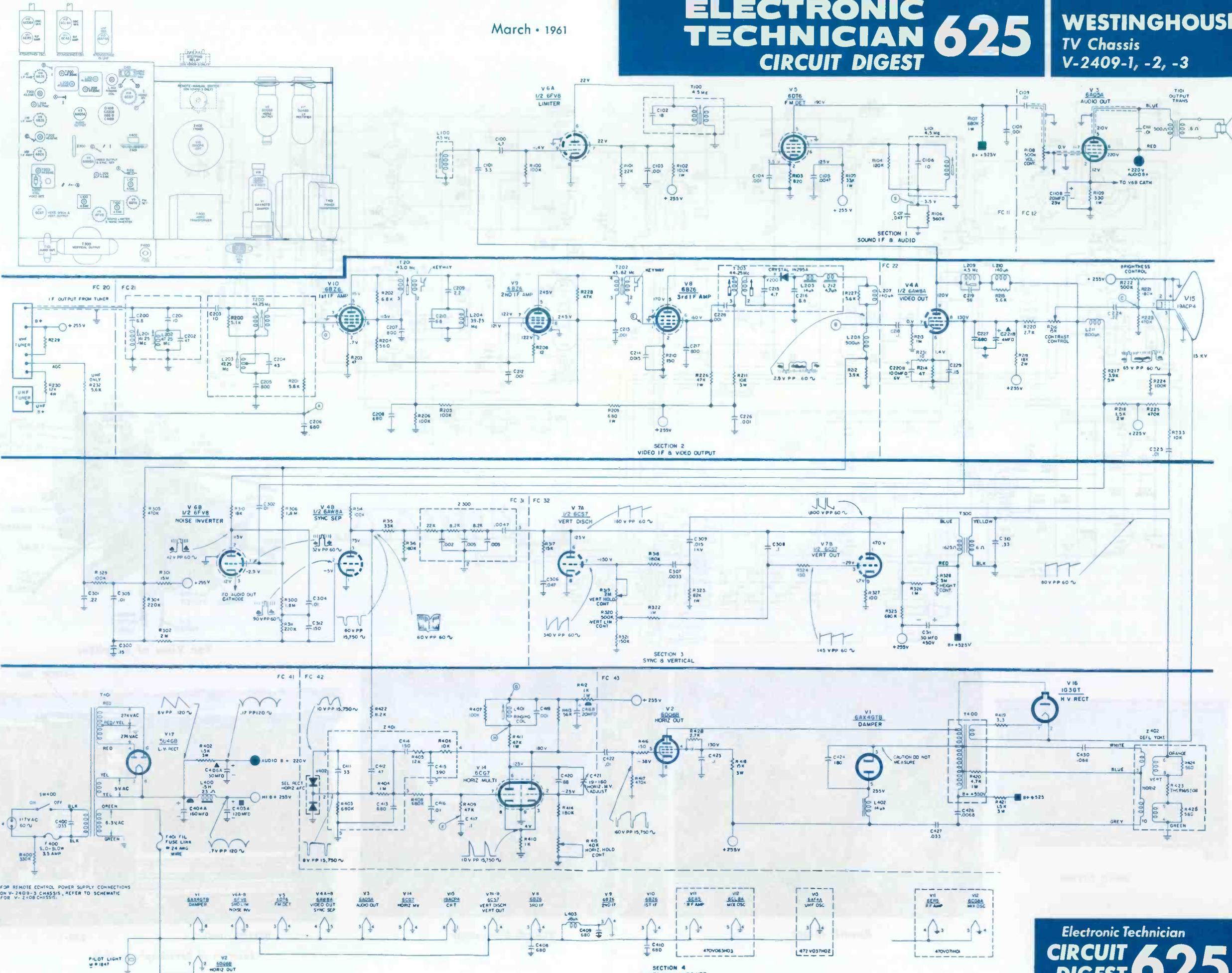


ZENITH
"Gold Video Guard" Tuner

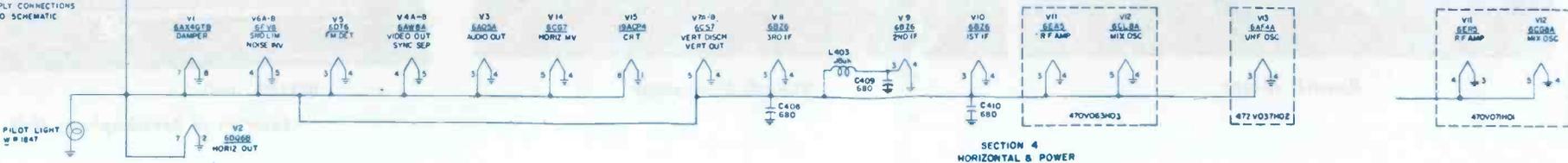
Electronic Technician
CIRCUIT DIGEST

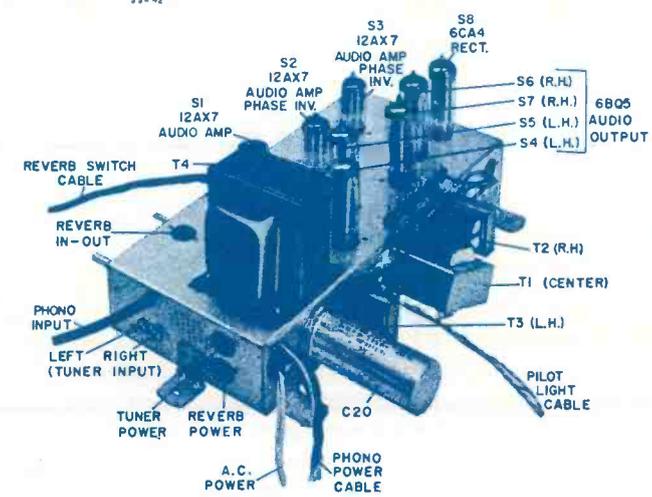
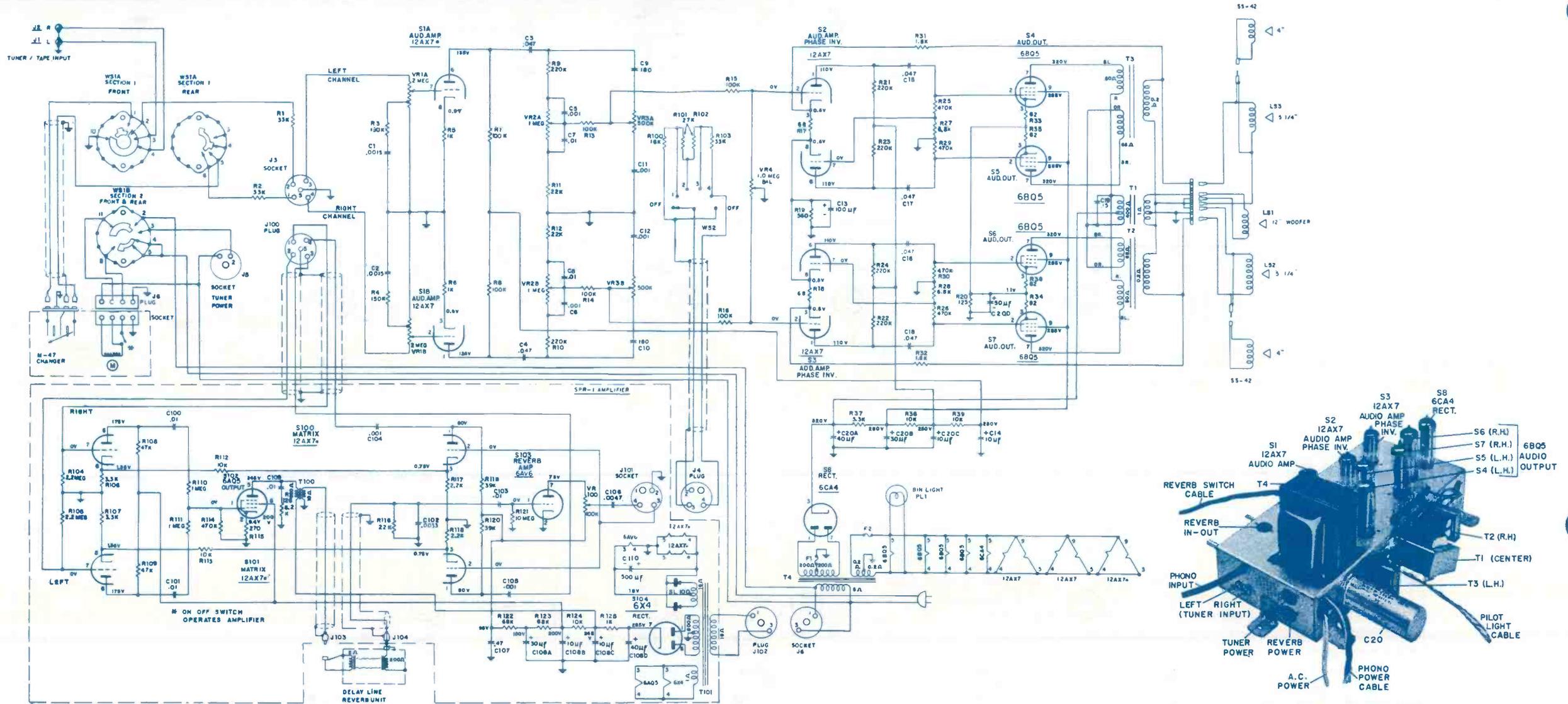
623

More Data on Reverse Side



FOR REMOTE CONTROL POWER SUPPLY CONNECTIONS ON V-2409-3 CHASSIS, REFER TO SCHEMATIC FOR V-2408 CHASSIS.





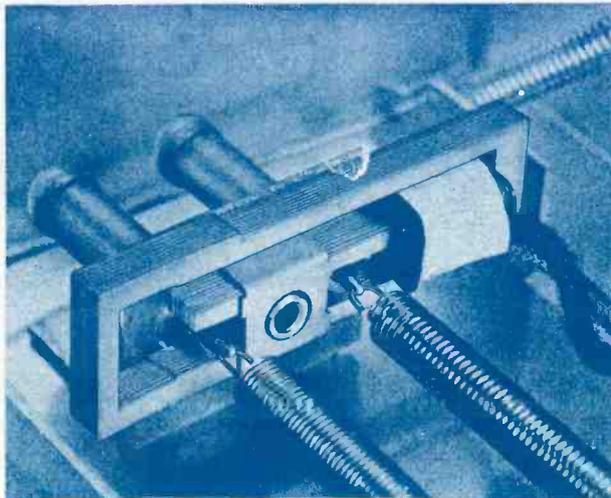
Top View of Amplifier



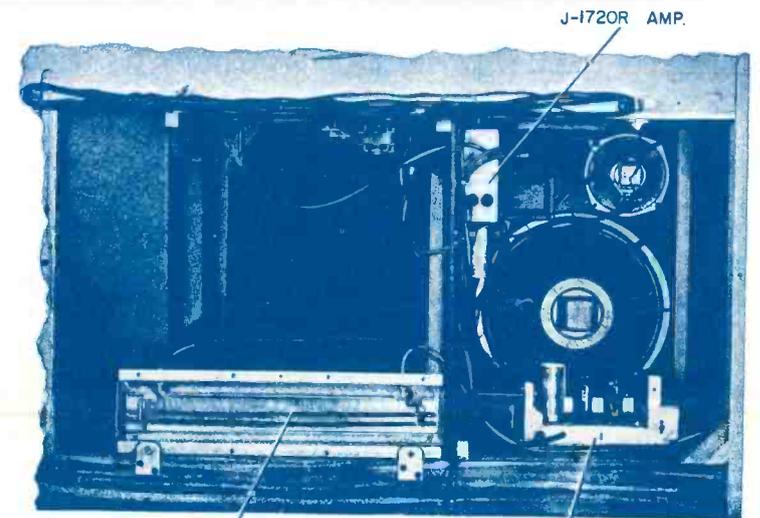
Model J-1720R



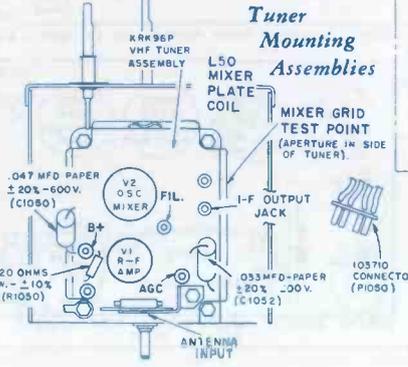
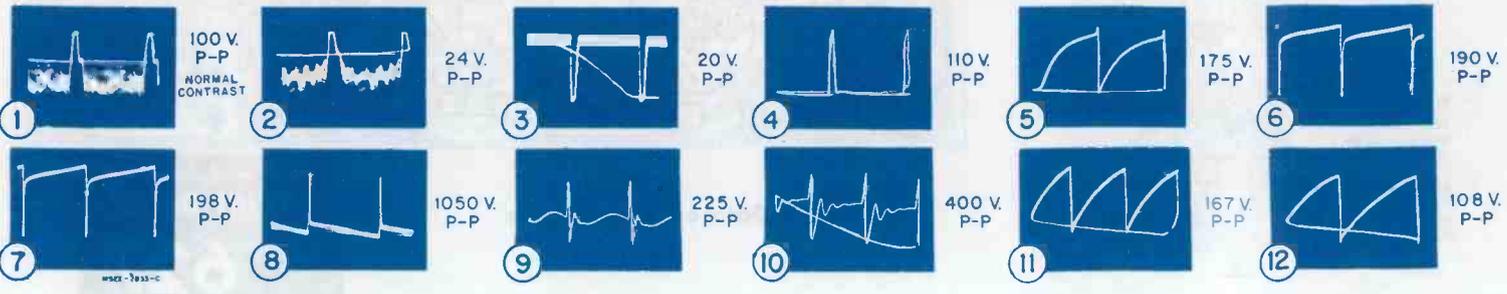
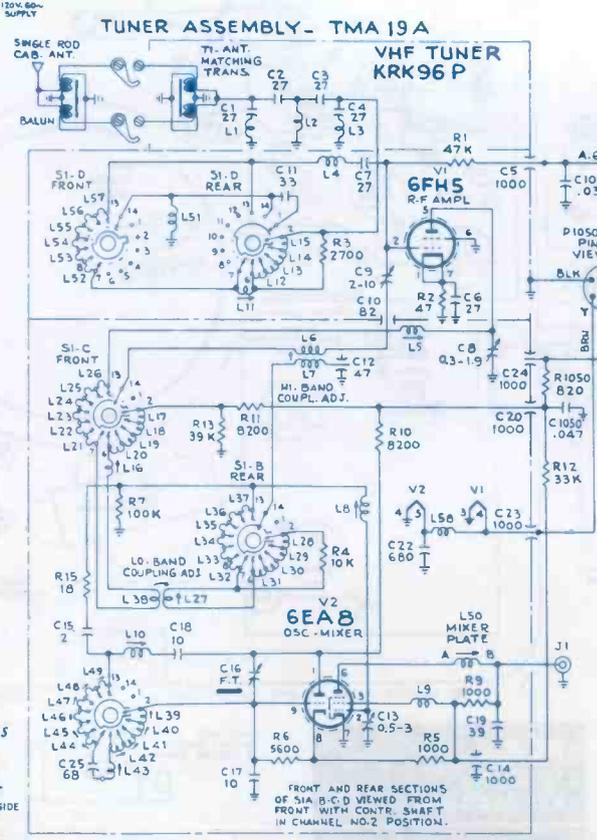
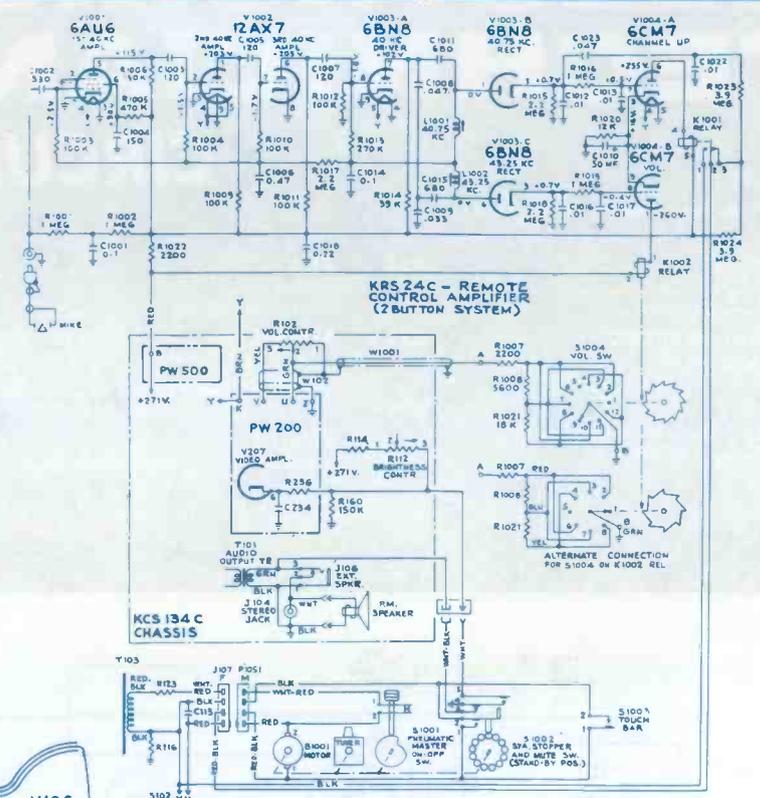
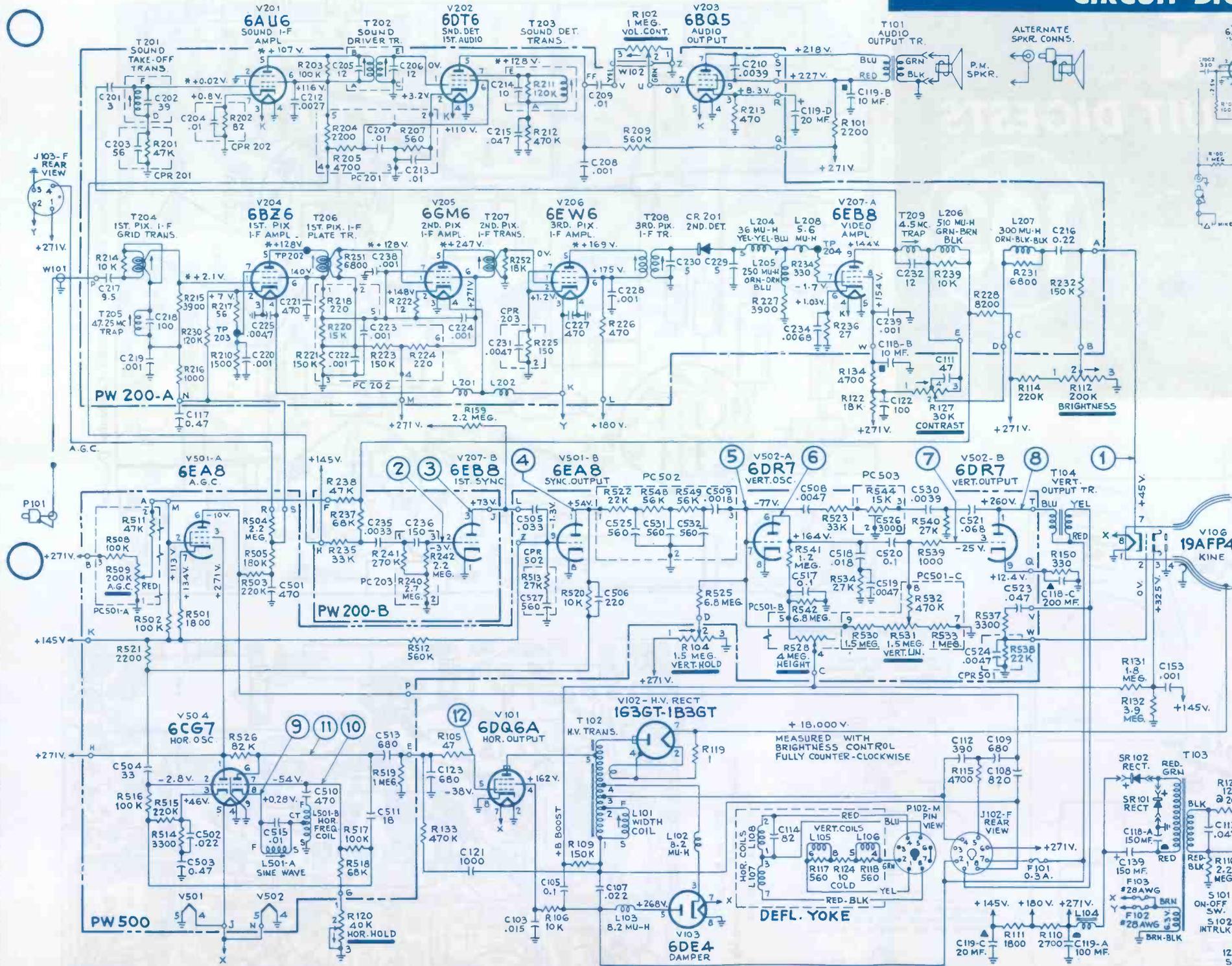
Reverb Motor



Reverb Generator



REVERB UNIT SPR-1 Location of Reverbaphonic Unit



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CIRCUIT DIGESTS

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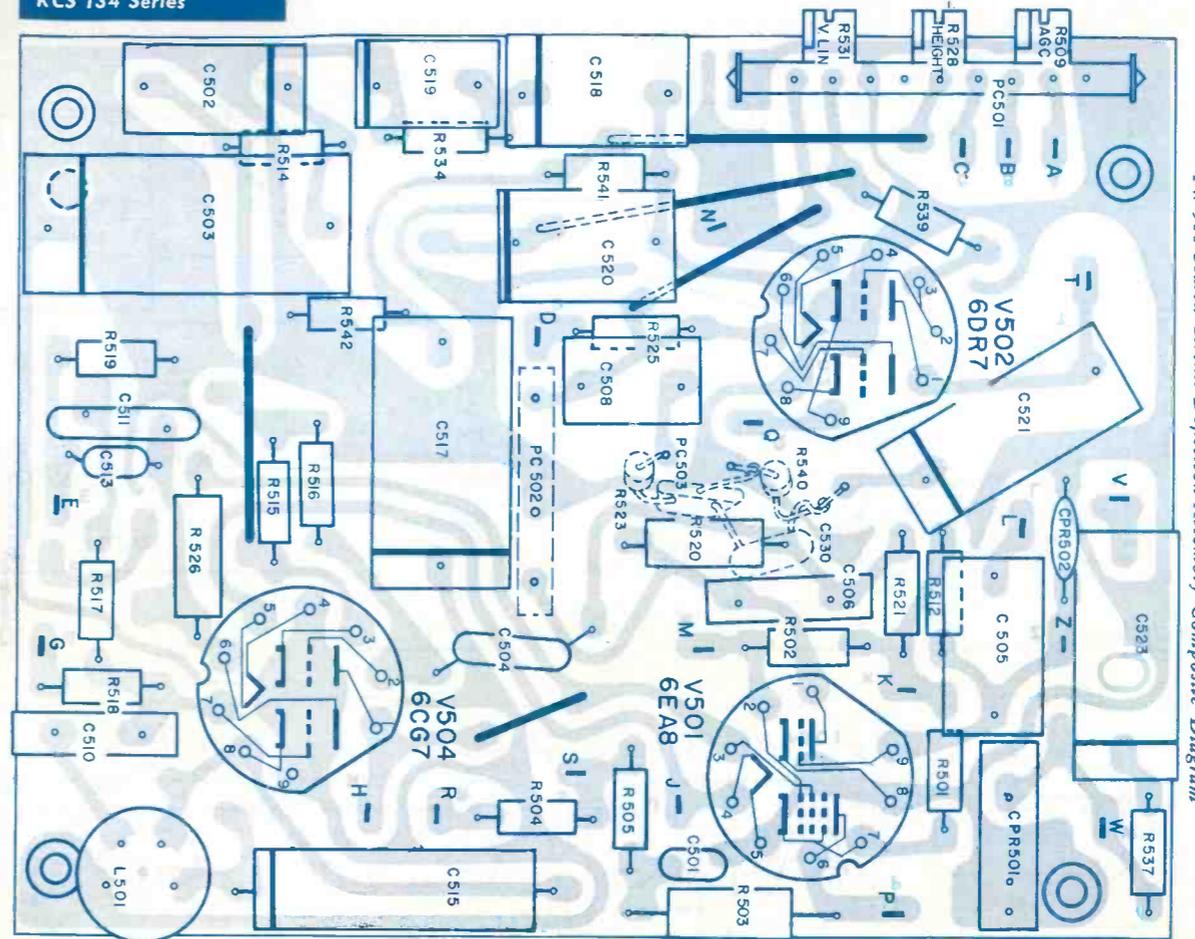
Circuit Digest Schematic No.

- EMERSON** Portable Transistor Radio Chassis 120528 **624**
- GENERAL ELECTRIC** TV Chassis "LW" Models M202 through 205 **621**
- PHILCO** Stereo Console W/Reverberation Model J-1720R **626**

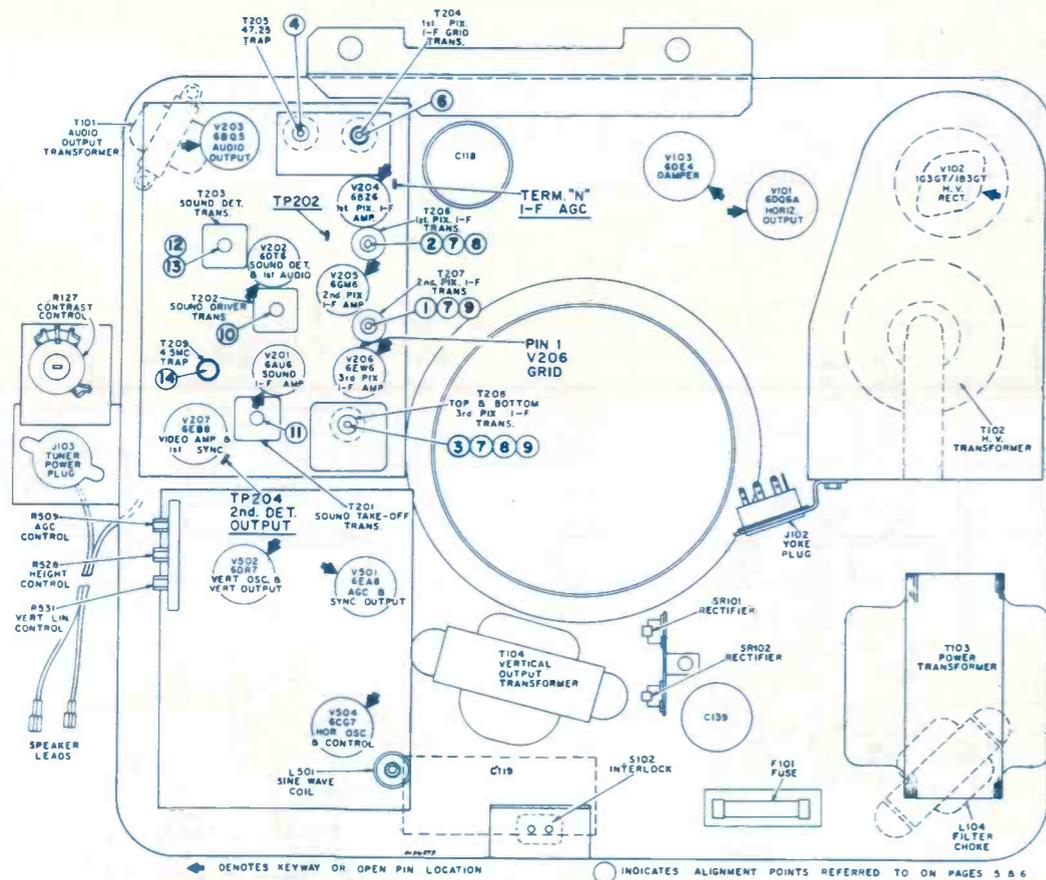
- RCA** TV Chassis KCS 134 Series **627**
- STRIBEL** Auto Radio **622**
- WESTINGHOUSE** TV Chassis V-2409-1, -2, -3 **625**
- ZENITH** "Gold Video Guard" Tuner **623**

GROUP
103

RCA
TV Chassis
KCS 134 Series

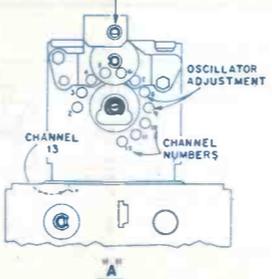


PW500 Sealed Circuit Deflection Assembly Composite Diagram

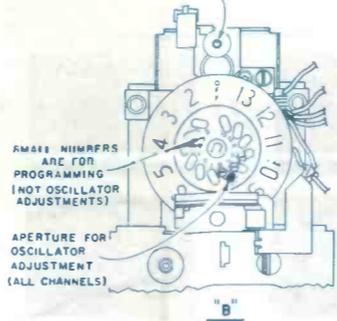


VHF Oscillator Adjustments

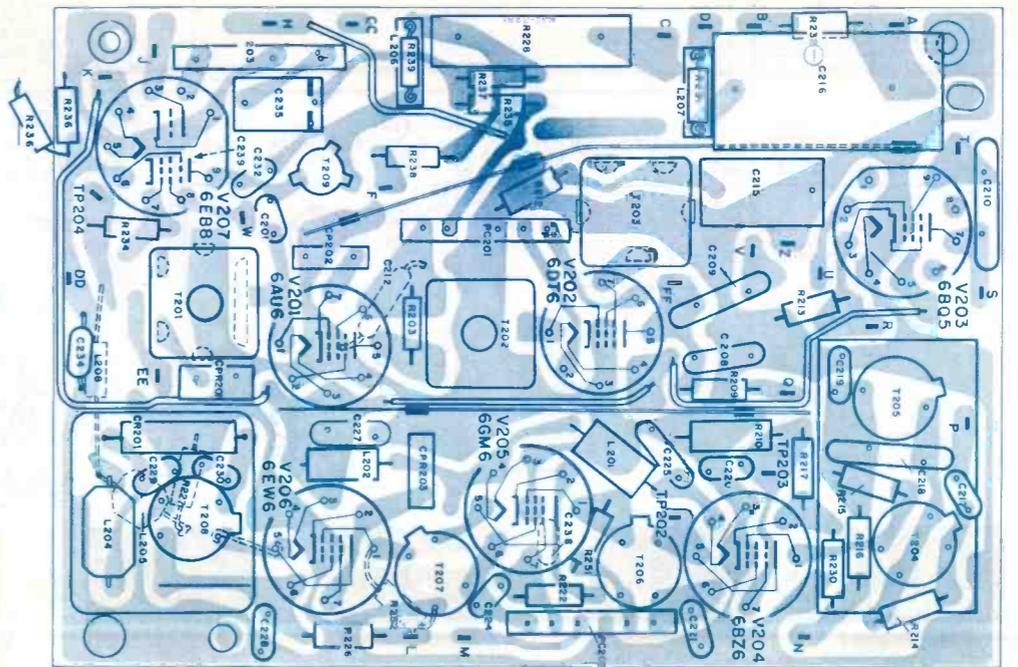
PUSH IN ON FINE TUNING SHAFT AND SET FINE TUNING TO MECHANICAL CENTER OF ITS RANGE.



TO SET FINE TUNING AT CENTER OF ITS RANGE—PUSH IN ON FINE TUNING SHAFT AND TURN CLOCKWISE SIX OR MORE FULL TURNS. THEN COUNTER-CLOCKWISE THREE FULL TURNS—REPEAT FOR ALL CHANNELS TO BE USED.



PW200 Sealed Circuit I-F and Video Assembly Composite Diagram



More Data on Reverse Side

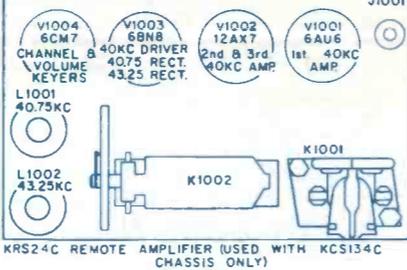
RCA
TV Chassis
KCS 134 Series

Electronic Technician
CIRCUIT DIGEST

627

S102/R102 ON-OFF SWITCH & VOLUME CONTROL

CHASSIS REAR VIEW



KRS24C REMOTE AMPLIFIER (USED WITH KCS134C CHASSIS ONLY)

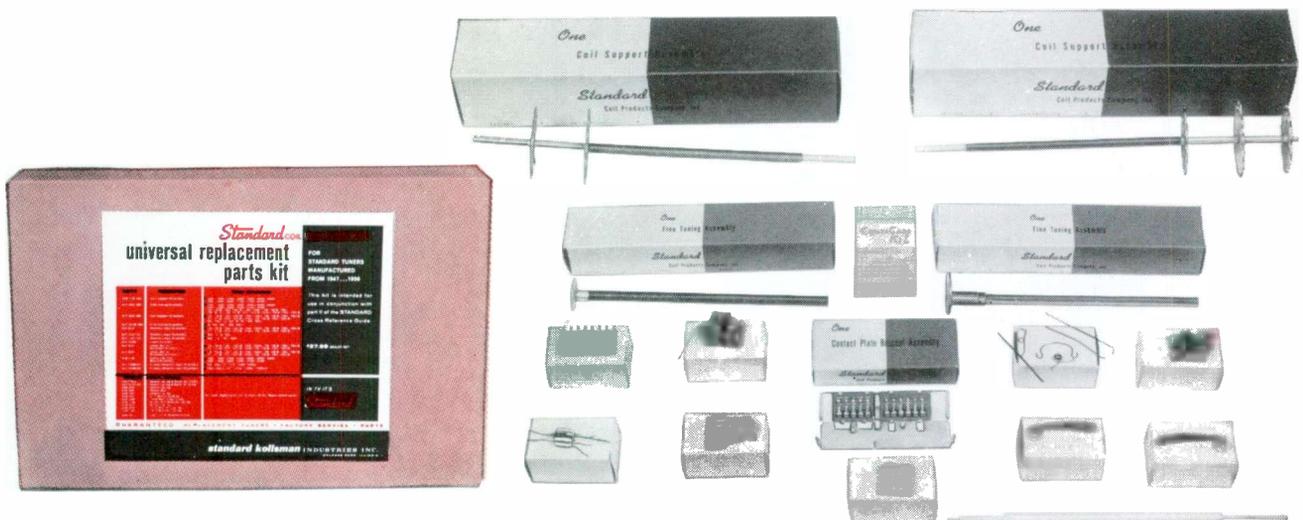
Electronic Technician
CIRCUIT DIGEST

627

Universal Replacement Parts Kit

MODEL 31T 3890

Popular Standard Coil field replacement parts used extensively by servicemen for STANDARD tuners manufactured from 1947-1956.



MODEL 31T 3890

A kit of mechanical and electrical parts for shop and field use to be used in conjunction with Section II of the STANDARD Cross Reference Guide. These parts make up 90% of the replacement parts most commonly used in field service.

INCLUDED

FREE

- Special IF alignment tool for late model STANDARD TV and FM tuners.
- Popular special springs, detent springs and roller assembly, detent ball assemblies, etc.

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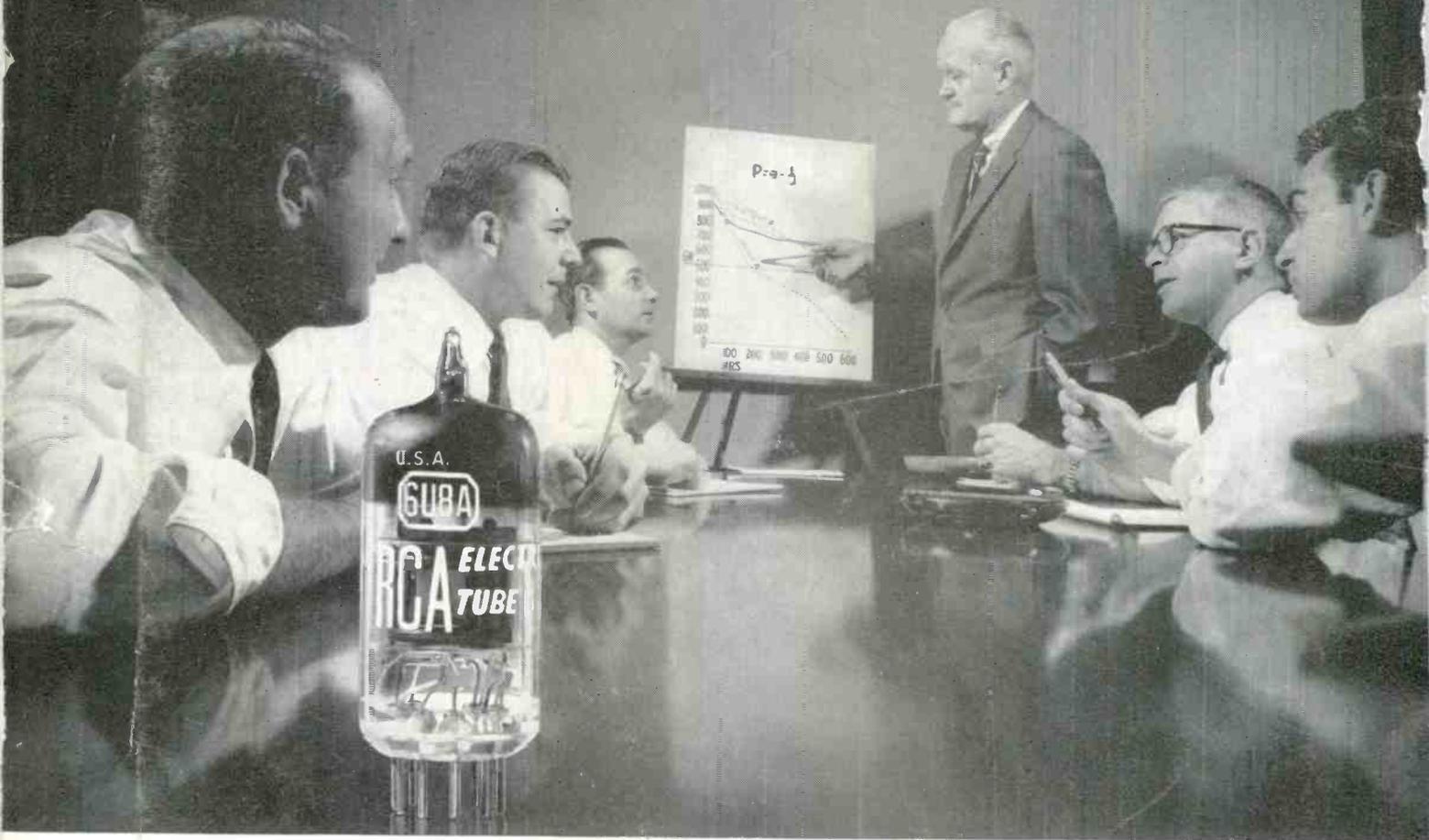
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For more data, circle 3-C3-1 on coupon, p. 54

TUBE QUALITY BY DESIGN



YOUR CUSTOMERS' CONFIDENCE BEGINS HERE

From a tube design conference like this at RCA comes a stream of innovations that continually improve the quality of RCA receiving tubes you install... which in turn helps build your customers' confidence.

A typical design conference includes design and development engineers, applications engineers, production supervisors, quality-control specialists, chemists and physicists. It takes many skills to make a basic tube improvement.

This group may be discussing a more effective pattern of anti-leakage slots in tube micas; or a sturdier cage structure to minimize microphonics; or a new metal alloy to improve heat dissipation; or new shielding and basing arrangements to minimize shorts and leakage; or a new heater wire coating to improve heater performance and assure longer life.

Whatever the problem, it's attacked with a single goal in mind: to provide you with a tube you can depend on. *Another reason why every RCA tube you install is an investment in customer confidence.* Give yourself the extra advantage of RCA tube dependability. Check with your Authorized RCA Distributor this week. *Electron Tube Division, Harrison, N. J.*



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