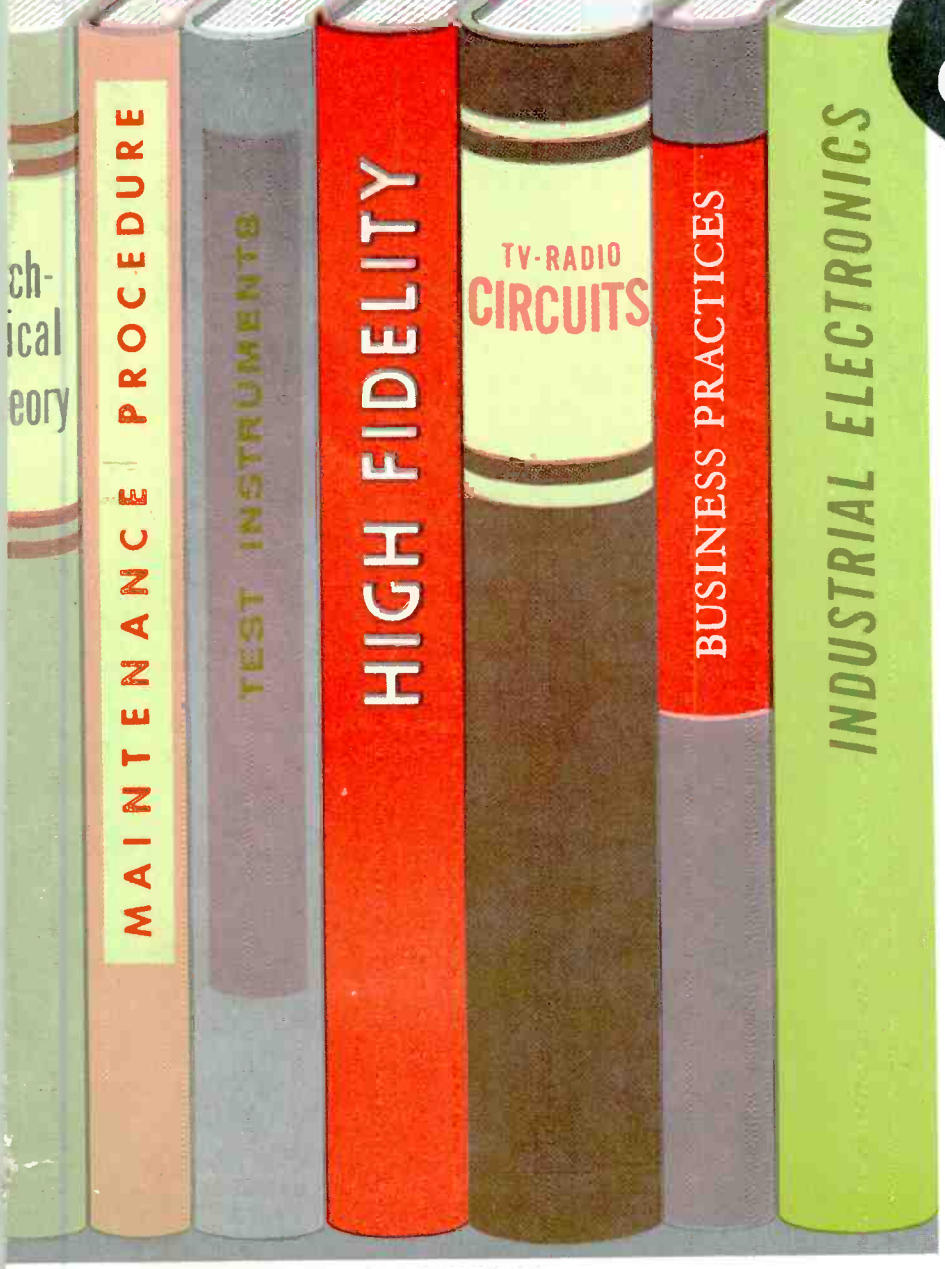
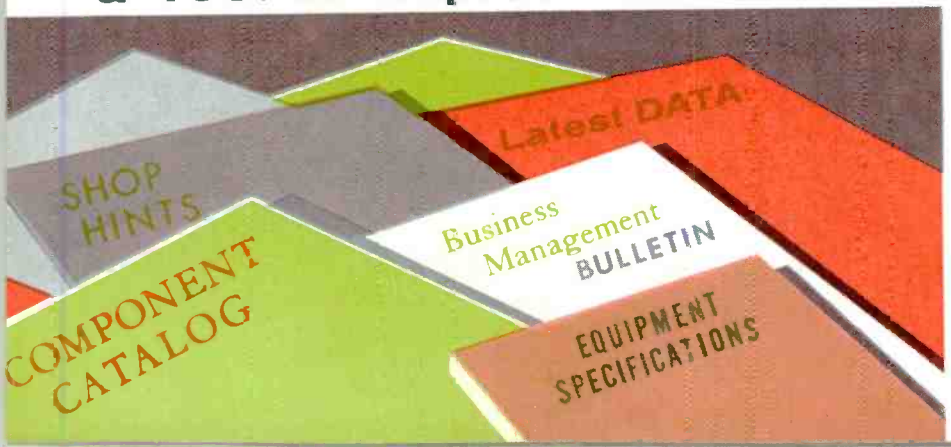
ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests



The PRINTED WORD . . .
a Tool to Improve Your Skills !



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August • 1958

ELECTRONIC TECHNICIAN
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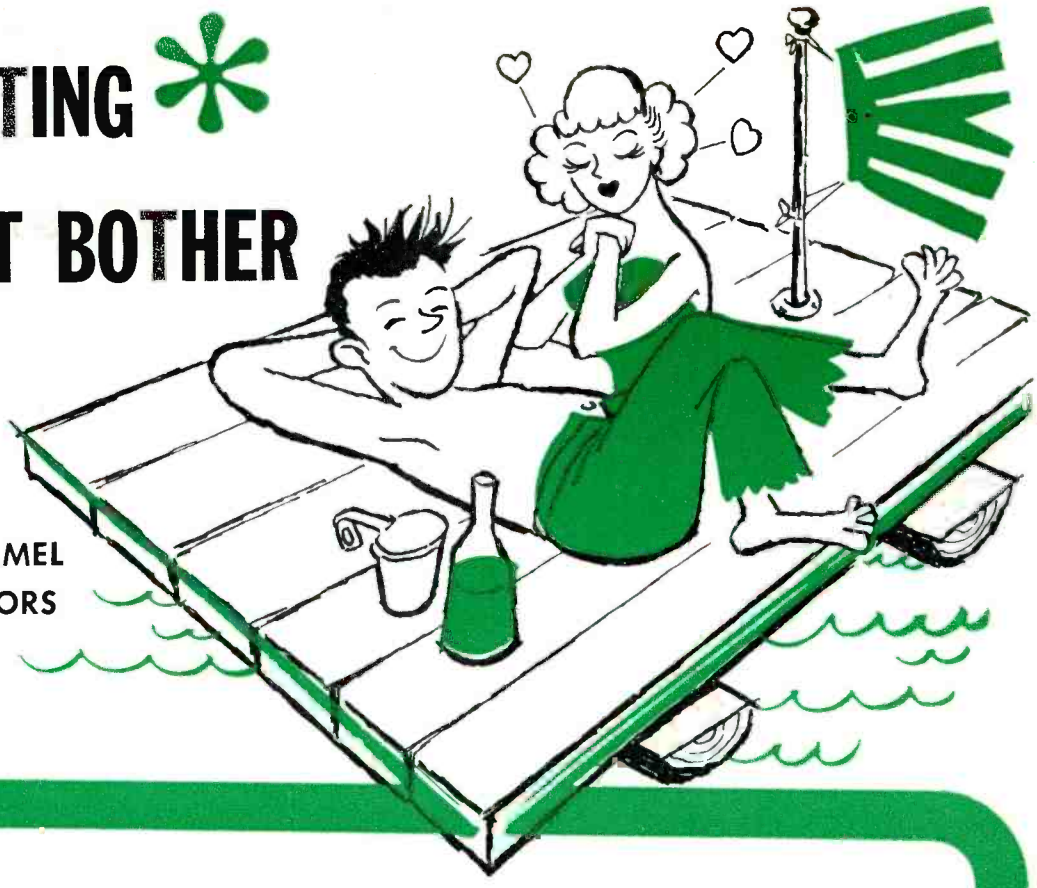
IF DRIFTING * DOESN'T BOTHER YOU . . .

VITREOUS ENAMEL POWER RESISTORS MAY DO



But only **IRC**'s RESISTEG Coating can assure stability under load life

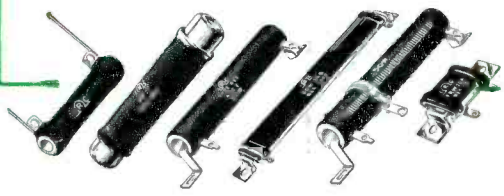
Circuits can be tricky enough without hanging out a welcome sign for drift and resistance change under load life. That's just what you do when you settle for less than IRC Resisteg Coated Power Wire Wound Resistors.

Vitreous enamel coatings beg trouble when they are cured. At their curing temperatures of 1200°F. or over, turns may shift position or, if pre-stretched to compensate for shifting, may acquire a work-hardened after-effect.

So why risk your service reputation? IRC Resisteg Coated units have about half the resistance change of vitreous enameled resistors, require no derating. End the drift in resistors and prevent a drift in your trade at the same time!

* IRC RESISTEG Coated Resistors have less drift and resistance change under load life; vitreous enameled resistors are not equal in stability.

ORDER TODAY FROM YOUR IRC DISTRIBUTOR!



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Entered as second class matter at the Post Office at Bristol, Conn., June 10, 1954. Subscription rates: United States and Canada, $4.00 for one year; $6.00 for two years; $8.00 for three years. Pan-American and foreign countries: $7.00 for one year; $10.00 for two years; $14.00 for three years.

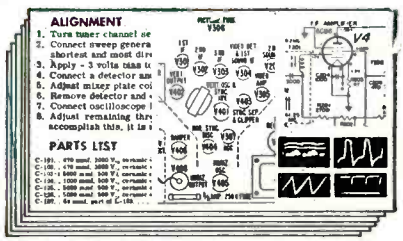
August, 1958

FRONT COVER Your technical library, consisting of trade magazines, manufacturer literature and books, is an important part of your servicing facilities. For reference, for education and for faster servicing, technical publications are a must . . . and interesting reading besides! See details on pages 21, 40 and 42.

FEATURES and ARTICLES

DEPARTMENTS

CIRCUIT DIGESTS



Stitt contacts service trucks by mobile telephone to keep them operating at maximum efficiency.

"The Yellow Pages really helped establish our business!"

says **LEON V. STITT,**
R & S TELEVISION SERVICE, Wichita, Kansas

"We've advertised in the Yellow Pages ever since starting business in 1953. The original ⅛ page ad pulled so well that we soon increased it to ¼ page — the largest unit sold. And since nearly all calls come in by phone, we use the Yellow Pages emblem on our trucks to remind people how to reach us when they need TV service."

Your advertising in the Yellow Pages has long life, is backed by year-round promotion. Have you reviewed your present Yellow Pages advertising program with your Directory representative lately? Call your local telephone business office now.

"THE YELLOW PAGES EMBLEM on our service trucks and our advertising (¼ page shown reduced) in the classified directory sell R & S TV Service," says Don R. Crawford.

Editor's Memo

The phoenix is a most interesting mythical bird. Fables say that it consumes itself in a funeral fire, and then rises from the ashes, young and beautiful to live another cycle of years.

Captive service is a kind of phoenix, except that it doesn't look very pretty from the independent service operator's viewpoint.

A few years ago there was a healthy uproar against factory and captive service. To define for the record, factory service includes repair work by manufacturers, their service companies and set distributors. Captive service is factory service that is built into the set's cost, preventing the independent servicer from even trying for the business.

To the dismay of some of our independent servicing friends, we have pointed out that factory service could be good competition, sometimes acting as a price umbrella. At least it should be tolerated. To the dismay of some of our manufacturing friends, we have clearly stated our opposition to captive service and the unfair disadvantage it forces upon independent technicians.

You may wonder why I've chosen to revive this old problem now. The reason is that a new trend has developed among several TV set manufacturers. An increasing number of them are offering "free" 90-day parts and labor warranties.

I believe that a manufacturer should warranty his equipment for a period long enough to guarantee that it was in good working order when purchased. Most inherent defects will show up in less than 30 days; 60 days longer is intended as more of a merchandising gimmick than an improved warranty.

These parts-and-labor warranties can even be misleading to the public. They are promoted to the public as "free," when in fact they are added costs built into the set price. The added warranty cost is often optional for the distributor or dealer; the consumer never gets the opportunity to accept or reject the warranty and its built-in extra cost; the technician never gets the chance to bid for the service work.

There is an ironic twist to all this. The set makers use the "free" warranty as a selling tool. The only trouble is that competing companies pick it up too, so the competitive advantage disappears. All they are left with is a not-too-profitable servicing operation . . . and the resentment of many hard-working electronic technicians.

Al Forman

R and D Labs
Engineers...
Servicemen...
Hobbyists...

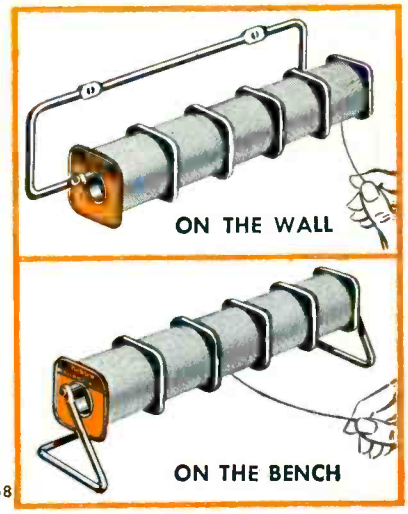
NEW Belden

WORKBENCH HOOK-UP WIRE DISPENSER KITS

Belden Dispenser Kits solve the problems of waste and inconvenience for all users of Hook-Up Wire and are available in the 14 most popular assortments of Vinyl, Vinyl-Nylon, Textile, and Teflon* insulated wire for every requirement.

Each kit contains an assortment of Hook-Up Wire colors and types plus a portable metal dispenser rack for workbench or wall mounting. The dispenser rack provides a complete, compact, and convenient wire department for every working area at the user's finger tips, simplifies user Hook-Up Wire stock maintenance, and helps keep wire clean and orderly while keeping the workbench neat and efficient. Available at all Belden jobbers.

* Du Pont trademark



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

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
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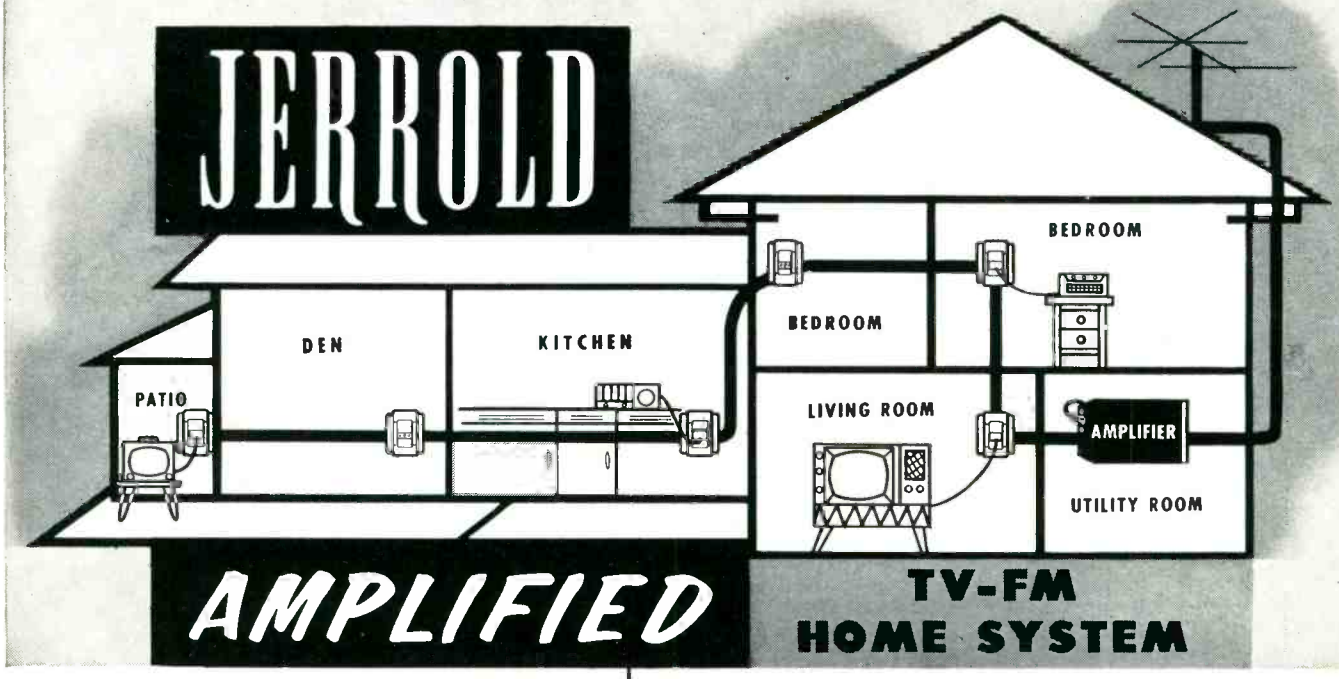
It's Here! The First *AMPLIFIED* PLUG-IN TV-FM HOME SYSTEM



* **A Completely Engineered, Fully Amplified System —Not a Multi-Set Booster**
* **Simple...Solderless...300 Ohm Twin-Lead Installation**
* **Sets not "Tied Down", can be moved anywhere**
* **"Snow Free" TV and "Hiss Free" FM Reception**

The FIRST truly engineered, amplified system designed for the home! Supplies *Hi Fidelity* reception to TV and FM receivers in *any* room! Makes TV sets truly portable . . . new TV and FM receivers can be added with a simple plug-in connection!

The Jerrold Home System features a low noise, high output, printed circuit amplifier that increases the TV and FM antenna signals 6 *times* (15 db). 300 ohm Twin-Lead is used to distribute the amplified signal throughout the home. Receivers are connected to the system by newly designed Home Outlets and Plugs.

The Jerrold Home System opens up a whole new market for the serviceman. It enables him to provide better TV and FM reception in *any signal location.*

For complete details contact your Jerrold distributor or write to Dept. PD 68

HOME SYSTEM COMPONENTS

HOME AMP... MODEL HSA-46

The 1st printed Circuit TV-FM amplifier. Greatly improves weak signals; flat response across entire (VHF) TV-FM band. Only 2 tubes, designed for 24-hr. operation, consumes only 18 watts. Color compatible, UL approved.

$49.95 LIST

◄ FLUSH OUTLET... MODEL HS-140
$2.75 LIST

SURFACE OUTLET... MODEL HS-135 ►
$1.95 LIST

The outlets supply clear strong signals without interference between sets. Each includes Perma-Grip plug for TV or FM. Color: Ivory.

No Trimming of Wire Necessary...No Soldering! Quick Screwdriver Installation.

ALSO AVAILABLE in ready-to-install kit form

Home System Kit Model HSK-300

Contains everything (except antenna) for complete 5 outlet system—including Twin-Lead.

$67.75 LIST

For Installation in New Homes and Existing Homes.

JERROLD **ELECTRONICS CORPORATION**
The Jerrold Building, 15th & Lehigh, Philadelphia 32, Pa.

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Visit our booth at the Wescon Show—Booth #720 & 721

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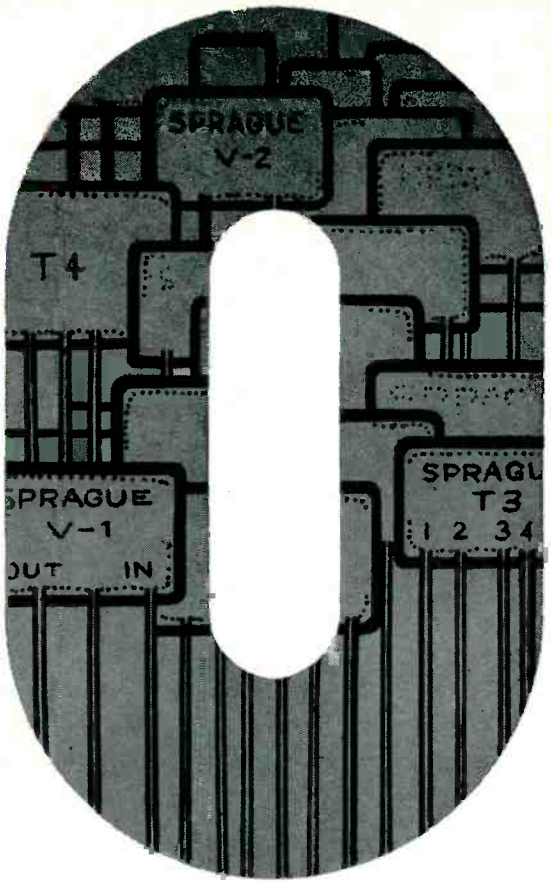


standard circuits

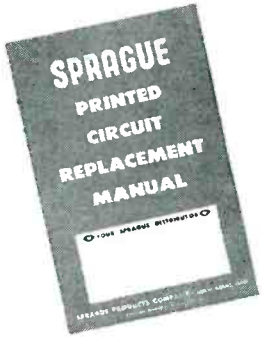
BULPLATE® Printed Circuits

for all your printed circuit replacements

Sprague's new BULPLATE Printed Circuit line now includes *the most comprehensive listing of printed circuits available anywhere.* By standardizing on the Sprague BULPLATE line, you'll be able to replace practically every printed circuit found in original equipment, including . . .

- antenna-chassis isolation networks
- detector-triode coupling networks
- retrace-suppression networks
- vertical feedback networks
- triode coupling networks
- detector-pentode coupling networks
- automatic gain control networks
- horizontal deflection networks
- sound i-f networks
- vertical integrators
- decoupling filters
- audio output networks
- phase comparators
- parallel resistor-capacitor networks
- tone compensation networks
- diode filters
- pentode coupling networks
- sync take-off networks

Get your copy of Sprague's new BULPLATE Replacement Manual K-351 now. Original set manufacturers' part numbers are cross-referenced to Sprague replacement part numbers . . . making Sprague BULPLATES extra-easy-to-use. Ask your distributor for a free copy, or send 10c (to cover handling and mailing costs) to Sprague Products Co., 65 Marshall St., North Adams, Massachusetts.



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LETTERS

To the Editor

Electronic Organ Info

Editor, ELECTRONIC TECHNICIAN:

For those readers interested in servicing electronic organs (see June 1958 issue, p. 32), I would like to recommend two fine books: "Electronic Musical Instruments," by Richard H. Dorf, published by Polygraphic Co. of America; it covers terminology and schematics of commercial organs. Also, "Electronic Organs," by Robert L. Eby, Van Kampen Press; it describes commercial units model by model. Both are obtainable at libraries and large book stores. Your readers will find that servicing organs is not much more difficult than they expected.

HAROLD T. GOSLOW

Detroit, Mich.

• *We have also found the 254-page hard-covered book, "The Electronic Musical Instrument Manual," by Alan Douglas, published by Pitman, full of practical information and circuits. Copies may be obtained from* ELECTRONIC TECHNICIAN *for $7.50 postpaid.—Ed.*

Complaint Department

Editor, ELECTRONIC TECHNICIAN:

I have never been more thoroughly disgusted than I am with your subscription service. Not once have I received an issue on time. For such miserable service, I definitely will not resubscribe.

PAUL CHRISTIANSON

Hollis, N.Y.

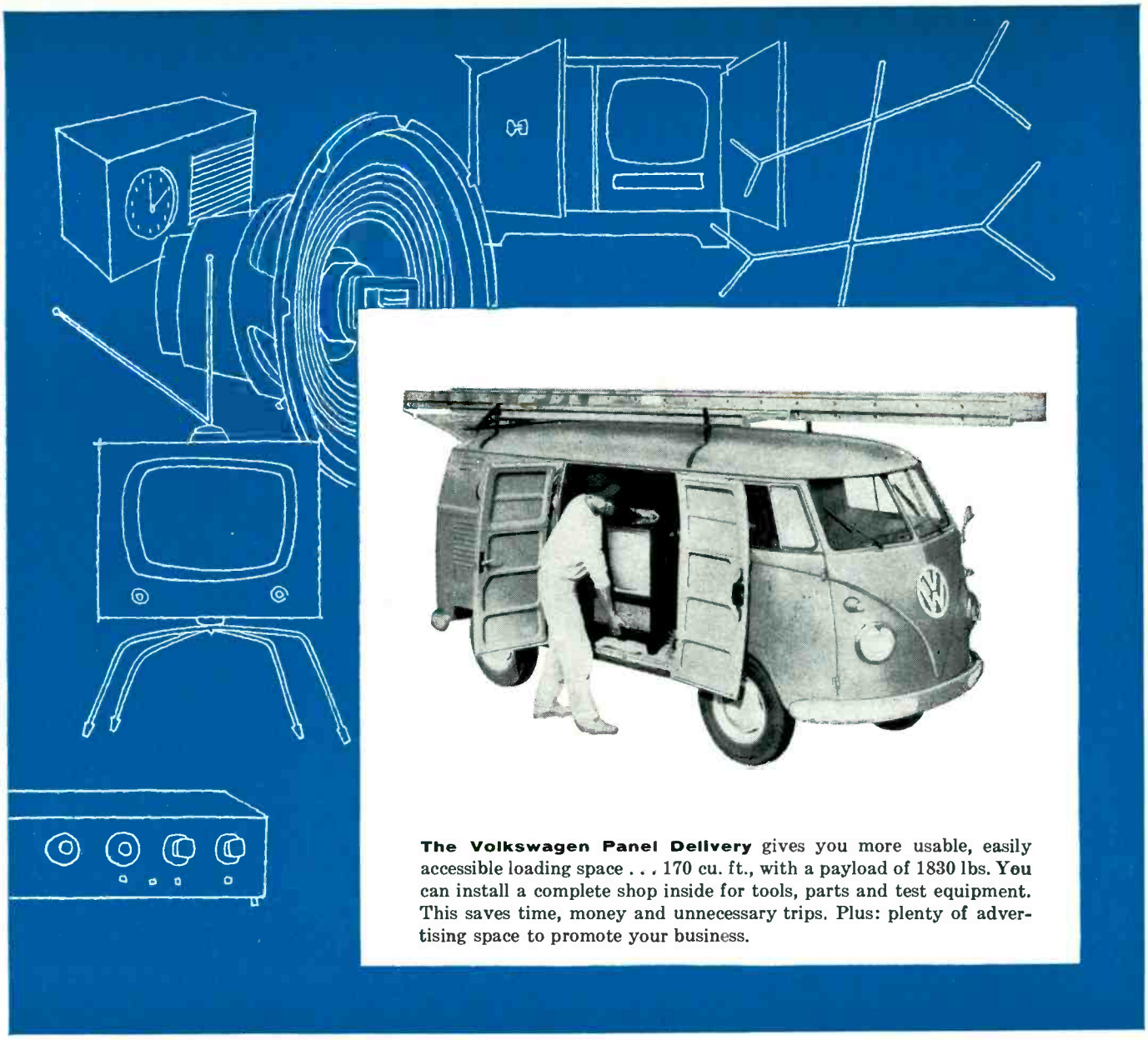
. . . It is time you replaced some component parts in the delay network between your circulation department and my mail box. I see electronic hobby books on the news stands weeks ahead of my delivery of ELECTRONIC TECHNICIAN. Do you think extra B-plus (or should it be $-plus) would help?

H. ALEXANDER

Victoria, B.C., Canada

• *Let's hope the increased postage rates which we are absorbing helps trigger faster response in the delay network—the Post Office. And here's a little publishing secret. Consumer magazines are often dated a month or more in advance to make them seem fresh and new on the news stands. There is no need to do this with* ELECTRONIC TECHNICIAN *since it goes only to professionals in the trade, and is not sold on news stands. News and new product announcements in an August trade magazine would not generally appear in a consumer magazine until September or later—if they appeared at all.—Ed.*

(Continued on page 10)



The Volkswagen Panel Delivery gives you more usable, easily accessible loading space . . . 170 cu. ft., with a payload of 1830 lbs. You can install a complete shop inside for tools, parts and test equipment. This saves time, money and unnecessary trips. Plus: plenty of advertising space to promote your business.

High-voltage performance at low charge

Besides Volkswagen's roomy and practical design, outstanding gas economy, ease of handling and parking, its great popularity is based on its remarkably low maintenance.

This engineered dependability is backed up by an unparalleled world-wide service organization. When service *is* needed, you get the best. Strategically-located warehouses and Volkswagen authorized service centers in all 49(!) states maintain a complete stock of genuine VW parts for fast service. *No wonder a Volkswagen costs less to buy, run, and maintain.*

VOLKSWAGEN
DELIVERS THE GOODS
...FOR LESS!

VOLKSWAGEN

Save time and trouble by furnishing BUSS

— the fuses your customers know and prefer!

You never have to stop and explain why you furnish BUSS fuses because . . . your customers accept BUSS fuses as the finest available.

The BUSS reputation for fuses of unquestioned high quality is built on the dependable protection millions upon millions of BUSS fuses have provided in homes, farms and industry over the past 43 years.

Selling and installing BUSS fuses, and other KNOWN items, does more than save you time . . . it helps protect your reputation for service and reliability.

It further pays you to standardize on BUSS fuses because they are 'trouble-free'. There are no 'kicks' or complaints about their operation and no 'call-backs' or adjustments to cut into profits.

The time you save, the trouble you avoid, the satisfied customers you keep and the full profit you make are all good reasons for furnishing genuine BUSS fuses.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders, write for bulletin SFB.

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

BUSS fuses are made to protect—not to blow, needlessly

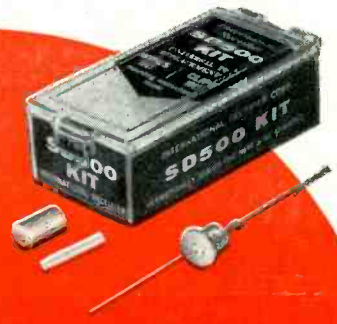
FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Makers of a complete line of fuses for home, farm, commercial, electronic, automotive and industrial use.

858

Now! 2 Silicon Types for simplified replacement of all existing TV Rectifiers!

Hermetically sealed universal replacement for all silicon types... No heat sink required.



SD-500 KIT

IT WIRES IN! ... to directly replace axial lead type units.

IT CLIPS IN! 10-second conversion permits plug-in into existing clip-type sockets previously installed. (Kit contains all needed parts.)

International Rectifier
hermetically sealed

SILICON TV REPLACEMENT RECTIFIERS

save installation time... reduce your rectifier stock... cut call-backs!

Hermetically sealed universal replacement for all existing selenium types ... a direct mechanical replacement.

NO HOLES TO DRILL; NO CONVERSION KIT REQUIRED

"UNISTAC" TV 500

Eyelet-construction enables you to directly replace selenium types without time-consuming conversion efforts. Improves set performance; gives long, trouble-free life.

Hermetic sealing means longer life!
Hermetic sealing provides a positive safeguard against contaminants destroying the rectifier junction. It is the *most important feature* to assure long, trouble-free life. Both types are manufactured to the same rigid requirements specified for military and critical industrial applications.

Available from 650 service distributors throughout the nation.

FOR SIMPLIFIED INSTALLATION AND MAXIMUM RELIABILITY ... SPECIFY ...

A WORLD OF DIFFERENCE THROUGH RESEARCH

International Rectifier Corp.

DISTRIBUTOR SALES DIVISION • El Segundo, California • ORegon 8-6281

(Letters continued from page 6)

Orchid Department

Editor, ELECTRONIC TECHNICIAN:

We appreciate your periodical and services greatly. They are the best, and we recommend them to all technicians.

JIM HOTCHKISS
Miami, Fla.

Associations

Editor, ELECTRONIC TECHNICIAN:

We were extremely pleased to see the listing of Technical Societies and Associations in your May issue. However, through some oversight, the San Antonio Chapter of the Radio Television Technicians Association of California was inadvertently missing. Secretary is James Spalding. We look forward to our third year as a Chapter of RTA. We want to thank you for the fine business and technical information in ELECTRONIC TECHNICIAN, and especially thank you for the cooperation you have given to the Associations in our fight against captive service and other evils of the business.

FRED J. BOWERMAN
President
Radio-Television Technicians Assoc.
San Antonio Chapter
South Gate, Calif.

. . . You are to be complimented for listing the various Service Associations. However, in addition to our Peoria group, which is affiliated with ARTS of Chicago, there are several which have not been listed. There is a fine group operating in Bloomington, Ill. In Missouri, there is The Electronic Association of Missouri (TEAM), which helped stop that state from enacting a licensing bill. It would seem an organization of your calibre would want to make the listing as complete as possible.

JOHN F. STOLL
Secretary-Treasurer
Associated Radio & Television Servicemen
Peoria Chapter
Peoria, Ill.

• *Right you are. We try to list all associations, and regret any omissions. If any others were not included, let us know about them.—Ed.*

Antenna Raising

Editor, ELECTRONIC TECHNICIAN:

Upon reading the complaint [June Letters] against your February antenna raising cartoon, based on the Iwo Jima flag raising, I conclude that reader has a chip on his shoulder. I too am a veteran, but I saw the cartoon as showing an antenna raising job to be difficult and important.

J. THOMAS MCCRARY
Brooklyn, N.Y.

How to add $1,040 to your profit this year

One simple fact will put at least $1,040 extra profit into the pockets of many men in your business this year. That fact is: *Every fourth car on the road needs a car radio.*

This means one out of every four of your customers is a good car radio prospect. And you can close most car radio sales in less than five minutes—just by telling prospects these two things:

They can own a Motorola® Car Radio for as little as $39.95.

There's a Motorola Car Radio custom-designed to fit like it came with their car.

And even if you sell only one Motorola Car Radio a week, your yearly profit will amount to at least $1,040!

Sales higher than ever. Car radio sales increased by 25% last year. And this year—with the most revolutionary improvement in 27 years—Motorola Car Radios are selling faster than ever.

Transistor-powered '57 Motorola Car Radios give you selling advantages like these: Transistors (1) have extra long life, (2) replace 16 parts that cause 75% of the trouble in other car radios, (3) cut battery drain by 50% or more, and (4) end *all* mechanical noise and vibration.

Priced to move fast. Motorola Car Radios retail at prices your customers are ready to pay—as low as $39.95, with a big profit margin for you.

No installation problems. You can do it yourself for extra profit or your Motorola installation depot will do it for you.

Why miss out on this easy, plus-profit opportunity any longer? Just mail this coupon today for all the facts. No obligation, of course.

Motorola, Inc.,
4545 W. Augusta Blvd.
Chicago 51, Illinois
Attn: Car Radio Department
Please give me all facts about the plus-profit Motorola Car Radio business. Thank you.

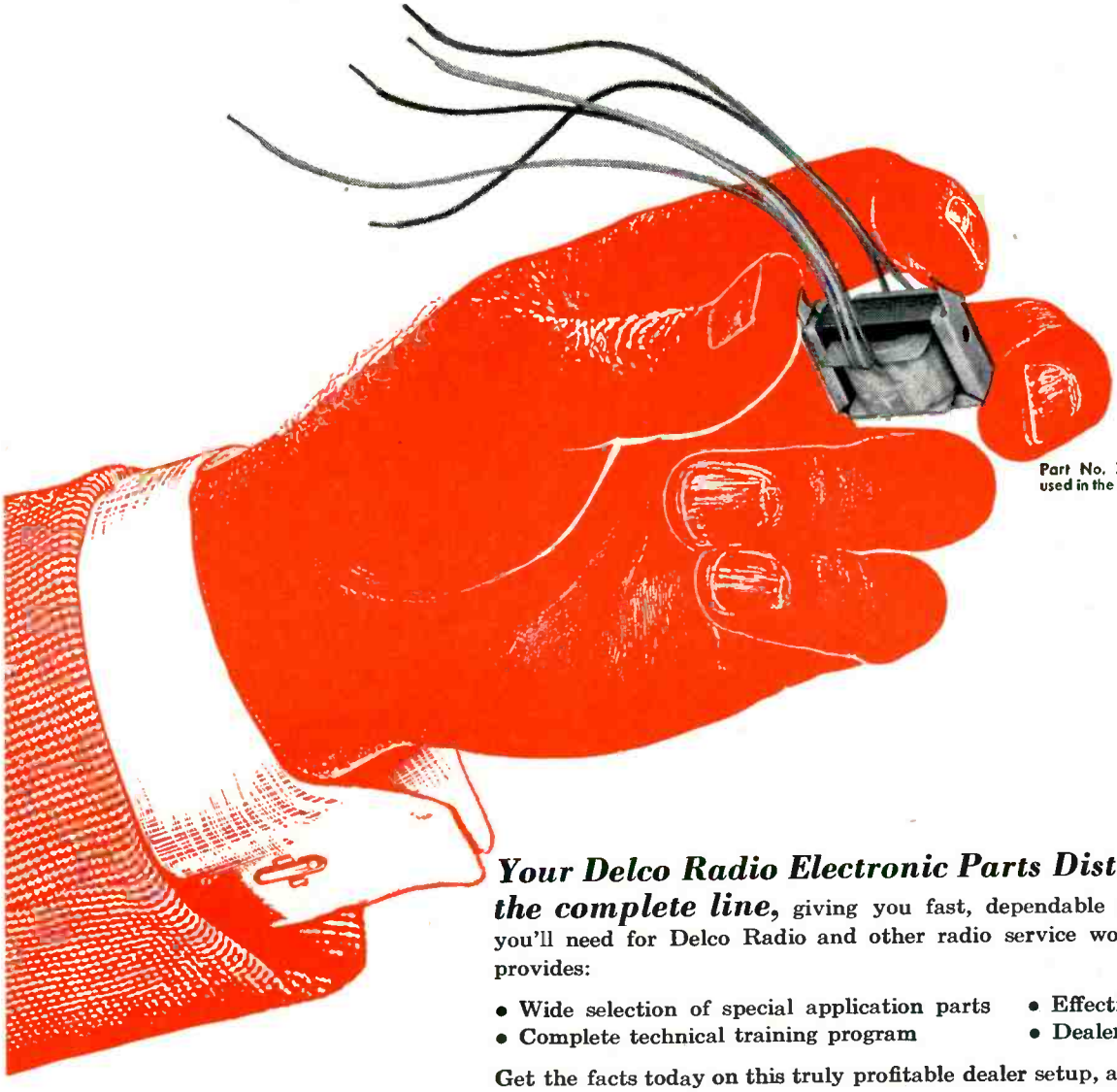
Name_____

Address_____

City_____ Zone____ State_____

MOTOROLA
World's Largest Exclusive Electronics Manufacturer

Use Delco Radio Service Parts!



Part No. 7270804—output transformer used in the new Delco Portable Car Radio.

Your Delco Radio Electronic Parts Distributor carries the complete line, giving you fast, dependable service on the items you'll need for Delco Radio and other radio service work. Delco Radio also provides:

- Wide selection of special application parts
- Complete technical training program
- Effective warranty program
- Dealer identification signs

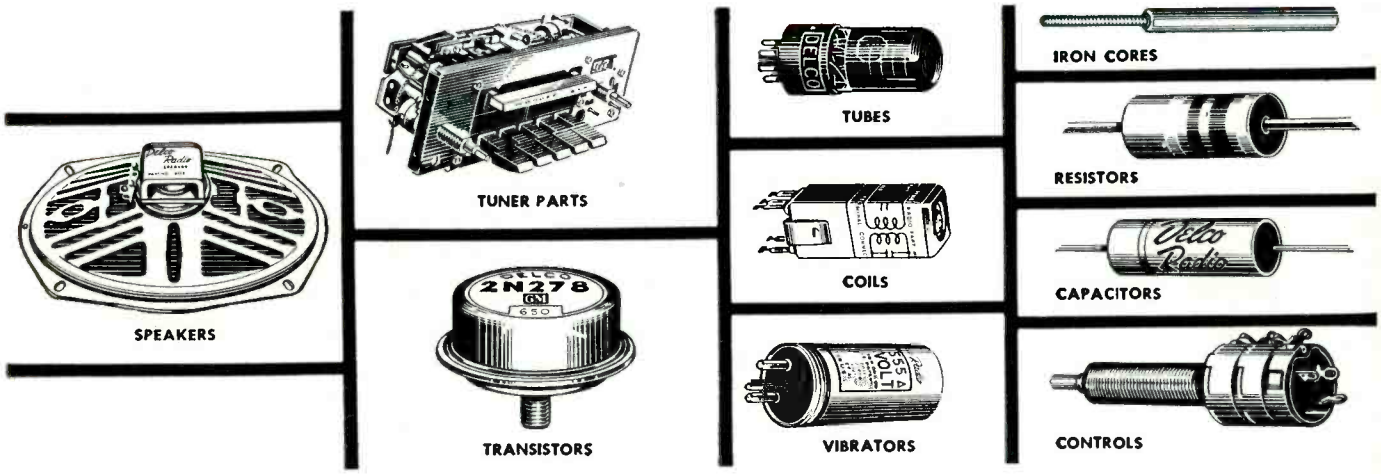
Get the facts today on this truly profitable dealer setup, and grow with General Motors!

Available everywhere through Electronic Distributors associated with . . .

GM U·M·S PARTS SALES UNITED MOTORS SYSTEM

DELCO RADIO

DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA



News of the Industry

AMPHENOL ELECTRONICS CORP. has erected a new 20,000 sq. ft. plant at Chatsworth, Calif., to house their new Western Division.

JACK GILBERT ASSOCIATES, New York City, has been appointed advertising agency for the Electronics Division of GENERAL BRONZE CORP.

PYRAMID ELECTRIC CO. reports the promotion of JOSEPH STARR to the new post of Sales Manager, industrial division.

IT&T COMPONENTS DIV. has appointed C. L. BAXTER as Manager of new products and markets for the tube department.

LESCARBOURA ADVERTISING, INC. has moved to larger quarters. Their new address is 139 Main St., Ossining, N. Y.

SPRAGUE ELECTRIC CO.'s Board Chairman, ROBERT C. SPRAGUE, was awarded a citation for distinguished citizenship, at a recent Convocation on Education.

HERBERT BAKER ADVERTISING, INC., Chicago, has announced that advertising for all divisions of ELECTRO-VOICE, INC. is now handled by their agency.

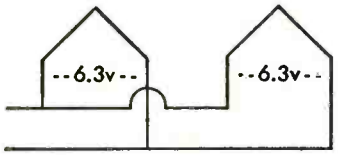
WESTINGHOUSE ELECTRIC CORP. announces the following appointments: H. J. HORSTMANN, Supervisor of service training, TV-Radio Div. Metuchen, N. J.; CARMEN RAMICH, Manager industrial tube sales, electronic tube div., Elmira, N. Y.

TUNG-SOL ELECTRIC, INC. reports that DR. ALFRED K. WRIGHT, Vice Pres. in charge of engineering, has been given the additional duties of Vice Pres. in charge of operations and engineering. Also that PAUL SCHARNINGHAUSEN, Gen. Mgr. electron tube manufacturing, has been named Vice Pres. and Gen. Mgr. of the Radio & TV Tube Division.

GENERAL ELECTRIC CO. announces the following appointments: A. J. KENERLEBER, Manager of the firm's new TV picture tube replacement plant, Augusta, Ga.; I. H. RATNOUR, Manager of rectifier customer service, Clyde, N. Y.; R. K. INGERSON, Manager of transistor customer service, Syracuse, N. Y. The firm also reports that the semiconductor products department has cut prices 50% on silicon controlled rectifier pre-production samples.

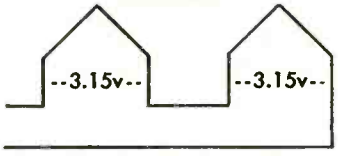
(Continued on page 16)

OLD-STYLE PARALLEL-CONNECTED HEATERS



. . . used small wire which was easily bent, contributing to heater-cathode short-circuits.

NEW G-E SERIES-CONNECTED HEATERS



. . . use wire twice as thick, that holds its shape. Short-circuits have been reduced.

ABOVE: LINT AND DUST ARE BANNED during "Snow White" assembly of General Electric receiving tubes, in order to reduce the possibility of short-circuits. G-E workers and supervisors wear lint-free garments; air is filtered and conditioned; floors are kept immaculately clean.

LEFT: NEW HEATER DESIGN CUTS SHORTS . . . heater to cathode . . . in 6BQ7-A and 6BZ7 cascode RF amplifiers. Here is an example of how G.E. constantly improves Service-Designed Tubes. New G-E series-connected heaters use heavy wire that resists bending, crimping, arc-overs.

Improved tube design—superior manufacture—mean fewer shorts with G-E Service-Designed Tubes!

GENERAL ELECTRIC Service-Designed Tubes *stay installed.* Short-circuit inoperatives are kept at a minimum. You save time by making fewer callbacks. You increase your service reputation with repair-work that seldom has to be done over—in a few days, even a few hours—because a tube has shorted internally . . . perhaps burning out other components of the TV circuit.

In design, as with the 6BQ7-A and 6BZ7 heaters —in manufacture, where every advanced technique is called on to remove lint and dust—General Electric gives you, as a television technician, tubes you can install with complete confidence.

Yet Service-Designed types cost no more! Your G-E tube distributor has these high-quality tubes. Phone him! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Ky.*

G-E SERVICE-DESIGNED TUBES INCLUDE:

1B3-GT	6AF4	6BG6-GA	6BX7-GT	6SN7-GTB
1J3	6AF4-A	6BK7-B	6BZ7	12SN7-GTA
1X2-A/B	6AL5	6BQ6-GA/6CU6	6CB6/A	25BQ6-GA/25CU6
5U4-GB	6AV5-GA	6BQ6-GTB	6CD6-GA	25BQ6-GTB
5Y3-GT	6AX4-GT	6BQ7-A	6J6	25CD6-GB

Progress Is Our Most Important Product

GENERAL ELECTRIC

11-11-125

(News of the Industry . . . Continued from page 14)

WEN PRODUCTS has taken over additional plant and office space adjoining their present buildings which, they report, gives them 50% additional capacity.

UNITED MOTORS SERVICE, Div. GMC. has announced the following management changes: H. W. DUNTON assigned as Chicago zone manager. succeeding P. T. CODY assigned Los Angeles zone manager.

AMPEREX ELECTRONIC CORP. reports that VALVO tubes, manufactured in Europe and used in many German radios and hi-fi equipment, are now available through AMPEREX distributors.

CBS-HYTRON has received an award for the advancement of technical education, for its 10-lesson Transistor Home-Study Course. The award is from the Massachusetts Council of Private Schools.

GIANTVIEW DIV. MEILINK STEEL SAFE CO has announced a closed circuit TV franchise plan by which one dealer in each leading city will be leased, or sold, a projector and will serve the local outlet for closed circuit networks originated by GIANTVIEW.

FINNEY CO.'s Vice Pres. M. L. FINNEBURGH, Sr. is personally conducting a newly inaugurated, nation-wide, series of educational meetings for distributors and dealers, stressing generally improved salesmanship and better customer relations.

Reps & Distributors

PYRAMID ELECTRIC CO. has named F. W. MOULTHROP CO., San Francisco, Calif., as their industrial and jobber sales rep for northern Calif.

WINEGARD CO. reports that a tape recorder was won by HAROLD REIGNER, TV technician, for writing the best promotion on the firm's Color 'Ceptor antenna. The award was made at a dealer meeting conducted by A. A. PETERS, distributors, Allentown, Pa.

INTERNATIONAL RESISTANCE CO. reports that awards have been presented to DAVE M. LEE CO., Pacific northwest sales rep for best performance during the first half of 1957, and to TOM DAVIS of the IRC's Syracuse sales office for the last half of 1957. Awards were a specially designed plaque, and an inscribed sterling silver cigarette case, respectively.

(Continued on page 18)

You will find CBS-Hytron's expanded industrial tube line the most comprehensive and the most dependable. See it at your distributor's. Ask him or write us for the CBS-Hytron catalogs you need: Power Tubes, E-290T . . . Military and Special-purpose Tubes, E-290S . . . Gas Tubes and Power Rectifiers, E-290C . . . Phototubes and Photocells, E-290P. *More reliable products through Advanced-Engineering*

CBS-HYTRON, Danvers, Massachusetts • A Division of Columbia Broadcasting System, Inc.

(Reps. & Distrs. . . .

Continued from page 16)

GOOD-ALL ELECTRIC MFG. CO. has named the ELECTRICAL SUPPLY CORP., Cambridge, Mass., as distributor in that area.

TWIN CITY ELECTRONIC WHOLESALERS ASS'N reports their recent incorporation, with headquarters at 1200 Nicollet Ave., Minneapolis 3, Minn.

JENSEN MFG. CO. announces the appointment of PHIL PILTCH, operating as ELECTRO-REP SALES, Rochester, N.Y., as their representative in upper N.Y. state.

SERVICE INSTRUMENTS CORP. announces the appointment of two new reps: JACK LERNER CO., Columbus, for Ohio, and BILL LINZ Co., Chicago, for Ill. and Wis.

ANDREWS & ANDREWS, manufacturers representative, has been re-established at 43 Kent Rd., Tenafly, N.J., and will cover metropolitan N.Y. and northern N.J.

WENDELL PLASTIC FABRICS CORP. reports that the firm's special annual rep award has currently been presented to ERLANGER SALES CO., Los Angeles, Calif.

COLMAN TOOL & MACHINE CO. announces the appointment of the following sales reps: CHESTER DREXLER CO., S. Farmingdale, L. I. N.Y., and JIM CHILCOTE SALES CO., Toledo, Ohio.

GENERAL ELECTRIC Communication Products Dept. reports that RADIO MESSAGE SERVICE, Atlanta, Ga., has been appointed as their representatives to handle sales of two-way radio equipment in Ala., Ga., and Tenn.

ANTENNA DESIGNS, INC. has announced the appointment of two new reps: JESSE ASSOCIATES, Birmingham, for Ala., Ark., northwestern Fla., La., Miss., and Tenn.; JOHN T. STINSON CO., Havertown, Pa., for Del. D.C., Md., southern N.J., and eastern Pa.

TELE-VUE TOWERS has named the following reps: MORTON L. FRIEDMAN, Chicago, for Ill. and Wis.; FRED A. ROSENWASSER SALES, Cleveland, for Ohio, western Pa., and W. Va.; EDWIN A. SCHULZ, Indianapolis, for Ind. and Ky.; J. M. RATHSBURG ASSOC., Detroit, for Mich.; CHESTER DREXLER CO., S. Farmingdale, L. I. N.Y., for N. Y., eastern Pa., Mass., Conn. and N.J.; and J. EARL SMITH, Dallas, for Texas, Ark., Okla., and La.

ITT now offers the Replacement and Service Markets a superior silicon rectifier... the "Gold Crown."—

Regal in the same way that made Federal selenium rectifiers first in performance of OEM, Replacement and Service markets, the New Gold Crown silicon affords optimum electrical, mechanical and design characteristics. These Gold Crown rectifiers are available in three styles of mounting devices . . . single and dual universal replacement kits and Quick Clip kit . . . 100 percent replacement for all your silicon and selenium requirements.

See your Federal Representative

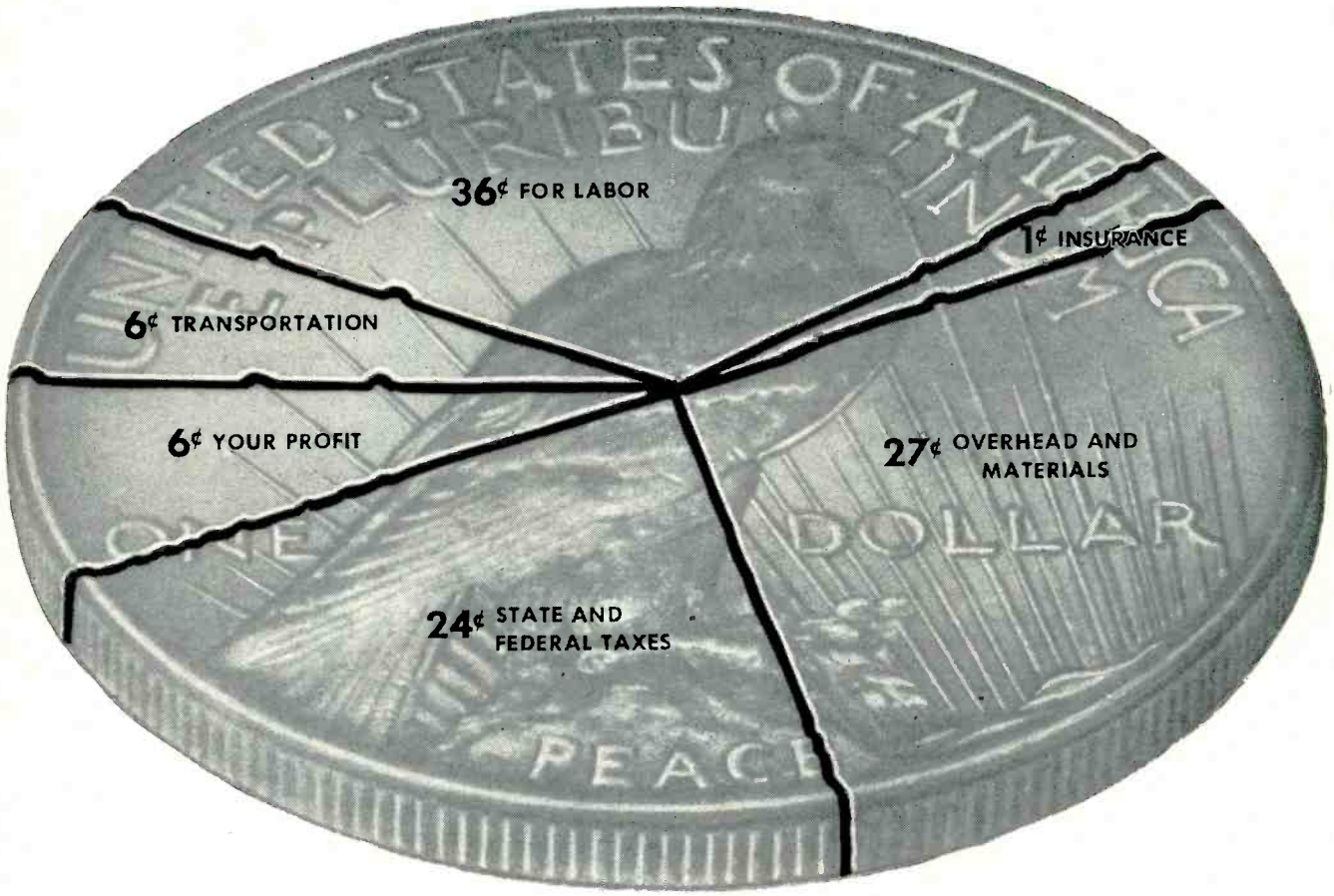
ITT

Components Division

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
P. O. BOX 412, CLIFTON, N. J.

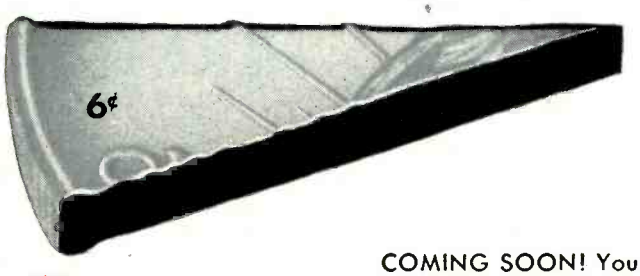
Wescon Show Booth #1403-1404

Mr. Service Dealer: Show Your TV-Radio Service Customer Where His Dollar Goes!



Let your customers know how much they get and how little you make on an average service call. Show them this chart. It was compiled by an independent organization for Raytheon and is based on research of Independent TV-Radio Service Dealer costs from coast to coast. It might be a good idea if you studied it carefully to see if any phase of your business is costing more than it should.

And remember: This 6¢ piece is your profit on a call. Don't lose it. One of the best ways to protect it is to avoid costly call-backs. And the best way to avoid call-backs is to always replace with Raytheon quality TV and Radio Tubes. Ask your Raytheon Tube Distributor to fill your orders with Raytheon Tubes.



COMING SOON! Your Chance To Climb On The GOLDEN LADDER

RAYTHEON MANUFACTURING COMPANY
Distributor Products Division

NEWTON 58, MASS. 55 Chapel Street
CHICAGO, ILL. 9501 Grand Ave. (Franklin Park)
ATLANTA 6, GA. 1202 Zonolite Rd. N.E.
LOS ANGELES 7, CALIF. 2419 So. Grand Ave.

Raytheon makes all these { Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes and Transistors, Nucleonic Tubes, Microwave Tubes.

RAYTHEON®
Excellence in Electronics

ELECTRONIC TECHNICIAN
Including Circuit Digests

The Printed Word—A Tool to Improve Your Skills

"Words are things, and a small drop of ink,
Falling like dew upon a thought, produces
That which makes thousands, perhaps millions, think."
—Lord Byron

The printed word is one of the most essential marks of civilization. It enables people to convey both emotions and practical information to one another. It enables people to express their thoughts, and to provoke others to think. And unlike the spoken word, the printed word leaves a precise and permanent record which may be referred to for many years to come.

The more complex the thoughts and data are, the greater the need to rely on printed words. For the electronic technician, a most complex body of knowledge must be readily available. And because electronics is a dynamic science in continuous change, new information must be constantly furnished to the electronic technician, if he expects to do his work properly.

There are three valuable sources of printed information, designed to help service technicians improve their skills:

MAGAZINES: Technical periodicals are a vital means of obtaining current information. Monthly publications such as ELECTRONIC TECHNICIAN supply technical articles on how to do a better servicing job, descriptions of new products, news, and the circuits of the latest electronic equipment on the market. The advertisements are informative. And very important, magazines can editorialize and investigate problems to improve industry conditions.

MANUFACTURER LITERATURE: When you need to know the technical specifications and related information on a particular product, when you want more details than a magazine normally provides, the place to get it is from the brochures and bulletins published by manufacturers. Product catalogs are also useful. To facilitate the transfer of literature from manufacturer to interested dealers, ELECTRONIC TECHNICIAN regularly publishes listings of free literature available. As a service to readers, technicians may obtain a number of items simply by filling in one coupon, or writing one letter, and sending it to us. We take care of funneling the requests to the manufacturer.

BOOKS: To obtain a broad understanding of a particular subject, books are an excellent source. Though they cannot be as timely as magazine articles, they do discuss the subject matter much more fully. Important too is the fact that books are the most convenient form of reference. To look up a fact, or to increase your education, books make a key contribution.

New Reader Book Service

For many years, ELECTRONIC TECHNICIAN has published brief reviews of new books. We found that many readers were highly interested, and further, that many would welcome a system which would facilitate their book purchases. Starting in this issue, we have done just that . . . set up a book purchase plan specifically geared to the technician's needs.

Look at pages 42 & 43. You will note descriptions of a number of electronic books which have been specially selected for you by the editors from the hundreds of books available from the world's leading electronic book publishers. As part of the service of the newly established ELECTRONIC TECHNICIAN BOOK DEPARTMENT, you may order any of these books directly from us. To be sure that you are completely satisfied, these books are sold with a money-back guarantee. In addition, we can obtain for you practically all of the new volumes reviewed in the New Books section.

The important thing to recognize is that the three sources of valuable printed information—Magazines, Manufacturer Literature and Books—complement each other. They are vital aids in improving your skills. We are pleased to be able to serve our readers now as a central source for all three forms of the printed word.

Tuning In the

INDUSTRIAL TUBES. CBS-Hytron's president Arthur L. Chapman predicts 1962 annual sales of tubes in the industrial tube market will exceed entertainment sales, and by 1965 will reach $400 million.

TAX RELIEF MEASURE for small business, the Ikard bill (H.P. 11258), being considered by Congress has the strong support of NEDA. Key feature allows a deduction from business net income for tax purposes an amount equal to additional investment in depreciable assets, inventory or open accounts receivable, not exceeding 20% or $30,000, whichever is less.

TELEVISION STATISTICS reported by the Advertising Research Foundation show that 42,400,000 households—84% of the national total—had TV as of March 1958. Two years ago it was 35,495,330 households, or 72.8% of the total then. The West showed the greatest increase, 17%; South 13.5%; North Central 9.5%; Northeast 8%. Saturation levels are Northeast 90%; North Central 88%; West 83%; South 75%.

INDUSTRIAL RADIO SERVICES have been revamped by the FCC, new services created and frequencies reallocated. Key item is the establishment of the Business Radio Service for commercial and institutional organizations. It absorbs the Citizens Radio, Low Power and Special Industrial Services. Also established was the Manufacturers Radio Service. These classifications offer increasing opportunities for communications servicing.

LOUD FIDELITY

A 1000-watt loudspeaker weighing 150 pounds—one of the most powerful single reproducers ever built—has been developed by Stromberg-Carlson. The alnico magnet weighs 24½ pounds, and the woofer cone can vibrate as much as 2 inches. It's not intended as an audiophile's ultimate, however. Convair will use it in jet noise tests.

"Don't ask me how it works—all I know is that we get wonderful TV reception!"

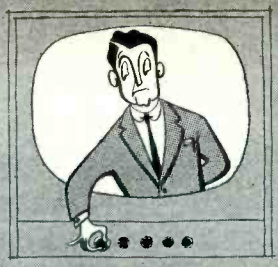
LESS THAN 200 PARTS DISTRIBUTORS, out of 1376 counted by National Credit office, maintained 616 branch locations. For 51% of the branch operators, branches did not purchase in 1957; 27% did purchase; 22% made partial purchases.

"WHY READ? Almost all that is worth knowing is in words. It takes an easy familiarity with reading and a tremendous appetite for recorded knowledge—past and present—to keep in step with these fast-moving times." —General Electric.

SMALL TOWN TV station operators have charged that community antennas systems are driving them out of business. Testifying before the Senate Interstate and Foreign Commerce Committee, Jerrold Pres. Milton J. Shapp noted that economic factors, not the nation's 560 cable systems are to blame. Since the lifting of the freeze in July 1952, 83 stations have gone off the air, 73 of them UHF. Only 6 of the 73 UHF's were in towns with community TV systems, only 2 of the VHF's. Shapp attributed their failures to competing stations.

ELECTRONIC REFRIGERATORS that cool without moving parts—no fans or compressors—have been reported in the developmental stage by RCA. Now comes word that Westinghouse is working on one. These units operate on the long known Peltier effect, which causes a junction of two metals (antimony and bismuth) to cool when current passes in one direction, and to warm when the current is reversed. Trouble has been that the amount of cooling was small, and even this was dissipated by the conductors. Now, however, with new knowledge of semiconductors available, engineers are matching up metals which cool well, are excellent electrical conductors—but are poor conductors of heat.

Picture .....



COLOR TV TO DATE: Over 300,000 sets in use, 309 out of 470 stations equipped to broadcast color, 95 equipped to originate their own color programs.

PAY-AS-YOU-BUY-TV has been inaugurated in Italy, using an approach proposed in the U.S. for toll TV. After a down payment, the viewer pays for his set as he watches the programs, feeding coins into an attached meter. If the buyer does not wish to see certain programs, the set remains off—and he holds on to his money in the bargain.

ANOTHER MANUFACTURER has given up TV set production. DuMont has sold its Consumer Division to Emerson, which will continue to market these TV and hi-fi units as a separate line under the DuMont label. Sale price is unofficially reported at $6 million cash, which DuMont will use to concentrate on remaining divisions. This brings to 14 the number of major set makers who have quit TV production in the past few years.

MOVING ALL TV CHANNELS to UHF has been seriously considered in Washington, but chances of adopting this plan now seem remote. The so-called Craven plan has a slightly better chance for acceptance. This would require the FCC to swap channels 2 through 6 for VHF frequencies now held for government use. If adopted—and it's a big IF—the TV spectrum would have 25 continuous VHF channels.

CALENDAR OF COMING EVENTS

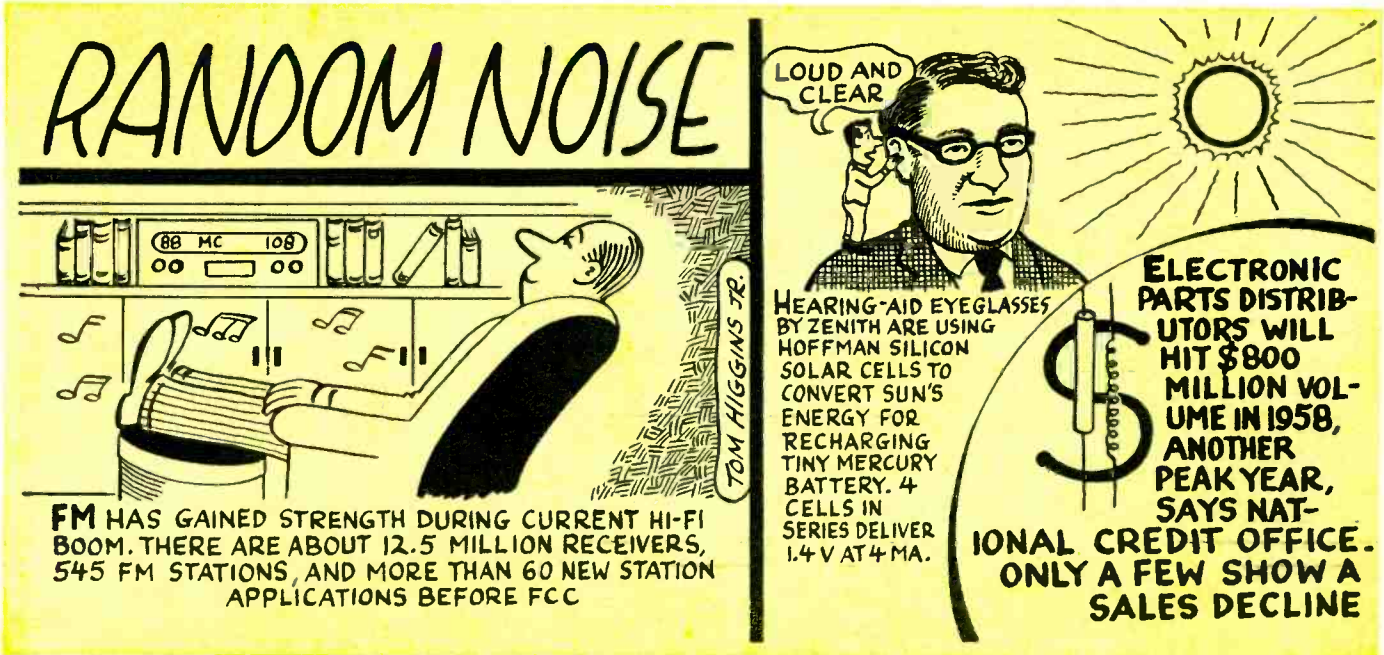
Aug.	19-22:	Western Electronic Show & Convention (WESCON), Pan Pacific Auditorium, Los Angeles, Calif.
Aug.	21-24:	NATESA Convention, Congress Hotel, Chicago, Ill.
Aug.	25-28:	Rocky Mountain Parts Conference, Glenwood Springs, Colo.
Aug.	27-31:	Upper Midwest Electronic Service, Conference & Exhibition, Municipal Auditorium, Minneapolis, Minn.
Sept.	10-13:	Keystone Electronic Service Conference and Exhibition, Carnegie Hall, Pittsburgh, Pa.
Sept.	15-19:	Instrument-Automation Conference and Exhibit, Convention Hall, Philadelphia, Pa.
Sept.	24-25:	Industrial Electronic Conference, Rockham Memorial Bldg., Detroit, Mich.
Oct.	8-10:	IRE Canadian Convention, Exhibition Park, Toronto, Can.
Oct.	13-15:	National Electronics Conference, Hotel Sherman, Chicago, Ill.
Oct.	27-29:	Radio Fall Meeting, Sheraton Hotel, Rochester, N. Y.
Oct.	30-31:	Electron Devices Meeting, Shoreham Hotel, Washington, D. C.
Nov.	20-22:	56th Meeting Acoustical Society of America, Chicago, Ill.
Dec.	3-5:	Eastern Joint Computer Conference, Bellevue Stratford Hotel, Philadelphia, Pa.
Dec.	9-11:	Mid-America Electronics Convention, Municipal Auditorium, Kansas City, Mo.

Hi-Fi Shows

Sept.	19-21:	Chicago. Palmer House.
Sept. 30-Oct.	4:	New York. (Institute Hi-Fi Mfrs.) N.Y. Trade Show Bldg.
Oct.	10-12:	Philadelphia. (Institute Hi-Fi Mfrs.) Benjamin Franklin Hotel.
Oct.	17-19:	Boston. Hotel Touraine.
Oct.	24-26:	Milwaukee. (Institute Hi-Fi Mfrs.) Wisconsin Hotel.

Rigo Enterprises Hi-Fi Shows

Sept. 5-7, Albany; Sept. 19-21, Syracuse; Sept. 26-28, Rochester; Oct. 3-5, St. Louis; October 10-12, Cincinnati; October 17-19, Detroit; Nov. 7-9, Omaha; Nov. 14-16, Kansas City, Mo.; Nov. 21-23, Seattle.



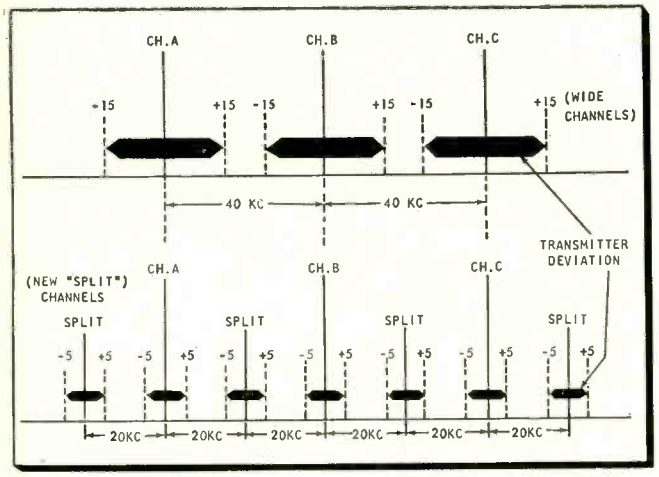


Fig. 1—Overwhelming need for more spectrum space was responsible for the 40 kc channels to be split into 20 kc channels in the 25 to 50 mc band, and are assignable on the same area basis.

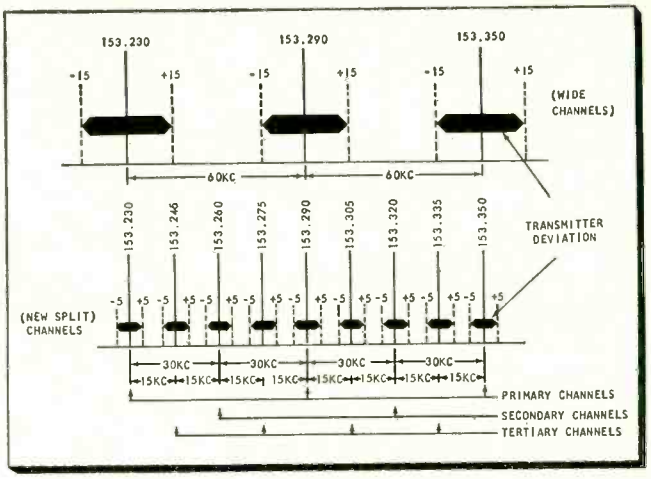


Fig. 2—A portion of the Petroleum Radio Service frequency assignments showing how the 60 kc spacing was subdivided into 30 kc and again into 15 kc channels. Basic same area separation is 30 kc.

Utilizing The New Split

Type Of Equipment Required And An Evaluation Of

CHANNEL SPLITTING

FCC
Parts 10, 11, & 16

Equipment
Transmitter
Receiver

Interim Systems

Modifications

C. J. SCHULTZ
Chief Systems Engineer
Motorola, Inc.

• The meteoric growth of the vehicular communication industry in the past decade has been paced by a series of r-f channel shortages, and technical break throughs which again permitted additional channel occupancy. Initially, considerable engineering effort was devoted to the development of new equipment for the progressively higher frequency bands available to the land mobile services. Thus the overflow from the original 30-40 mc VHF mobile band moved into the 152-162 mc portion of the spectrum. By 1951 occupancy of the 450-460 mc UHF band was an accomplished fact and the developing channel saturation in the 152-162 mc band was partially relieved.

Equipment manufacturers through much diligent research, were successful in developing transmitters and receivers which had significant improvements in frequency stability. Freed from the necessity of having broad receiver selectivity to compensate for equipment drift, receiver designers evolved a new basic circuit approach, which significantly improved receiver characteristics. The inclusion of a changeable passive filter element in the receiver permitted future changes in overall selectivity characteristics.

Striving for equipment perfection was not merely an end in itself but a means toward an end. The ultimate goal was the development of transmitters and receivers which would provide same-area, adjacent-channel performance. Increased receiver selectivity necessitated changes in transmitter design concepts. The new, more selective receivers were less tolerant of frequency drift and over-modulation than their less selective predecessors. Control of transmitter modulation spectrum not only provided more effective communication with the new selective receivers, but it minimized unnecessary radiation in the adjacent r-f channel.

Because receiver selectivity and front end design provided sufficient immunity to adjacent-channel transmitters, same-area adjacent-channel spectrum utilization became a reality. The need for "guard channels" was eliminated with the new VHF mobile equipment. The continuing flood of new licensees began to fill the many guard channels. It was becoming more apparent to many of the forward thinking industry and government leaders that no immediate prospect for future expansion was in sight. All VHF and UHF frequency bands allocated to the mobile services were in use. In 1951 the FCC requested the Joint Technical Advisory Committee (JTAC) to establish a Sub-Committee which would provide the FCC with answers to a number of questions they posed regarding channel splitting. A series of tests conducted by the mobile equipment manufacturers proved that the state of the art would permit a further subdivision of existing channel assignments.

In recognition of the JTAC Sub-Committee's report, together with supporting evidence and commen-

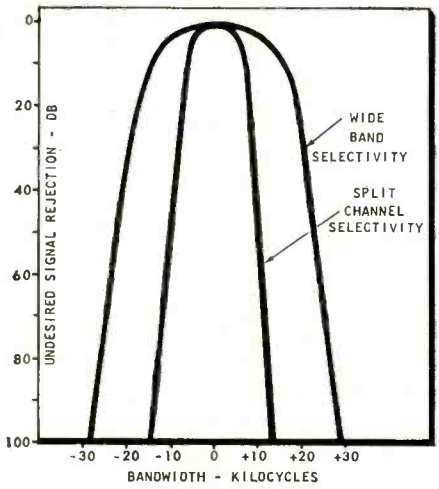
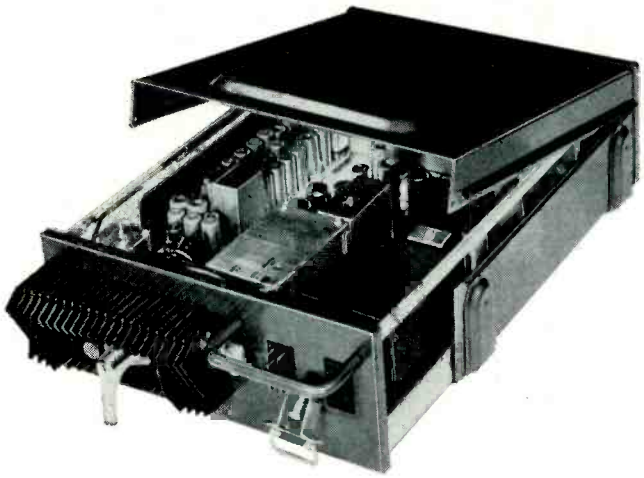


Fig. 3—Relative difference in overall selectivity between a wide and split channel receiver.



Here's the new 100-watt "T-Power" 2-way radiophone uses transistors in lieu of vibrators and a dynamotor in the power supply.

Channel Mobile Frequencies

Performance Of Narrow And Wide Channel Communications.

tary from the various user groups and equipment manufacturers, the FCC issued notice of proposed amendments to Parts 10, 11, and 16 of the Commission's Rules governing the Public Safety Radio Services, the Industrial Radio Services, and the Land Transportation Radio Services, respectively. These proposed amendments outlined a program to implement the changeover to new split-channel assignments.

Channel Splitting

Initially the FCC had considered not splitting the existing 40 kc channels in the land mobile portion of the 25-50 mc band, but the overwhelming needs of various governmental agencies and industrial users for additional channels was considered and the 40 kc channels were subdivided into 20 kc channels and are assignable on a same-area basis. Fig. 1 illustrates how the new split channels were created.

The procedure used to split the 60 kc channels in the 150-162 mc band is somewhat more involved. Fig. 2, shows a portion of the Petroleum Radio Service frequency assignments. The present primary channels (60 kc spacing) have been subdivided into secondary channels (30 kc spacing). The secondary channels will be subdivided again into tertiary channels (15 kc spacing). The basic channel separation between assignable frequencies in the same area will be 30 kc. In certain cases of demonstrated need for additional channels, assignments will be made on the 15 kc tertiary channels if sufficient path loss is available to reduce interference to the adjacent secondary channel to a tolerable level. As the state of the art advances it should ultimately be possible to use 15 kc channelizing on a same-area basis. Frequency offsets other than 15 kc may be granted if field tests, conducted by competent engineering personnel, indicate that it would be advantageous to all licensees concerned. The present 100 kc channels in the 450-460 mc band will be removed from a developmental status, subdivided and assigned on a regular 50 kc same-area basis.

Split Channel Equipment

The FCC has established transmitter frequency stability tolerances for new split-channel equipment as shown in Table 1.

If the companion receiver stability is equal to that of the transmitter, the frequency tolerances noted could result in a maximum frequency displacement between the transmitter and receiver, of 2 kc at 50 mc and 1.62 kc at 162 mc, if both the transmitter and receiver have drifted the maximum amount in opposite directions. Wider tolerances would result in still larger possible frequency displacements which would cause a significant degradation in the performance of a split channel system.

Equipment stability has another important aspect. The highly selective receivers used in split channel systems have overall selectivity curves whose skirts provide about 10 db attenuation for each kilocycle of frequency change. Thus, a 50 mc transmitter which is 2 kc closer to the adjacent channel receiver, effectively degrades the interference rejection margin of that receiver by 20 db. Fig. 3, illustrates the relative difference in overall selectivity between a wide channel receiver and one designed specifically to operate in the split channel assignments.

A frequency deviation of ± 5 kc has been adopted as standard for the land mobile service transmitters in the 25-50 mc and the 150-162 mc bands. Transmitters designed for the 450-460 band will use a frequency deviation of ± 15 kc. All transmitters

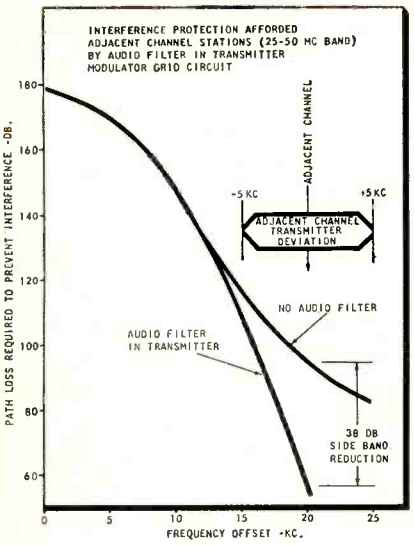


Fig. 4—Audio filter in transmitter modulator reduces side bands in this case by 38 db.

designed for split channel service must incorporate a low-pass audio filter preceding the grid of the modulator stage. Considerable theoretical and experimental evidence exists which shows that such a filter provides a significant reduction in modulation sideband products which would normally fall in the adjacent channel. Fig. 4 shows the amount of improvement which might be expected when the recommended filter is used. It is an FCC requirement that any emissions removed from the carrier frequency by at least 50% but not more than 100% of the authorized bandwidth shall be attenuated more than 25 db below the unmodulated carrier.

With an ever increasing number of transmitters being licensed, it is particularly important that spurious and harmonic radiations be rigidly controlled. Minimum standards for attenuation of these undesired radiation products as shown in Table 2 have been established.

It must be remembered that these are minimum values and do not necessarily represent the attenuation levels which must be achieved in typical urban or other high usage areas to prevent harmful interference.

Narrow Vs Wide Band

Considerable emphasis has been placed on the various advantages of reducing carrier deviation and deriving more communication channels. The question is inevitably asked "What do you have to sacrifice to gain these benefits?" To answer this question we might analyze some of the theoretical considerations and experimental evidence developed by various investigators.

Front end selectivity in any vehicular receiver, whether it is a wide or split channel unit, is relatively broad in comparison to the overall receiver selectivity. Under comparable environmental conditions then, we might expect equal performance in such characteristics as intermodulation rejection and desensitization. It has also been established that the capture signal ratio for both split and wide channel equipment is, for all practical purposes, the same. The performance differences, then, would seem to lie in the overall selectivity determining elements of the receiver, the i-f amplification and detection circuitry.

It is evident that an FM system using a high modulation index (large carrier swing) will require a receiver having a much broader overall selectivity characteristic than a comparable receiver used in an FM system having a low modulation index. Because of its selectivity characteristics the wide channel receiver

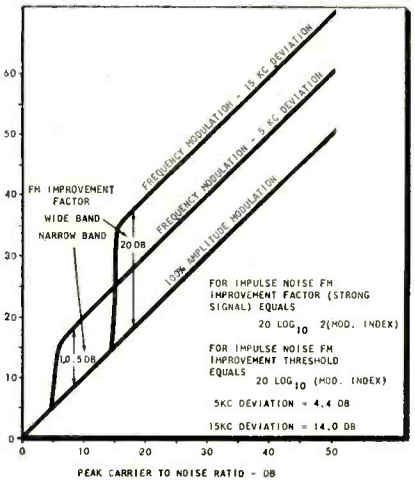


Fig. 5—Wide band receiver can accept more noise, hence requires a stronger signal to reach the FM improvement threshold.

will accept more noise than the narrow channel receiver and require more carrier signal strength before the FM improvement threshold is reached. Fig. 5 illustrates this effect. While the narrow channel system exhibits an FM improvement threshold at much weaker carrier signal strengths than the wide channel system, it does not provide as great a signal-to-noise ratio improvement for signal strengths greater than the threshold level. It can be shown that the relative increase or decrease in the FM improvement factor is numerically equal to:

$$20 \log_{10} \frac{\text{Mod. Index (wide)}}{\text{Mod. Index (narrow)}} \text{ db.}$$

If the logarithmic relationship of the modulation indexes of the two systems were the only consideration, we might expect the narrow channel system to exhibit a 9.5 db loss of FM improvement factor relative to the wide channel system. However, the particular pre-emphasis, audio selectivity and receiver bandwidths used in the two systems results in a much smaller difference in performance. The JTAC tests showed that narrow band equipment averaged only about 3 db less signal-to-noise ratio than an equivalent wideband system when subjected to impulse noise in weak areas.

Fig. 5 also indicates that we might theoretically expect a somewhat superior signal-to-noise ratio from a narrow channel receiver in weak signal areas. Actual field tests of commercial equipment have proven that narrow band radio will communicate further under no-noise conditions, but it is more susceptible to impulse noise interference and carrier frequency displacements.

Interim Systems

All land mobile communication systems licensed after November 1, 1958, under Parts 10, 11, and 16 of the FCC Rules, must use equipment which meets the new narrow band technical standards. After November 1, 1963, all systems including those licensed prior to November 1, 1958 must comply with the new narrow band technical standards. This brief statement of rule making seems destined to generate a large number of channel compatibility problems because of the rather long period before compliance with the new narrow band technical standards becomes mandatory.

Numerous comments submitted by user groups and a recognition of the many problems associated with implementation of the new rules

Table 1—Transmitter frequency stability tolerances for new split-channel equipment.

Operating Frequency	Base Station Tolerance	Mobile Station Tolerance Over 3 Watts*	Mobile Station Tolerance 3 Watts or Less*
25- 50 mc	±0.002 %	±0.002 %	±0.005 %
50-1000 mc	±0.0005 %	±0.0005 %	±0.005 %

*Final amplifier plate power input.

prompted the FCC to issue a Notice of Proposed Rule Making which proposes that old equipment be used without a cutoff date. In those instances where it was demonstrated that harmful interference was generated, the licensee of the wide band equipment would be required to reduce transmitter deviation. It was further suggested that all licensees replace or modify existing equipment so that it complies with the narrow band standards at the earliest possible date. If the FCC proposal, specifying consideration of frequency stability when reducing transmitter deviation were adopted, many older types of equipment would be reduced to as low as 3 kc deviation. This would obviously cause a serious system performance degradation.

Fig. 6, shows the frequency deviation of a split channel transmitter and selectivity characteristics of both a wide channel and a split channel receiver. Curve a and b shows the selectivity characteristics of equipment operating in the 25-50 mc and 150-162 mc bands respectively. These selectivity characteristics permit a rough evaluation of the interference which will be generated.

To better illustrate the relative performance of wide and narrow channel equipment let us assume that an industrial communication system has been operating in the 150 mc band for a number of years. Recently the adjacent split channel was occupied by a new licensee. Transmitter deviation of the wide band system was reduced to 5 kc to minimize harmful interference and to comply with the new narrow channel technical requirements. The industrial system licensee anticipated using the wide band equipment for some time and was interested in what effect the reduction in carrier deviation would have on audio quality and system coverage.

The first and most obvious thing noticed was a 10 db loss in audio volume. With one third as much deviation, the discriminator audio recovery is also one-third that formerly obtained with 15 kc deviation.

Table 2—Minimum standards for attenuation of undesired radiation products.

Max. Final Amplifier Plate Power Input	Emission Attenuation Below Unmodulated Carrier
Less than 3 watts	40 db
3-150 watts	60 db
150-600 watts	70 db
Over 600 watts	80 db

Fortunately, the receiver had sufficient reserve audio gain so that a usable signal could be obtained by turning up the volume control.

Checking the receiver in the lab, it was found that the 12 db Sinad ratio sensitivity had changed from 0.29 μv with 15 kc deviation to 0.28 μf with 5 kc deviation—an insignificant change. (The Sinad Ratio is a reference signal level numerically equal to:

$$20 \log_{10} \frac{\text{Signal} + \text{Noise} + \text{Distortion}}{\text{Noise} + \text{Distortion}}$$

This reference level is more meaningful than receiver quieting since it takes into account receiver distortion, hum, noise and other signal degrading factors.)

It was also noted that the overall system distortion had dropped somewhat since the reduced modulation requirements permit operating the modulator circuit over a more linear part of its characteristic curve.

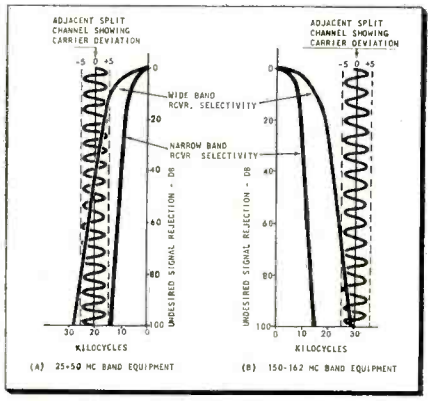


Fig. 6—Comparative interference rejection of narrow band and wide band receivers.

Assuming that the new split channel station transmitter is not on the air, the coverage, for all practical purposes, should be the same as before. To further evaluate the situation, assume that both stations use 100-foot towers, dipole base station antennas and 50-watt transmitters with 5 kc deviation. Data taken under controlled laboratory conditions shows that a separation of 32 miles is needed between the two stations if absolutely no interference from the new station is to be detected in the wideband receiver. A 1 μv desired signal in the wideband receiver will be degraded to a 6 db Sinad ratio signal if the new station is located 5.4 miles away. A considerable improvement can be made by replacing the wideband receiver with a receiver designed specifically to meet the new narrow band technical standards. It is now possible to use a separation of only 6.8 miles

VHF BAND	BASE STATION RECEIVER SELECTIVITY	RECEIVED SIGNAL INTERFERENCE LEVEL	ADJACENT SPLIT CHANNEL: BASE STATION SEPARATION (MILES)	ADJACENT SPLIT CHANNEL: MOBILE UNIT SEPARATION (MILES)
25-50MC	WIDE BAND	NONE*	100	70
	WIDE BAND	SEVERE**	72	41
	NARROW BAND	NONE*	32	13
	NARROW BAND	SEVERE**	8	2.8
150-162MC	WIDE BAND	NONE*	32	10
	WIDE BAND	SEVERE**	5.4	1.6
	NARROW BAND	NONE	6.8	1.8
	NARROW BAND	SEVERE**	3.2	1.1

* BARELY DETECTABLE INTERFERENCE TO WEAK SIGNAL JUST BREAKING SQUELCH

** INTERFERENCE DEGRADES 1 MICROVOLT DESIRED SIGNAL TO 6DB SINAD RATIO (DESIRED SIGNAL IS MARGINALLY UNDERSTANDABLE)

CONDITIONS ASSUMED: SMOOTH 4/3 EARTH PROPAGATION
ALL TRANSMITTERS 50 WATTS OUTPUT
STATION ANTENNA - DIPOLE -
STATION ANTENNA HEIGHTS - 100 FT
MOBILE ANTENNA - QUARTER WAVE "WHIP" ANTENNA
40MC RCVR. SENS. -- WIDE BAND - 0.2μv
NARROW BAND - 0.17μv (12DB SINAD)
150MC RCVR. SENS. -- WIDE BAND - 0.29μv
NARROW BAND - 0.2μv (12DB SINAD)

NOTE: MILEAGES SHOWN ARE MAXIMUM FIGURES AND MAYBE LESS DEPENDING UPON LOCAL TERRAIN AND AMBIENT NOISE CONDITIONS.

Table 3—Separations required for satisfactory operation. Stations can usually be closer together, depending upon terrain.

between stations and have no detectable interference or reduce the separation between stations to 3.2 miles if a 1 μv desired signal reduced to a 6 db Sinad ratio can be tolerated.

The figures shown are for comparative purposes. In actual practice the stations can be located closer together because usual types of terrain have more attenuation than the smooth earth assumed in calculating these distances. Also we may not stretch our coverage to the limit. Signals from mobile units may exceed 1 μv and permit closer spacing of stations for a given amount of interference. Further information in Table 3 shows the general magnitude of the interference obtained and the separations required to assure satisfactory operation. As pointed out before, local terrain conditions can cause significant reductions in the distances noted.

Modifications

Many systems prior to complete changeover to equipment specifically manufactured to meet the new narrow band technical standards will use modified or partially modified wide band equipment. The transmitter is perhaps the easiest component of the system to modify. A partial modification could consist of merely reducing the deviation to ±5 kc. The addition of an audio filter having the characteristics described earlier would be the next step. Full conversion would probably require a modification of the oscillator circuitry and the installation of a heated crystal to meet the 0.0005% stability requirement. The complexity of this conversion depends to a great extent upon the original design and age of the equipment. Most manufacturers will supply conversion kits and detailed instructions on equipment conversion. Some older

(Continued on page 47)

SERVICING

The Hybrid Auto Radio

Design Differences Require Special Handling Precautions. Transistor, Low-Voltage Tubes & Power Supply Considerations.

LUTHER B. HOFFMAN

• The 12-volt storage battery, low-potential tubes and transistors, have brought about, or rather made possible, the car radio designer's dream —a unit which derives its operating potentials from the pure dc of the battery. This is the radio that has been unflatteringly tagged Hybrid. Several differences exist between this receiver and its predecessors and unless certain preliminary precautions are observed, misleading symptoms will complicate trouble-shooting procedure.

Confusion may result from the manner of d-c voltage distribution. Heater voltages are higher than plate and screen voltages. An ohmmeter will indicate what seems to be a jungle of high-leakage shorts. Actually, this compact and vibrator-free auto radio is the essence of simplicity.

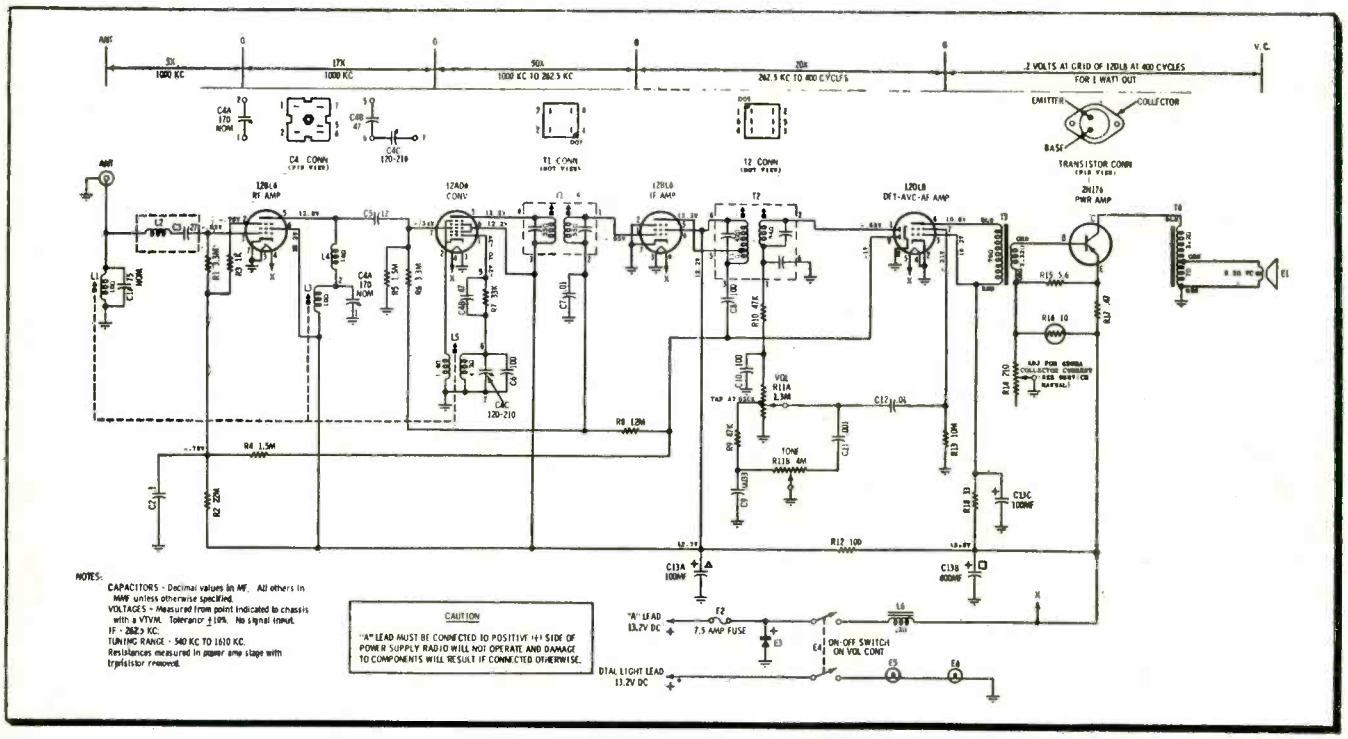
A quick glance at the schematic of the Motorola Model 852 auto radio in Fig. 1 shows a conventional arrangement. However, the diagram reveals the absence of a vibrator and step-up transformer power supply, a 2N176 transistor is used in lieu of a power-amplifier tube, and the use of low-voltage tubes. There are several differences in the handling procedure once these sets hit the test bench. A few precautions must be observed lest more trouble be introduced than was present originally. Polarity must be observed. Since the battery is connected more or less directly to the plate and screen of the various tubes, it is obvious that the set will not function with the battery leads reversed. In addition some components may be damaged.

Power Supply

The battery eliminator, when one is used instead of the battery by itself, must be considered. The output of most of these units is a pulsating dc. The meter may indicate proper voltage output from 12 to 14 volts, but this is an average reading.

(*Continued on page 62*)

Fig. 1—Motorola auto radio Model 852 in many respects resembles its conventional predecessors. It has fewer parts, simpler design and newer features. Low-voltage tubes and transistor output stage do away with the need for a vibrator or power transformer.



Difficult Service Jobs Described by Readers

AGC Unkeyed? Look to AFC

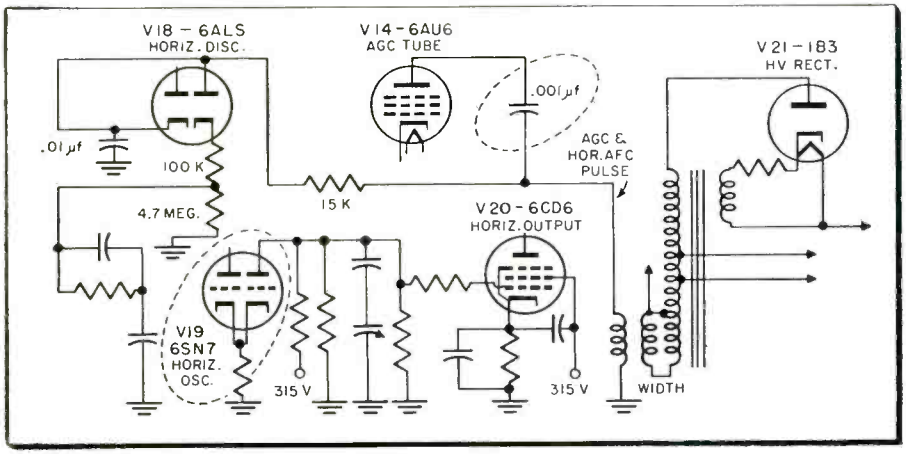
Trouble in a Model #5176-CM-E Arvin TV set, on the bench, had me going around and around trying to track it down. The symptoms were intermittent picture overload and diagonal bars. From these indications I assumed the trouble was due to improper AGC action. AGC and i-f tubes were checked with particular emphasis on the test for gas. Next, I overrode the agc line with a bias box and the picture cleared up. This confirmed my suspicion that agc was not working properly. A scope on the plate of the keyed agc tube showed that the pulse from the horizontal output transformer was present, but was 180 v p-p instead of 250 v p-p. The coupling capacitor between the width coil and the plate of the keyed agc tube was checked by clipping in a new one. This cleared the trouble, so the new one was installed. A short time later the trouble was back. In the process of checking the width coil I noticed that every time the scope probe or test clip lead was placed in this pulse feeding circuit, the trouble would clear up. An inspection of the schematic showed that this circuit is also coupled back to the afc circuit. Touching, loading, or other changes in this area also caused the horizontal oscillator frequency to change. The oscillator frequency must be correct or the pulse to the keyed agc tube will be improper. Replacing the horizontal oscillator tube corrected the trouble.—*J. H. Berg, Bremerton, Wash.*

Hi-Fi Oscillator

A new Altec amplifier model 344-A was brought into the shop because of a general noisy operation and a rising shrill whistle which occurred only when equipment was initially turned on. After the set warmed up a bit, the whistle disappeared and would not again assert itself until the amplifier cooled off and was turned on again.

The noise problem was corrected by resoldering some poor connections on the printed wiring board. I still had the whistle. Even in the very short period during which the oscillation took place I could scope the bug everywhere, except in the preamplifier circuit. Replacing filters, bypassing tube plates and screens to ground, and inserting small ohmage resistors in series with grid leads had no affect in killing this oscillation; which to say the least was very annoying and baffling. Many times I pushed the amplifier aside and would come back to it later. Finally, I suggested to the customer that he return it to the factory, since it was still within the warranty period, and I had had it. The customer was already on his way over to pick up the amplifier, but I thought I'd take just one more look at it. On this particular model there are separate volume controls and separate neon bulb indicators for each input channel. The bulbs show which channel is functioning. I had seen code practice oscillators using neon lights, and believe it or not, the idea, as far fetched as it seemed, occurred to me that it might be worth checking these bulbs. I was really grasping for straws. Removing the lighted neon bulb did not help. Leaving the function switch in the same position as it was, I removed the unlighted bulb in the next channel and with it went the whistle. I reinserted the bulb to make sure, and the whistle returned. This thing was thrown from bench to bench for a week—and all it needed was an NE-51 bulb. —*Elmer Woods, Los Angeles, Calif.*

Improper horizontal oscillator frequency upset keyed AGC circuit in this Arvin TV set.



TOUGH DOGS WANTED!

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

Test Equipment

Selection Of Signal Generators Should Be Based

COLOR-BAR GENERATORS

Types

Rainbow
Keyed Rainbow
NTSC

Functions

Sync
Burst
Luminance
Chrominance
Sound Carrier

Features

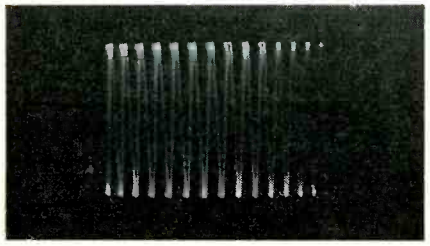
Attenuators
Separate Output

ROBERT G. MIDDLETON

• The need for proper test equipment is a recognized fact among qualified technicians. New lines of work, new techniques, new designs, etc., all contribute to the never ending demand for more and better test instruments. Not all of the same type of equipment have the same characteristics, and not all technicians evaluate the various functions and capabilities of a testing device in the same way. Trial and error purchasing is costly, and it isn't always possible to use a piece of gear for a couple of weeks before plunking down the hard earned cash.

In many instances it is difficult to obtain first hand impartial information. While manufacturers' specifications can generally be relied upon, the problem of which specification should be given more importance than another remains. Fortunately in most cases it is sufficient to know what each function the equipment is capable of performing and to what extent any existing limitations will interfere with servicing procedure. The dot generator and oscilloscope for use in servicing color TV were covered in the May 1958 issue of Electronic Technician. The dot generator's greatest claim to fame is its ability to enable a visual indication of convergence in the Color CRT. While it can also be used for other signal injection procedures and to check for linearity, the color bar generator is more specifically designed for troubleshooting and adjusting color TV circuits.

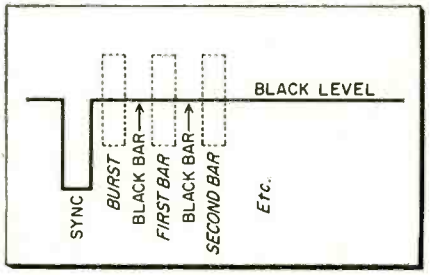
Fig. 1—Sinusoidal offset color subcarrier is 3.58 mc ± (n x 15,750).



Rainbow Generator

The simplest color display, which has some of the characteristics of a color-bar pattern, is the type obtained from some rainbow generators. The rainbow pattern can be developed by applying the output from an a-m generator into the output of the video-detector circuit in a color-TV receiver. It actually consists of a sinusoidal offset color subcarrier signal, as shown in Fig. 1.

Fig. 2—Keyed rainbow signal provided with sync and burst has greater utility.



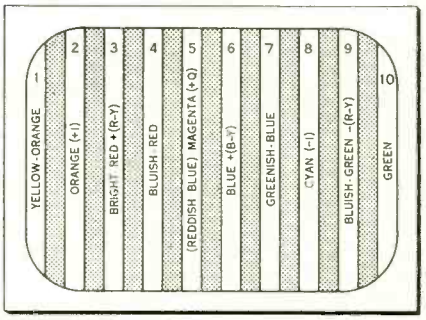


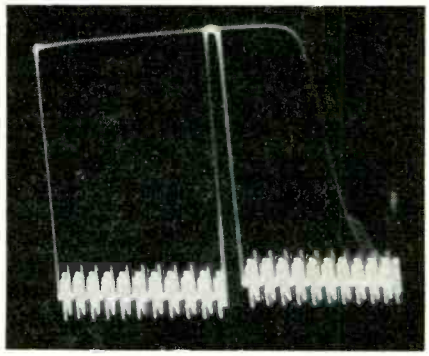
Fig. 3—Keyed rainbow generator provides 10 distinct bars of color on receiver's CRT.

An offset color subcarrier is a signal having the frequency of 3.58 mc plus or minus an integral number of horizontal scan intervals (n x 15,750).

When the color-subcarrier signal is offset by one or more horizontal scan interval (3.58 mc ± 15,750 cycles), the rainbow pattern appears as one or more groups of vertical bands of color on the screen of the color CRT. The order of the rainbow colors is in one direction when the offset frequency is above the color subcarrier and reversed when the offset frequency is below.

A rainbow pattern alone has small utility in practical service work, aside from indicating whether or not the chrominance circuits are working, and to show the presence of gross faults in the color channels. When used in combination with a scope, a rainbow pattern is capable

Fig. 4—Reduced chrominance voltage enables useful test of receiver's color sync system.



For Color TV

Upon Evaluation Of Instrument's Features And Functions.

of providing considerable information concerning the functioning of a color-TV receiver. For vectorscope technique see the August 1957 issue of Electronic Technician. However, it is a truism that the simplest color patterns are the most difficult to use in servicing procedures.

A rainbow pattern has much greater utility when keyed, and provided with sync and burst, as shown in Fig. 2. This type of signal represents the next step up the ladder toward the standard NTSC signal. The pattern produced by the keyed rainbow signal is shown in Fig. 3. It is divided up into 10 vertical bars of color, each bar separated by a black keying bar. Thus each color bar is separately identifiable. Since the sync pulse and burst serve to synchronize the receiver circuits, the color-phase control can be readily adjusted when the keyed rainbow signal is used as an indicator. It should be observed that rainbow signals generally appear dim and bluish, as compared with a pattern produced by a complete color signal.

The various bars in the keyed rainbow pattern displayed in Fig. 3 correspond to the important color axes. When a wide-band scope is applied at the output of the (R-Y) detector, maximum output should be observed for the ± (R-Y) bars, and zero output for the ± (B-Y) bars. At the output of the (G-Y) matrix, maximum output should be observed for the ± (G-Y) bars, and zero output for the ± (G-Y) <90° bars. Keyed rainbow generators are often provided with separate sync-voltage and chrominance voltage controls. Fig. 4 shows the output from a keyed rainbow generator with the chrominance voltage greatly reduced on purpose. This provides a very useful test of the ability of the color sync system in the receiver to lock in on a weak burst signal.

Some generators are also provided with a sound-carrier to serve as a guide in setting the fine-tuning control of the color receiver. Colors are not reproduced with correct hues unless the receiver is properly tuned. When a sound carrier is provided, misadjustment of the fine-tuning control is evidenced by appearance of a 920-kc beat in the pattern (4.5 mc—3.58 mc). When the TV set is properly tuned the sound carrier falls into its proper low place on the response curve, the sound traps are able to complete the job and eliminate the beat signal.

NTSC Generator

An NTSC color-bar generator provides a complete color signal which consists of sync, burst, luminance, and a chrominance signal as shown in Fig. 5. Many generators provide both modulated r-f and video output. The video output can be adjusted, in most cases, up to 100% saturated colors; however, 100% saturated color-bar voltages will overmodulate the video carrier. Therefore modulated r-f output should be limited to lesser saturations. In the NTSC system, 75% saturation is the

(*Continued on page 58*)

Fig. 5—Complete NTSC color signal contains sync, burst, luminance and chrominance.

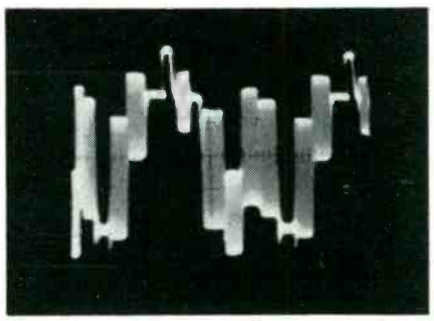
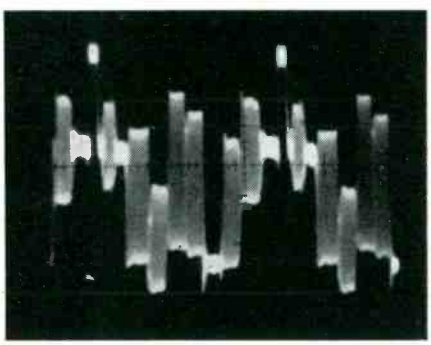


Fig. 6—Noise and beat voltages, introduced by receiver signal circuits, present at detector output.



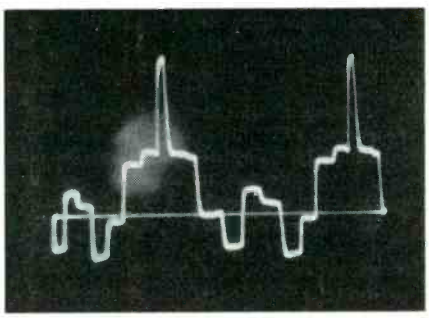
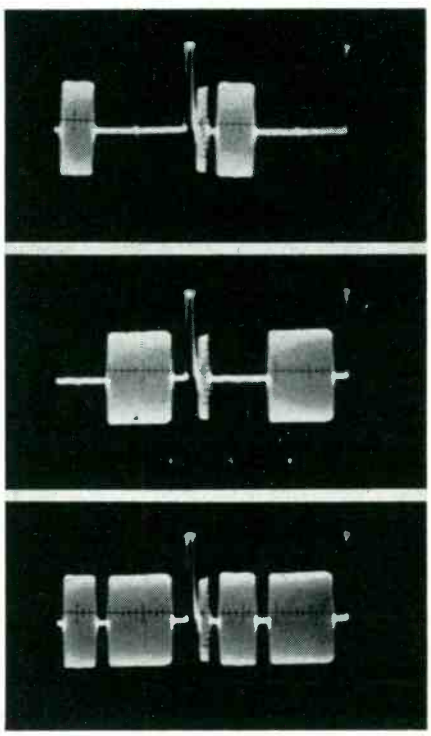


Fig. 7—Luminance portion of NTSC signal may be available separately in some generators.

Fig. 8—Separate (R-Y), (B-Y), and combined signals from top to bottom respectively are desirable when adjusting color detectors and quadrature circuits.



Servicing Tape Recorders

Interaction Between Electrical And Mechanical Problems, Plus Design Compromises, Present A Challenge.

AL DIAMOND

• One of the secrets of satisfying the customer in tape recorder servicing is to listen to his complaints very carefully.

Consider a situation which took place a short while ago. A tape recorder was brought into the shop by a very aurally unhappy person. He had just spent $15.00 in another establishment and the recorder sounded worse than ever. His complaint was all inclusive, in that the recorder was generally no good.

A quick check revealed both mechanical and electrical difficulties, none of which seemed to be too serious. The recorder was microphonic and extremely sensitive to the touch; a new pressure pad installed by the other shop was riding low, and not holding the tape against the recorder head and one of the idler wheels, which was also functioning as a tape guide, was not rotating. The deck was pretty clean. The previous shop had done a fairly good job; which was somewhat surprising considering that the tape-guide-idler wheel had too many washers on it, and was tightened down so that it wouldn't budge; and the misalignment of the new pressure pad.

Idler Wheel

Freeing the idler wheel seemed like an easy first step. The extra washers were removed, the parts were thoroughly cleaned and lubricated with a non-gumming watchmakers oil. This oil is reserved for these special occasions and is applied quite sparingly.

Pressure Pad

Next, the problem of the misaligned pressure pad was solved simply by bending and adjusting the metal near its pivot points. A good rule to follow when making this type of adjustment is to increase or decrease the angle of existing bends. Do not, if possible, create any new kinks or angles in portions of the metal which are normally straight. When the pressure pad was removed an excessive amount of wear on the combination record, playback, and erase head was noticed for the first time. Normally this would have been exposed in a preliminary inspection, but the shine of the new pressure pad assembly had diverted attention. Add a new head and $15.00 to the bill.

Foreign Tube

The volume control was turned up to listen to the microphonic condition. By gently tapping the chassis and even more gently tapping the tubes, the trouble was isolated to a lead weighted, shielded 12AX7 tube in the front end. Removing the tube removed the microphonic condition. The tube was new and was installed by the last shop. It was beginning to look as though similar paths were being followed and a more successful conclusion was becoming more doubtful as the job progressed. After trying ten different brand new 12AX7's, in stock, and not being able to find a quiet one in the lot, and after wasting some time checking resistors and capacitors under this tube's socket, an ECC83 foreign tube was substituted and the microphonics disappeared like magic.

Hum

Having changed the control and applying an attentive ear to what was coming out of the loudspeaker, it was noticed that a fairly higher than normal hum level existed which was not affected by the volume control setting. Assuming trouble to be in the B+ filter circuit, or other circuits after the control, the usual run of tests were performed which included shunting and testing filter capacitors and tube substitution. The scope showed an a-c ripple on the order of 35 volts peak-to-peak from ground to the speaker voice coil. The output tube was pulled while the amplifier was still on in an effort to isolate the hum. This seemed strange, so the rest of the tubes were pulled. The same hum remained even after all the tubes were removed. A 0.05 μf capacitor from one side of the a-c line to chassis ground was checked, and found to be good and free of leaks. The only thing now drawing current was the primary of the transformer and according to the megohm scale on the VTVM there was no connection or leak to ground between any of the transformer windings. The transformer was given a visual inspection; all four through-bolts and nuts that help hold the transformer together were very loose. In order to get at these screws it was necessary to disassemble the tape deck from the main chassis. Disconnect drive belts and linkage and remove the tape transport motor. The mechanism was noisy to begin with, so this little operation presented an opportunity to minimize the mechanical noise. There was surprisingly little wear, no worn parts to replace and as was originally observed, the mechanism was fairly clean. Just to be on the safe side, it was given the full cleaning and lubrication treatment. About an hour later the nuts and bolts were tightened, the deck was back in place, all the tubes were out, and the power switched on, only to find the same hum. The transport mechanism was just as noisy. After a few more fruitless experiments of substituting speakers and adding filters, these problems were tabled. On second thought perhaps the hum and noise level wasn't too bad; program material could probably drown it out. A roll of prerecorded tape was placed on the machine after all the tubes were reinserted. The

(Continued on page 61)

How To Handle

Direct Mail Response

Turn Inquiries Into Sales. Five Steps To More Profits.

DIRECT MAIL

1. *Plan Program*
2. *Acknowledge Promptly*
3. *Maintain Records*
4. *Follow Up*
5. *Evaluate Results*

ERNEST W. FAIR

• "We had a lot of inquiries the last time we used direct mail in our business but were very definitely disappointed in results—they just weren't good. What happened?" This comment and question from a service shop owner brought up a point of major importance. All kinds of good advice from many sources, on how to plan a direct mail effort, and how to do it well, are followed, but still something is lacking—the dollars and cents return just isn't there.

In almost every case, just one thing was at fault—no time whatever was spent in planning how to handle "inquiries only" which the well directed mail campaign produced. Handling response to direct mail is just as important as planning the campaign. For a shop owner or manager to neglect careful planning of what to do after the mail has gone out is to invite waste of a good portion of the money invested in the program. Of even more importance, it may very well discourage any further use of what could be a profitable business building effort.

What should go into the plan for handling these inquiries? Here are some important factors which can help obtain maximum results from a direct mail effort.

Handle all inquiries promptly. Too often very little attention is paid to requests for information on coupons or in letters. All effort is usually focused on the direct business of the customer who wants to buy now. Every inquiry is potential business, or the customer would never have taken the trouble to reply. Neglect to follow through will not only fail to make the sale but may offend the customer. Promptness in handling is of the utmost importance. The advertising effort has created a live prospect. A reply four or five days later will kill nineteen out of twenty potential sales. No shop owner would think of ignoring a customer who shows interest in a definite item or service. That same interest has been shown by the mail inquiry. It should receive equal attention.

Acknowledge all requests. It usually pays to have a standard acknowledgment form to thank the customer for his business or inquiry. It should be mailed the same day of receipt of the customer's letter. Setting up such a procedure also helps to provide an up-to-date follow-up and records system. No potential business should be overlooked.

Place competent people in charge of handling both the mail and telephone response. Too often this is relegated to just anybody who happens to answer the phone or who is not busy doing something else. If giving the right answer, at the right time, with the proper attitude, is given the importance it deserves, then someone who knows and understands advertising and selling and has the ability to handle every detail will be given this responsibility. In a small shop the owner would do well to personally supervise this activity.

Set up a simple and practical system of record keeping. This is important to assure accuracy in handling business and other bookkeeping entries, it can also furnish an accurate picture of results obtained from each direct mail advertising program. The simpler the system the easier it is to maintain and to analyze. Fewer mistakes and customer complaints arise from an orderly set of records. It is good procedure to have the staff go over the entire program in detail before the first mail is sent out. Then, if necessary, any one of them can handle the resulting business or inquiries.

Carefully process inquiries received according to a pre-arranged plan. Each one should be given the closest scrutiny and attention. Where there is a large volume of replies, the tendency is to handle it as a mass operation. To make the most of these leads, no matter how large the mail, each return should be treated as an individual.

Be sure there is a good follow-up program planned. If the shop owner has used only a single mailing, and lets it go at just taking care of the immediate response, he will invariably be surprised at how much extra business can be obtained by the follow-up. This can be in the form of a second mailing, telephone call, or even a tie-in with other advertising which the business may be subscribing to on a regular basis.

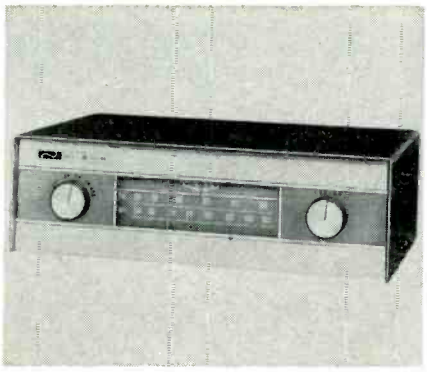
After all is said and done, it is wise to evaluate the total effort, go over the program with other people in your shop, try to improve the procedure, ferret out the mistakes, and set up a schedule for the next direct mailing. •

Audio SERVICING

New High Fidelity

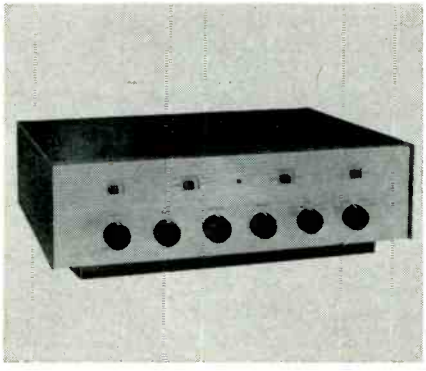
GE FM-AM TUNER →

AM-FM tuners, available as model FA-11, with russet leather vinyl finish, and as FA-12, in willow gray have the following specifications: sensitivity, FM, 5 μv on 300 ohm input for 30 db quieting; AM, 200 μv/m for 20 db s/n ratio; built-in ferrite rod AM antenna; high and low level audio outputs; distortion, 1.5% harmonic at rated output; less than 2% IM; selectivity, FM, 200 kc bandwidth 6 db down; noise level, FM, 55 db below 100% modulation. General Electric Co., Genesee St., Auburn, N.Y. (ELECTRONIC TECHNICIAN 8-31)



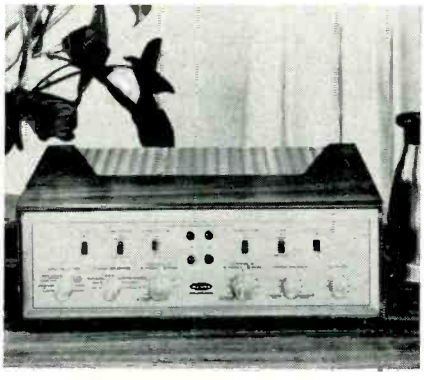
Harman-Kardon AMPLIFIER →

The Trio, model A-224 stereo amplifier is part of the new Crest stereo line. Retail price is $99.95. It is a complete stereo amplifier with two separate 12-watt power amplifiers, (24 watt peak each), can be used as a 24-watt monaural amplifier. Features include: separated ganged treble and bass controls, balance control, mode switch, speaker selector switch, contour control, tape output for recording and rumble filter. Harman-Kardon, Inc., 520 Main St., Westbury, N. Y. (ELECTRONIC TECHNICIAN 8-32)



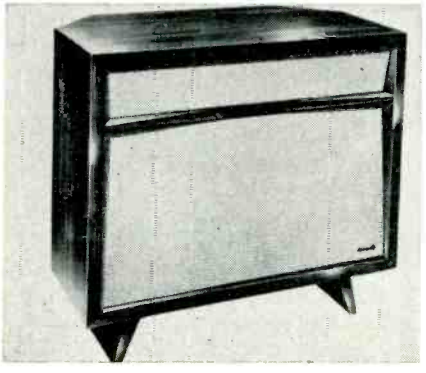
Scott STEREO PREAMP →

Stereo pre-amplifier model 130 include stereo tape monitor, scratch and rumble filters, phase reversal switch and balance control. Frequency response is 19 to 35,000 cps ± 1 db. Harmonic distortion is less than 0.15% at 2.5 v. rated output. The 130 is equipped for "trereo" 3-channel amplification to fill in "hole in the middle." The 130 also can be used as an electronic cross-over. Price $169.95. H. H. Scott, Inc., 111 Powder Mill Rd., Maynard, Mass. (ELECTRONIC TECHNICIAN 8-33)



University ENCLOSURE →

The Troubadour lowboy enclosures EN-15LH for 12" or 15" speaker or multiple systems is a rear loaded folded-horn with a baffle board angled for optimum sound projection. May be used in a corner, against wall or under a bay window. Price $139.50 to $149.50. It is also offered as a complete system, S-12, with C-15W woofer, H-600 wide-angle horn, T-30 driver, and HF-206 super tweeter. Price $343.50 to $353.50. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. (ELECTRONIC TECHNICIAN 8-34)



For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 40.

Oxford SPEAKER SYSTEMS

Cabinets, finished on all four sides, permit horizontal or vertical positioning. Included is a 3-speaker system with network, 12" woofer, an 8" mid-range and a 3½" tweeter. Choice of red mahogany, cherry or blonde oak wood cabinetry. Oxford Components, Inc., 556 W. Monroe St., Chicago 6, Ill. (ELECTRONIC TECHNICIAN 8-47)

Nortronics TAPE CONVERSION

Two new Stereo-Kits convert existing tape recorders to stereo. Model SK-100 is for standard ½-track, 2-channel stereo tapes on present tape recorders of the monophonic variety. Model SK-50 provides for the reproduction of the newer ¼-track, 4-channel stereo tapes. Also available are Erase-Kits which mount on either side of the stereo head to provide the necessary erasure operation when recording. The Nortronics Co., Inc., 1011 S. 6th St., Minneapolis 4, Minn. (ELECTRONIC TECHNICIAN 8-39)

Bell AMPLIFIER LINE

New line of Pacemaker High Fidelity Amplifiers designed for the low-budget economy market include a 10-watt single-channel and a 20-watt, 2-channel stereo amplifier. The latter, Pacemaker 2221, replaces an earlier model. Built-in preamps on both channels are equalized to play magnetic and ceramic phono, FM-AM tuner and tapes. Inputs are provided for playback from tape heads and tape preamplifiers. Bell Sound Systems, Inc., 555 Marion Rd., Columbus, Ohio. (ELECTRONIC TECHNICIAN 8-40)

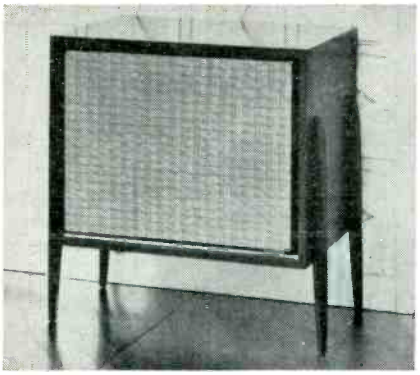
Fisher PREAMPLIFIER

New model PR-66 Stereophonic Preamplifier and Equalizer is completely self-contained and self-powered on one chassis. Designed for remote operation, it has no controls, and may be used as a preamplifier-equalizer for stereo cartridges and records, and for direct connection from stereo tape playback heads, or as a 2-channel preamplifier for two microphones. Monophonically, it serves as a 2-channel preamplifier. Fisher Radio Corp., 2121 44th Drive, Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 8-41)

& Stereo Products

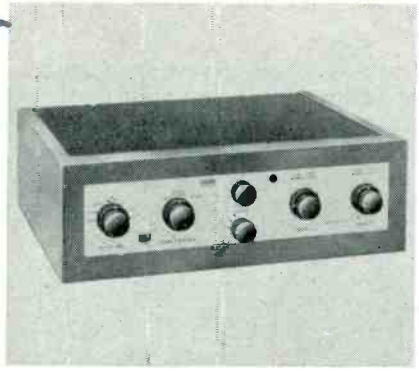
E-V SPEAKERS & ENCLOSURES

The Wolverine popular-priced series contains high-fidelity speakers, enclosures, mid-range and high frequency kits. Includes 8" and 12" coaxial speakers, 3 enclosures—along-the-wall, corner, and bookshelf—plus two "step-Up" packages, a mid-range driver and crossover, and a high frequency driver and crossover. Features include heavy duty die-cast frames, an edgewise-wound voice coil, long-throw voice coil and sealed-in glass coil form. Electro-Voice, Inc., Buchanan, Mich. (ELECTRONIC TECHNICIAN 8-35)



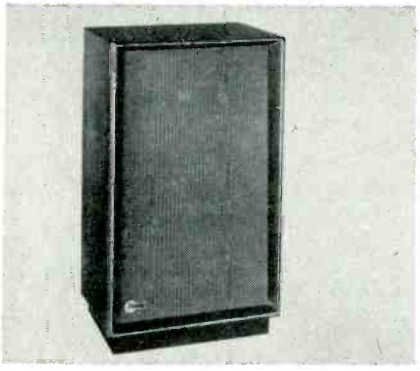
Eico STEREO AMPLIFIER

Model HF81 Stereophonic Dual Amplifier-Preamplifier (Kit $69.95, Wired $109.95) has dual 14-watt amplifiers. When the source is monophonic, 28 watts are available. IM distortion (60 & 6000 cps at 4:1) is 2% at 28 watts, 0.5% at 10 watts (5 watts each channel). Frequency response at 2 watts (1w each channel) is ± 0.5 db, 10 cps to 100 kc. Harmonic distortion at 16 watts (8w each channel) less than 1% from 30 cps to 10 kc. Electronic Instrument Co., Inc., 33-00 Northern Bldv., Long Island City 1, N.Y. (ELECTRONIC TECHNICIAN 8-36)



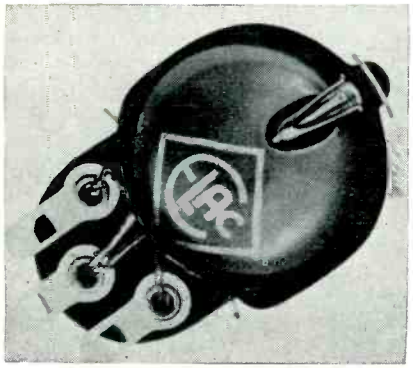
Wharfedale SPEAKERS

Model W/AF/1 contains the W10/FSB 10" full range speaker, and a tweeter, with a balancing control in enclosure AF10. Acoustic-Filter design improves power-handling. Enclosure measures 30"H x 17"W x 12"D. Price is $144.50; enclosures AF/10/cab alone, $68.50. The W/AF/2 system shown is similar to W/AF/1, but larger and has 12" speaker. Price is $199; enclosure AF/12/cab alone is $94.50. British Industries Corp., 80 Shore Rd., Port Washington, N.Y. (ELECTRONIC TECHNICIAN 8-37)



Audiogersh CARTRIDGE

The Stereotwin 200 is a stereo variable reluctance cartridge. It fits all standard tone arms and is constructed to eliminate the hum problem. The mounting bracket of the cartridge provides two different positions for inclination of the cartridge. The Stereotwin 200 is equipped with a 0.7 mil diamond needle, and the recommended tracking force is from 4 to 6 grams. Price is $59.50. Audiogersh Corp., 514 Broadway, New York 12, N.Y. (ELECTRONIC TECHNICIAN 8-38)



Turner MICROPHONE

The model 210A microphone has a smooth response from 40 to 20,000 cycles. Output level is —86 db at 50-ohm impedance, —80 db at 200-ohm impedance. It can be mounted on desk stand, floor stand or boom. The Turner Co., 909 17th St., N.E., Cedar Rapids, Iowa (ELECTRONIC TECHNICIAN 8-44)

Weathers STEREO CARTRIDGE

High quality ceramic Stereo Cartridge has a low 2-gram tracking force and a frequency response of 15 to 30,000 cycles with a separation of 25 db between stereo channels. Output is 0.25 volts. Weathers Industries, Barrington, N. J. (ELECTRONIC TECHNICIAN 8-43)

Altec STEREO CONTROL

An inexpensive master stereo control, model S40, converts two monophonic amplifiers to stereo high fiedelity. The S40 costs $12 and is designed for use with the company's 344A Quartet monaural amplifier. It simply plugs in; a second amplifier and speaker are easily added. Altec Lansing Corp., Anaheim, Calif. (ELECTRONIC TECHNICIAN 8-46)

Ronette STEREO CARTRIDGE

Four-terminal turnover stereo cartridge and four-terminal single stylus model are similar in size to the TX-88 Superfluid Cartridge and employs the duo-clip stylus assembly. The new cartridges will mount on ½" or 5/16" centers. Ronette Acoustical Corp., Lynbrook, N.Y. (ELECTRONIC TECHNICIAN 8-42)

Stentorian SPEAKERS

Two new loudspeakers, a 10" universal speaker and a 3½" cone tweeter, are suitable for high fidelity systems. The Super HF1016U Universal is rated at 15 watts. It has an extended frequency range with uniform response from 30 to 15,000 cycles, and a cone resonance of 35 cycles. The T-359 is a 3½" cone tweeter giving a uniform response from 3,000 to 17,000 cycles with a power rating of 15 watts at the low end of the response. The tweeter features a special lightweight cone and a 16-ohm voice coil. Barker Sales Co., Audio Div., 339 Broad Ave., Ridgefield, N. J. (ELECTRONIC TECHNICIAN 8-45)

Semiconductor Electronics

A New Technology — A New Industry

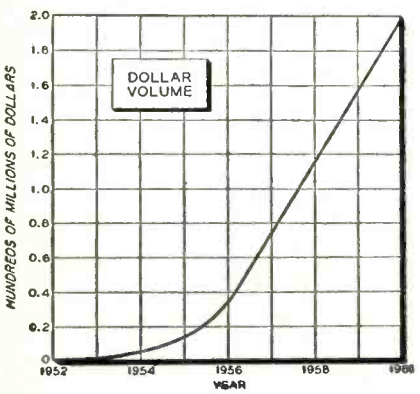
YEAR	INDUSTRIAL COMPUTERS	ENTERTAINMENT	AUTOMOBILE (NOT INCLUDING RADIO)	OTHER INDUSTRIAL
1957	1.7	19.4	0	1.5
1958	5.5	30.5	0.4	3.8
1959	8.2	52.0	2.0	6.0
1960	14.6	72.0	5.7	8.0

MILLIONS OF UNITS

Predicted number of transistors in use in the various areas of the electronics industry.

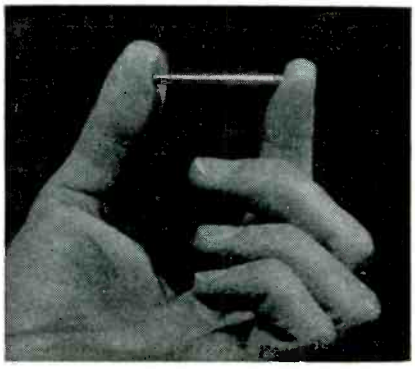
• Transistor technology has so advanced in the last 10 years that it is now technically possible for semiconductors to do about 70% of the work done by electron tubes, Dr. Mervin J. Kelly, President of Bell Telephone Laboratories reported at a semiconductor conference at their research and development center in Murray Hill, N. J. The immediate obstacle to the coming dominance of transistors and the closely related diodes is the presently relatively high cost of manufacturing them for high reliability and long life. Further research and its application to devices will result in lower costs. Almost one-half of the development effort of the nation in device electronics is devoted to semiconductors. Transistor production for 1957 was estimated at 30 million units, and that of semiconductor diodes at 60 million units in the same year. The 90 million semiconductors had a dollar sales volume in excess of 100 million. Predictions are that in 1965

Sales volume by 1960 for semiconductors may reach 2 hundred million dollars.



the dollar volume of transistor and semiconductor diode sales will be greater than that of electron tubes. By 1975, semiconductors will serve in 90% of electronic devices, and tubes in the remaining 10%. The transistor will be the driving force in the creation of many new facilities and services, some of them as yet undreamed.

These predictions are possible because of the following advantages of



Despite its extremely small size, this amplifier built for research study contains a broadband transistor and fourteen other circuit elements.

transistors: Their low power and voltage needs as compared to tubes; the small size of semiconductors making practical the miniaturization of other electronic components and consequent economic savings; the long life of the devices; and the likelihood that transistors will one day cost less than tubes.

The advantages have been possible in part because of at least three significant contributions: The understanding of conduction of electricity in semiconductors obtained through the work of Walter H. Brattain, John Bardeen and William Shockley, who shared the 1956 Nobel Prize in Physics for their discovery of the transistor effect; techniques of growing single crystals of silicon and germanium and the zone melting method; and the diffusion process of manufacture which permits uniformity. Tubes operate in systems over an 11,000 megacycle frequency range, and transistors can be designed over a frequency range of 1,000 megacycles. But within that latter range, perhaps 90% of electronic systems operate. Recent research demonstrates that it appears possible that semiconductor amplifiers will be obtained for frequencies as high or even higher than attained with advance design electron tube structures. Research will result in new understanding that will make possible low cost manufacturing processes and bring about the massive application of semiconductors in electronics.

The reliability and life of transistors developed thus far have rescued the Armed Forces from the possibility that some fine day the military would have its warehouses loaded with electronic equipment nobody could operate or maintain, according to Dr. Julius P. Molnar, Vice President in charge of military development. Before the transistor, electronic systems for weapons had become complex monsters, which too often failed to function because of a simple defective or worn out component. Many people saw the possibility of electronics going the way

(Continued on page 55)

Experimental electronic telephone contains transistor circuits for both speech transmission and tone ringing. Push-buttons send multi-frequency tones in place of the usual direct-current pulses to the central office.

Cut testing time in half—
DOUBLE TUBE SALES

B&K

DYNA-QUIK

Makes Money for Servicemen Everywhere

- ***Each Dyna-Quik Tube Tester completely tests each tube in seconds***
- ***Eliminates substitution testing***
- ***Shows customer true condition and life expectancy of tubes***
- ***Sells more tubes right on-the-spot***
- ***Cuts servicing time, wins customer confidence***
- ***Saves costly call-backs, brings more profit***

One extra tube sale on each of 5 calls a day pays for the Dyna-Quik in a few weeks.

NEW MODEL 650

Fastest, Most Complete, Portable
DYNAMIC MUTUAL CONDUCTANCE TUBE & TRANSISTOR TESTER

Checks over 99% of the tubes most widely used in television receivers, plus popular home and portable radio tubes. Tests over 500 tube types. Lists over 125 tube types, with settings, on socket panels for maximum operating speed. Complete listing in fast telephone-index type selector. Includes 16 spare sockets and sufficient filament voltages for future new tube types. **Tests each section of multiple tubes separately** for Gm—Shorts—Grid Emission—Gas Content—and Life. Provides instantaneous Heater Continuity check. Shows tube condition on "Good-Bad" scale and in micromhos. Special bridge assures automatic line compensation. No multiple switching—No roll chart. Includes pin straighteners. **Transistor Tester** checks junction, point contact and barrier transistors, germanium and silicon diodes, selenium and silicon rectifiers. Net, **$169.95**

2 additional tube sales per call on an average of 5 calls a day can increase your income as much as $50.00 per week

NEW MODEL 500B *Money-Making Portable*
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Thousands of the famous B&K Dyna-Quik are in profitable use today by service technicians everywhere. **Servicemen say:** *"Best tube tester I've ever owned for speed and dependability." "Makes money. Really indispensable." "Have two...one for the shop and one for house calls."*

Now, with more tube sockets, the new Model 500B makes it easy to test more tubes faster and make more money. Accurately quick-checks most of the TV and radio tubes usually encountered in everyday service work. **Tests tubes** for shorts, grid emission, gas content, and leakage. Measures true dynamic mutual conductance with laboratory accuracy in the home or shop. Makes complete tube test in seconds, tests average TV set in a few minutes. Quickly detects weak or inoperative tubes. Shows tube condition on "Good-Bad" scale and in micromhos. Life Test shows customer the tube life expectancy. Makes it easy to **sell more tubes** right-on-the-spot.

One switch tests everything. No multiple switching. No roll chart. Automatic line voltage compensation. 7-pin and 9-pin straighteners. New tube reference charts are made available by the factory at regular intervals. Net, **$129.95**

See your B & K Distributor, or write for Bulletin **AP12-T**

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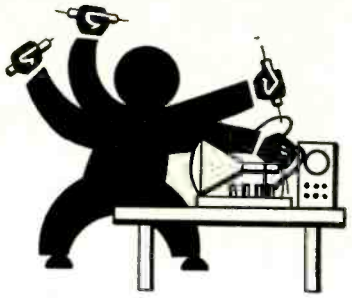
SHOP HINTS



Tips for Home and Bench Service

Neutrode Tuner Neutralization Adjustment

The neutralization circuit in the Standard Coil Neutrode Tuner is very stable and seldom needs adjustment. However, if any of the tuner components including the 6BN4 tube are replaced, neutralization adjustment may be required.

Need for neutralization is indicated by loss of picture quality even after all other servicing procedures, including complete alignment, has been completed.

For accurate neutralization, proceed as follows:

1. Allow receiver to warm up for 15 minutes.
2. Turn contrast control fully clockwise (max. contrast).
3. Set other controls for a normal picture.
4. Connect the negative lead of the bias supply to the r-f AGC buss, test point X, and the positive lead to chassis.
5. Set channel selector and sweep generator to channel 12, and sweep 10 mc.
6. Connect the oscilloscope to the output of the video detector. A normal overall rf-if response curve will be obtained.
7. Increase bias voltage up to the point of tube cut-off. (Up to 15 volts may be required. Readjust output of sweep generator to maintain a usable response. Tube cut-off is recognized when no further reduction in amplitude occurs as bias is increased. An alternate method of producing tube cut-off is to remove the 250 volts B+ at the tuner. The response curve should develop a pronounced dip, as shown in Fig. 2.)
8. Use a non-metallic screwdriver to adjust "A15" to place the dip in the center of the curve, with peaks of equal amplitude. If, under conditions as stated above, no dip is observed, the neutralization trimmer is too far out of adjustment. Turn "A15" back and forth until the dip is located then repeat step 8.

Admiral Corp., Chicago 47, Ill.

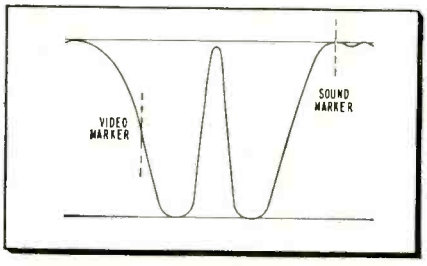


Fig. 2—Ideal Overall VHF rf-if response curve obtained when Neutrode Tuner is correctly neutralized.

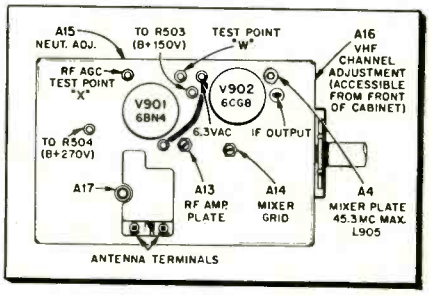
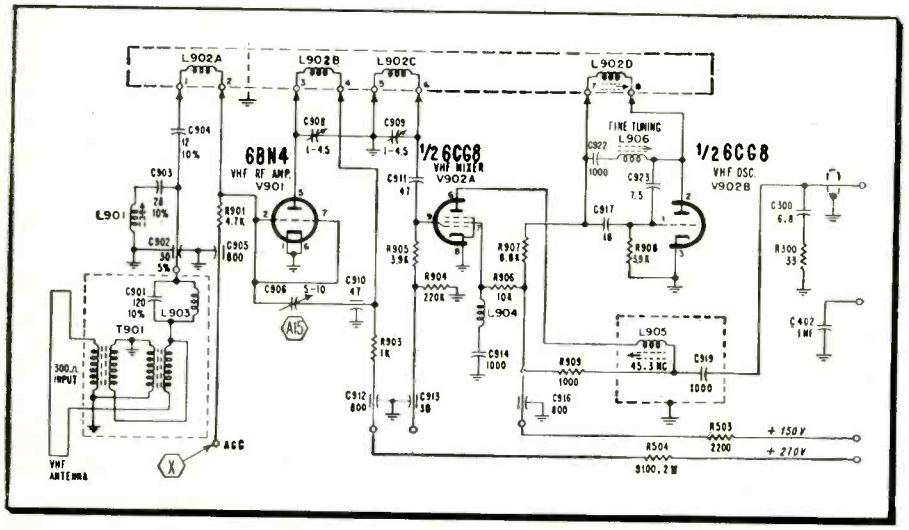


Fig. 3—Location of neutralizing capacitor.

Fig. 1—Standard Coil Neutrode Tuner used in many TV sets including Admiral Model 20C6C.

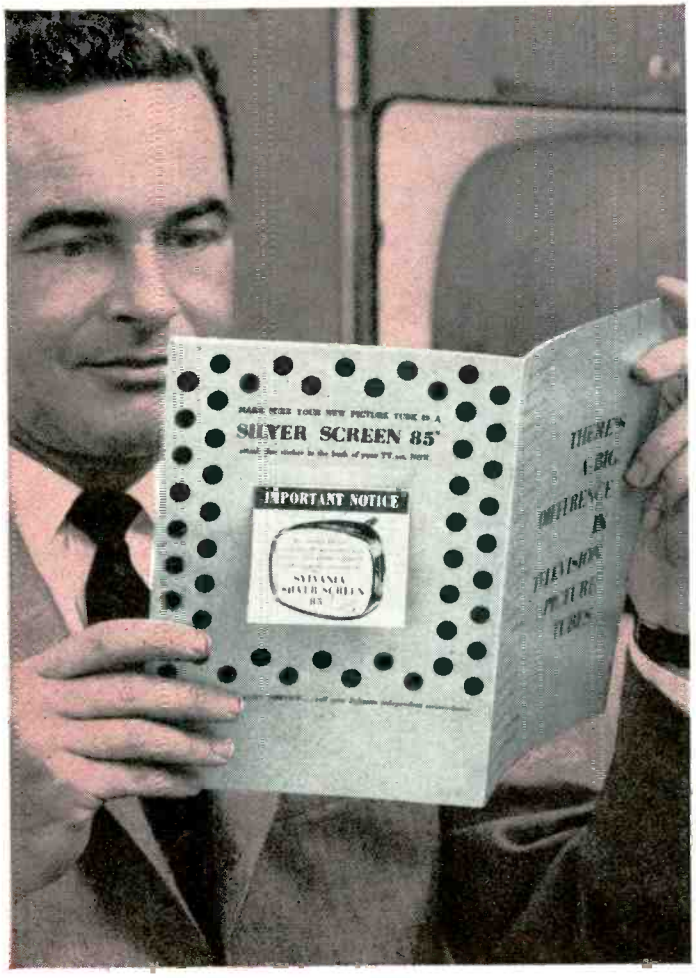


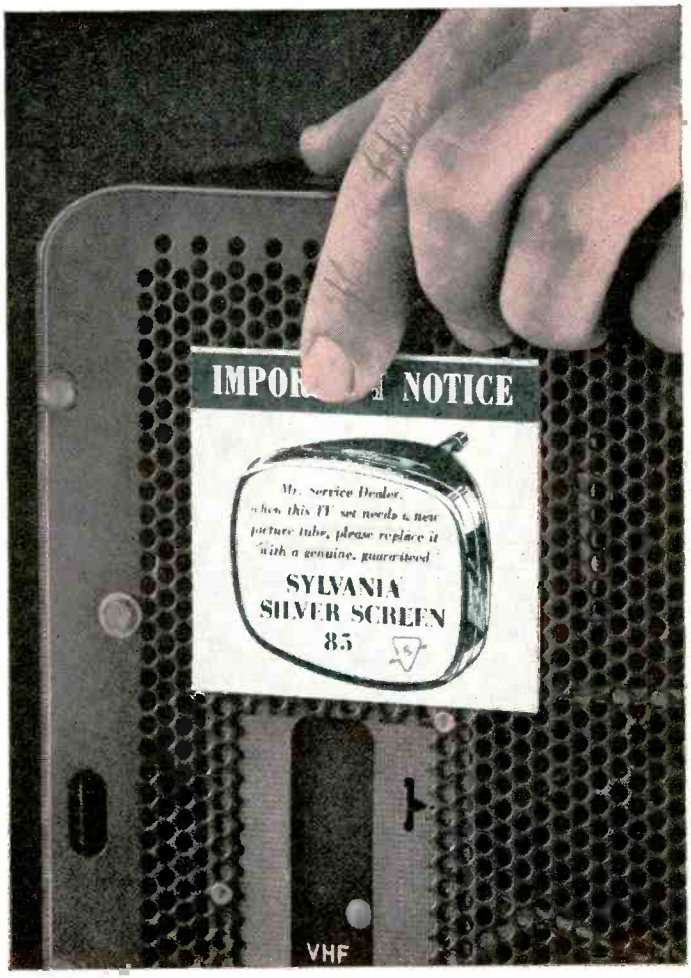
Installing Nuts and Washers In Inaccessible Places

Cramped fingers and frayed tempers can be avoided when installing nuts, washers, spacers, etc., on bolts in inaccessible places. Slip the nut and washers over a rod, stiff wire, or ice pick, in the proper sequence. Hold the small parts high on the rod with a finger, and place on the bolt. Allow the parts to slide down the shaft, one at a time, and if necessary dress the rod slightly so that the washer fits on the bolt properly. When the nut is dropped it can also be aligned in this manner, while another rod or screwdriver is used to turn the nut enough to catch a thread or two. The rods can then be removed, and a spinner wrench can finish the job.—*H. C. Garrett, Kansas City, Mo.*

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. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.





This label is your signal that a **value-minded** customer has been sold up to Silver Screen 85.

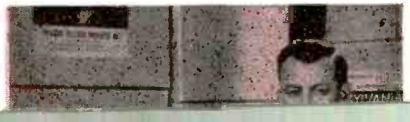
New consumer booklet from Sylvania helps you

SELL UP TO SILVER SCREEN 85

Free booklet tells the story of Silver Screen 85's superior performance— detachable sticker lets the consumer tell you he's *presold* on Silver Screen 85

Leave a copy on every service call or make a complete mailing to your customers and prospects. Either way, Sylvania's new booklet, "There's A Big Difference In Television Picture Tubes," can help you sell up to more profits through more Silver Screen 85 sales.

In layman's language, this booklet details the difference between Silver nationwide sample. What's more, there's a handy sticker on the back of each booklet for the customer to attach to the back of his TV set. This



FREE LITERATURE

To receive the literature below without charge, simply circle the numbers on the coupon corresponding to the items of interest. Cut out and mail to ELECTRONIC TECHNICIAN.

1 Replacement Capacitor Guide: A new up-to-date edition of a TV Electrolytic Capacitor Replacement Guide is a 62-page pocket sized booklet, listing all the electrolytic replacement capacitors for every TV set ever manufactured. Form No. AFG-462 includes special twist prong types and hard-to-find "firecracker" capacitors (1B8: Aerovox Corp.)

2 Industrial Tubes: A new brochure gives detailed description of the advanced frame grid tube. Tells what it is, how it is made, gives specific military and industrial applications and a comprehensive working definition of tube life and reliability. Included are general descriptions of 2 new frame grid tubes. (2B8: Amperex Electronic Corp.)

3 Motel TV: A new 4-page booklet, illustrated in two colors, shows a typical master antenna system in a simplified block diagram, features lower cost, longer life, better motel appearance, and improved TV reception. (3B8: Blonder-Tongue Labs.)

4 Rotator & Antennas: 4-page folder describes new rotator circuit design, with schematic and text. Also, interesting piece, "Wanted For Murder: 'Salty' Waters," deals with TV antenna installation problems created by salt air. (4B8: Channel Master Corp.)

5 Power Supply Kits: Folders covering the uses and specifications of two power supply kits describe the new dual purpose, dual output, model KPS-2, and K612T filtered d-c power supply kit, which can power transistor circuits, 6 and 12-volt auto radios, and hybrid sets, without hum. The K-612T kit includes a heavier transformer and choke, to operate auto sets with solenoid tuners at lower voltage settings. (5B8: Electro Products Labs.)

6 Silicon Transistors: New brochures EGG 296 and 272-2 contain specification and application information on silicon unijunction transistors. They are semiconductor voltage sensing and triggering device. One is a 6-pager, the other a 4-pager. They contain characteristic curves and circuits. (6B8: General Electric Semi Products Dept.)

7 Wire And Cable: Two-color, 20-page catalog, "The Answer To All Your Wiring Needs," features the Parallead lead-in-line, plus standard and custom constructed wire and cable for every electronic purpose. (7B8: International Wire & Cable Co.)

8 Coaxial Switcher: How to use comparative r-f measurement techniques without costly, time-consuming test "set-ups" and "take-downs," and without problems of detector and amplifier balancing, is the subject of a technical newsletter just published. The answer: The Coaxial Switcher, model FD-30, which by providing simultaneous display of two channels or voltages on one scope. (8B8: Jerrold Electronics Corp.)

9 Components: General Catalog No. 59 is important since it catalogs over 1,000 different standard items in the form of r-f chokes, line filters, i-f transformers, line filter chokes, etc. Also offered is the TV Technician's Coil Replacement Guide No. 159 containing numbers for more than 2,000 different chassis. (9B8: J. W. Miller Co.)

10 Hi-Fi Speakers: A new Tempo high fidelity speaker catalog gives complete information and fully illustrates full-range speakers, tweeters, woofers, and a complete three-speaker system with 3-way crossover network. Also illustrated are the new bass reflex cabinets. (10B8: Oxford Components, Inc.)

11 Radio Control Systems: Catalog B-138 is a new catalog which carefully describes and illustrates radio control systems for industrial, commercial and residential uses. Complete information including technical data and prices are included. (11B8: Perma-Power Co.)

12 Phono Needles: A 24-page needle catalog tells quickly and exactly which needle or cartridge fits any phonograph or model. Here's what's in the catalog: 1. Section that visually identifies the needle type. 2. Alphabetical list of all major needle manufacturers. 3. Side-by-side part number comparison with other needle manufacturers. 4. Converts over 1,000 competitive needles to exact Philco numbers. (12B8: Philco Corp. Accessory Div.)

13 Transistors: No more headaches trying to figure out what types of transistors are interchangeable. Complete cross-reference data is available in the form of a master interchangeability guide, resale price list, and an individual cross-reference listing. (13B8: Workman TV Inc.)

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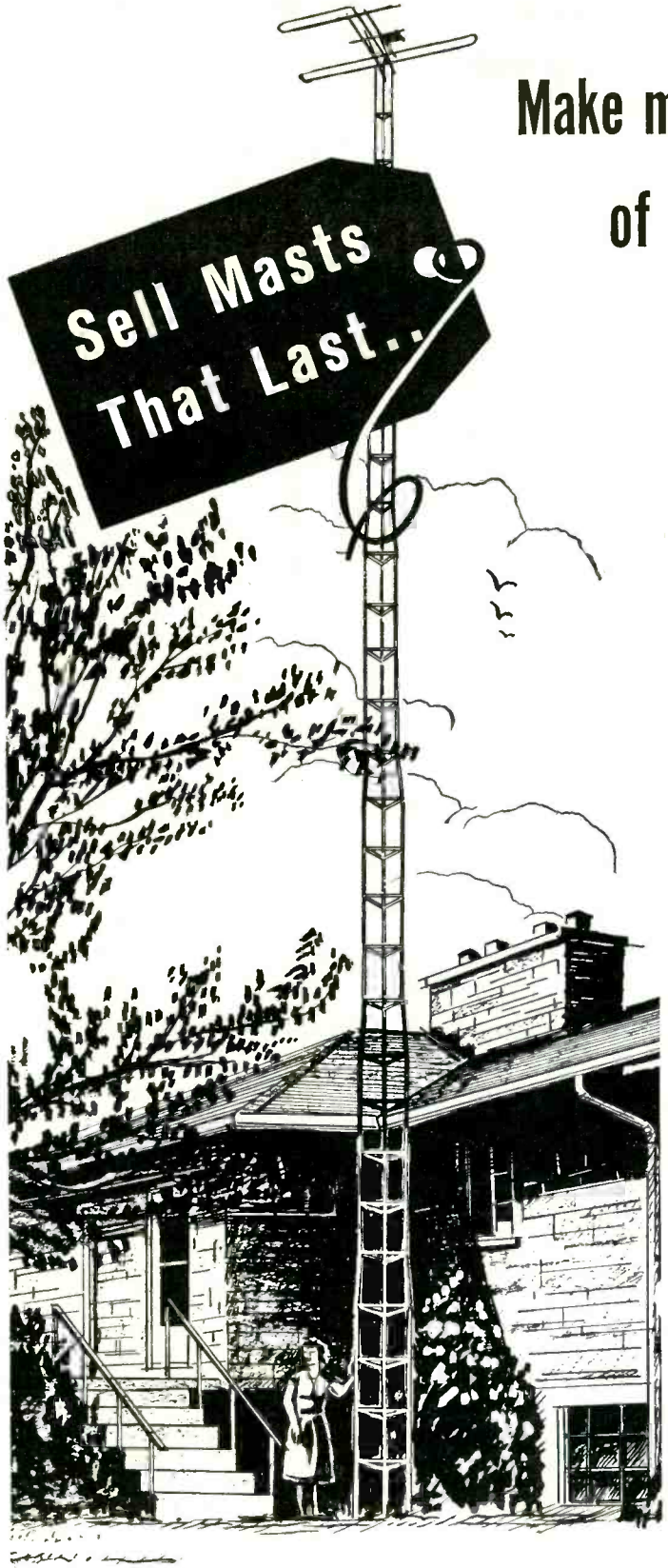
8/25/8



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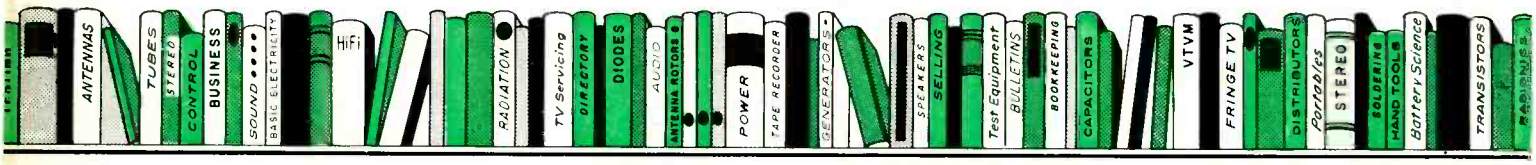

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By J. Derman, F. Makstein & H. Seaman. Both theory and practical construction designs are examined, along with maintenance techniques and procedure for determining size of air conditioner required. Covers motors, compressors, condensers, evaporators, regulating valves, circuits and other system elements. Soft cover, 160 pages. Price **$3.50.**

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By Robert Swiggett. The application of various printed circuits—ceramic based, etched, plated and others—to electronic devices is clearly explained, along with manufacturing methods and characteristics. Section on servicing tells how to replace components without damaging circuit. Soft cover, 112 pages. Price **$2.70.**

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By Alex Schure. This five-volume "picture book" course on all aspects of TV is illustrated in a personalized way to make all concepts easily understood. Theory and performance of the transmitter, receiver, antennas, circuits, etc., are explained. Contains more than 700 illustrations. Soft cover, 5 vols., 688 pages. Price **$10.00/set.**

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By Van Valkenburg, Nooger, Neville. Over 25,000 Navy trainees have learned electronics with this easy-to-read "picture book" course. Over 800 drawings support the five-volume text covering rectifiers, amplifiers, antennas, oscillators, multipliers, transmitters, receivers and many other electronic circuits. Soft cover, 5 vols., 550 pages. Price **$10.00/set.**

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By Jack Darr. Entire text is slanted from the practical viewpoint on overcoming the problems in maintaining and installing auto radios. Included are discussions on antennas, noise elimination, speakers, remote heads, intermittents, parts replacement, realignment, tuners, instruments and tools. Soft cover, 128 pages. Price **$1.80**

RADIO OPERATOR'S LICENSE Q & A MANUAL

By Milton Kaufman. This sixth edition gives you the information you need to pass FCC license examinations. In question and answer form similar to actual FCC tests, all eight elements are covered, including law, radiotelephone, radiotelegraph, aircraft and ship radar. Abbreviations, code, etc. included. Hard cover, 736 pages. Price **$6.60**

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INTRODUCTION TO COLOR TV

By M. Kaufman & H. Thomas. This second edition starts with color fundamentals, and goes through tricolor picture tubes, receiver functioning and how to make required adjustments. Subcarrier, matrix, quadrature amplifier and convergence arrangements are among specific details included. Soft cover, 160 pages. Price **$2.70.**

STEREOPHONIC SOUND

By Norman Crowhurst. This first assessment of the new stereo techniques sweeping the hi-fi field starts with the basics of binaural listening, and then concentrates on actual systems. Subjects include radio, disc, tape, recording procedure, speaker placement, system construction and theatre systems. Soft cover, 128 pages. Price **$2.25.**

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By Eugene Ecklund. This practical manual on the repair of record changers covers mechanical elements, such as drives, tripping and dropping mechanisms, change actions and spindles. It also explains pickups, needles and motors. Amplification compensation, fault location and tests are included. Hard cover, 278 pages. Price **$5.95.**

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By George Chute. How various electronic devices operate, and how they are employed in industry is clearly explained with little use of mathematics. Subject matter includes rectifiers, time delays, gas tubes, welding controls, ignitrons, heat and light relays, thyratrons, motors, servos and others. Hard cover, 431 pages. Price **$8.00.**

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HANDBOOK OF BASIC CIRCUITS, TV, FM, AM

By Matthew Mandl. The schematics and functions of 136 carefully selected circuits found in home and industrial electronic products are analyzed. AVC bridges, AGC, dampers, sawtooth, discriminators, limiters, splitter, sync stretchers, multivibrators and doublers are among the many important ones presented. Hard cover, 365 pages. Price $7.50

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By Matthew Mandl. Extensive coverage of TV circuit functions and troubleshooting procedures makes this a practical reference. Trouble index relates symptoms and probable cause to text. Antennas, transmission lines, use of test instruments, UHF and color TV are included, as well as b&w TV stages. Hard cover, 460 pages. Price $6.50.

CLOSED CIRCUIT AND INDUSTRIAL TELEVISION

By Edward Noll. The technical and business aspects of closed circuit systems are explained in detail. Commercial equipment is described, along with construction information. Scanning process, picture transmission, camera tubes and circuits, video amplifiers, sync, adjustments and optics are explained. Soft cover, 230 pages. Price $4.95.

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By Milton Kiver. The unique characteristics of signals broadcast at ultra-high frequencies require specially designed circuits and components. This volume explains the technical functions and precautions involved in UHF equipment. Data relates to TV channels 14-83 and communication bands. 376 illustrations. Hard cover, 414 pages. Price $7.50.

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EDITORIAL: ELECTRONIC TECHNICIAN's 303.67 editorial pages in the first six months of 1958 is 38.2% to 131.3% greater than all competing publications.

RENEWAL: ELECTRONIC TECHNICIAN's subscription renewal rate of 51.19%, ABC 12/57, compares with 32.09% to 37.27% for other magazines in the field.

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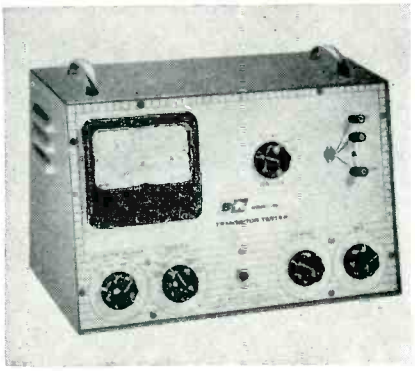
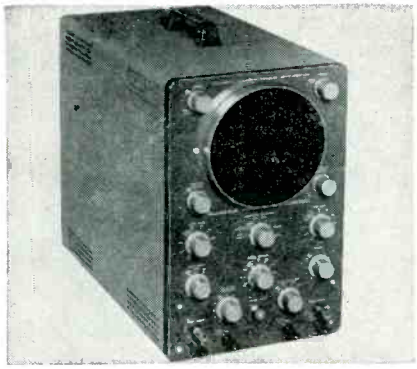
B&K TRANSISTOR TESTER



Model 150 professional-type transistor tester accurately measures junction transistor Beta, and actual grounded emitter current gain. Reads Beta directly on meter. Accuracy is within 5%. Beta measurement is made with a calibrated and small ac signal. Built-in generator contains transistorized 1 kc oscillator with buffer amplifier. It has mercury cell supply, burn-out proof circuitry, and tests both PNP and NPN. Price $179.50. B&K Mfg. Co., 3726 N. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 8-16)

Heath OSCILLOSCOPE KIT

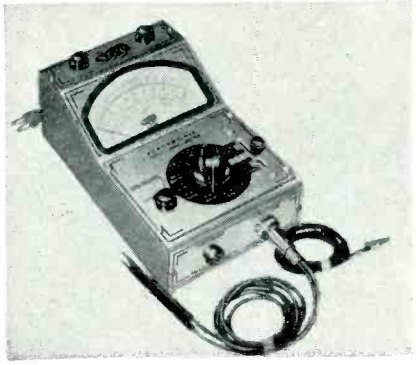


Model 0-12 5" scope kit offers vertical frequency response from 3 cps to 5 mc plus 1.5 db minus 5 db without extra switching. Response is down only 2.2 db at 3.58 mc. Sweep circuit functions effectively from 10 cps to better than 500 kc in five steps. Automatic sync linearity and lock-in. 1 v. peak-to-peak calibrating source. Provision is made for Z-axis input for intensity modulation. Price $64.95. Heath Co., 305 Territorial Rd., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 8-17)

Shell TUBE TESTER

Portable tube and vibrator tester model P-18 is built into a lightweight attache case. It contains 18 sockets which will test over 800 tube types, plus three sockets for testing 6 or 12 volt vibrators. Contacts conform to military specifications for positive contact and long life. It will check each side of multi-purpose tubes independently by emission. Three controls are employed for quick checking. Weight approximately 12 lbs. Shell Electronic Mfg., 1688 Utica Ave., Brooklyn, N. Y. (ELECTRONIC TECHNICIAN 8-18)

Seco VTVM



Model 208 VTVM features a 4½" 200-microamp meter mounted on a sloping panel. It provides 7 dc, 7 ac, and 7 ordinary ohm ranges, plus a special EIA ohm scale to check standard color coded resistance values and tolerance limits. Accuracy is within 3%. "Shift-lever" type function switch allows you to change functions fast, without looking. Color coding on function switch identifies proper probe. Price is $74.50. Seco Mfg. Co., 5015 Penn Ave. S., Minneapolis, Minn. (ELECTRONIC TECHNICIAN 8-19)

HP SIGNAL GENERATOR

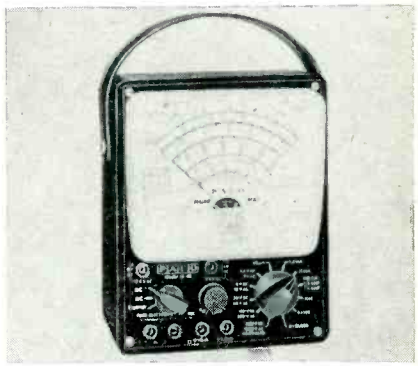
The 606A signal generator is a precision instrument covering the broad frequency range 50 kc to 65 mc. Output is 3 volts full range, and may be continuously attenuated to 0.1 μv. The 606A employs the master oscillator power amplifier circuit with a full feedback loop, insuring constant output over the full frequency range. It has extremely low distortion even at high modulation levels. Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 8-22)

Du Mont OSCILLOSCOPE

Type 401-A is a general purpose, low frequency oscilloscope offering high gain, identical amplifiers, automatic synchronization, and a wide range of sweeps. Other highlights include an exclusive externally or internally triggered "electronic shutter" for beam brightening during X- and Y-plotting procedures. Also, X- and Y-amplifier controls may be used continuously without disturbing the calibration. Available are either an electronic power supply or a voltage regulating power transformer. Allen B. Du Mont Labs., Inc., 760 Bloomfield Ave., Clifton, N. J. (ELECTRONIC TECHNICIAN 8-21)

Paco VOM KIT

Model M-40 VOM kit features extended ranges and high sensitivity on ac and dc voltage ranges (20,000 ohms v./dc, 10,000 ohms/v. ac). Include 4-5/8" 50 μa Pace meter and deposited-film and wirewound resistors. Specifications: 7 dc voltage ranges 1.5 to 6000 v; 7 ac ranges 3 to 12,000 v; 3 resistance



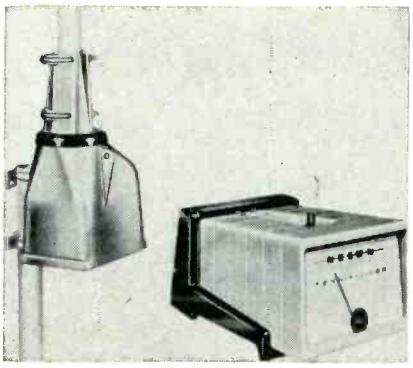
ranges to 20 meg; 6 dc current ranges 0-60 μa to 15 amp. Price is $31.50. Also available is AM-1 HV probe at $5.95 for measurements to 30 kv. Paco Electronics Co., 70-31 84th St., Glendale 27, N. Y. (ELECTRONIC TECHNICIAN 8-20)

New Products for Technicians

For more information, write in ELECTRONIC TECHNICIAN'S new product code number on coupon on page 40.

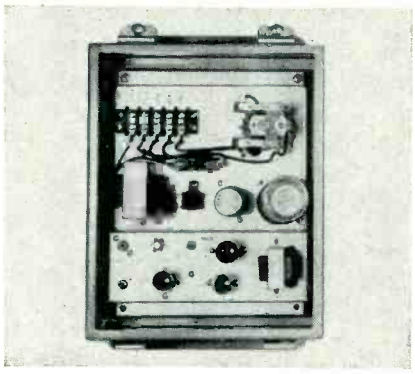
Channel Master ROTATOR →

The Tenn-A-Liner, Model No. 9522, features high torque parallel circuit. It permits rotator to be turned even if indicating device should fail to function. Other features are: automatic brake; heavy duty gears; automatic self-calibration for different lengths of control cable; continuous direction indication switch operating independent of the motor. Carries 90-day instant replacement warranty to dealer. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 8-8)



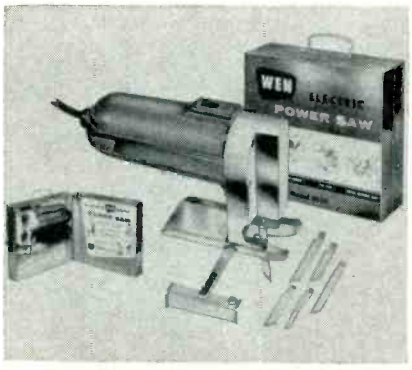
Perma RADIO CONTROLS →

Remote signal system, actually a radio controlled switch, consists of transmitter, receiver, antennas, and mounting hardware. It may be used to control commercial and residential devices such as entrance gates, remote lighting, watchman signaling, burglar alarms, warehouse doors from plant truck, docklights from boats, and many others. Operating distances from a few feet to over one mile. 115 v. ac, 6 or 12 v. dc. Perma-Power Co., 3100 N. Elston Ave., Chicago, Ill. (ELECTRONIC TECHNICIAN 8-9)



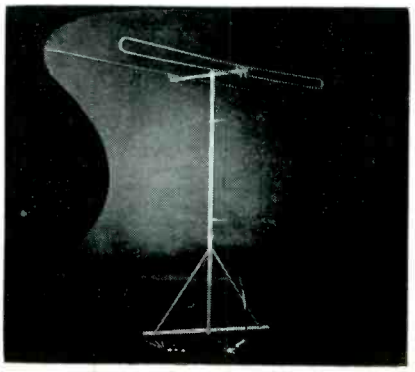
Wen POWER SAW KIT →

"8 Saws in 1" power saw is now made available in kit form for $32.95 list. Kit consists of metal carrying case, saw, circle cutter, rip-sawing attachment and 5 assorted blades. Include 3 wood cutting blades ranging from coarse to a fine scroll, and 2 metal and plastic cutting blades. Blades from 7 to 32 teeth/in. 115 v. ac/dc motor, 1.8 amp. rating. Develops 2650-⅝" strokes per minute under load. Wen Products, 5806 Northwest Hwy., Chicago 31, Ill. (ELECTRONIC TECHNICIAN 8-10)



Trio FM ANTENNAS →

Line of FM antennas to meet growing interest in Hi-Fi radio has three models: FM-1K, turnstile type; the FM-2K, inline; and FM-6, 6 element broadband yagi antenna with wide spaced elements. Models FM-1K and FM-2K are offered with installation kit including universal roof mount, 60' of leadin, standoffs, etc. Shown is FM-2K which lists at $14.95. Model FM-1K, turnstile kit lists at $15.50 and FM-6 at $15.95. Trio Mfg. Co., Griggsville, Ill. (ELECTRONIC TECHNICIAN 8-11)



Kay-Townes ANTENNA

An outdoor VHF antenna designed for fringe and deep fringe areas, the "Clear-View" is an 8-element unit with high level gain and low wind resistance. Available in one and two bay units, CV-1 and CV-2. Kay-Townes Antenna Co., Box 593, Rome, Ga. (ELECTRONIC TECHNICIAN 8-14)

Walsco "TIP TAPPER"

A new tool for radio-TV servicemen, called the Tip Tapper, serves as a combination tube tapper, probe and screwdriver. The Tip Tapper, which is 12" long has one screwdriver end. The other, tapping end has a hard portion for normal shock tests and a sponge portion for ultra-sensitive tests. The entire unit is made of unbreakable butyrate plastic to prevent shocks. Walsco Electronics Mfg. Co., 100 W. Green St., Rockford, Ill. (ELECTRONIC TECHNICIAN 8-13)

Ungar SOLDERING KIT

Deluxe soldering kit features the featherweight handle, and 16 readily interchangeable tips and tiplets to provide a tip temperature variation from 650° to 1000°. Because of this interchangeability, this one kit is adaptable to handle any soldering assignment. With the extra length that tiplets provide, hard to get at locations are easily reached. It comes in a goldtone metal carrying case, complete with handles and clasps. List $25.00. Ungar Electric Tools, Inc., 4101 Redwood Ave., Los Angeles 66, Calif. (ELECTRONIC TECHNICIAN 8-15)

JFD INDOOR ANTENNAS

Exact replacement antennas include model TA359 Periscope for RCA 1957, Magnavox 1956-7 and Motorola 1956 portable TV receivers, and TA360 replacement antenna for General Electric and Hotpoint 14" and 17" portable TV sets. Also available is the Merlin Indoor Antenna designed for concealed back-of-the-set installation, a new antenna featuring 2-section aluminum dipoles called the Belair; and the TA146 Jewel, only 13 inches high, with 4-section chromed brass dipoles and a heavily weighted tip-proof base. JFD Manufacturing Co., 6101 Sixteenth Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 8-12)

Split Channel

(Continued from page 27)

equipment manufactured prior to 1949 is in use today which, short of a complete change in design, will never be satisfactorily converted to meet the narrow channel technical requirements.

Depending upon the initial design philosophy, the conversion of a wide band receiver to meet the new narrow channel technical requirements may be a formidable task requiring many man-hours of labor, considerable expense and the revision of a significant portion of the receiver circuitry. On the other hand, some manufacturers have provided conversion kits and detailed instructions which permit conversion of their wide band sets with little labor and few circuitry changes.

Conversion of a receiver consists of several basic steps. The first is a change in the overall selectivity characteristic. This may require the simple interchange of a passive filter element or it may require the disassembly and reworking of several i-f transformers. The second step would be a change in the discriminator slope to increase the audio recovery from the 5 kc carrier deviation. Coupled with the discriminator conversion is a revision of the squelch circuitry and limiter stages to assure reliable squelch operation and adequate signal limiting. The next step would be the addition of a heated crystal and any oscillator circuitry modifications which might be needed to bring the receiver stability up to that which meets the new narrow band technical standards.

Ultimately, all equipment will be replaced with new equipment which meets the specified technical requirements.

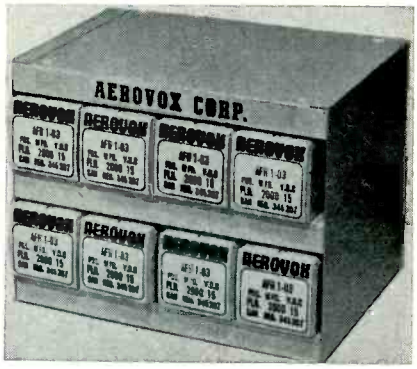
Every effort should be made to convert existing equipment to the new "split" channel technical standards at the earliest possible date. Such conversion will significantly reduce the interference between existing wideband systems and new systems occupying the split-channel frequency assignments. Another advantage of immediate conversion is the elimination of integration problems which would arise as new equipment, meeting the split channel technical standards is added to existing systems. •

New Components & Tubes

For more information, write in ELECTRONIC TECHNICIAN'S new product code number on coupon on page 40.

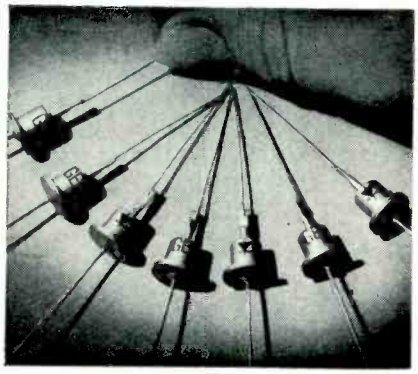
Aerovox ELECTROLYTIC KITS →

Designed exclusively for service applications in radio and TV replacements, two new "Stack-A-'Lytic" capacitor kits incorporate 8 of the most popular AFH twist-prong electrolytics. All electrolytic units are boxed and housed in a free metal cabinet. Cabinets allow for expansion of dealer's inventory with a positive locking feature that enables the purchaser to add additional "Stack-A-'Lytic" cabinets. Distributor Div., Aerovox Corp., New Bedford, Mass. (ELECTRONIC TECHNICIAN 8-1)



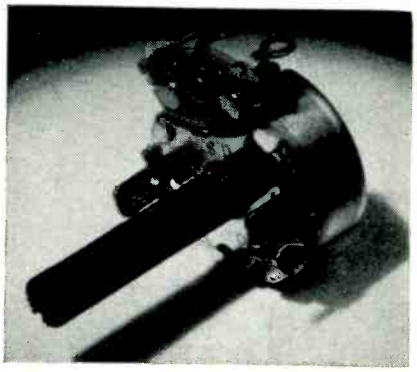
GE SILICON RECTIFIERS →

Two new families of economy-priced low current silicon rectifiers are available. Four rectifiers comprising the 100°C family have been JETEC type-designated IN1692, IN1693, IN1694 and IN1695. PIV is 100 to 400 v. Output of 250-ma dc at 100°C. Forward drop is only 0.6 v. Leakage is 0.5 ma. The 125°C family of rectifiers with less leakage are IN1487, IN1488, IN1489, IN1490, IN1491 and IN1492. Semiconductor Products Dept., General Electric Co., Syracuse, N. Y. (ELECTRONIC TECHNICIAN 8-2)



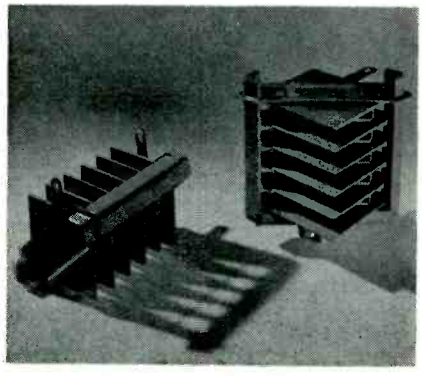
Clarostat CONTROLS →

Series B47 tab mount controls for the service trade includes 25 resistance values meeting just about every electrical requirement. Each unit has a 1" long, knurled and slotted, phenolic shaft that can be used "as is" or readily altered to fulfill most applications. Their widespread use as initial equipment, and replacement percentage factor now warrant tab mount controls as standard catalog items. Clarostat Mfg. Co., Inc., Dover, N. H. (ELECTRONIC TECHNICIAN 8-3)



Federal SELENIUMS →

"Slim-Line" selenium rectifier line for radio & TV consists of two sizes which cover the range from 150 to 450 ma for half-wave rectifier applications and B-plus supplies in voltage doubler circuits. They feature a sturdy yoke-type construction which engages the corners of the selenium cells eliminating center holes. 1" sq. cell stacks carry 300 ma. Components Div., International Telephone and Telegraph Corp., Clifton, N. J. (ELECTRONIC TECHNICIAN 8-4)



Westinghouse INDUSTRIAL TUBE

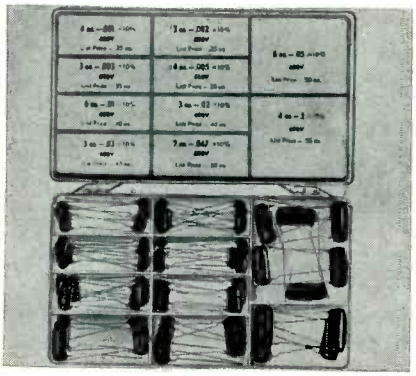
An industrial receiving tube for use in 2-way mobile communications, the seven-pin miniature Type 7167, is a low noise, high gain VHF tetrode. It's intended for transmitters and receivers where the heater voltage is supplied directly from the 12 volt automotive battery. In addition, the 7167 employs a coiled heater which mechanically improves its resistance to shock and vibration. Westinghouse Electronic Tube Div., Elmira, N. Y. (ELECTRONIC TECHNICIAN 8-7)

RCA POWER TUBE

The 7212 is a small beam power tube electrically equivalent to 6146, but designed for applications where dependable performance under severe shock and vibration is essential. It is useful as an r-f power amplifier and oscillator as well as an a-f power amplifier and modulator. Plate dissipation is 25 watts. It can be operated with full input to 60 mc and with reduced input to 175 mc. Because of its high gain and high efficiency, the 7212 can be operated with relatively low plate voltage to give large power output with small driving power. Electron Tube Div., Radio Corp. of America, Harrison, N. J. (ELECTRONIC TECHNICIAN 8-6)

Elmenco CAPACITOR KIT

Kit #15 of miniaturized tubular bypass capacitors contains an assortment of 39 units in a variety of values, all rated at 600 v. This DP series is non-inductively wound and vacuum dipped for solid impregnation. Tolerance is



10%. Leads are axial and crimped to facilitate use in printed circuits. Special winding provides high insulation resistance. Also useful for transistor circuits. Arco Electronics, 64 White St., New York 13, N. Y. (ELECTRONIC TECHNICIAN 8-5)

Catalogs & Bulletins

CAPACITORS: A 4-page brochure provides: descriptions; illustrations; specifications; test data; and applications. Includes a list of distributors. Vitramon, Inc., P. O. Box 544, Bridgeport 1, Conn. (ELECTRONIC TECHNICIAN B8-7)

CHOKES: A 4-page folder contains illustrations and specifications covering 17 types of chokes including: ferrite bead, ferrite core, MIL-inductance and RF. National Co. Inc., Malden 48, Mass. (ELECTRONIC TECHNICIAN B8-6)

CAPACITORS: Tubular and upright types of sub-miniature electrolytic capacitors are covered in a new catalog sheet. Voltage range, temperature ranges and physical specifications are included. Illinois Condenser Co., 1616 N. Throop St., Chicago 22, Ill. (ELECTRONIC TECHNICIAN B8-5)

TOOLS: A new comprehensive 20-page catalog, No. 26, lists pliers, snips, chisels, punches and drills. Kraeuter & Co., Inc., 585 18th Ave., Newark 3, N. J. (ELECTRONIC TECHNICIAN B8-3)

ELECTRONIC COMPONENTS: A 28-page multi-color catalog, S-58, covers adapters, connecters, jacks, plugs, switches, etc., giving illustrations, prices, schematics and dimensional drawings. Many new products are included. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill. (ELECTRONIC TECHNICIAN B8-4)

SEMICONDUCTOR PRODUCTS: A new 6-page folder provides a convenient reference to the firm's full line of semiconductor products. The arrangement is by product category and covers all electrical and physical characteristics. Semiconductor Div., Hoffman Electronics Corp., Evanston, Ill. (ELECTRONIC TECHNICIAN B8-2)

WIRE & CABLE: Catalog #107 and a new supplement contain many new items. The complete line of TV, inter-com, and audio wire and cables, plus TV service aids are listed. Rotator cable, antenna wire and kits are also included. Columbia Wire & Supply Co., 2850 W. Irving Park Rd., Chicago 18, Ill. (ELECTRONIC TECHNICIAN B8-1)

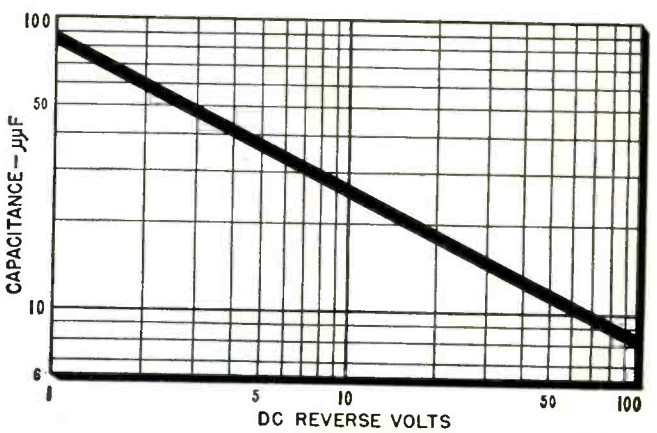
Silicon Diode Used As A Variable

Junction Rectifier Can

• From the first day silicon diodes were manufactured engineers have been making capacity measurements of silicon junctions, principally for the purpose of increasing their frequency response in rectifying applications. A by-product of the knowledge gained is the recently-introduced application of silicon junctions as variable capacitors. Fig. 1 shows a typical voltage-capacity curve for International Rectifier Corporation's style "S" diodes. This curve shows the capacity variation inversely proportional, approximately, to the square root of the bias voltage applied. Fig. 2 illustrates the oscillator and ratio detector circuits of a popular frequency-modulated tuner kit. The darker lines show how a 3DS1 diode can be installed as an automatic frequency control device. The afc defeat switch is necessary because the 1.5 volt bias in this receiver allows more than a 2 megacycle swing of the local oscillator and would therefore skip weak stations located between two stronger ones. The 1.5 volt bias is obtained from the cathode of the first i-f amplifier. Variations in this voltage do not affect the frequency of the local oscillator, due to the fact that a change in the output of the ratio detector would make the necessary correction in the capacity of the diode.

It can be seen that the diode directly replaces a reactance tube which might be used to accomplish the same result. The other components used are identical to values

Fig. 1—Capacitance vs bias for the 3DS1 silicon diode at 1,000 cycles.



Capacitor

Replace Reactance Tube

in a reactance tube circuit, with the exception that no cathode resistor and bypass capacitor are necessary. Filament and plate supplies also are not used, reducing hum which might be generated. The extremely low power dissipation in this application insures that the diode will last almost indefinitely.

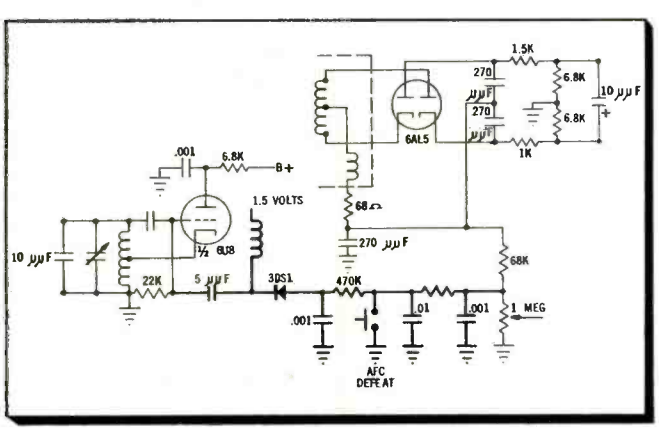
The type of diode to be used is principally dependent upon the bias which will be applied to it. The bias plus the oscillator voltage must not exceed the peak inverse voltage rating of the device. The diode should be biased sufficiently to prevent the oscillator output from driving the diode into the forward or conducting direction, as clipping would result.

Other possibilities for variable capacity diodes are: Sweep frequency generators; radar and radio jamming (replacing motor-driven capacitors), and frequency modulated transmitters—the latter being particularly desirable in aircraft because it reduces the weight of the equipment. Electronically tuned receivers and generators are also a possibility. •

CREDITS & ILLUSTRATIONS

Wm. Gibson, International Rectifier Corp.

Fig. 2.—The 3DS1 diode installed as an AFC device in an FM receiver.



New Books

Books marked with an asterisk (*) may be obtained prepaid from Electronic Technician

***BASICS OF DIGITAL COMPUTERS.** (3 vols.) *By John S. Murphy. Published by John F. Rider Publisher. 416 pages, soft cover. $6.95/set.*

Using the easy-to-learn picture book technique, these three volumes explain the theory and functions of digital computers—in a way the average electronic technician can understand. Mathematics is almost non-existent in the text. The "humanized" illustrations are pleasurable to examine, as well as educational. Vol. 1 covers fundamentals, counting systems, computer language, programming, and how computers memorize and follow orders. Vol. 2 discusses logic diagrams, flip-flops, clamping, circuits, magnetic cores, decoders and coder. Vol. 3 explains memory, reading, recording, writing, control, timing, input-output and data processing. In brief, these volumes are very good—and are highly recommended.

PIN-POINT COLOR TV TROUBLES IN 15 MINUTES. *By Harold P. Manly. Published by Coyne Electrical School. 500-526 S. Pauline St., Chicago 12, Ill. 548 pages. Paper cover. $5.95.*

150 types of faulty pictures and sound which may be caused by over 1,000 troubles are described. From a practical viewpoint, the book deals with trouble location and correction. Extra heavy covers fitted in a plastic binding permit this almost 1½-inch thick volume to lie flat for field use. Theory is presented only where necessary. Tables of symptoms, trouble shooting charts, comparison with b&w TV troubleshooting are all geared to help fix the set faster.

***HIGH QUALITY SOUND REPRODUCTION.** *By James Moir. Published by The Macmillan Co. 613 pages, hard cover. $14.*

Here is one of the most thorough and rigorous treatments of high fidelity and associated topics such as hearing, acoustics and all related components and equipment. Included are microphones, recorders, amplifiers, transformers, feedback, tone controls, rectifiers, speakers, networks and stereo. The extensive coverage of curves, circuits and mathematics make this text a valuable addition to the technical library of the more advanced electronic technicians engaged in audio work.

Specially Selected
List of Electronic Books
See Pages 42 & 43

***MEDICAL ELECTRICAL EQUIPMENT.** *Advisory Editor, Robert E. Malloy. Published by Philosophical Library, Inc. 312 pages. Hard cover. $15.00.*

Principles, installation, operation and maintenance of electrical equipment used in hospitals and clinics are aptly described and illustrated. There is a real and urgent need for authoritative information on medical electrical equipment presented in easy to understand terms. No less than 21 people have contributed material for this book. There are 238 illustrations.

***VACUUM TUBE RECTIFIERS.** *By Dr. Alexander Schure. Published by John F. Rider Publisher, Inc. 78 pages. Paper cover. $1.50.*

This book meets the high standards of accuracy and readability found in the other volumes of the Electronic Technology Series. Coverage includes physical characteristics of single-phase and polyphase rectifiers, output filter circuits and filter design data. Theory and circuitry are also given for half-wave and full-wave rectifiers and voltage-multiplying circuits. Tables of tube characteristics supplement design theory to make this a practical as well as a theory book.

(Continued on page 54)

Association News

California

The Television Electronic Association of Marin County (TEAM) has joined with San Mateo and San Francisco in becoming a full fledged member of NATESA. This brings together a large portion of the electronics industry in the northern part of California. Representing TEAM are Pres., Ralph Lee Hoy; V.P., George A. Klein; Secy., Oakley W. Dexter Jr.; and Treas., Cecil Brown. NATESA director is Len Schaub and alternate is Art Gildings.

CSEA officials who have patiently sought to negotiate safe agreements for the service industry if and when pay TV becomes a reality were bitter about the "run around" they have been given by Skiatron and others. Schmitt added that it also has become obvious that NBC and CBS will, of necessity, have to go into toll television if other companies succeed in doing so. In joining the growing number of foes to proposed toll TV systems, CSEA is following the lead of NATESA which has been vigorously fighting it for the past number of months.

Illinois

NATESA's 10th Annual Convention takes place in the Congress Hotel in Chicago from August 22nd through 24th, 1958. Included in the program are business, technical and social activities. Men, women and children will pay $12.50, $10.00, and $7.00 respectively.

In addition to TEAM from California, NATESA reports that the following associations have also signed up: Illinois, TESA; Iowa, TSA; Louisiana, TESA; Missouri, TESA; Ohio, ETAT; Pennsylvania, RTTA; and TEA; Texas, Tri-State TV Assn.

The Association of Radio & Television Service of St. Joseph Valley, Inc., with headquarters at 1901 Miami St., South Bend, has just celebrated its third birthday. The Association, better known in the area as ARTS of St. Joseph Valley, became a formal organization on June 14, 1955, and is affiliated with NATESA. They have been actively trying to upgrade the TV service industry. Officers are: Pres., Russ Bills; V.P.'s, Andy Kramer, Bill Rapport; Secy., Cas Molenda; Treas., John Read; Sgt.-at-Arms, Ed. Thompson; and Chairman of the Board of Directors, John Frick.

Indiana

At the annual membership meeting of the Indiana Electronic Service Association, the following officers were elected: Chairman, Charles A. Conwell; V. Chair., James W. Baker; Secy., Robert M. Sickels; and Treas., Edward T. Carroll. The annual membership meeting was held in the Sheraton-Lincoln hotel, Indianapolis. To aid in increasing the membership, dues for 1958 was reduced to $5.00 per local member. A committee to help new associations to organize and affiliate with IESA was formed.

Kentucky

Kentuckiana Television & Radio Technicians' Association, Inc., of Louisville, elected: Pres., C. T. Simmons; V.P., Jim Hall; Secy., Lou Wilkes; and Treas., Art Johnson.

Michigan

The Oakland County Electronics Association, Inc. in Pontiac, elected the following officers and board members: Pres., Bernard Seiber; V.P., John Stefanski; Secy., Thomas E. Johnson; Treas., Bill Holcomb. Board Members: Chairman, Sigmund Schimiloski. Robert Dalby, Dick Jorgenson, Quinton Sweet, Andy Condon, Ralph Norton and Bill Obel. With the aid of publicity by the Pontiac Chamber of Commerce and the Pontiac Press over 40 TV sets were donated by consumers and repaired by the members of OCEA and delivered free to local institutions.

New York

ARTSNY has just completed a 10-week color TV course. Plans for future training include air conditioning and other technical subjects of interest. Courses will be set up for groups of 30 or more. Manufacturers wishing to talk about their products or present technical lectures are invited to contact this organization.

(*Continued on page 61*)

(New Books, Con't. from page 52)

***FEEDBACK THEORY AND ITS APPLICATIONS.** *By P. H. Hammond. Published by the Macmillan Co. 350 pages. Hard cover. $7.00.*

The aim of this book is to present well-tried methods of linear and non-linear feedback system analyses and to illustrate their application to a variety of engineering devices. The book is intended for post-graduate engineering and physics students. Servomechanisms, controllers and electronic analogue simulators are covered.

***PORTABLE AND CLOCK RADIOS.** *By Ben Crisses and David Gnessin. Published by John F. Rider Publisher, Inc. 128 pages. Paper cover. $2.75.*

Theory and other basic information have been kept to a minimum so that practical information could be emhasized. Emphasis is given to filament circuitry and current drain problems. Three chapters are devoted to repair, replacement and alignment. Another section discusses design improvements. Still other sections include dial stringing and clock mechanisms. Transistorized circuits are also included.

***ELECTROSTATICS.** *By Dr. Alexander Schure. Published by John F. Rider Publisher, Inc. 72 pages. Paper Cover $1.35.*

Basic to understanding electric current is a firm knowledge of electric charges and electric fields. This book covers a lot of ground in explaining one of the cornerstones of electricity. It considers fundamental physical units and quantities preparatory to the study of Coulomb's Law, Gauss's Law and others. The electric field is covered both quantitatively and qualitatively making liberal use of worked out examples. The cgs and mks unit systems are explained; capacitance and capacitors are analyzed. A final chapter is devoted to electrostatic applications.

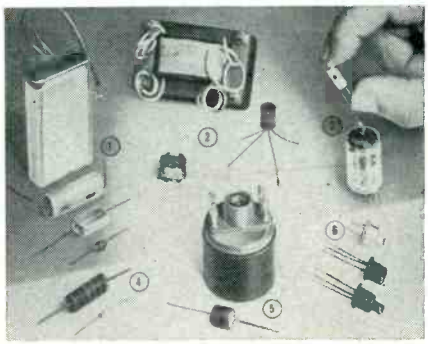
Semiconductors

(Continued from page 36)

of the dinosaurs in the past ages.

That day has been postponed, for at least another decade or two by the advent of the transistor. The simplicity, small size and the reliability of the transistor have given military electronics in its more complicated forms a new lease on life.

The possibility of computers which might perform a type of thinking was foreseen by Dr. John A. Morton, Director of Device Development. He said that computers with from 10 to 100 times the speed and complexity of today's models are almost a certainty. We can possibly look forward to electronic systems that can learn from their past experience in helping themselves to solve new problems. If we still insist these future machines cannot think, we shall have to redefine our concept of thought. The extensions to man's mind made possible by solid state electronics will yet have a greater impact upon so-



Electronic components miniaturization, made feasible by the transistor. The components include: 1—capacitor with three miniaturized units; 2—transformer with two transistor circuit models; 3—typical vacuum tube compared with point-contact transistor in case; 4—resistors; 5—inductors; and 6—three recent production models of transistors.

ciety than the nuclear extension of man's muscle.

Among many developments past and future, Dr. W. J. Pietenpol, Director of Solid State Devices Development predicted the use of an electronic switching device, known as "TASI," scheduled for installation in 1959. TASI provides a switching means so that the idle time in telephone conversations can be used to provide additional channels. During pauses or listening times, a talker is disconnected from the channel so it may be used for another; upon resumption of speech he is automatically reconnected.

The field of electronics is, today, one of ever more importance to modern technology. It has become an important part of our daily life with radios, TV, telephones, X-ray, fire control, radar, machine controls and others too numerous to mention. Electronics has grown from a business of less than one billion dollars in 1938 to 13 billion dollars in 1958, which ranks it in fifth place in our industrial empire. Electronics offers man a tool for analyzing, controlling, and transmitting vast quantities of information. Without these electronic instruments, we would be lost in the maze of modern technology. The complexity of modern electronic equipment makes necessary the use of hundreds, thousands, tens of thousands, and sometimes millions of electron devices within any given system. Thus, we have become aware of the importance of high efficiency, low power requirements, small size, high reliability and low cost. It is by fulfilling these qualities that the transistor has found a place of major importance in the rapidly expanding electronics industry. •

AUDIO FIDELITY tells one and sundry that "STEREO-DISC" is its trademark.

WELLCOR has introduced equipment cabinets E-1 and E-2.

JENSEN INDUSTRIES' new cartridge line is being promoted on counter display cards holding six of the most popular types.

BELL & HOWELL has appointed Sanford Electronics as distributor for its tape recorder line in the New York and Newark areas.

PILOT RADIO has named George Solomon Co., New York, export rep in certain Latin American countries, including Cuba and Puerto Rico.

BOGEN is using extrusions in its cabinets, a departure from usual stamped sheet metal. Plastic extrusions are made by ANCHOR PLASTICS; aluminum extrusions by ETCHED PRODUCTS.

ALTEC-LANSING has introduced the Model 29A cardioid condenser microphone only 3/4" in diameter, 7/8" long, weight 1.75 oz. The company has also come out with the 1567A mixer preamp for PA and remote broadcast systems. Gain is 97 db; response 30-15,000 cps within 1 db.

AUDIO REPORTS, INC., hi-fi market research organization, asserts in their statistical report, The Hi-Fi industry, that as of March 1, 1958 people interested in hi-fi planned to buy stereo in this manner: 14% through the spring; 11.2% during the summer; 32.4% after summer; 42.4% no definite plans. Study, which includes much additional data, is based on interviews with 5145 people, 2945 of them consumers at hi-fi shows, 2200 dealers and salesmen.

PHILCO has broken with a complete needle line, including a compact plastic counter merchandiser. A 24-page catalog identifies any needle type and converts over 1000 competitive needles to Philco numbers.

SHURE distributor sales manager Ray Ward says monaural hi-fi is still an excellent buy, particularly since it can be converted to up-and-coming stereo. He points out forthcoming technical improvements and possibly unsettled prices as favoring present monaural purchases.

FIDELITONE has come out with a replacement stereo diamond needle priced at $16.95. It's just under 0.7 mil. Pres. Douglas Hudson estimates that stereo cartridges will replace monaurals by 50%, accounting for 2.5 million units, based on 1958 production. For 1959, 5 million stereo cartridges are anticipated.

GENERAL [illegible] is introducing the GC-5 stereo cartridge, similar to the GC-7, but with 0.5 mil diamond needle, and priced $3 higher @ $26.95. Performance ratings are better: 2 to 4 gram tracking; 20 to 20,000 cps; lateral compliance 4; vertical compliance 2.5. It's designed for high quality turntable arms.

WEBCOR's new stereo line includes console phonos from $179.95 to $475, and tape recorders in the $199.95-$319.95 range. Also available are speakers and amplifiers from $49.95 to $149.95. Second-channel equipment for directive frequencies over 150 cps is included.

PARAMOUNT ENTERPRISES has come out with a low-cost stereo record player demonstrator with earphones. The firm has announced the Hallmark 715 stereo console with VM or MONARCH changers listing at $299.95.

TV Test Equipment

(*Continued from page 31*)

maximum signal transmitted for a test pattern. If desired, 100% saturated video can be injected into the color receiver circuits after the video detector, but true 100% saturated color bars should not be applied as a modulated r-f signal at the antenna-input terminals.

When a modulated r-f color-bar signal is applied to the receiver and viewed at the output of the picture detector with a wide-band scope, the signal may not look as clean as the video output taken directly from the generator, as shown in Fig. 6. Noise and beat voltages are introduced by the receiver signal circuits. The better the alignment of the receiver, and the better the design of tuned circuits, the more faithful is the reproduced video signal.

Of great use in practical servicing procedures are the individual outputs of the luminance and chrominance components of the complete color-bar signal available in some generators. Fig. 7 shows the luminance component only which can be obtained by suitable switch settings in the generator. The (R-Y) and (B-Y) outputs are shown individually and combined in Fig. 8. These signals are of central importance when adjusting the color detectors and quadrature circuits.

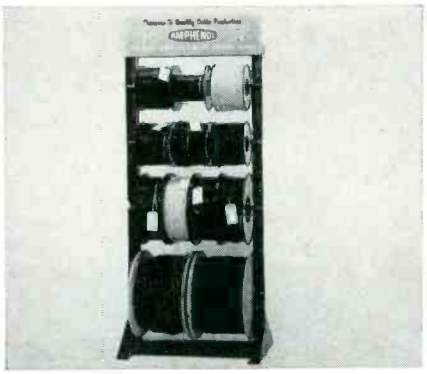
The video output may be available in both positive and negative polarities. Proper polarity of the video-frequency signal introduced into various stages of the receiver must be observed. Attenuators should be provided to control the output level of the video and modulated r-f signal. Output impedance should be low, so that the frequency characteristics of the signal will be preserved even when applied across moderately reactive circuits in the receiver. A high-level 3.58 mc CW signal is available in some generators. Such a signal at a level of 1 or 2 volts can be utilized for troubleshooting the chrominance circuits, and can temporarily substitute for a dead color-subcarrier oscillator in the receiver.

Most manufacturers provide a technical answering service as well as complete specifications on their instruments. It is a good idea to discuss servicing and test equipment problems with them. An important question to ask is "Will it take care of future needs?" The goal of course is to be able to provide professional service in a minimum of time. ●

New Products

Amphenol CABLE RACK

Ease of use and inventory control plus saving of floor space and reduction of waste from short cable lengths are the principal advantages of the new sturdy Coaxial Cable Floor Rack. 69" high and 3½" wide, it occupies approximately 4 square feet of floor space. Reels are mounted on steel axles which permit quick handling and measuring of cable. Amphenol Electronics Corp., 1830 S. 54th Ave., Chicago 50, Ill. (ELECTRONIC TECHNICIAN 8-51)



American MICROPHONE

A new miniature dynamic microphone, especially designed for concealed use, is now in production. This hidden mike D801, is a high-output, low-impedance unit for use at voice frequencies. It has frequency response of 250 to 6000 cycles and an output level of —52 db (—46 db at voice frequencies). It can be wall mounted, or counter-sunk in a speaker stand. It measures only $1\frac{5}{32}$" in diameter and $\frac{63}{64}$" in depth. American Microphone Mfg. Co., 412 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 8-53)

New Products

Sonotone MICROPHONE

The Ceramike model CM-10, is a budget-priced microphone list priced only $19.50, covers the frequency range from 50 to 13,000 cycles, flat within ±3 db. The sensitivity of 57 db below 1.0 volt per microbar, is more than ample

for general purposes. It is omnidirectional and has a high impedance. Temperature and humidity changes do not affect the sensitive ceramic transducer. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 8-52)

G-E ADAPTER-LEAD

New "Tri-Plex" adapter-lead speeds TV service. One lead and adapter combination quickly connects either 50°, 70°, or 110° CRTs to tester or chassis. It permits checking the customer's 110° tube on present conventional testers,

and enables the technician to use most any standard CRT for tube substitution and other bench work. General Electric Co., Owensboro, Ky. (ELECTRONIC TECHNICIAN 8-60)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 40.

Association News

(Continued from page 53)

Representatives of the largest electronic parts and set distributors in Pittsburgh and outlying areas, at a meeting with Pennsylvania and Ohio state and local service associations, discussed plans for the first tri-state electronic service conference and exhibition which will be held September 10-13 in Carnegie Hall, in Pittsburgh's Schenley Park.

The four-day session, will be known as KESCO—Keystone Electronic Service Conference and Exhibition. Lewis Winner, former editor and publisher has planned the entire technical presentation. It will feature twenty-one professionally-staged lecture-shows on home and industrial electronics.

Missouri

Seven Kansas City firms were expelled from TSE of Kansas City. They are firms reported to be associated, along with a parts distributor, in a venture which advertises free tube testing in the home.

Tape Recorders

(Continued from page 32)

distorted mess that came out was hardly worth the effort. After replacing 4 leaky 0.01 μf paper capacitors, the system now checked out fairly clean with plenty of volume and was probably as good as could be expected.

One final complaint to check out was the low output when using an external amplifier. The schematic shows this output to come from a cathode follower circuit. An inspection of this stage in the amplifier revealed a 0.05 μf capacitor from cathode to ground across the cathode resistor. The schematic did not have any bypass capacitors at this point. The cutting pliers finished the job. Just one more final check to be sure. The volume control advanced almost all the way when suddenly the amplifier broke into a very strong low frequency oscillation. A loud passage in the program material plus a high setting on the control, shock excited some circuit. The trouble was consistent and it was possible to make it cut in and out at will. The recorder was once again opened up. The scope showed oscillations all over the place. A 0.05 μf capacitor was used to shunt various tube elements to ground with particular attention to screen and cathode rather than grid and plate of the various tubes. Little or no noticeable signal losses would be encountered if the trouble could be eliminated by gimmicking the cathode and screen circuits. The screen of the 6V6 output tube seemed to be the key point. The oscillation would disappear just by touching the tube pin, it wasn't necessary to ground the test capacitor. The screen of this tube is bypassed to ground by a 10 μf capacitor. The capacitor passed all tests; even so, another one was substituted but the oscillation persisted.

The 0.05 μf was again placed on the screen of the 6V6 and again the amplifier settled down. The test capacitor was now placed on the electrolytic, which was about 4 inches away, and the howl remained. Was it possible that lead dress of a 4-inch piece of wire in a high level circuit was critical? The answer, in the affirmative, came when the wire was pressed down about another ¼ inch so that it was resting flat against the chassis. The customer's comment, "It never played better." Our own thoughts, "———."

Nevertheless the rewards are great, more happy customers, more monetary payments, and personal satisfaction in succeeding where others have failed. •

Hybrid Auto Radio

(Continued from page 28)

Peak-to-peak voltages may be more than double the voltage indicated, depending upon the ripple content. A properly charged battery, without a charger hook-up is recommended for this type of service, and if a power supply is used, it should be well filtered and regulated.

Because of the high current capabilities of a 12-volt storage battery, more than the usual amount of precautions should be observed. A short circuit, intentional or otherwise can fuse a probe to a terminal and cause the metal to melt until the connection is broken. Some resistors will go down the drain even on momentary contact. The transistor can burn itself out should it lose its bias. If a metal probe must be used, tape it. Use a meter to determine the presence and amount of voltage.

Transistor

The transistor also comes in for its share of special considerations. Unlike a tube it must be securely fastened to the chassis or other heat sink device. Mounting screws must be tight to assure proper heat dissipation. Insulators where required must be used to avoid shorting to chassis. Motorola uses DC-4 grease on both sides of the insulator to insure proper conduction of heat. When replacing a transistor, collector current should be checked, and adjusted according to the manufacturer's specification. The transistor in Fig. 1 is supposed to be set for 425 ma collector current. The bias control R 14 should be set at maximum counterclockwise, to prevent excessive current and then adjusted for proper collector current. It is possible to use a VTVM between collector and ground. Proper current in this case will result in a reading of 0.85 volts. However, in the absence of a known voltage figure, it would be best to actually measure the current. It is difficult to determine the amount of resistance at this point, and therefore the voltage drop cannot be easily determined. An ohmmeter reading is practically useless.

While it is possible to insert the ammeter in the emitter leg, it is best to place it in the collector lead, Meter resistance and base current become a factor when inserting the meter in the emitter circuit side. Another method is to insert the ammeter in the battery leads and measure the current with and without the transistor in the circuit. Remove the power before disconnecting or inserting the transistor. The increased current reading when the transistor is in the circuit can be attributed to the amount of current drawn by the transistor. When measuring current in the battery leads, it is necessary to take into consideration the bias current and it should be added to the required collector current.

In many cases tube data for tube checkers is not available; there exists a danger of shortening the life of these tubes if not completely killing them, if conventional techniques are used to find tube checker settings. The best procedure is to substitute known good tubes and transistors for suspected parts.

Additional precautions with transistors in the output stage, is not to operate the radio without the speaker. Transient voltages may damage the transistor. It is also a good idea to shut off the radio when using a soldering gun. Stray a-c voltages injected by test instruments, soldering gun and other probes, can cause transistor damage.

Troubleshooting

Now that the precautions are taken care of, the actual troubleshooting procedure is simple and straightforward. Either a signal-tracing or signal-injection method may be used. The usual check points apply. About the quickest way is to cut the signal path in half by checking at the control grid of the a-f amplifier. Since this tube is of the space charge type the control grid is the second grid, pin 7 of the 12 DL8 in Fig. 1. The space-charge grid between the cathode and control grid increases the emission and enables the tube, with only 10.8 volts on the plate, to furnish enough audio power to drive the transistor stage.

Another look at Fig. 1 will show some more peculiar configurations. The suppressor and control grid of the 12BL6 in the r-f amplifier stage are tied into the avc line. Also it should be noted that the —1 volt avc voltage is delayed. If the full avc voltage were applied in the conventional manner, it would cause severe distortion on strong signals.

Once the break in signal path is found, further isolation of the trouble can be accomplished by voltage tests, and finally a check of suspected components. •

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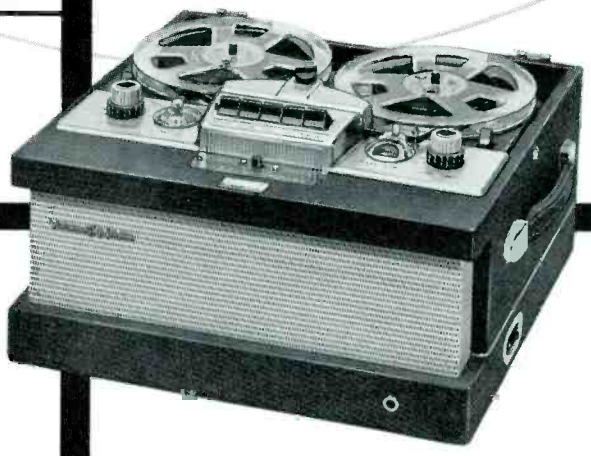

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