

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

A J DIGLIO
94 SLEEPING GIANT DR
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TV Radio Model & Chassis Numbers

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April • 1958



NOW...

THREE Sizes of IRC® "Skin-Packed" Fuse Resistors

IRC's quality 5 ohm fuse resistor—the FR5—is a replacement for

| RCA Stock No. | RCA Part No. | Original Value |
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This new 5 ohm IRC Fuse Resistor provides you with the same fine features as IRC's dependable FR5.6 at 5.6 ohms and FR7.5 at 7.5 ohms:

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- Improved plug-in type for fast, easy replacement in the newer TV receivers. Terminal pin holes facilitate attaching leads where necessary.
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You can depend on the quality and reliability of IRC "Skin-Packed" Fuse Resistors.

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*Good!
New size!*

Needed something like this! Now one resistor can take the place of three—fewer to lug around

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I like "Skin-Packs" can buy as few or many as I need and there's less breakage and damage and losses

No chance of making a mistake

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ELECTRONIC TECHNICIAN

including
Circuit Digests

TELEVISION • ELECTRONIC • RADIO • INDUSTRIAL

AUDIO

April, 1958

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ELECTRONIC TECHNICIAN • April, 1958

FRONT COVER Even if you're a cryptographer, a professional code expert, you probably have a rough time deciphering the model and chassis numbers applied to radio and TV sets. For a detailed explanation of how to interpret these numbers for various makes, see article starting on page 28.

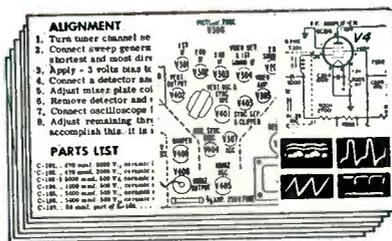
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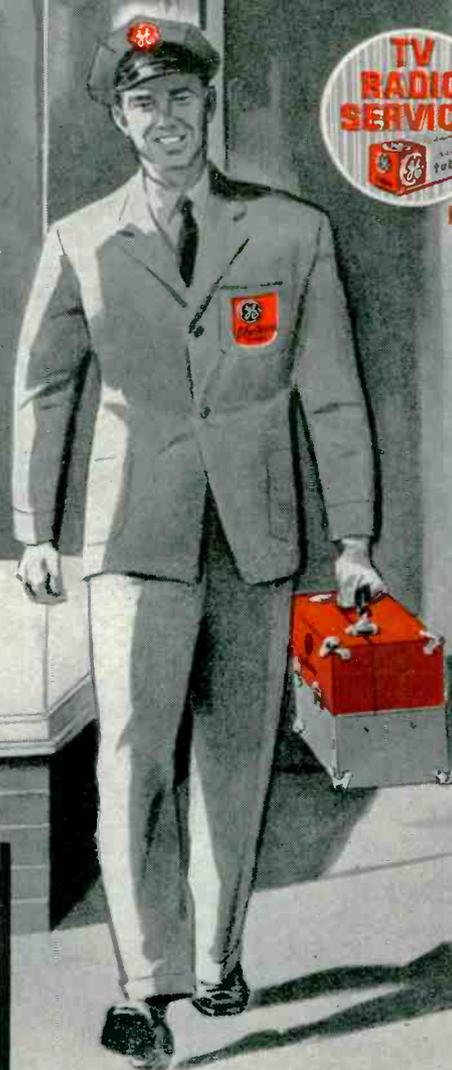
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CIRCUIT DIGESTS



*They're New...
Smart... Attract Customers*



SPE-
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C. DISPLAY BACKDROP. Arrange this handy back-up display to meet your advertising needs. Material is flexible, can be curved or will mount flat. For window trim walls, or counter fronts. Two 36" x 24" designs per strip.

D. GIANT TUBE CARTON. Eye-arresting... indicates the quality components you install and sell.

E. DOOR, WINDOW DECAL. Neat, attractive, new dry-apply type. 12" diameter.

GENERAL ELECTRIC'S COLOR-KEYED SHOP SIGNS!

Color-keyed to the G-E tube carton—symbol of quality!



Here is your chance to give your shop-front and windows eye-appeal with "sell". Colors of all eleven new General Electric signs and displays match handsomely the famous G-E tube carton. Quality appearance is keyed to high quality of product—a message every passerby is sure to read.

Attractive and modern, General Electric's color-keyed signs and displays also stand for leadership. They identify your shop as a source for television repairwork done to professional standards, backed by up-to-the-minute facilities.

All your display needs are met by smart new G-E designs—from an eye-catching, easy-to-apply door or window decal, to metal and illuminated outdoor and indoor signs... plus colorful utility items like the electric clock and thermometer.

These brand-new signs and displays are waiting for you now at your General Electric tube distributor's. Ask him how to obtain them! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

◀ **SERVICE CLOTHING**, smartly styled, also is available. Garments are color-keyed to new G-E signs and displays—give that professional look. Durable, launder easily.

◀ **SERVICE CASES** in three useful sizes—small, medium, and large—match color-theme of General Electric displays. Now you can carry with you neatly, compactly, everything you need for making home service calls!

Progress Is Our Most Important Product

GENERAL ELECTRIC

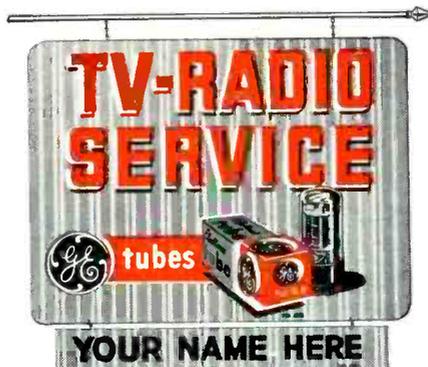
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METAL FLANGE SIGN. A display workhorse. Double-faced. Mount it anywhere! Compact—15" by 12"—handy for building corners, delivery entrances, and other side locations.



ILLUMINATED CLOCK, electric. Both useful and advertises your business. Easily read—16" diameter—with long-life bulbs. Hang on a wall, or mount on a counter (easel is provided).



HANGING METAL SIGN. For shop front or service entrance. Message both sides, plus your nameplate. Large—48" by 36"—easily seen. Hanging hardware is included; lights are available.



COUNTER-WALL-WINDOW SIGN. Illuminated. Use it anywhere in your shop! Wrap-around cover has the attractive display on both sides. 15" by 11½" by 5".



OUTDOOR-INDOOR THERMOMETER. Tells temperature accurately. Every viewer will see your advertising message. Replaceable front. 12" diameter.



METAL TACK-ON SIGN. Narrow, smart dimensions—14" by 42". Fasten against building, or mount as a free-standing display.



“Most of our service business comes from our ads in the Yellow Pages”

says **PAUL BILEZIKIAN**, Proprietor,
NEWTONVILLE ELECTRICAL CO., INC., Newtonville, Mass.

“One reason the Yellow Pages are our major advertising effort,” says Mr. Bilezikian, “is that they bring us most of our service business—and service gets us into customers’ homes. That way we get a chance to quote prices on the products we sell—and to compete successfully in a competitive market.”

The Yellow Pages of your telephone directory take your business right into the homes of your good prospects. Why not call your telephone business office today for more facts on how the Yellow Pages can bring *you* more business?



FOUR YELLOW PAGES DISPLAY ADS, and ten listings under such headings as *Electricians* and *Electric Contractors* keep Newtonville Electrical Co.'s name before the public.

NEWTONVILLE ELECTRICAL CO. is also listed in the Newton telephone directory under the trade-marks of 4 major appliance manufacturers, Bendix, General Electric, Kelvina-tor and Westinghouse.

Editor's Memo



Funny how we take for granted the men who keep the wheels of commerce going round. Have you ever thought of the time and trouble that goes into delivering your morning mail? The sorting and filing that keeps your bank balance straight?

If you do think about such things, you're in the minority. Most people simply expect such services, without realizing how important they are until something happens to curtail them. Unlike manufacturing a product, a service leaves little to show for its efforts in demonstrable terms . . . until the service ceases.

Electronic maintenance is like that to the public. The service technician is taken for granted as the fellow who'll come around to fix things up if there's a breakdown. When equipment is working properly, who gives the technician or his years of work and study a second thought?

In my imaginative ramblings, I've wondered what would happen if all electronic technicians decided to take a week's vacation at the same time. A couple million TV sets would go out of order—and stay out of order—to the wails of kiddies and parents alike. Still more radios would become silent. Hundreds of thousands of phonos and hi-fi rigs would splutter to a stop. Police would have a tougher time catching lawbreakers without many of their 2-way radios. A number of factory production lines would close down. Numerous aircraft and ships would be in jeopardy without their navigation gear functioning. And so on.

Yes, electronic technicians perform vital services. They're not sufficiently appreciated.

Of course, there are many others who are unsung heroes. I'd like to nominate to the Spooferama Hall of Fame the following:

The inventor of a new drink consisting of vodka and milk of magnesia. (It's called a Phillips Screwdriver.)

The employee who justified his demand for a raise by saying three companies were after him. (The gas & Electric company, the telephone company and the finance company.)

The man with a plan for the future. (The installment plan.)

The technician who slugged the designer of inaccessible electronic equipment.

Al Forman

now available
to servicemen
from Radio Receptor

AUTOMATIC

SILICON RECTIFIER

for universal replacement

The choice of leading TV manufacturers as
original parts in many new models!

- **hermetically sealed**
- **no pressure contacts used**
- **no heat sinks required**

Today more and more TV set manufacturers are turning to General Instrument Corporation's Automatic Manufacturing Division for the finest silicon rectifier made. Now Radio Receptor offers the service industry the *same* outstanding rectifier with characteristics that greatly improve the performance of any radio or TV set.

A single type – AUTOMATIC PT5 – can be used for all rectifier replacement. It's smaller, longer lived and cuts installation work in half. Pigtail leads can be connected to existing unused terminals or suitable terminal strips are available if needed. Start using them now and give those old sets a lift!

PT5
rated at
500 mA
at
130V A.C.

General Instrument Distributor Division

RADIO RECEPTOR COMPANY, INC.

Subsidiary of General Instrument Corporation

240 Wythe Avenue, Brooklyn 11, N. Y., EVergreen 8-6000



FOR ORIGINAL
INSTALLATION
AND REPLACEMENT
THREE
GREAT NEW
CHANGERS FROM
Collaro



THE COLLARO CONTINENTAL
MODEL TC-540

Featuring the revolutionary new transcription type tone arm. Here, for the first time, is professional quality at a moderate price.
\$46.50 list



THE COLLARO CORONATION
MODEL RC-440

Combines the custom qualities of the Continental with the flexibility of a standard plug-in arm and universal head shell. Will accept all standard high fidelity cartridges.
\$41.50 list



THE COLLARO CONQUEST
MODEL TC-340

A radically new, simplified changer with a tone arm that automatically changes and finds the record to be played. Incorporates the new Collaro dynamically balanced transcription type tone arm.
\$37.50 list

Prices slightly higher west of the Mississippi

Here's a new line of changers from Collaro designed to satisfy high fidelity standards—at a price within the range of every consumer who wants a changer. And at a handsome profit to you).

When you sell Collaro — you sell the changer tested and accepted by leading American console manufacturers.

When you sell Collaro — you sell the changer more and more servicemen throughout America are recommending and installing.

That's because Collaro quality and Collaro price—backed up by aggressive sales promotion and national advertising campaigns—make Collaro an attractive item for the consumer market.

And this year, Collaro changers feature the revolutionary new transcription-type tone arm. This is a one-piece, counter-balanced unit which takes any standard high fidelity cartridge. It is free of audio spectrum resonances and it permits the last record to be played with the same low stylus pressure as the first record. Between the top and bottom of a stack of records there's a difference of less than a gram in tracking pressure as compared with 4 to 8 grams on conventional changers.

All three models feature: heavy-duty 4-pole, shaded pole induction motors; rim-weighted, balanced turntable for fly-wheel action; 4 speeds plus manual switch for turntable operation; automatic shut-off after last record—and many other exclusive features.

Make your next installation or replacement job—a Collaro. You'll wind up with more satisfied customers that way. (Not to mention your own profit.)

Write for complete specifications and distributor details to:



Rockbar Corporation, Dept. C-016
Mamaroneck, New York

40%

DUMONT POSITIVE QUALITY

FEWER CALLBACKS*

A positive fact about
Du Mont Positive Quality . . .

Du Mont Picture Tubes cut callbacks due to
tube failure by 40%. Consider what
this means to you — fewer callbacks,
greater profits.

Ask your distributor about
Du Mont Positive Quality Picture
Tubes and Electronic Tubes.

- Send name and address for
your free copy of the Du Mont
Replacement Tube Chart.



*Based on actual
engineering figures.

DUMONT®

Television Tube Division

Allen B. Du Mont Laboratories, Inc., Clifton, N. J.

SUCCESSFUL TECHNICIANS RELY ON RIDER SERVICE 'AIDS'

BOOKS • MANUALS • SDO

FABULOUS "picture-book" COURSE
NOW AVAILABLE

BASIC TELEVISION, by Alexander Schure. This new 5 volume addition to the famous "picture book" courses is the most understandable presentation of black and white television receiver theory at the basic level ever published. It starts with the transmitter and discusses in detail the following subjects: Volume 1, the transmitter; the handling and the operation of the camera; formation of the picture signal and the general content of the transmitter. Volume 2 covers the organization of the entire TV receiver treating each section individually from antenna to picture tube. Volumes 3, 4 and 5 treat with TV receiver circuit explanations. Each volume covers a specific number of sections in the receiver. #198—soft cover, 5 vols. 688 pp \$10.00 per set #198-H all 5 volumes in a single cloth covered binding, \$11.50.

Finest TV service information
available anywhere
RIDER TV MANUALS



TV 22
NOW
AVAILABLE

The most successful technicians have always used and relied upon Rider Television Manuals. The reason—they are the only bound source of *unabridged*, accurate TV receiver servicing information prepared by receiver manufacturers.

Completely Current with TV Production

TV 22 includes the latest color TV sets, portables and 110" slim sets. The factory-approved and factory-authorized data of 19 TV set manufacturers are covered in this 1600 page manual. Also covered are latest VHF-UHF tuner data; production runs and changes; cumulative index—volumes 1 to 22; manufacturers' circuit descriptions; current information on private label brands; printed circuit layouts and other valuable data.

Makes TV Servicing Easy

Rider Manuals have proven themselves to be best by test among leading service technicians. They are designed for easy use, already bound—completely indexed. TV 22 contains this valuable and easy-to-use information: installation data; signal waveforms for troubleshooting; alignment; voltage charts; test equipment set-ups; tube layouts; printed circuit bottom views and frequent component call outs; tuners and boosters.

Rider TV Manuals furnish the same information that the original TV receiver manufacturer and his distributor use for servicing. This means accuracy, authenticity and completeness of detail—the finest TV service information available anywhere.

Rider's TV 22 is available now at your local parts jobber. If your jobber doesn't handle Rider TV Manuals, write direct. Order TV 22 today—limited printing. **Only \$24.00**

REPAIRING HI-FI SYSTEMS, by David Fidelman. This book deals with finding the troubles and repairing faults in hi-fi equipment with no test instruments—simple equipment—and elaborate equipment. Typical troubles are analyzed and repaired through a system of logical steps. Soft cover, 212 pp., illus. # 205, \$3.90.

RIDER'S NEW SDO SERVICE

('single diagram only')
ONLY 50¢ PER CHASSIS AT YOUR LOCAL JOBBER

HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS, by Jack Darr. The growth of the intercom as a modern tool of business presents an important service and installation opportunity. This book covers completely installation and maintenance of commercial intercommunication equipment. Soft Cover, 152 pp., illus. #189, \$3.00.

HOW TO SERVICE TAPE RECORDERS, by C. A. Tuthill. Discusses the tape recorder and its operation. Explains the types of circuits, drive mechanisms, troubleshooting, and repair. Soft cover, 160 pp., illus. #167, \$2.90.

MUST READING FOR EVERY TECHNICIAN

SERVICING TV AFC SYSTEMS, by John Russell, Jr. #192, 128 pp., \$2.70. **SERVICING TV VERTICAL & HORIZONTAL OUTPUT SYSTEMS**, by Harry Thomas. #150, 176 pp., \$2.40. **TV TUBE LOCATION & TROUBLE GUIDE (RCA)**, by Rider Lab Staff. #194, 56 pp., \$1.25. **HANDBOOK OF 630-TYPE TV RECEIVERS**, by Miller & Bierman. #174, 200 pp., \$3.50. **HOW TO USE METERS**, by John F. Rider. #144, 144 pp., \$2.40. **HOW TO USE TEST PROBES**, by A. Ghradi & R. Middleton. #165, 176 pp., \$2.90. **HOW TO SERVICE TAPE RECORDERS**, by C. A. Tuthill. #167, 160 pp., \$2.90.

Rider books, manuals, SDO are available at your Parts Jobber. Look for the Rider Bookseller. If these books are not available, order direct. T-4.

LETTERS

To the Editor

8-Tube TV Solved

Editor, ELECTRONIC TECHNICIAN:

In answer to Mr. Regina's question (March 1958 Letter, p. 13) about a TV with 8 tubes, I had one last week. It was a Muntz using a 21XP4A CRT. The customer said he purchased it in Chicago a few years ago for \$79.

BILL FRANKEL

Flushing, N.Y.

TV Plus Radiotelephone

Editor, ELECTRONIC TECHNICIAN:

The article, "Double Barreled Squelch in 2-Way Radios," in your February issue was full of good information not available in the market. I enjoy reading it very much, since I do radio and TV work, and also have my radiotelephone license.

ALBERT NOWAKOWSKI

Glenolden, Pa.

Cheap Is Cheap

Editor, ELECTRONIC TECHNICIAN:

I am interested in a portable transistor tape recorder, imported from West Germany, and advertised in the newspaper for \$29.95. It operates on four flashlight batteries and weighs less than 2 lbs. Is such a recorder worth having?

T. ZIER

Zier Radio & TV
Brooklyn, N.Y.

• We haven't tested this unit, but we always bear in mind that one rarely gets something for nothing.—Ed.

Info Sources

Editor, ELECTRONIC TECHNICIAN:

With reference to your March 1957 issue, I would like further information on a thyatron motor speed controller. We would like to build our own controls for use with production turntables.

E. C. GILLESPIE

Maintenance Superintendent
Detroit Harvester Co.
Ypsilanti, Mich.

... I am a qualified radio-TV technician, confined to a wheelchair because of polio. I am starting up a transistor equipment service center, and would appreciate receiving the names of manufacturers of such devices.

WILLIAM K. BYERS

Des Moines, Iowa

• The manufacturers of everything from Accessories to Yokes will be listed in the May 1958 issue, which includes the ELECTRONIC TECHNICIAN BUYERS DIRECTORY.—Ed.

3rd SUPPLEMENT to the RECEIVING TUBE SUBSTITUTION GUIDEBOOK, by H. A. Middleton. A must for every technician! Contains more than 830 latest receiving tube substitutions • more than 200 picture tube substitutions • more than 230 American to European tube substitutions • more than 200 European to American tube substitutions • a cumulative index listing the tube types treated in the basic book and all 3 supplements. It pays for itself almost immediately! #139-3—Soft cover, 72 pp., 8½ x 11", illus. Only \$1.35.

RECEIVING TUBE SUBSTITUTION GUIDEBOOK, by H. A. Middleton. #135—Soft cover, 224 pp., 8½ x 11", illus., \$3.00.

FIRST SUPPLEMENT, #139—Soft cover, 48 pp., 8½ x 11", illus., \$.99.

SECOND SUPPLEMENT, #139-2—Soft cover, 48 pp., 8½ x 11", illus., \$.99.

ADVANCED TV SERVICING TECHNIQUES, by Zbar and Schildkraut. A complete advanced TV servicing course, developed by the Radio-Electronics-Television Manufacturers Association. Shows how to use every conceivable type of test equipment, how to service every part of a TV receiver. Explains latest techniques. Soft cover, 8½ x 11".

MAIN TEXT, 192 pp., illus. #161, \$3.60.

LABORATORY WORKBOOK, 32 pp. #161-2, \$95.

TV PICTURE TUBE-CHASSIS GUIDE, by Rider Lab Staff. No busy service technician can afford to be without this easy-to-use TV tube type chassis guide. It covers all picture tube types used in TV receiver production from 1946 to February 1957—over 7,000 listings. This reference guide is organized by chassis number, and in some cases, by models so that the technician can immediately locate the correct picture tube type simply by knowing the chassis number. #204, Only \$1.35.

REPAIRING TELEVISION RECEIVERS, by Cyrus Glickstein. The most modern completely practical book, written by an expert with long experience in television receiver repair. Devoted to trouble-shooting and repair techniques which are modern, yet down-to-earth. Covers the use of simple as well as elaborate test equipment of all kinds. Profusely illustrated. Soft cover, 212 pp., 5½ x 8½", illus. #191, Only \$4.40.

HOW TO READ SCHEMATIC DIAGRAMS, by David Mark. Covering the symbols and abbreviations used in schematic diagrams related to the electronics field, this book starts with individual components and carries through to receivers and similar equipment. Components and circuits are identified, explained. 160 pp., illus. #208, \$3.50.

VACUUM TUBE RECTIFIERS, by Dr. Alex. Schure. The latest addition to the famous Rider Electronic Technology Series is an encyclopedia on rectifiers. It includes over 25 illustrations diagramming the function of rectifiers and establishing their relationship within the circuits. Tables show comparisons of the products of the major manufacturers. The text on each device or concept, is supplemented by examples. #166-21, \$1.50.

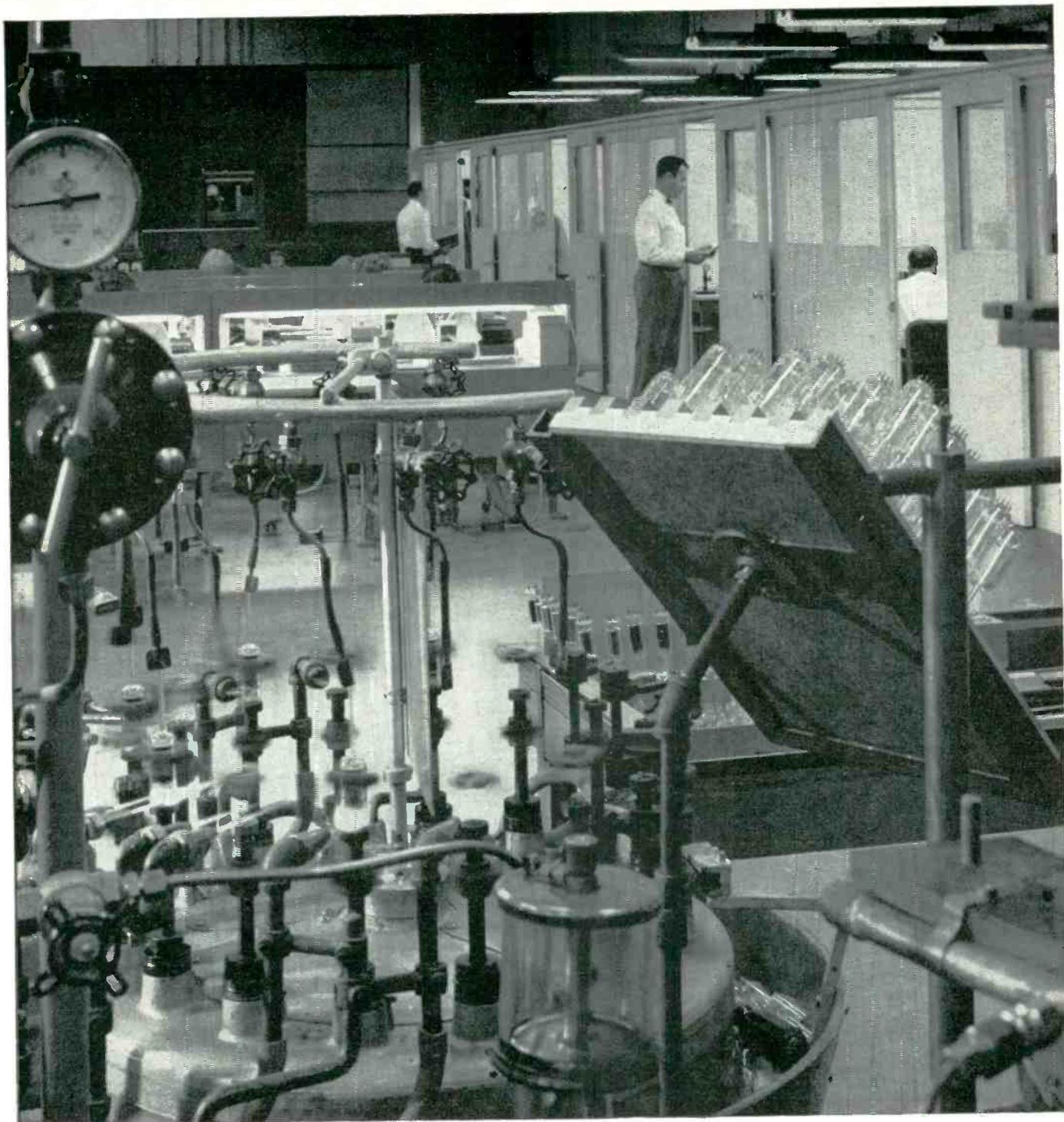
BASICS OF DIGITAL COMPUTERS, by John S. Murphy. Written by John S. Murphy, an outstanding personality in the computer field, this three volume "Picture-Text" course covers the fascinating and ever-expanding field of electronic digital computers. With its many branches of programming, maintenance, design, sales, estimating customer requirements, etc., the technician or the electronics hobbyist will find it of great value. Coming soon.



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116 West 14th Street, New York 11, N.Y.

In Canada:
Charles W. Pointon, Ltd.
6 Alcina Ave., Toronto, Ontario



CBS cuts call-backs through approved-for-production design

Here a tube from the laboratories of CBS development engineers is being readied in pilot production for mass production. It may be a CBS original, standard type, or improved tube. The aim is the same: To insure dependable, trouble-free performance through approved-for-production design. Teams like this test in pre-production

all CBS tubes . . . receiving, special-purpose, cathode-ray . . . and semiconductors. Their approved designs give you reliable products like the 6DQ6, 6626, CBS-Colortron and 2N155. It's easy for you to take advantage of this approved-for-production design. Insure yourself of minimum call-backs always by asking for CBS always.

*Reliable products
through Advanced-Engineering*

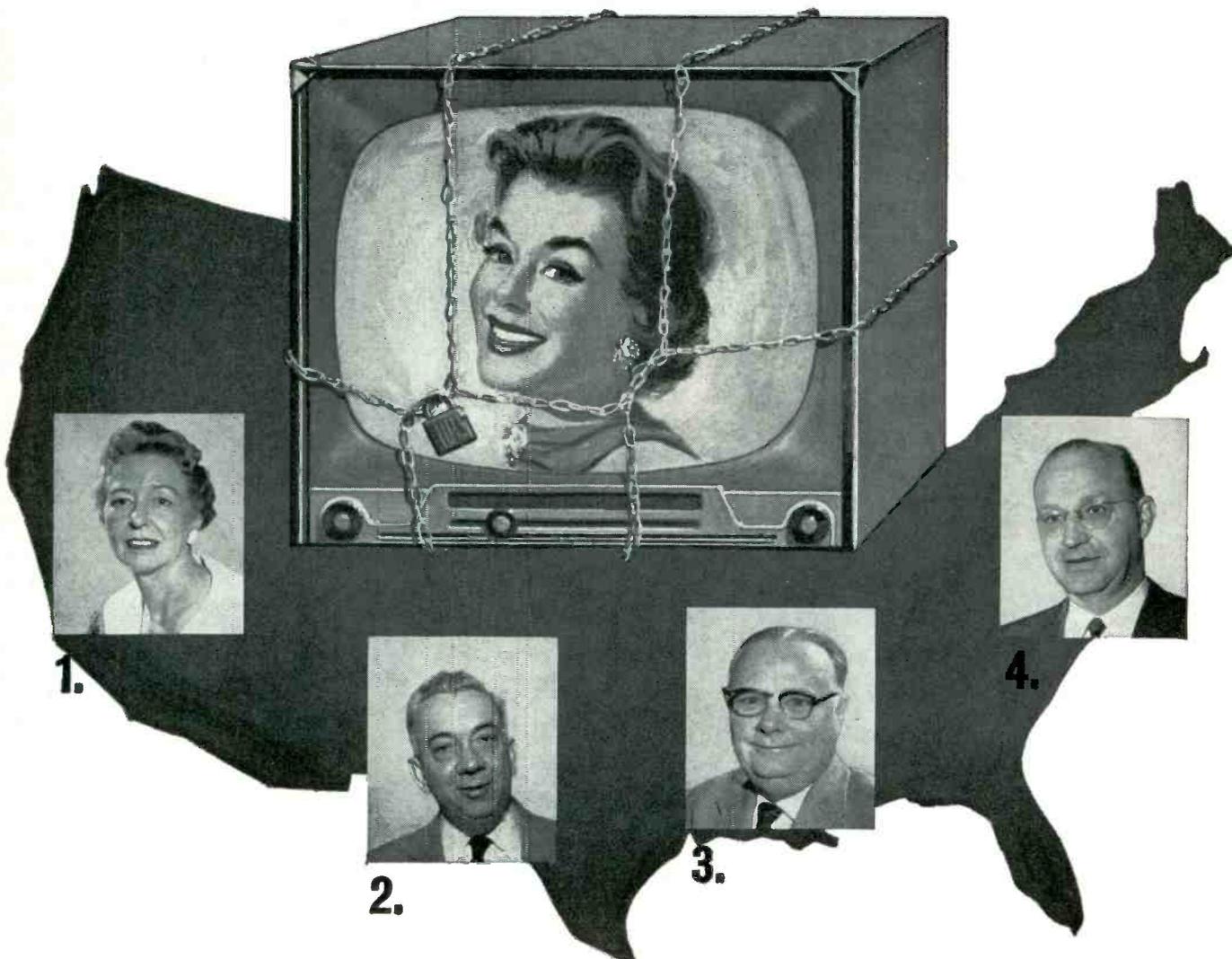


CBS-HYTRON, Danvers, Massachusetts
A Division of Columbia Broadcasting System, Inc.
For the best in entertainment tune to CBS.

ASK THOSE WHO "TORTURE TEST" WESTINGHOUSE RELIATRON® TUBES!

From coast-to-coast, TV tube distributors are putting Westinghouse RELIATRON Tubes through the most grueling "torture test" ever devised. Locked inside 87 standard make TV sets, these

tubes have racked up an amazing total of 425,000 hours' *continuous* operation—and are still going strong! Visual proof that when it comes to cutting call-backs... you can rely on RELIATRON Tubes.



1. Louise Miller of Miller's Radio & Television Supply, Oakland, Calif., says: "I padlocked Westinghouse RELIATRON Tubes inside a TV set 8,436 hours ago . . . turned the set on . . . and it's been running ever since! No wonder my Westinghouse Tube sales are booming!"

2. Bill Sutton of Sutton Radio-TV Company, Ft. Worth, Texas, says: "My 'Locked TV' has been operating steadily for 8,916 hours with RELIATRON Tubes! At this rate, my service dealers will certainly cut call-backs."

3. Charlie Goebel of Manhattan Radio Equipment Co., Kansas City, Missouri, says: "My 'Locked TV'

set has been turned on 9,936 hours without a single RELIATRON Tube failure! How's that for long tube life!"

4. I. Goldenberg, Sherwood Distributors Inc., Union, New Jersey, says: "8,649 hours have passed since I turned on my 'Locked TV' and it's still working fine. That's one reason why I've been selling more RELIATRON Tubes than ever before."

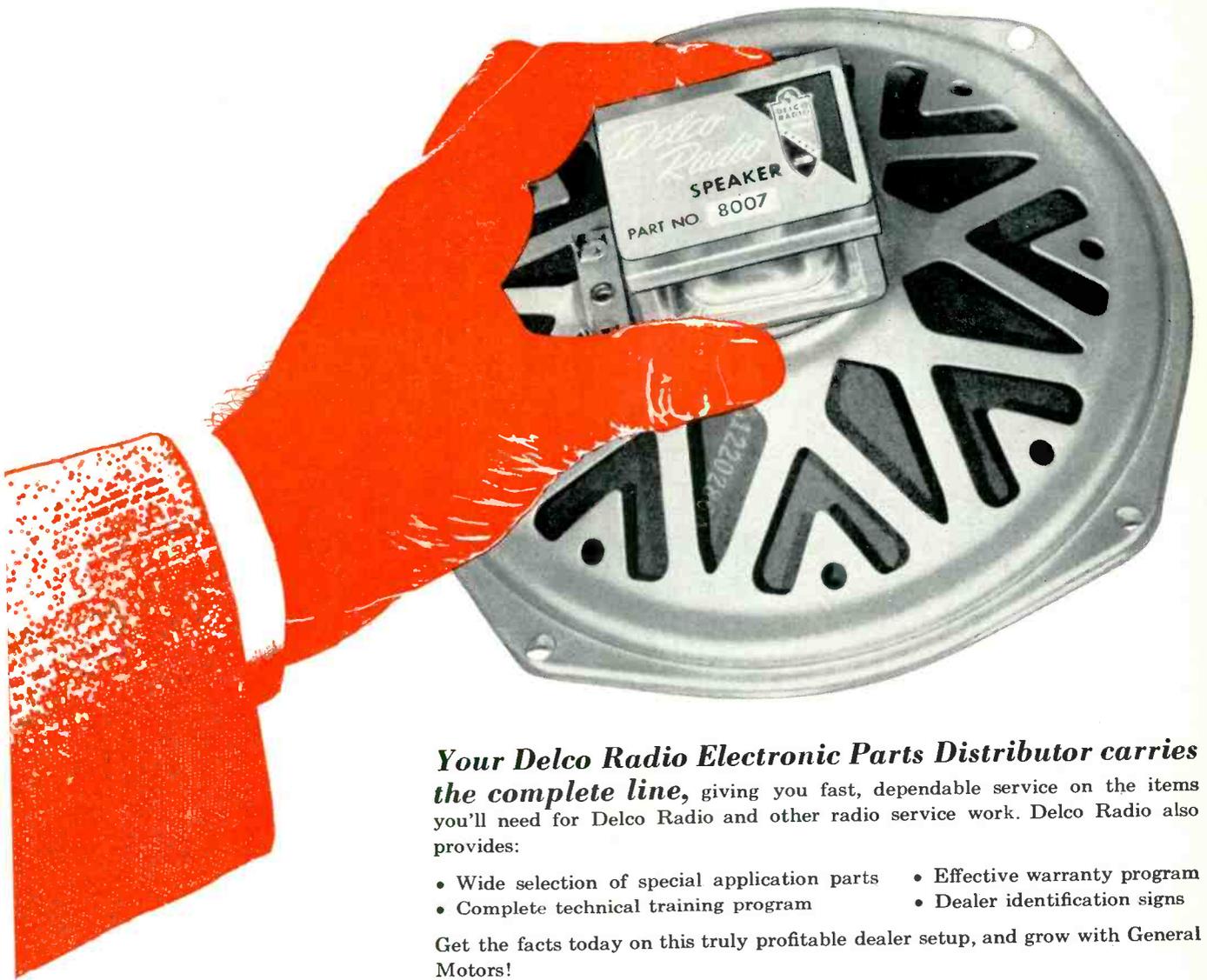
YOU CAN BE SURE...IF IT'S

Westinghouse

Electronic Tube Division, Elmira, New York

Use Delco Radio Service Parts!

8-inch "Hi-Fi" speaker, No. 8007 offers the most highs, the most lows, the most watts in a medium-price speaker. Designed for replacement use and high fidelity audio systems.



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 . . .

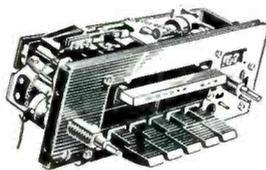


DELCO RADIO

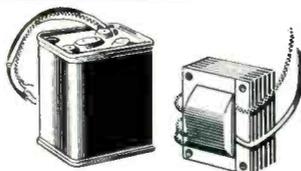
DIVISION OF GENERAL MOTORS, KOKOMO, INDIANA



TRANSISTORS



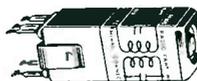
TUNER PARTS



TRANSFORMERS



TUBES



COILS



VIBRATORS



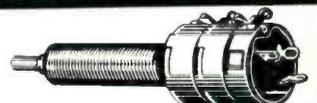
IRON CORES



RESISTORS



CAPACITORS



CONTROLS

watch your mike sales go up with

TURNER'S tape recorder mike replacement package



Size: 14" x 22". Fits neatly on your counter or hangs on wall.

YOUR CUSTOMER sees at a glance what he's getting. His choice of five mikes, each in its own super-clear plastic bag; his choice of style; his choice of color. Each package has a mike, cable with standard plug plus plug adapter. These Turner mikes fit any tape recorder.

You sell these mikes right from the board. No need to carry extra stock of mikes. Your jobber's salesman can quickly spot which mikes you've sold. When a mike is sold, the name and model number show on the board. It's a simple matter for him to keep your display up to date.

The Turner display package is available from your jobber. Be sure to ask him about it. It's an easy way to increase your microphone business with a minimum of effort.



IN CANADA: CANADIAN MARCONI CO.,
Toronto, Ontario and Branches
EXPORT: . . . AD AURIEMA, INC.
89 Broad St., New York 4, N. Y.

Association News

ETG North Shore Award

Frank Byrne of the North Shore Electronic Technicians Guild in Massachusetts relates this story: "Not too long ago, radio and TV technicians in North Shore communities viewed each other with suspicion, envy or indifference, and only occasionally as friendly competitors. Then, with the advent of the North Shore TV Association, the picture changed. The technicians and dealers who joined the organization discovered they had much in common. They found it to their mutual advantage to be co-operative and friendly. More recently the Association affiliated with ETG, and it is now seriously dedicated to expanding its North Shore Chapter.

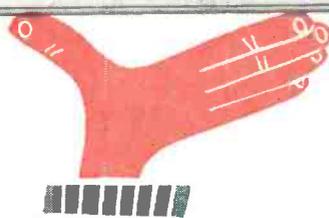
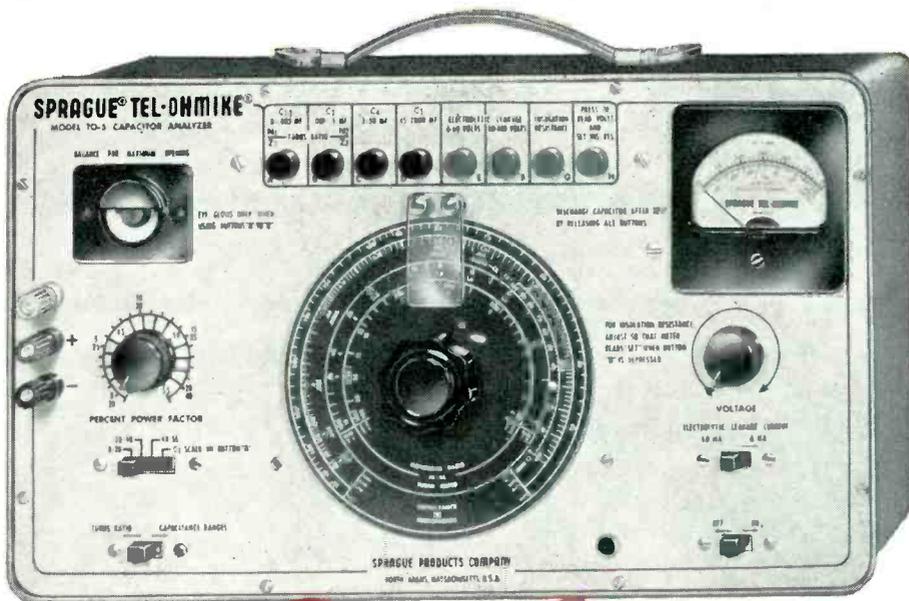
SARTA Elects

The San Antonio Radio & Television Association Inc., in Texas, elected: Pres., C. W. Schertz; V. P., O. O. Brigman; Secy., Don VanDerBrugen; Treas., Tom Boyd; Directors, Roland Mueller, and Ralph McCoy. The Ladies' Auxiliary of SARTA received their State Charter. Jean Schertz, Connie Kayser, Louise Niehaus, Wilma Boyd and Margaret Brigman are the officers of this unique association.

NATESA Spring Meeting

The ten NATESA affiliates in Missouri will act as host to what is expected to be the largest Spring Meeting, on April 26th and 27th in Springfield, Mo. TESA of the Ozarks, the Springfield affiliate, will do the actual on-the-scene preparation, and are arranging a fishing trip for early arrivals. The agenda will cover interesting seminars on business and technical subjects. "Friends of Service Management" awards voted at the 1957 convention will be presented at the banquet. A program for the ladies is being arranged while meetings and seminars are in progress. The meeting is open to officers and members of all associations interested in improving the service business, even though not affiliated. TV shop owners may come as observers. Registration includes all meetings, seminars, breakfast, lunch, banquet and floor show. Send reservations to Jack Mulford, 618 Kimbrough, Springfield, Missouri.

(Continued on page 16)



**NEW TO-5 TEL-OHMIKE®
capacitor analyzer**

measures all 4 . . . plus

| | | | | |
|--|---|--|--|---|
| 1 CAPACITANCE | 2 POWER FACTOR | 3 LEAKAGE CURRENT | 4 INSULATION RESISTANCE | extra feature TURNS RATIO |
| Measures up to 2000 μf in five overlapping ranges . . . including an accurate 1 to 100 μf range, exclusive with Sprague. | Power factor of electrolytic capacitors is measured by the highly accurate bridge method. Reads up to 55% in three ranges for convenience in measurement. | Leakage current of electrolytics is measured directly on the meter, with exact rated voltage up to 600 v. applied from continuously adjustable power supply. Two ranges — 0-6-60 ma. | Insulation resistance of paper, ceramic, and mica capacitors is read directly on meter . . . up to 20,000 megohms. | In addition to its function as a complete capacitor analyzer, the TO-5 also measures the turns ratio of power and audio transformers. |

The NEW TO-5 TEL-OHMIKE Capacitor Analyzer is one of the fastest and surest ways of measuring . . . capacitance, power factor, leakage current, insulation resistance, and turns ratio. This compact, easy-to-use instrument has the highest accuracy of any instrument of its type available to the service trade.

New jumbo dial makes meter reading easy. Special color-keyed pushbuttons permit instant range selection . . . and allow automatic safety discharge of capacitors after testing. Magic-eye tube simplifies bridge balancing for capacitance and power factor measurements.

SEE THE NEW TO-5 TEL-OHMIKE IN ACTION . . . AT YOUR DISTRIBUTOR!

This 4-in-1 test instrument is only 8 $\frac{3}{8}$ " high, 14 $\frac{5}{8}$ " wide, and 6 $\frac{1}{8}$ " deep . . . weighs a mere 12 $\frac{1}{2}$ pounds. The complete price for . . .

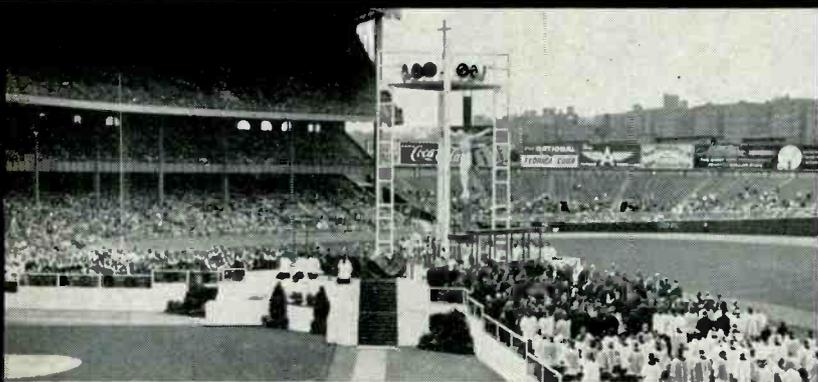
MODEL TO-5 (115 VAC/50-60 cy) .. Only **\$83⁹⁰** net

Also available: Model TO-5X for 115-230 V/25-60 cy. . . . \$89.90 net
Model TP-5RM for rack mounting \$93.90 net



SPRAGUE PRODUCTS COMPANY, DISTRIBUTORS' DIVISION OF SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASS.,

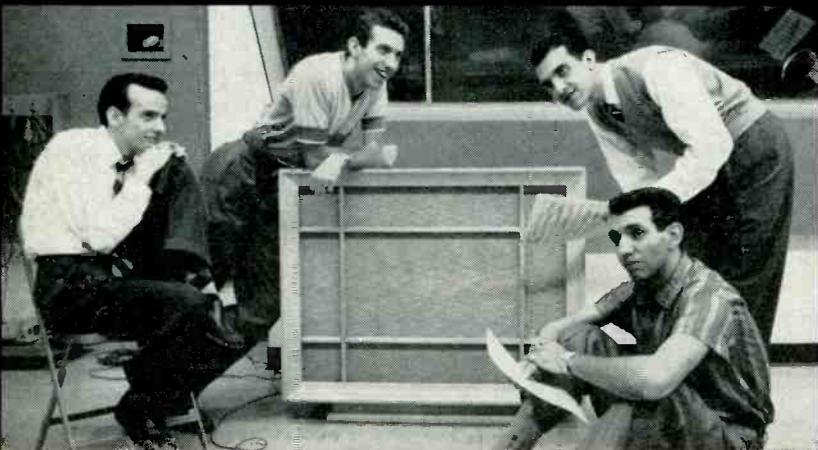
When EXPERTS need quality high fidelity ... they CHOOSE *University* SPEAKERS



FOR UNUSUAL STADIUM FUNCTION The vast expanses of Yankee Stadium were converted to an open-air cathedral for the mass offered by Francis Cardinal Spellman, R.C. Archbishop of New York, to mark his 25th Anniversary as Bishop.

"The Yankee Stadium is well-known for its acoustic difficulties. The specific problem for this special event was to cover hundreds of thousands of square feet with true high fidelity reproduction of voice, organ and choir without reverberation and echo effects. With a single group of University speakers mounted over the altar, we were able to 'saturate' the stadium with highest quality sound that the N.Y. Times called 'cathedral-like' in its front page story. What's more, the high efficiency and distortion-free characteristics of the speakers enabled us to use remarkably low amplifier power."

*Edward P. Casey, President
Edward P. Casey Sound Systems, Inc., New York*



FOR PROFESSIONAL RECORDING STUDIO The Crew Cuts, well-known recording artists, are shown monitoring playback of the master tape to check over-all quality and fidelity of a new recording made at Universal Recording Corporation (the world's largest independent recording studio for all the leading artists and labels).

"For many years, we have used various speaker systems in our control rooms and studios. Recently, we installed the University 'Classic.' According to Mr. Mason Coppinger, our chief engineer, the 'Classic' has not only met the rigid power requirements of studio monitoring, but gives us a realistic picture in terms of the final reproduced balance. The favorable reaction from our clients, artists and our engineers especially, is unanimous!"

*M. T. Putnam, President
Universal Recording Corporation, Chicago*

A FEW OF UNIVERSITY'S MANY



WOOFERS



TWEETERS



MID-RANGE



NETWORKS



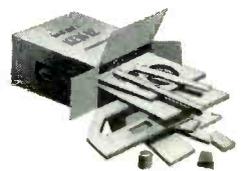
DIFFAXIALS



SYSTEMS



ENCLOSURES



KWIKITS

from the world's largest selection
to gratify every need and budget

MAIL COUPON TODAY FOR FREE LITERATURE

Desk Z-3, University Loudspeakers, Inc.
80 So. Kensico Ave., White Plains, N.Y.

I would like to learn more about University loudspeakers and components. Please send me the free literature checked.

- Speaker Systems
 Speaker Enclosures and Kits
 Speaker Components

Name _____

Address _____

City _____ Zone _____ State _____

LISTEN

University sounds better



... for bigger sales,
the big new

Super "8"

It's brand new! Extra heavy. The King-size "8" Ball, for today's king-size market . . . but at a regular price! Popular, proved ball mount . . . adjusts up to 35°. Sleek and modern for today's cars. Triple chrome plated. 4 sections extend to 57". 54" lead cable. Outside, one-man installation. Boost your profits with this King of new antennas. Order the Model TCF-4 Super "8" today!

watch



**WARD
PRODUCTS
CORP.**

1148 Euclid Avenue, Cleveland 15, Ohio
Division of The Gabriel Company
In Canada: Atlas Radio Corp., Ltd.,
50 Wingold Ave., Toronto, Ontario

(Continued from page 12)

look what **\$24⁵⁰** buys
in test equipment!



**HEATHKITS
GIVE YOU
TWICE AS MUCH
equipment for
every dollar
invested**

The famous model V-7A Vacuum-Tube-Voltmeter is a perfect example of the high-quality Instruments available from Heath at $\frac{1}{2}$ the price you would expect to pay! Complete, only **\$24⁵⁰**



Get the most out of your test equipment budget by utilizing HEATHKIT instruments in your laboratory or on your production line. Get high quality equipment, without paying the usual premium price, by dealing directly with the manufacturer, and by letting engineers or technicians assemble Heathkits between rush periods. Comprehensive instructions insure minimum construction time. You'll get more equipment for the same investment, and be able to fill your needs by choosing from the more than 100 different electronic kits by Heath. These are the most popular "do-it-yourself" kits in the world, so why not investigate their possibilities in your particular area of activity! Write for the free Heathkit catalog now!



Contains detailed descriptions of Heathkit models available, including VTVM's, scopes, generators, testers, bridges, power supplies, etc.



Also describes Heathkit ham gear and hi-fi equipment in kit form. 100 interesting and profitable "do-it-yourself" projects!

FREE catalog

Mail coupon below for your copy—Now!

HEATH COMPANY
A SUBSIDIARY OF DAYSTROM, INC.,
BENTON HARBOR 18, MICHIGAN

Name _____
Address _____
City & Zone _____
State _____

RTASCV Elects

The Radio TV Assn. of Santa Clara Valley in California elected: Pres., Richard J. Kelso; V. P., W. I. Smith; Secy.-Treas., Harold L. Kelley Jr.; Directors, James C. Davis, C. S. Dawson, Russell J. Hamm, Jack Morrisroe, Quentin W. Mutchow and O. N. Timmons.

RTG Meets JFD

Members of the Radio & Television Guild of Long Island were guests of Green Tele-Radio, and JFD Electronics Corporation. Featured as speakers were: Ruby Green, Martin Bettan, Herb Yassky, Simon Holzman, Robert A. Larson and James Sarayiotis. Latest developments in antenna and accessory products as well as merchandising and advertising techniques for improving sales were discussed.

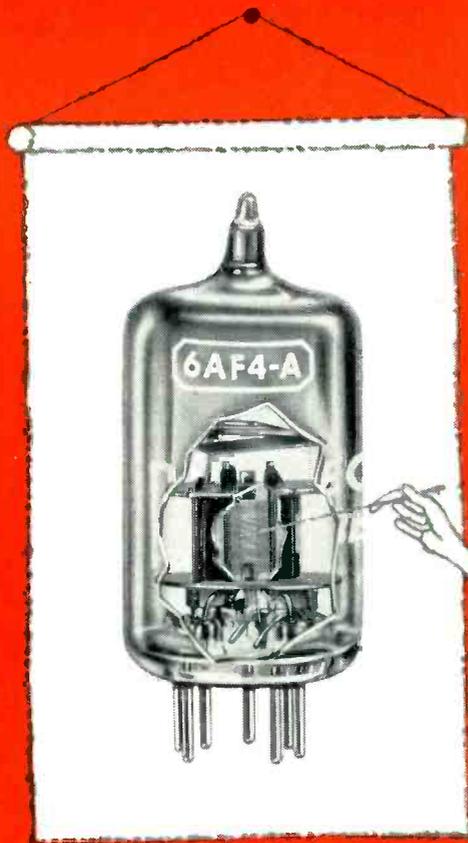
TESA—Installs

The Television and Electronic Service Association of Greater Buffalo, at its annual Installation Banquet at Chestnut Lodge, ushered in Irv. Toner to the President's seat for the third consecutive year. Principal speakers were Russ Harmon, Dan Hurley and Richard Miller. In reviewing his past terms as President, Mr. Toner stressed the benefits his own customers have derived and the help he and his servicemen have received from the interchange of ideas and standardization of servicing techniques made possible by association membership. Other officers are: Norm Telaak, J. Beitz, George Leffler, Joe Adams, J. Opiela, Pat Pratt, Ralph D'Augustine, Nick Meitie and Ed Donaher.

ARTSNY Elects

The Associated Radio-Television Servicemen of New York Inc., elected the following officers: Pres., Marty Boxer; Executive Secy., Max Leibowitz; and Treas., Phil Goldfarb. Technical Chapter: V. P., Peter La Presti; Recrdg. Secy., Jacob Allen; Corres. Secy., O. Capetelli; and Sgt.-at-Arms, John Bush. Business Chapter: V. P., Charles Edward; Recrdg. Secy., Lou Gioa, Fin. Secy., Jack Sperling; and Sgt.-at-Arms, Bob Mulivitz. A motion was passed to permit Apprentice Membership. A three year limit was placed on this category. Either the apprentice becomes eligible for higher membership, or he must revert back to Associate Member after the time limit. A Benevolent Fund was also voted into existence, with plans for a permanent Board of Trustees.

anatomy
of the
tube...
LESSON #1



GRID

How RCA builds special
prescription grids...extends 6AF4-A life!

RCA's redesign of the 6AF4-A has resulted in minimized slump, product uniformity, and projected average life of 4,000 hours or more!

Here are some of the materials RCA "prescribes" in manufacturing the new 6AF4-A. The grid is plated with Palladium, a rare metal capable of withstanding high temperatures. The use of this grid structure minimizes interelectrode leakage, prevents grid loading, and as a result, provides stable tube performance. The cathode, a nickel alloy, is specially selected to reduce interface resistance and thus minimizes slump. The use of pins which are silver-plated reduces skin effect at ultra high frequencies and improves tuner performance.

All these features, in addition to dynamic life tests, help to assure long and dependable performance. No wonder RCA's 6AF4-A is tops!

So, here's the #1 lesson in radio, phonograph, and TV service—when ordering tubes for replacement, specify "RCA Tubes only."



RADIO CORPORATION OF AMERICA
Electron Tube Division

Harrison, N. J.

NEW improved model Simpson 260!

TRADEMARK

**RUGGED
PRINTED
CIRCUIT!**

still
only
\$43⁹⁵

Complete with leads and
Operator's Manual.
Also available in
Roll-Top model at
only . . . \$49.95



...the VOM that outsells
all others combined

**MANY NEW FEATURES MAKE THE 260
MORE VALUABLE THAN EVER!**

- POLARITY REVERSING SWITCH
- 50 MICROAMPERE—250 MILLIVOLT RANGE
- EASIER-TO-READ SCALES
- LESS CIRCUIT LOADING
- POPULAR DBM RANGES
- FULL-WAVE BRIDGE RECTIFIER SYSTEM
- RUGGED PRINTED CIRCUIT
- ALL COMPONENTS EASILY ACCESSIBLE

- IMPROVED FREQUENCY RESPONSE IN A. C. MEASUREMENTS

See it at your Distributor, or write

SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street, Chicago 44, Illinois

Phone: EStebrook 9-1121

In Canada: Bach-Simpson Ltd., London, Ontario

WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT



New Books

TELEVISION INTERFERENCE HANDBOOK. By Philip S. Rand. Published by Nelson Publishing Co., P. O. Box 36, Redding Ridge, Conn. 56 pages. Paper cover. \$1.75.

Here is a practical and informative book which explains the causes and cures for various forms of TVI, including ham transmitters, industrial devices, motors, diathermy, garage door openers, other TV sets, and many others. Various shielding and filtering methods to eliminate interference are shown. A helpful appendix lists troublesome harmonics, channel frequencies and pertinent FCC regulations.

BASIC TELEVISION (5 volumes). By A. Schure. Published by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11, N.Y. 688 pages. Paper cover, \$2.25 per volume, \$10 per set. Also in single cloth binding, \$11.50.

"One picture is worth 10,000 words," so you can imagine the information contained in the more than 700 figures included here. Each of these drawings is illustrated in a manner which makes the most difficult concept readily understandable. Text is very clear. Vol. 1 covers the transmitting end of TV. Vol. 2 discusses receiver organization, antennas and transmission lines. Vols. 3, 4 and 5 go into the details of receiver circuitry, including closed circuit TV. If you are a relative newcomer to TV, this work will be a most valuable "bible"; if you are an old pro, you will be surprised at how much you can learn. Again we must emphasize the value of the illustrative presentations which visualize the concepts discussed.

GENERAL ELECTRIC TV SERVICE GUIDE, Volume III. Prepared and published by General Electric Co., Electronics Park, Syracuse, N.Y. 90 pages. Paper cover. \$1.75.

The new guide covers G.E. TV receivers manufactured from 1955 to 1957 which period includes the 110-degree Slim Silhouette line. It also contains production change information and component location diagrams. All three service guides, including Volume 1, now in its third edition covers sets manufactured from 1946 to 1953, and Volume 2, in its second edition covers sets from 1953 to 1955, are large spiral bound books designed to lie flat on the work bench for convenient reference. The Guides include such features as a photo index; schematic diagrams, replacement parts list, tube and trimmer locations, test points, production changes, and VHF and UHF-tuner photos.

CASH IN ON **ZENITH'S**
Tremendous Customer Acceptance
AND PERFORMANCE



**USE
 ZENITH
 QUALITY
 PARTS**

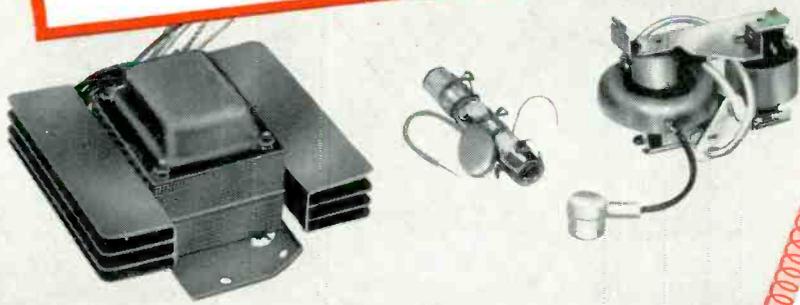
IT'S ZENITH FOR
DEPENDABILITY
 YOU CAN COUNT ON!

There's a reason...

Universally designed parts are of necessity manufactured to broad tolerances...and they may not give the maximum in performance and reliability.

Components in a Zenith Radio, Television or High Fidelity Instrument are built to be perfectly matched and balanced for superior performance. To keep Zenith sets operating at original performance, use Zenith quality service components.

When you use Zenith components in Zenith sets, it's a custom repair that both you and your customers can depend on.



You can safely guarantee Zenith repairs when you use dependable Zenith components.

Buy parts by Zenith... backed by 39 years of leadership in radionics exclusively. The quality goes in before the Zenith name goes on.

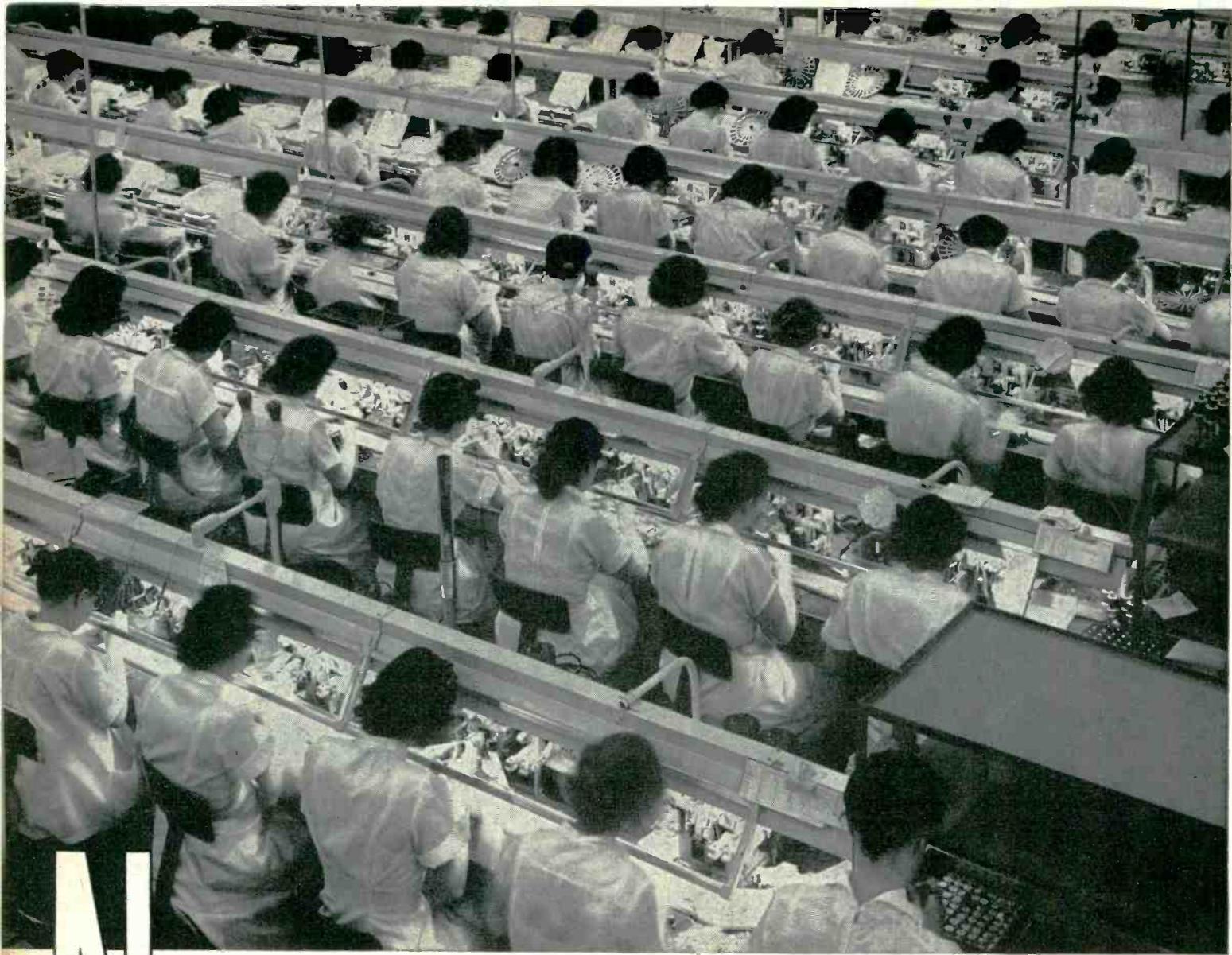
SEE YOUR ZENITH DISTRIBUTOR



**MEANS
 QUALITY**

ZENITH RADIO CORPORATION • PARTS AND ACCESSORIES DIVISION

6001 W. Dickens • Chicago 39, Illinois



NOW!

General Electric Service-Designed Tubes

made even better... through "Snow White" cleanliness!

Lint-free Dacron and Nylon garments... filtered, conditioned air... floors cleaned many times a day... these and other steps toward "Snow White" cleanliness now make G-E Service-Designed Tubes still more dependable! Dust and lint—notorious for causing tube shorts—are banned in General Electric's immaculate receiving-tube factories.

SUPERIOR-QUALITY G-E SERVICE-DESIGNED TUBES INCLUDE:

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

General Electric Service-Designed Tubes increase your profit opportunity, build goodwill with customers. Performance is improved over prototypes; tube life is longer... yet Service-Designed Tubes cost the same as other receiving types. Phone your G-E Tube Distributor! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

11-11-124

News of the Industry

INTERNATIONAL RESISTANCE CO. has elected DR. ALFRED H. WILLIAMS to its Board of Directors.

XCELITE, INC. reports the following appointments: ARCH WARDEN, Vice Pres.; CLARENCE SCHWABEL, Secy.-Treas.; A. J. HOLMES, Ass't Sales Mgr.

EITEL-MCCULLOUGH, INC. has named MYRAN C. POGUE to the newly created post of Manager of Market Research.

JFD MFG. CO. held a TV Antenna Clinic at the recent R. H. MACY CO. Music Festival, in the TV show room of Macy's New York City store.

STANDARD COMPONENTS, INC. has a newly designed display package for the firm's new deflection component line.

INDUSTRO TRANSISTOR CORP. states that the demand, from free European nations in 1958, for American-made transistors will be at least three times greater than it was last year.

PHILCO CORP. TV DIV. announces the grand prize winner in their national open house award for dealers. He is HOWARD MITCHELL of MITCHELL RADIO & APPLIANCE, Rockford, Ill., who was awarded a new 1958 Chrysler Imperial Automobile.

RADIO CORP. OF AMERICA announces that CHARLES R. DENNY has been elected to the newly created position of Vice Pres., Product Planning. Since 1947, Mr. Denny has been an executive of the National Broadcasting Co., a service of RCA.

JERROLD ELECTRONICS CORP. has announced plans to expand their sales organization which, upon completion during the first half of 1958, will nearly double the number of sales and engineering offices throughout the U.S. This announcement was made in connection with the opening of their mid-western regional sales office in St. Louis.

CBS-HYTRON has four new signs and clocks which are available to the Independent Service-Dealer through CBS Tube Distributors. PA-44, an Indoor Clock-Sign for the dealer to spell out his name or sales messages; PA-43, an Outdoor Sign highlighting the dealer's name on both sides; PA-11, a double-faced enameled Flange Sign for indoor or outdoor use; and PA-167, an Independent Service Clock which is a clock, display and night light.

RADIART VIBRATORS



Consistently dependable power

Next time an auto-radio vibrator replacement is called for, try Radiart. There's a complete line for all 6-volt and 12-volt applications. And no waiting for the type you want, because your local Radiart Distributor maintains a full stock for your convenience. Ask him for your free copy of the Radiart Vibrator Replacement Guide, or write to Dept. ET-4, The Radiart Corporation, Indianapolis 5, Indiana.



RADIART TOBE Vibrators

Old Hands at Dependability



Name the great new CDR TR-16 Rotor

Your name can win the Plymouth Station Wagon

Here Are the Features to Help You Pick a Name

- Entirely new with features never before available in the popular price range.
- Quick-mounting mast collet permits speedy installation (no loose parts to assemble).
- Self-centering sawtooth clamps take masts up to 1½" in diameter.
- Instant locking prevents drift.
- Mechanical brake releases magnetically.
- Direction of rotation is instantly reversible.
- Rotor makes complete 360° revolution in 45 seconds.
- Completely weather-sealed, rotor meets rigid MIL salt water test.
- Fits standard towers.
- Streamlined to reduce wind resistance.
- Streamlined control box, non-breakable, impact-resistant case. *Better still visit your jobber today and try it.*

CORNELL-DUBILIER ELECTRIC CORP.
South Plainfield, New Jersey

THE RADIART CORPORATION
Indianapolis, Indiana



CDR Rotors

Old Hands at Dependability

MERIT COIL & TRANSFORMER CORP. reports completion of their move to consolidate all of the firm's production facilities at Merit Plaza, Hollywood, Fla., in the greater Miami industrial region. Regional offices will be maintained in Chicago, Ill.

WABER MFG. CO. has been formed to manufacture electronic components and accessories. Located at 105 Heatherwood Rd., Havertown, Pa., and headed by ISODORE WABER, recently resigned Vice Pres. and Director of CBC Electronics Co.

JOHN F. RIDER PUBLISHER, INC. has received a citation from the DEPARTMENT OF COMMERCE for the firm's contribution to the 1957 International Trade Fairs. Their technical books were displayed at the Fairs throughout the world.

CHANNEL MASTER CORP. reports that a Federal Court action has been filed against SKY RAY MFG. CO. and that company's distributor LAMPLEY RADIO CO. for infringement of Patent No. 2,817,085 covering the firm's TW (Travelling Wave) Antenna. It is charged that Sky Ray copied this antenna and infringed the patent by making and selling the Sky Ray antenna "Sky Traveller."

RAM ELECTRONICS states that, depending upon the number of components purchased, technicians may qualify for such premiums as appliances, tools, etc., under the firm's new Share in Pleasure program.

THE GABRIEL CO. announces the appointment of JOSEPH B. CEJKA as General Sales Manager for electronics. For eight years, prior to joining the firm, Mr. Cejka was Vice President of the Brach Mfg. Co.

Reps & Distributors

TENNA MFG. CO. has appointed the HENRY P. SEGEL CO., Brookline, Mass., as sales reps for the New England territory.

ERIE RESISTOR CORP. announces the appointment of FERGUSON ELECTRONICS SUPPLY CO., Detroit, Mich., as Industrial Distributors of ERIE, Teflon, and Corning Glass Works electronic components.

MARJO TECHNICAL PRODUCTS CO. announces the appointment of two additional representatives. BARSTOW & DORAN, INC., Los Angeles, Calif., for southern Calif., Ariz., Nev., and Hawaii; LEONARD D. ALLEN, Syracuse, N. Y. for upper New York state and Erie, Pa.

WARD PRODUCTS CORP. announces the appointment of MEL FOSTER CO., Minneapolis, Minn. as sales reps to cover Minn., North and South Dak., and western Wisc.

THE HALLICRAFTERS CO. has appointed RICHARD W. BELLEW, El Dorado, Ark., as factory rep of Communications Equipment, to cover Ark., La., and Miss.

ANCHOR PRODUCTS CO. reports that STAN CLUPHT & ASSOCIATES, Denver, Colo., has been appointed to represent them in the Rocky Mountain Territory.

INDUSTRO TRANSISTOR CORP. announces that the ROBURN AGENCIES of New York City, has been appointed to handle the firm's export sales.

HENRY LAVIN ASSOCIATES, New England sales engineering firm, reports the appointment of JOHN D. HAUCK to their sales staff.

WINEGARD CO. reports that the following factory sales reps have been appointed: RICHARD G. BRADBURY, Niagara Falls, N. Y., for New York state; and VINCENT ALLSTAEDT, Santa Monica, Calif., for Calif.

PAUL HAYDEN ASSOCIATES, announces that GEORGE HARMAN has joined this "rep" firm with headquarters at Miami Beach, Fla.

JERROLD ELECTRONICS CORP., Electronic Test Equipment Div., has appointed the following representatives: GERALD G. LEEDS CO., Great Neck, N. Y., to cover New England, New York, eastern Penna., Va., and Washington, D.C.; ARVA, an affiliate of the RON MERRITT CO., Seattle, Wash., for Wash., Ore., Mont., and Idaho; INSTRUMENTS FOR MEASUREMENTS, Hollywood, Calif., for southern Calif., and southern Nev. The firm states that Reps are being sought, for their expanding Electronic Test Equipment Div., for all areas of the country, with the exception of New England, the Mid-Atlantic States, and the West Coast.



"How's that for high frequency response?"

WIN THIS PLYMOUTH STATION WAGON



The name you pick may win

this beautiful 1958 Plymouth Station Wagon

Here's all you do... There's not a thing to buy. Just visit your local CDR Distributor and look over the new TR-16 Rotor — then ask the Counter Man for an Official Entry Blank. Select a name, fill in the blank and mail... that's all there is to it!

This contest is open to any person over 21 years of age, and residing in the continental U. S. Officers, employees and members of the sponsoring organization and advertising agency are not eligible. Contest is subject to Federal, State and local regulations.

No entries will be returned, and the decisions of the Judges will be final. Contest closes April 30, 1953.

CORNELL-DUBILIER ELECTRIC CORP.
South Plainfield, New Jersey

THE RADIART CORPORATION
Indianapolis, Indiana



CDR Rotors

Old Hands at Dependability

Mr. Independent Service Dealer:



When you buy tubes are you robbing yourself?

Not when you buy Raytheon TV and Radio Tubes

First of all, Raytheon has no factory TV-radio service organization that competes with you for profitable servicing business — you're not helping a "competitor" when you buy Raytheon Tubes.

Then, too, when you buy Raytheon TV and Radio Tubes you get the finest quality tubes money can buy — tubes designed for top performance in all makes and models of receivers. Raytheon does not manufacture sets and therefore must make tubes that will meet the rigid performance requirements of the many sets pro-

duced — tubes ideal for all replacement work.

And last, but by no means least, when you buy Raytheon Tubes you deal with local *independent* tube distributors who are anxious to give you the best in service and technical assistance. They are eager to supply you with the hundreds of helpful shop and sales aids Raytheon makes available for you — helps that make your job easier, more efficient and more profitable.

Make all of your tube dollars work for you — always ask your Tube Distributor for Raytheon quality TV and Radio Tubes.



RAYTHEON MANUFACTURING COMPANY

Receiving Tube and Semiconductor Operations

NEWTON 58, MASS. CHICAGO, ILL. ATLANTA 6, GA. LOS ANGELES 7, CALIF.
55 Chapel Street 9501 Grand Ave. (Franklin Park) 1150 Zonolite Rd. N.E. 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.



ELECTRONIC TECHNICIAN

Including
Circuit Digests

IT'S TIME TO ENFORCE THE LAW!

An open letter to Congress and the FCC

It may come as something of a surprise to you, but there are currently thousands of radio transmitters in illegal operation in the United States. And very little is being done about it.

Our radio frequencies are a national resource, and are consequently a Federal responsibility. The basic policy guiding the use of these frequencies is spelled out in a law known as the Communications Act, passed by Congress in 1934. The Act clearly specifies severe penalties for breaking the law.

The Federal Communications Commission is charged with administering the use of our radio frequencies (with the exception of that large part of the spectrum appropriated by the government for its own use).

Many devices which operate at radio frequencies do so at such low power and under such transmission conditions that they do not interfere with other communication services. Therefore, no license of any kind is required. For example, the oscillator in a home radio is such a limited-distance low-power transmitter. FCC rules specify the exact limitations to qualify for non-licensed service.

Illegal Radiation

Nevertheless, some manufacturers continue to make electronic devices which, though not licensed, radiate beyond the legal limits. They do this because it is often cheaper to produce a device which does not conform with the law. The resulting illegal radiation is a menace to vital communication services, and an unfair economic advantage over producers whose equipment performs within legal limits.

A case in point is the radio-controlled garage door operator. Because of price advantage, certain manufacturers continue to make units which radiate illegally. Electronic technicians who install them, and consumers who buy them, are usually unaware of the illegal nature of operating some of these remote controls.

There is no doubt that illegal door operators cause interference to legal services. Complaints of

TV interference are frequently heard. Still more important is the interference with aircraft radio. For instance, it is reported that in San Diego, improperly designed radio garage door operators menaced public safety by interfering with aircraft glide path transmissions. It is said that the FCC forced some 200 people to disconnect these remote controls. The innocent users were stuck.

Why doesn't the FCC crack down on the manufacturers? Well, the law is so written that essentially the transmitter user is regulated, not the manufacturer. The problem of enforcing the law against many thousands of users is a difficult one for the FCC field monitoring staff. Besides, the manufacturer is the guilty one, not the user who bought the remote control in good faith.

There are, of course, many excellent radio-controlled door operators requiring no license. They perform well and are perfectly legal. There are other fine units designed to operate in the Citizens Band, where licensing is required, but very easy to obtain. We urge technicians to be cautious. Before buying or installing, make sure the product will operate legally. ET editors will be glad to recommend approved manufacturers, though we will not pass on the merits of other companies.

Passing on the legality of a product is up to the government agency set up to enforce the law—the FCC. If the FCC believes the law should be modified to give it a measure of control over the source of the trouble—the irresponsible manufacturers—then we strongly urge Congress to take action.

The FCC and our elected officials are obligated to protect the public. This includes the electronic technician who installs and maintains equipment. Technicians are in front-line contact with consumers. More often than not, technicians are blamed for the built-in improper operation of equipment. It is unfair for either the public or technicians to suffer from irresponsible manufacturers and government failure to carry out the law.

The spirit of the Communications Act is clear—orderly legal use of the spectrum. It's up to Congress and the FCC to see that it's enforced!

Tuning In the

TUBE COUNTERFEITERS who rebrand old tubes and turn them in to manufacturers for in-warranty credit have received some just desserts. A New York judge fined several of the culprits, and sentenced one to jail for a couple of years. Racket was originally exposed in the July 1955 issue of Technician. The wheels of justice grind slow, but exceedingly fine.

LAND NAVIGATION The new "black box" is a cooperative project developed by the Army's Engineer Research and Development Laboratories at Fort Belvoir, Virginia and Ford Instrument Company, division of Sperry Rand Corp. It enables the operator of a tank or other vehicle to know his exact position, how to reach a designated position, and how to return to any given base. In operation, the driver of the vehicle adjusts the computer by feeding in present position information based on a map coordinate system. He also feeds in the coordinates of his destination. The switch is thrown to "operate," and the unit is ready. Continuous intelligence is fed into the system from the vehicle's gyro-compass, and from the speedometer or odometer cable of the vehicle. Via a system of computers, this information provides the driver with a continuous display of vehicle heading, destination heading, and distance to destination. If the two heading arrows are superimposed on the display, he knows that he is heading towards his destination by the shortest possible route. If some terrain feature forces him to detour, he simply swings around it and gets back on course by matching up the two arrows. The computers compensate automatically and instantaneously for any deviations.

PORTABLE AUTOMOBILE TV



Delco engineers have come up with this experimental XTP-1 transistor-powered 9" portable TV for Oldsmobile. When removed it plugs into 110 volts ac. When not in use, it folds into the rear of the front seat. In normal viewing, the screen is at 45° to the floor. The set can not be seen by the driver, complying with various safety codes.



"Everything the latest for him—see his remote controls."

TRANSISTOR power supplies for two-way mobile communications equipment are becoming increasingly popular. They are claimed to require less maintenance, as well as require less space, than other types of power supplies. Of particular interest is the fact that transistor supplies are becoming available in higher powers. On almost the same day, both General Electric and Motorola announced the "first" 100-watt mobile radio powered by transistor supply, for use in the 25-54 mc band. Powers of 50 and 60 watts are available for the 144-174 range.

WARNING: If a convincing fellow pays you a visit, with a money-making offer to let you in on the ground floor of a pay-TV system (just a nominal payment for franchise, shares or registration), **DON'T BUY!** None of the reputable firms in the pay-TV field have such special "deals" for service technicians.

HI-FI DEALER PROGRAM has been developed by the Institute of High Fidelity Manufacturers (IHFM) to provide a display plaque and recognition for audio component dealers who qualify. Four requirements are that the dealer: 1) Stock, through regular trade channels, the products of not less than eight general members of IHFM. 2) Maintain adequate demonstration facilities. 3) Maintain suitable service facilities and personnel. 4) Honor and recognize factory warranties. Annual fee is \$25. Products stocked may include speakers, cartridges, tape, styli, changers and other equipment. Interested dealers should request an application blank from the Institute of High Fidelity Mfrs., 125 E. 23 St., New York 10, N.Y.

Picture



NOISE REJECTION is what most receiver designers aim at, but certain Stromberg-Carlson engineers are aiming at just the opposite goal. They are producing atmospheric noise recorders, to be used in radio noise studies over the next 11 years. Naturally, the more noise you can hear, the more you can learn about static, sunspot cycles and the like.

SATELLITE TV has been brought a step closer by the development of new transmitting and receiving CRT's by CBS-Hytron. Recent 7-inch prototypes provide 12,000-line resolution over the entire screen area, which is better than the human eye can do, and over 22 times better than conventional TV. For satellite use, a smaller version is being designed. In satellite operation, a film picture would be taken of the earth or moon, and the new TV eye would scan it. The resulting signals would be transmitted to earth with practically the same resolution as the original photo.

INCIDENTAL INFORMATION from our far-flung correspondents: The state of Manipur, India, has 237 licensed radio receivers.

TELEMOVIES are enjoying a comeback in the Bartlesville, Okla., cable theatre system. When the number of subscribers fell to 300, the price was reduced from \$9.50 to \$4.95 per month, with movies on one channel instead of the original two. Muzak background music was placed on the second channel. Community antenna service was made available to subscribers. The number of subscribers quickly jumped to 600, and is still growing. Reason for the original drop was attributed to free TV movies—147 of them in one month—coming from Tulsa.

CALENDAR OF COMING EVENTS

- Apr. 10-12: Southwest Regional Conference & Electronic Show, Municipal Auditorium, San Antonio, Texas.
- Apr. 18-19: 12th Annual Spring Technical Conference on TV and Transistors, Eng'g Society Bldg., Cincinnati, Ohio.
- Apr. 22-24: 1958 Electronic Components Conference, Ambassador Hotel, Los Angeles, Calif.
- Apr. 28- May 1: National Association of Radio & TV Broadcasters Annual Convention, Hotels Baltimore & Statler, Los Angeles, Calif.
- Apr. 30- May 2: 7th Region IRE Tech, Conf. & Trade Show, Sacramento, Calif.
- May 7-9: Spring Meeting of The Acoustical Society of America, Washington, D. C.
- May 13-15: Spring Assembly Meeting of The Radio Technical Commission for Marine Service, Benjamin Franklin Hotel, Philadelphia, Pa.
- May 19-21: 1958 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
- June 4-6: Armed Forces Communication & Electronics Ass'n., Sheraton Park Hotel, Washington, D. C.

Coming next month!

ELECTRONIC TECHNICIAN BUYERS DIRECTORY

The only directory in the electronic maintenance field.

NATIONAL RADIO WEEK falls on May 5-10 in 1958.

RANDOM NOISE

SALES OF AUTOMATIC GARAGE DOOR OPENERS WILL SURPASS \$14 MILLION IN '58, COMPARED TO \$5 MILLION IN '57, REPORTS ALLIANCE MFG CO. TV-ELECTRONIC TECHNICIANS WILL ACCOUNT FOR GOOD PART OF GROWTH

WIDER VARIETY OF PRODUCTS ARE USING TRANSISTORS-GERMAN MANUFACTURER IS SELLING TRANSISTORIZED FLASH UNIT IN U.S. FOR \$49.50

TOM HIGGINS JR.

FM TRAFFIC SIGNAL SYSTEM USES CODED TRANSISTORIZED LIGHT-MOTOR IN WA

Deciphering TV-Radio Model & Chassis Numbers

Guide To Chassis and Model Numbers Aids Servicing,

Parts Ordering, Finding Data, And Identifying Sets.

ROBERT CORNELL
TECHNICAL EDITOR

• What do the numbers on TV and radio sets mean? Do you get them, or do they get you? Sometimes they pack a load of information and sometimes they are meaningless. Sometimes they are an orderly alphabetical and numerical arrangement, and sometimes they are a hopeless, chaotic and disjointed mess of hieroglyphics. Some manufacturers admit that a state of hopeless confusion exists and that something should be done about it. An orderly and planned system of numbering can do much to simplify inventory control, billing, ordering and even selling. The technician's life would be much easier if he could identify a set easily, file and find schematics, and know in a flash what set a customer or distributor has in mind when a number is mentioned.

All is not lost, thanks to the Electronic Industry Association, located at 1721 De Sales St. N. W., Washington 6, D. C., and to some individual manufacturers, a system has been developed. Actually, several different systems have materialized over the years. So far as the technician concerned

plete unit may give details as to the types of cabinet, style, and finish, and may also indicate if it is a radio or TV, portable or fixed, year of production, size of CRT, etc.;

2—The chassis number, in most cases the most important one to the technician, indicates the actual piece of electronic equipment used. Schematics, technical information and parts required may be ascertained by being able to identify the chassis. Some model TV sets may come equipped with any one of a number of different chassis, and by the same logic, or lack of it, a chassis may be fitted into many different models.

The chassis number may also indicate size of CRT, number of tubes, VHF only or UHF/VHF, year of production, etc.;

3—Run numbers may or may not be indicated. Some set makers use letters after the chassis number, others may use R1, R2, R3, etc. and still others may use just numbers. As was pointed out earlier, sometimes the serial number may be a clue to the run number. The run number designates electrical and mechanical changes. In many cases an earlier run set may be upgraded in the field by installing some of the modifications a manufacturer used

List of companies covered in this report. See Guide To Radio and TV Model Numbers.

| Manufacturer or Prime Source | EIA Production Source Code Number | Manufacturer or Prime Source | EIA Production Source Code Number |
|--|-----------------------------------|--|-----------------------------------|
| Admiral Corporation 3800 W. Cortland St., Chicago 47, Ill. | 101 | Montgomery Ward (Silvertone) 618 W. Chicago St., Chicago 7, Ill. | — |
| Andrea Radio Corp. 27-01 Bridge Plaza, North Long Island City 1, N. Y. | 113 | Motorola, Inc. 4545 Augusta Blvd., Chicago 51, Ill. | 185 |
| Allen B. Du Mont Laboratories, Inc. 35 Market St., East Paterson, N. J. | 158 | Olympic Radio & Television 34-01 38th Ave., Long Island City 1, N. Y. | 200 |
| Emerson Radio & Phonograph Corp. 14th & Coles Streets Jersey City 2, N. J. | 171 | Philco Corp. Tioga & C Streets Philadelphia 34, Pa. | 260 |
| General Electric Co. Electronics Park, Syracuse, N. Y. | 188 | Radio Corp. of America Camden 8, N. J. | 274 |
| The Hallicrafters Co. 10th & Kostner Ave., Chicago 24, Ill. | 199 | Sylvania Electric Products, Inc. 700 Ellicott St., Batavia, N. Y. | 312 |
| Offman Electronics Corp. 100 S. Avalon Blvd., Angeles 3, Calif. | 207 | Traveler Radio Corp. 571 W. Jackson Blvd., Chicago 6, Ill. | 320 |
| Point Co. 10 W. Taylor St., Chicago 44, Ill. | — | Western Auto Supply Co. (Truetone) 2107 Grand Ave., Kansas City 8, Mo. | — |
| Magnavox Co. Wayne 4, Ind. | 232 | Westinghouse Electric Corp. TV-Radio Division Metuchen, N. J. | 337 |
| | | Zenith Radio Corp. 6001 Dickens Ave., Chicago 39, Ill. | 343 |

to stabilize or otherwise improve a set's performance.

One other set of numbers appear on most major components and the chassis itself. That is the Electronic Industries Association Production Source Code. It is a standard numeric symbol, assigned and registered by EIA headquarters. Manufacturers may stamp or mark any or all of their products to identify the production source. In addition to the standard code, which usually consists of 3 or 4 numbers, a date code may be added. However, in most cases, it should not be necessary to trace a component further back than the producer of the completed consumer product. In many instances the technician, by applying some of these numbering principles and studying a group of numbers, may be able to decipher and obtain the intelligence hidden in these codes. About the best advice one can follow, when lost in the maze of digits, is to contact the manufacturer directly.

Another advantage to knowing the manufacturer's system of numbering may help identify the chassis, even when the numbers are obliterated. The Guide To Model and Chassis Numbers Chart, presented here, is in most cases self explanatory. In the interest of presenting as large a cross-section of the industry's endeavors to identify their products, in a rapid and convenient form for reference purposes, some details were omitted from the chart and presented in the text. For one reason or another, certain details of some of the numbering systems, were not available at the time of writing.

Highlights of the different systems used by different set producers follow:

Andrea

The combination numbering system applies to both radio and TV chassis and in a general way to hi-fi. The latter portion of the model number includes the chassis number.

Du Mont

A personal touch is added by giving each TV set a name. From Allenby to Winthrop past Newport, Riviera and Versailles, the road is fortunately identified with RA numbers. RA in this case stands for Receiver Apparatus. The numbers run in sequence from RA-101 up to the latest RA-406/407, and represent the order of engineering development. When two numbers are combined as in RA-402/403, the first number

stands for a VHF set only and the second is for a VHF/UHF version. Earlier sets used a sticker or metal plate attached to the chassis for identification. Later sets have a serial number stamped on the rear panel. The first 3 numbers of a 9 digit configuration is the RA number from RA-301 on.

Emerson

Both model and chassis numbers are basically all numerical, and do not indicate size of picture tube, type of chassis, etc. The first digits of the TV chassis number are meaningless to the technician. Both radio and TV chassis carry the same first 3 digits (120). The last 3 digits indicate the order of release of different chassis. One consolation perhaps is that within the past year and a half to two years, radio model numbers are under 1000 and TV models are over 1000.

General Electric

TV—A new numbering sequence, started recently, identifies size of CRT, type of cabinet, chassis, and cabinet color, style and finish. Chassis styles run from the letters A to U with some pauses for double lettered jobs such as EE, MM, etc. More recent chassis whose circuitry is similar to previous issues but have mechanical differences bear Q2, M3, U2, etc., designations.

Radio—All new table models to be introduced within the next few years will run numerically from 100 to 399. Clock radios will run numerically between 400 and 699. Portable radios between 700 and 999. Provision is made to identify 5 different colors.

Hoffman

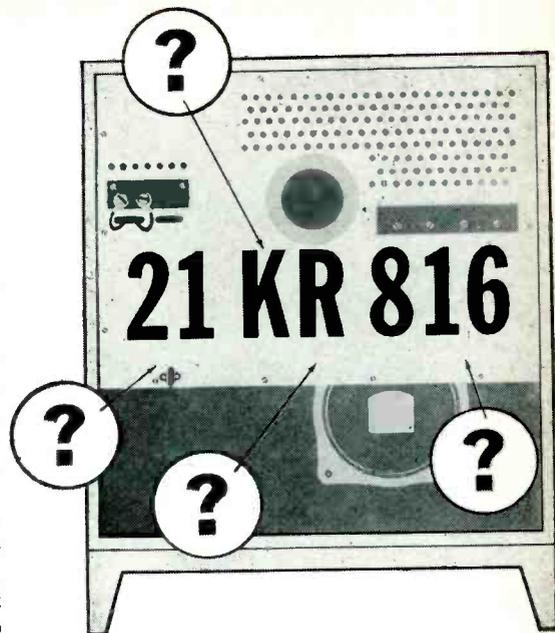
A new model numbering system was put into use with the introduction of the 1956 line of TV receivers. It was designed to cut down the quantity of numbers required.

Hotpoint

The letter S is used in the model numbering system to designate the TV receiver as a Hotpoint product. Because they are a division of the General Electric Co., many similarities appear. The chassis used in 1957 and 1958 productions are designated as follows:

| Chassis | CRT | Year |
|---------|-----------|---------|
| MM | 17" | 1956-57 |
| M3 | 17" & 21" | 1958 |
| Q | 14" | 1957 |
| Q2 | 14" | 1958 |
| T | 9" | 1957 |
| U | 21" & 24" | 1957 |
| U2 | 21" & 24" | 1958 |

Production runs are identified as early or late production.



Magnavox

In addition to chassis numbers, there are model numbers and style numbers. The easiest way to dig out the service data, in the absence of the manufacturer's service manual index and service manuals, is to go according to chassis numbers. Several descriptive letters in front of the number help identify the equipment.

Each chassis is also given a series number. These numbers are included in some chassis numbers and are preceded by a letter V or U, which stands for VHF or UHF/VHF respectively. The series 21 chassis might appear as V-21-02CB. Other meanings are built into these numbers, for example the 02 in this case, in addition to other things, indicate a 24-inch CRT, as does 04, 06, 07, and 10. Numbers 01, 03, 05, 08, 11, and 12 indicate a 21-inch tube plus other changes. However, these numbers do not have the same meaning in other series TV sets.

Montgomery Ward

A 4-digit number which is part of the company's uniform article numbering system, is used to identify both radio and TV. The higher the number, the more recent the set.

Olympic

Chassis identification is relatively simple. An alphabetical sequence is used such as GA, GB, etc. HB, HC, HD, etc. will probably follow GZ as new chassis are produced. Combinations of letters which spell words or have other connotations such as HA are avoided. If the letter U is added, it represents UHF/VHF.

Upgraded and deluxe sets usually carry a higher letter in the alphabetical order. Run numbers and EIA

(Text continued on page 45.
See next page for Number Guide.)

Guide To Radio &

ADMIRAL EIA Code 101

RADIO MODEL
 NUMBER OF TUBES OR TRANSISTORS: 5 A 4 3 CABINET FINISH

CHASSIS NUMBER

TV MODEL
P H 1 4 D 1 1
 C-CONSOLE L-LOWBOY P-PORTABLE T-TABLE CRT SIZE
 H-HIGH FIDELITY R-REMOTE CONTROL

TV CHASSIS
 NUMBER OF TUBES: 1 9 S Z 4 F S MODEL VARIATIONS
 IF USED 41 MC IF OTHERWISE 21 MC IF ENGINEERING NUMBER

HOFFMAN* EIA Code 207

TV MODEL
 P-CHERRYWOOD OR PROVINCIAL FINISH W-WALNUT M-MAHOGANY B-BLONDE CRT SIZE: 7-17" 1-21" 4-24"

M U 1 0 2 4 C RUN
 If Used, U-UHF/VHF

1-B & W TABLE
 2-COLOR TABLE
 3-B & W OPEN-FACE CONSOLE
 4-COLOR OPEN-FACE CONSOLE
 5-B & W HALF-DOOR CONSOLE
 6-COLOR HALF-DOOR CONSOLE
 7-B & W FULL-DOOR CONSOLE
 8-HI-FI 800-AMPL. & SPKR. ONLY 8000-Includes AM FM Tuner
 9-B & W COMBINATION
 10-COLOR COMBINATION

ANDREA* EIA Code 113

TV & RADIO MODEL
 CABINET FINISH: B-BLONDE W-WALNUT E-EBONY F-FRUITWOOD M-MAHOGANY V-TV R-RADIO CHASSIS TYPE: SIZE OF PICTURE TUBE OR NUMBER OF TUBES IF IT'S A RADIO CHASSIS

B-CO-V P-21 K
 CABINET STYLE: CO-COMBINATION T-TABLE MODEL C-CONSOLE MC-MODERN CONSOLE 2C-CABINET w/DOORS or SPCL.CABINET REVISIONS

HOTPOINT*

TV MODEL
 CRT SIZE: 21 S 4 0 5 ENGINEERING NUMBER CABINET FINISH

COMPANY DESIGNATION: 3-PORTABLE 4-TABLE 5-CONSOLE 6-LOWBOY 8-CONSOLE

DUMONT* EIA Code 158

MAGNAVOX* EIA Code 232

TV MODEL
 T-VHF U-VHF/UHF CONVERTER MU-VHF UHF TUNER R-RADIO CTA 4 5 8 AA

AMP-AMPLIFIER AA Different Versions of the Same Chassis BA BB

A-AUDIO OUTPUT STAGE B-USES AUDIO OUTPUT OF RADIO E-NO AUDIO OUTPUT, BUT HAS TONE & VOL. CONTROLS D-SEPARATE AUDIO AMPLIF.

EMERSON* EIA Code 171

MONTGOMERY WARD*

1-PORTABLE TABLE RADIO PORTABLE PHONO STOCK NUMBER
 2-HI-FI RADIO CONSOLES PHONO 4 0 4 1
 3-TV PRIOR TO 1954 IN TV SETS: 0-UHF 1-UHF/VHF
 4-TABLE & PORT.TV
 5-CONSOLE TV

GENERAL ELECTRIC* EIA Code 188

TV MODEL
 CRT SIZE: 17 P 1 3 3 0 T-TABLE P-PORTABLE C-CONSOLE COLOR, STYLE & FINISH

YEAR: 1-1958 2-1959 3-1960 CHASSIS: 2-Q2 3-M3, 17" CRT 4-M3, 21" CRT 5-U2

RADIO MODEL
P 7 2 5 T-TABLE C-CLOCK P-PORTABLE COLOR MODEL

MOTOROLA EIA Code 185

RADIO MODEL
 NUMBER OF TUBES: 5 7 C D 2 WHEN USED, CLOCK RADIO CABINET FINISH

TV CHASSIS
 W,R,V,T, WHEN USED, MECHANICAL DIFFERENCES: W T S-5 3 8 A-0 1 TV SET MINOR ELECTRICAL REVISIONS

ENGINEERING NUMBER: A,B,C, etc.-MAJOR ELECTRICAL REVISIONS Y-UHF TUNER

TV MODEL
 If Used, UHF/VHF: Y A 2 1 C 5 B CRT SIZE CABINET FINISH: P-PORTABLE T-TABLE K-CONSOLE C-CONSOLETTTE

HALLICRAFTERS EIA Code 199

TV MODEL
 CRT SIZE: 21 K T 6 4 0 B K-CONSOLE T-TABLE B-BLONDE M-MAHOGANY ENGINEERING MODEL

T-TOP TUNING F-FRONT TUNING S-SIDE TUNING

* See Text for More Details

TV Model Numbers

OLYMPIC* EIA Code 200

TV MODEL
CRT SIZE
14-14"
17-17"
1-21"
4-24"

1 K D 8 2 B F

K - COMBINATION
T - TABLE & PORTABLE
C - CONSOLE

FINISH
F - FM
U - UHF/VHF
FU - FM/UHF

CHASSIS
TV MODEL
I A 1 0 0

ENGINEERING NUMBER

CABINET TYPE
CRT SIZE

TRAV-LER* EIA Code 320

TV MODEL
YEAR OF PRODUCTION
CRT SIZE
UHF/VHF

7 2 1 - K - 6 1 1 U

CABINET TYPE
K - CONSOLE
LP - COMBINATION
MT - METAL TABLE
T - TABLE
TL - TABLE w/LEGS

CABINETRY

TV CHASSIS
7 4 0 - 1 7

CHASSIS BLANK
TUNER No. (Prior to 1957 Indicated a Change in Circuitry)

YEAR OF PRODUCTION
MODIFICATION

PHILCO EIA Code 260

TV CHASSIS
CRT SIZE
E-14"
H-17"
L-21"
P-24"

8 L 7 1 U

ENGINEERING NUMBER

If Used, UHF/VHF

CHASSIS TYPE
2 - PORTABLE
4 & 5 - STANDARD
7 - DELUX
10 - COLOR

TV MODEL
U F 4 2 1 6 L

If Used, UHF/VHF

YEAR OF PRODUCTION

CRT SIZE
2-14"
3-17"
4-21"
6-24"

CABINET TYPE

TRUETONE*

D - RADIO OR PHONO
2D - TV

SELLING YEAR

D 1 8 4 4

CABINET STYLE
1 - CONSOLE
2 - TABLE
3 - PORTABLE
4 - AUTO RADIO
5 - PHONOGRAPH

COLOR OR MODEL

EQUIPMENT MANUFACTURER

RCA-VICTOR* EIA Code 274

TV MODEL
CRT SIZE
G - *If Used, COLOR*

2 4 - C D - 7 5 4 5 U

D, S or T - GENERAL PRICE RANGE

If Used, UHF/VHF

CABINET FINISH

WESTINGHOUSE EIA Code 337

TV MODEL
CRT SIZE

2 1 K R 1 9 0

K - CONSOLE
T - TABLE OR PORTABLE
C - COMBINATION

R - PROVISIONS FOR REMOTE CONTROL

MODEL, COLOR, Etc.

RADIO MODEL
MODEL, COLOR, Etc. **5 8 7 P 7**

TYPE OF RADIO
T - TABLE MODEL
P - PORTABLE
C - CONSOLE
R - PROVISIONS FOR RECORD PLAYER
PR - PORTABLE RECORD PLAYER

NUMBER OF TUBES OR TRANSISTORS

SYLVANIA* EIA Code 312

TV MODEL
CRT SIZE, As Indicated, Except 21" Color is 31"

2 1 C 5 1 3 M U P

ENGINEERING NUMBER

If Used, UHF/VHF

If Used, POWER TUNING

CABINET FINISH
A - BEIGE
B - BLONDE
L - BLUE
J - BROWN
C - CHARTREUSE
E - EBONY (Black)
D - GRAY, DK.

F - GRAY, Lt.
G - GREEN
H - IVORY
M - MAHOGANY
K - MAPLE
N - MAROON
Q - PINK

R - RED
S - TAN
T - TURQUOISE
W - WALNUT
Z - WHITE
Y - YELLOW
X - GOLD

P - PORTABLE
T - TABLE
M - MODULAR TABLE
C - OPEN CONSOLE
D - CONSOLE w/DOORS
R - CONSOLE COMBINATION

TV CHASSIS
5 3 7 1 0 1 2 3 3 4 0 4 8

FOR FACTORY INFORMATION
ELECTRICAL REVISION CODE

SIGNATURE CODE

ZENITH EIA Code 343

TV MODEL
YEAR OF PRODUCTION
Z - 1957
A - 1958

A 1 5 1 0 L

TYPE OF CABINET
10 TO 30 - TABLE
31 and UP - CONSOLE

CRT SIZE
15-14"
18-17"
22 or 23-21"
26-24"

CABINET COLOR

ENGINEERING NUMBER

SPACE COMMAND
30- w/21"
40- w/24"

TV CHASSIS
1 5 A 2 5 Q

U - UHF/VHF
Q - EQUIPPED w/SPACE COMMAND

NUMBER OF TUBES

YEAR OF PRODUCTION

RADIO CHASSIS
7 Z 2 0

CABINET COLOR OR FINISH

Details

Test Equipment For

Third Echelon Hi-Fi Servicing

Professional Approach And Top Level Techniques Help Establish Factory Standards In The Field

NORMAN H. CROWHURST

• Third echelon maintenance is top level procedure. Beyond this point, the audio engineer steps into the picture. Detecting and correcting design faults, while ordinarily not in the realm of repair work may become evident and suggestions for modification may present themselves when the technician uses these advanced servicing techniques. He is also in a better position to satisfy his customers and elevate himself and his reputation. However, the main servicing mission is to restore the equipment so that it will operate according to the factory standard. The dividing of this highly specialized form of service work into three echelons of maintenance is done with good reason. This approach is based on the premise that:

1—There is a large demand for qualified shops and technicians to provide high-fidelity servicing, and that this demand is growing.

2—Radio and TV technicians already have the basic know-how,

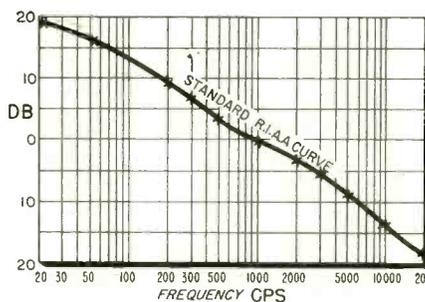


Fig. 2—Response of phono equalizer should be compared with the appropriate standard.

small tools, some test equipment, shop facilities and customer contact.

3—An intelligent analysis of the amount of work and degree of servicing capabilities, within the limitation of equipment and other facilities on hand, will enable profitable accomplishment of a great proportion of the service work required.

4—By dividing the total high-fidelity servicing picture in this manner, it enables the technician to add the right kind of test equipment to his present setup in a logical order, and permit him to perform all the work within a predetermined

echelon of maintenance.

The need for certain items of quality test instruments and their applications will become even more evident as the technician digs deeper into the aspects of Hi-Fi. Fig. 1 shows a straight-forward arrangement of equipment not much different from what was previously presented except for the addition of a calibrated decade attenuator and a greater emphasis on quality test equipment. This arrangement can be used to perform many tests, including checks for distortion and frequency characteristics, and of course to make point-to-point checks in the signal-tracing or signal-injection methods of troubleshooting procedure. Incidentally, do not use a high-frequency note for signal injection. It may be well to briefly recall an interesting but sometimes baffling problem that could present itself in a modern feedback type amplifier. Normally an open coupling capacitor would cause complete loss of signal. In some cases, however, only a serious loss of low frequencies would be evident. The small amount of stray capacitance left may be enough to allow a certain amount of signal to pass through. As the feedback tends to level off the response, there may be only a little more than the usual amount of distortion. Signal tracing

Fig. 1—Typical arrangement of quality test equipment for Hi-Fi servicing. Decade attenuator simplifies response measurements. VTVM calibration is not critical in this setup.

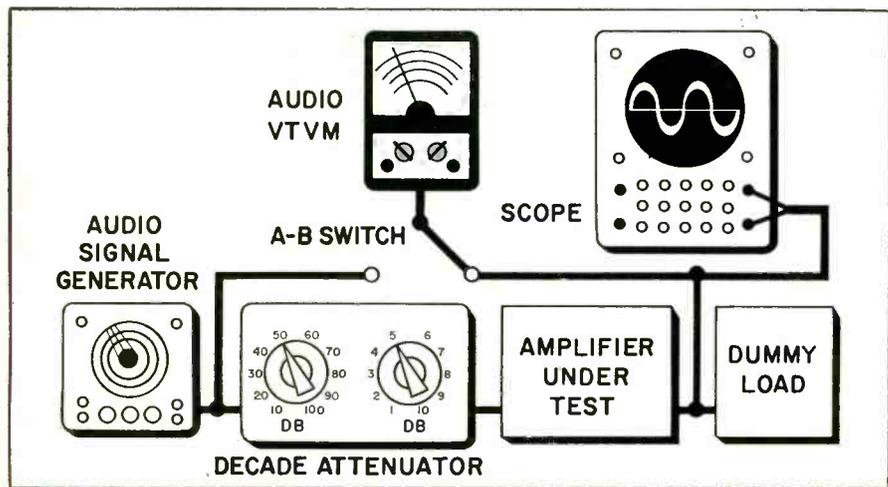
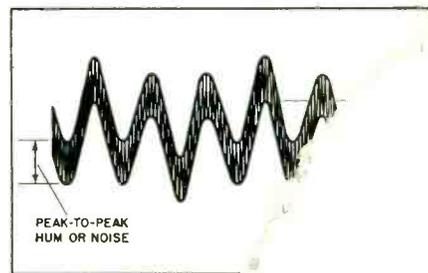


Fig. 3—Scope pattern can reveal what percent of total output is due to hum and noise.



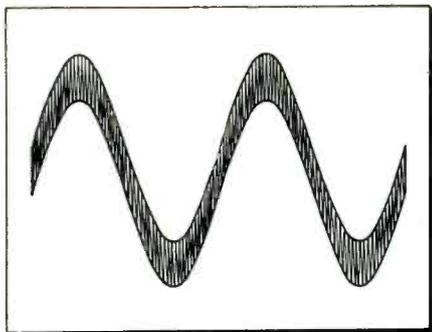


Fig. 4—IM distortion test signal contains a low and high-frequency component.

with a low-frequency tone will help isolate the defective capacitor.

Frequency Response

The setup for checking frequency response is greatly simplified by the use of a calibrated decade attenuator and a SPDT switch. The switch facilitates an A, B, comparison of the input and output signal of the amplifier. By adjusting the attenuator so that both A and B readings are exactly alike, the attenuator will then indicate the gain of the amplifier. In other words, if the loss introduced by the attenuator is exactly equal to the gain of the amplifier, then the amplitude of the signal at the output of the amplifier will be equal to the output of the signal generator. The attenuator may consist of two decades, one calibrated in steps of 1 db, and the other in steps of 10 db. This versatile arrangement permits the technician to introduce any known amount of loss up to 110 db in steps of 1 db. In most instances variations of less than 1 db are not important, but even variations as low as 0.1 db can be predicted by using the meter in conjunction with the decade box.

The switch could be eliminated when using a signal generator

equipped with an output meter, and the generator adjusted for constant output as the frequency is varied. However, by switching the same audio VTVM, different indications due to different frequency-response characteristics of the output indicator and VTVM are minimized. Also if switch position A leads to the attenuator input rather than the generator output the loss in the generators cable can be disregarded. However, any losses introduced by other cables such as between the attenuator and the amplifier or other impedance matching networks which may be included in the equipment setup must be considered and added to the readings. Another important aspect to be on the alert for is the unequal loss at different frequencies which may take place in the various leads and probes. It is true that the frequency response of cables is more of a factor when working with RF, but even at 15,000 to 20,000 cycles, a 3-foot length of improperly insulated cable, can suffer a 6 to 12-db loss.

Equalization

Tone controls and equalization characteristics should be checked against the manufacturers' standards to see that they conform within reasonably close limits. A deviation of 1 db from the curve published is quite acceptable. A more serious deviation indicates that some component is defective or has changed in value.

To check equalization characteristics follow pretty much the same procedure used to check the frequency response; putting in or taking out attenuation so that the output and input voltage both measure the same when the switch is flipped. Then read off on the calibrated attenuator the overall gain of the

amplifier at this frequency.

It is desirable to use the same frequency check points recommended by the manufacturer. The various readings at the different frequencies can be plotted on an appropriate graph as shown in Fig. 2.

It is a good idea to keep an eye on the scope, during these tests, for a clean signal. Should any hum, noise or stray oscillations be present, it will cause a higher output reading and lead to some erroneous conclusions. It is a pleasure to see how easily the scope is able to detect a parasitic oscillation when it sneaks in. Unless otherwise indicated when tests are conducted on the amplifier, the tone controls should be left in a flat position.

Harmonic Distortion

Some manufacturers give distortion in terms of IM, some in terms of harmonic distortion, and some in

Fig. 6—Poor transient response indicates defects which static tests might not reveal.

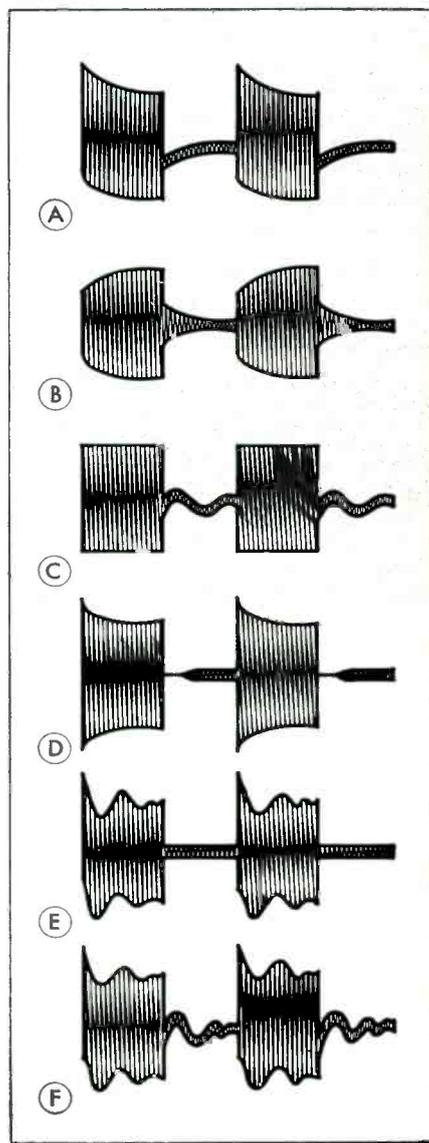
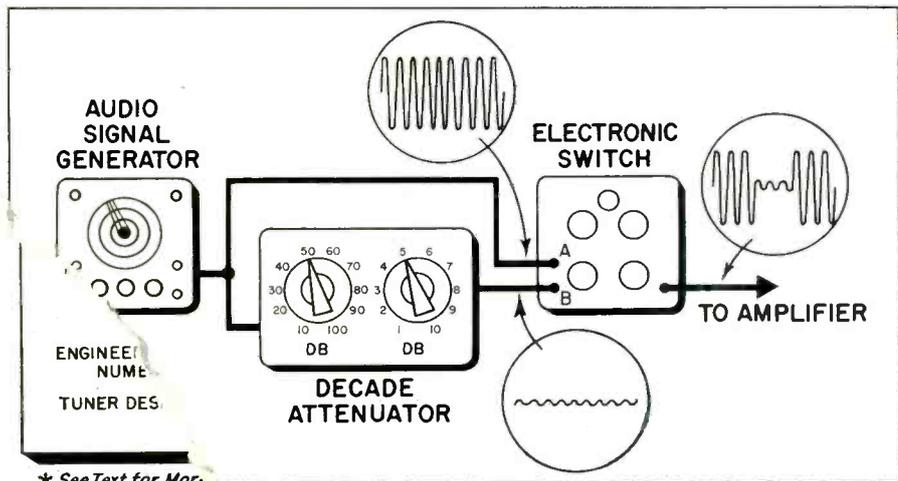


Fig. 5—Electrical switch injects tone bursts into the amplifier to test for transient response characteristics. The switch can also supply a square-wave signal for other tests.



* See Text for More.

both. As there is no direct correlation between the two, the only way to be certain that the amplifier performs according to specifications is to test it the same way the manufacturer did. The really well set up shop will have both types of distortion analyzers. It is important that distortion measurements are made at the prescribed amplifier output levels. As the amplifier output increases to maximum rating and beyond the distortion figure also increases.

For the harmonic test it is important that the signal generator, supplying the input signal, have a waveform possessing considerably less distortion than the amplifier is expected to produce at the output. The harmonic meter has no way of telling whether the harmonics present were generated by the amplifier or already present in the generator.

If the harmonic distortion meter is confused by different distortions emanating from different places, don't think too harshly of the meter just get a better generator. Consider a rather simple situation where the signal generator puts out a fairly clean signal with only 1% of the second harmonic. The amplifier in this case may be producing 2% of the third harmonic. The root-mean-square of this combination is 2.24%, which is not too serious an error. However, if the generator distortion was 0.5% the output reading would be 2.06%, which is much nearer the correct value, and which could be considered acceptable.

If the harmonic meter is sufficiently sensitive, it can be used to check the generator output directly. Here again it is advisable to have the scope connected; to see the signal being measured. Should hum or noise be present, it is possible to determine the extent of the interference, and make proper allowances. Fig. 3 identifies the various portions of a combined signal and noise waveform, and shows how to determine the peak-to-peak voltages of each. If this trace were taken at the output of a distortion meter, the major portion of the curve would represent, instead of desired signal, peak-to-peak distortion.

Filters

There are several alternatives to getting a signal generator with a low enough distortion figure. One is to use a filter designed to purify the fundamental. Such filters are available, but they are not always suitable. A 1,000-cycle filter may separate 1,000 cycles from the other frequencies present in the input signal, but there is no guarantee that

the filter itself does not cause distortion. A careful check should be made of any filter before using it, to ascertain that the distortion content is down. A filter may have an attenuation figure of 60 db for second harmonic and higher order components of input signal. One would expect then that a generator with 2% harmonic distortion would be reduced by this filter to have only 0.002% distortion. Checking the frequency response of the filter will verify its ability to pass or reject different frequencies, but it will not necessarily reveal what happens

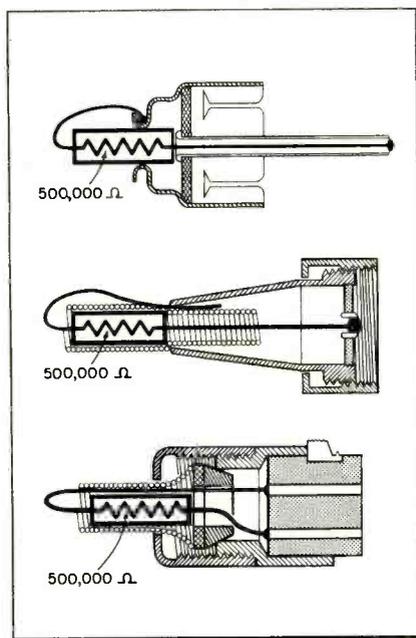


Fig. 7—Zero-signal input plugs, used when testing for inherent amplifier noise and hum.

to the signal. It may well be that the filter could produce 0.5% distortion or more of a different kind. Even though the filter removes the distortion from the generator it could still leave an unsatisfactory signal for testing.

IM Distortion

An IM test set avoids some of the requirements for a high degree of waveform purity that exists with distortion meters. There are many standard IM tests and there is almost as little correlation between any of them as there is between IM and harmonic measurement. To avoid confusion, the safest plan is to follow the specifications for the amplifier under test.

There are two kinds of IM tests—with further subdivisions of one of them. The first one uses both a low-frequency and a high-frequency

signal, as shown in Fig. 4. The low-frequency signal modulates the high one, and produces sidebands, if there is any non-linear amplification present in the amplifier. The IM test set filters out the low frequency and detects the high band. The extent of deviation, if any, is measured and is indicative of the non-linearity or distortion introduced by the amplifier under test.

The frequencies selected and the relative amplitudes of each may vary from manufacturer-to-manufacturer. The low frequency may be 40, 50, 60, 70, 100 cps or other value in this general region. For the high-frequency component, 1,000, 2,000, 3,000, 7,000 cps or other signal may be used. Two relative low-to-high frequency amplitude ratios have been more or less accepted as standard, namely a 1-to-1 and 4-to-1 ratio. The kind of distortion an amplifier produces with different low frequencies varies, so comparison of readings of different amplifiers tested with different frequencies or different ratios is virtually meaningless. If a comparison is desired, it must be between readings obtained from similar tests.

The second kind of IM test uses two high frequencies which are fairly close together. These signals can produce a beat note in a non-linear amplifier. The size of the low-frequency component developed, if any, is indicative of the amount of distortion. This test method is not used as widely as the tests employing the high and low frequencies.

Theoretically, the IM test is more closely related to the kinds of distortion heard; which is why some engineers prefer it. But the choice of a fixed ratio means that certain kinds of distortion may slip by with a small reading; whereas the harmonic measurement would show them up. The reverse may be true in other situations.

Transient Response

A square wave test procedure may be used to quickly check frequency response as well as transient response characteristics. Some audio sine-wave generators also provide square-wave signals. While it is true that quite a lot can be learned by using the square waves, most manufacturers do not make use of this signal. Perhaps further advancements in the art may lead to an increase in the use of square waves in the specifications standard. To conduct transient performance tests an electronic switch, which is quite an inexpensive instrument, can be

(Continued on page 57)

SHOP HINTS



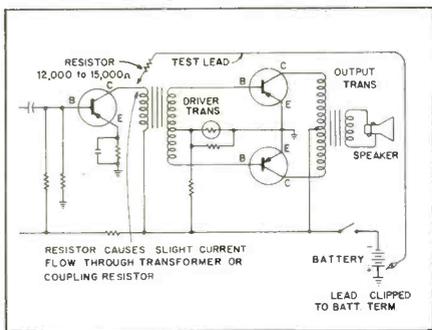
Tips for Home and Bench Service

Transistor Radio

To keep small hard-to-get parts from bouncing off a hard workbench, place a piece of rug or cloth on top of the bench. This will also minimize scratching the finish of plastic cases.

Click Probe

A click probe can be quickly assembled, as illustrated, and used to determine a break in the signal path. Connect a 12,000 to 15,000 ohm resistor to the positive side of the battery (may or may not be ground) and touch the free end of the resistor to



Quickly improvised click probe helps isolate a defective stage in a transistor radio.

the transistor terminals, starting with the output stage, and working back. Listen for clicks in the speaker. The absence of clicks will indicate a break in the signal path. Once the defective stage has been isolated, it becomes a fairly simple matter to find the bad component.

Spurious Responses

Spurious responses such as tweets, birdies, and squeeging have been found to originate in the converter circuit of some transistor radios. The condition is due to excessive strength of the oscillator signal. Quite often the simplest check and correction is to try another converter transistor.

The oscillator voltage can be checked with an oscilloscope or an

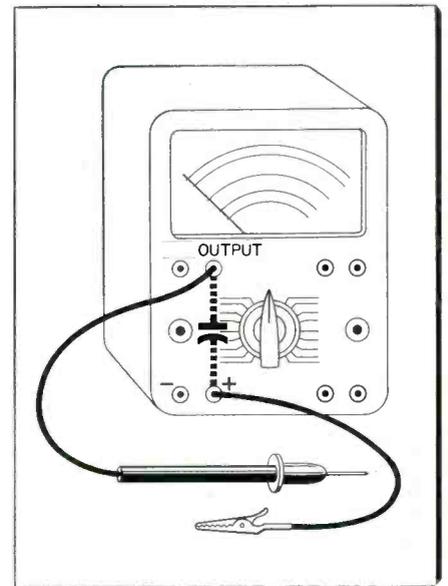
RF type of VTVM and should be within the limits of 0.07 to 0.25 volts rms (0.20 to 0.70 volts peak-to-peak) at the converter base. On some models the oscillator voltage is measured at the converter emitter and should be approximately 0.12 volts rms (0.34 volts peak-to-peak). Excessive oscillator voltage can be most easily overcome by shunting the oscillator coil (primary tuned circuit) with a one-megohm resistor. On a radio already equipped with this 1 megohm resistor, it may be necessary to remove it when changing the transistor in the converter circuit—RCA Service Co., Camden 8, N. J.

Handy Capacity Probe

A capacity probe is nothing more than a capacitor in series with a piece of wire, yet it can be of great help to the technician who has to troubleshoot a set in a hurry and without test equipment. Either the signal-injection or signal-tracing procedure can be used. For signal injection, one end of the probe can be attached to a 6.3-volt a-c filament line; the other end can go from point-to-point injecting the 60-cycle signal. In the audio circuits hum will be heard; in the video circuits, it will show up as light and dark areas on the CRT; and in the vertical sweep circuits it can open up a completely collapsed raster when the oscillator is not functioning. As a signal tracer, one end of the probe can be connected to the top of the volume control and the sets audio system used as an indicator. Sync pulses and other signals can also be tracked from point-to-point.

Most VOM's have a jack marked output. It is used to extend the usefulness of the a-c voltage ranges. An internal isolating capacitor in series with this jack prevents d-c voltages

from affecting the a-c voltage readings. By connecting one lead to the output jack, and the other lead to the hot (sometimes designated as positive) jack, the meter's internal capacitor is placed in series with the two leads. This arrangement



VOM's leads and internal capacitor serve as a handy capacity probe for troubleshooting.

can be used as a capacitor probe. The advantage being that no extra leads or capacitors are required for this setup. Because the meter itself is not in the circuit there is no need to consider voltage range settings. Of course, the capacitor's voltage rating should not be exceeded.—Sid Schildkraut, Queens, N. Y.

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\$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.

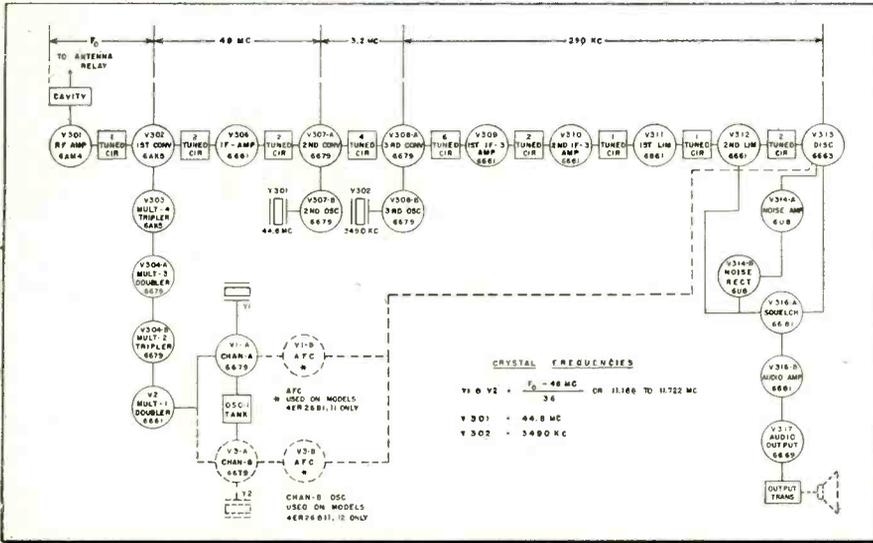


Fig. 1—Receiver block diagram illustrates how the frequency of the local oscillator is multiplied and then mixed with the incoming UHF signal. Two additional local oscillator circuits are used to step down the I-F frequency from 48 mc to 290 kc.

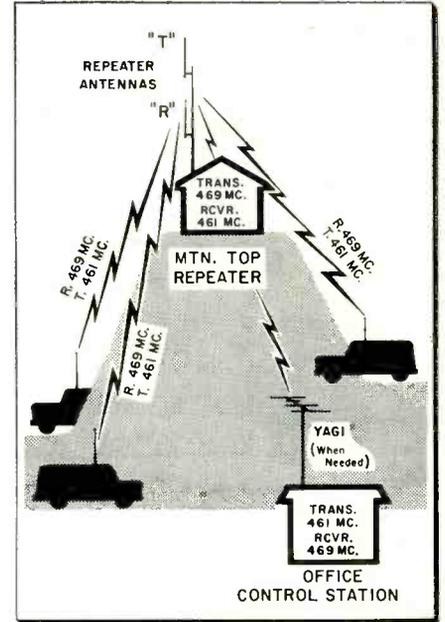
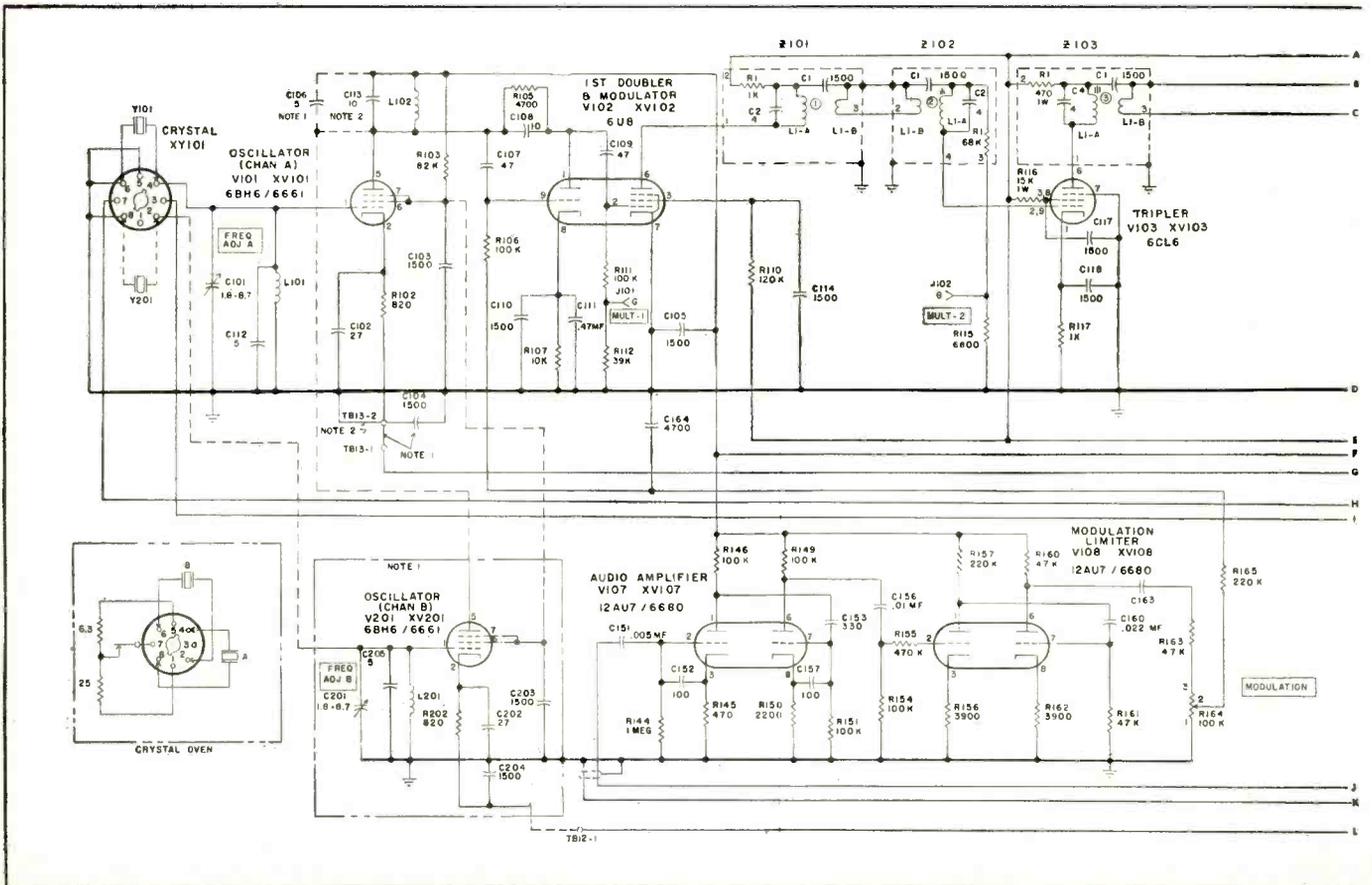


Fig. 3—Strategically located repeater station picks up the desired signal and automatically retransmits it. This enables communications beyond the line-of-sight on the UHF band.

"Citizen's Radio" For Home & Industry

Communication Opportunities Open On The 460-470 MC Band.

Fig. 2—Simplified schematic of a two-channel FM, UHF, transmitter. A 13 mc crystal oscillator's output is multiplied



• A radio service which had its inception a scant five years ago as an aid to experimenters, housewives and others desiring a medium for less important communications has mushroomed into one of our most important communications bands. This band of frequencies is the spectrum between 460 and 470 mc which is listed officially as the "Citizen's Radio Service." That the Federal Communications Commission did not visualize any extensive commercial usage of these frequencies is attested to by the lenient eligibility requirements which the Commission attached to this service. Paragraph 19.12 of the FCC Rules states very simply that any person eighteen or more years of age and a citizen of the United States is eligible to apply for a Citizens Radio Station license. There is perhaps no other form of regulated endeavor which offers such ease of licensing.

What value can something have which is so easily attainable? Actually, that is what most people thought in the early days of the

Fig. 4—Fixed station equipment fits neatly with office decor and is suitable for a company official or dispatcher.

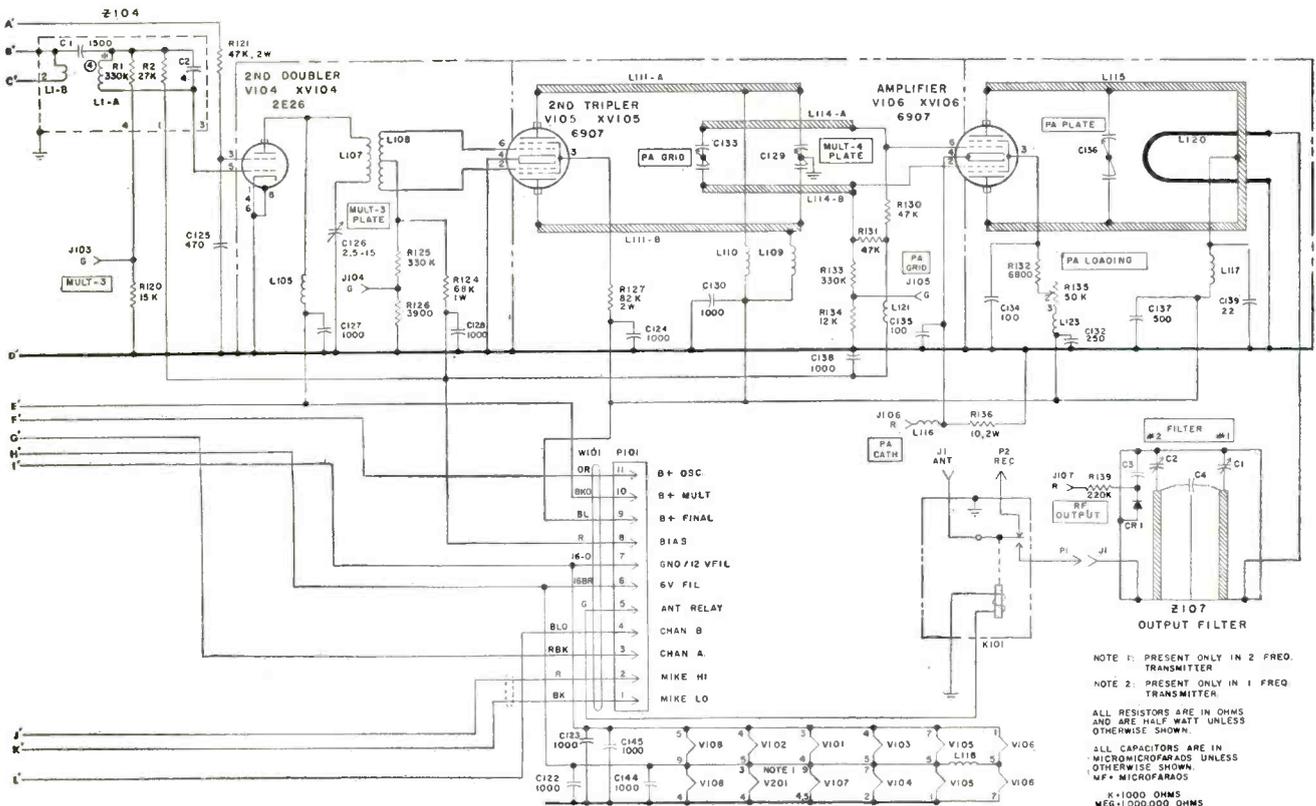


Citizens Radio Service. As initially promulgated, the Citizens Band provided for operation on the frequencies of 27.255 mc and 460 to 470 mc. Except for the 27.255 mc frequency, there was very little commercially available equipment for use on the Citizens Band. The frequencies above 450 mc were considered as being useful only for point-to-point

microwave circuits.

The real value of these ultra high frequencies became apparent first in the large metropolitan areas such as Los Angeles, Chicago, and New York where many industrial users were ineligible for licensing because of the FCC's standard metropolitan area ruling. Briefly, this "SMA" provision excluded most industrial users from

36 times to reach the 468 mc band. The power supply used depends on whether the installation is mobile or fixed.



eligibility for radio licensing when their proposed area of operation fell within populous areas of 500,000 or more persons. Thus, the ready-mix concrete people, the radio repairman, the delivery truck operator, and many others in these areas could not qualify for special industrial radio licenses. Only one radio service was open to them for private radio system licensing. That service was the Citizens Radio Service.

Classes of Licenses

The Citizens Radio Service provides for three basic classes of licenses. A breakdown according to class, frequency and maximum authorized power input is as follows:

| | | |
|---------|----------------|----------|
| Class A | 460-462 mc | 50 watts |
| Class A | 468-470 mc | 50 watts |
| Class B | 462-468 mc | 10 watts |
| Class C | 27.23-27.28 mc | 5 watts |

The power input is defined by the FCC as the input power to the plate circuit of the electron tube or tubes which supply energy to the radiating system. Various technical standards are set forth in Part 19 of the FCC Rules for these three classes of licenses. These standards provide that equipment for Class A and B stations and non-crystal controlled Class C stations must be "type approved equipment." Class C operation is limited to control applications, such as model aircraft, garage door openers, and the like. Thus, the Class A and B licenses are the ones which are of interest to those who desire voice communication. The Class A service is the one which has the greatest appeal to the mobile radio user because of its greater power and higher technical standards. However, in the already heavily congested metropolitan areas considerable use is being made of the Class B portion of the Citizens Band in applications where the 10-watt power input limitation can be tolerated.

The first receivers for the 460 to 470-mc band presented no serious technical problems, except for stability. Most of these were of the triple conversion type. A standard double-conversion 48-mc receiver was employed with the addition of a UHF converter. In order to compensate for small frequency changes, automatic frequency control was found to be desirable. These AFC circuits employ a voltage from the discriminator which is applied to a reactance tube in much the same manner as used in an FM broadcast receiver. The block diagram of a typical 460-mc receiver illustrates the various functions of each stage.

The first Class A transmitters presented more serious problems than the receivers because of the dearth of suitable low-priced transmitting tubes which could be operated efficiently in mobile units at the ultra high frequencies. For the first few years, several of the larger manufacturers of mobile radio equipment standardized upon the 2C39 lighthouse tube, which had proved quite successful in microwave applications. One of these tubes was used as a doubler or tripler, driving a similar tube in the power amplifier output stage. Because of their unique construction, these tubes require that specially designed cavity circuits be employed in conjunction with them. This requirement, of course, places a serious limitation upon the design engineer, who is striving to devise a compact transmitter. Although the 2C39 tube is a desirable tube for operation under controlled conditions, it proved to have two major disadvantages for mobile applications. First of all, it is expensive, and secondly, it is not as rugged as the design engineers would like. To prevent damage, special care must be exercised in removing the 2C39 from its housing.

This limitation in Citizens Band transmitter design was removed in 1956 with the advent of the 6907 double-tetrode tube. This rugged tube removed all of the deficiencies of the 2C39. The 6907 is designed specifically for mobile, aircraft and fixed station use at frequencies up to 600 mc. In addition to being a mechanically rugged tube, with sintered glass seals, it is an electrically heavy duty tube. It may be mounted in conventional sockets, and in any mounting position. Bulb temperatures up to 250°C are permissible. In continuous commercial service, at 462 mc, one of these tubes is rated at 25-watts output as a Class C power amplifier.

The GE type ET-24-B transmitter is basically similar to VHF communications transmitters with the exception that a higher factor of frequency multiplication is employed. A simplified schematic is shown in Fig. 2. A crystal oscillator at approximately 13 mc is followed by a standard phase modulator. The phase modulator combines the audio voltage from the speech amplifier and limiter chain with the crystal oscillator output so as to produce a phase varying output voltage, which is equivalent to an FM signal. This signal is then passed through a series of frequency multiplying and amplifying stages. The 13-mc output

of the crystal oscillator is multiplied by a factor of 36 in this process, and the resulting output of the transmitter is 468 mc. The output of the power amplifier stage is passed through a very selective filter network, which removes harmonics and other spurious radiation as required by the FCC.

This transmitter and receiver strip is then combined in a suitable package with an appropriate d-c or a-c power supply so as to form either a mobile unit or base station. In either type of service, a power output of approximately 15 watts has been found to yield satisfactory coverage in a properly designed communications system.

Types of Operation

There are four basic types of operation. All or any combinations of these may be employed in a radio system. These are:

1. Mobile-to-mobile.
2. Locally controlled base-to-mobile or other base.
3. Remotely controlled base-to-mobile or other base.
4. Repeater operation.

Methods one and two are self-explanatory. Method three is employed when greater range is required than can be obtained with a locally controlled base station. Since propagation in the UHF spectrum must be considered from the line-of-sight viewpoint, it is often necessary for the base station to be located on a hill or building several miles from the dispatching point. A unit similar to that shown in use by the dispatcher, but with the inclusion of additional remote control equipment, is placed at the remote site. The dispatcher is then provided with a small remote control console and microphone. Out-going and in-coming messages, as well as control voltages, are then transmitted over a leased telephone line. Operation is then similar to that in method two, except that the range is extended due to the more favorable antenna location at the elevated point.

For a simple system which requires good coverage from the base station to mobile units, this latter method is generally the choice. It has several limitations which, for some modes of operation would be objectionable. First of all, placing the base station at an advantageous spot does not improve car-to-car operation. The cars must still transmit directly to each other. Likewise, in situations where several branches of the same company desire to communicate directly with each other or

with cars in other areas, the simple remote control operation may not be adequate. Last, but not least, type three operation necessitates the leasing of telephone lines. To circumvent these limitations, repeater operation may be employed.

Repeater Operation

A typical Citizens Band repeater installation is illustrated in Fig. 3. All base and mobile units transmit on 461 mc and receive on 469 mc. The 461 mc signal is received at the mountain-top receiver. A carrier-operated relay at this receiver turns on the transmitter which retransmits the signal on 469 mc. It becomes quite apparent then, that with this repeater operation, any mobile unit that can reach the advantageously located repeater station can, in turn, reach any other mobile or base station within range of the repeater.

Thus, mobile or base stations situated in valleys on either side of a range of mountains can communicate very satisfactorily with each other, whereas without the repeater station, communication would be impossible in the UHF band. Because of the several ranges of mountains that divide various portions of Los Angeles, repeater operation has been extremely popular in that area. In other areas where topography has not been a factor, repeater operation has also been employed in order to provide greater car-to-car range.

Repeater operation has two serious limitations. It requires the use of two frequencies, and system operation is completely interrupted in case of a failure at the repeater station. In most areas, the frequency availability problem is still not acute in the Citizens Band. In other areas, careful cooperation between user groups and coordinating committees has kept the interference problems under control. The second disadvantage is a calculated risk which better equipment and servicing techniques have kept to a very minimum.

As Citizens Band utilization grows at an accelerated pace in many areas, the problem of frequency congestion and interference becomes acute. The problem can be appreciated when it is understood that the FCC does not assign the Citizens Band licensee a specific frequency of operation in the Class A band. Instead, the Commission merely grants the licensee permission to operate anywhere within the confines of the band in accordance with the rules and regulations. Complete chaos

(Continued on page 41)

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- 8 Communications:** Literature describes two-way communications equipment, in which technicians are becoming increasingly interested. Includes mobile, ship-to-shore radiotelephone. (8B4: Kaar Engineering Co.)
- 9 Instrument Kits:** 4-page brochure on test equipment kits ranges from a \$28.50 signal generator to a \$47.50 scope. Informative technical specs also cover tube checker, signal tracer, bridge, battery charger, VOM and VTVM. (9B4: Paco Electronics Co.)
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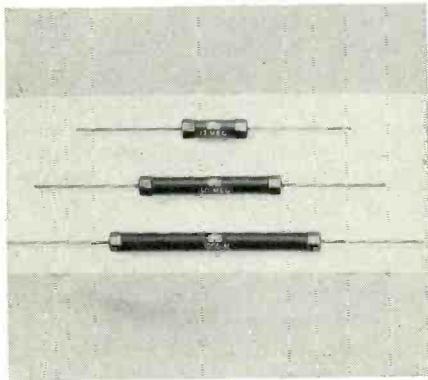
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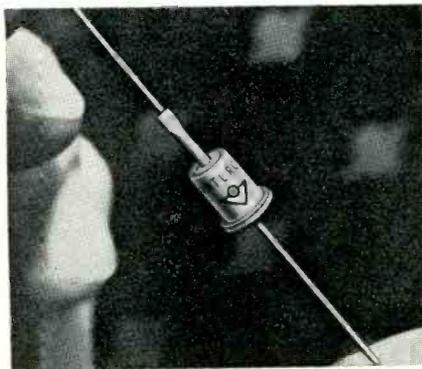
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the new Pyramid units
between -55°C to $+100^{\circ}\text{C}$
at the higher temperature.
um slug capacitors have an over-all
32"; outside diameter $7/32$ " along th
of the unit. the Pyramid line has
commonly used values.

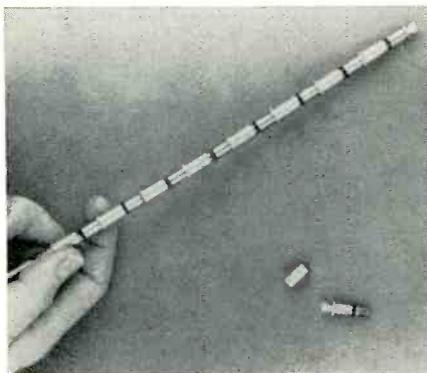
Int'l Rectifier DIODES

→
Miniature type all welded silicon power diodes are designed for equipment applications where miniaturization and reliability are prime considerations. Rectified dc output current ratings to 500 ma at 50°C are obtainable over a peak inverse voltage range of 100 to 600 volts. A hermetically sealed package, featuring pigtail lead construction, houses the fused junction. To further increase reliability, no solders or fluxes are used in the sealing operation. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 4-3)



Audio Devices RECTIFIER

→
A silicon rectifier that can be used singly, or assembled into series chains for higher voltage applications, is called the A750 "expandable rectifier." The individual unit is threaded at each end, so it can be screwed into bushings, a chassis, or plugged into a clip holder. Each unit is 1 in. long with an inverse voltage rating of 400 v. and forward current of 750 ma. To produce a HV rectifier, units are connected end-to-end. Ten units will have a rating of 4000 v. Audio Devices, Inc., 620 E. Dyer Road, Santa Ana, Calif. (ELECTRONIC TECHNICIAN 4-4)



Centralab CAPACITORS

Ceramic capacitors with capacitance up to 100 times that previously available in this type of unit are called "Ultra-Kaps." They are designed primarily for transistor circuit applications, and are engineered specifically for by-pass and coupling applications. Four standard values, .22, .47, 1.0 and 2.2 μf are now being stocked. These units are all rated at 3 vdcw and range in diameter from $\frac{1}{4}$ " to $\frac{3}{4}$ ". Centralab, Div. of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 4-5)

Triad TRANSFORMERS

A line of power transformers, designed for use with low voltage transistor power supply, operate on 12-14 v. dc input with output voltages from 250-600 v. dc. They provide 80% to 85% efficiency for the entire supply which operate in the 2000 cycle region. Prices range from \$8.34 to \$15 net. Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif. (ELECTRONIC TECHNICIAN 4-6)

Raytheon RECEIVING TUBES

Four tube types added are the 6BN8, 6BW8, 6CY7 and 6DS5. 6BN8 is a high mu triode and double diode miniature with 600 ma heater. 6BW8 is a duplex-diode sharp-cutoff pentode miniature, 450 ma heater, with diode section being used as a TV horizontal phase detector and pentode section used as a sound i-f amplifier, limiter, and agc keyer. 6CY7 is a double triode miniature for use as a combined vertical-deflection oscillator and amplifier. 6CY7 is identical to 8CY7, except that it has a 750 ma heater. 6DS5 is a beam power miniature, 800 ma heater, for audio output. Receiving Tube & Semiconductor Operations, Raytheon Mfg. Co., 55 Chapel St. Newton 58, Mass. (ELECTRONIC TECHNICIAN 4-8)

Sencore CONVERSION KIT

A conversion kit for the TDC22 transistor checker, at \$2.00 dealer net, (part number TCK-2) converts the TDC22 to the latest type circuit used in the TRC4 tester which checks high power transistors more thoroughly. Service Instruments Corp. (Sencore), 171 Official Rd., Addison, Ill. (ELECTRONIC TECHNICIAN 4-9)

Citizen's Radio

(Continued from page 39)

could easily develop in congested areas. Interference between users of any radio service is a problem which requires close cooperation and understanding between the licensees. Even though the FCC grants the user permission to utilize any of the frequencies within the Citizens Band, it must be understood very clearly that the basic rules and regulations are very explicit in their prohibition of unnecessary or malicious interference. Once this provision is recognized, it is found that the concrete mixer, the delivery truck operator, the salesman, the electrician, the plumber, and the myriad of other citizens who share the frequencies between 460 and 470 mc can live together as good neighbors and reap the rewards and tremendous savings which are enjoyed by users of two-way radio.

Minimum Standards

The basic technical standards as stipulated in Part 19 of the Regulations are relatively loose and must be considered only as the minimum requirements for successful operation in congested areas. For example, in the Class A band, the FCC permits a band width of 200 kc. This would allow for only 20 channels between 460 to 462 mc and 468 to 470 mc. Obviously 20 channels would be insufficient to accommodate over 300 systems in an area such as Los Angeles. Thus, one of the first actions of a coordinating committee, established in this area, was to limit the width of each channel to 50 kc, which resulted in four times as many available channels. Since side-band splatter can be a serious problem in adjacent channel operation, the Committee agreed upon maximum deviation adjustments of 7 kc in contrast to the 15 to 20-kc modulation practiced in some areas. Other basic standards were specified such as 8-mc separation between receiver and transmitter in repeater operation. In addition, simplex systems are relegated to one portion of the band and similar technical standards were stipulated which have resulted in satisfactory operation for most of the participants.

Experience with the Citizens Band has shown that the propagation
(Continued on page 43)

Servicing is faster with SONOTONE CERAMIC CARTRIDGES



Because 50 manufacturers use them in 417 phonograph models

No wonder you can finish replacement jobs faster. Sonotone is the standard cartridge of the phonograph industry—no more custom fitting or time-wasting adjustment. Sonotone fits over 90% of all your quality calls—means less inventory to stock and check, too.

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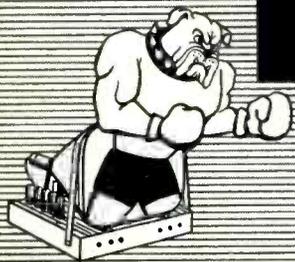
Order Sonotone Ceramics from your dealer now. For full information, including replacement charts, write:

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Electronic Applications Division, Dept. CT-48

ELMSFORD, NEW YORK

PROC
P.



"Tough Dog"

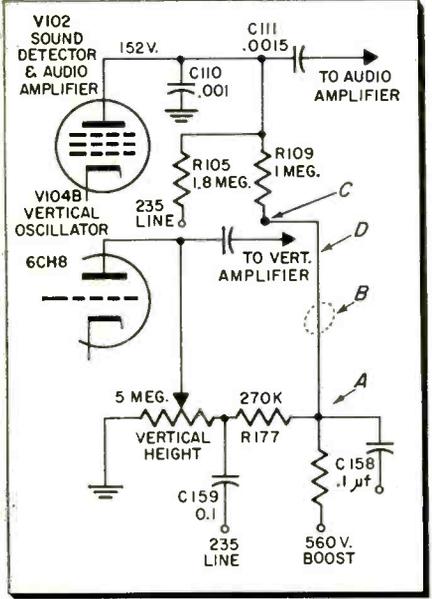


Corner

Difficult Service Jobs Described by Readers

Intermittent Vertical

This RCA TV set Chassis KCS102D developed an intermittent vertical oscillator trouble. The sound was normal and the tubes were good. The plate voltage on V104B vertical oscillator, checked low and erratic. Tracing back to the voltage source, R176 was found to be partly burned and



Vertical oscillator upset by defect in B+ circuit. Sound was not noticeably affected.

open. A replacement was installed, and it promptly started to overheat. Disconnecting C158, C159 and R177 caused no noticeable change in current through R176. Next, wire D was disconnected at point A. Current through R176 dropped to normal and the vertical oscillator started to function in a normal manner. Even though the 1st audio amplifier receives most of its B+ voltage from the lead that was disconnected, sound came through OK. Plate voltage on V102 was only 40 instead of 200

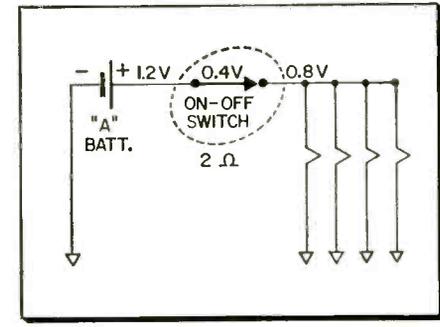
volts. Something in the audio circuit was drawing too much current. C110, C111, and R105 were disconnected after wire D was put back in place, and still the high current condition remained. In desperation a new wire was run from point A to C. This cured the trouble. The wire from Point A to C passed through a small hole in the chassis at point B. The insulation at this point was partly worn off, and was responsible for a leak to ground. The voltage through R105 from the 235-volt line supplied 40 volts to the plate of V102 which was enough for the sound section to work. Changing wire D, fixed the vertical oscillator and increased the voltage on the 1st audio amplifier, but strangely enough it did not seem to produce any increase in sound output. —Gene M. Augustine, Iowa, La.

Intermittent Oscillator

No one can deny that some small radio repairs can turn out to be just as tough as repairs on some large TV sets. A portable RCA Model 6-B-4 had been dropped and brought into the shop. Its operation was noisy and intermittent. Both A and B batteries were low, so new ones were installed. Results were the same—on again, off again. All I could come up with after an hour's work was that the local oscillator was cutting in and out. However, all components in the oscillator circuit checked OK.

The IR5 filament voltage was 0.8 volts. Somewhat low, but since all tube filaments checked normal and since a fresh 1.5-volt battery had been installed, the drop was at first attributed to the normal tube load. To prove this theory, all the tubes were pulled out of the circuit. The filament voltage increased. After spending much time examining the

rest of the set without any luck, I was forced to reconsider the filament-voltage situation. In spite of the fact that I could find no reason for the excessive drop I knew it wasn't normal. A reading directly off the battery terminal was taken, and much to my surprise it read a full 1.2 volts. The only thing between the battery and the filament connection at the IR5 tube socket was the on-off switch. Sure enough therein lay



Intermittent oscillator due to low-filament voltage was caused by 2 ohms too many.

the trouble. A resistance check across the switch terminals actually showed a 2-ohm reading with the switch in the on position.

The 0.4 volts developed across this undesired resistance was enough to cause the oscillator to become intermittent. A spot of solder on each of the two rivets in the switch cured the trouble. —Frank A. Salerno, Long Island City, N. Y.

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.

Citizen's Radio

(Continued from page 41)

characteristics at 460 mc are quite comparable with those at 150 mc. Diffraction effects are not as pronounced at the higher frequencies, which tends to reduce the theoretical range in the presence of obstructions. In actual practice, however, it has been observed that this condition which tends to reduce the range at the Citizens Band frequencies is offset by the fact that UHF is more easily reflected from plane surfaces. In downtown areas and tunnels, communications have been found to be superior at 460 mc in comparison to the lower frequencies. With properly designed systems, contacts in excess of 100 miles are not uncommon. The most serious degradation of performance at 460 mc is experienced in areas of dense foliage. It has been found that attenuation due to foliage at these frequencies is considerably more serious than at the lower frequencies; hence, care must be exercised in the placement of antennas so as to obviate this limitation if maximum range is to be achieved from a given location.

At the Citizens Band frequencies, a quarter wavelength is only about six inches. This means that mobile and base station antennas assume very small proportions.

Because of the small dimensions involved at 460 mc, the antenna designers have been able to devise several types of high-gain, omni-directional base station antennas which are compact and easily mounted. Economical antennas are available which provide as much as 10 db gain over a simple antenna. As the frequencies increase and the wave lengths decrease, dielectric losses climb at a rapid rate. Assuming that the system to be designed will require the maximum range that can be economically provided from a given location, the designer would choose one of the highest gain antennas available and install in such a manner as to clear surrounding obstructions by 10 or more wave lengths (more than 20 feet) if feasible. This must not be considered as an absolute value, but as a design center about which compromises must usually be made. If economizing is required, the antenna system should be the last to be given consideration. Good judgment and courtesy in the operation of a Citizen's Radio station will result in satisfactory and profitable utilization of two-way radio equipment for all. •

Kaar MARINE RADIOPHONE

A new kind of marine radiotelephone designed for passenger-carrying vessels complies with the recent FCC decree that vessels carrying more than six passengers be equipped with radiotelephones meeting certain rigid specifications, effective June 1, 1958. Model 248 offers five channel communication plus broadcast band reception. A squelch control is incorporated. Marine radio offers real sales and installation opportunities for electronic technicians. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 4-27)



ADDS INCOME 2 WAYS

1. Tests and Repairs Picture Tubes
(110° Tubes and Color Tubes too, with new C40 Adapter)
2. Makes New Tube Sales Easier

CATHODE REJUVENATOR TESTER

New C40 Adapter for 110° Tubes and Color Tubes



CRT 400 PROVES REAL MONEY-MAKER

Thousands of servicemen today make money and keep customer good-will by checking and correcting b&w picture tube troubles with the famous B&K CRT 400, right in the home without removing tube from set. Restores emissior and brightness. Repairs inter-element shorts and open circuits. Checks leakage. Indicates picture quality customer can expect. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new picture tube replacement sales easier!

Model 400 (without ac adapter) Net, \$59⁹⁵

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Designed for use with all B&K Models 400 and 350 CRT's. Makes it easy to test and rejuvenate TV color picture tubes and 110° picture tubes. Isolates and detects difficult color troubles. Tests and rejuvenates each gun of the color picture tube separately the same way as a black & white tube.

Model C40 Adapter Net, \$9⁹⁵

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

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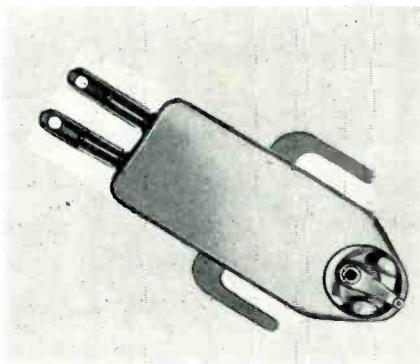
Sonotone CARTRIDGE →

Using a unique fluid damping compound, the Model 7T-S dual sapphire turnover ceramic cartridge is priced at \$9.00. The dual diamond 7T-D is \$39.50. The series "7" provides nearly double the compliance and a smoother frequency response than offered previously by the company in this price range. By encasing the armature and part of the needle guide in the compound, this design produces a response of ± 2 db from 20 to 12,000 cps, plus smooth roll-off up to 20,000 cps. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 4-30)



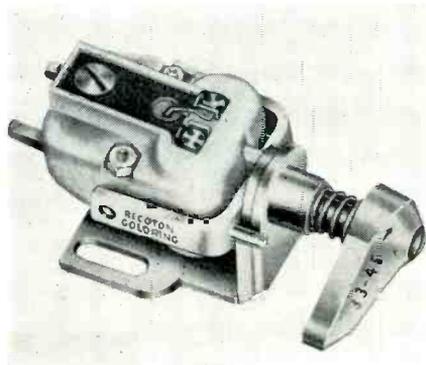
Norelco CARTRIDGE →

The "magneto-dynamic" phono cartridge incorporates the linearity of the moving-coil type with the ruggedness and high output of the variable reluctance type. The magnet moves, while the coil is stationary. Frequency response is rated at 10 to 20,000 cps within 2 db; output is 35 mv; lateral compliance is claimed to be greater than 5; and tracking force is 5 grams. Price with 1-mil diamond needle is \$29. North American Philips Co., 230 Duffy Ave., Hicksville, L. I., N. Y. (ELECTRONIC TECHNICIAN 4-31)



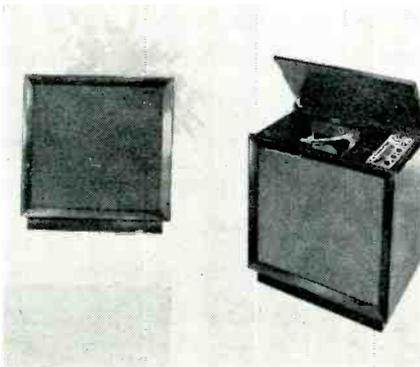
Recoton CARTRIDGE →

Goldring Model RG-500 and RG-550 variable reluctance turnover cartridges have frequency response essentially flat from 20 to 20,000 cps. The RG-550 offers mu-metal shield to eliminate audible hum. Mass at the stylus tip is 3.5 mg. Total weight including mounting bracket is less than 1 oz. Tracking pressure is only 5 to 7 grams when used with a record changer; 3 to 4 grams with a transcription arm. Output is 10 mv. Recoton Corp., 52-35 Barnett Ave., Long Island City 4, N. Y. (ELECTRONIC TECHNICIAN 4-32)



Pilot RADIO-PHONO →

FM-AM radio phonograph console Model PT-1031 features a combined FM-AM tuner, and preamplifier to 32-watt peak amplifier; an acoustically integrated 3-way speaker system, consisting of a 12" woofer, 6" midrange and 3" tweeter; and the Garrard RC121, 4-speed record changer with the latest variable reluctance magnetic cartridge and Diamond-Sapphire styli. It measures 28½" high x 25¾" wide x 16¼" deep. Price is \$379.50 in mahogany. Pilot Radio Corp., 37-06 36th St., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 4-33)



Erie STEREO CARTRIDGE

Ceramelex stereophonic cartridge uses a single ceramic element. It is rated at 50 to 15,000 cps ± 5 db into a 3 megohm load, while typical channel separation is 20 db. Output voltage at 1 kc is .5 v minimum. A tone arm pressure of 6 to 8 grams is the recommended tracking force. The cartridge will operate with any standard amplifier and is compatible with monaural records. Erie Resistor Corp., Electronics Div., Erie, Pa. (ELECTRONIC TECHNICIAN 4-34)

Bogen RECORD PLAYER

Model B-21 is a 4-speed record player, featuring a foolproof manual start and stop. The B-21 plays all discs up to 12" at all four standard speeds and each of the speeds may be varied within 5%. The unit contains a four pole motor, and has a universal plug-in head. Its mounting space is 13" x 10" x 2½" above and 2½" below motor board. The price of the B-21-LC (less cartridge) is \$25.95. David Bogen Co., P. O. Box 500, Paramus, N. J. (ELECTRONIC TECHNICIAN 4-35)

Ferrodynamics TAPE REEL

A unique 7" reel, the V-slot selection-finder reel is constructed with a V-slot for quick threading. Permanent selection finder numbers are molded along the edges of this slot, permitting rapid location of the desired selection when playing back the tape. The reel is made of opaque slate gray plastic and matches the permanent plastic container that protects all Sonoram tapes. Ferrodynamics Corp., Route 17 & Gregg St., Lodi, N. J. (ELECTRONIC TECHNICIAN 4-36)

Hartley SPEAKERS

Company's newest innovation is a speaker with polymerized cone that is chemically treated and baked at 578°F. This creates a harder cone that acts like a piston. The speakers are reported to be non-resonant from 1 to 18,000 cps. Hartley Products Co., 521 E. 162 St., New York 51, N. Y. (ELECTRONIC TECHNICIAN 4-37)

Scott AMPLIFIER

The 210-F 36-watt amplifier has a new dynamic noise suppressor including separate controls for low frequency and high frequency noise suppression. The front panel includes a record compensator and input selector, relative bass and treble loudness selectors, a volume selector, a 3-position speaker selector and a pickup selector. The 210-F contains complete tape recording facilities. H. H. Scott, Inc., 111 Powder Mill Rd., Maynard, Mass. (ELECTRONIC TECHNICIAN 4-38)

Deciphering Radio-TV

(Continued from page 29)

date-source code are stamped on the chassis.

RCA

TV—Model numbers on sets from 1951 to date have followed a fairly stable pattern. They indicate size of CRT, general price classification and model details. Chassis numbers are perhaps the most important to the technician for servicing purposes. Black and white TV chassis have a KCS designation, such as KCS 107. Some other letters and their meanings as used on and around the TV chassis are:

- KRK Miscellaneous TV assembly used on r-f tuners, optical barrels, etc.
- CTC Color TV chassis.
- KC Prewar TV chassis.
- KK Prewar TV power unit.
- KRS Postwar TV power units (mostly with projection TV).
- RC Radio tuner chassis with or without power supply.
- RK Miscellaneous radio assembly. RK-121 is AM-FM tuner unit. RK-203 is earphone attachment for transistor radio.
- RP Record playing mechanism.
- RS Radio power unit with or without audio amplifier.

Radio—Model numbers cannot be used to determine year of manufacture or number of tubes. A combination of letters and numbers, such as 6-XF-9, are used. The letters do have a meaning as follows:

- C Clock radio. (In prewar years denoted console radio).
- X AC-DC
- BX Batt-AC-DC
- RF Power trans
- XF AC-DC, AM-FM
- BT Battery transistor (Previously denoted battery table radio.)
- HF High-fidelity
- JS 3 or 4-speed attachment
- JD 2-speed attachment (45-33).
- JY "45" attachment.
- EMP Electrical - manual - portable record player.
- TR Tape recorder.
- EY Electrical "45" record player.

Sylvania

TV—The serial numbers are quite interesting in that they are also packed with information. Service literature would be coded 537-1 for the example used in the chart.

Radio—The first two digits of the

It's as EASY as This

TO INSTALL A MASTER TV SYSTEM WITH

Masterline

UNITS

B-T LABS

MLA

LINE SPLITTER

MTO-11

TO1-75

A Connect the antenna line to the INPUT of your Masterline MLA Line Amplifier. The signal is now amplified 37db (70 times).

B Connect a line splitter or line coupler to the OUTPUT of the MLA. You now have 2 or more branch lines for feeding to TV receivers.

C Where the branch line is run out-of-doors, connect a Masterline MTO-11 (outdoor tap-off) wherever a TV set feed line is required.

D Where the branch line serves as a riser inside a building, connect a Masterline TO1-75 or TO1-300 (wall-plate-tap-off) wherever an antenna outlet is required.

This is only one example of a Master TV System, to show the flexibility of Blonder-Tongue distribution equipment. There are many more, all covered in the new B-T INSTALLATION MANUAL.

Write for your Free copy to Dept. T-4

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Manufacturers of TV Cameras, TV Amplifiers, Boosters, Converters, Accessories and Originators of the Masterline and 'Add-A-Unit' Master TV Systems.



3 Million Transistor Portables

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and Bigger Dealer Profits*

That's a lot of transistor portables that are going to be needing batteries this year . . . nearly three times as many as a year ago, and the figure is still growing.

For this skyrocketing new market, Mallory offers a complete line of transistor and portable radio batteries.

Mercury batteries, pioneered by Mallory, last longer, give steadier volume than ordinary batteries. Mallory Zinc-Carbon batteries are dependable and economical—meet all the requirements of today's modern portable radio sets, and flashlights as well.

Mallory Battery Company
A Division of



In Canada, Mallory Battery Company of Canada Limited, Toronto 4, Ontario

• Capacitors • Vibrators • Resistors • Controls • Switches • Filters
• Rectifiers • Power Supplies • Mercury and Zinc-Carbon Batteries

four used for radio and phono models have some meaning. The last two numbers are for factory use.

In addition a suffix letter is used to designate color.

Table Model Radios

| | |
|--------------|----|
| Leader | 11 |
| Deluxe | 12 |
| Super Deluxe | 13 |

Clock Radios

| | |
|--------------|----|
| Leader | 21 |
| Deluxe | 22 |
| Super Deluxe | 23 |

Portable Radios

| | |
|-------------------------|----|
| (3 way or battery only) | |
| Miniature | 31 |
| Leader | 32 |
| Deluxe | 33 |
| Super Deluxe | 34 |

Phonographs

| | |
|-------------------|----|
| Table Model | 41 |
| Base Model | |
| (For use with TV) | |
| Console | 43 |
| Portable | 44 |

Radio-Phono Combinations

| | |
|-------------------------|----|
| Radio-Phono Portable | 45 |
| Radio-Phono Table Model | 46 |
| Radio-Phono Console | 47 |

Radio-Phono—Tape Recorder

| | |
|---------------------------|----|
| Combinations | |
| Radio-Phono—Tape Recorder | |
| Console | 48 |

Tape Recorders

| | |
|------------------------|----|
| Tape Recorder Portable | 49 |
|------------------------|----|

Trav-ler

There is no set procedure for identifying radio and phonograph model numbers. Clock radios do have the letter C inserted in the model number, as in 56C42. Transistor radios have the letters TR preceding the numerical portion as in TR-250.

Trutone

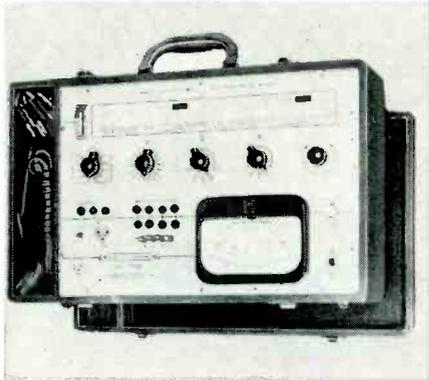
The model numbers consist of a 4-digit number preceded by a prefix. These sets are made for and merchandised by Western Auto Supply Co. •

RMS FRINGE ANTENNA

The Dyna Wave VHF antenna features weather-proof construction, low silhouette design to reduce wind drag, fully automatic snap-lock construction for rapid installation, super high impact styrene plastic insulators to secure all elements, and the new Quadro-Grip U-bolt assembly which grips the antenna crossarm. It is available in two models: DW-60 and DW-120 stacked for double power performance in extreme fringe areas. Radio Merchandise Sales, 2016 Bronxdale Ave., New York 62, N. Y. (ELECTRONIC TECHNICIAN 4-25)

Precision TRANSISTOR TESTER

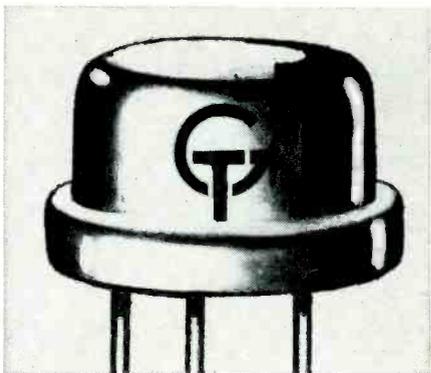
Model 960 portable transistor and crystal diode tester for industrial and service maintenance use, gives comprehensive tests for Icbo, gain, leakage, shorts, etc., on low, medium and high-power transistors of both the p-n-p and n-p-n types. It is estimated that 60% of electronic devices made in 1958 will include semiconductors, accounting



for 85% of the dollar value. Between 20 and 25% of all electronic devices put in use in 1958 will include transistors. An estimated 45 to 50 million transistors will be made in 1958. Features include 5½", 100 µa Pace meter, roll chart and ac operated without batteries. Price is \$89. Precision Apparatus Co., 70-31 84 St., Glendale 27, L. I., N. Y. (ELECTRONIC TECHNICIAN 4-18)

General TRANSISTORS

The new drift transistors operate at high speeds unattainable by the germanium alloyed types. The drift transistor differs from its germanium alloyed counterpart in that the emitter side of the base region has a greater impurity concentration than the collector side. This creates a built-in field which drives the charge carriers across



the base region at a faster rate and enables the transistor to operate at higher frequencies. Applications include: use in TV circuits, short wave radio, high frequency oscillators and very high speed switching computers. General Transistor Corp., 91-27 138th Place, Jamaica 35, N. Y. (ELECTRONIC TECHNICIAN 4-16)

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MALLORY
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 Auto radio servicing...

Mallory Gold Label Vibrators



No service-dealer likes to see a job come back—especially when it means pulling the car radio out a second time.

Avoid doing "2 jobs for the price of 1"—by installing a Mallory Gold Label Vibrator. These are especially designed for an extra measure of service, even under rugged working conditions. The unique buttonless contact design by Mallory assures fast, positive starting every time... and, this is the quietest vibrator ever made.



For economy service jobs, choose Mallory Highlander vibrators... second only to Gold Label in quality. Get them in the handy 10-pack carton.

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- Rectifiers
- Filters

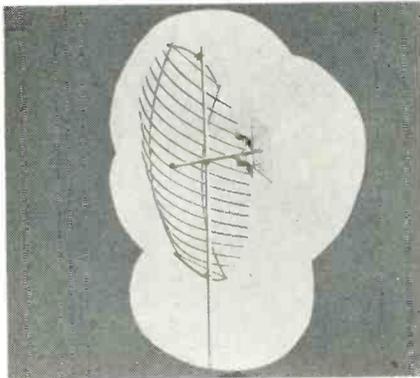
P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

New Antennas & Accessories

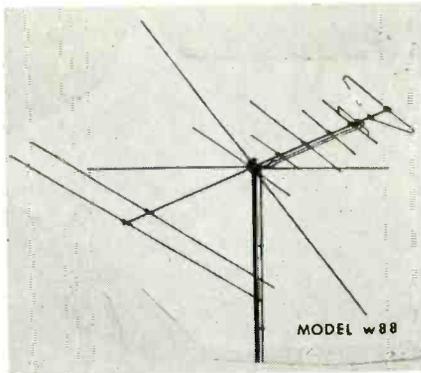
Channel Master PARABOLIC →

Reported as the first true parabolic antenna for TV reception, the ParaScope, Model 425, all-channel UHF antenna, offers 14.5 to 19.1 gain. It is the design used in radio astronomy, radar and missile tracking. The principle is the reflection and concentration of this signal onto one focal area. The larger the screen, the more signal. Reflecting screen is 6 ft. in diameter. Weight is 10¼ pounds. Retail list is \$44.95. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 4-21)



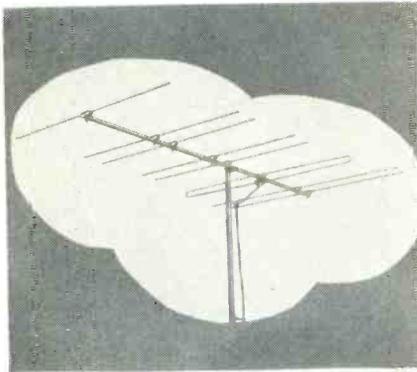
Trio CONICAL-YAGI →

The Winged 88, a souped-up version of the Sharpshooter 88 conical-yagi antenna, features a Wing director used in conjunction with a new T-match dipole. This new combination is an exclusive feature of the Winged 88 and gives increased gain and sensitivity. The Wing director has proven itself as an integral part of the Zephyr Family and Color Series antennas. Single and two-bay models of the Winged 88 are offered with the single bay priced at \$13.15. Trio Mfg. Co., Griggsville, Ill. (ELECTRONIC TECHNICIAN 4-22)



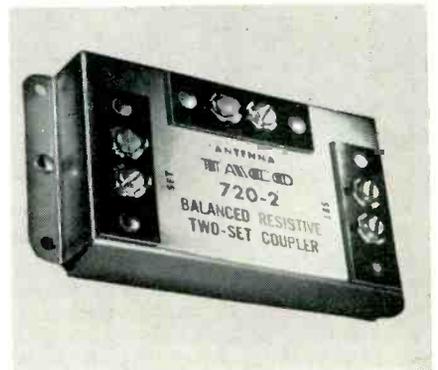
Winegard YAGI →

Model FMY8 is a high gain, 8-element directional yagi. It has a flat frequency response across the entire FM band, with 10.2 db gain. Ideal for fringe areas and long distance reception. Users are said to report perfect reception up to 200 miles from the station. The driven element is of the folded dipole type. Directors and reflectors are divided into five and two separate dipole elements. Retail price is \$22.95. The Winegard Company, Burlington, Iowa. (ELECTRONIC TECHNICIAN 4-20)



Taco MULTI-SET COUPLERS

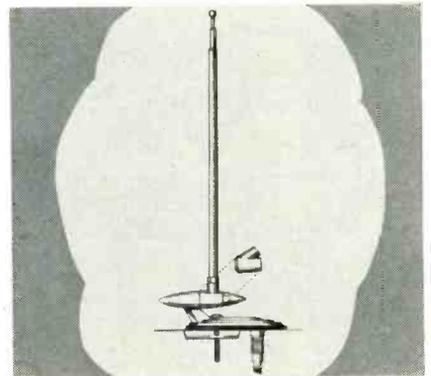
Balanced resistive multi-set couplers, indoor Model 720 and outdoor Model 725, provide up to 24 db isolation between receivers while at the same time providing maximum transfer of signal to each TV set. These couplers are merchandised in a point-of-sale display



carton to meet the walk-in and store traffic trade. They supplement the 820 series which have received wide acceptance. Screw-type terminals are used. Technical Appliance Corp., Sherburne, N. Y. (ELECTRONIC TECHNICIAN 4-23)

Tenna AUTO ANTENNA

Top or side cowl mounting on any car cowl or fender contour, are features of the Model JA-7 Bullet auto radio antenna. The unit comes with two chrome, die-cast swivels, which permit vertical or 45° angle mounting of the removable mast, and two plastic base mounting



pads for any car contour. Quick top installation is provided by a special mounting toggle. The mast is a 3-section telescoping unit which extends to full 57 in. The Tenna Mfg. Co., 7580 Garfield Blvd., Cleveland 25, Ohio. (ELECTRONIC TECHNICIAN 4-24)

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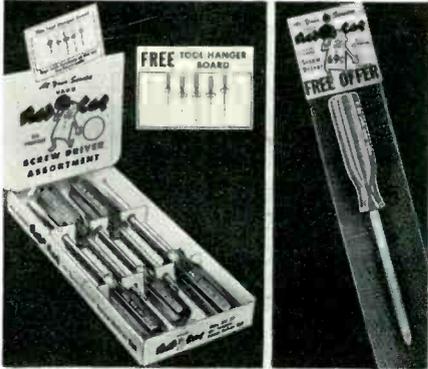
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New Products

Vaco SCREWDRIVERS

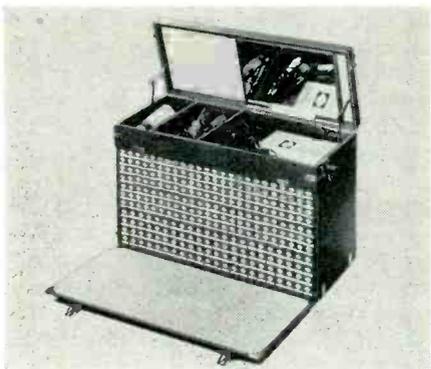
The Red Cap line consists of 7 different screwdrivers: RC-1, #1 Phillips, with 3" long blade; RC-2, #2 Phillips with 4" long blade; RC-3, 3/16" x 4" round blade; RC-5, 3/16" x 6" round blade; RC-6, 1/4" x 4" round blade; RC-8, 1/4" x 6" round blade; and RC-10, 5/16" x 6" round blade. The screw



drivers are available in either individual plastic containers at 59¢ to 98¢, or in a display carton assortment of five for \$2.98. A 12" x 24" masonite tool hanger board is available free with each box or 6 individual units. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill. (ELECTRONIC TECHNICIAN 4-39)

CBS-Hytron CADDY

A new tube and tool caddy, with dealer-inspired improvements, holds 395 tubes (268 miniatures, 102 GT's, and 25 G's), and has 3 larger tool and instrument compartments, a 9 1/2 x 12-inch reversible test mirror mounted inside the cover with adjustable friction



hinges, and a finger-notched handle. Dimensions are 24 1/2 x 16 1/2 x 10 inches. It has scuff-proof plastic covering and metal corner reinforcements. CBS-Hytron Div., Columbia Broadcasting System, Inc., Danvers, Mass. (ELECTRONIC TECHNICIAN 4-12)

Beckman DIGITAL VOLTMETER

An all-electronic digital voltmeter, Model 5350, measures dc and ac voltage and resistance to accuracies of 0.5% quickly. The instrument is equipped with an automatic polarity indicator, decimal position indicator lights, accurate oven-controlled reference voltage for calibration and ac/dc switch type probe. Readings to 150% of full scale are properly indicated even if the input goes beyond the range setting. Berkeley Div., Beckman Instruments, Inc., 2200 Wright Ave., Richmond 3, Calif. (ELECTRONIC TECHNICIAN 4-19)



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We didn't realize how many service men wanted to get into the Test-O-Matic self service tube business until we offered our new booklet "Radio-TV Tubes that Sell Themselves" in a recent issue of Electronic Technician. Hundreds and hundreds of requests came pouring in. We've printed more and if you haven't sent for yours do it now or ask your parts distributor for a copy. It tells all about how to establish good high volume spots, restocking, bookkeeping, financing . . . everything to put you in this lucrative "Test-O-Matic" part-time business. Ask your jobber about the Test-O-Matic plan.



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CONELRAD for Emergencies

• Plans are being pushed to use the radio and television CONELRAD attention signal to notify listeners of emergency storm and flood warnings, reports the Department of Commerce Weather Bureau. This new warning system became possible following a recent order issued by the Federal Communications Commission which authorized this special use of the existing national defense CONELRAD alerting procedures.

Although designed for national defense purposes, CONELRAD hereafter can also be used to distribute Weather Bureau warnings of impending natural disaster, such as may threaten when a hurricane suddenly changes course, or when a violent tornado approaches a city, or when a flash flood builds up from torrential rains and rushes down a river valley.

The CONELRAD attention signal was designed so that a warning could be broadcast by all radio and TV stations at the beginning of a defense alert. This unique attention signal is given by discontinuing the normal broadcast program, turning off the station's power (or sound only, in case of TV) for 5 seconds, then on for 5 seconds, then off for 5 seconds and on again, and then broadcasting a steady 1000 cycle tone or beep for 15 seconds.

System Operation

The CONELRAD signal can accomplish two things. It can attract listeners' attention and it can turn on automatic alarm devices. The automatic alarm device normally is an ordinary radio receiver equipped with a special switching arrangement which controls the loudspeaker so that the radio receiver may be kept in operation on a standby basis and tuned to a radio station even though the loud speaker is muted or silenced. When the CONELRAD attention signal is broadcast by the radio station, the special switching arrangement on the radio receiver automatically turns on the loud speaker so that any emergency message which follows can be heard. This switching arrangement can also be used to set off flashing lights, buzzers, bells or other visual or sound signals.

Civil Defense offices, schools, police departments, fire departments, and others in many communities are already equipped with such receivers. Engineers have reported that the alarm feature can be built into ordinary radios at the factory for a relatively small cost. It is estimated that more than 200,000 CONELRAD alert receivers already are in operation in the United States.

Dr. F. W. Reichelderfer, Chief of the U. S. Weather Bureau, said that much of the value of the CONELRAD device as a public emergency weather warning aid will depend on the ability of radio manufacturers to include a low cost automatic alarm feature in radio receivers to be built in the future.

The CONELRAD attention signal will be used as fol-

lows when a weather disaster threatens: Upon request of the responsible Weather Bureau office, broadcast stations serving the threatened communities will (1) interrupt normal programs, (2) broadcast the CONELRAD attention signal, (3) transmit the Weather Bureau's emergency weather warning on *their normal broadcast frequencies*, and (4) then resume their scheduled programs.

All listeners are reminded that when the CONELRAD procedure is used for "weather warning emergencies" the radio stations *will remain on the air* and will broadcast the warnings on their normal frequencies. This procedure is in contrast to a "defense alert" where radio and TV stations go off the air and any transmissions thereafter are made only on the special CONELRAD frequencies of 640 and 1240 kc.

The Weather Bureau plans to ask radio and TV stations to transmit the CONELRAD attention signal ahead of weather warnings *only in the most serious emergencies*. For example, if a dangerous hurricane is approaching the coast and suddenly speeds up or changes course, especially during the night, new and urgent warnings must be given to threatened communities. Another serious weather emergency could arise during a rapidly developing blizzard.

Warning specialists state that CONELRAD equipped receivers would insure receipt of storm and flood warnings by radio, and help overcome telephone line jamming.

The Weather Bureau emphasizes, however, that the CONELRAD signal would *not* be used for tornado forecasts indicating the possibility of tornadoes in a large area hours ahead, nor would the new CONELRAD procedure be used to announce a hurricane watch along the coast when the danger from a storm at sea was a day or more away. In most cases of adverse weather, local Weather Bureau stations provide ample notice through their usual widely distributed forecasts and warnings, and under such cases of expected bad weather the CONELRAD attention signal would not be used.

Automatic Alarms

Severe storm forecasters of the Weather Bureau believe that many lives can be saved from storms and floods if there existed a "no-fail alarm" that will awaken people when a new threat suddenly develops in the middle of the night so that all people affected will listen immediately for the warning information they need.

The CONELRAD procedure for weather warnings will be used only in the Continental U. S. The Weather Bureau estimates it will take several months to work out local arrangements, but expects the new procedures to be in effect in most areas in time for the 1958 tornado and hurricane seasons. In a few cities such arrangements already have been completed. The FCC reports this new public service use of CONELRAD already has received enthusiastic endorsement from many stations throughout the U. S.

Radio set manufacturers have been advised of this new public service aspect of CONELRAD and it is expected that many future models of radio receiving sets will contain an automatic alarm feature.

The Weather Bureau points out that CONELRAD procedures will supplement, *not* replace, present storm warning distribution arrangements.

As its coined name implies, the CONELRAD program was established by the Federal Communications Commission and the Air Force for the *CON*Trol of *EL*ectro-magnetic *RAD*iation. It is intended primarily to thwart possible enemy bombers and guided missiles from using radio transmission as navigational aids yet permit alerting and other essential radio operation in event of enemy attack. •

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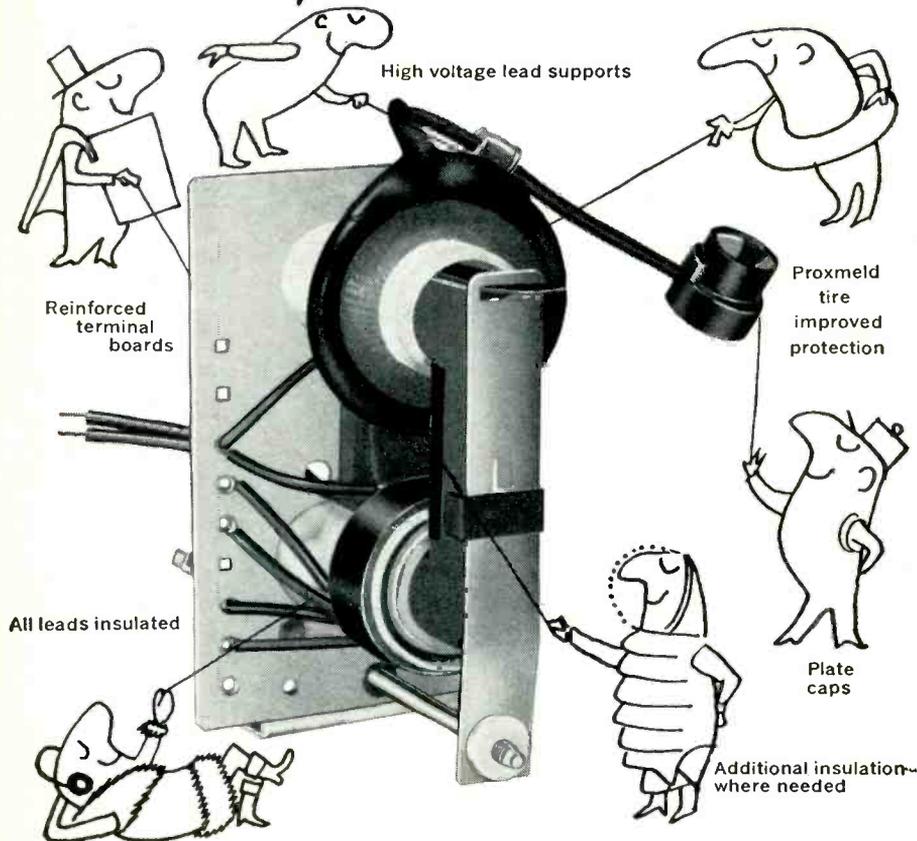
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Suppliers of rebuilt TV Tuners to leading manufacturers, technicians & service dealers, coast to coast.

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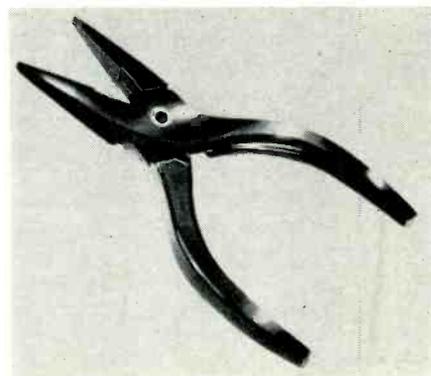
The "No-Noise" Rubber Coat Spray, that can be sprayed from the can, produces effective insulation and protection for TV, radio, FM, auto wiring and antennas. It is non-inflammable and contains no plastic. Among its features are: insulation where applied; protection for



an indefinite time; prevention of arcing, shorting and corrosion; and thorough waterproofing. Priced to technicians at \$3.25 for a 6 oz. spray can. Electronic Chemical Corp., 813 Communipaw Ave., Jersey City, N. J. (ELECTRONIC TECHNICIAN 4-10)

G-C PLIERS

New long nose shock-proof pliers, No. 8387, are made of insulated plastic. They are designed to give complete safety in repairing high voltage sections of TV sets. Their plastic construction makes them non-magnetic and



there is no interference with circuit operation. List price: \$2.25 each. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 4-14)

For more information on these products, fill in coupon on page 48. Mail it to ELECTRONIC TECHNICIAN, Reader Service Dept., 480 Lexington Ave., New York 17, N. Y.

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won't damage glass tubing
let alone wire or cable!

ARROW STAPLE GUNS can't damage wire or cable because driving blade automatically stops staple at right height! That's why Arrow Staple Guns are proved safer on jobs all over the country. And Arrow staples have tremendous holding power because they're rosin-coated, have diverging points that lock into wood.

T-25 (shown) for wires up to 1/4" in diameter. (Hi-Fi wire, radiant heating, bell, thermostat, telephone, inter-com, etc.) tapered striking edge gets into tight corners. Uses 3/8", 1/2", and 5/8" staples, List \$15
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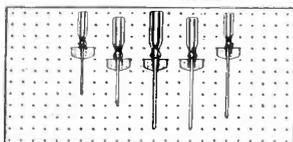


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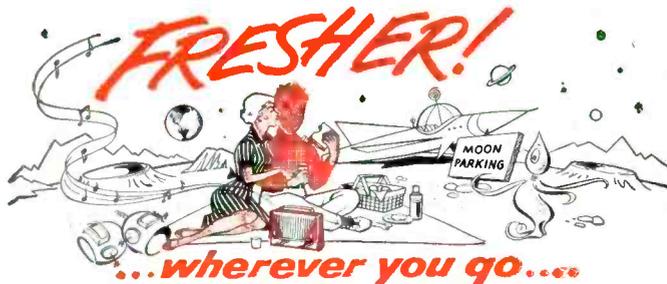
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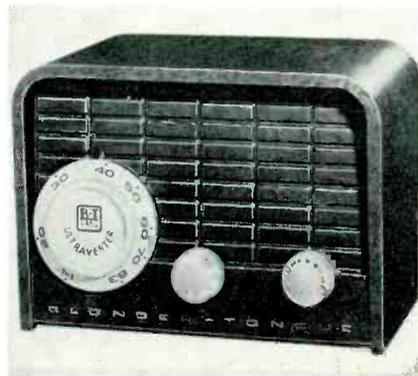


Elenco CAPACITORS

An assortment of 200 Elenco brand steatite tubular capacitors is offered in a 16-drawer metal cabinet. The cabinet with clear plastic drawers is valued at \$6, but is given free with each stock package order. This TV-600 package contains various quantities of 16 different capacitance values rated at 600 volts dc, including: .001, .002, .0022, .003, .0033, .0047, .005, .01, .02, .022, .03, .033, .047, .05, .1 and .25. Maximum temperature is 85°C. Arco Electronics, 64 White St., New York 13, N. Y. (ELECTRONIC TECHNICIAN 4-29)

B-T UHF CONVERTER

Model BTU-2R Ultraverter now features a tuner redesigned to new FCC standards. The converter adds all UHF channels from 14 through 83 to standard VHF receivers. It has a dual-speed channel selector, double-tuned input, low-noise triode amplification, and precise 300 ohm match which give sharper



pictures in weak signal areas. It uses 2 tubes, operates on 117 volts, 60 cycles, weighs 4 lbs., measures 6¾ x 4¾ inches, and is housed in a modern 2-toned plastic cabinet. Retail at \$39.95. Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark 2, N. J. (ELECTRONIC TECHNICIAN 4-15)

Compare just released Model 77 to ANY peak-to-peak V.T.V.M. made by ANY manufacturer at ANY price!

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VACUUM TUBE VOLTMETER

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- ✓ Model 77 uses a selenium-rectified power supply resulting in less heat and thus reducing possibility of damage or value changes of delicate components.
- ✓ Model 77 meter is virtually burn-out proof. The sensitive 400 microampere meter is isolated from the measuring circuit by a balanced push-pull amplifier.
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SPECIFICATIONS

• DC VOLTS — 0 to 3/15/75/150/300/750/1,500 volts at 11 megohms input resistance. • AC VOLTS (RMS) — 0 to 3/15/75/150/300/750/1,500 volts. • AC VOLTS (Peak to Peak) — 0 to 8/40/200/400/800/2,000 volts. • ELECTRONIC OHMMETER — 0 to 1,000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms. • DECIBELS — -10 db to + 18 db, + 10 db to + 38 db, + 30 db to + 58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.73v). • ZERO CENTER METER — For discriminator alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

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AS AN ELECTRONIC OHMMETER: Because of its wide range of measurement leaky capacitors show up glaringly. Because of its sensitivity and low loading, Intermittents are easily found, isolated and repaired.

Model 77 comes complete with operating instructions, probe and test leads. Use it on the bench — use it on calls. A streamlined carrying case, included at no extra charge, accommodates the tester, instruction book, probe and leads. Operates on 110-120 volt 60 cycle. Only

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Try it for 10 days before you buy. If completely satisfied send \$12.50 and pay balance at rate of \$6.00 per month for 5 months. — No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

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Cleans and prevents oxidation on TV, radio, other electronic circuit contacts. No harmful solvents or acids.

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Catalogs & Bulletins

AUTO RADIO VIBRATOR DISPLAY: A colorful counter display carton is described and illustrated in a one-page flyer. The carton features a cut-away of three and four prong vibrators and will hold 100 units. American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn. (ELECTRONIC TECHNICIAN No. B4-7)

ULTRASONIC CLEANER: Data sheet covers generators and transducers. Gives such information as frequency, power input and capacity. Includes prices. Narda Ultrasonics Corp., 160 Herricks Rd., Mineola, N. Y. (ELECTRONIC TECHNICIAN No. B4-8)

DYNAMOTORS: A 28-page catalog, No. 158, describes the entire line of Dynamotors and lists the new fan cooled genemotor for the first time, as well as several new models comprising the whole genemotor line. Also 11 new listings in the 1½" and 2" frame genemotors. Carter Motor Co., 2767A W. George St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN B4-4)

SILICON DIODES: A 4-page bulletin—the first in a new series covering semiconductor applications: "The Use of Silicon Junction Diodes to Protect Sensitive Current Devices" contains application notes, illustrations of typical circuits and results of tests. Hoffman Electronics Corp., Semiconductor Div., 930 Pitner Ave., Evanston, Ill. (ELECTRONIC TECHNICIAN B4-5)

AUTO RADIO SERVICE: A new colorful piece of promotion material for use with the Model V101 Auto Radio Service Merchandiser. The "Litterbag" ties in with the national effort to keep streets and highways free of litter and provides simple hints on auto radio service as well as space for the service station stamp. Vis-U-All Products Co., 303 Fuller Ave., N. E., Grand Rapids 3, Mich. (ELECTRONIC TECHNICIAN B4-3)

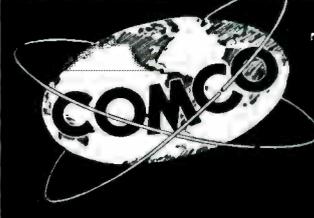


"That's odd, it says all solid black lines are secondary roads."

RESISTORS & TRANSISTORS: A compact two-color circular gives electrical and mechanical specifications of silicon transistors and molded precision film resistors. Texas Instruments, Inc., S.C. Div., P.O. Box 312, Dallas, Texas. (ELECTRONIC TECHNICIAN B4-6)

HOME-STUDY COURSES: A new colorful circular describes Radio-Electronics and Television courses which are intended for home-study. Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. (ELECTRONIC TECHNICIAN B4-2)

TV PICTURE TUBES: A 14-page booklet containing pertinent mechanical and electrical characteristics, as well as typical operation conditions for more than 300 TV picture tubes. Includes data on aluminized, black and white and color picture tubes; face plate, deflection angle, bulb dimension and ion trap information, basing diagrams, and aluminized picture tube replacement guide with notes on adjustments or changes required for interchangeability. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN B4-1)



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communications equipment

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| <p>VHF-FM FOR:</p> <ul style="list-style-type: none"> MOBILE AIRCRAFT MARINE MOTO-CYCLE PORTABLE BASE | <p>VHF-AM FOR:</p> <ul style="list-style-type: none"> AIRPORT VEHICLES GROUND STATIONS POINT-TO-POINT | <p>VHF</p> <ul style="list-style-type: none"> ANTENNAS REMOTE CONTROLS ACCESSORIES |
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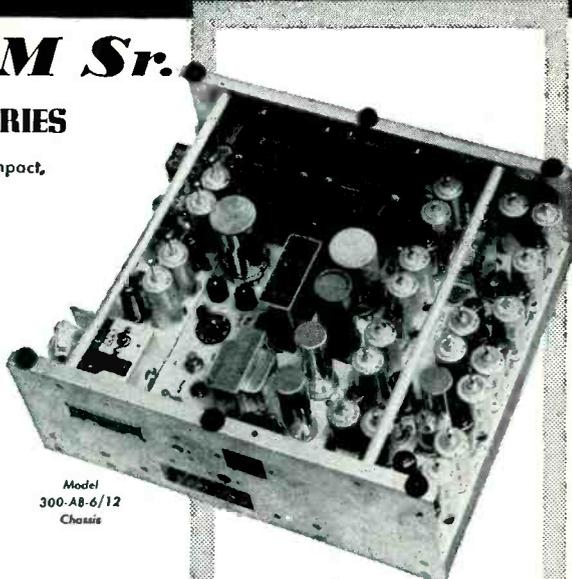


FLEETCOM Sr.

MODEL 300-6 12 SERIES

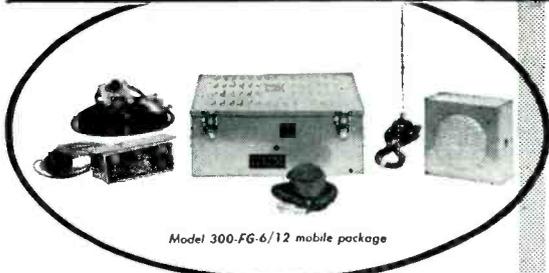
The FLEETCOM Sr. is rugged, compact, universal 6/12, VHF-FM two-way mobile communications equipment for the Public Safety, Industrial, Land Transportation and other radio services.

COMCO'S 17 years experience in design leadership and production "know-how" is engineered and built into every FLEETCOM Sr. unit.



Model 300-AB-6/12 Chassis

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Model 300-FG-6/12 mobile package

ATTENTION DEALERS!
Write for available territories.



Features:

- 55 Watts output in low band
- Front or rear mounts
- Case size 14"x13½"x6";
- Maximum output with minimum battery drain.

UNIVERSAL! Instantly convertible for 6 or 12 volt operation.

COMPLETE! Ready for installation and operation.

QUALITY! Exceptional value/price ratio.

DESIGNERS AND MANUFACTURERS OF RADIO COMMUNICATIONS EQUIPMENT

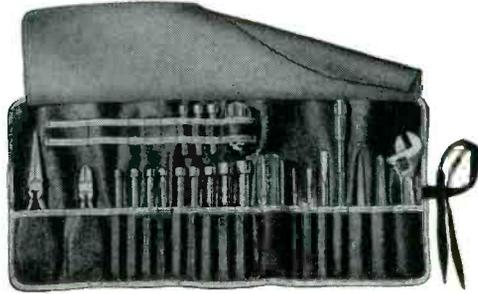
COMMUNICATIONS COMPANY, Inc.

FOUNDED 1938 CORAL GABLES, MIAMI 34, FLORIDA

CONVENIENCE UNLIMITED!

New XCELITE Kit

Holds ALL Your Most-Needed Tools



Yes, with the 99 SM Service Master, you'll be able to handle 99% of your service calls . . . quickly, easily, profitably. This convenient, attractive non-scratch roll kit contains 23—yes, twenty-three—of the most popular items from the famous XCELITE "99 Line" of precision-made tools.

You professional Radio, TV, Hi-Fi and Elec-

tronics Servicemen will have your favorite XCELITE Nutdrivers, Screwdrivers, Detachable Handles, Pliers, Reamers, Adjustable Wrench—all "filed" for instant access in the 99 SM Kit. Included is the highly-useful 99X-10 6" Snap-In Extension Blade.

If you have certain specialized service needs, you can "custom-assemble" your own selection of tools from XCELITE'S "99 Tool Line". Then your 99 SM Kit will fit your own service jobs to a "T".

See Your Dealer Today . . . Order YOUR 99 SM Service Master Kit To Handle 99% of ALL Your Service Calls!

XCELITE, INCORPORATED
Dept. C, Orchard Park, N. Y.

In Canada—Charles W. Pointon, Ltd.
6 Alcina Ave., Toronto, Ont.



FERRODYNAMICS CORP. has come out with a Tensilized Double Play Mylar recording tape in its Sonoramic line. This tape, on a DuPont base, resists stretching. A 7" reel holds 2400 ft.

DUOTONE reports its first stereo phono cartridge. Complete details are not yet available. Units are expected to be ready for mass marketing by the time of the Chicago Parts Show, May 19-21. Price will be competitive with other stereo ceramic cartridges.

WEBSTER ELECTRIC reports that its recently announced stereo ceramic cartridge, now in full production, will retail for \$24.50. Designated the SC-1D, it is a plug-in type, and has a diamond needle. VP Howard Stacey anticipates a booming market for these cartridges in both the replacement and OEM markets.

NATIONAL CREDIT OFFICE reports an extensive study finds there are 2143 concerns in the U.S. who specialize in the distribution of high fidelity components and units. Alaska, Hawaii and Canada have 43. Area breakdown is: New England 162; Mid Atlantic 274; S. Atlantic 254; E. N. Central 400; S. Central 297; W.N. Central 167; Mountain 115; and Pacific 474.

HARTLEY PRODUCTS President Robert Schmetterer writes us that Hartley sells through service dealers: "With direct access to the home, the service dealer was in a position to know where the prospect was before said prospect even thought of Hi-Fi. A plus feature is the acceptance the service dealer has for his knowledge which is in view of the customer by virtue of his maintaining radio-TV-phono equipment. We can cite dealer-service-men who are outselling by far many of the salon type operators."

ERSIN Multigrain FIVE CORE SOLDER
CONTAINS 5 CORES OF NON-CORROSIVE FILER

World's finest!

Made especially for the **RADIO AND ELECTRONIC MARKET**

Guarantees your work — FASTER! SURER! NO CALL-BACKS!

LOWEST POSSIBLE PRICES — PROMPT DELIVERY

SOLD ONLY THROUGH RADIO PARTS DISTRIBUTORS!

Dept. MD 558
MULTICORE SALES CORPORATION
PORT WASHINGTON, NEW YORK

WILL YOUR REPLACEMENT Fuse Resistor BURN OUT AGAIN?

Not if you use — **The NEW SENCORE "FUSE-SAFE" CIRCUIT TESTER**

Another Sencore Time-Saver

Save costly call backs by testing the circuit before replacing fuse, fuse resistor or circuit breaker.

Individual scale for each value fuse resistor — no interpretation, just read in red or green area.

- ★ Measures line current and up to 1100 watts of power at 115 volts using line cord and socket.
- ★ Two convenient current ranges — 0 to 2 amps and 0 to 10 amps. Test leads clip in place of fuse or fuse resistor.
- ★ 5 ohm, 10 watt resistor prevents TV circuit damage and simulates operating conditions.

As Recommended by Leading Manufacturers

Mfg by **SENCORE**
SERVICE INSTRUMENTS CORP.
171 OFFICIAL RD., ADDISON, ILL.

\$895 DEALER NET
MODEL FS-3
AC-DC or both as needed for Fuse Resistor Circuits

Cut out this ad now for further information

Third Echelon

(Continued from page 34)

used to deliver a satisfactory square wave. It can also be used for tone-burst testing.

The equipment setup is shown in Fig. 5, and consists of alternately applying a high and low amplitude sine wave, both having the same frequency. One input of the electronic switch receives the full output from the generator while the second input receives the same signal, but cut down by the attenuator. The output from the electronic switch is also shown in Fig. 5.

When this signal is passed through an amplifier, various defects may come to light, which might not show up on other types of tests. Examples of the distorted waveforms which may be seen are shown in Fig. 6. Like the use of square-wave tests, this procedure is not too widely used, and may become more popular in the future.

It is fairly simple to check hum and background noise level. An audio VTVM placed across the output of the dummy load on the amplifier is all that is needed. For this test, the volume control is set at maximum, and the bass and treble controls are set for flat response. The input of the amplifier should be properly set up. The signal generator, attenuator, probes and all other equipment attached to the amplifier input is disconnected to avoid picking up any stray hum and noise signals. In most cases a 500,000 ohm resistor connected from the grid to the input tube to ground will isolate the input circuits and provide a proper load. See Fig. 7.

There are many different kinds of test procedures and specifications for high fidelity equipment. Unfortunately, not all authorities agree on the relative merits of the various tests. The absence of a fixed set of standards and the difficulty in evaluating the quality or determining whether the unit is operating according to the factory standard, when tests other than those originally used, leaves the technician with no alternative but to employ the exact tests specified by each manufacturer for each piece of equipment. It is hoped that the presentation of the echelons of maintenance concept will encourage more technicians to look further into this very profitable field of high fidelity, to undertake the work they can do with their present set up and to expand their activities as the situation warrants. •



American Beauty

ELECTRIC
SOLDERING IRON

TINY TIP FOR MINIATURE, SUBMINIATURE AND MICRO-TYPE CONNECTIONS.

The slim, new American Beauty "T-12" iron with its plug-in transformer is especially built to solder today's tiny connections easily, accurately and dependably.

This NEW tip-element (about the size of a kitchen match) with its 3/32" tip is built for fast, hot, production-line use—day after day.

Here is the quality-built, economical answer to YOUR miniature soldering problems! Write for literature and prices.

AMERICAN ELECTRICAL HEATER COMPANY

171-H

DETROIT 2, MICHIGAN



MAKE SURE IT FITS!

OXFORD SPEAKERS

You obtain the finest sound reproduction when you select the proper speaker for the specific application. Each OXFORD SPEAKER is "tailor-designed" to actually "fit the need."

Specify OXFORD when you next require quality speakers. Remember: Oxford quality has consistently been superior for over thirty years.

| | |
|---|--|
| <p>RADIO & TV SPEAKERS</p>  <p>OXFORD Speakers are used by more original set manufacturers — find out why!</p> | <p>OUTDOOR SPEAKERS</p>  <p>For rugged, steady performance under any conditions, OXFORD Weather-proof speakers will meet the need.</p> |
| <p>DUAL CONE HI-FI SPEAKERS</p>  <p>Oxford's newest development to provide maximum performance. For Hi-Fi and rear deck applications.</p> | <p>PORTABLE RADIO SPEAKERS</p>  <p>More Oxford speakers are used in portable sets than ever before... there must be reasons!</p> |



Our new catalog is available... write for yours NOW!

OXFORD Components, Inc.

Subsidiary of Oxford Electric Corp.

556 West Monroe Chicago 6, Ill
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In Canada: Atlas Radio Corp., Ltd., Toronto

Case History:

How To Raise Service Charges

RUDOLPH MALKIN

• The Music Mart of the Northwood Shopping Center had a difficult time establishing a reasonable service charge in the northeast residential section of Baltimore, Maryland, but patience and planning solved the problem. In order to establish itself the firm cut its original prices in an effort to assure its customers it was not intent upon gouging them, and held this nominal fee for several years. Then, two years ago, it raised its prices back up to a reasonable profit-making level which reflected the increased service costs and has been able to hold them there without loss of repair volume.

The reason for the drop in charges, of \$5.00 in 1950 to \$3.50, for service calls and maintaining an average labor charge for shop repairs ranging from \$7.50 to \$12.00 was that the store was new and was trying to increase the number of personal contacts to assist the sale of new TVs, radios and phonographs. "We also wanted," says Jack Duffy, manager of the store, "to cultivate the confidence of the people in the area by being able to point out to them that we maintained our own repair facilities and were completely capa-

ble of standing behind guarantees issued with our new product sales." The original \$5.00 price was maintained for two years in spite of the fact that there were numerous small basement operations in the area and discount houses were making heavy in-roads into the store's retail sales.

Eventually, says Duffy, he could predict the end of every service call. Inquiries about the firm's rates would evoke, "Five dollars! I'll call later." It seemed as though people would not spend \$5.00 to keep a \$300.00 TV set operating. When the point arrived that there were few service calls and the firm began to be known as expensive, the decision to drop the price was made by Mishel Seidel, owner of the firm.

Advertised Price Cut

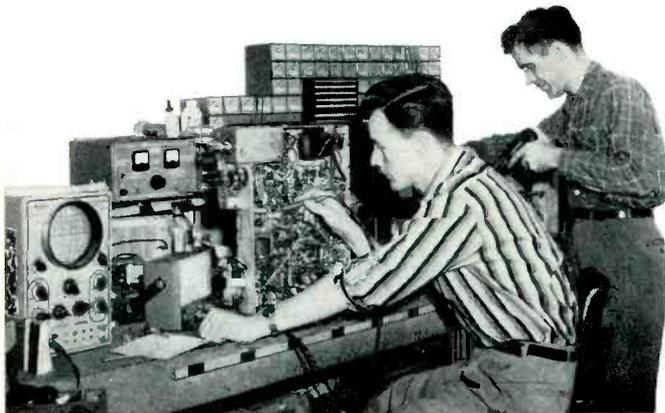
The store's sales and service area was saturated with throw-a-ways, newspaper ads were placed extensively, and radio and TV time was used to announce the new rate of \$3.50 plus parts. From the beginning the store lost money. It and its sister store, in West Baltimore, divided the city between themselves and a response to a call from a distant part of the city meant additional

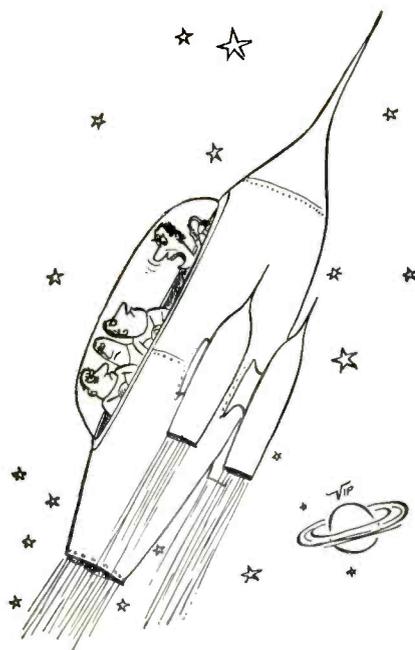
losses. Since rapid service was required, only extremely skilled technicians could be used in order to facilitate "on-the-spot" repairs whenever possible. Labor costs were, consequently, heavy.

The response to the service charge reduction was large and during the next two years, while the prices were in effect, the store developed broad and lasting contacts. In spite of the competitive price, quality standards were maintained. After two years the management was faced with two conditions which made a raise in service prices inescapable, but practical. Labor and parts costs had risen to the point where they could no longer afford to provide "customer building" service at the reduced price, and second, the firm had developed a wide reputation for reasonable and dependable service. A tentative date was set for the new prices to go into effect. For six months, after the date arrived, every time a customer called requesting service, the new prices were announced. Instead of the former flat price for the entire city and its environs, the service areas were circled with radius rings, and a sliding scale of prices was set up. A \$4.50 base rate was established for the

Paul T. King (left) Music Mart technician, and Arnold L. Leonard, shop manager, at the bench. Average shop repair price range of \$7.50-\$12.00 was raised to \$12.00-\$15.00.

Jack Duffy, manager of the Northwood store, checks out-going work. The firm is receiving the same number of complaints on \$35.00 bills as it received before on \$15.00 charges.





"O.K! O.K! We'll turn back to earth and get your JENSEN NEEDLES."

local areas; \$7.50 for adjacent county areas; and \$10.00 for extreme distances.

No formal announcement of the price raise was made and in the beginning discretion was exercised in enforcing it. Invariably the question was, "What's the idea? You fixed my TV last week for \$3.50. What's the idea of the raise?" Duffy's first retort was to ask if the customer was satisfied with the technician's work on the last job. The answer was, at the worst, a disgruntled, "Sure . . . Sure." "Well," Duffy answered, "we want to keep that man on our staff and skilled men are getting more expensive. We could hire 'tube pullers' but they wouldn't be able to find simple defects. They'd pull your set, bring it in and you'd be stuck with a shop charge instead of a service charge." As a salve for the customer's indignation the old rate would be allowed for the final time and then stress that future service calls would command the new charge. There was the usual difficulty with the new customers and less with the majority of the old ones. A few old ones were lost but were replaced by new contacts during the ordinary course of business.

The original difficulty was overcome by the establishment of the store's reputation for quality repair work by the two year sacrifice in which the store wooed repair jobs. Now that people know what they are paying for they are more objective about the cut-rate prices still prevalent in the area.

Other details of the price raise are as follows: The store's average shop price today ranges from \$12 to \$15 for labor costs in contrast with the old \$7.50 to \$12.00 range. Since the average re-conditioning requires about two tubes and labor, an overall \$6.50 charge is estimated on all cash and carry items, such as small phonographs and radios. If only one tube is required the difference is deducted from the customer's estimate. Since the customer expected a bill of \$6.50 or more, he is impressed with the store's honesty and is not likely to take chances with another shop. The former basic charge for these items was \$5.00. Automatic record changer estimates were raised from \$5.00 to \$10.00 in order to permit a regular maintenance procedure besides repairing the immediate malfunction. Removal of dirty grease in the working parts and replacement of worn drive wheels is now standard practice. Whenever additional attention is re-

(Continued on page 61)

NEW

RAYTHEON

2N155

ACTUAL SIZE

POWER TRANSISTOR for AUTO TRANSISTOR RECEIVERS

This new Raytheon PNP alloy-junction germanium transistor helps Service Dealers do more auto transistor receiver servicing. Designed especially for the output stage in automobile receivers, the 2N155 is used in the Ford receiver, and is an ideal replacement transistor for the power units in many other car receivers. Here is a list of the many transistor types this one, high quality, low cost Raytheon 2N155 transistor can be used to replace:

| | |
|--------|-------|
| AR5 | 2N242 |
| 2N176 | 2N250 |
| TS176 | 2N257 |
| 2N235 | 2N285 |
| 2N235A | 2N301 |

For the complete service dealer profit picture on Raytheon Transistors, get in touch with the Raytheon Tube Distributor nearest you.



Excellence in Electronics
RAYTHEON MFG. CO.
Receiving Tube and Semiconductor Operations
New on 58, Massachusetts

NEW! IMPROVED!

SENCORE

TRC4

TRANSISTOR CHECKER

Another Sencore Time-Saver

America's newest, most popular test instruments

NOW CHECKS:

- ★ Transistors for opens, shorts, leakage and current gain. Includes new gain test on power transistors.
- ★ Crystal Diodes checks forward to reverse current ratio on all diodes.
- ★ Selenium Rectifiers checks forward and reverse currents.

Controls are accurately set for each transistor by referring to replaceable set-up chart on rear. Test leads or socket provides for fast hook-up. See your parts distributor.

ONLY \$17.95
Dealer Net

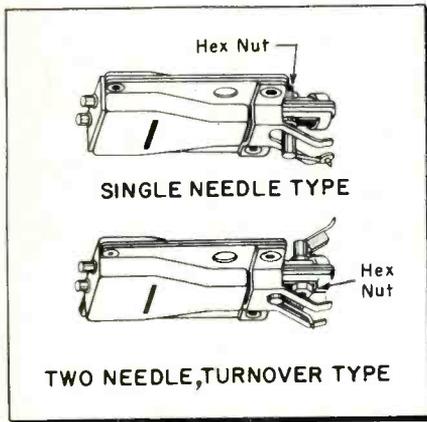
Cannot become obsolete. Approved by leading manufacturers.

SIMPLE TO OPERATE

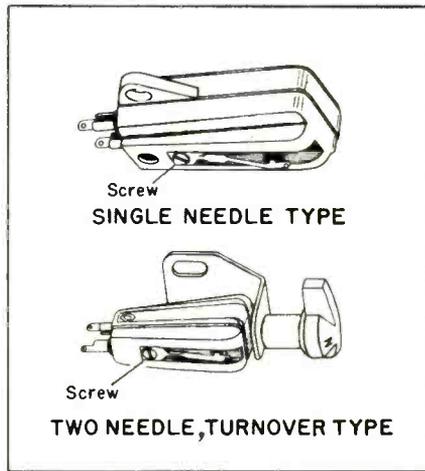
Mfg by **SERVICE INSTRUMENTS CORP.**
171 OFFICIAL RD., ADDISON, ILL.

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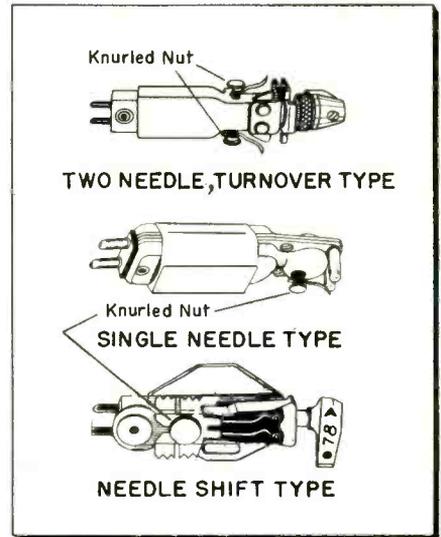
How To Replace Needles



Hex Nut Held—Insert needle shank through cartridge hole. Place washer on needle shank, then secure hex nut.



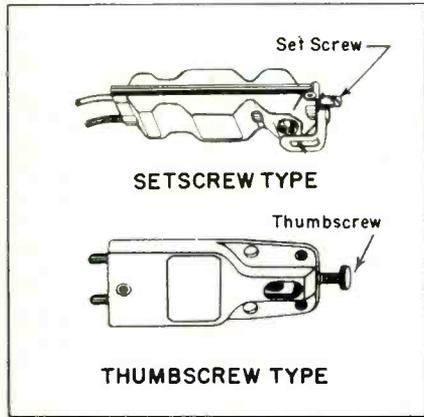
Screw Held—Line up needle arm in recess at bottom of cartridge. Secure retaining screw.



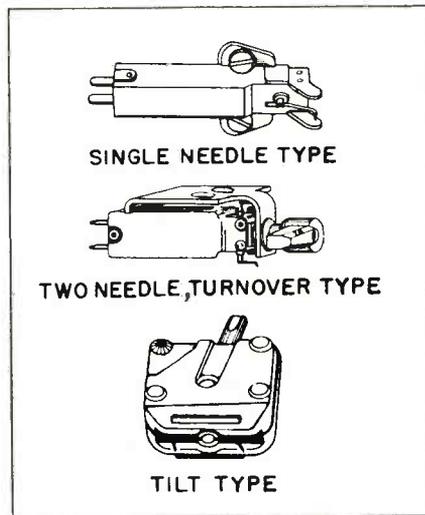
Knurled Nut Held—First fit needle into slot in threaded stud, tighten knurled nut. Needle offset should contact nut shoulder.



Friction Held, Vertical Push-In—Insert needle in cartridge chuck. Use gentle thumb pressure to seat.



Conventional Needles—First face flat or V-groove toward front, insert, then tighten the screw.



Frictional Held Horizontal Push-In—Make sure needle tip is perpendicular to record surface. Push needle arm into needle tube.

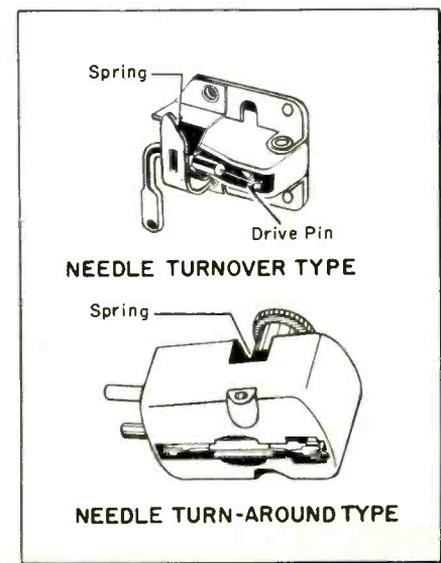
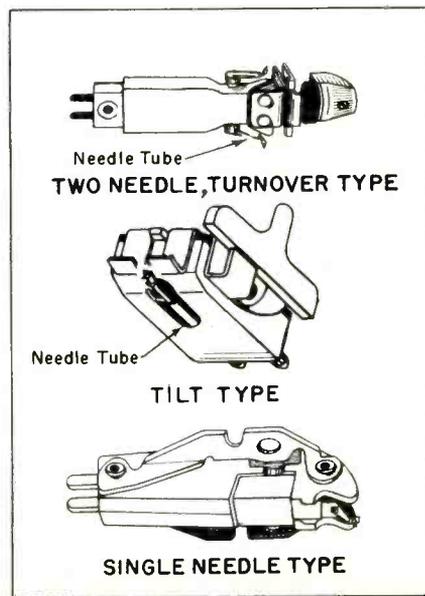
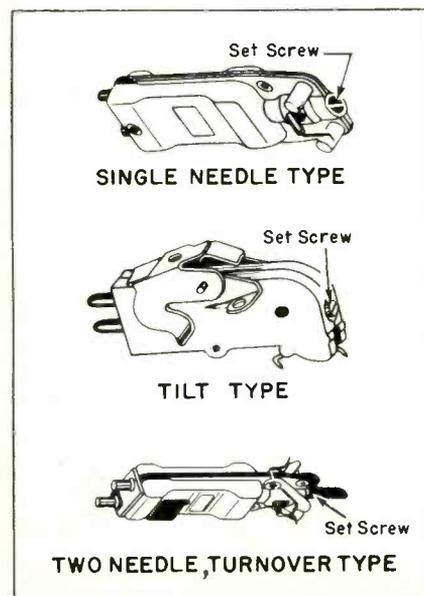
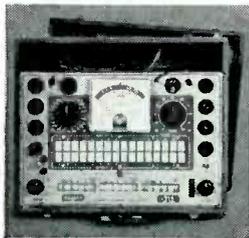


ILLUSTRATION CREDITS
Duotone Co., Inc.

Spring Held Needle Turnover—Be sure needle rests in V slot of cartridge drive pin, then slip needle turnover handle under the spring lever.

Spring Held Needle Turn-Around—Insert needle shank through cartridge hole. Assemble flat washer on shank, then spring, C washer, and knob. For 3-piece shank assembly, simply push clip-in needle assembly into the rectangular channel in the shank body.



SAVE 4 WAYS

WITH A
JACKSON 648A
DYNAMIC® TUBE TESTER

SAVE ON TIME

Jackson 648A, with fingertouch sequence switching is the world's fastest fully-flexible tube tester.

SAVE ON CALL BACKS

Jackson 648A features famous Jackson Dynamic® circuit, for reliable tests on all radio, tv and most industrial tubes.

SAVE ON INVESTMENT

Jackson 648A is one of the lowest cost, fully-reliable, fully-wired testers on the market.

SAVE ON UPKEEP

Jackson 648A is fully flexible, provides for almost any new development in tube design. No cards to lose. No sea of sockets to confuse you. 23 Separate heater voltages—more than any other tester. Latest test data published monthly on page 65, PF Reporter.



Famous "Service-Engineered"
Test Equipment

JACKSON ELECTRICAL INSTRUMENT COMPANY
16-18 S. Patterson Boulevard • Dayton 2, Ohio

FREE Information About This BUSINESS OPPORTUNITY



key to car radio service market

How many car radios have you serviced lately? Most service operators are missing this tremendous market because they have no regular contact with car owners!

This VIS-U-ALL Auto-Radio Service Merchandiser literally moves your shop into the gas stations and garages where car owners must go. It multiplies your sales of parts—booms your repair volume, too. And without increasing your overhead!

Let us tell you how easy it is to increase your net profit by \$50 a week. See distributor or write us.

VIS-U-ALL products company
301 Fuller N.E., Grand Rapids 3, Mich.

Service Charges

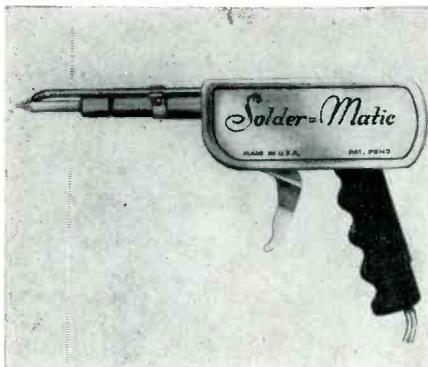
(Continued from page 59)

quired, customers are called for authorization to proceed with the more expensive repairs. A basic \$7.50 charge was set up for cash and carry repairs on single speed, small players. The reason for this lower price was to avoid the impression that the store was attempting to force sales of new stock by quoting prohibitive repair prices on a cheap item.

Another result of the raise in prices was a lessening of pressure upon the outside technician and an improvement in the effectiveness of the firm's service. Under the old price every effort was made for on-the-spot repairs, since shop work meant increased losses. Call time was lost and too often the repairs proved unsatisfactory or impossible anyway. Callbacks have been reduced by at least 90% since the introduction of our new prices. This in itself has contributed a vast amount of additional savings, plus an improvement in customer relations. The store is receiving about the same volume of complaints on \$35 bills as it received formerly on the \$15 bills. The customers involved are no more difficult to placate than they were when complaining about the smaller bill. The two Mart stores employ a total of 6 technicians, one shop co-ordinator and two delivery men. Four pick-up trucks and one Vanette comprise the service-delivery fleet. •

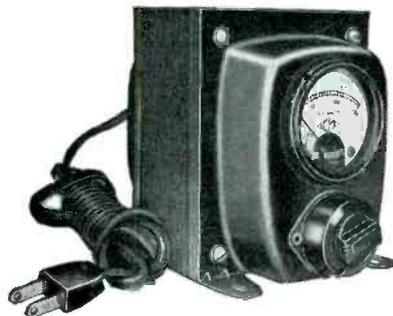
Atlas SOLDER IRON

The new Solder-Matic Electric Iron weighs only 6½ oz. It features the feeding of the solder from a spool through a guide tube to the tip of the Iron in response to a trigger feed. The opera-



tor's other hand is, therefore, free to hold the work. Soldering operations are done more quickly and the quality of joints are improved. Atlas Mfg. Co., 1126 S. Decatur St., Montgomery, Ala. (ELECTRONIC TECHNICIAN 4-13)

THE HANDIEST TESTER YOU CAN HAVE IN YOUR KIT



THE ACME ELECTRIC T-8394 VOLTAGE ADJUSTOR

Smart service men, who like to save time and make more money by doing so, are using the Acme Electric T-8394M Voltage Adjustor on every service call. With this unit, varying voltage conditions ranging from 95 to 125 volts input can be simulated. Under these varying voltage conditions defective components that function properly at normal voltage, but cause trouble at low voltage or over voltage can be located and replaced.

And, in thousands of instances, service customers have insisted on buying this handy unit from the service man so that they may maintain a normal voltage at the set and enjoy top TV reception.

Furnished complete: primary cord and plug; secondary receptacle; accurate meter indicates output voltage; control switch regulates secondary voltage. Compact, inexpensive.

See this at your dealers.

ACME ELECTRIC CORPORATION
884 WATER STREET CUBA, NEW YORK

Acme Electric
TRANSFORMERS

FOR HOUSE CALLS

—it's

HEXACON

FEATHERWEIGHT

INSTANT SOLDER GUN

FITS TUBE CADDY—Takes Half the Space of Transformer Guns

SMALLEST SOLDER GUN WEIGHS ONLY 8 OUNCES

— but

POWER-PACKED AT 150 WATTS and

SOLDERS IN SECONDS

No heavy bulky transformer — sturdy lifetime tip—never wears or bends—effective spotlite

Model G14 with 1/4" tip — \$7.95
Order from your distributor today

HEXACON ELECTRIC COMPANY

180 W. CLAY AVE., ROSELLE PARK, N. J.

SERVING INDUSTRY AND CRAFTSMEN FOR A QUARTER OF A CENTURY

EBY TEST ADAPTERS and SECONDARY SOCKETS

The EBY series of test adapters are designed to fit any type of miniature 7, 9 pin sockets and the standard octal type socket.

The base pins are a unique design assuring positive and equal contact on all sides of the base pins and socket contacts. The contact tabs are long enough to make test probe contact. They are also long enough for alligator clip connections.

List Price

7-77 7 pin miniature test adapter designed for rapid contact connections with test probe or alligator clip. Ideal for incircuit measurements from top of equipment. **\$2.25 ea.**

8-88 Same as above except for 8 pin octal type socket. **\$2.20 ea.**

9-99 Same as above except for 9 pin octal type socket. **\$2.50 ea.**

SECONDARY SOCKETS

The EBY series of secondary sockets are primarily designed for use in tube testers and other types of equipment to prevent wear and tear of primary sockets. They are easily installed in primary socket by a simple means of a single bolt and nut and become a part of the original equipment.

List Price

AD-7 7 pin secondary socket. Plugs into 7 pin socket and fastens with nut and bolt. Protects primary socket against damage due to excessive insertion. **\$2.25 ea.**

AD-8 Same as above except for octal pin socket. **\$2.10 ea.**

AD-9 Same as above except for 9 pin **\$2.50 ea**

EBY SALES COMPANY of N. Y.

130 LAFAYETTE STREET, NEW YORK CITY 13, N. Y.

GE POTTED RECTIFIERS

Complete germanium and silicon rectifier circuits potted in epoxy resin in octal socket tube bases are now being produced. The silicones used in the potted circuits are the IN536, IN537, IN538, IN539, IN540, IN1095, IN1096, IN1487, IN1488, IN1489, IN1490, IN1491 and IN1492. In addition, circuits containing IN91, IN92 or IN93 germanium cells are also available. Semiconductor Products Dept., General Electric Co., Syracuse, N. Y. (ELECTRONIC TECHNICIAN 4-7)

Philco ANTENNA ROTORS

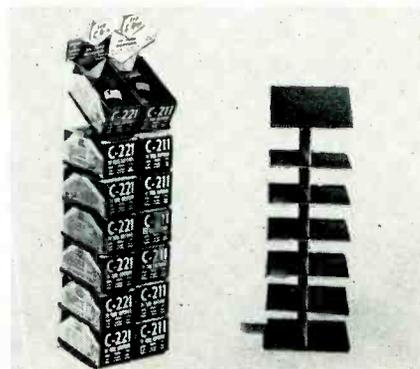
Four new TV antenna rotors, Models P-15, P15B, P-16 and P16B feature: no drift, instant locking mechanical brake; waterproof, rustproof heavy duty construction; and a newly designed control box which is only 3 5/8" high. The meter, which is an integral part of the control box, has a zero-adjust facility. This per-



mits more accurate adjustments to be made for line voltage and lead length than were possible with the potentiometer used in previous models. Philco Corp., Accessory Div., P. O. Box 3635, Philadelphia 25, Pa. (ELECTRONIC TECHNICIAN 4-40)

Perma-Power DISPLAY RACK

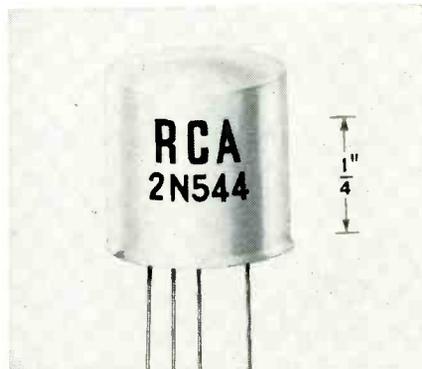
This new metal rack has been designed to display Tube Briteners and Color TV Service Aids. It holds 12 individual boxes, six in each of two rows with room to display one or two open boxes at the top. It can be hung on the



wall or used on counters and is so constructed that one or more racks can be used together back to back, side by side, or located separately. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 4-11)

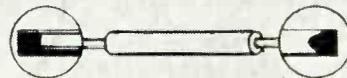
RCA TRANSISTOR

The 2N544 is a new junction transistor of the germanium p-n-p type. It is designed for r-f amplifier service in entertainment-type battery-operated receivers and commercial communications receivers operating in the standard AM broadcast band. The unique design of the 2N544 results in a very



low value of collector-to-base capacitance, permitting superior high-frequency performance. The 2N544 can provide a power gain of 30.4 db at 1500 kc in circuits utilizing a neutralizing network. Radio Corp. of America, Semiconductor Div., Somerville, N. J. (ELECTRONIC TECHNICIAN 4-17)

Ge Alignment Tools



G-C K-TRAN TOOL Specially designed for K-Tran and I.F. transformers. 6" long, screwdriver at each end (fiber and metal).

No. 5097.....List \$0.85



G-C NYLON HEX WRENCH

New alignment tool for Zenith, Admiral and other TV sets. 5" long, one end undercut to reach bottom slugs.

No. 8606.....List \$0.55



G-C SLUG RETRIEVER

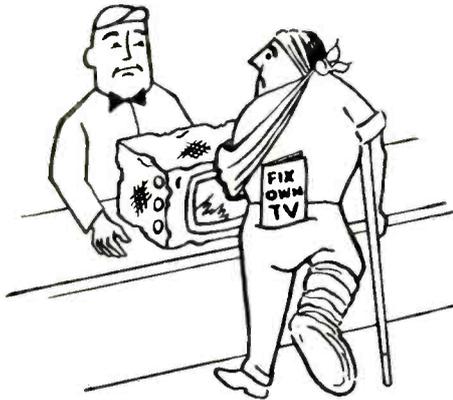
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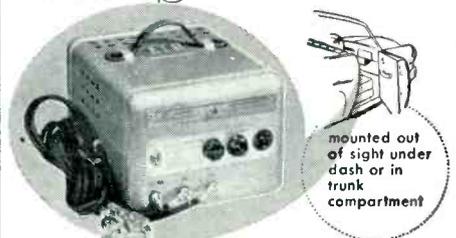


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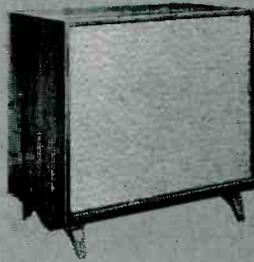
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KT-21



KT-22



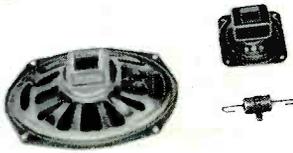
KT-23



KDU-10



KDU-11



KDU-12

36 PAGE JENSEN MANUAL 1060

This is your guide to kit selection and enclosure construction. Complete data and instructions for all Jensen Speaker Kits from the famous 3-way "Imperial" system to the budget cost 2-way "Duette" system. Describes Bass-Ultralex and Back-loading Folded Horn enclosures in complete detail with exploded views and simplified wiring instructions.

JENSEN MANUAL 1060 — Net Each 50c



KT-31

KT-32

| Model | KT-31†† | KT-32†† | KT-21 | KT-22 | KT-23 | KDU-10 | KDU-11 | KDU-12 |
|-----------------------------------|----------------|----------------|-------------------|-------------------|--------------------|------------------------------|----------------------------------|--------------|
| Type | 3-way Imperial | 3-way Tri-plex | 3-way Concerto-15 | 2-way Concerto-12 | 2-way Contemporary | 2-way Duette or Contemporary | 2-way Automobile or Duette Table | 2-way Duette |
| Frequency Range††† | 25-UHL | 30-UHL | 30-15,000 | 30-15,000 | 40-15,000 | 5-15,300 | 50-15,000 | 65-13,000 |
| Power Rating (Watts) | 35 | 35 | 30 | 25 | 20 | 20 | 20 | 15 |
| Impedance (Ohms) | 16 | 16 | 16 | 16 | 16 | 8 | 4 | 4 |
| Components: | | | | | | | | |
| L-F ("Woofer") | P15-LL* | P15-LL | P15-LL | P12-NL | P12-RL | P4-RL | P69-RL† | 69J10† |
| M-F (Mid-Range) | RP-201 | RP-201 | | | | | | |
| H-F ("Tweeter" or "Supertweeter") | RP-302 | RP-302 | RP-102 | RP-102 | RP-103 | RP-103 | RP-103 | P35-VH |
| Networks | A-61; A-402 | A-61; A-402 | A-204 | A-204 | A-204 | Capacitor | Capacitor | Capacitor |
| Controls | ** | ST-917; ST-901 | ST-901 | ST-901 | ST-901 | | | |
| Shipping Wt. (Lbs.) | 43 | 43 | 29 | 19 | 15 | 7 | 6 3/4 | 3 3/4 |
| Net Price | \$184.50 | \$169.50 | \$99.50 | \$73.00 | \$42.75 | \$24.75 | \$23.75 | \$10.50 |

*Special "woofer" for "Imperial" Back-Loading folded horn—not available separately. †6 x 9 Oval—not available separately. ††Includes M-1131 Intranange equalizer—not available separately. †††Special M-F and H-F Controls—not available separately. †††L-F response depends on enclosure. (UHL—Upper Hearing Limit).

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