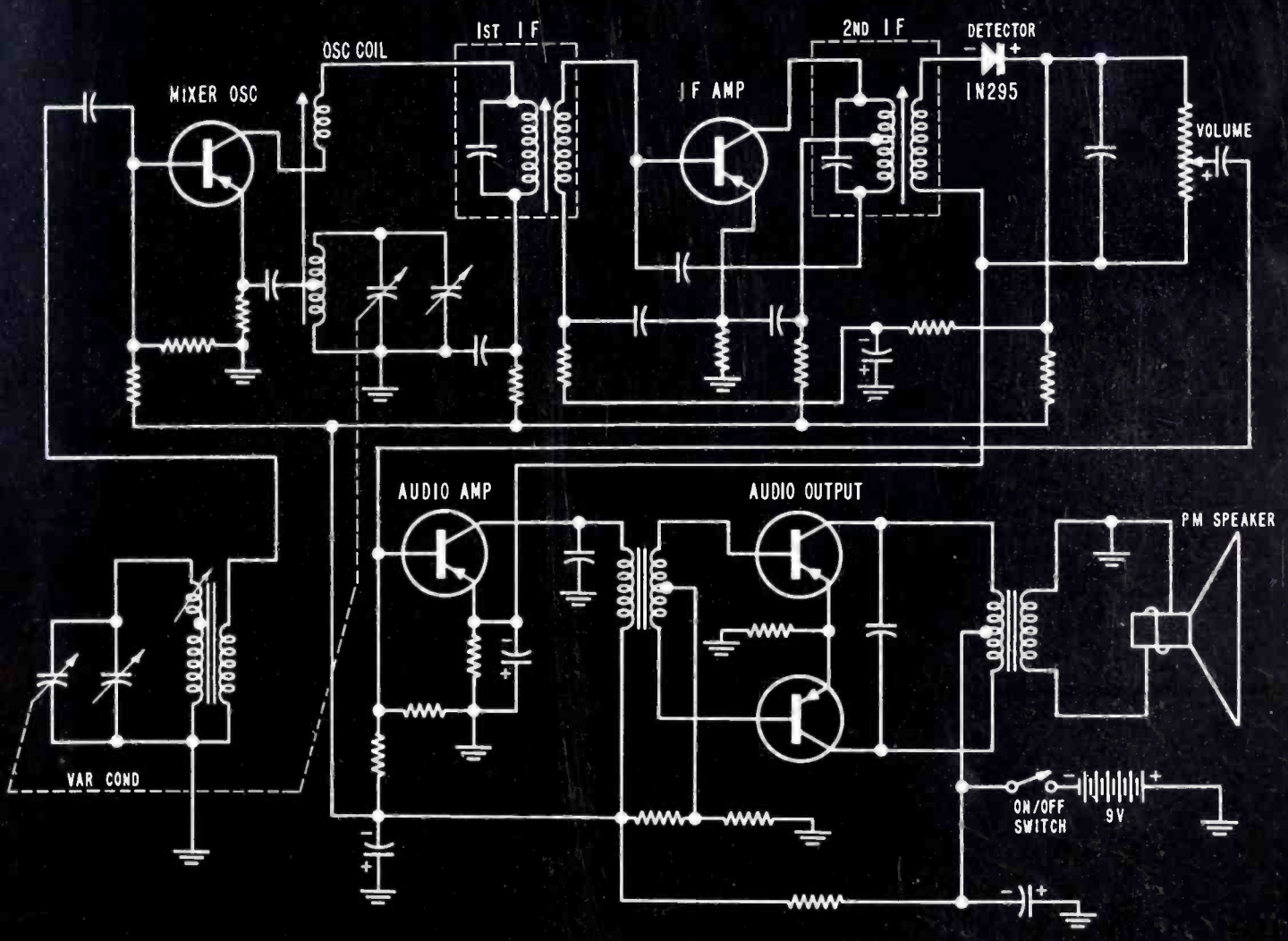
MARCH, 1958

VICE ENGINEERING
IUSTRIAL
CTRONICS

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE



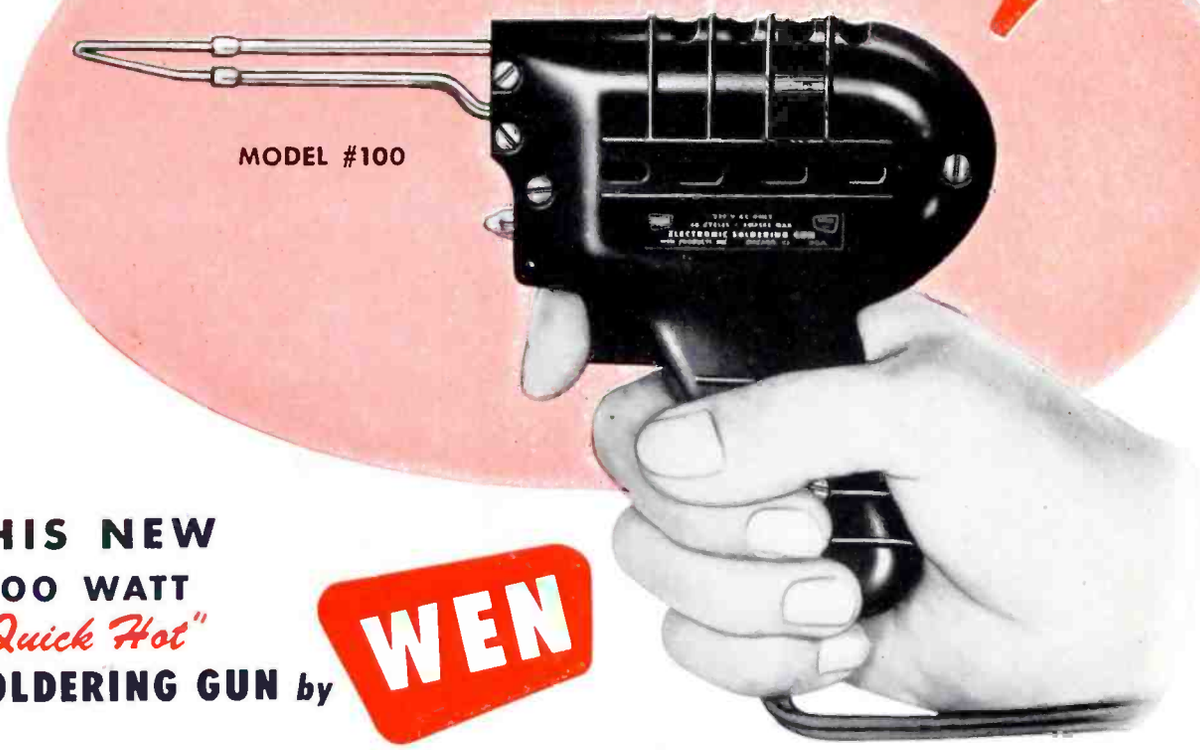
Five - transistor portable with a push - pull class - B audio system.

See circuit analysis, this issue

SERVICE MAN — SALESMAN — DEALER — JOBBER
HOME WORKSHOPPER — PROFESSIONAL REPAIRMAN

THEY ALL SAY

It's a Honey!



THIS NEW 100 WATT "Quick Hot" SOLDERING GUN by WEN

This lowest priced electronic soldering gun on record has other exclusive features that would make it preferred regardless of price.

- It's smaller, slimmer, more compact — beautifully balanced — handy as your hand.
- It's lighter — weighs only 19 ounces. Doesn't tire you.
- Heats in 3 seconds on ordinary 110-120 Volt AC, 60 cycle.
- Cools quickly too when trigger is released.
- Has automatic spotlight that's focused on the tip.
- Has long reach, long life soldering tips that are replaceable and interchangeable with hot-cutting or flat iron finish-repair tips.
- Sturdy, ebony black plastic handle and housing are heat and impact resistant.

And only $5.95 LIST

IDEAL FOR 90% OF ALL YOUR SOLDERING REQUIREMENTS

OTHER WEN POWER TOOL LEADERS

2 SPEED 3/8" POWER DRILL

$29.95 LIST

1000-3000 RPM as needed, on 120 Volt AC/DC. Speed change quick, positive. Provides just the right speeds for different jobs. Geared Jacobs chuck. All you need in an electric drill in this 1 tool. With attachments — it is a whole work shop.

8 SAWS IN 1 POWER SAW

$29.95 LIST

Has no equal. Cuts almost anything smoothly, swiftly — 2 x 4's in seconds, ½" steel, plastics, conduits. Cuts circles, scrolls, dovetails, straight lines or angles. Makes own starting holes. Blows sawdust off guide lines. 3 blades, coorse, medium, fine. Operates on 110-120 Volt AC. /DC.

WEN **PRODUCTS, INC.** 5808 NORTHWEST HIGHWAY, CHICAGO 31, ILL.

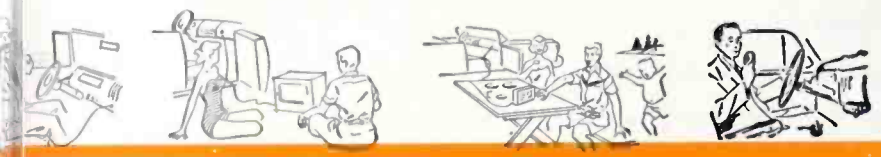
(Export sales, Scheel International, Inc., Chicago)

ALL WEN PRODUCTS ARE SUPERBLY MADE — U.L. APPROVED — FULLY GUARANTEED

ATR PRODUCTS FOR MODERN LIVING

...OW ENJOY... *Household Electricity*
...ywhere!... Anytime!... in your own CAR, Boat or Plane!

...INSTALLATION! . . . MOST MODELS JUST PLUG INTO CIGARETTE LIGHTER RECEPTACLE!



ATR INVERTERS
for changing storage battery current to A.C. Household Electricity Anywhere . . . in Car, Boat, or Plane!

ATR Electronic Tube PROTECTOR
protects ALL Electronic Tubes in TV or Hi-Fi, Amplifier and other Electronic Equipment. Will double or trip tube life including TV Picture Tube.

ATR Auto Radio VIBRATORS
for both Auto Radio and two-way communication receiving sets; featuring Ceramic Stack Spacers for long lasting life.

ATR Portable BATTERY CHARGERS
for keeping the storage battery fully charged right in the Car, Truck, Boat, or Plane! A storage battery necessity—makes motor starting easy!

ATR Universal INVERTERS*

...rates Standard A.C.
...E RECORDERS
...T Sets
...ating Machines
...ps
...ic Address Systems
...ctric Shavers
...ard Players
...Mixers
...Emergency Lighting
...LS
...NG (6 volts) 125
...50 watts. Shipping weight 27 lbs.
...LER NET PRICE $59.97
...Price . . $89.95
...HG (12 volts) 150
...75 watts. Shipping weight 27 lbs.
...LER NET PRICE $59.97
...Price . . $89.95

ATR Plug-in Type *Portable* INVERTERS*

Operates Standard A.C.
- DICTATING MACHINES
- Small Radios
- Record Players
- Electric Shavers
- Heating Pads, etc.

MODELS
6-RMF (6 volts) 60 to 80 watts. Shipping weight 12 lbs.
DEALER NET PRICE $30.00
List Price . . $45.00
6C-RMF (6/12 volts) 60 to 80 watts. Shipping weight 12 lbs.
DEALER NET PRICE $33.00
List Price . . $49.50
12T-RME (12 volts) 90 to 125 watts. Shipping weight 12 lbs.
DEALER NET PRICE $28.33
List Price . . $42.50

ATR Plug-in Type *Portable* MIGHTY MIDGET INVERTERS

Operates Standard A.C.
- SMALL DICTATING MACHINES
- Small Record Players
- Electric Shavers, etc.

MODELS
6-DME (6 volts) 30 to 40 watts. Shipping weight 5 lbs.
DEALER NET PRICE $13.30
List Price . . $19.95
6C-DME (6/12 volts) 30 to 40 watts. Shipping weight 5 lbs.
DEALER NET PRICE $15.67
List Price . . $23.50
12-DME (12 volts) 40 to 50 watts. Shipping weight 5 lbs.
DEALER NET PRICE $13.30
List Price . . $19.95

ATR SHAV-PAKS

Keep Clean-Shaved! Plugs into Cigarette Lighter Receptacle. Keep in Glove Compartment
Operates Standard A.C.
- ELECTRIC SHAVERS
- Small Timing Devices . . . in CARS, Buses, Trucks, Boats, or Planes.

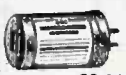
MODELS
6-SPB (6 volts) 15 watts. Shipping weight 2½ lbs.
DEALER NET PRICE $6.63
List Price $9.95
12-SPB (12 volts) 15 watts. Shipping weight 2½ lbs.
DEALER NET PRICE $6.63
List Price $9.95

ATR Electronic Tube PROTECTORS

WILL DOUBLE OR TRIPLE THE LIFE OF ALL TYPES OF ELECTRONIC TUBES, INCLUDING TV PICTURE TUBE.

ATR Electronic Tube Protectors are available in two models; automatic in operation, for use with any electronic equipment having input wattage of 100 to 300 watts. Fuse protected, enclosed in metal case for rugged construction and long life.

MODELS
Model 300 (Floor Model) as illustrated above. 115 volts A.C. Shipping weight 2 lbs.
DEALER NET PRICE $4.63
List Price $6.95
Model 250 (Wall Model) 115 volts A.C. Shipping weight 1 lb.
DEALER NET PRICE $3.30
List Price $4.95



ADDITIONAL MODELS AVAILABLE

ATR "A" Battery ELIMINATOR

For Demonstrating and Testing Auto Radios—TRANSISTOR or VIBRATOR OPERATED!

Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines—Equipped with Full-Wave Dry Disc-Type Rectifier, assuring noiseless, interference-free operation and extreme long life and reliability.

MAY ALSO BE USED AS A BATTERY CHARGER

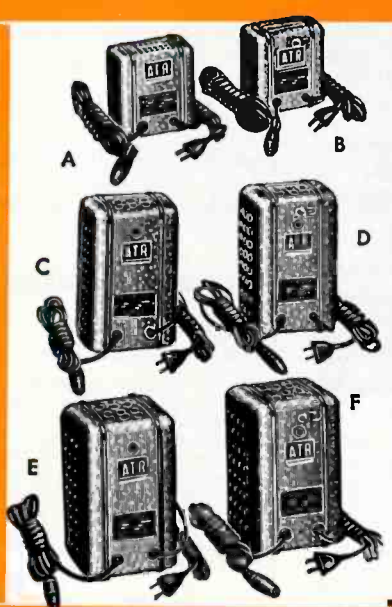
...LS
...ELIF . . . 6 volts at 10 amps. 12 volts at 6 amps. Shipping ...ght 22 lbs.
...LER NET PRICE $42.95
...ELIT . . . 6 volts at 20 amps. 12 volts at 10 amps. Shipping ...ght 33 lbs.
...LER NET PRICE $59.95

ATR Auto-Radio VIBRATORS

By every test ATR Auto-Radio Vibrators are best! . . . and features Ceramic Stack Spacers—Instant Starting—Large Oversized Tungsten Contacts—Perforated Reed—plus Highest Precision Construction and Workmanship.
There is an ATR VIBRATOR for every make of car!

Ask your distributor for ATR's Low Priced type 1400, 6 volts 4-prong Vibrator, and 1843, 12 volts 3-prong or 1840, 12 volts 4-prong Vibrator. THE WORLD'S FINEST!

FREE! Write for ATR 8-page Vibrator Flyer today!



ATR Auto Plug-in Home-type *Portable* BATTERY CHARGERS

NO INSTALLATION . . . JUST PLUG INTO CIGARETTE LIGHTER RECEPTACLE!

KEEPS CAR BATTERY FULLY CHARGED IN YOUR OWN GARAGE! NEEDED MORE NOW THAN EVER BEFORE—MAKES MOTOR STARTING EASY! OPERATES DIRECTLY FROM STANDARD 110 VOLTS A.C. CURRENT.

MODELS

A—12CA4 (3 amp.) 12 volts Shipping weight 5 lbs.	DEALER NET PRICE $11.96 List Price $15.95
C—12CA6 (6 amp.) 12 volts Shipping weight 7 lbs.	DEALER NET PRICE $17.96 List Price $23.95
E—12CA10 (10 amp.) 12 volts Shipping weight 9 lbs.	DEALER NET PRICE $24.71 List Price $32.95
B—612CA4 (4 amp.) 6/12 volts Shipping weight 6 lbs.	DEALER NET PRICE $14.21 List Price $18.95
D—612CA6 (6 amp.) 6/12 volts Shipping weight 8 lbs.	DEALER NET PRICE $20.96 List Price $27.95
F—612CA10 (10 amp.) 6/12 volts Shipping weight 10 lbs.	DEALER NET PRICE $27.71 List Price $36.95

FOR THE NAME OF YOUR NEAREST ATR ELECTRONIC PARTS DISTRIBUTOR, PLEASE COMMUNICATE WITH YOUR NEAREST ATR REPRESENTATIVE LISTED BELOW.

...ATIVES:
...ob A. Emmel Co., 2837 W. Pico ...ngeles 6. Phone—REpublic 1-...
...p.: S. Calif.
...an Sales, 154 Eighth St., San ...e. Phone—HEmlock 1-0692. ...Calif.; Nev.
...el Nelson Co., P. O. Box 5502, ...Phone—NE 4-6781.
...ado.; Idaho; Mont.; N. M.; W. ...o, Texas; Utah; Wyo.
...& Gottleman Co., 5209 N. ...., Chicago 25. Phone—JUniper ...
...t.: Gary & Hammond, Ind.
...ht Engineering, P. O. Box ...Valbourne Rd., Indianapolis 44. ...Hobart 8880.
...nd. excl. Gary & Hammond.
...ip Sales Co., 6389 Antioch Ave., ...e. Phone—VAlentine 7522.
...wa; Kan.; Me.; E. Neb.

MD.: Harris P. Taylor Co., P. O. Box 111, 9421 Georgia Ave., Silver Spring. Phone—JUniper 5-4902.
Territory: Ala.; D. C.; Del.; Fla.; Ga.; Md.; N. C.; Ohio counties of Jefferson, Mahoning & Trumbull; Pa.; S. C.; Tenn.; Va.; W. Va.

MASS.: Gerber Sales Co., 48 Pearl St., Brookline 46. Phone—BEacon 2-2425.
Territory: New England.

MICH.: American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn. Phone—Capitol 2-3791.
Territory: Mich.

MINN.: H. M. Richardson Co., 9 E. 22nd St., Minneapolis 4. Phone—FEderal 6-4878.
Territory: Minn.; N. D.; S. D.

N. Y.: Lee Rocke, Newhope Corp., 6 E. 39th St., New York 16. Phone—LExington 2-7372.
Territory: N. J.; Metropolitan N. Y. incl. 5 Boroughs; counties of Staten Island, Long Island, Westchester & Putnam.

N. Y.: Frank W. Taylor Co., Box 222, De Witt. Phone—SYracuse 72-5198.
Territory: Upper N. Y.

OHIO: John O. Olsen, 16201 Shaker Blvd., Cleveland 20. Phone—WYoming 1-2624.
Territory: Ky.; Ohio, except counties of Jefferson, Mahoning & Trumbull.

TEXAS: Berthold Sales Co., 4411 Maple Ave., Dallas 19. Phone—Lakeside 6-8329.
Territory: Ark.; La.; Miss.; Okla.; Texas, excl. El Paso.

WASH.: James J. Bacher Co., 221 W. Galer, Seattle. Phone—ALder 6478.
Territory: Ore.; Wash.; Alaska.

CANADA: R. C. Mahnert Sales Co., New 73 Crockford Pl., Scarboro, Ontario. Phone—REdfern 7078.
Territory: E. Canada.

CANADA: Charles L. Thompson, Ltd., 3093 Woodbine Dr., N. Vancouver. Phone—YOrk 2597.
Territory: W. Canada.

HAWAII: Gene Platy, 2830 Home Rule St., Honolulu 17.
Territory: Hawaii.

ATR AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U. S. A.

AMERICAN TELEVISION & RADIO CO.
300 E. 4th St., St. Paul, Minn.

Gentlemen:
The name and address of my nearest electronic parts distributor is

.....

NOTE:—If distributor cannot supply you, feel free to order direct from factory, or ATR representative nearest you, as listed to the left!

☐ Send additional literature and price list on .....
..... as illustrated above.

NAME .....
ADDRESS .....
CITY ..... ZONE..... STATE.....

Vol. 27 No. 3 MARCH, 1958

27th YEAR OF CONTINUOUS PUBLICATION

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE
Including RADIO MERCHANDISING and TELEVISION MERCHANDISING
Registered U. S. Patent Office

COVER CIRCUIT

Five-Transistor Portable (Packard Bell 6RT1) 18

FEATURES

Service Engineering—Industrial Electronics: Magnetic Tape Dictating Machines — Harold B. McKay and Leo G. Sands 14

This Month in SERVICE 17

Transistorized Portable (Cover—With Complete Circuit) — Glen R. Soden 18

Troubleshooting Vertical Oscillator and Integrator — Jesse Dines 19

Audio: Circuitry Report on Remote-Control Stereophonic Tape System 20

FM Fringe Reception — Jack Beever 22

Repairing Printed-Wiring Board Chassis — LeRoy Wolff 24

Service Engineering-Industrial Electronics: An Analysis of 2-Way Transmitter-Receiver Techniques Now Used and Proposed to FCC 26

Service Notes: Troubleshooting Square-Wave Response of TV Receivers . . . Clearing Internal Shorts in Color-TV Tubes 27

Leadin and Antenna Requirements on the Ultrahighs 28

Earth's Field Effects on Color-TV Tubes 30

Service Engineering-Industrial Electronics: Closed-Circuit TV Controls 38

CIRCUIT DIAGRAMS

Comptometer D10A5 15
Packard Bell 6RT1 Transistor Radio (Cover) 18
Admiral 23A1 Vertical Osc and Integrator 19
General Electric 805-6-7-9 Osc and Integrator 19
Webcor Imperial Stereo 20
Webcor Imperial Stereo Preamp 20
Webcor Imperial Aural Balance Remote 20
Jerrold Hybrid Coax Splitter 22
Jerrold Remote Power Supply for Mast-Mounted FM Preamp 23
Basic AM-FM Multiple Technique for Signal Amp and Frequency Multiplication 26
Basic AM-FM-SSB Mixing Technique 26
Modulating Square-Wave Voltage on RF Carrier 27
Simple Modulator Setup for Square-Wave Tests 27
2-Way Basic System 39

DEPARTMENTS

Audio Installation and Service 20
Service Engineering 26
TV Antenna Digest 28
Tube News 30
Association News 32
Ten Years Ago in SERVICE 33
Latest Audio Developments 34-37
Catalogs and Books 40
Test Instruments 41
Accessories 42
Bench-Field Tools 44
Radio-TV Components 45
Personnel 48

Index to Advertisers 47

Second-Class mail privileges authorized at New York, N. Y.; additional entry at the Post Office, Norwalk, Conn . . . Subscription price: $2.00 per year ($5.00 for 3 years) in the U.S.A. and Canada; 25 cents per copy. $3.00 per year in foreign countries; 35 cents per copy.

Editorial Consultant: **Lewis Winner**

Associate Editor: **David E. Pearsall II**

Assistant Editor: **Robert D. Wengenroth**

Editorial Assistant: **Arnold Gewirtz**

Editorial Assistant: **Howard Jennings**

Field Editor (Mid-West): **Rudolph T. Plemich**

Art Director: **Anthony R. Aliffi**

Supervisor, Circuit Diagrams: **Michael D. Bellezza**

Editorial Production: **Astrid Kelly**

•

CIRCULATION DEPARTMENT

Circulation Manager: **A. Goebel**

Ass't Circulation Mgr.: **A. Kiernan**

•

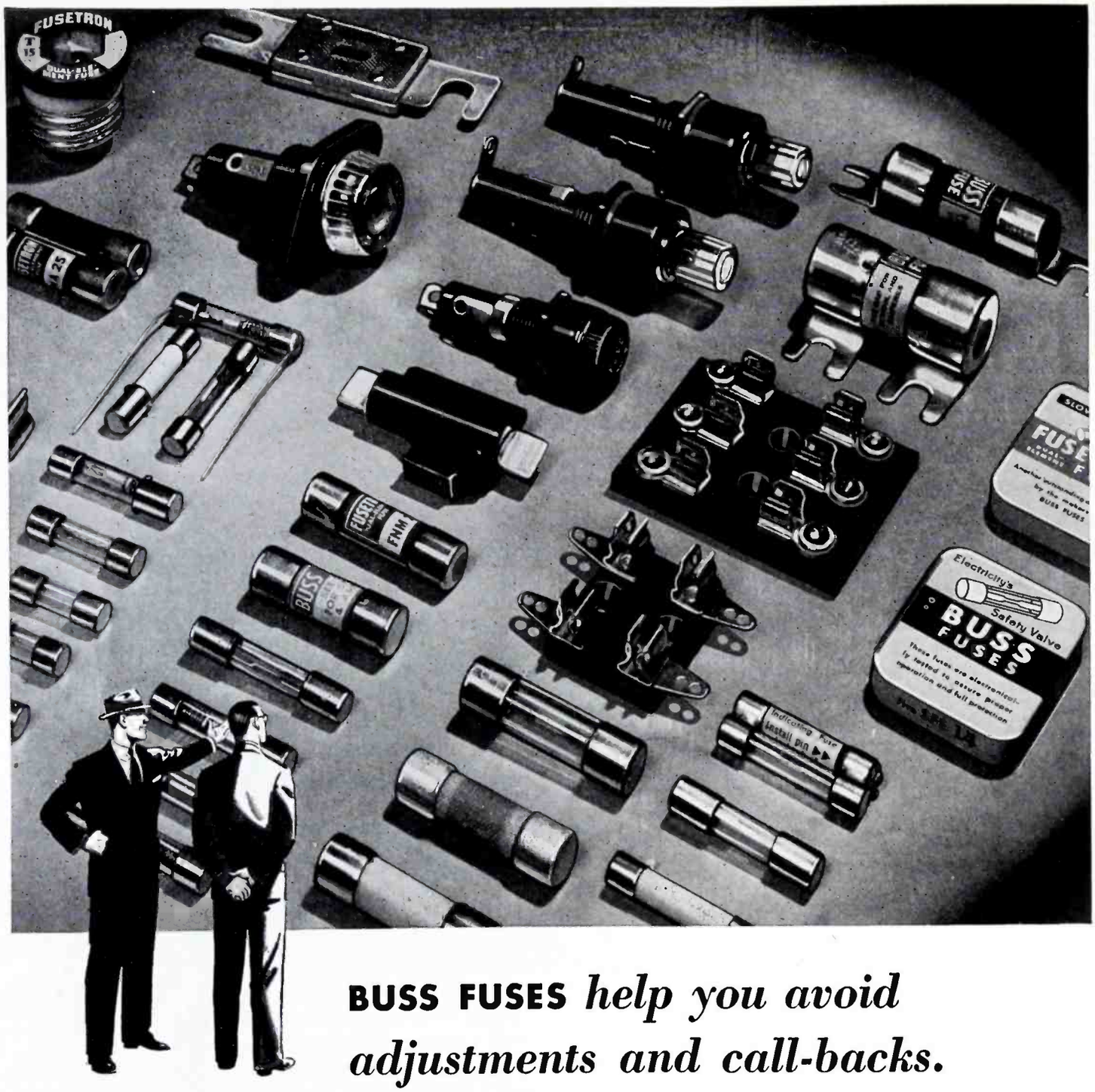
ADVERTISING DEPARTMENT

Advertising Mgr.: **Aaron L. Lafer**

Pacific Coast: **Leo Sands, Dist. Mgr.**
920 Commercial St.
Palo Alto, Calif.:
Tel.: YOrkshire 8-4478

Published Monthly by
Bryan Davis Publishing Company, Inc.
52 Vanderbilt Ave., New York 17, N. Y.
Tel.: MUrray Hill 4-0170

B. S. Davis, Pres. A. Goebel, Secy.



BUSS FUSES *help you avoid adjustments and call-backs.*

Faulty fuses can cause trouble for you and your customers by failing to protect — or by blowing needlessly . . . but, with BUSS fuses you can be sure of dependable protection under all service conditions.

Every BUSS fuse you sell or install is tested in a sensitive electronic device. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected.

That's why BUSS fuses provide maximum protection against damage due to electrical faults. Users are safeguarded against unnecessary repair bills, — and your reputation for quality and service is protected.

Equally important, BUSS fuses eliminate needless blows that irritate users and require adjustments or call-backs on the part of sales and service organizations.

Protect yourself against faulty fuses causing trouble by relying on BUSS fuses. To meet service needs, there is a complete line of BUSS fuses available.

For more information on the complete line of BUSS and FUSETRON Small Dimension Fuses and Fuseholders . . . Write for bulletin SFB. Bussmann Mfg. Division McGraw-Edison Co. University at Jefferson, St. Louis 7, Mo.

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

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

MAKERS OF A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRONIC, AUTOMOTIVE AND INDUSTRIAL USE.

S-358

NEW WINEGARD SCOTCHMAN® TV ANTENNAS

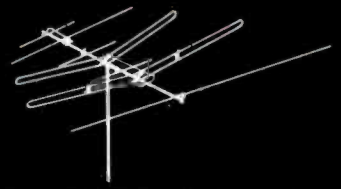
are making the antenna business easier, more profitable

MODEL 503: Near fringe and suburban area, all-channel 5-element antenna with new improved Vee driven elements. Can be used with attachment Kits A, B, C or D. Ideal for stacking.

$14.95 list

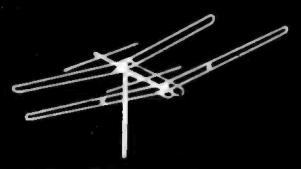
Priced as low as

$6.95 LIST



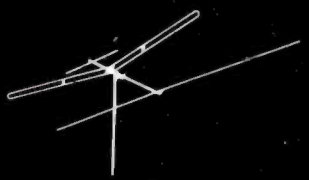
MODEL 504: All-channel, high performance, 7-element fringe area antenna. Exclusive impedance-compensated Vee driven elements and patented* Electro-Lens design. Easily converted to 13 element antenna for tough reception areas with Kit A.

$19.95 list



MODEL 502: 4-element with new improved Vee driven element design for city and suburban areas. Exceptionally good reception on the high channels . . . almost bi-directional on low channels. Higher gain and better ghost rejection than conicals. A natural with Kit D.

$9.95 list



MODEL 501: 3-element antenna recommended for use in place of conicals. New Vee driven element design. Smooth forward response lobes and accurate impedance match on both high and low bands. Cuts ghosts. No finer antenna for city and suburban areas at this low price.

$6.95 list

Now—with just 4 basic Scotchman all channel antennas and attachment kits—you can handle every possible reception and installation problem—simply, more effectively, and at lower cost than ever before.

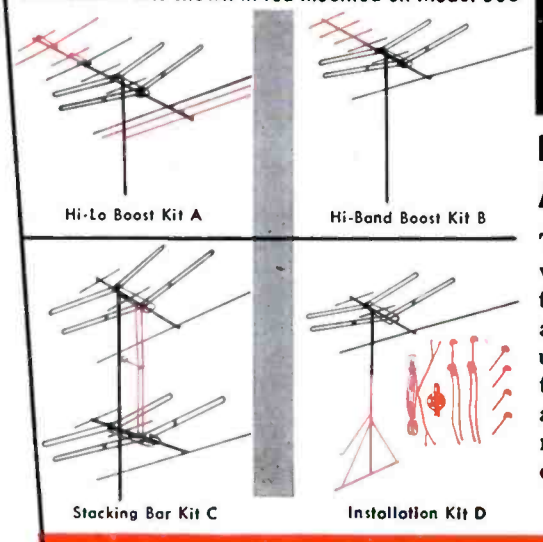
For average installations, all you need is one or a stack of the versatile Scotchman antennas. And for those tough reception problems, where you need more gain or higher front to back ratio, the easy-to-use plug-in Scotchman attachments let you *tailor-make* a special antenna to suit your requirements. But that's not all! Scotchman antennas are completely factory pre-assembled . . . have such quality features as unbreakable TDM styrene insulators, fatigue-resisting aluminum tubing, closed element and boom ends.

Never before could you get such outstanding performance, adaptability and quality at such low cost!

Get Free Gifts With Scotch Stamps!

In every Scotchman antenna carton, you get valuable Scotch stamps—and they're worth plenty! Turn them in for more antennas or take your pick of handy Pegboard Tool Sets or other merchandise. Start saving Scotch stamps today!

Attachment kits shown in red mounted on Model 503



New Scotchman Attachment Kits

These 4 attachment kits combi with the basic Scotchman mod to give you more than 30 differe antenna combinations! They can used to increase the gain or fro to-back ratio of any model, sta antennas, to increase sensitivity mount your antennas on any ty of surface.

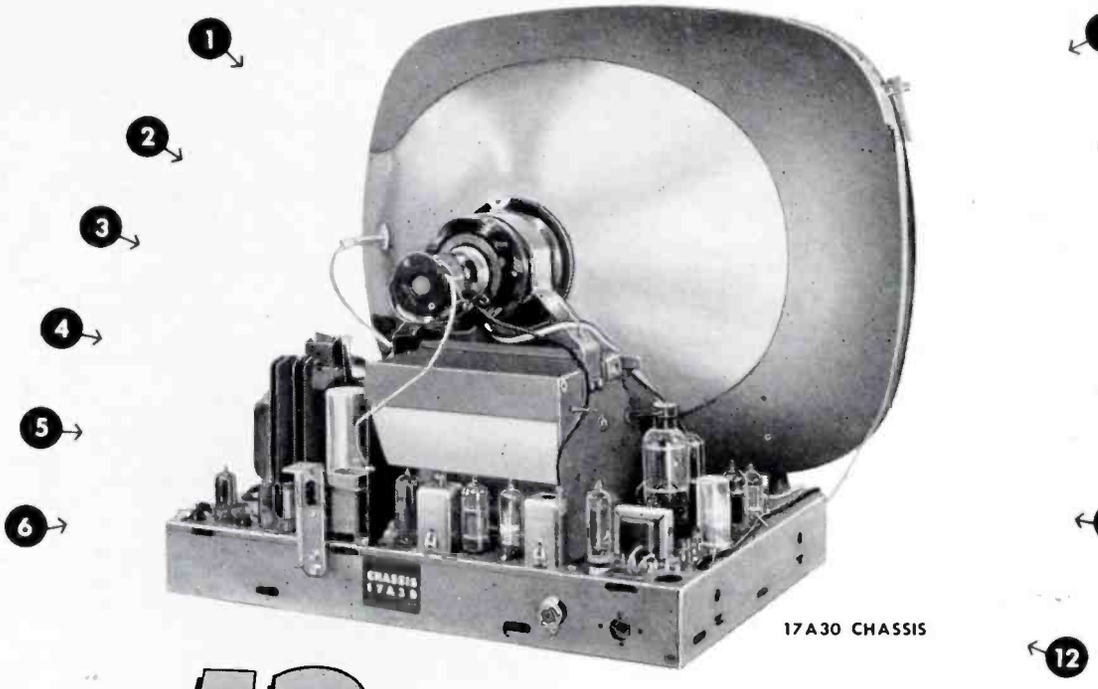
Write for Technical Bulletin No. WS- 400

Winegard Co.

3015-J SCOTTEN BLVD. BURLINGTON, IOWA

*U. S. patent 2,710,1[illegible]

NO SCREWBALL



17A30 CHASSIS

12 REASONS WHY THE HANDCRAFTED "SERVICE SAVER"

HORIZONTAL CHASSIS

in Zenith TV means more satisfied customers for Zenith Dealers and Servicemen

1. **21-INCH PICTURE TUBE** mounted to chassis.
2. **SHORT NECK 90° TUBE**...no 110° linearity or yoke problems.
3. **FIN-COOLED POWER TRANSFORMER** has 185% more cooling surface.
4. **TECHNICAL CONTROLS** on front of chassis for ease of adjustment... no mirrors required.
5. **ALL ALIGNMENT** adjustments on top of chassis.
6. **ALL CIRCUIT TUBES** accessible for service without removing the chassis.
7. **TUBES ARE PLACED** in logical circuit sequence.
8. **NO PAPER ENCASED BYPASS CONDENSERS**... all are plastic or ceramic molded.
9. **NO HIDDEN PARTS**... all are easily replaced.
10. **NO PRINTED CIRCUITS**... all connections are hand soldered.
11. **PRECISION BUILT**, rugged horizontal chassis.
12. **NO SHORTCUTS** to impair the reliability.

OUT OF CONSIDERATION FOR SERVICEMEN WE USE

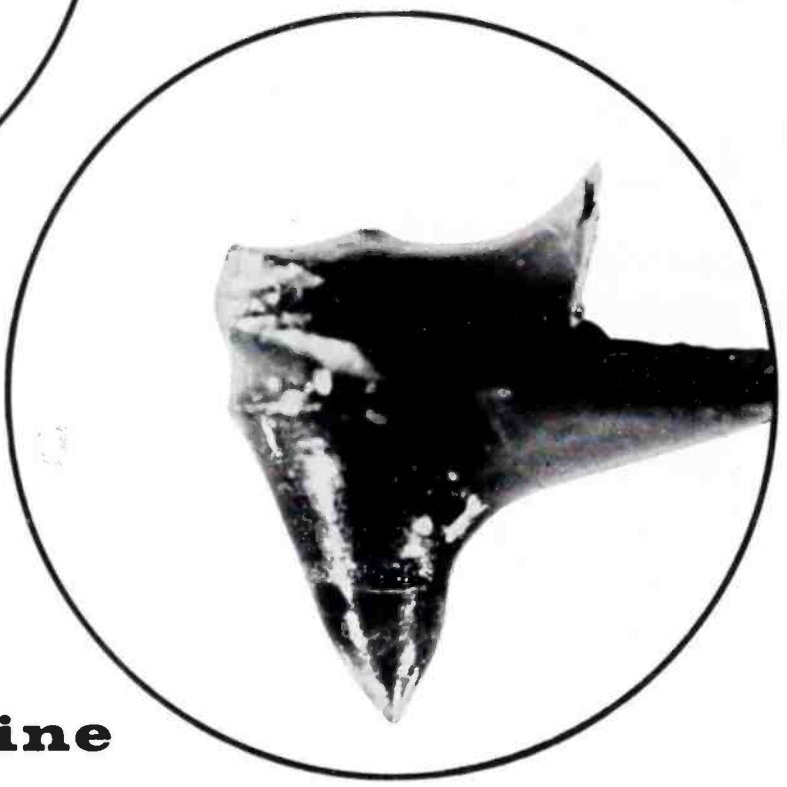
NO PRINTED CIRCUITRY

IN THE CHASSIS

Every servicing dealer knows that printed circuitry in a television chassis often leads to costly servicing and may also cause service delays. Zenith's handcrafted standard circuitry in television means greater operating dependability and fewer service headaches.

Enlargement of genuine G-E diamond stylus (Magnified photo)

Your customers will hear the difference!



Enlargement of so-called "bargain" stylus (Magnified photo)

That's why it pays to sell and install genuine General Electric replacement styli

When you install a so-called "bargain" stylus, you're taking a chance on ruining your customers' records. Is it worth the risk? Is it worth endangering the good will you've worked so hard to build up?

Stick to General Electric and be sure! G-E replacement styli are designed and built by the same people who developed the famous General Electric variable reluctance cartridges. They are manufactured *only by G.E., for G-E cartridges.*

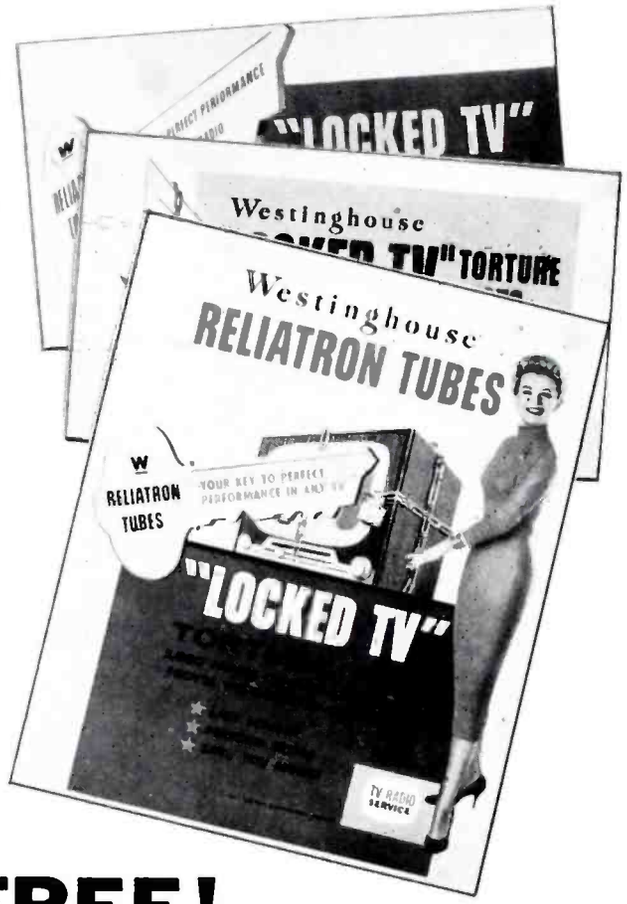
A G-E replacement stylus is a precision-built, precision-engineered assembly . . . manufactured within microscopic tolerances . . . scientifically designed to track properly for hundreds of hours without audible distortion.

Your customers are now reading about them in a wide variety of top newspapers, Hi-Fi and general magazines. Do you have enough stock to meet the demand? General Electric Co., Specialty Electronic Components Dept., Section HFS3, West Genesee Street, Auburn, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

WESTINGHOUSE HELPS TV SERVICEMEN "GET A FAIR SHAKE!"



FREE!

"Build Consumer Confidence" Promotion

Today most people are unaware of the buy they get in TV and radio service. Now, Westinghouse helps you educate them with a program designed to win you friends and influence sales! You get a complete kit *free!* Keystone of the promotion is the mailing piece shown left. It describes how many hundreds of parts there are to check . . . how much knowledge it takes to be a serviceman . . . equipment costs . . . etc. It shows how TV servicemen, like doctors and lawyers, constantly study to keep up with advances. In addition you get window displays, streamers, everything you need—all free! Don't wait, put this promotion to work for you now . . .

CALL YOUR WESTINGHOUSE DISTRIBUTOR

YOU CAN BE SURE...IF IT'S Westinghouse

Electronic Tube Division · Elmira, New York

UNIVERSITY AND FRED WARING MAKE SOUND HISTORY ...and more sales for you!

"University speakers were top performers on our *Hi-Fi Holiday concert tour.**

"I had always dreamed of applying hi-fi techniques to our live concerts . . . but I hadn't thought it could be accomplished to my satisfaction. I presented the problem to University engineers prior to launching our most recent nation-wide tour. Result? University provided the most stirring sound I had ever heard in a concert hall, so dynamically effective that we named our show 'Hi-Fi Holiday.'

"'Hi-Fi Holiday' made sound history . . . it was sound success—and we plan to repeat the tour. University deserves a low bow for their contribution to the success of our show—a top performer most welcome to share the stage with The Pennsylvanians anytime."

FRED WARING

**First such live stage presentation in musical and high fidelity history.*

CASH IN ON THIS OVERWHELMING TRIBUTE TO UNIVERSITY QUALITY AND PRESTIGE

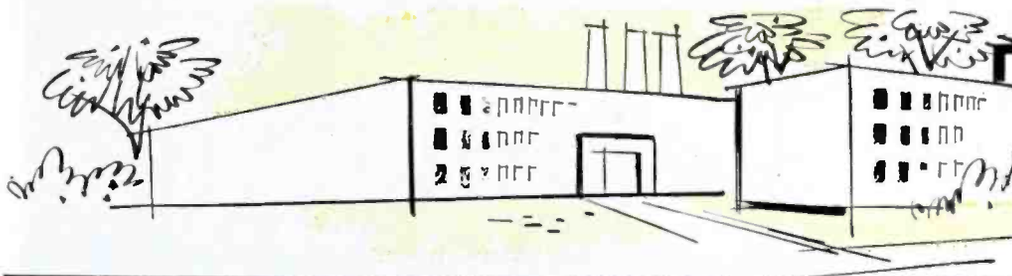
The acclaim given "Hi-Fi Holiday" and University's sound reproduction by audiences and critics alike has reflected itself in greatly accelerated interest and sales of University hi-fi equipment for the home—everywhere!

This was the first time that live choral and instrumental stage performances, under the direction of a prominent maestro, demonstrated how even the "real thing" could benefit from truly genuine high fidelity equipment.

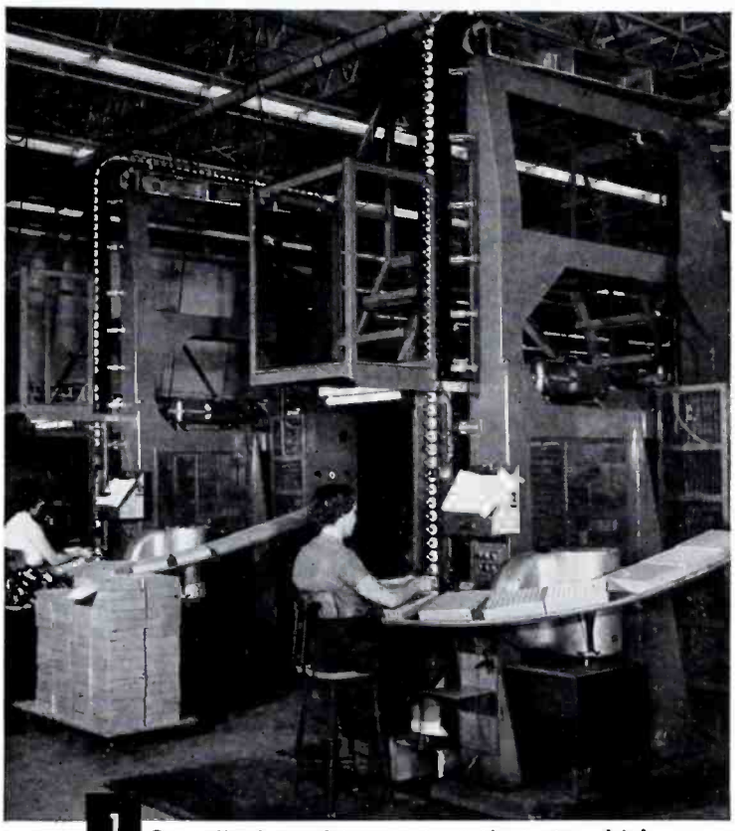
The dramatic role University played in the success of Fred Waring's "Hi-Fi Holiday" coast-to-coast concert tour brought the wonder of high fidelity to the ears of tens of thousands of Americans — many of them in your area. When your customer "talks high fidelity" . . . plan his system with University.

UNIVERSITY LOUDSPEAKERS, INC., 80 SO. KENSICO AVE., WHITE PLAINS, N. Y.

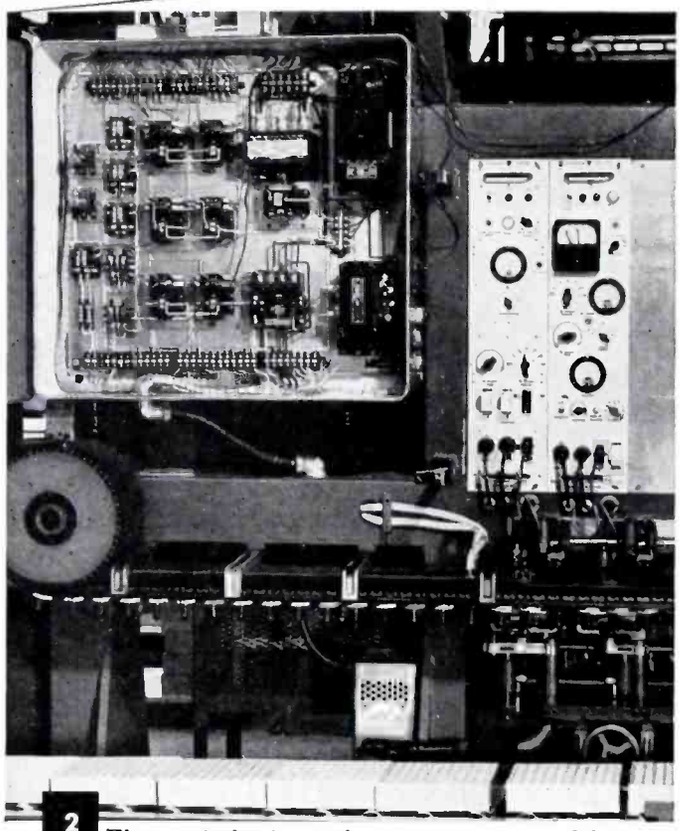
LISTEN *University® sounds better*



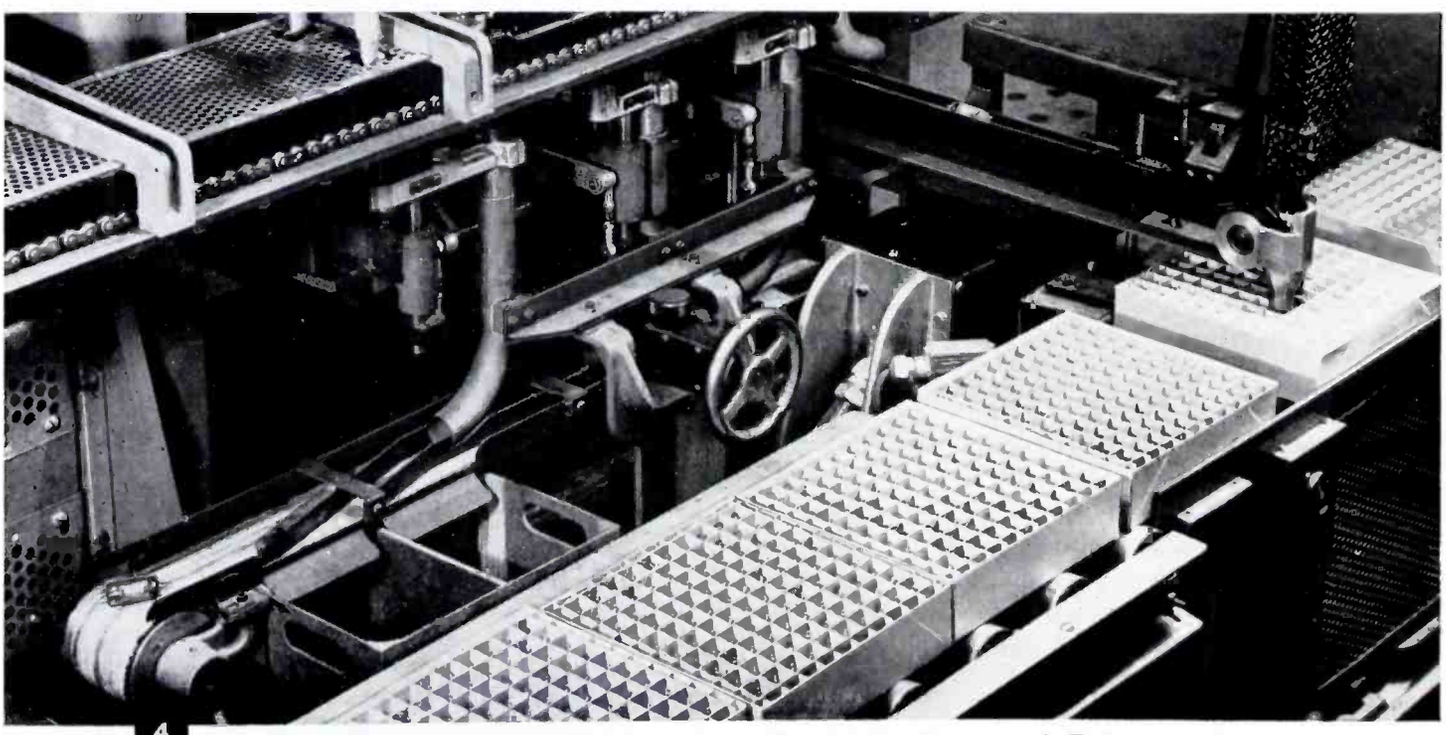
This is



1 Overall view of two automatic testers highlights "chain belt" where tubes are preheated in preparation for tap tests. Operator loading tubes checks pins for straightness.

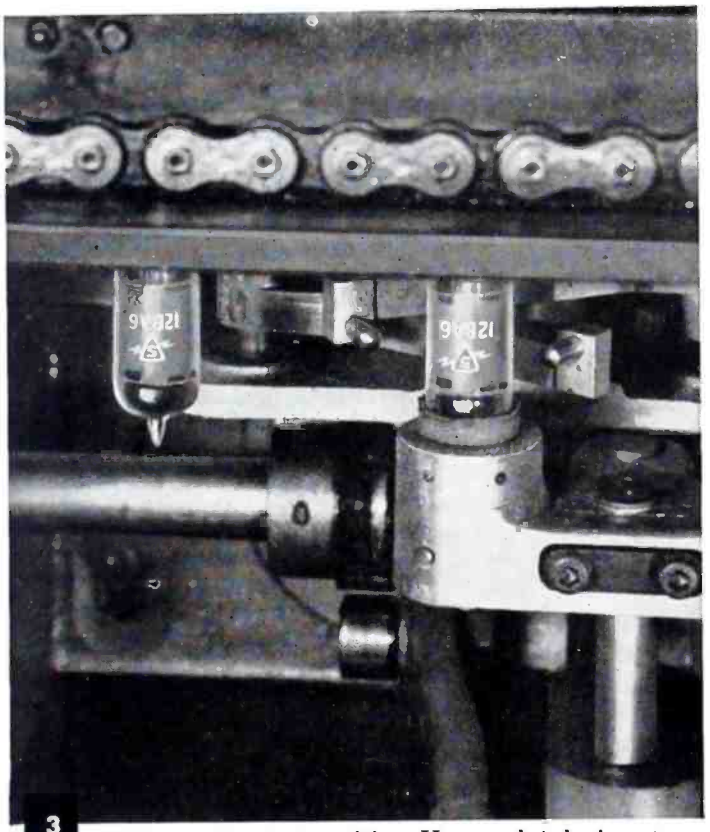


2 Electronic brain of the tester is designed by Sylvania so that any tube type can be tested simply by plugging in its proper adapter (about the size of a pack of cigarettes).

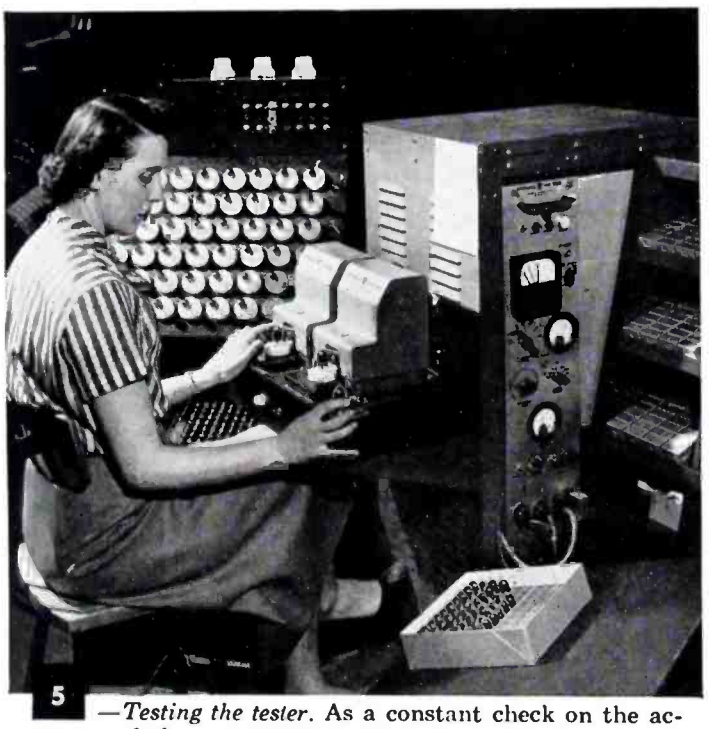


4 —Automatic unloading of "good" tubes into cartons comes after all tests have been made and "inoperatives" separated. Rejects are dropped to conveyor belt, collected into bins, and scrapped.

Sylvania Williamsport



3 Close-up of tap test position. Here each tube is automatically tapped with 100 g (100 times gravity's force). Tube is tapped in two positions in two planes 90° apart—first for opens; second for shorts.



5 —*Testing the tester.* As a constant check on the accuracy of the automatic tester—samples from each lot tested, are retested on similar equipment used as a standard. Records are kept of all tests serving as data to feed back to design, manufacturing, and quality-control groups.

—where automation is at work to keep your tube stock free from "inoperatives"

FOR every four thousand tubes tested at Sylvania's plant in Williamsport, Pa., not more than one "inoperative" will escape Sylvania's automatic testing "dragnet" or reach your shelves.

Like Williamsport, all major tube-finishing plants are equipped with automated testers designed and built by Sylvania. Automation makes it possible to test each tube individually and more efficiently for *opens, shorts, leakage* and *emission*. As a result, Sylvania maintains the industry's lowest percentage of inoperatives. For you this means more efficient and profitable servicing—bothersome, time-consuming returns are kept to an absolute minimum.

Why not try using Sylvania exclusively as many dealers do? You'll find that's the best way to profit from Sylvania's exclusive testing program.

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., Montreal

LIGHTING • TELEVISION • RADIO • ELECTRONICS
PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

Magnetic Tape

A Field Report on the Acoustical and Electronic Features of the

by HAROLD B. McKAY and LEO G. SANDS

FIG. 1: PLASTIC-BELT tape dictating machine.

THE INTRODUCTION OF MAGNETIC RECORDING has still further widened the vistas for the dictating machine. With today's modern office dictating machine it is possible to record speech on a belt or tape which may be reused thousands of times without showing any noticeable wear or deterioration in performance. The principles are the same as for ordinary tape recording, except that the mechanism of the machine is different and the tonal reproduction range is much narrower.

The earliest dictation machines were essentially phonographs° which used cylinders instead of discs. The sound was picked up and concentrated by a horn on the end of a flexible tube. At the other end the sound waves were impressed on a mechanism which caused the needle to emboss the record, the impression varying in frequency and amplitude with the applied sound. The cylinders could be used over and over again by shaving off the recorded material exposing a shiny new surface.

Electronic dictation machines followed the early acoustic-powered machines; a microphone was substituted for the pickup horn and an amplifier drove a magnetically-driven stylus. Besides cylinders, discs—which were easier to mail and required less storage space—came into vogue. Both types are still in wide use and many of the most modern machines on the market use tiny discs.

Although dictating machines are fundamentally recording and playback devices, the usual tape recorder or phonograph cannot be considered as a substitute. For instance, in dictating service, the recorder must be stopped and started frequently to make sentence revisions.

In machines which follow the idea of embossing the voice on a recording medium as cuts from a stylus, different designs have been developed. One such machine employed regular 35-mm motion picture film, but used only the acetate base as the medium on which a recording needle could inscribe a series of long tracks. This method was essentially that of the Edison wax method, but used a plastic film base instead of wax.

Basic Method Still Used

Some machines today still use this basic method, employing a plastic film in the form of a wide belt a few inches long. A series of tracks can be inscribed on this belt, which is small and flexible enough to be placed in

---

°*Thomas Edison invented his first tinfoil record phonograph in* 1877, *and his improved wax cylinder model in* 1895. *In about* 1900, *Poulsen produced the first magnetic recorder; the telegraphone. Because of the shortcomings of the steel alloys and the distortion produced by hysterisis, the magnetic system was not destined to come into its own until forty years later. But the Edison wax cylinder found immediate acceptance. The Edison phonograph found a great application as an office dictating machine long before it became a widely accepted instrument of entertainment. As early as* 1903, *hundreds of thousands of these recorders were in use by business establishments throughout the country.*

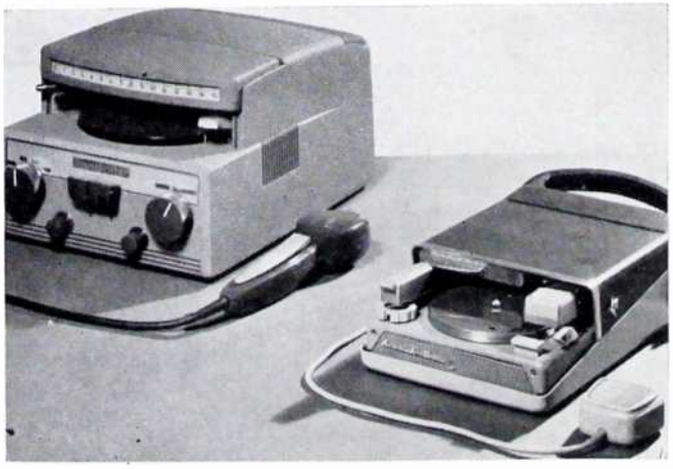


FIG. 2: DISC TAPE dictating machine; office (left) and portable (right). Note separate record and playback tone arms on portable.

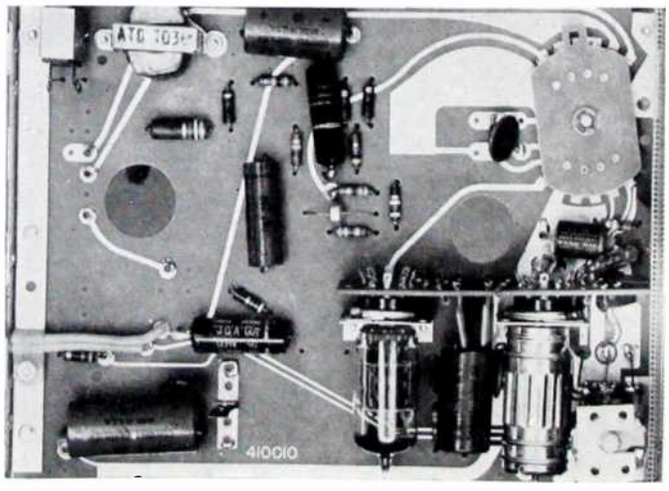
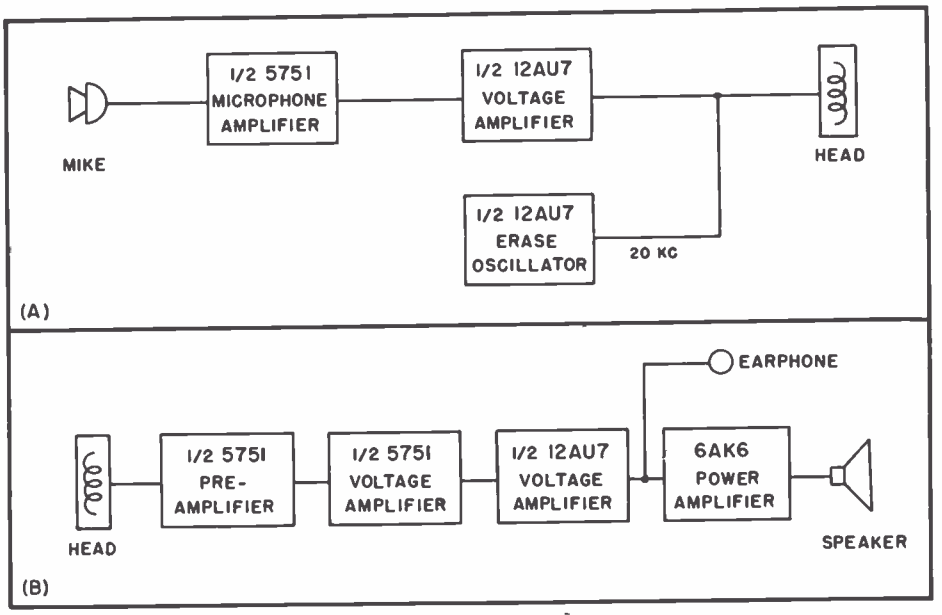


FIG. 3: PRINTED-WIRING amplifier chassis used in disc-type dictating machines.

Dictating Machines

Latest Types Which Can Be Repaired by Service Men

FIG. 4: DICTATING - TRANSCRIBING machine which uses a wide mylar belt for magnetic recording. FIG. 5 (right): BLOCK DIAGRAMS showing effective circuitry for recording (a) and transcribing (b).



an ordinary business envelope and mailed.

Other machines use a small plastic disc or phonograph record which is inscribed by a needle. Unlike the old acoustically - operated phonographs, such modern record cutters use electronic amplifiers and recording heads. Some machines employ standard 33⅓ rpm recording speed so that such records may be played back on regular phonographs when the message is intended to be received orally, rather than transcribed.

Embossed recordings of this type have the advantage of being more permanent in nature, at least to the extent that they cannot be accidentally erased. However, this very feature can be a disadvantage, because they are not erasible and thus cannot be corrected. Different methods of getting around this difficulty have been devised.

Among the other requirements of a dictating machine is that recordings must be indexed so that specific items can be played back without having to listen to unwanted recorded information. Some machines° record on a plastic belt and are equipped with a sort of odometer which permits the user to crank the belt around to any point he wishes to play back.

Other systems use an index card which indicates the locations of particular recordings on the medium. An ingenious idea is incorporated in one

(*Continued on page* 34)

°*Like the Miles Walkie-Recordalt.*

FIG. 6: SPOOL-TYPE dictating machine with standard tape wound on special spools. Push buttons provide fast rewind (extreme left), fast forward, record, playback and stop (extreme right).

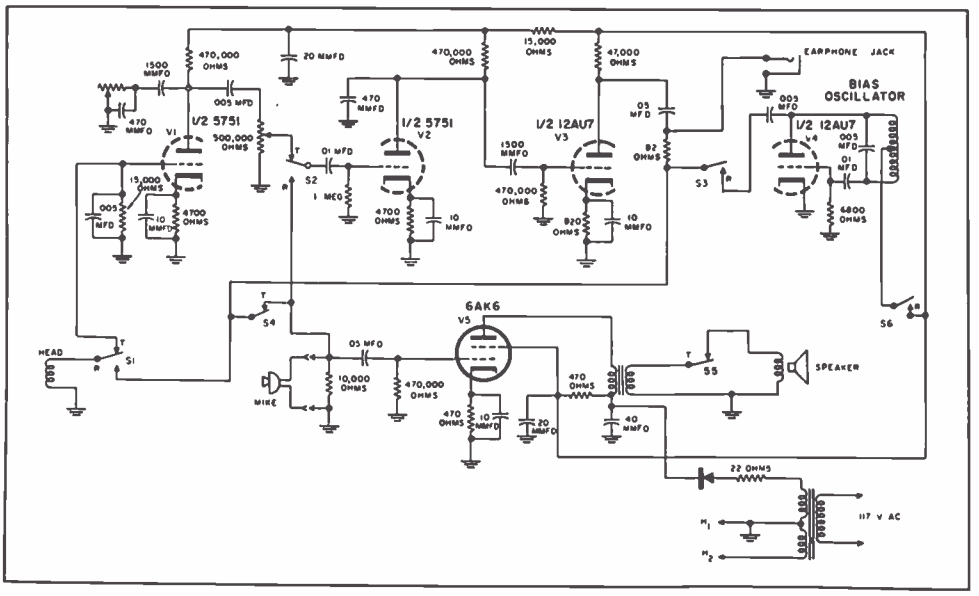
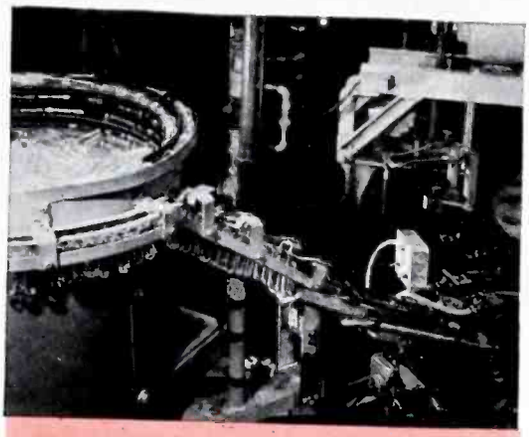
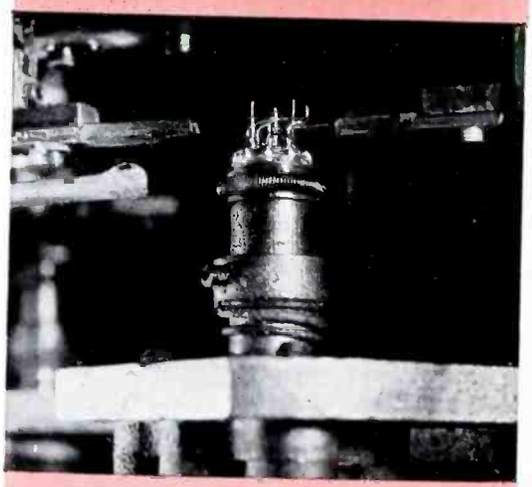


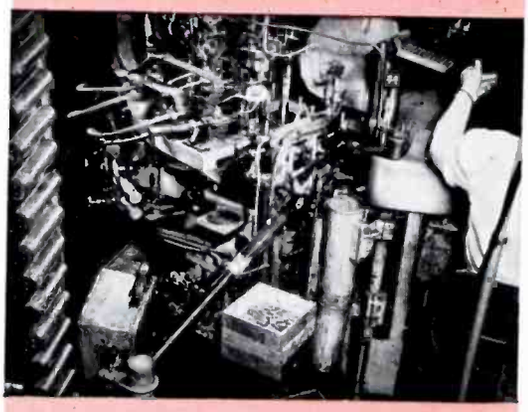
FIG. 7: SCHEMATIC of Comptometer D10A5 dictating machine.



Cylindrical machine at left gently vibrates glass tube envelopes, urges them to climb inside track and automatically feed down ramp to tubulating machine. Tubulating machine etches tube type on envelopes, cuts glass to precise tube size, attaches exhaust tube to envelope to allow creation of a perfect vacuum.

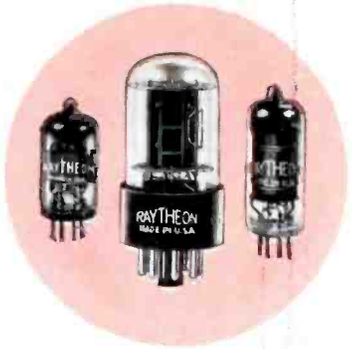


Close up of the button on which tube elements are mounted. Fingers, left and right, move in to swiftly make complicated bends which must be kept extremely precise to insure proper positioning of tube's elements.



This exhaust machine seals the glass envelope to the stem of the mounted tube. Pumps then create a perfect vacuum in the tube, the inside parts are "bombed" (heated white hot) and the getter is then flashed to allow this perfect vacuum to be retained during life. Tubes are automatically discharged after they have been tipped, then slide down a ramp to a conveyor and are carried to the next operation.

IT'S NOT *HUMANLY* POSSIBLE



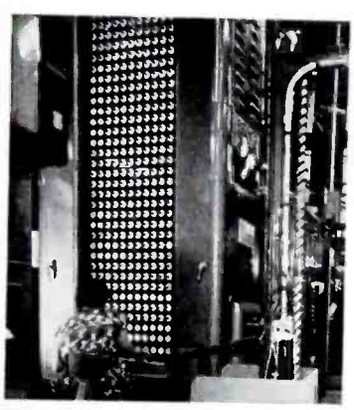
To Make RAYTHEON TUBES AS GOOD AS THEY ARE

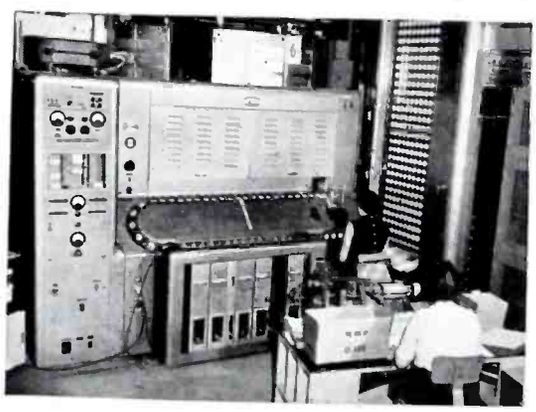
Here at Raytheon, we think we have the most skillful people in the industry, yet their combined skill alone couldn't make Raytheon TV and Radio Tubes as good as we make them. It takes hundreds of thousands of dollars worth of special instruments and machinery as well.

Pictured are but a few of the many automatic precision machines and delicate instruments that are needed to create the matchless quality of Raytheon Tubes; precision machines that build into Raytheon Tubes their superb physical perfection; delicate instruments that test and safeguard not only the quality of the finished tubes but the thousands of components that are part of the whole.

Much of this fine machinery was designed and built by our own skillful people — exists only in the Raytheon plants. That's why Raytheon TV and Radio Tubes receive rigid quality control tests exclusive to Raytheon. That's why Raytheon TV and Radio Tubes are truly RIGHT . . . for SOUND AND SIGHT!

Buy them from your Raytheon Tube Distributor.





Left: Note the conveyor bringing the finished tubes from the exhaust machine to this rotary aging rack. The aging rack operates the tubes for ½ hour to eliminate early tube failure. Voltages are applied to stabilize the characteristics and season the tubes so that uniform results will be obtained through life. High voltages are applied to eliminate any weak tubes.

Right: This Raytheon designed machine performs many complicated tests — tests formerly dependent on human judgment — and automatically eliminates tubes not up to Raytheon standards of quality and performance.

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.

RAYTHEON®
Excellence in Electronics

THIS MONTH IN SERVICE

MARKET FOR REPLACEMENT PARTS GROWING--The market for electronic part replacements is expected to increase at a rate of 10 to 15 per cent a year for at least the next decade, Gordon K. Douglass of Sylvania predicted at a recent meeting of distributors in Texas. He noted that market research experts have forecast that 1958 distributor billings would be more than $130-million above 1957.

ELECTRONIC CIRCUIT SENTRY DEVELOPED--An electronic circuit sentry has been designed by RCA communications product engineers to minimize damage to power system equipment and improve service. . . . The circuit sentry is a fast-acting transistorized device utilizing the transmission of a tone signal to set in motion a series of relays which, in twelve-thousands of a second, actuate circuit breakers and isolate the faulty high-voltage lines. . . In the sentry, when a relay detects a fault in a power line, it immediately transmits a tripping signal to its associated transmitter. The latter, in turn, instantly transmits the signal to all necessary receivers which cut the damaged line from the network. The device prevents false tripping by using the frequency-shift principle. When tripping occurs, the transmitted tone signal shifts from an idle or guard frequency to a trip frequency. . . . The transmitter or receiver unit occupies 3½" of a standard 19" relay rack.

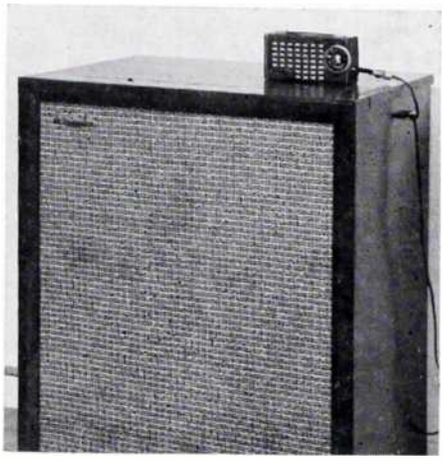
ASSOCIATIONS IN SOUTH AND EAST NAME '58 OFFICERS -- Three associations -- RTTG (Miami, Florida), SARTA (San Antonio, Texas, and TSA (Delaware Valley)--elected officers for 1958 recently. . . . In Miami, Parker A. Latta was named president of the Radio and TV Technicians Guild of Florida, Inc., succeeding George Peroni. Others named include John J. Petruff, first vice president; James J. Ross, second vice president; Sam Kessler, recording secretary; Larry Lawrence, corresponding secretary, and Ed Stevens, treasurer. . . In San Antonio, C. W. Shertz was reelected president of the San Antonio Radio and Television Association. O. O. Brigman was elected vice president; Don Van Der Brugen, secretary and Tom Boyd, treasurer. . . . The Television Service Association of Delaware Valley named Ray Cherrill, president; John S. McCloy, vice president; Harvey Morris, secretary; Louis J. Smith, corresponding secretary and Jack Rubin, treasurer. Board of directors of the group include Cherrill, McCloy, Morris, Rubin, Smith, and Ralph Newby, Ray Fink, Charles Knoell, Al Haas and Sam Brenner. The association was formed through the consolidation of the Northeast TV Service Dealers Association, Philadelphia Radio Servicemen's Association and the Television Service Dealers Association of Philadelphia. . . . See page 32, this issue, for additional news on association activities.

NEDA SALUTES TV SERVICE MEN--The National Electronic Distributors Association saluted the TV Service Man recently in a statement issued with a mailing of posters to be displayed during National Television Servicemen's Week. . . . The Week, said Joseph DeMambro, NEDA president, gives us an opportunity to reaffirm the fine spirit of cooperation that has always existed between TV Service Men and distributors. As the funnel of new products, of business guidance, of product information to the Service Man, distributors, he added, have helped the service segment of our industry grow to its present eminence. . . . The TV Service Man stands on the threshold of his greatest advance since he transformed himself from a mechanic to a businessman, DeMambro continued. The frontier of public acceptance of a responsible, independent TV service industry has been reached, he noted. . . . Commenting on the Service Man and the Week, Harold Stamm of RCA, sponsor of the event, said that the growth of the TV servicing industry has been impressive. When TV was in its infancy twelve years, he pointed out, about 18,000 Service Men were in the field. Today, he said, more than 150,000 maintain the nation's radio and TV receivers.

SERVICE WILL BE AT IRE NATIONAL CONVENTION--SERVICE will once again have a booth--4416 (Production Floor) -- at the forthcoming IRE National Convention to be held at the Coliseum, Columbus Circle, N. Y. City . . . You are cordially invited to visit with us.

[See Front Cover]

Transistorized Portable



Chassis, Enclosed in Leather Case-Cabinet, Employs 5 Transistors and 1 Diode as Detector

by GLEN R. SODEN, Packard Bell Electronics

PACKARD-BELL transistor radio, atop a 3-speaker hi-fi ensemble with one 10" woofer and two tweeters with crossover network, which it can drive with its 115-mw output.

A MARKED ADDITION to the continually growing field of personal entertainment are the compact transistor portable radios.

In Fig. 1 (and on the *cover*) appears the circuit of a recently-developed model[1] which uses six semiconductors; five transistors and one diode.

General Description

Unlike other portables, this model utilizes the all-leather feature for the cabinet itself. Two snap buttons on the back flap allows for access to the chassis and battery compartment. There are two operating controls: tuning knob which also has civil defense markings and a volume control knob with an on-off switch which projects through the end of the cabinet for finger-tip control.

[1]*Packard Bell Electronics 6RT1.*

P-W Circuit Panel

All components are mounted on a *printed-wiring* dip-soldered circuit panel; component wires are flanged. The chassis is held in place by two Phillips-head screws; one screw is located on the lower right-hand corner inside the cabinet and the other under the channel selector dial on the front of the cabinet. The whole unit is self contained and will operate after removal from the cabinet.

[2]*Oscillator-mixer type. When using an RCA transistor (for the mixer) in place of Raytheon type in chassis, the 15,000-ohm bias resistor should be changed to 10,000 ohms (½ watt).*

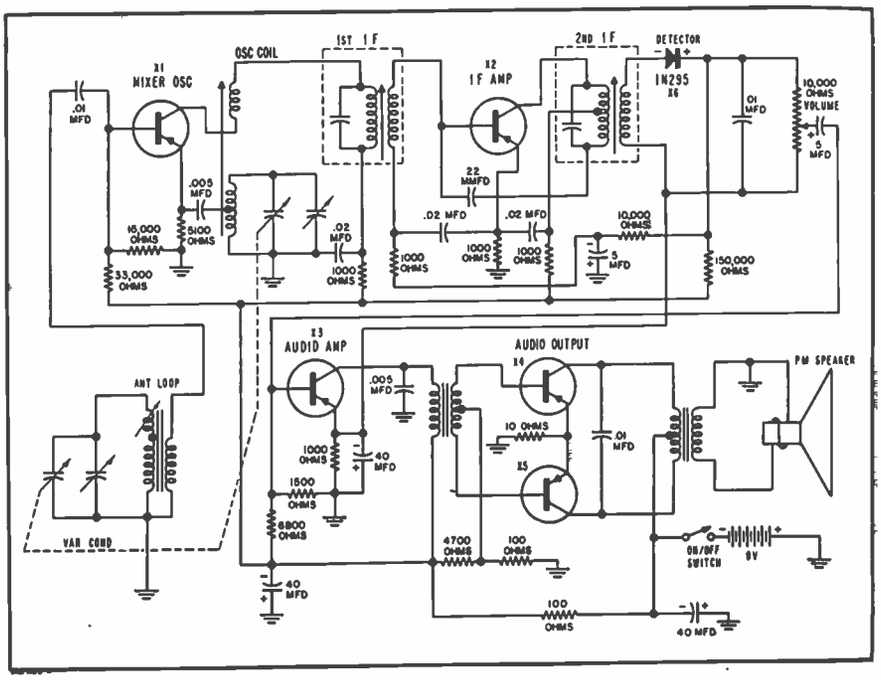


FIG. 1: CIRCUIT of Packard Bell 6RT1 transistor portable.

Circuit Analysis

An *Autodyne* converter circuit[2] is used. One transistor with two tuned circuits is used for intermediate frequency amplification.

Neutralization of this circuit is accomplished by a 22-mmfd feedback ceramic capacitor. Special care should obtain when replacing the *if* amplifier transistor due to variations in transistor capacitance. Since the feedback capacitor is required for proper neutralization, over-neutralizing will cause instability and regeneration. To compensate, it may be necessary to use a lower value of capacitance; about 18 mmfd. Insufficient neutralization can cause low gain and a loss of sensitivity. This may be compensated by a higher value of capacitance; approximately 23 mmfd. If these changes are required, realignment is recommended.

Audio System

For improved efficiency and proper impedance match, a coupling transformer is used between the audio amplifier and output stages. Push-pull *class-B* audio is used; power output is 70 milliwatts undistorted, with a maximum power output of 115 milliwatts.

The speaker, of the *p-m* dynamic type, has a .68 ounce Alnico-5 magnet. The voice coil impedance is 12 ohms at 1,000 cycles; cone diameter is 2¾".

A 9-*v* power supply is used. One single 9-*v* or six 1½-*v* penlight batteries of either carbon or mercury cells may be used.

Troubleshooting Vertical Oscillator and Integrator

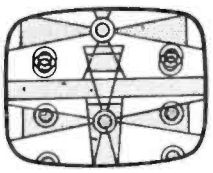
by JESSE DINES

Trouble	Picture Indication	Cause	Remedy

Note—Before troubleshooting, one should be sure that the

(1) Sync separator and video circuits operate normally
(2) Line voltage, B+ and boost (when fed to vertical oscillator plate) voltages are normal
(3) Vertical hold, linearity and height controls are properly adjusted.

Loss of vertical sync (on all channels).



If varying the vertical hold control in one direction causes picture to roll up and varying the control in opposite direction causes picture to roll down, trouble is in the vertical output stage. If the foregoing problem does not obtain, trouble is in the vertical oscillator stage.

The *dc* voltages should be measured and one should also make waveform checks of defective stage to isolate further the trouble.

Loss of vertical sync; varying vertical hold control cannot sync in picture.

The following components may be defective: C_{411} (330 ohms), R_{440} (150,000 ohms), R_{404} (750,000 ohms), R_{405} (1.5 megohms), R_{457} (1 megohm), T_{401} and vertical integrator.—
See circles 1, 2 and 3 in Fig. 1.
Also check C_{309} (470 ohms), R_{297} (39,000 ohms), C_{296} (1000 ohms), R_{295} (100,000 ohms), R_{296} (4.3 megohms), R_{309} (18,000 ohms), R_{298} (100,000 ohms), C_{294} (1 mfd), C_{308} (470 mmfd), R_{302} (3 megohms) and C_{305} (.03 mfd).—
See circles 1, 2, 3 and 4 in Fig. 2.

Replace defective component.

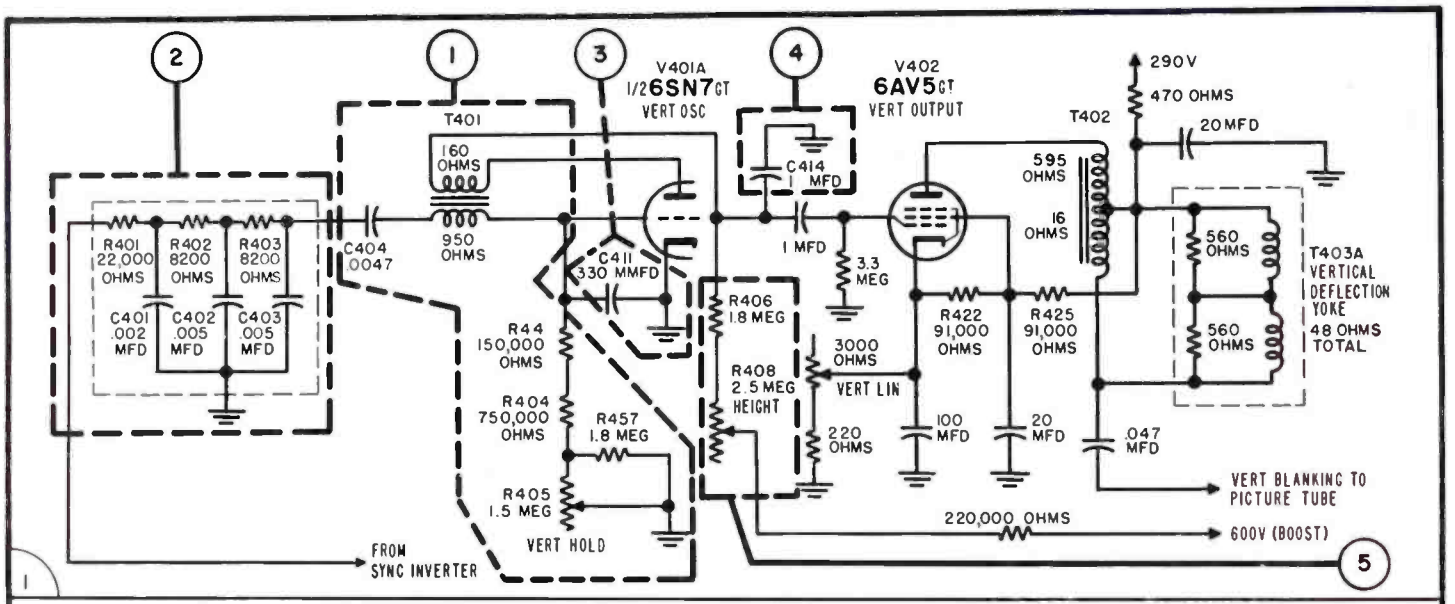
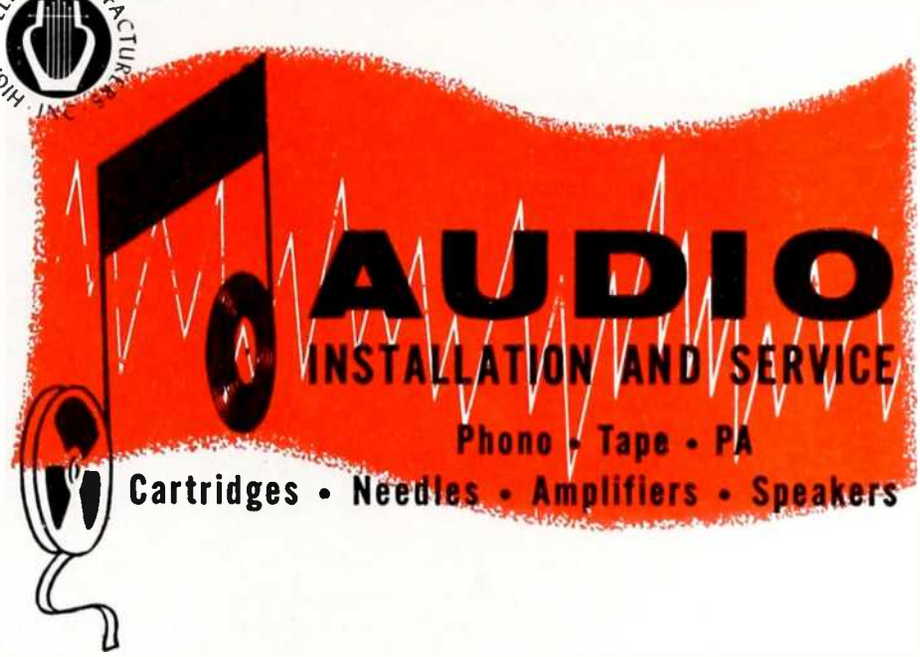


FIG. 1: VERTICAL OSCILLATOR and integrator circuit in Admiral 23A1.

FIG. 2: SCHEMATIC of vertical oscillator and integrator system in GE 805/6/7/9.

Circuitry Report on Remote-Control Stereophonic Tape Recorder



WITH THE INCREASING interest in stereophonic reproduction has come a variety of developments in not only components, but in packaged units of the type illustrated in Fig. 1‡. Through the use of jacks, it is possible to use all sorts of combinations to produce hi-fi tapes. For instance, should one have a power amplifier, it may be substituted in place of the speaker system at J_4. With additional preamps, other inputs beside mike and phono may be heard stereo.

It is even possible to use another amplifier at J_3 to generate a straight second channel, or use an extension system in another room. With any of these additional arrangements, the sound may still be remote controlled. An *aural balance remote control* overrides the volume and tone in each channel when they are turned fully on. The volume and balance are then adjusted at the remote control. Any of these outputs can be automatically stopped when the tape ends or breaks, along with the 4-pole induction motor.

‡*Webcor Imperial.*

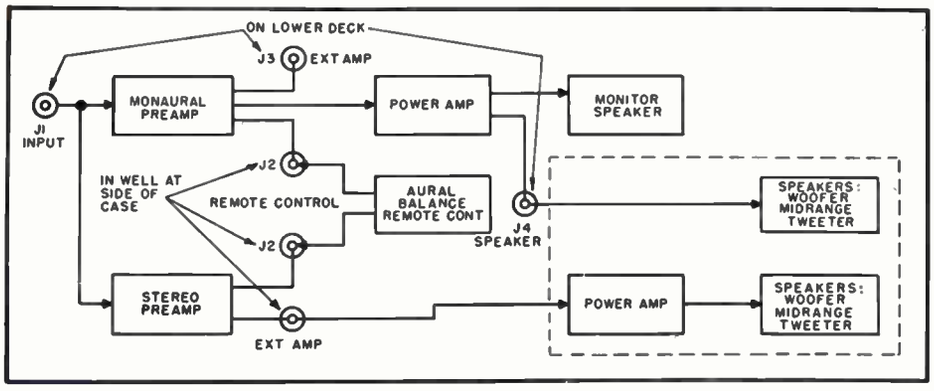


FIG. 1: BLOCK DIAGRAM of the complete stereo system used in the Webcor Imperial.

Monaural and Stereo Preamps

Monaurally, the sound channel consists of a low-noise input 12AX7 and several 12AU7A's for amplification, one section of the latter being an amplifier and the other section being a driver. The second 12AU7A is a bias oscillator. For monitoring the recording level, a 6E5 tuning eye is fed the rectified signal from two diodes.

Stereophonically, the second sound channel consists of a low-noise input 12AX7, with a built-in volume control, a 6AT6 amplifier and cathode-follower type output. Directly from this output are the two jacks; the external amplifier and remote control.

Providing oscillations well above the audible range (60 kc) is a 12AU7 used as a push-pull plate-type tuned oscillator. Essentially, three capacitors (470, 470 and 2000 mfd) are in series across the oscillator coil; this oscillator provides a stable output. Circuits of this type are preferable when a low-impedance recording head is used. A low-value capacitor (.1 mfd) was selected so that the proper bias obtains at the recording head.

A 6E5 tuning-eye circuit receives its signal from the cathode of the first section of the 12AU7 in the monaural channel. This signal feeds into the filter network ahead of the two seleniums, while *dc* level is set by the *eye adjust control.*

Providing B+ and filament power for the monaural channel, the power

(*Continued on page* 37)

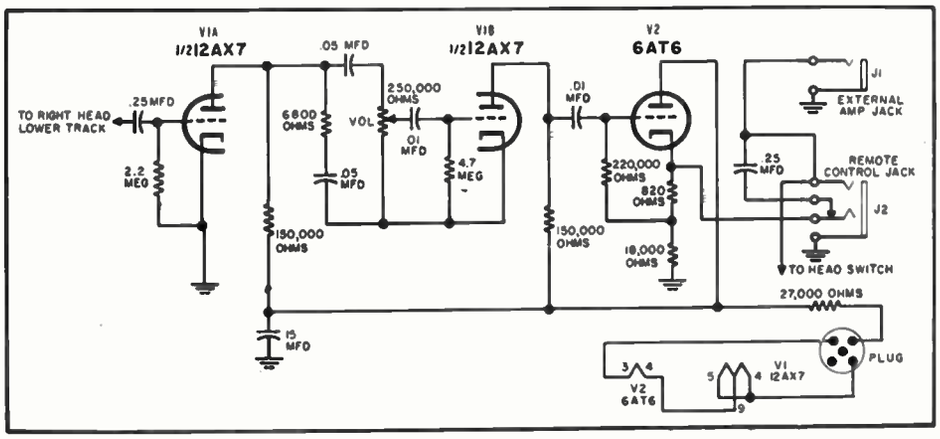
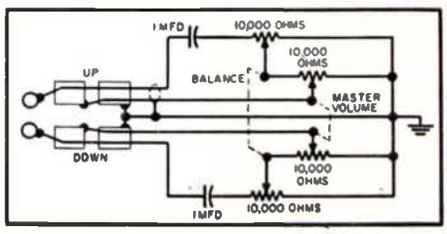


FIG. 3: DIAGRAM of the aural balance remote control.



(Left)

FIG. 2: CIRCUITRY of the stereo preamp.

(Above)

build your PRESTIGE and PROFITS with

CHANNEL MASTER ACCESSORIES

Channel Master masting is made of finest quality high carbon steel

CHANNEL MASTER REDUCES ALL MASTING PRICES!

Only Channel Master can bring you top quality masting at the lowest possible prices . . . because *only* Channel Master manufactures telescoping masts in its own steel tubing mill.

- Prices for Channel Master telescoping and straight-length masting are the lowest on the market.
- Telescoping masting line now *fully assembled* — and costs far less than previous non-assembled masts.

Cut your Costs . . . Boost your Profits — Call your Channel Master distributor now.

Cash-In On Channel Master's Consumer Popularity! Feature these top-quality accessories bearing the nationally advertised Channel Master name.

MOUNTS COUPLERS STANDOUT INSULATORS GUY WIRE

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.
WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES

Only CHANNEL MASTER offers you this

"SUPERMARKET" VARIETY of TV WIRE

Your choice of 37 models...14 different types...of VHF, UHF, and Rotor Wires

- NEW! JUMBO TRANSMISSION WIRE — extra heavy-duty 170/18 and 155/20 wire.
- NEW! "SUPER FOAM" TRANSMISSION WIRE — superb-quality foam poly insulation.

When you feature Channel Master you have the widest selection of TV wire . . . plus premium quality for longer life and better performance — at no extra cost. That's why . . .

"Live Wire" Dealers use Channel Master Exclusively

FM Fringe Reception

How to Resolve Airplane Flutter and Fading Problems, Select Proper

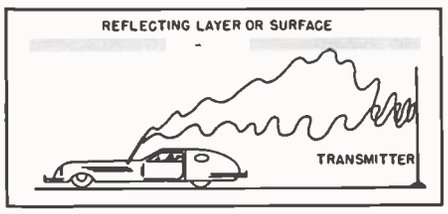


FIG. 1: HOW REFLECTED WAVE paths vary, with lengths changing at different rates; a condition in FM and TV responsible for fading and flutter.

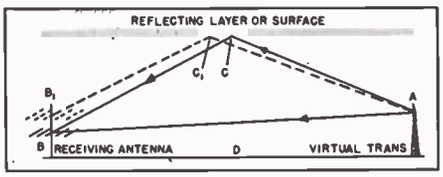


FIG. 2: DRAWING illustrating signal paths present between FM transmitting and receiving antennas.

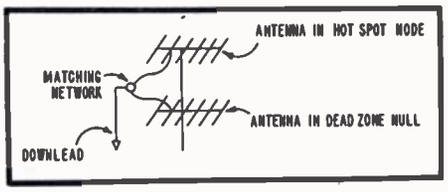


FIG. 3: A STACKED ANTENNA array which serves to illustrate current flow problems.

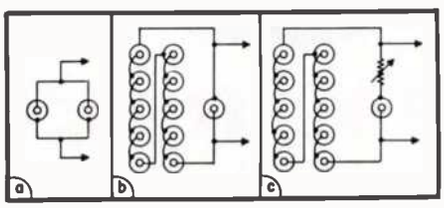


FIG. 4: DRY-CELL setups illustrating current-output effect when two cells are connected in parallel (a); 10 cells are paralled to one cell (b); and a variable resistor is used (c) to adjust for impedance to conserve energy and avoid loss of power.

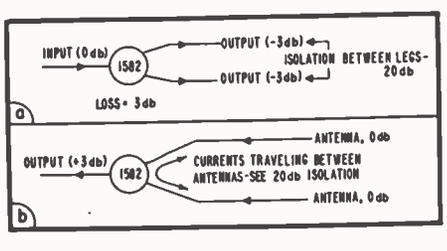


FIG. 5: HOW HYBRID COAX SPLITTER can be used as an antenna coupler and provide isolation between antennas.

FADING AND AIRPLANE flutter problems, common to FM and TV, are caused in identical fashion. It is possible to reduce these effects by the same technique. To understand this condition, we must analyze the behavior of *vhf* signals.

At AM we have a parallel situation which can serve as an analogy for the *vhf* effect.

In AM car radios one finds that signals drop down into the noise area when no shielding, such as a bridge or steep hill, is present causing signal loss by absorption. What has happened is quite simple; the auto antenna has been receiving signal from two paths, one of which is the ground wave, direct from the transmitter. The other has been the sky or a reflected wave from a hillside or large building. The second path is of a different length than the first one, and its length is *changing at a different rate* than the first path; Fig. 1.

Since the fields arriving at the auto antenna will be either in phase or out-of-phase, they will add to a higher voltage than either wave above provides, or a lower voltage. If the car happens to be at a place where the sky wave is as strong as the ground wave, the cancellation can be complete or almost complete. We are dealing here with wavelengths on the order of 600′ to 1500′ long, so that the effect is quite noticeable over some distance of travel.

If we replace the AM transmitter with an FM transmitter and the reflecting layer with an airplane wing or fuselage, we can see an exact parallel. But since the wavelengths are only about 12′ at FM frequencies, the effect is more rapid and more pronounced, especially since the aircraft is moving rapidly.

The general condition is called *multi-path reception*. At FM, the presence of heavy clouds, inversion layers in the atmosphere and sometimes reflection from the troposphere and ionosphere, cause the same multi-path effect. On occasion, ducting occurs when an atmosphere inversion causes a large waveguide to be in effect, with the earth as one wall and the inversion boundary as the other. Under these conditions, FM signals may reach out many thousands of miles.

Our problem is to do something so that the antenna array is not affected by this flutter and fading, or at least, affected minimally. To do this let us consider the conditions seen *up* and *down* on an FM antenna mast. In Fig. 2 we have an exaggerated drawing of the paths present between an FM transmitter and a receiving antenna. These are given as line-of-sight conditions to clarify the picture; actually the virtual transmitter will be the point on the horizon from which the signal appears to come, since where fading exists, the transmitter is below the horizon.

The drawing shows two paths to the receiving antenna, although in reality many may exist. These are labelled *AB* for the direct path and *ACB* for the reflected path. If there are x number of wavelengths in path *AB*, then there are a greater number in path *ACB* which is longer; therefore, the number of wavelengths in path *ACB* will be $x + y$ wavelengths or $x + y$ and a portion of a wavelength. The reflecting layer is not a stable thing; it is a layer which constantly moves, breaks and changes its order of refraction. Because of this, path *ACB* will be constantly changing its length.

Let us now consider a given moment of time when path *ACB* is $x + y + \frac{1}{2}$ wavelengths long between transmitter and receiver. At the antenna, point *B*, we have the direct wave of one polarity energizing the antenna, and the reflected wave of opposite polarity (one half wave difference, or 180° out of phase) on the antenna at the same time. The developed voltage of the antenna will be the difference of these two voltages, and if they are equal, the resultant voltage will be zero. At this same moment we can consider the relationship in the dotted paths to the *ghost* antenna drawn above the antenna of Fig. 2. Path AB^1 is the same length as path *AB*, but path AC^1B^1 has been shortened. If the shortening has been one-half wavelength, then the path AC^1B^1 is equal to $x + y$ wavelengths and the two paths provide in-phase signals at the antenna. The developed voltage on

by JACK BEEVER, Systems Design Engineer, Jerrold Electronics Corp.

Antenna and Tower Location, and Install Coax Splitters

the antenna will be *greater* than either wave alone could provide.

Offhand, we would say that the antenna at B is placed at the wrong point on the mast; it should be at B^1. However, such an installation will not help, because the reflecting layer is in constant motion, and it only takes a few feet to cause a half-wavelength difference in the length of path ACB. Under these conditions, the point which is now at the antenna at B^1 will be moving up and down as the phase difference between the two signals changes.

There is another, very important, path not shown on Fig. 2. This is path ADB or ADB^1, from a point on the ground between transmitter and receiver. Average terrain is a very good reflector at the small angles seen in these paths, so that a great part of the energy in the antenna will result from this path. In this case, however, the reflecting surface is fixed for long periods of time. It *will* change due to the variation in apparent ground surface caused by annual foliage differences and snow and rain.

Having cleared up the mechanism of fading, how can we use the information to set up an antenna array which will take advantage of the situation of moving points of high-signal density? At first, it appears that if we stacked a pair of antennas vertically and picked the proper spacing, we would always have one in a *hot spot* and could depend on some signal at all times. Unfortunately it isn't quite that simple. Fig. 3 shows such a stack.

If the two antennas were equally energized, the currents developed by the top antenna would arrive at the mixing network to see equal and in-phase currents arriving from the bottom antenna. Therefore, the lower antenna would appear to the upper antenna as an infinitely high impedance; no current from the top antenna would flow in the lower antenna. This condition is exactly the same as one involving the connecting of two dry cells in parallel; no current flows, although both are developing a voltage.

In the case of the *stratified* signal of Fig. 3, though, we have a different situation, since here the lower antenna is developing very little or no signal. Let us assume that the lower antenna is developing 1/10th the signal voltage of the upper antenna. Then we have a situation like b of Fig. 4, where a battery of 10 cells is paralleled across one cell. Obviously, most of the energy of the 10 will be dissipated in heating up the single cell by a reverse current and no more voltage will appear across the output leads than the voltage of a single cell. In the case of the antennas, the lower antenna acts as a transmitting antenna, radiating most of the energy captured by the upper antenna and leaving very little for the down lead.

We can carry the analogy a little farther and see if there is a possible cure for the situation and if we can devise some device to resolve the problem. In Fig. 4*c*, we have a variable resistor in the lead going to the single cell. If this is adjusted to make the impedance offered by the cell and rheostat greater than the internal impedance of the battery of 10 cells, then very little of this energy of the 10-cell battery will be dissipated in the single cell.

However, in our situation with the antennas, we face the difficulty that the high-voltage source is constantly changing places with the low-voltage source. We need a device which will automatically differentiate between the low and high level sources so that most of the energy of the high-level source will be fed to the output lead of the array. The need is filled by a *hybrid* coax splitter.[1] When this splitter is used *backwards* as an antenna-coupling device, its property of *isolation* between the output legs effectively isolates antennas from each other. Fig. 5 illustrates this point.

The net result of 20-db minimum isolation seen at FM frequencies is that the antenna with the lower level of voltage cannot receive more than 1/10th of the voltage of the higher antenna across its terminals, and therefore, cannot dissipate it. At the same time, the path to the down lead only shows the transformation loss, which is too small to readily measure, being of the order of .1 db.

If antennas are spaced vertically, about two-thirds of a wavelength apart, and coupled with a hybrid splitter, we can feel fairly certain that we will have one antenna in a good field strength area when the other is in a weak one. If we can watch the signal strength from a distant station as we go up the mast, and discover that the nulls and nodes of signal are definite and easily recognized, we should measure the distance between null and node and space the antennas apart by this distance.

[1] *Such as the Jerrold coax splitter, model* 1582.

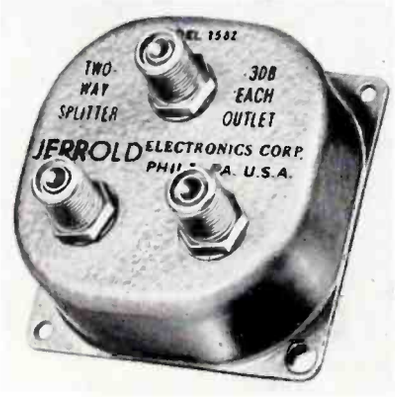


FIG. 6 (left): A TWO-WAY line splitter.

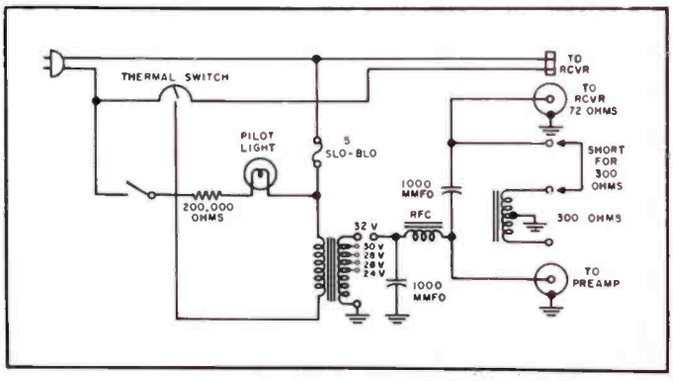


FIG. 7 (right): CIRCUIT of remote power supply for mast-mounted FM preamplifier.

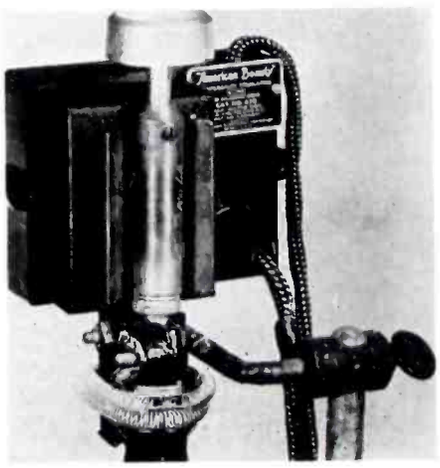
Repairing Printed-

by LEROY WOLFF,

Lifted Lead Problems . . . Replacing

LEADS WHICH have loosened from *p-w* boards, but have not fractured, may be reattached by using a resin adhesive. Generally, however, it will be found more practical to replace such a lead by using hookup wire. The lead should be peeled away in each direction until a point is reached at either end which will serve as a solid connection point for the wire. This may be a component terminal or one of the eyelet holes used to transfer a lead from one side of the board to the other. If no previous connection was soldered to such an eyelet, however, the resin coating must be removed before attempting to flow solder into it. It is important to be sure that the hookup wire is dressed along the path followed by the plated lead if the circuit involved is critically affected by stray capacitance or coupling. The same care should be used in soldering the ends in place, as described previously.° The free ends of the wire can be pulled moderately tight, bent over and laid along the cleaned portion of the lead, each end of wire extending beyond the break so they overlap and cover the break side by side. They can then be soldered in place as previously detailed. If several leads across the break are available and are clamped in this way, it will be found that the board is sturdy enough to withstand any reasonable strain.

Caution: One should not attempt to repair breaks in plated leads across cracks in a board without clamping each lead as outlined.° Any leads



P-W BOARD soldering-gun fixture.

Wiring Board Chassis

Field Setvice Engineer, Motorola, Inc.

Damaged P-W Boards and Parts

which cross a crack in the board, even though the lead may not be fractured, must be treated the same way. If these precautions are not observed, more service calls for intermittent operation are inevitable.

If no plated leads cross the fracture in the board, the clamps can still be installed in the same way; in this case the parallel free ends being soldered together to lend rigidity.

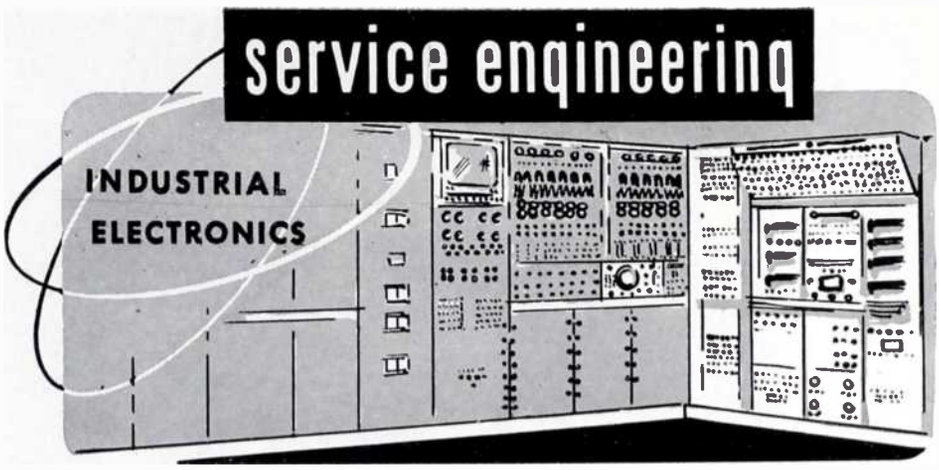
Replacement of a Damaged Board: When replacing an entire board in a *p-w* chassis, a duplicate assembled board should be used as a reference pattern. If a duplicate board is not available, the next best pattern is the reproduction of the board found in a service manual. Lacking this manual, a rough sketch of parts location of the board should be made before any disassembly is started. The larger components such as transformers, gang variables, controls, etc., usually have uniquely spaced and positioned mounting lugs which insures their correct installation on the new board. But, individual resistors and capacitors of different values must be carefully watched to insure correct transfer since, in many cases, they fit many mounting locations interchangeably. The leads, which may be used to connect controls, speaker, or any other component to the board, should be indicated on the sketch as to location and color code.

One practically foolproof method of transfer is to install each item or lead removed from the broken board immediately in its appropriate place on the new board, tacking in place at once so it will not fall out. This method is safe, but somewhat more time consuming.

In the replacement of an entire board, the use of a soldering pot (previously described*) is almost a necessity. Its use makes removal of multi-lug components as simple as the removal of a single lead. Without the pot, the only way of removing such items as electrolytics, gangs, *if* trans-

(*Continued on page* 47)

*SERVICE; *February*, 1958.



An Analysis of 2-Way Transmitting and Receiving Techniques Now in Use and Proposed to the FCC‡

TWELVE YEARS ago safety and special service users of 2-way equipment were operating on an 80-kc assignment basis in low band and were looking at 120 kc assignments for the high band. Within the intervening years the 2-way industry has gone to 40 kc in low band and 60 kc in high band. Now, it appears as if it will be 20 kc in the low band and 30 kc in the high band. Except for FCC administrative problems and the time it takes to resolve the situation, we could be operating today in ¼ the channel space originally used.

Within the past two years it has become quite a game to debate the technical attributes of various *ultimate* systems. The time has come for a narrowing-down process to be applied to the broad field of possibilities for mobile systems of the future.

What are we talking about? We are discussing the merits of three modulation techniques as applied to commercial vehicular radio service. These are: Narrow band FM, double-sideband AM and single-sideband AM.

To evaluate them we must find out which system provides the best balance between: Performance in transmitting the desired information, performance in rejecting undesired information, low initial cost, simplicity in use, and low maintenance cost.

It is important that the whole plan of evaluation be considered. Up to now most discussions have terminated after the first two subject areas; assumptions have been made that the remaining items can be equalized with time. Such assumptions are weak if analyses of the fundamental problems are not made. As a simple example, let us consider these three evaluation factors as applied to monochrome and color television. Color television may someday be as inexpensive as monochrome *is today*, but it is doubtful whether color can ever be as inexpensive as monochrome at the same date in technology. Color-TV involves the sending of *more* information and no matter how many breakthroughs occur to make it simpler, it seems logical to assume that monochrome systems could also be simplified to maintain a basic cost maintenance and simplicity advantage over color.

There is no reason that one modulation system must be used for broadcast, vehicular radio, point-to-point, amateur radio, aircraft radio, TV, etc. Each broad category has particular operational requirements that lead to the choice of different systems. There are nine factors that characterize the commercial vehicular radio field: (1) Wide range in desired signal strength; (2) strong undesired signal strength; (3) rapid changes in signal strength; (4) bunching of systems in fairly confined geographical areas; (5) extreme environmental conditions such as wide temperature range, considerable vibration, shock, and wide voltage variations; (6) need for minimum and rapid maintenance; (7) limited mounting space; (8) limited capacity energy source, and (9) relatively high man-made noise levels.

Industry has examined *DSB, SSB, FM* under variations in audio limiting, preemphasis and deemphasis. SSB has been worked with and without reduced carrier and with and without carrier controlled *agc*. Even± 2.5-kc deviation FM has been checked with low voice frequency control of the carrier level in an effort to increase the peak power limit available from a pair of tubes. Intelligibility versus microvolts has been checked by extensive listening tests with trained and untrained ears. In short, just about everything versus anything has been tried.

If one is willing to put up with reduced accuracy under difficult receiving conditions, weaker signals can be read with SSB. Most users in the safety and special services must, however, seek 90% accuracy for reasons of safety of limb and property. In meeting this requirement FM is superior.

The intelligibility improves faster with increasing signal strength in a narrow band FM system than with DSB or SSB.

Additional significant data in the area of desired signal performance are as follows: (1) SSB can tolerate frequency drifts only in the order of ±100 cycles; FM can tolerate ±2 kc, and DSB can tolerate ±3 kc. (2) Ignition noise just about kills SSB, unless some type of noise blanking circuit is used.

Ignition noise has been found to hurt FM unless phase balance is maintained or similar noise blanking

(*Continued on page* 39)

‡*From a report prepared by* **R. F. Gifford**, *Communications Product Department, G. E.*

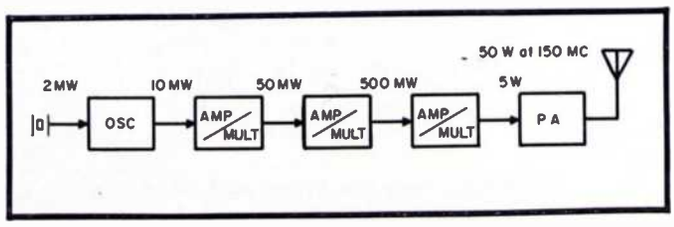


FIG. 1: THREE BASIC multiplication techniques for signal amplification and frequency multiplication for AM and FM.

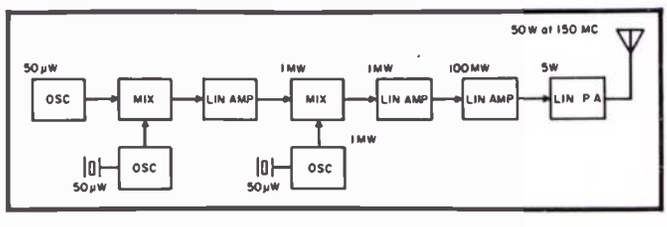
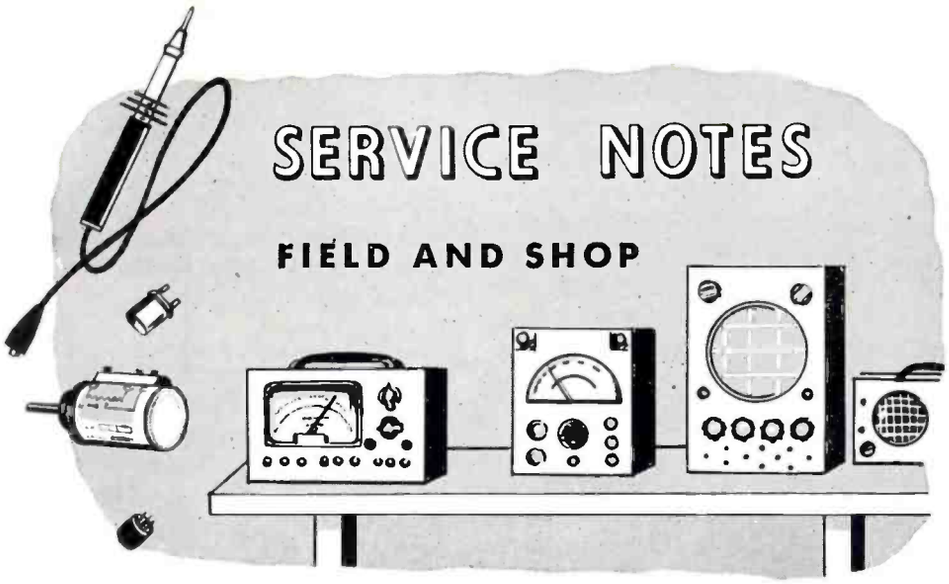


FIG. 2: THREE BASIC mixing techniques for signal amplification and frequency multiplication for AM, FM and SSB.



Troubleshooting Square-Wave Response of a TV Receiver‡ . . . Clearing Internal Shorts in Color-TV Tubes*

IF A TV RECEIVER can reproduce high-quality pictures, it responds accurately to a square wave modulated on the picture carrier. On the other hand, a receiver which has sub-standard signal circuits does not reproduce high-quality pictures, and does not respond accurately to square-wave signals.

A simple test setup as shown in Fig. 1 can be used to apply a square-wave test signal to the antenna-input terminals of a TV receiver. The signal generator is set to the picture-carrier frequency of the channel under test. The square-wave generator is set to suitable test frequencies, such as 60 cps, and then to 100,000 cps.

The modulator unit causes the square-wave voltage to modulate the *rf* carrier from the signal generator. You can use a simple circuit arrangement, as shown in Fig. 2. The output from the receiver is checked by using a wide-band 'scope and low-capacitance probe applied at the output of the video amplifier.

Typical square-wave responses to

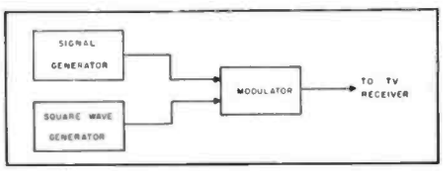


FIG. 1: HOW TO MODULATE a square-wave voltage on an rf carrier voltage to check overall receiver response.

100-kc square-wave signals are illustrated in Fig. 3. Only the leading edge of the signal is shown, because this is the part that is important in checking receiver response. Good response is indicated by the solid line; poor response by the dotted line. Poor response can be caused by the *rf* or *if* amplifier, picture detector, or video-amplifier circuits. Poor response can also be caused by a combination of faults in all these circuits. Good alignment, lack of regeneration, and proper values of peaking coils and load resistors are necessary to obtain good square-wave response.

The square-wave generator must be capable of better performance than the receiver under test. This means that the rise time of the generator must be .1 *us* or better. The waveform from the generator should also be good to avoid misleading test results. Waveform checks can be made with a wide-band 'scope.

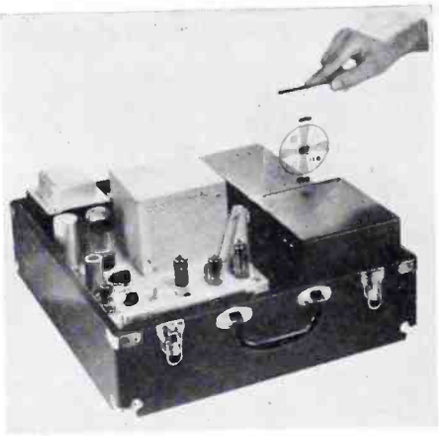


FIG. 5: VIDEO scanner in operation.

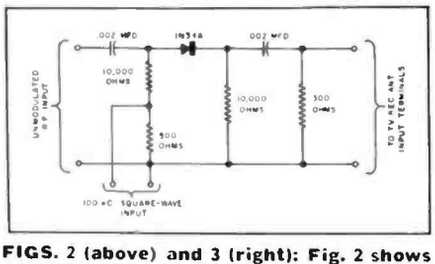
Fig. 4 shows a detailed square-wave response for an average TV receiver. The rise time of the receiver circuits is about .25 *us*, and the overshoot and ringing are within 4%, indicated by counting vertical squares. The rise time can be roughly determined by comparing the receiver waveform output with the waveform output taken directly from the square-wave generator.

When time is limited, many shops prefer to use a *flying spot scanner* instead of square-wave tests; such a scanner feeds a test-pattern signal into the TV receiver. The quality of receiver response is shown by the fidelity of test-pattern reproduction. Vertical wedges show high-frequency response; horizontal wedges low-frequency response. Interlacing, ringing, and all essential receiver responses are shown by details of the reproduced test pattern.

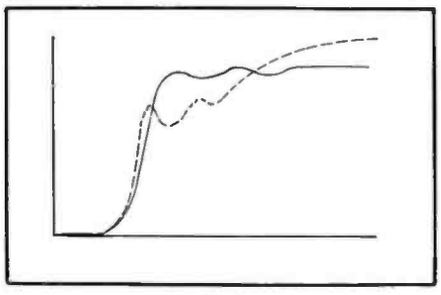
Clearing Internal Shorts in Color Picture Tubes°

BECAUSE OF THE close spacing between grid No. 1 and cathode (*G*, and *K*) it is possible for small particles to become lodged between them,

(*Continued on page* 36)

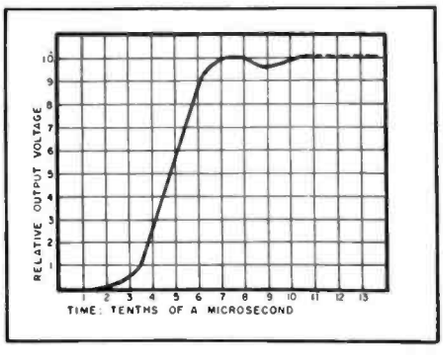


FIGS. 2 (above) and 3 (right): Fig. 2 shows a simple modulator arrangement, satisfactory for square-wave testing. Fig 3 illustrates good receiver response shown by solid line; poor response is shown as dotted line.

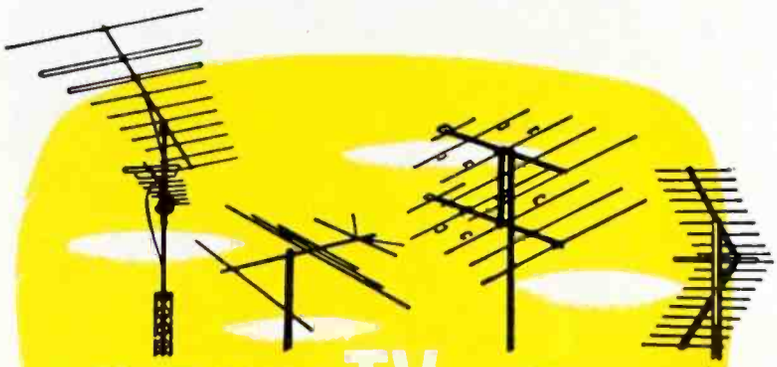


(Right)

FIG. 4: DETAILED SQUARE-WAVE response for an average TV receiver.



Leadin and Antenna Requirements on the Ultrahighs‡



UHF-VHF TV ANTENNA DIGEST

DESIGN • APPLICATION • INSTALLATION • SERVICE

WHEN THE END products of TV reception, the received picture and sound, are examined on *uhf* by viewers who are accustomed to *vhf* reception, they are certain to be struck by one great difference. For the same effective radiated power by the transmitters, the same distances away, with both transmitting and receiving antennas at corresponding elevations, favorable flat terrain, and similar type receiving antennas, the picture and sound will be considerably *weaker* at *uhf* than at *vhf*. While the first reaction might be to attribute this behavior to greater propagation losses at *uhf*, in reality this is not the case. Actually, the overall result is obtained because a number of components decrease in efficiency as the frequency increases.

Let us compare these factors on channel 5 (79 mc), channel 10 (195 mc) and channel 45 (659 mc); assuming that (*a*) all three transmitters have their antennas at the identical location, (*b*) all three have the same effective radiated power, (*c*) all three produce exactly equal and uniform field strengthens (in microvolts per meter) at the receiving site, (*d*) all three receiving antennas are half-wave resonant dipoles, cut for channels 5, 10 and 45 respectively, (*e*) all three receiving antennas are located in exactly the same spot, (*f*) the same leadin, consisting of 100′ of tubular twin lead, is run to the TV receiver, (*g*) impedance matches are maintained throughout, (*h*) and the same TV receiver (capable of receiving all three channels) is used.

Although the three antennas have the same gain (unity, or zero db) their actual signal extraction efficiency is different. The smaller antenna extracts less microvolts from a field strength of *x* microvolts per meter, because its *effective length* contains less meters. Referring all comparisons to the performance on channel 5, the actual microvolts fed by the antennas into the leadin compare as follows:

Channel	Frequency (mc)	Antenna Output (db)
5	79	0
10	195	–7.8
45	659	–18.4

This great difference shows clearly that to supply the same order of signal to the transmission line, either the higher channel transmitters must have much greater effective radiated power, or the higher channel receiving antennas must have higher gain, or both.

Let us now compare the signal loss on the transmission line (clean and dry) between the receiving antenna and the TV set:

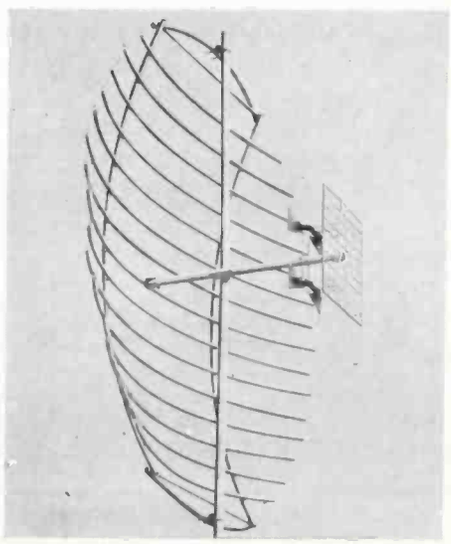
Channel	Frequency (mc)	db (for 100′; clean and dry)	Diff (db)
5	79	1.2	0
10	195	1.8	– .6
45	659	3.6	–2.4

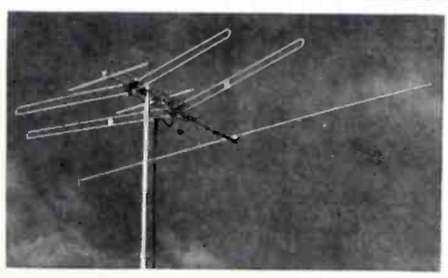
It can be seen that under dry and clean conditions transmission-line differences are not very great. However, the differences become very sizable when the line is very dirty and wet as shown below:

Channel	Frequency (mc)	db (for 100′; very dirty and wet)	Diff (db)
5	79	9.5	0
10	195	13.3	– 3.8
45	659	26.7	–17.2

(*Continued on page* 46)

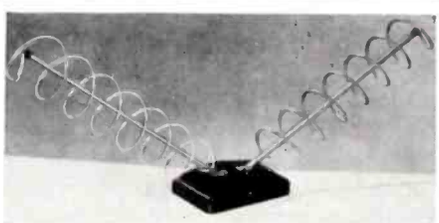
‡*From a report prepared by* ***J. C. Spindler****, Engineering Division, Zenith Radio Corp.*





(Left)

PARABOLIC UHF ANTENNA said to have a 14.5:19.1 gain over the uhf range. The principle of the parabolic antenna is the capture of signal by a large-diameter curved screen, and the reflection and concentration of this signal onto one focal area. Direct signal pickup, which would arrive out of phase with the reflected signal, is prevented by a small screen situated between the signal source and the dipole. Rear signal pickup is blocked by the back of the parabolic screen, which acts as a solid sheet. The reflecting screen is 6′ in diameter. Antenna weighs 10¼ pounds.—Para-Scope; Channel Master, Ellenville, N. Y. [SERVICE]



(Above)

VHF antenna (kit) which features the spiral-tenna design.—Model 606; Hi-Lo Manufacturing Corp., 1122 West Newport Ave., Chicago 13, Ill. [SERVICE]

(Left)

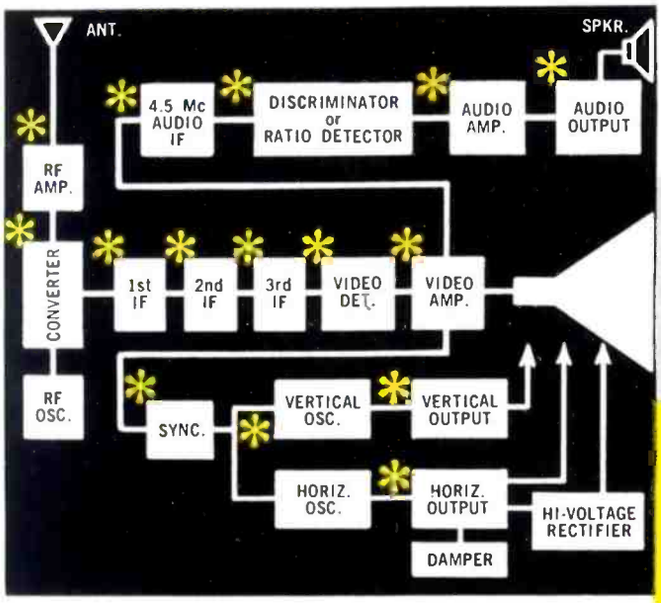
FIVE-ELEMENT all-channel antenna with vee-driven elements. Completely assembled at the factory. Features styrene insulators, fatigue-resisting aluminum tubing, die-cut element ends and plugged boom ends.—Scotchman series model 503; Winegard Co., 3000 Scotten Boulevard, Burlington, Ia. [SERVICE]

NEW
COMPLETE

DIRECT VIEWING

TELEVISION ANALYST

test each stage SEPARATELY



and watch the ← result on the TV set itself

NEW

B&K

MODEL 1075

UNIQUE NEW SIGNAL-INJECTION TECHNIQUE

Saves TV Trouble-Shooting Time and Work

R.F. I.F. Supplies complete r.f. and i.f. signals with video and audio modulation to quickly trouble-shoot each stage in each of the sections of the TV receiver. Enables you to check the r.f. sensitivity and AGC settings of TV receivers.

VIDEO Reproduces a complete test pattern on the screen of the TV picture tube and injects signals into each video stage of the TV receiver for fast, visual trouble-shooting and correction—anywhere, anytime. Makes it easy to check bandwidth, resolution, shading and contrast capabilities of the TV set.

SYNC Provides composite signal, sync positive and negative.

SWEEP CIRCUIT DRIVING PULSES Provides separate vertical and horizontal driving pulses for trouble-shooting deflection circuits.

INTERMITTENTS Test signal injection also aids in locating intermittent troubles.

AUDIO Provides a 4.5 mc sound channel, FM modulated with approximately 25 kc deviation. (This audio carrier is modulated either from a built-in 400 cycle tone generator, or from your own external audio source.) Injection of the 400 cycle tone signal simplifies trouble-shooting of the audio section.

COLOR Enables you to trouble-shoot and signal trace color circuits in color TV sets.

Generates white dot and crosshatch patterns on the TV screen for color TV convergence adjustments.

Generates full color rainbow pattern of orange, red, magenta, blue, cyan, green to test color sync circuits, check range of hue control, align color demodulators, etc.

SET ADJUSTMENT Enables you to check and adjust the vertical and horizontal linearity, size and aspect ratio of television receivers.

QUICK, DIRECT, COMPLETE TV TROUBLE-SHOOTING

Now, by point-to-point signal injection and test pattern reproduction, you can easily trouble-shoot and signal trace *any stage throughout the video, audio and sweep sections* of black & white and color TV receivers. With the remarkable new Model 1075 B&K TELEVISION ANALYST, you can quickly isolate and diagnose TV troubles (including intermittents). By use of the generated test pattern, you can *actually see* the condition directly on the picture tube of the television set itself. No external scope is needed. The TELEVISION ANALYST is practically a *complete* TV service shop *in one instrument!* Net, **$259.95**

See your B&K Distributor or write for Bulletin 1075-S

B&K

B & K MANUFACTURING CO.
3726 N. Southport Ave. · Chicago 13, Illinois

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont. *Export:* Empire Exporters, 458 Broadway, New York 13, U. S. A.

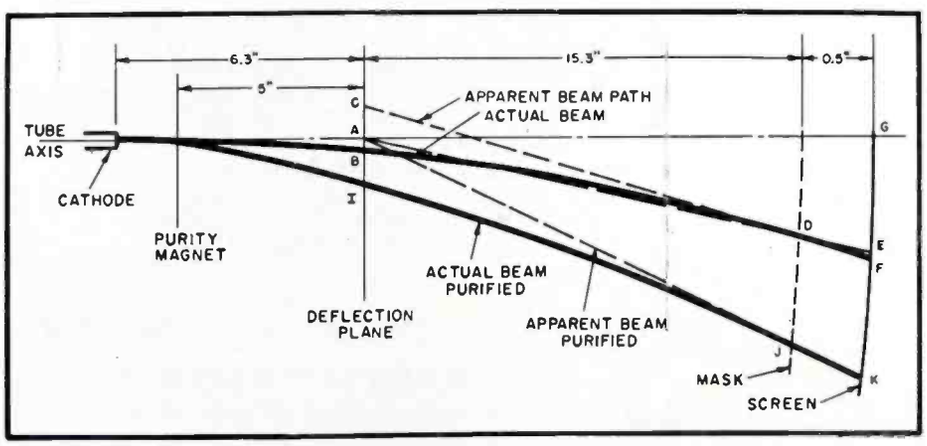
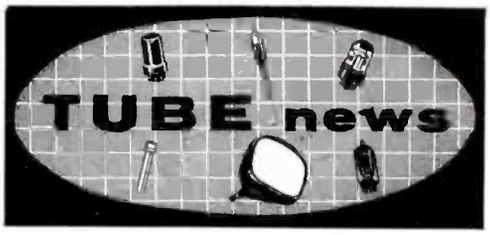


FIG. 1: BEAM PATHS in a shadow-mask color tube.



Earth's Field Effects on Color-TV Tubes‡

THE SHADOWMASK COLOR tube, like most color tubes, is a fairly sensitive gaussmeter, in that it will detect a weak magnetic field and give a visual indication of the magnitude and direction of the field. The tube designer's job is, of course, to make it as insensitive a gaussmeter as possible.

From the viewpoint of formal electron optics, determining the effect of the earth's field on a shadowmask color tube is a formidable task. The earth's field will, of course, vary in magnitude and direction with respect to the tube, depending on geographical location and the direction the tube is facing. The field is distorted by the presence of iron in the tube or in the vicinity of the tube. Beams are scanned over a fairly large solid angle, with path length and orientation in the field varying from one part of the screen to another. The three beams do not follow exactly the same path through the non-uniform field and are, therefore, not affected in exactly the same manner.

Since design changes take place often in color tubes, calculation of electron paths would be prohibitively slow; the approach, therefore, has been experimental. When one wants to know what effect a particular field will have on a particular tube, the easiest way to find out is the obvious one of trying it out. To understand why the effects take place, however, it is helpful to do some field measuring and calculation of electron paths.

In visualizing magnetic effects it is helpful to start with simple cases and add the complications one by one, and in many cases to consider the earth's field as being composed of three superimposed uniform fields; one vertical, one horizontal and parallel to the tube axis, and one horizontal and perpendicular to the tube axis.

The first simplification to be made is to assume a single axial beam

‡*Based on a talk delivered at the IRE-EIA Fall Meeting, Toronto, Canada, by* ***G. A. Burdick****, TV Picture-Tube Division, Sylvania Electric Products, Inc.*

rather than three converging ones, and first consider what happens to the undeflected beam in a uniform field; i.e., a tube containing no magnetic material, such as the 19″ round and some of the 21″ rectangular tubes. This situation can be handled analytically as illustrated in Fig. 1 which shows the electron paths in a typical 21″ color tube, with a field perpendicular to the plane of the slide. An electron which starts down the tube axis will follow a circular path which intersects the deflection plane at *B*, the aperture mask at *D* and the screen at *F*. As far as the screen is concerned, the electron appears to follow the *C-D-F* path, shown dotted. If the light source used to make the screen was at point *A* on the axis, the phosphor dot will be at *E*. To register the electron beam on the dots, it is necessary to use the purity magnet to move the beam to a new path (*I-J-K*) so that it will appear to follow the *A-J-K* path.

Analyzing the magnitude of the earth's field effect we find that if the tube is operated at 25 *kv* in a uniform field of .55 gauss, the displacement at the deflection plane (*A-B*) is about .05″ and the displacement at the screen (*G-F*) is about ⅜″. The misregistration between beam and phosphor dot is about .009″ (dot diameter is 0.017″), and the distance (*C-A*) between the apparent source of electrons and the axis is over ¼″. When the tube is purified, the motion of the beam is over ¼″ at the deflection plane (*B-I*) and about ⅞″ at the screen (*F-K*). Raster decentering *G-K* is, therefore, about 1½″, which, of course, must be corrected with yoke or centering magnet. The beams will be decentered by about ⅜″ at the deflection place (*A-I*), which introduces a neck shadow problem. (In tubes of this type, practically no tolerance obtained on yoke position.)

There is a partial cure for this situation; one which has been proposed independently by a number in the field. Instead of moving the beam to get registration on the phosphor dots it is more reasonable to move the light source, thus moving the dots over. If the light source is located at point *C*, no purity correction is needed. If desired, the light source can be displaced still further, which will minimize neck shadow, since the beams will then have to be centered in the neck to obtain color purity.

The earth's field, of course, varies in magnitude and inclination in different parts of the world and the orientation of the tube in the field is also variable. Any particular light source

(*Continued on page 47*)

ASSOCIATIONS

NATESA

TEN NATESA affiliates in Missouri will act as host at the annual Spring Meeting which will be held in Springfield, Mo., April 26 and 27. TESA of the Ozarks, the Springfield affiliate, will do the actual on-the-scene preparation; a fishing trip for early arrivals on Friday the 25th is being arranged.

This meeting will be open to officers and members of all associations.

Registration will include meetings, seminars, breakfast, lunch and the banquet and floor show. *Jack Mulford,* 618 Kimbrough, Springfield, Mo., is in charge of reservations.

° ° °

RTTG, Long Island, N. Y.

THE ELECTRONICS FAIR of the Radio and Television Guild of Long Island, N. Y., will be held on May 30, 31, and June 1 at the Hempstead Armory.

One of the highlights of the three-day show will be a forum on *TV Service Changes.* Sitting in on the panel will be Dr. Persia Campbell, consumer counsel to the Governor, a local legislator interested in licensing, service representatives, manufacturers representatives and the press.

° ° °

ESFETA, N. Y.

SYRACUSE played host to ESFETA during the winter meeting.

Max Liebowitz, ARTSNY delegate, appearing as a member of the State Board of Education, discussed electronic vocational school training and the role the state plans to play in a technical training program.

ESFETA members voted to hold the annual meeting at the Arlington Hotel, Binghamton, on April 13.

AT MEETING of Radio and Television Guild of Long Island which featured talks by Martin Bettan, New York City sales rep for JFD; Herb Yassky, JFD regional sales manager; Simon Holzman, JFD antenna engineer; Robert A. Larson, president of RTTG, and James Sarayiotes, Delphi Advertising, on the latest developments in antenna and accessory products as well as merchandising and advertising techniques for improving sales and profits. Left to right: Martin Bettan, Robert A. Larson, Al Weiss, manager of the Rockville Centre Branch of Green Tele-Radio, and Ruby Green of the same organization.

ASSOCIATIONS

TESA, Buffalo, N. Y.

THE TELEVISION AND ELECTRONIC Service Association of Greater Buffalo, N. Y., recently held its annual installation banquet. *Irving Toner* was installed as president for the third consecutive year.

Other TESA officers installed were *Norm Telaak, J. Beitz, George Leffler, Joe Adams, J. Opiela, Pat Pratt, Ralph D'Augustine, Nick Meitie* and *Ed Danaher.*

Guest speaker at the banquet was *Russ Harmon,* president of NATESA. Others at the dinner were *Dan Hurley,* president of ESFETA, and *Richard Miller,* president of both the Cincinnati chapter of NATESA and the Ohio State organization.

TEN YEARS AGO IN SERVICE

THE ASSOCIATED RADIO SERVICEMEN of New York issued their initial association bulletin edited by *Kurt J. Goldbeck,* which featured a report on the group's grievance committee activities. It was noted that of 20 complaints, received since the ARSNY offer to act as mediator, 17 had been settled immediately. This action prompted many New York radio commentators to praise the association on the air and urge Service Men to join the group. . . . The 15th annual banquet and electronics exhibit of the Lehigh Valley Radio Service Association (Pa.) was announced for March 29th. The group's executive committee began studying a proposal to join the Federation of Radio Servicemen's Associations of Pennsylvania. . . . The Radio Technicians' Guild, Whaling City Chapter, New Bedford, Mass., announced a new set of bylaws. At one meeting of the group a talk on audio response was delivered by *Standish L. Smith* of the New England Telephone and Telegraph Company. . . . The Radio Servicemen's Association of Pittsburgh, Pa., was in the process of post-war reorganization. . . . A city licensing ordinance was introduced by the Green Bay Electronics Servicemen's Association (Wis.); 42 members of the group had signed a petition urging that the measure be passed. Proposal was said to be similar to an ordinance passed in Madison, Wis., some 10 years previously. . . . *Walter W. Jablon* was elected vice president of the Espey Manufacturing Co., Inc. . . . *Norman B. Krim* was appointed manager of the receiving tube division of Raytheon Manufacturing Co. . . . *Herbert D. Johnson* was named sales manager of The Hickok Electrical Instrument Co.

Magnetic Tape

(*Continued from page* 15)

type°°, which uses different spacings of the grooves on the record to signify coming events. Thus a blank space of the width of two grooves means a correction or cancellation is coming. A wider space can mean the end of the letter or other special instructions. Thus by merely inspecting the record one can tell how long a letter will be or when a line is about to be cancelled.

Controls

The control devices for many of the dictating machines follow the pattern of early wax recorders. The person doing the dictating usually manipulates a hand control to start, stop or play back the recording. This is generally a push button on the microphone.

The stenographer often listens to the recording through an earphone for privacy, and starts or stops the record with a foot switch.

Both recording and transcribing machines are usually equipped with a pointer or other indexing device so that particular parts of the record may be identified.

Magnetic Recorders

Magnetic recordings have been made on steel discs, tapes, and on music wire. Early attempts were handicapped by various unsolved problems. Music wire, which was used extensively, was not originally of the best alloy for magnetic recording. Results were weak and noisy, and crosstalk resulted from adjacent turns

°°*Soundscriber.*

STEREO PREAMPLIFIER designed to work with two basic high power amplifiers. Features two independent channels for each of 5 inputs with a ganged selector, turnover, roll-off, volume, bass and treble controls. Function switch is included to enable channel A or B to be used as a monaural preamp driving both power amplifiers when no stereophonic program source is available. Self powered with dc filaments.—Model 208; Grommes, Division of Precision Electronics, Inc., 9101 King Street, Franklin Park, Ill. [SERVICE]

of wire magnetizing each other when wound on the spool.

In addition, there was the problem of hysteresis—that quality of ferrous metal which results in the magnetic field in the metal being non-linear with respect to the current which magnetized it. Actually, in recording magnetically, there is a medium ground, limits within which a good recording can be obtained.

To keep the recording current within these boundaries, a *bias* current is used in the recording head. This may be direct current of a value sufficient to keep the recording out on the smooth part of the curve. In a sense, it might be said that the voice currents ride on top of the direct current —run up and down the slope—but are prevented from going out on the points.

Alternating current may also be used for this purpose. When *ac* is used, a supersonic frequency is frequently chosen so that it will not be heard in the playback. Frequencies in the order of 0 to 40 kc are used for this purpose. Due regard must be given to the possibility that modulation effects may cause pickup of nearby radio transmitters if the wrong frequency is used.

Ordinarily, an *ac* bias voltage will not produce modulation. In fact, it should be distinctly understood that the 30-kc voltage is not a carrier. Both the supersonic and the voice voltages are present together in the circuits of the recorder, but modulation is not intended for proper operation, although it may occur if non-linear elements exist in the equipment.

The bias arrangement, whether *dc* or *ac*, can also be used to erase recordings previously made on magnetic media.

[To be Continued]

TRANSISTORIZED, battery-operated power megaphone said to have an effective range of up to three-quarters of a mile. Six flashlight cells drive a six-transistor amplifier to provide 15 watts output.—Power-Voice; Motorola, Inc., 4545 W. Augusta Blvd., Chicago 51, Ill. [SERVICE]

Service Notes

(*Continued from page 27*)

shorting them together. The shorts can be classified as either hot or cold; the hot short being the one that occurs when the tube is warmed up, and the cold short the type that persists even when the tube is cold.

The following steps should be followed to remove a G_1, K short:

The neck should be tapped several times with a rubber-cushioned rod and checked with an ohmmeter to see if short persists. If short persists, the first step should be repeated several times. If the short still persists the tube should be placed in a face-down position on a surface that will not scratch the face plate and the neck tapped again. One should check again with an ohmmeter to see if elements are still shorted. If they are still shorted, the foregoing step should be repeated several times. If the short still persists one should then try to burn out the particle.

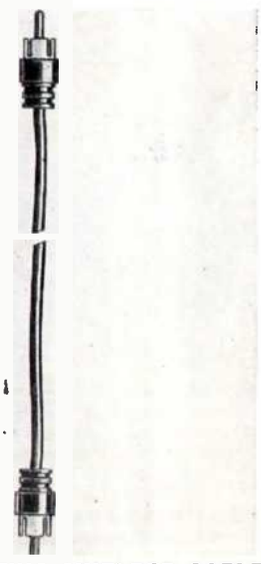
An 8 to 12-mfd capacitor, charged to 300 - 400 volts, should be discharged through the G_1, K short to burn out the particle. The negative side of the capacitor should be connected to the G_1 and the positive side to the cathode.

When a hot short is encountered, the tube should be warmed up before burning out the particle. In the case of a bad short caused by a loose cathode, it may be impossible to remove the condition. In some cases, the short may clear up momentarily, but will return again.

Particles lodged between elements in the gun other than the G_1 and K, may cause arcing between them at low voltages. One should tap the tube as recommended and check for arcing by applying normal voltages between the grids.

---

‡*From a field report by Walter J. Cerreny, Hickok Electrical Instrument Co.* °*From notes prepared by RCA Service Co.*



INTERCONNECTING SHIELDED CABLE for replacements, as well as original installations. Lenite terminations are molded on and grooved for easy-gripping.—Lab-Tronics, Inc., 3656 N. Lincoln Ave., Chicago 13, Ill. [SERVICE]

Audio

(*Continued from page 20*)

amplifier drives the monitor speaker from its push-pull output. A feedback winding on the output transformer *ac* balances the stages. A full-wave 5Y3GT rectifier furnishes the B+ and filament power to the stereo channel through a plug connector. Filaments are all operated from a 12-*v* winding, center-tapped to ground.

In the *aural-balance remote control* are 1-mfd coupling capacitors which pass the low frequencies. The master volume for each channel is mechanically linked, as is the balance control.

In each half of the speaker sound system is a woofer, mid-range speaker, and a tweeter providing 16-watts of output.

PHONO CARTRIDGE, with 3- to 6-gram tracking force, using a moving magnet principle designed for record changers and transcription tone arms. Magnet turns on a vertical axis; needle tip is placed at end of a light metallic beam, providing low needle point mass. Cartridge can be used with amplifier having a magnetic phono input. Supplied with a 1-mil diamond needle for microgroove or a 2.7-mil sapphire needle for 78 rpm records. — Professional Dynetic; Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. [SERVICE]

12-WATT AMPLIFIER with built-in preamp, which features inverse feedback circuit, separate bass and treble controls, tone compensated loudness control, record compensator and auxiliary tap, phono input jacks for ceramic, crystal and reluctance pickups, built-in auxiliary input jack for AM-FM tuners or tape recorders, multi-speaker output taps for impedance matching for 4, 8 and 16 ohms. Uses two 6AQ5s, two 12AX7s and one 5Y3.—Model Q1500PA; Dynamic Electronics-New York, Inc., 73-39 Woodhaven Blvd., Forest Hills, L. I., N. Y. [SERVICE]

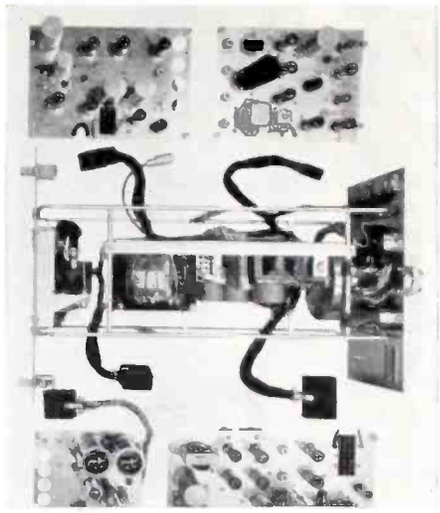


FIG. 1: CLOSED-CIRCUIT-TV plug-in equipment for black and white pictures.

Closed-Circuit TV Controls

CLOSED-CIRCUIT TV control units, which normally can be mounted anywhere within 500′ of the camera may be considered the heart of a *c-c* chain, as it controls the camera; it may also control the monitor and in all cases supplies the video information to the monitors.

The control unit° consists of six separate parts. There is the main frame which contains a germanium-diode power supply; *dc* voltages are supplied from this unit to the camera, and a sub-chassis of the control unit.

A sync sub-chassis of the control unit generates the sync pulses for the entire chain; the sync voltages originate with a 31.5-kc oscillator. Provisions are made to tie this oscillator through an *afc* circuit to the line voltage, where the line voltage is a constant 60 cps. The vertical drive pulses occur 60 times a second. The timing pulses are obtained by dividing the constant 31.5-kc oscillator output by 25 and a second time by 21. The horizontal drive pulses occur 15,750 times a second and are obtained by dividing the output of the 31.5-kc oscillator by two.

A sweep sub-chassis of the control unit develops horizontal and vertical sweep sawtooth voltage for the vidicon, clamp pulses, circuits for horizontal and vertical blanking, focus current regulation and a sweep-failure protection circuit; this circuit insures against vidicon damage or burning should the vidicon sweep circuits fail.

A video processing sub-chassis of the control unit provides video amplification from the camera preamplifier and the video blanking and clamping circuits. This chassis also has the *rf* oscillator and modulates the *rf* carrier with video.

The final sub-unit of the control unit is the control panel which contains the external operating controls. They are the focus, target, beam and gain and are the only control and camera adjustments that are used once the chain has been set up.

The monitor, while it contains its own vertical and horizontal sync circuits, may be switched to external control and be controlled by horizontal and vertical pulses from the control unit. All sync voltages and video voltages are terminated in a 75-ohm load. Each monitor has a video input and output jack. A second monitor can be bridged from the first, a third from the second until the final monitor. The output of the final monitor is terminated in a 75-ohm output. When a normal TV receiver is used as a monitor, the 75-ohm output is matched to the common 300-ohm input by a matching transformer.

As in any industrial electronic product, there are many options such as remote lens control, camera switchers, video switchers, and other devices to permit a wide range of product applications.

°*In a* **G. E.** *closed-circuit system.*

Service Engineering

(*Continued from page 26*)

techniques are added. Ignition noise hurts DSB to about the same degree.

A transmitter is essentially an amplifier that provides a high level *rf* output. A stable signal source is amplified sufficiently to provide the desired output level. In general the higher the stability requirement, the lower the power available at frequency determining source. This is a logical observation provided that physical volume is held constant. With higher power there is more localized heating of the circuit components and this in turn places greater stress on the components. Aside from requiring that we start the transmitter signal at low power level, high stability specifications normally require operating the source at a relatively low frequency.

There are three popular approaches to filling *amplifying* requirements. The multiplier technique is most common; multipliers may double, triple, quadruple, etc., limited only by consideration of attenuation of spurious signals and resultant power gain. Assuming a ±0005% stability the power in the frequency source must be in the order of 2 milliwatts. This is, of course, a highly non-linear system and can be used only for FM and high-level modulation AM.

Another is the closed-loop technique wherein the *pa* is an oscillator which is controlled by a feedback system using a stable frequency source and *afc* to maintain frequency. Such a system is readily usable on FM and perhaps on AM, limited only by the performance of the oscillator when modulated.

A third popular method of signal amplification and frequency multiplication would be the frequency conversion technique. This approach involves the use of mixing devices and circuits to generate higher frequencies without excessive non-linearities or distortion. Being a linear system it can be used for SSB and, of course, for AM and FM. When used for SSB, high stability oscillators will be required and the frequency source power levels would have to be lowered to the 50-milliwatt level.

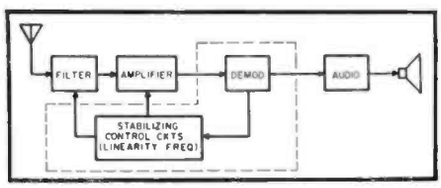


FIG. 3: BASIC 2-WAY receiver block diagram.

CATALOGS—BOOKS

PHILCO ACCESSORY DIV., Philadelphia 34, Pa., has issued a 1958 *Appliance Parts and Accessories Catalog* covering major service replacement items. Parts are listed by product model numbers and are cross-referenced to show different models on which a given part is used. Also included are complete lists of parts with part numbers, description, service substitutions and suggested retail prices. Data covers Philco refrigerators, freezers, air conditioners and electric ranges produced in the last ten years. [SERVICE]

° ° °

CBS-HYTRON, Advertising Service, Parker St., Newburyport, Mass., has released a revised illustrated tool catalog, PA-6, with information on printed-circuit soldering aids, tube-and-tool caddy, solder dispenser and refills, wax-up pick-up stick, 4-way tool, tube tapper, tube lifter, tube puller, test adapters, pin straighteners and probing tweezers. [SERVICE]

° ° °

B & K MANUFACTURING CO., 3726 N. Southport Ave., Chicago 13, Ill., has published a 4-page catalog sheet with information and specifications on a portable video and audio generator, dynamic mutual conductance tube and transistor tester, picture tube rejuvenator-tester, test equipment calibrator and shorted turns indicator. [SERVICE]

° ° °

RAYTHEON MANUFACTURING CO., 55 Chapel St., Newton 58, Mass., has announced a diode interchangeability chart listing a total of more than 1000 diodes. More than 400 Raytheon replacements are listed. [SERVICE]

° ° °

UNIVERSITY LOUDSPEAKERS, INC., 80 S. Kensico Ave., White Plains, N. Y., has released a brochure covering its *Progressive Speaker Expansion* plan. Includes complete descriptions, illustrations and prices of speakers, networks and enclosures. [SERVICE]

° ° °

CHICAGO STANDARD TRANSFORMER CORP., 3501 W. Addison St., Chicago 18, Ill., has published a 100-page replacement guide, STV-8, devoted to TV replacement transformers including flybacks, yokes, vertical outputs, audio outputs, filter chokes, focus coils, horizontal blocking oscillators, horizontal-deflection outputs, and linearity coils and others. Covers more than 7000 models and chassis of 98 manufacturers. [SERVICE]

° ° °

COYNE ELECTRICAL SCHOOL, Chicago, Ill., has issued a 700-illustrated book on *Pin Point Record Changer Troubles in 5 Minutes* by *P. Sheneman*. Book utilizes a new technique for servicing record changers in the field. Illustrations are used in conjunction with a check-chart method. Models are arranged alphabetically by manufacturer. Specific cures are offered for mechanical and electrical troubles in record changers made during the past ten years. Price $4.95. [SERVICE]

TEST INSTRUMENTS

LEAKAGE CHECKER

A TUBE AND CAPACITOR-leakage checker, LC3, featuring a filament testing portion, positive test on heater-to-cathode leakage for series-filament TV receivers, picture tube socket for testing tubes in cabinet and a replaceable roll chart, has been introduced by Service Instruments Corp., 171 Official Road, Addison, Ill.

Unit, which tests 130 types, has a leakage sensitivity of 100 megohms for test from control grid to any other tube element and for conventional capacitor leakage tests. Rejects leakage of 50,000 ohms or lower between cathode and heater and also for electrolytic capacitor tests. Capacitors are checked with voltage applied. [SERVICE]

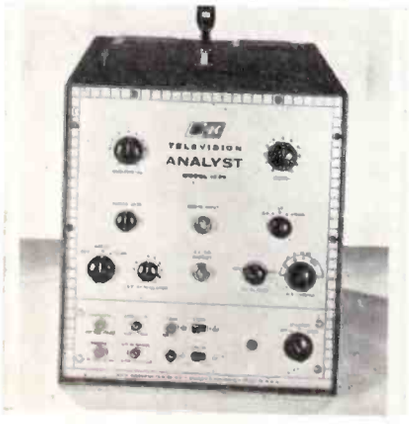
o o o

SIGNAL-INJECTION DIRECT-VIEWING TV ANALYST

A SIGNAL-INJECTION direct-viewing TV analyst, 1075, with point-to-point signal injection and test pattern reproduction for troubleshooting and signal tracing *rf*, *if*, video, audio and sweep sections of b-w and color-TV receivers, has been developed by B&K Manufacturing Co., 3726 N. Southport Ave., Chicago 13, Ill.

Generated test pattern allows condition to be viewed directly on picture tube screen. Supplies complete *rf* and *if* signals with video and audio modulation. *RF* sensitivity and *agc* settings of receivers can be checked. Provides composite signal, sync positive and negative; also separate horizontal and vertical driving pulses for troubleshooting deflection circuits, a 4.5-mc sound channel, FM modulated from a built-in 400 cycle tone generator, or from external audio source.

Unit also allows signal tracing of circuits in color-TV sets. [SERVICE]



VOM'S

Two VOMS, 630-PL and 630-APL, with clear unbreakable shadowless fronts and wide-spread scales, have been announced by Triplett Electrical Instrument Co., Bluffton, Ohio.

Units feature 5 to 500,000-cps response on *ac*, continuous resistance reading from .1 ohm to 100 megohms, polarity reversing switch, single switch to select both circuit and range, and voltage scales reading by 10's (2.5-10-50-250-1000-5000). [SERVICE]

ACCESSORY DISPLAYS

RUBBER COAT SPRAY, a rubber coating that can be sprayed from a can, developed by Electronic Chemical Corp., 813 Communipaw Ave., Jersey City, N. J. Spray is said to produce insulation and protection for TV, radio, FM, auto wiring and antennas; it is non-inflammable and contains no plastic.

SIXTEEN-DRAWER cabinet containing an assortment of 200 steatite tubular capacitors rated at 600 volts in 16 popular values supplied to Service Men with each stock package order by Arco Electronics, Inc., 64 White St., New York, N. Y. [SERVICE]

COUNTER DISPLAY for ATR electronic tube protector. Carton carries nine ATR Model 250 wall protector and three ATR 300 floor models. [SERVICE]

B-W TV CORRESPONDENCE COURSE

A CORRESPONDENCE COURSE on *b-w* TV servicing for independent radio and TV Service Men has been announced by Sylvania Electric Products, Inc.

Course material, prepared by the Radio Television Training Association, features 12 lessons covering all aspects of convergence, purity, circuitry and associated fields. Examination sheet supplied with each lesson; corrected lessons returned with an explanation of errors.

Course is available through the purchase of Sylvania receiving and picture tubes. [SERVICE]

ACCESSORIES

DC POWER SUPPLY KIT

A DC POWER supply kit, K-612T, utilizing the same circuit design, patented conduction cooling and components used in the D-612T power supply, has been announced by the Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill.

Unit is said to have ample regulation to operate solenoid tuning controls in newer auto radios. Also can be used to operate and service marine radios, phone circuits, fans, low voltage *dc* accessories and model train systems.

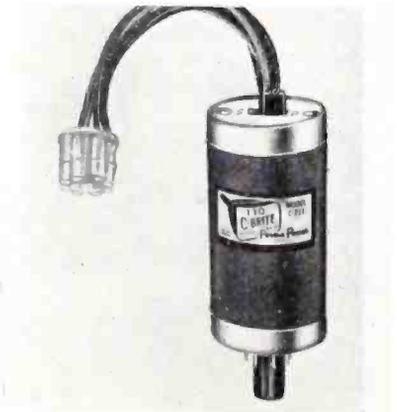
Provides two continuously variable voltage ranges—0-8 and 0-16 *v* with 10 amps continuous duty up to 12 *v*; *dc* at potentials up to 16 *v* for battery charging, electroplating and lab work in schools and industry. Will supply up to 21 *v* for transistor portable-radio loads. Ripple is said to be .1% for low current loads required to service transistor portable radios; less than .5% ripple up to 5 amps. [SERVICE]

° ° °

110° TUBE BRIGHTENERS

Two 110° TUBE brighteners, C-211 (for use with button-base types) and C-221 (for use with shell bases), have been announced by Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill.

Brighteners operate on series or parallel-wired filament circuits, as required, by setting a selector switch; they are autoformer types, giving a full 7.8 *v* output. [SERVICE]

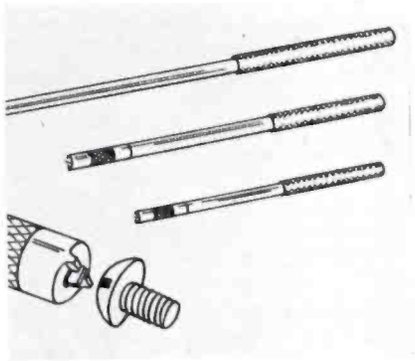


BENCH-FIELD TOOLS

NYLON HANDLE SCREW STARTER

A NYLON-HANDLE screw starter, featuring a mechanism which grips screwhead so it cannot drop, has been announced by Owatonna Tool Co., Cedar St., Owatonna, Minn.

Unit is said to be extremely useful in hard-to-reach places carrying shock voltage. Available in three lengths: 2½", 6" and 9". [SERVICE]



° ° °

TUNER/VOLUME CONTROL CLEANER

A TUNER and volume control cleaner, *Mute*, that it is said can be used while set is in operation, has been announced by Electronic Solvents, Inc., 170 N. Park St., East Orange, N. J.

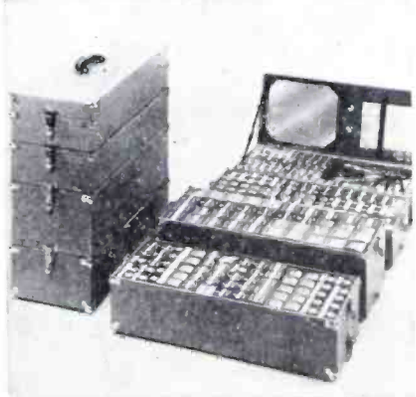
Tonic is claimed to eliminate dirt and oxidation with no danger of detuning. Available in 6-ounce spray can and 8 and 32-ounce spout cans. [SERVICE]

° ° °

TUBE-TOOL ACCESSORY CARRIER

A TUBE, TOOL and accessory carrier, *Totemaster*, composed of four interchangeable box sections of various sizes and a carrying top, has been developed by Mastra Co., 2115 Superior Ave., Cleveland 14, Ohio.

Sections can be locked together into one unit or tailored to any convenient size for a service call. Entire unit contains more than 4000 cubic inches and can carry 360 popular sized tubes in addition to tools and accessories. Detachable carrying top has a non-distortion mirror for TV alignment, built-in 7- and 9-pin straighteners, strap holder for order book or schematics and an adjustable web to hold cover at any angle. Heavy duty pull catches and corner protectors are used. [SERVICE]



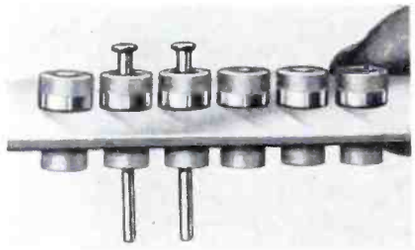
COMPONENTS

HIP-MOUNTING FEED-THROUGH CAPACITORS

HIP-MOUNTING CERAMIC feed-through capacitors, *CFT*, featuring a ridge which holds insertion of capacitor in chassis hole to a fixed uniform distance, have been developed by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Units measure ⅜" long with protrusion from chassis plane of 9/64" for larger-diameter end and less than 15/64" for shank end, depending on chassis thickness. Diameters of head and shank ends are 7/32" and .187", respectively. Electrode is hot-solder coated.

Feed-through hole (.062" min.) accommodates wires up to No. 15 AWG. Ends are cupped and solder-coated. *Dc* working voltage is 600 *v*; available in values from 4.7 to 1000 mmfd. [SERVICE]



o o o

AXIAL-LEAD SILICON RECTIFIERS

AXIAL-LEAD SILICON rectifiers, *K*, which can be operated at 750 *ma* to 55°C with no heat sink, have been developed by the rectifier division, Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.

Units incorporate an environmental seal with epoxy resin. Polarity is identified by color-coded resin at each end. Voltage ratings are 100, 200, 300 and 400 *v* peak inverse. [SERVICE]

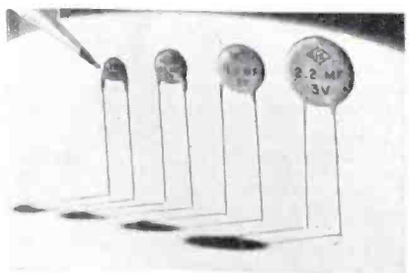
o o o

HIGH-CAPACITY CERAMIC CAPACITORS

CERAMIC CAPACITORS, *Ultra-Kaps*, with capacitance up to 100 times previously available, have been announced by Centralab, 900 East Keefe Ave., Milwaukee 1, Wis.

Units have been designed primarily for transistor circuit applications.

Four standard values, .22, .47, 1 and 2.2 mfd, are now being stocked; rated at 3 *vdcw*. Range in diameter from ¼" to ¾". Described in Centralab bulletin 42-488.



TV Antennas

(*Continued from page 28*)

Next let us compare the performance of a good TV receiver:

Channel	Frequency (mc)	Sensitivity (Noise figure-db)	Difference
5	79	5	0
10	195	9	− 4
45	659	17	−12

Thus the receiver performance itself is down considerably at the higher frequencies.

Finally, let us combine the data on antennas, transmission line and receiver, using a *practical* figure for the transmission line (half way between *dry and clean* and *dirty and wet*):

Channel	Frequency (mc)	Difference in db: Antenna	Line	Set	Total
5	79	0	0	0	0
10	195	− 7.8	−2.2	− 4	−14
45	659	−18.4	−9.8	−12.0	−40.2

This difference is startling indeed, and it is because of this situation that higher transmitter powers, higher receiving antenna gains and better transmission lines are required at *uhf*. To evaluate how much the situation can be improved, let us assume that the effective radiated power on channel 5 is 15 *kw*, that on channel 10 it is 30 *kw*, and that on channel 45 it is 200 *kw*. Let us further assume that the receiving antennas are well chosen for each channel and are now different, with gains of 3, 7 and 12 db, respectively. Finally, let us assume that very good 276-ohm open wire lead is used. The overall result will then be:

Channel	5 (reference)	10	45
Transmitter (db)	0	+3	+11.3
Receiving ant gain (db)	0	+4	+ 9
Receiving ant eff length (db)	0	−7.8	−18.4
Line (db)	0	− .2	− 1.1
Receiver (db)	0	−4	−12
Total (db)	0	−5	−11.2

Florida Plant

MERIT PLAZA, Hollywood, Florida, site of the new plants, warehouses and executive offices of the Merit Coil and Transformer Corp. [SERVICE]

ADVERTISERS IN SERVICE
MARCH, 1958

	Page
American Television and Radio Co.	1
Arco Electronics, Inc.	35
Argos Products Co.	48
Atlas Sound Corp.	33
B&K Manufacturing Co.	29
Blonder-Tongue Laboratories, Inc.	24
British Industries Corp., Multicore Sales Corp. Div.	46
Bussmann Manufacturing Co.	4
Centralab, A Div. of Globe-Union, Inc.	3
Channel Master Corp.	21
Cleveland Institute of Radio Electronics	41
Communications Co., Inc.	38
Cornell-Dubilier Electric Corp.	42, 43, 44, 45
Coyne Electrical School, Educational Book Publishing Div.	47
DeRO Electronics	46
Duotone Co., Inc.	37
EICO	2
Erie Resistor Corp.	34
General Cement Manufacturing Co., Div. of Textron, Inc.	33, 39, 47
General Electric Co., Specialty Electronic Components Dept.	9
Heath Co.	40
Injectorall Co.	46
Jensen Industries, Inc.	33
Kester Solder Co.	36
Ohmite Manufacturing Co.	39
Perma-Power Co.	48
Radio Corporation of America, Electron Tube Div.	25, Back Cover
Raytheon Manufacturing Co.	16
Recoton Corp.	34
John F. Rider Publisher, Inc.	37
Service Instruments Corp.	46
Sonotone Corp.	32
Sprague Products Co.	8
Sylvania Electric Products, Inc.	12, 13
Tobe Deutschmann Corp.	42, 43, 44, 45
Triplett Electrical Instrument Co.	Inside Back Cover
United Catalog Publishers, Inc.	39
University Loudspeakers, Inc.	11
Waage Manufacturing Co.	47
Walsco Electronics Manufacturing Co.	31
Wen Products, Inc.	Inside Front Cover
Westinghouse Electric Corp., Electronic Tube Div.	10
Weston Electrical Instrument Corp., A Subsidiary of Daystrom, Inc.	30
Winegard Co.	5
Xcelite, Inc.	36
Zenith Radio Corp.	6, 7

Signs and Clocks for Service Shop

INDOOR CLOCK - SIGN, outdoor sign, flange sign and electric clock designed for the independent Service Man by CBS Hytron. Indoor clock-sign features interchangeable 5" type; outdoor sign highlights shop's name on both sides; double-faced enameled flange sign can be used indoors or outdoors. Signs and clocks are available through CBS tube distributors.
[SERVICE]

Servicing P-W Boards

(*Continued from page 25*)

formers, *res-caps*, modules, sockets, etc., is by slow heating and prying, a little at a time, each lug until finally they are all free. Not only is this a lengthy procedure, but the danger of breaking or otherwise damaging a component is always present. With a correctly-designed temperature controlled soldering pot, the component can be removed without damage to component or board, the latter being important where a defective component is being replaced on a good board.

In some few cases, it may be found that the spacing of the mounting lugs of a large component may cover an area greater than can be accommodated by the soldering pot. In such cases, it is best to dip as many lugs as can be fitted in at one time, at the same time gently lifting the same end of the component. As soon as the lugs loosen, permitting a slight movement out of the board, these lugs should be withdrawn and the remaining lugs dipped using the same procedure, alternately until the part is freed. Do not exert too much pressure. It is better to effect removal slowly than risk damage.

Tube News

(*Continued from page 31*)

offset is good only for one geographical location and orientation of the tube.

There is a certain amount of built-in shielding when the tube contains a steel frame or mask; the 21CYP22 is an example of this type. A steel frame, in fact, attenuates the field within the tube to a much greater extent than one would expect, particularly if it is degaussed in the position in which it is to be used. This degaussing in place, (or *regaussing* as it has been called) is important if maximum effectiveness is to be attained from a steel shield of any kind.

PERSONNEL

LEWIS J. SHIOLENO has been appointed general manager of the electronics division of Erie Resistor Corp., 644 W. 12th St., Erie, Pa.


Shioleno


Warden

ARCH WARDEN has been named a vice president of Xcelite Incorporated, Orchard Park, N. Y. Warden will also continue his duties as sales manager. . . . *A. J. Holmes* who joined Xcelite in 1957 has been named assistant sales manager.

o o o

FRANK I. LESTER has been promoted to sales manager of communications equipment, Hammarlund Manufacturing Co., Inc., 460 W. 34th St., New York 1, N. Y.

o o o

WALTHER H. FELDMAN, president and a director of the Worthington Corp., has been elected a director of Tung-Sol Electric, Inc.

o o o

WESLEY E. WOOD has been named district sales manager, New York metropolitan area, for the television tube division of Allen B. DuMont Laboratories, Inc., 750 Bloomfield Ave., Clifton, N. J.

o o o

JOHN R. WAGENSELLER, formerly manager of personnel for the RCA Semiconductor Div., has been appointed manager, Services, Marketing Department.

o o o

W. HERBERT LAMB, and *Walter A. Weiss* have been named vice presidents of TV picture tubes and radio tubes, respectively, of Sylvania Electric Products, Inc.


Lamb


Weiss

o o o

KENNETH G. BUCKLIN has been promoted to manager, engineering, receiving tube operations, RCA Electron Tube Div., Harrison, N. J. . . . *George J. Janoff* is now manager, market planning, entertainment receiving tubes, for the division.

o o o

JAMES M. TONEY has been appointed vice president and general manager of the RCA Victor Television Division.

o o o

THOMAS B. ALDRICH has been appointed industrial sales manager of Rockbar Corp., 650 Halstead Ave., Mamaroneck, N. Y.

Burton Browne Advertising

NEW TRIPLETT MODEL 630-PL | $44.50 net

new... most easy to read

- Clear, unbreakable, shadowless front for instant wide vision.
- 5 to 500,000 cps on A.C.
- Continuous resistance reading from 0.1 ohms to 100 megohms.
- Polarity reversing switch.
- *Only one* (king-sized) switch selects both circuit and range —minimizes wrong settings, burnouts.

Only Triplett affords you such a wide choice of VOMs. Whatever your application—broad or limited—there is a Triplett VOM particularly suited for it.

the mighty nine + two

TRIPLETT ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO

You're in the spotlight for the

BIGGEST SHOW OF ALL TIME!

RCA offers every TV service-dealer a "front-row-center" ticket to a service-selling program! You are the "star" in this big performance:

☆ National Television Servicemen's Week—
and you can win valuable prizes in the exciting
RCA "Mystery Shopper" contest!

4th Annual NTSW March 24-29, 1958!

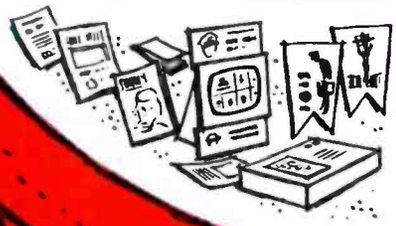
"National Television Servicemen's Week"—"showing" for the 4th consecutive year in national magazines such as Life and TV Guide, television and radio commercials, nation-wide publicity...local newspaper advertising and special attention-getting displays and promotion kits—gives you the "star" billing.

Valuable Prizes Offered!

See the "RCA MYSTERY-SHOPPER CONTEST" ad appearing in other trade magazines this month. You can win one of 192 big awards. Every service-dealer who enters receives a gift, just for entering. Contact your RCA tube distributor for full details.

Attention Getters! Traffic Stoppers! Business Builders!

A dazzling "cast" of NTSW stickers, streamers, cards, displays, premiums, mailers, broadsides, signs of all kinds—all available through your RCA TUBE DISTRIBUTOR. See him *now!*



Never before in the history of the TV service-industry has there been such a tremendous "cast" of featured "players" to back up a "star" performer—you, the *independent TV service-dealer.*

Yes, RCA is putting you in the spotlight to help you • gain greater public recognition than ever before • build customer good-will • promote your skill and experience • merchandise your sales and service business.

Take a bow! You're the "star"! Contact your RCA TUBE DISTRIBUTOR *now* for full details!

RADIO CORPORATION OF AMERICA

Electron Tube Division — **Harrison, N.J.**