

ELECTRONIC TECHNICIAN

**Universal
Replacement
Transistors**

**Transistors in
Hi-Fi Equipment**

**Servicing Transistorized
and Hybrid Car Radios**

OCTOBER 1962

60¢

Tarzian offers

FAST, DEPENDABLE TUNER REPAIR SERVICE



ALL
MAKES

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\$850
INCLUDING

ALL PARTS
(EXCEPT TUBES)
and LABOR

24-HOUR SERVICE
1-YEAR WARRANTY

**Tuners Repaired on
Approved, Open Accounts**

**See your distributor, or
use this address for fast,
factory repair service**

It just makes sense that a manufacturer of tuners should be better-qualified, better-equipped to offer the most dependable tuner repair and overhaul service.

Sarkes Tarzian, Inc., pioneer in the tuner business, maintains a complete, well-equipped Factory Service Dept. —assisted by Engineering personnel—and staffed by specialized technicians who handle **ONLY** tuner repairs . . . on **ALL** makes and models.

Tarzian-made tuners received one day will be shipped out the next. There is a 12-month guarantee against defective workmanship and parts failure due to normal usage. And compare our cost of \$8.50 and \$15 for UV combinations. There is absolutely no additional, hidden charge for **ANY** parts except tubes. Replacements available at low cost on tuners beyond practical repair.

Tarzian-made tuners are identified by this stamping. When inquiring about service on other tuners, always give tube complement . . . shaft length . . . filament . . . voltage . . . series or shunt heater . . . IF frequency . . . chassis identification. All tuners repaired on approved, open accounts. Check with your local distributor for Sarkes Tarzian replacement tuners, replacement parts, or repair service.

SERVICE MANAGER • TUNER DIVISION • DEPT. 3A

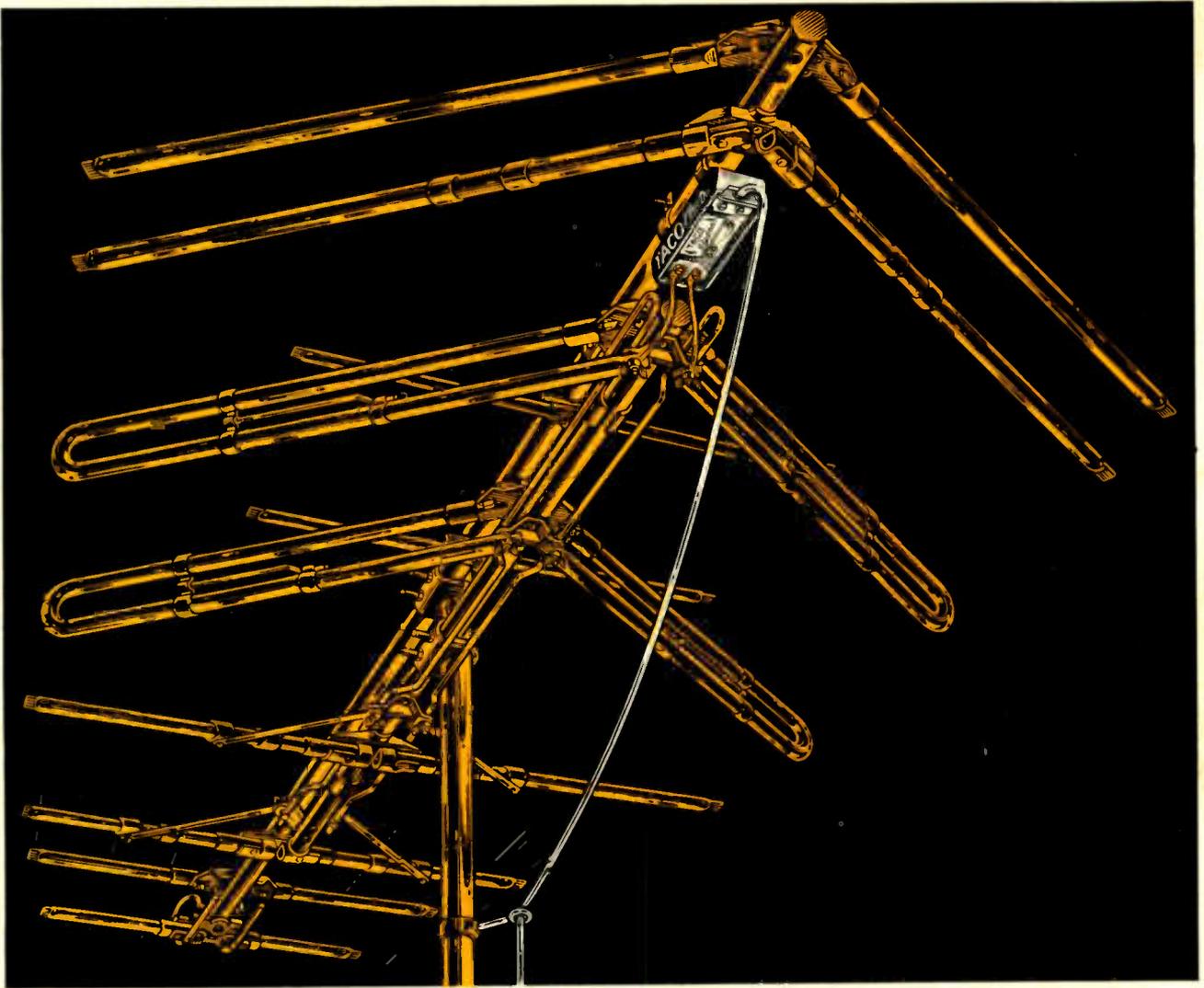


SARKES TARZIAN INC

*east hillside drive • bloomington, indiana
edison 2-7251*

MANUFACTURERS OF TUNERS . . . SEMICONDUCTORS . . . AIR
TRIMMERS . . . FM RADIOS . . . AM-FM RADIOS . . . AUDIO TAPE
. . . BROADCAST EQUIPMENT

TACO **T-BIRD** ELECTRA



HOTTEST- and TOUGHEST

Compare and you'll see why! →

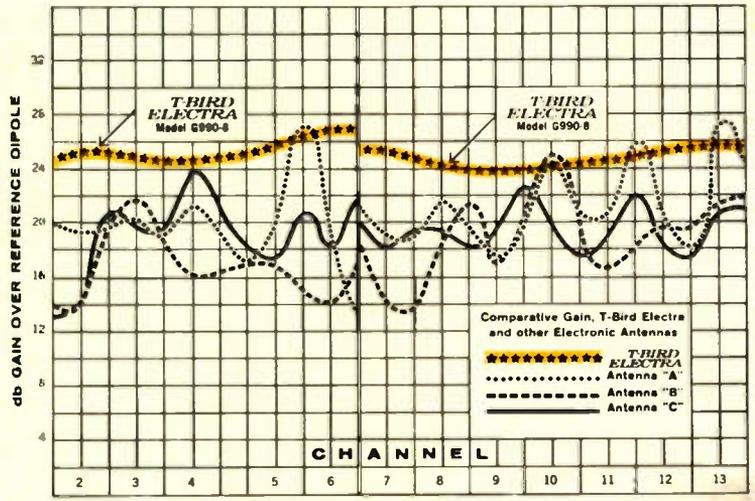
Besides being the most durable, note the almost flat response curve of the T-BIRD ELECTRA throughout the VHF band—no hills and valleys that cause smear and distortion in black-and-white, and disrupt optimum reproduction of color. T-BIRD ELECTRA delivers a strong, clean signal, free of element "junction noise" and gain flutter—a boon to black-and-white reception, a must for color!

Write for name of nearest distributor

TECHNICAL APPLIANCE CORPORATION

Dept. JTD-53, Consumer Products Division
Sherburne, New York

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THE JERROLD CORPORATION



... for more details circle 63 on page 50

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STAMPS
WHEN YOU

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SYLVANIA
RECEIVING
TUBES

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OF GIFTS
FOR YOU
AND YOUR
FAMILY
WHEN YOU
BUY
SYLVANIA
RECEIVING
TUBES

FOR THE
S&H
GIFT
ALOG
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S&H Green Stamps add up in a hurry when you buy Sylvania tubes. So does customer good will when you stay with Sylvania quality.

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SYLVANIA

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GENERAL TELEPHONE & ELECTRONICS



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ELECTRONIC TRADE
CIRCULATION**

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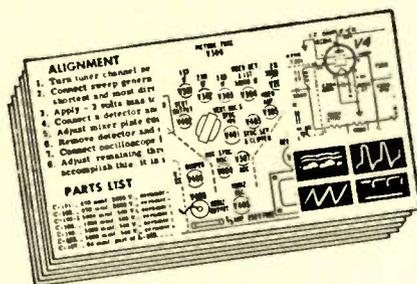
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CIRCUIT DIGESTS



PRECEDING BACK COVER

DELCO: Chevrolet Auto Radio, Model 985332

EMERSON: TV Chassis, Models 1800 and 2000 series

GAMBLE-SKOGMO: TV Chassis, Model TV17-9444A

MOTOROLA: Ford Auto Radio, Model C2AA-18806-M, -N and C2YA-18806-E

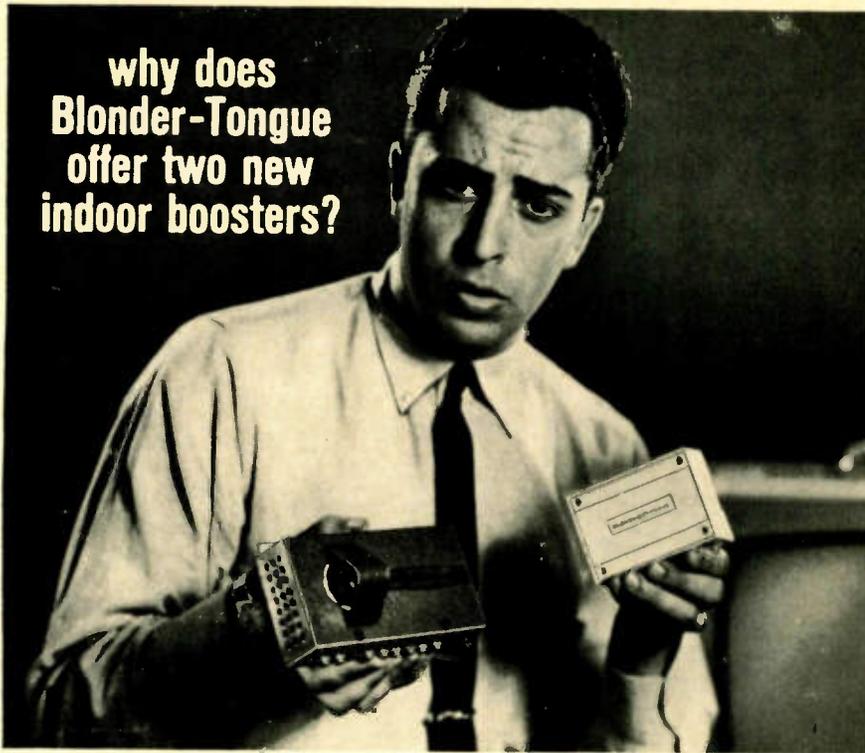
PHILCO: Remote Control Receiver, Model RC-65

RCA: Color TV Chassis CTC 12A, B, P, and R Models 213-G-21-M, -23-M, -23-R, -26-M, -27-M, -27-R, -31-M, -31-R, -33-M, and -33-R

SYLVANIA: Stereo Hi-Fi, Models 45C31-1, 55C31-1, and G9400

ZENITH: TV Chassis, 16K20 and 16K20Q5

**why does
Blonder-Tongue
offer two new
indoor boosters?**



Let's talk straight-from-the-shoulder about indoor boosters. Transistor boosters provide higher gain and are more rugged, but they have one problem—overload (windshield wiper effect, loss of sync, etc.). If you use a transistor booster in an area with one or more strong TV or FM signals — *you may be buying too much booster!* On the other hand, tubed boosters perform very well in these areas — and what's more, they cost less. That's why Blonder-Tongue has two new home indoor boosters — the transistor IT-4 Quadrabooster and the frame-grid tubed B-33 Amplicoupler.

The B-33 costs less than the transistor IT-4, \$19.95 as against \$29.95. In most cases, the extra cost of the IT-4 is more than justified by its remarkable performance and long life. However, if the B-33 can do the job, we don't want you to spend more than is necessary for the finest TV reception.

Which one is best for you? Try one, or both. They can be hooked up in seconds at the set terminals. Try them on all channels. With either an IT-4 or a B-33, you'll end up with the best TV reception possible.

BLONDER-TONGUE IT-4 TRANSISTOR QUADRABOOSTER • 4 to 8X increase of signal voltage for 1 set • improves reception on up to 4 TV or FM sets • long-life transistor • stripless terminals • exclusive neutralizing circuit minimizes overload. List \$29.95

BLONDER-TONGUE B-33 FRAME GRID AMPLICOUPLER • More than 2X increase of signal voltage for 1 set • Improves reception on up to 3 TV sets • Lowest price multi-set booster on the market. List \$19.95

indoor or outdoor • tubed or transistor • VHF or UHF • 1 set or 4 sets

BLONDER-TONGUE TV/FM BOOSTERS

MODEL AB-4-AC, Transistor Mast-Mounted TV/FM Booster w/remote AC power supply. Provides brilliant reception on up to 4 sets from a single antenna. Takes advantage of the optimum signal-to-noise ratio.List \$34.95.
MODEL AB-4 with remote battery power supply.List \$29.95.

MODEL B-24c, 4-set TV/FM Booster. Low cost home TV system uses rugged frame grid tube to power for as many as 4 TV or FM sets.List \$24.95.

MODEL BTA, TV Booster. Lowest cost booster on the market. Improves TV reception in prime or weak signal areas.List \$15.50

MODEL UB, UHF Booster. Brings in UHF where all other methods fail. 5 models cover all channels from 14 to 83.List \$93.50.

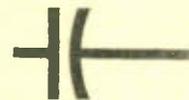
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BLONDER-TONGUE

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Canadian Div. Benco Television Assoc., Ltd., Toronto Export: Rocke Int'l, N. Y. 16, Cable: ARLAB
Home TV Accessories • UHF Converters • Master TV Systems • Closed Circuit TV Systems • CATV Systems
... for more details circle 17 on page 50

EDITOR'S MEMO



Fond Farewell

This is the last issue of **ELECTRONIC TECHNICIAN** of which I will serve as editor. I am leaving the magazine to participate in a venturesome new business undertaking.

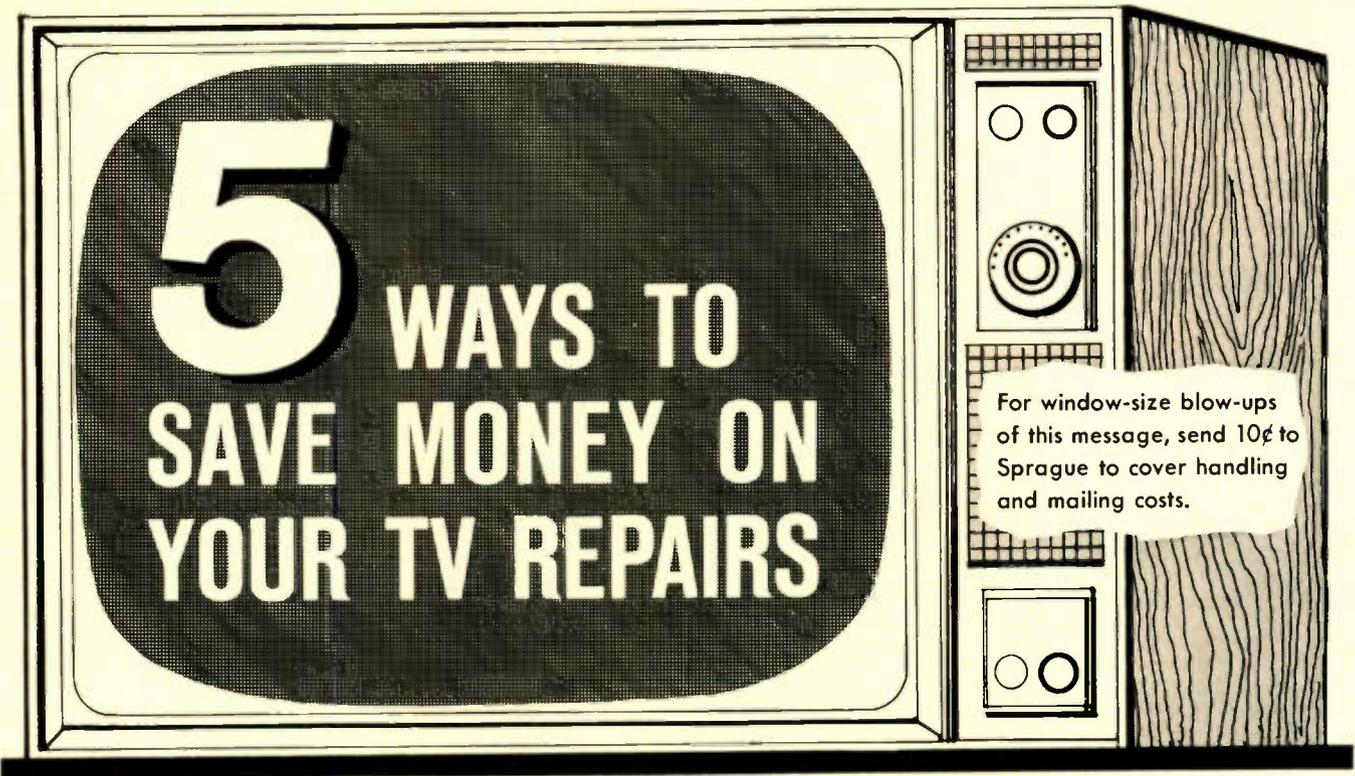
Though a swan song of this sort is likely to provoke a muttered chorus of "So what?" from many readers, I hope that some of the great number of friends I have been lucky enough to make will feel a mild twinge of regret. Certainly, my own personal regret is great. Bustling about the country for the past decade, pad and pencil at the ready, I have had the pleasure of meeting a wide variety of personalities. From almost every one of these people, and from the still larger number with whom I have corresponded, I have had the satisfaction of learning.

A sad part of leave-taking is parting with the close friends and associates on the magazine, all of whom will remain on the staff. I will miss them, particularly my long time partner, Howard Reed, publisher of **ELECTRONIC TECHNICIAN**. Howard and the editors — the best in the business, as far as I'm concerned—will no doubt continue to spare no effort to serve you with the best publication possible. I am gratified to leave you in such capable hands.

To readers and staff both, my sincere wishes for your personal fulfillment and business success.

Farewell!

Al Forman



5 WAYS TO SAVE MONEY ON YOUR TV REPAIRS

For window-size blow-ups
of this message, send 10¢ to
Sprague to cover handling
and mailing costs.

- 1 DON'T BE A "SCREWDRIVER MECHANIC."**

Every year, hundreds of "do-it-yourself-ers" damage or ruin their sets, pile up needless expense, and endanger their safety by trying to make their own TV repairs. Your TV is the most intricate piece of equipment you've ever owned—far more complicated than your car! If you're tempted to tinker with it, DON'T! Guesswork is much too costly.
- 2 LEAVE YOUR TV REPAIRS TO A "PRO."**

Years of training and experience make the TV technician an expert. He has repaired hundreds—perhaps thousands—of TV sets. He spends countless hours and hundreds of dollars on manuals, keeping up-to-the-minute on new developments, circuits, trouble-shooting techniques. He is qualified in every way to diagnose TV trouble accurately—cure it quickly and safely.
- 3 DON'T LOOK FOR SERVICE "BARGAINS."**

There aren't any! Cut-rate prices mean cut-rate methods and cut-rate parts in your TV set. And these lead to unsatisfactory set performance, probable damage, and additional costly repairs. The expert TV technician charges a fair price for honest service. He can't afford special deals and service "bargains" any more than you can!
- 4 CALL YOUR TV EXPERT AT THE FIRST SIGN OF TROUBLE.**

Don't wait for your set to go completely dead. Failure of one TV part sets up a chain reaction—other parts are damaged and repair costs pile up. Early attention prevents this and also makes it easier—and less expensive—to find and cure the trouble. To keep your repair costs low, call your TV technician when trouble *starts!*
- 5 TRUST YOUR INDEPENDENT TV TECHNICIAN.**

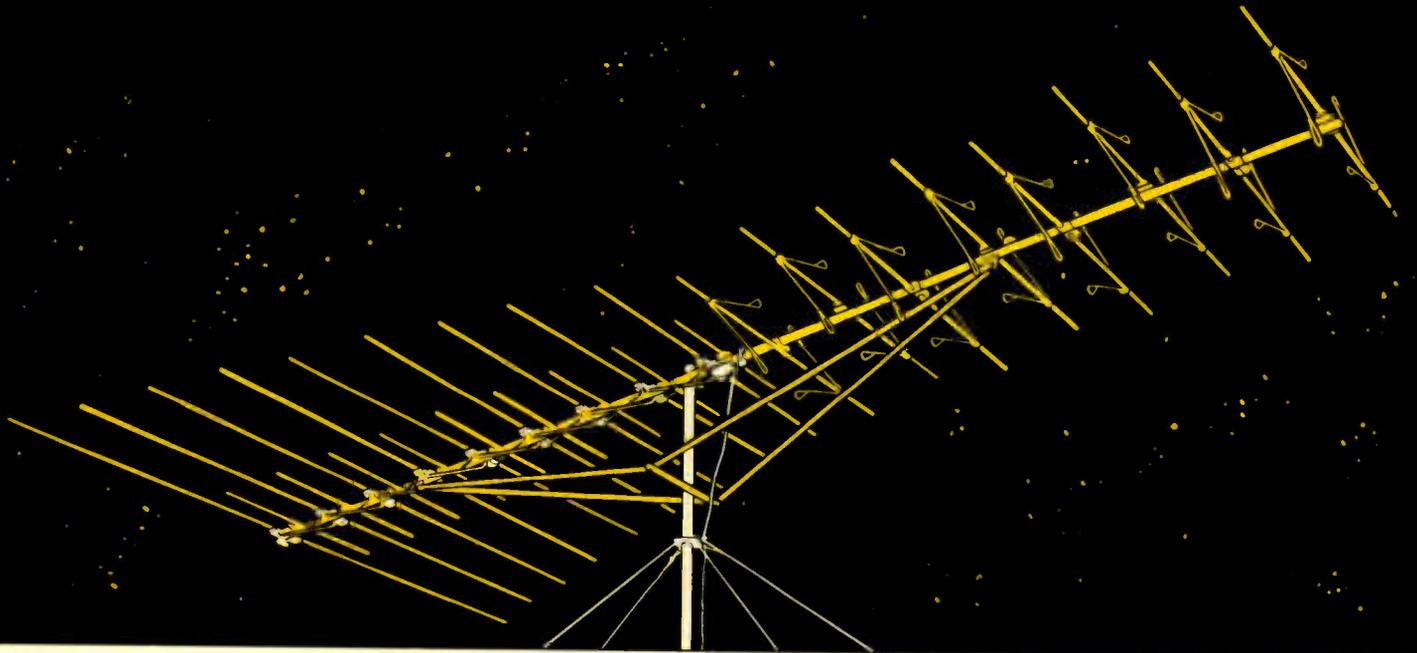
As a member of your community, he stakes his reputation on your continued satisfaction. His years of study and experience, his large investment in equipment, and the fact that *he's in business for himself* are your assurances of good work and honest prices. His first loyalty is to *you*—his customer.

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

YOUR NEIGHBORHOOD TV-RADIO TECHNICIAN

... for more details circle 61 on page 50

6 NEW SPACE- BY *CHANNEL MASTER*



All new Telstar Crossfire

Electronic Antenna combines unequalled performance of new Super-Crossfire Antenna with new built-in Telstar Booster

World's most powerful antenna features exclusive, advanced, new, TRI-BAND Director System for low band, high band, and FM. Gives lots more gain—plus tremendous added gain of Telstar Booster.

In the Crossfire Antenna, Channel Master gave you Proportional Energy Absorption—the most effective principle yet for achieving top picture power in picture-poor areas. Now, in the **Telstar Crossfire**, we've teamed this principle with two new exclusive developments—to make this far and away the most powerful antenna in the world.

Basically, the Telstar consists of our brand new Super-Crossfire—an antenna with a brand-new Director system. The TRI-BAND Director System—exclusive with Channel Master—enables each Director to receive low and high bands, and FM...on a single element. Thanks to a unique Phase Controller, each director—on the high band—functions as 2 half-wave co-linear elements with in-phase current distribution. In effect, **simplified** directors

make it possible to use more directors—for increased effectiveness. Result?

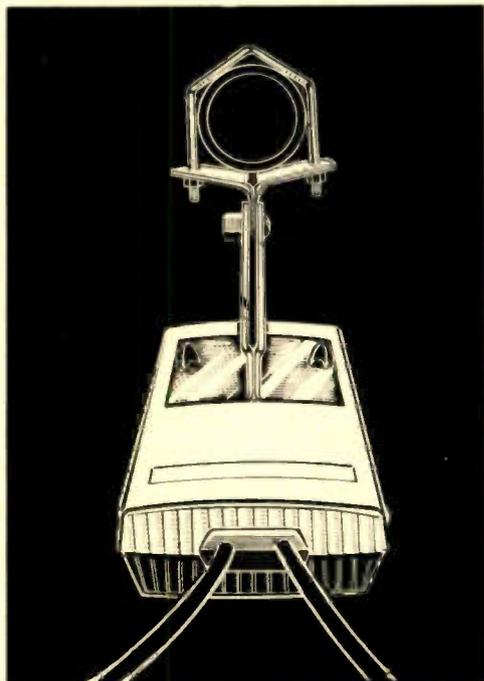
... In the Super-Crossfire Antenna (Model 3607... available separately)... you get up to 42% more gain than the 28-element Crossfire, plus the same high front-to-back ratios.

... In the Telstar Crossfire Antenna (Model 3606)... you get all the outstanding features of the Super-Crossfire... plus the extra-powerful gain and low noise-figure of the brand new Telstar Booster (see right). No other antenna even comes close.

- **Exclusive New!** Both Telstar and Super-Crossfire feature still another Channel Master first: New 2-way boom bracing... stops cross-arm bounce and horizontal wind-whip.
- **Exclusive!** All Channel Master outdoor antennas are fully protected against corrosion by E.P.C. "Golden Overcoat."

AGE TRIUMPHS

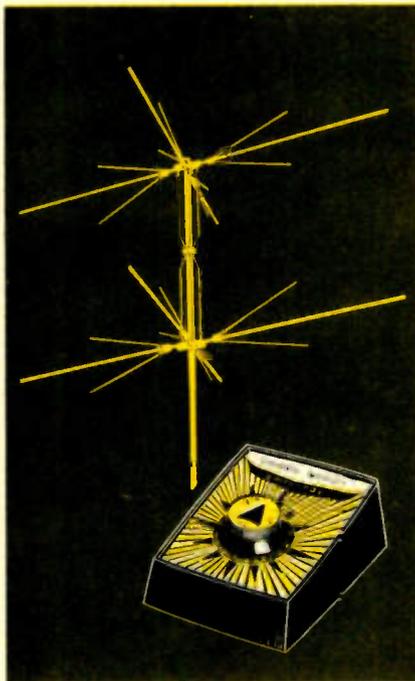
**BEST-PERFORMING OF ALL ANTENNAS AND BOOSTERS!
AND MOST PROFITABLE FOR YOU! BEST FOR BLACK-
AND-WHITE AND COLOR TV. FM STEREO, TOO!**



NEW **Telstar** BOOSTER-COUPLER *features peak-power plus lightning- resistant circuit!*

TV and FM Stereo get the biggest performance boost yet with a booster that is miles ahead of the "second best" booster. The Telstar Booster is especially engineered to pour more usable power than any other booster to 1, 2, 3, or 4 sets! The latest circuitry and advanced low-noise transistor result in highest gain and highest signal-to-noise ratios yet.

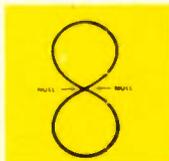
Lightning-resistant, too—because circuit utilizes the lightning rod principle to prevent transistor burnout caused by induced atmospheric lightning. Laboratory-tested by 250,000 lightning volts! Beautifully styled in blue-and-white. **Model 0023**



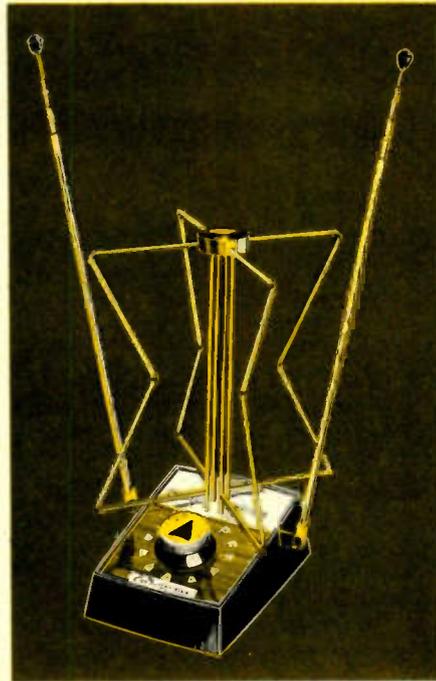
New **OMNI-RAY** TV/FM STEREO ANTENNA GHOST-KILLER EXTRAORDINARY!

A brand-new outdoor antenna with directivity electronically controlled by an indoor switch. (No rotator needed) • Stops ghosts and interference in metropolitan, suburban, and near-fringe areas. For Color TV, Black-and-White, and FM Stereo.

1. Perfect figure-8 reception pattern, electronically rotated in 22½ degree steps.
2. Deep side nulls: 10:1 rejection ratio.
3. "Aim the beams" for top power; "aim the nulls" for top ghost and interference rejection.
4. Special "Duo-Twin" Transmission lead prevents mutual coupling.



Your choice of: • Supersembled stacked antenna only • Complete kit, single bay • Complete kit, stacked



Handsome New **CANAVERAL**

FIRST INDOOR DIPOLE ANTENNA WITH TRUE ELECTRONIC CIRCUITRY.

Unique "Pix-Power" switch and impedance-compensating circuit give you these exclusive advantages:

1. On low band—resonates on all channels (even 2 and 3) by electronically lengthening or shortening elements—without need for manual dipole adjustment.
2. On high band—Greatly increases gain by functioning as 2 co-linear half-wave dipoles—without manual adjustment.
3. Has balanced system with 300-ohm impedance-matched output to eliminate standing waves.

Has the longest elements anywhere (96" tip to tip) for greater pull-in power.

Smartly-styled, with tremendous merchandising possibilities. **Model 3720**

NEW! Rechargeable **BRIGHT-MITE**®

The revolutionary tiny miracle light that outshines big flashlights. Powered by the Permanent Energy Cells that power the Satellites. Ask about our terrific Display Pack deal.



See your Channel Master distributor for literature on all these products.

... for more details circle 22 on page 50

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offers you the **GREATEST VALUE**
in **TUBE TESTERS**

TOP QUALITY • SPEED • ACCURACY • LOW PRICES
...sell more tubes—earn more money

a true **DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER**
for only **\$79⁹⁵**_{Net}



Model 1000
MUTUAL CONDUCTANCE TUBE TESTER

Tests for true dynamic mutual conductance (Gm)

Tests for shorts and leakage between any tube elements

Tests for gas and grid emission sensitivity over 100 megohms

Tests picture tubes

Here, for the first time is a true dynamic mutual conductance tube tester to sell for less than a hundred dollars... in fact it bears a price tag of only \$79.95... truly, one of the greatest values in test equipment to come your way in a long time.

Size: 14x9¹/₄x4³/₄"

Model 1100 TUBE TESTER

... an outstanding tester—yet amazingly low in price!

Tests for shorts and leakage

Tests for dynamic cathode emission



Tests for grid leakage

Tests for gas content

\$39⁵⁰_{Net}

Size: only 10³/₄x8¹/₄x3¹/₄"

Here is the answer to technicians who seek a dependable, professional performing tube tester at a minimum cost. The Model 1100 has a range of operation that will outperform many, more expensive testers. It boasts an exclusive meter bridge circuit, found only in more expensive testers. Conveniently compact in size—a whale of a money-maker.

ALL MERCURY Tube Testers have these features:

- Also test the new tube types including Novars, Nuvistors, Compactrons, new 10-pin tubes as well as battery type tubes, auto radio hybrid tubes, voltage regulators, foreign and hi-fi tubes, thyratrons and most industrial tube types.
- Check each section of multi-section tubes separately
- Handsome, two-tone long lasting etched aluminum panel
- Housed in sturdy carrying case with handsome leatherette finish.

Model 1200
MUTUAL CONDUCTANCE TUBE TESTER

Tests for true dynamic mutual conductance (Gm)

Tests for shorts and leakage between any tube elements

Tests for gas and grid emission... sensitivity over 100 megohms

\$119⁹⁵_{Net}

Here is a deluxe dynamic mutual conductance tube tester with a unique push-button set-up method that can be compared with the ease of selecting a record on a juke box. Push buttons provide complete flexibility in accommodating all present and new tube types and basing arrangements. The Model 1200 is the most versatile tube tester available today.

See your electronics parts distributor or write for complete Mercury catalog

Deluxe
Dynamic Mutual Conductance Tube Tester with FAST PUSH BUTTON SETTINGS



TREMENDOUS VALUE!

Also tests black and white and color picture tubes.

Also tests transistors.

Also tests batteries under load

Size: 18¹/₄x10¹/₄x4³/₄"



ELECTRONICS CORPORATION

manufacturers of quality electronic products

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

... for more details circle 44 on page 50

LETTERS
TO THE EDITOR

Texas Size Pot

EDITOR, ELECTRONIC TECHNICIAN:

I am afraid that there was a mistake made in your review of the WV-120A power-line monitor which appeared in the November 1961 feature "New Test Instruments for Bench and Caddy." The reference to a 500-ohm, 100 watt rheostat should read "10 watt."

NORMAN ERDOS
Commercial Engineering
RCA Electron Tube Division

• Yes, indeed. A typographical faux pas can make the difference between "playing-it-cool," and the antics of a "Cat on a Hot Tin Roof."—Ed.

Forced Election

EDITOR, ELECTRONIC TECHNICIAN:

In reference to your article on "Transistors The Easy Way," page 30 of August issue, I quote part of the first sentence (sic): "Ever since the first election was forced to move through a conductor..." Now I understand why our political situation is in such a state of confusion.

BEN DE ROND

Huntington, W. Va.

• 'Tis exceeded only by the confusion of our proofreaders.—Ed.

Stereo-Mono Soup Boils

EDITOR, ELECTRONIC TECHNICIAN:

Reference Mr. Frickert's letter "Monophonic Minded" in the August issue. It was a great relief to find that sanity does exist amid the stereo sea of madness. I would like to point out that most of the people who have stereo equipment are victims of sledge hammer brainwashing techniques. How can a person without any technical training be told about specifications which feature terms such as: feedback, compliance, crosstalk, damping factor (obviously a reference to the prevailing weather conditions), decibels, harmonic and intermodulation distortion, cathodyne phase splitters, matrix circuits, ad infinitum, and then be seduced into making a purchase of equipment on the basis of these terms? He obviously does not understand them (and neither does the average salesman); consequently he must be brainwashed. Don't misunderstand me. I'm not against stereo as a medium. I do oppose the brand prevalent today. Stereo can only be reproduced by top quality equipment.

ELECTRONIC TECHNICIAN

RAD-TEL Gives You More For Your Money!



**RAD-TEL'S QUALITY
BRAND NEW TUBES
FOR TV, RADIO, AND HI-FI
1 YEAR GUARANTEE**

UP TO 75% OFF*

1-DAY SERVICE - Over 500 Types in Stock



**SERVICEMEN:
RAD-TEL HAS THE
LATEST TUBE TYPES.**

* Manufacturers Suggested List Price

FREE! Send For New Tube & Parts Catalog
Send For Trouble Shooting Guide



Be your own TELEVISION REPAIRMAN

The Original NOW YOU CAN
FIX YOUR OWN TV SET BOOK

You can fix your own TV if you have TV Fixit Book . . . because 80% of troubles are caused by tubes. This book explains, illustrates trouble and what tubes cause this trouble. Pinpoints in over 3000 layouts by model number, position and type tube causing trouble.

\$1.00

No. 170



RAD-TEL TUBE CO. TV, RADIO AND HI-FI

DEPT. ET-10 55 CHAMBERS STREET, NEWARK 5, NEW JERSEY

TERMS: 25% deposit must accompany all orders, balance C.O.D. Orders under \$5: add \$1 handling charge plus postage. Orders over \$5: plus postage. Approx. 8 tubes per 1 lb. Subject to prior sale. No C.O.D.'s outside continental U.S.A.

EACH TUBE ATTRACTIVELY BOXED & BRANDED RAD-TEL

Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
—	024	.79	—	6A08	.87	—	6K6	.63	—	12CU5	.58
—	1AX2	.62	—	6AV6	.41	—	6S4	.52	—	12CU6	1.06
—	1B3	.79	—	6AW8	.90	—	6SA7GT	.99	—	12CX6	.54
—	1DN5	.55	—	6AX4	.66	—	6SH7GT	1.02	—	12D4	.69
—	1G3	.79	—	6AX5	.74	—	6S17	.88	—	12DE8	.83
—	1J3	.79	—	6BA6	.50	—	6SK7GT	.95	—	12DL8	.88
—	1K3	.79	—	6BC5	.61	—	6SL7GT	.84	—	12DQ6	1.04
—	1R5	.77	—	6BC8	1.04	—	6SN7GT	.65	—	12DS7	.84
—	1S5	.75	—	6BE6	.55	—	6SQ7	.94	—	12DT5	.76
—	1T4	.72	—	6BF5	.90	—	6T4	.99	—	12DT7	.79
—	1U5	.65	—	6BF6	.44	—	6T8	.85	—	12DT8	.78
—	1X2B	.82	—	6BG6	1.70	—	6U8	.83	—	12DW8	.89
—	2AF4	.96	—	6BH8	.98	—	6V6GT	.54	—	12DZ6	.62
—	3AL5	.46	—	6BJ6	.65	—	6W4	.61	—	12ED5	.62
—	3AU6	.54	—	6BJ7	.79	—	6W6	.71	—	12EG6	.62
—	3AV6	.42	—	6BK7	.85	—	6X4	.41	—	12EK6	.62
—	3BC5	.63	—	6BL7	1.09	—	6X8	.80	—	12EL6	.50
—	3BN6	.75	—	6BN6	.74	—	7A8	.68	—	12EZ6	.57
—	3BU8	.78	—	6BQ6	1.12	—	7AU7	.65	—	12F8	.66
—	3BY6	.58	—	6BQ7	1.00	—	7EY6	.75	—	12FA6	.79
—	3BZ6	.56	—	6BU8	.70	—	7Y4	.69	—	12FM6	.50
—	3CB6	.56	—	6BX7	1.11	—	8A08	.90	—	12FR8	.97
—	3CS6	.58	—	6BZ6	.55	—	8AW8	.93	—	12FX8	.90
—	3DG4	.85	—	6BZ7	1.03	—	8BQ5	.60	—	12GC6	1.06
—	3DK6	.60	—	6C4	.45	—	8CG7	.63	—	12J8	.84
—	3DT6	.54	—	6CB6	.55	—	8CM7	.70	—	12K5	.75
—	3GK5	.99	—	6CD6	1.51	—	8CN7	.97	—	12L6	.73
—	3Q4	.63	—	6CG7	.61	—	8CS7	.74	—	12SF7	.69
—	3S4	.75	—	6CG8	.80	—	8EB8	.94	—	12SK7	.95
—	3V4	.63	—	6CL8	.79	—	8FQ7	.56	—	12SL7	.80
—	4BQ7	1.01	—	6CM7	.69	—	9CL8	.79	—	12SN7	.67
—	4CS6	.61	—	6CN7	.70	—	11CY7	.75	—	12SQ7	.91
—	4DT6	.55	—	6CQ8	.92	—	12A4	.60	—	12U7	.62
—	4GM6	.60	—	6CR6	.60	—	12AB5	.60	—	12V6	.63
—	5AM8	.79	—	6CS6	.57	—	12AC6	.55	—	12W6	.71
—	5AN8	.90	—	6CS7	.69	—	12AD6	.57	—	12X4	.47

**RAD-TEL TUBE CO. NOT AFFILIATED WITH ANY
OTHER MAIL ORDER TUBE COMPANY**

—	5AQ5	.54	—	6CU5	.58	—	12AE6	.50	—	17AX4	.67
—	5AT8	.83	—	6CU6	1.08	—	12AE7	.94	—	17DQ6	1.06
—	5BK7	.86	—	6CY5	.70	—	12AF3	.73	—	18FW6	.49
—	5BQ7	1.01	—	6CY7	.71	—	12AF6	.67	—	18FX6	.53
—	5BR8	.83	—	6DA4	.68	—	12AJ6	.62	—	18FY6	.50
—	5CG8	.81	—	6DE6	.61	—	12AL5	.47	—	19AU4	.87
—	5CL8	.76	—	6DG6	.62	—	12AL8	.95	—	19BG6	1.39
—	5CQ8	.84	—	6DJ8	1.21	—	12AQ5	.60	—	19EA8	.79
—	5EA8	.80	—	6DK6	.59	—	12AT6	.50	—	19T8	.85
—	5EU8	.80	—	6DN6	1.55	—	12AT7	.76	—	21EX6	1.49
—	5J6	.72	—	6DQ6	1.10	—	12AU6	.51	—	25AX4	.70
—	5T8	.86	—	6DT5	.81	—	12AU7	.61	—	25C5	.53
—	5U4	.60	—	6DT6	.53	—	12AV6	.41	—	25CA5	.59
—	5U8	.84	—	6DT8	.94	—	12AV7	.82	—	25CD6	1.52
—	5V6	.56	—	6EA8	.79	—	12AX4	.67	—	25CU6	1.11
—	5X8	.82	—	6EB5	.73	—	12AX7	.63	—	25DN6	1.42
—	5Y3	.46	—	6EB8	.94	—	12AY7	1.44	—	25EH5	.55
—	6AB4	.46	—	6EM5	.77	—	12AZ7	.86	—	25L6	.57
—	6AC7	.96	—	6EM7	.82	—	12B4	.68	—	25W4	.68
—	6AF4	1.01	—	6EU8	.79	—	12BD6	.50	—	32ET5	.55
—	6AG5	.70	—	6EV5	.75	—	12BE6	.53	—	35C5	.51
—	6AH4	.81	—	6EW6	.57	—	12BF6	.60	—	35L6	.60
—	6AH6	1.10	—	6EY6	.75	—	12BH7	.77	—	35W4	.42
—	6AK5	.95	—	6FG7	.69	—	12BK5	1.00	—	35Z5	.60
—	6AL5	.47	—	6FV8	.79	—	12BL6	.56	—	36AM3	.36
—	6AM8	.78	—	6GH8	.80	—	12BQ6	1.16	—	50B5	.69
—	6AQ5	.53	—	6GK5	.61	—	12BR7	.74	—	50C5	.53
—	6AS5	.60	—	6GK6	.79	—	12BV7	.76	—	50EH5	.55
—	6AT6	.49	—	6GN8	.94	—	12BY7	.77	—	50L6	.61
—	6AT8	.86	—	6H6	.58	—	12BZ7	.86	—	70L7	.97
—	6AU4	.85	—	6J5GT	.51	—	12CN5	.56	—	117Z3	.85
—	6AU6	.52	—	6J6	.71	—	12CR6	.67	—	807	.75

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FREE! Send FREE Tube and Parts Catalog

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... for more details circle 51 on page 50

LETTERS TO THE EDITOR

When will we return to the days when classical music was reserved for those who had a "taste" for it and not what some companies record as stereo—actually a musical ping-pong game. Much of the equipment today is designed around a price-first concept. Good equipment is designed first and then the price tag goes on.

JOHN J. KLANATSKY

Astoria, N. Y.

Dislikes Union for Techs

EDITOR, ELECTRONIC TECHNICIAN:

I have just read the letter written by Mr. Arnold Waxman, in the July issue, and I do not agree with him. I would resent having to pay someone so I could stay in business. And worse yet, having someone tell me what I should charge, and what hours I should work. I feel that it is nobody's business but mine how many hours a day I work. And if my customers didn't like my prices they would not have stuck with me, some of them over 25 years. The public is not so dumb. If they are overcharged, or, if

they like your service, they will tell their friends also. I have never had to ask for business. I might add that I am *not* one of those "screw-balls" that think all Unions are bad. But I just want to run my own business. That is why I have stayed in the service business all these years. Incidentally, I have never sold radios, phonos, TVs or any other merchandise except repair parts. For the past 10 years my business has supported 3 persons.

HENRY R. FOGG

Morrisville, Vt.

Wants Transistor Info

EDITOR, ELECTRONIC TECHNICIAN:

Enclose cheque in payment for subscription to ELECTRONIC TECHNICIAN MAGAZINE. Would like more transistor receiver circuits and more detailed technical discussions.

P. U. SUKHADIA, B. Sc.

Bombay, India.

Sharp Eyes

EDITOR, ELECTRONIC TECHNICIAN:

Why does the girl (ET May '62, page 22, third picture, second row, of the G-E ad) not have shoes on?

B. T. HELMS

Jackson, Tenn.

● *The model has her shoes off because the photographer instructed her to take them off. Why did he do it? Alas, photographers minds are inscrutable. And since he refuses to talk, the problem will remain one of the great unsolved mysteries of our time. Here's a toast to your eagle eye.—Ed.*

From Iran

EDITOR, ELECTRONIC TECHNICIAN:

I am in the Army, and I work in TV as an electronic technician. I have read all of the electronic magazines on the market. I have found ET to be the one I like best. But I would like to know why there are so few articles on the studio end of TV. I mean articles on equipment used in the TV studio. It seems to me that the only end of the business written about is the receiver repair business.

CHARLES E. RYAN, JR.
U. S. Army AFTV

Teheran, Iran.

● *It is obviously impossible for one magazine to cover the multitude of individual areas in the broad electronics field. A line has to be drawn at some point. ELECTRONIC TECHNICIAN has confined its coverage primarily to TV, radio and Hi-Fi, receivers; 2-way radio*

Don't
Compromise
INSTALL THE
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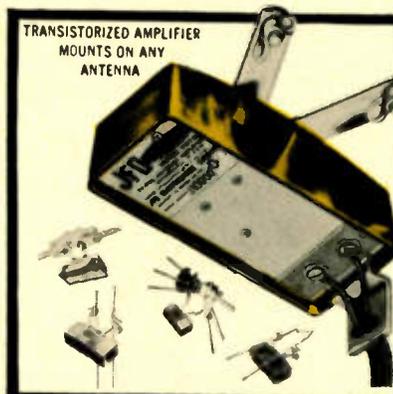


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THE ONLY "ADD-ON" TV/FM ANTENNA AMPLIFIER THAT MOUNTS AT THE RIGHT PLACE—DIRECTLY ON ANTENNA TERMINALS—THE POINT OF HIGHEST SIGNAL-TO-NOISE RATIO.

- PADT transistor circuitry provides superior gain, higher saturation level, and larger cross-modulation index characteristics—up to 18 db. gain on low band and 15 db. on high band—13 db. (TNT106FM 25 db. gain on FM).
- Interference-proof circuit design rejects spurious signals from amateur, citizen's band, fire, police, aircraft and other commercial services. Only the pure amplified video signal gets through to the set.
- Converts any antenna-type into a truly electronic antenna system. Weather-proof solid aluminum busbars connect directly on to the terminals of any antenna. No makeshift straps, clamps or brackets. Another exclusive JFD feature.

... PLUS 11 OTHER OUTSTANDING PERFORMANCE AND CONSTRUCTION FEATURES THAT DELIVER MAXIMUM GAIN AND HIGHEST SIGNAL-TO-NOISE RATIO—IN BLACK AND WHITE OR COLOR!



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TNT100	Battery-powered TV/FM Transis-tenna	34.95
TNT105	"All-In-One" Home TV/FM Transis-tenna	29.95
TNT106FM	AC-powered FM Transis-tenna	36.95

See your JFD distributor or write for brochure 250 and get the facts.

JFD ELECTRONICS CORPORATION

6101 Sixteenth Avenue, Brooklyn 4, N. Y.

... for more details circle 38 on page 50

ELECTRONIC TECHNICIAN



are you replacing top quality tubes with identical top quality tubes?

You can, now! You can carry the identical tubes that you find in most of the quality TV sets you're servicing. Chances are, you were not aware that these sets were designed around special Frame Grid tubes originated by Amperex.

For some time now designers have been using many Amperex Frame Grid tubes in their quality TV receivers and we can tell you now that even more Amperex tubes are being designed into the sets you'll be handling in the future.

Compare, if you will, the performance of Amperex Frame Grid tubes with conventional IF tubes: they provide 55% higher gain-bandwidth, increase TV set reliability by simplifying circuits and they make your servicing easier, faster and more profitable because their extraordinary uniformity virtually eliminates time-consuming realignment when you replace tubes. Technicians are finding Amperex THE line to carry.

Tubes introduced by Amperex and currently being used by major TV set makers include:

Frame Grid				Others	
2GK5	4GK5	6GK5	6EH7	6AL3	9A8
2ER5	4EH7	6ES8	6EJ7	6BL8	15CW5
3GK5	4EJ7	6ER5	6HG8	6BQ5	16AQ3
3EH7	4ES8	6FY5	7HG8	12AX7	27B5

For optimum customer satisfaction and maximum profit operation for yourself, make room in your caddy right now for the identical, matchless-quality tubes designed into the original sets. Next time you visit your distributor look for the green-and-yellow box and ask about Frame Grid tubes for TV and other entertainment replacement applications. Amperex Electronic Corporation, 230 Duffy Ave., Hicksville, L. I., N. Y. In Canada: Philips Electron Devices Ltd., 116 Vanderhoof Ave., Toronto 17.

... for more details circle 11 on page 50

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First Choice with Service Technicians Everywhere! Over 89,754,000 Already Sold!

Now being used in millions of television sets, radios, phonographs, electronic circuitry and military applications. ■ Operates at 125° C without derating. ■ Standard Tolerance $\pm 10\%$ ■ Missile Reliability ■ Completely moisture proof ■ Up to 50% smaller than other types.

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... for more details circle 12 on page 50

LETTERS

TO THE EDITOR

receivers and transmitters, and electronic test instruments employed in maintaining this equipment.—Ed.

Honeyed Rum

EDITOR, ELECTRONIC TECHNICIAN:

I have just received your July issue. I have always awaited ET with great anxiety . . . I don't know if I am the only subscriber in Jamaica, but if I am, I must say I have something over the other technicians here. I have the addresses of the Japanese radio distributors from whom I can obtain schematics and other service data . . . These radios are very popular here . . . I think ET should contain a bit more about radios than at present. After all, tube radios haven't died yet!

JOHN DRYDEN

Jamaica, W. I.

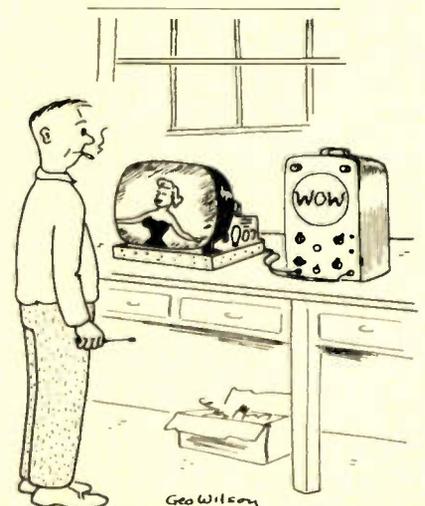
Inventors Hoe Rough Row

EDITOR, ELECTRONIC TECHNICIAN:

Thanks for your "Authors' Guide For Preparing Manuscripts . . ." My Brother and I lost a sonar patent after fighting corporate patents for seven years. In that time we had nearly every type of ancient and modern distance-measuring system in sonar and radar thrown at us. The papers we accumulated would make a series on the subject if this field would be of interest in your magazine. Also, since there is so much chicanery and obstacles thrown into the path of the independent inventor with "zombi," block diagram, and counterfeit patents it could make an article itself.

JOEL PERKINSON, JR.

Miami, Fla.



ELECTRONIC TECHNICIAN

SENCORE

SIMPLIFIES COLOR SERVICING

NEW! CA122

COLOR CIRCUIT ANALYZER

A simple approach to a complex problem

Here is an instrument that is designed to eliminate the guesswork in color TV servicing. A complete analyzer that provides all required test patterns and signals for testing from the tuner to the tri-color tube. Additional analyzing signals for injection at each stage including audio, video and sync, brings to life a truly portable and practical TV analyzer for on the spot service; virtually obsoleting other analyzers with the advent of color. Sencore's simplified approach requires no knowledge of I, Q, R-Y, B-Y, G-Y or other hard to remember formulas. The CA122 generates every signal normally received from the TV station plus convergence and color test patterns.

The CA122 offers more for less money:

TEN STANDARD COLOR BARS: The type and phase that is fast becoming the standard of the industry. Crystal controlled keyed bars, (RCA type) as explained in most service literature, offer a complete gamut of colors for every color circuit test.

WHITE DOTS: New stabilized dots, a must for convergence, are created by new Sencore counting circuits.

CROSS HATCH PATTERN: A basic requirement for fast CRT convergence.

VERTICAL AND HORIZONTAL BARS: An added feature to speed up convergence, not found on many other color generators.

SHADING BARS: Determines the ability of the video amplifier to produce shades (Y Signal) and to make color temperature adjustments. An important feature missing on other generators.

COLOR GUN INTERRUPTOR: For fast purity and convergence checks without upsetting color controls. Insures proper operation of tri-color guns, preventing wasted time in trouble shooting circuits when CRT is at fault.



A must for color . . .
a money maker for black and white TV servicing

ANALYZING SIGNALS: RF and IF signals modulated with any of the above patterns for injection into grid circuits from antenna to detector. IF attenuator is pre-set for minimum signal for each IF stage to produce pattern on CRT thus providing a check on individual stage gain. Sync and video, plus or minus from 0 to 30 volts peak to peak, have separate peak to peak calibrated controls for quick checks on all video and sync circuits. Crystal controlled 4.5 mc and 900 cycles audio simplify trouble shooting of audio circuits.

NEW ILLUMINATED PATTERN INDICATOR: A Sencore first, offering a rotating color film that exhibits the actual color patterns as they appear on color TV receivers. Locks in with pattern selector control.

You'll pay more for other color generators only.

Dealer Net 187.50

NEW! PS120 PROFESSIONAL WIDE BAND OSCILLOSCOPE

A portable wide band 3 inch oscilloscope for fast, on-the-spot testing. An all new simplified design brings new meaning to the word portability . . . it's as easy to operate and carry as a VTVM. Though compact in size, the PS120 is powerful in performance: Vertical amplifier frequency response of 4 MC flat, only 3 DB down at 7.5 MC and usable to 12 MC, equips the technician for every color servicing job and the engineer with a scope for field and production line testing. AC coupled, with a low frequency response of 20 cycles insure accurate low frequency measurements without vertical bounce. Sensitive single band vertical amplifier; sensitivity of .035 volts RMS for one inch deflection saves band switching and guessing. Horizontal sweep frequency range of 15 cycles to 150 KC and sync range from 15 cycles to 8 MC (usable to 12 MC) results in positive "locking" on all signals. New exclusive Sencore features are direct reading peak-to-peak volts — no interpretation; dual controls to simplify tuning; lead compartment to conceal test leads, jacks and seldom used switches. Rear tilt adjustment angles scope "just right" for easy viewing on bench or production line.

Size: 7" w x 9" h x 11 1/4" d. Weight: 12 lbs.

Dealer Net 124.50
(with low cap. probe)

Kit 74.50



A must for servicing color TV in the home . . . lowest priced broad band scope. All hand wired — all American made

. . . for more details circle 56 on page 50

SENCORE

SIMPLIFIES SWEEP CIRCUIT TROUBLE SHOOTING

SS117 SWEEP CIRCUIT ANALYZER

For Color and Monochrome Testing

A professional trouble shooter that helps you methodically walk the trouble out of "tough-dog" sweep circuits in monochrome and color receivers. The SS117 provides a positive but simple push button test on all circuits indicated in the block diagrams. These time-consuming circuits are checked step-by-step with tried and proven signal injection and substitution methods. All checks can be made from the top of the chassis or from under the chassis when it is removed from the cabinet.

TV horizontal oscillator check is made by substituting a universal oscillator known to be good. Horizontal output check consists of a cathode current and screen voltage test. The TV horizontal yoke is checked by substituting a universal yoke from the SS117 and viewing brightness or restoration of 2nd anode voltage. Horizontal flyback is checked dynamically in circuit by measuring the power transfer to the yoke when TV is turned on. TV horizontal sync can be used to control the SS117 horizontal oscillator, providing a positive check on sync from the video amplifier to the TV oscillator. Vertical circuits are tested by simple signal injection from vertical yoke to oscillator for full height on CRT. The SS117 with the CA122 Color Analyzer provides a complete TV analyzer for virtually every stage in monochrome or color receivers.

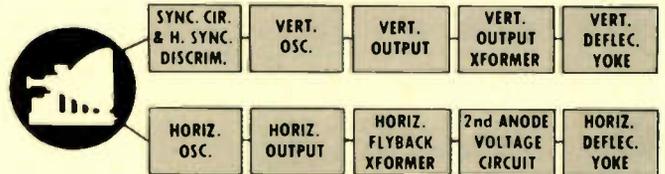
External checks for AC, DC, peak to peak voltage readings and DC current in the upper right hand corner save using a separate VTVM. Accurate 2nd anode measurements up to 30,000 volts are made with a sensitive 300 microamp meter and the attached high voltage probe. AC outlets, all steel construction and mirror in the cover makes every servicing job easier.

Size: 10 1/4" x 9 1/4" x 3 1/2". Wt. 10 lbs.

Dealer Net..... 89.50



The SS117 checks them all



FREE—A 33 RPM half hour permanent record packed with every unit explains each test.

FOR FASTER MORE ACCURATE TUBE TESTING

TC114 MIGHTY MITE TUBE CHECKER

This is the famous Mighty Mite, acclaimed by over 25,000 servicemen, maintenance men and engineers as "the best they've ever used." A complete tube tester that is smaller than a portable typewriter yet finds tubes that testers costing hundreds of dollars miss, thus selling more tubes and reducing call backs. A real money maker for the serviceman and a trusty companion for engineers, maintenance men and experimenters. The Mighty Mite has been acclaimed from coast to coast as the real answer for the man on the go. Even though the Mighty Mite weighs less than 8 pounds, new circuitry by Sencore enables you to use a meter to check grid leakage as high as 100 megohms and gas conditions that cause as little as one half microamp of grid current to flow. Thus, too, it checks for cathode current at operating levels and shorts or leakage up to 120,000 ohms between all elements. And it does all this by merely setting four controls labeled A, B, C, & D with new type easy grip knobs. Check these plus Sencore features... Meter glows in dark for easy reading behind TV set... The new Mighty Mite has large size Speedy-Setup Tube Chart inside of cover—cuts setup time for even faster servicing. New stick proof D' Arsonval meter will not burn out even with shorted tube... Rugged, all steel carrying case and easy grip handle.

The improved Mighty Mite will test virtually every radio and TV tube that you encounter, nearly 2000 in all, including foreign, five star, auto radio tubes plus the new Compactrons, Novars, Nuvisitors and 10 pin tubes. Has larger, easy-to-read type set-up booklet for faster testing.

Size: 10 1/4" x 9 1/4" x 3 1/2". Weight: 8 lbs.

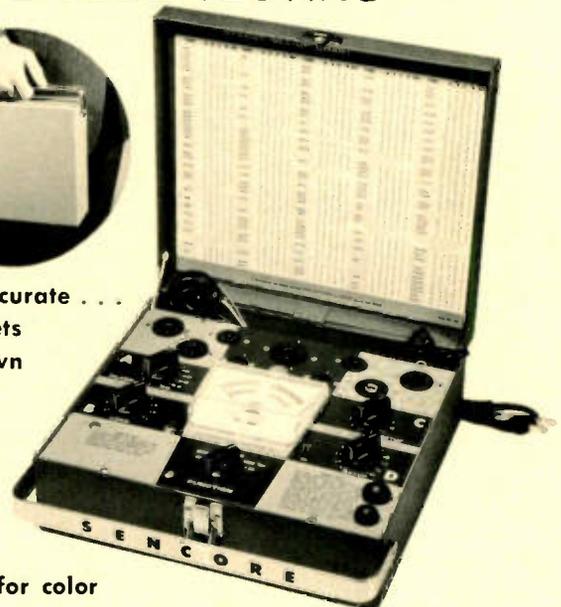
Dealer Net..... 74.50

TM116 TUBE TESTER MODERNIZING PANEL

New tube adapter for testing Compactrons, Novars, Nuvisitors and 10 pin tubes in any tube tester except cardomatic types. Plugs into octal socket of your tube tester enabling you to test these new tubes in the same manner



Fast, Accurate . . .
never lets
you down



A must for color



that your tester checks
conventional tubes. Tube set-up
chart included with each adapter.

Dealer Net..... 24.95

SENCORE

TRANSISTOR CIRCUIT TESTING MADE EASY & PROFITABLE

TR110 TRANSI-MASTER

A new transistor tester that will analyze the entire transistor circuit in minutes. Transistors can be checked in-circuit or out-of-circuit. Here is how it works:

First, check the batteries or power supply with the 0 to 12 volt voltmeter. Next, check the current drain with the 0 to 50 milliamp meter. A special probe is provided so that you do not need to break the circuit. Intermittents caused by cracked boards can be localized by the current check.

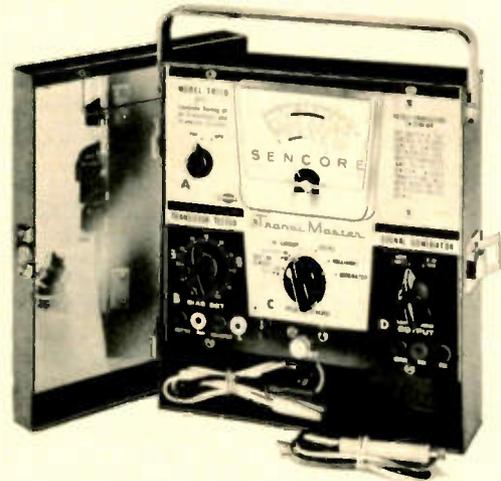
If trouble is not located by now, isolate the trouble to a specific stage by touching the output of the harmonic generator to the base of each transistor and note spot where sound from speaker (or scope where no speaker is used) stops or becomes weak. The generator becomes a sine wave generator for audio stages to help find distortion.

If trouble points to a transistor, check it in a jiffy with the exclusive in-circuit power oscillator check provided by the TR110. A special probe is also provided for this.

If the transistor checks bad in-circuit, remove it and give it an out-of-circuit check with the oscillator check or the more accurate DC check.

The DC check is provided for comparison reasons, experimental or engineering work and to match transistors in audio output stages. Beta (current gain) is read direct or on a good-bad scale for service work.

Dealer Net 59.50



- COMPLETE IN OR OUT-OF-CIRCUIT TRANSISTOR TESTER
- SIGNAL TRACER • VOLTMETER
- BATTERY TESTER • MILLIAMMETER

TR115 TRANSISTOR DIODE-CHECKER

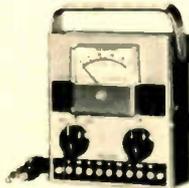


Tests transistors for leakage, gain, opens and shorts. Reads gain as good or bad or directly in Beta. Checks diodes for forward to reverse ratios. Tests them all from the smallest transistors used in hearing aids to the power types used in auto radios. Also lists Japanese equivalents. This simple to operate, time tested checker can be used with or without set-up chart for both servicing, experimenting and lab work. The industry's most popular transistor tester, used by Bell Telephone, Sears Roebuck, Edison and many others.

Dealer Net 24.95

Kit 15.95

NEW! BE124 BATTERY ELIMINATOR



An easy to use power supply that replaces batteries during repair time of transistor radios. Tapped voltages at 1.5 volt DC intervals from 0 to 12 volts are on front panel for easy connection and to insure center tap and bias voltages when required. Function switch converts meter to a trouble shooting 0 to 50 Ma current reading device to monitor the current drain of the transistor radio. Improved regulation and voltage calibrate pot. guarantee accurate well filtered output. Also for charging nickel cadmium batteries.

Dealer Net 24.95

Kit 15.95

HG104 HARMONIC GENERATOR



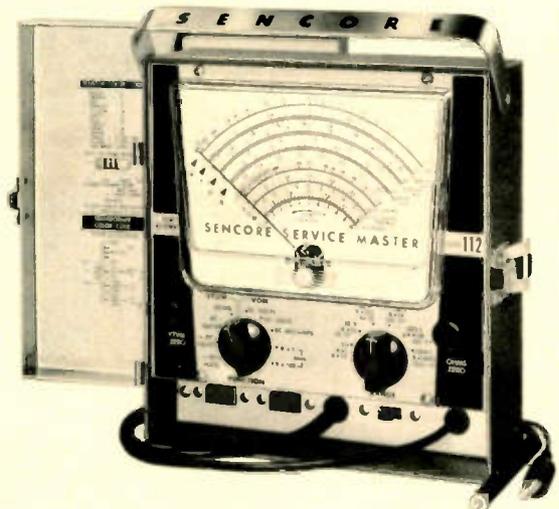
Finds Defective Stage in a Minute . . . a real time saver. Just touch the output leads of the HG104 to inputs and outputs of transistors and a clear 1000 cycle note from speakers will tell you whether or not the stage is defective. It works every time from speaker to antenna. Two leads and calibrated output (not found on pencils) are a must for speaker connection, grounding to prevent RF spray and front end checks. With batteries.

Dealer Net 9.95

A NEW VERSATILE APPROACH TO CIRCUIT TESTING

SM112 SERVICE MASTER

A combination VTVM and VOM in one compact unit to simplify every testing need. The SM112 offers a conventional VTVM, operating from 115 volts AC for accurate bench or lab work . . . flip the function switch to VOM and two standard flashlight batteries power the unit as it is connected to a 5,000 ohms per volt meter. This Sencore first enables you to make voltage, resistance and current measures anywhere anytime. And to top this, indicating arrows located along the left side of the meter flash on and off as the controls are rotated to indicate the exact scale to read on any VTVM position or range. Hard to remember technical data is listed in the removable cover. One permanent probe is used for every test on VTVM or VOM. High voltage probe fits on end of permanent probe for measurements up to 30,000 volts DC. Standard specifications of 11 megohm input impedance on VTVM, 6 AC and DC voltage ranges from 0 to 1000 volts on both VTVM and VOM, 6 resistance ranges from 0 to 1000 megohms on VTVM, 2 ranges on VOM, and a 2 percent six inch meter provide all requirements for fast accurate measurements. Zero center scale and peak-to-peak measurements as added features create a truly great Sencore value.



Dealer Net only 79.95

... for more details circle 57 on page 50

SENCORE COMPONENT CHECKING MADE EASY BY SENCORE PARTS SUBSTITUTION

RC121 COMPONENT SUBSTITUTOR

A complete range of carbon resistors, capacitors, electrolytics and universal selenium and silicon rectifiers at your finger tips for on-the-spot substitution. Say goodbye to messy crumpled parts, unnecessary soldering and unsoldering when substituting components for test purposes only. Each section operates independently with a value close enough for every substitution need. Components in each section are isolated from chassis and from other sections. New electrolytic substitution section provides dual electrolytics as well as 25 single electrolytics. Exclusive surge protector prevents arcing, sparking or heating of single or dual capacitors being bridged. Electrolytics are automatically discharged when surge protector is released. Here are the values provided...81 in all.

- 1. CARBON RESISTORS**...12 resistors, 1 watt from 10 ohms to 5600 ohms. 12 resistors, 1/2 watt from 10 K to 5.6 megohms.
- 2. POWER RESISTORS**...20 wire wound, 20 watts from 2.5 to 15,000 ohms.
- 3. CAPACITORS**...10 capacitors at 600 volts from 100 MMFD to .5 MFD.
- 4. RECTIFIERS**... Universal Selenium; .5 amps, 800 PIV. Universal Silicon; 5 amps, 800 PIV.

All your favorite

Sencore Substitution time-savers in one compact unit.

- 5. ELECTROLYTICS**...10 dual electrolytics from 2 MFD to 250 MFD at 450 V DC can be used as singles or tie them together and double capacity to form up to 25 separate single values. Both sections protected by surge protector.

All hand wired, complete with four test leads.

RC121	Dealer Net	39.95
RC121 (Kit)	Dealer Net	27.95



H36 "HANDY 36"

Provides the 36 most often needed resistors and capacitors for experimenting, substituting and testing. 24 Resistors from 10 ohms to 5.6 megohms, 10 Capacitors from 100 mfd to .5 mfd, 2 Electrolytics 10 mfd and 40 mfd at 450 volts.

Dealer Net 12.75

RS106 RECTIFIER TROUBLE SHOOTER

Substitutes for single and dual Selenium and silicon rectifiers, single and dual diodes. Gives you a positive check every time. A must for servicing voltage doubler circuits. Protected by a 1/2 amp. Slow Blow Fuse.

Dealer Net 12.75



ES102 "ELECTRO-SUB"

Complete safe substitution for Electrolytic Capacitors from small transistor radio types to the largest used in Hi-Fi amplifiers. Contain 10 electrolytics from 4 to 350 mfd. Completely safe, has automatic discharge, surge protector circuit. Usable from 2 to 450 volts, DC.

Dealer Net 15.95

PR111 "BIG 20" SUBSTITUTOR

For power resistor substitution from 2.5 to 15,000 ohms. Withstands up to 20 watts for normal testing time.

Dealer Net 12.75

Time Saving Service Aids

BE113

DUAL TV BIAS SUPPLY

A single 0 to 20 volts DC bias supply or two separate 0 to 20 volts DC bias supplies—without interaction. Save time in AGC trouble shooting and aligning TV sets. Provides all TV biases recommended in photofact schematics and by all TV manufacturers. Well filtered—provides virtually pure DC with less than one tenth of one percent ripple. Calibration accuracy better than equivalent battery tolerance.

Dealer Net 12.75

VB2 VIBRA-DAPTER

Checks 3 and 4 prong Vibrators faster and easier. Plugs into any tube checker; ideal for use with LC3 or the Mighty Mite. To check 6v. vibrators, set for 6AX4 or 6SN7; for 12v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing.

Dealer Net 2.75



FC123

FILAMENT CHECKER

Newly designed filament checker for continuity speed testing of all tube filaments including the new compactrons, novars, novistors and 10 pin tubes as used in new series TV receivers. Test leads are provided for CRT filament testing, continuity tests are AC or DC neon indicator voltage tests. TV cheater cord is used to power unit as a check on the cord to insure 115 volts AC on TV.

Dealer Net 3.95

HM119 "HANDYMAN"

A Sencore time-saver to eliminate wasted time behind TV sets. Imagine, a cheater cord with on-off switch, dual extension cord, up to date filament checker, universal fuse checker, handy trouble light, neon voltage and continuity checker, pin straighteners and cord wrapper all in one complete unit.

Dealer Net 9.95

ALL AMERICAN MADE
ALL HAND WIRED

SENCORE

ADDISON, ILLINOIS

... for more details circle 58 on page 50

ELECTRONIC TECHNICIAN

2N131A	P	AT20H	2N293	N	NR10	2N514A	N	PT250	2N1159	P	PT50	GE-4	N	NR10	RS3279	P	HF12M	121-46	P	AT30M	2SA07	P	HF20H	2SB187	P	JR15	2123	P	JR15
2N132	P	AT20H	2N296	P	PT50	2N515	N	NR5	2N1160	P	PT50	GE-5	N	NR10	RS3282	P	AT20M	121-48	P	HF12M	2SA72	P	JR30	2SB188	P	JR15	2T24	P	JR15
2N132A	P	AT20H	2N297	P	PT50	2N516	N	NR5	2N1166	P	PT50	GE-6	N	NR10	RS3285	P	AT20M	121-49	P	HF12M	2SA73	P	JR30	2SB189	P	JR15	2T25	P	JR15
2N133	P	AT20M	2N297A	P	PT50	2N517	N	NR5	2N1168	P	PT50	GE-7	N	NR5	RS3288	P	HF12M	121-51	P	HF6M	2SA81	P	JR30X	2SB199	P	JR5	2T26	P	JR15
2N133A	P	AT20H	2N299	P	JR30X	2N519	P	HF6M	2N1171	P	HF12M	GE-8	N	NA20	RS3299	P	AT20M	121-52	P	AT20M	2SA83	P	JR30X	2SB200	P	JR15	2T51	N	NA20
2N135	P	HF6M	2N300	P	JR30X	2N520	P	HF6M	2N1172	P	PT30	GF20	P	AT20M	RS3301	P	AT20M	121-53	P	HF12M	2SA92	P	JR30	2SB202	P	JR15	2T52	N	NR5
2N136	P	HF12M	2N301	P	PT40	2N521	P	HF12M	2N1173	N	NA30	GF21	P	AT20M	SYL101	N	NR10	121-54	P	HF12M	2SA93	P	JR30	2SB215	P	JP40	2T53	N	NR5
2N137	P	HF12H	2N301A	P	PT40	2N522	P	HF20H	2N1174	N	NA30	GF32	P	AT30H	SYL102	N	NR5	121-60	N	NA20	2SA109	P	JR30X	2SB216	P	JP40	2T61	N	NA20
2N138	P	AT20H	2N302	P	HF12H	2N523	P	HF20H	2N1191	P	AT30H	GT11	P	HF6H	SYL103	N	NA20	121-61	P	AT30M	2SA110	P	JR30X	2SB217	P	JP40	2T62	N	NA20
2N138A	P	AT30H	2N303	P	HF20H	2N524	P	AT30M	2N1192	P	AT30H	GT12	P	HF6H	SYL104	N	NA30	121-62	P	HF12M	2SA111	P	JR30X	2SB218	P	AT30M	2T63	N	NA20
2N138B	P	AT30H	2N306	N	NA30	2N525	P	AT30M	2N1198	N	NR10	GT13	P	HF12M	SYL105	P	HF12M	121-63	P	HF12M	2SA112	P	JR30X	2SB219	P	AT30M	2T64	N	NA20
2N139	P	HF12H	2N307	P	PT25	2N526	P	AT30H	2N1199	N	NR10	GT14	P	AT30H	SYL106	P	HF6M	121-64	P	AT20M	2SA113	P	JR30X	2SB220	P	AT30M	2T64R	N	NA20
2N140	P	HF12H	2N307A	P	PT25	2N527	P	AT30H	2N1213	P	HF20M	GT20	P	AT30M	SYL107	P	AT20M	121-65	P	HF12M	2SA114	P	JR30X	2SB221	P	AT30M	2T65	N	NA30
2N145	N	NR10	2N308	P	AT20M	2N535A	P	AT20M	2N1214	P	HF20M	GT20R	P	AT20M	SYL108	P	AT30M	121-66	P	HF6M	2SA137	P	JR30	2SB222	P	AT30M	2T65R	N	NA20
2N146	N	NR10	2N309	P	AT20M	2N535B	P	AT20M	2N1215	P	HF20M	GT34	P	AT30M	SYL109	P	PT40	121-67	P	HF6M	2SA144	P	JR30	2SB223	P	AT30M	2T66	N	NA30
2N147	N	NR10	2N310	P	AT20M	2N536	P	HF3H	2N1216	P	HF20M	GT74	P	AT30M	SYL1279	N	NA30	121-68	P	AT20M	2SA145	P	JR10	2SB224	P	AT30M	2T66R	N	NA20
2N148	N	NR10	2N311	P	HF6M	2N544	P	JR30X	2N1217	N	NR10	GT75	P	AT30H	SYL1310	N	NR10	121-69	P	AT30M	2SA146	P	JR10	2SB225	P	AT30M	2T67	N	NA20
2N148A	N	NR10	2N312	N	NR10	2N545	P	PT50	2N1227	P	NR10	GT81	P	AT30M	SYL1311	N	NR10	121-70	N	NR5	2SA151	P	JR10	2SB225	P	AT30M	2T67	N	NA20
2N149	N	NR10	2N313	N	NR10	2N553	P	PT50	2N1245	P	PT50	GT81R	P	AT20M	SYL1312	N	NR10	121-71	N	NR5	2SA152	P	JR30	2SB231	P	PT150M	2T69	N	NA20
2N149A	N	NR10	2N314	N	NR10	2N554	P	PT12	2N1246	P	PT50	GT82	P	AT30H	SYL1313	N	NR5	121-72	P	HF6M	2SA169	P	HF20H	2SC73	N	NR10	2T71	N	NR5
2N150	N	NR10	2N315	P	HF12M	2N555	P	PT25	2N1251	N	NA30	GT109	P	AT30H	SYL1329	N	NA30	121-73	P	HF6M	2SA171	P	HF12M	2SC75	N	NR10	2T72	N	NR5
2N150A	N	NR10	2N316	P	HF12M	2N556	N	NR10	2N1264	P	HF3M	GT109R	P	AT30M	SYL1524	N	NA30	121-74	P	HF6M	2SA173	P	HF6M	2SC76	N	NR10	2T73	N	NR10
2N151	P	AT30H	2N317	P	HF20M	2N557	N	NR10	2N1265	P	AT10M	GT123	P	HF6H	SYL1536	N	NR10	121-75	P	HF6M	2SA174	P	JR15	2SC77	N	NR10	2T74	N	NR5
2N155	P	PT25	2N319	P	AT20M	2N558	N	NR10	2N1266	P	AT10M	GT132	P	HF12M	SYL1537	N	NR5	121-76	P	HF6M	2SA175	P	JR30	2SC78	N	NR10	2T75	N	NR5
2N156	P	PT25	2N320	P	AT20H	2N561	P	PT50	2N1273	P	AT10M	GT229	N	NA20	SYL1538	N	NA30	121-77	P	HF6M	2SA176	P	JR15	2SC79	N	NR5	2T76	N	NR5
2N157	P	PT40	2N321	P	AT20H	2N563	P	AT30M	2N1280	P	HF6H	GT759	P	HF12H	SYL1539	N	NA30	121-78	P	HF6M	2SA177	P	JR15	2SC89	N	NR5	2T76R	N	NR5
2N157A	P	PT40	2N322	P	AT20H	2N564	P	AT30M	2N1281	P	HF12H	GT759R	P	HF6H	SYL1547	N	NA30	121-79	P	HF6M	2SA180	P	JR30X	2SC175	N	NR10	2T77	N	NR5
2N158	P	PT40	2N323	P	AT20H	2N565	P	AT30M	2N1282	P	HF12H	GT760	P	HF12H	SYL1548	N	NA20	121-80	P	HF6M	2SA181	P	JR30	2SC176	N	NR10	2T78	N	NR10
2N158A	P	PT40	2N324	P	AT20H	2N566	P	AT30M	2N1284	P	HF6H	GT761R	P	HF12M	SYL1583	N	NA20	121-81	P	HF6M	2SA182	P	JR10	2SC177	N	NR10	2T82	N	NR10
2N164	N	NR10	2N325	P	PT40	2N567	P	AT30H	2N1287	P	AT30H	GT761	P	HF12H	SY11608	N	NR10	121-82	P	HF6M	2SA183	P	JR30X	2SD11	N	NR5	2T83	N	NR10
2N164A	N	NR10	2N331	P	AT20H	2N568	P	AT30H	2N1287A	P	AT30H	GT759R	P	HF6H	T0038	P	AT30M	121-83	P	HF6M	2SA201	P	JR10	2SD61	N	NR5	2T84	N	NR10
2N165	N	NR10	2N343	P	JR30	2N569	P	AT20H	2N1291	P	PT30	GT760R	P	HF6H	T0039	P	AT30M	121-120	P	AT20M	2SA202	P	JR30X	2SD62	N	NR5	2T85	N	NR10
2N166	N	NR10	2N345	P	JR30X	2N570	P	AT20H	2N1293	P	PT30	GT761	P	HF12H	T0040	P	AT30M	310	P	AT20M	2SA203	P	JR10	2SD63	N	NR5	2T86	N	NR10
2N167	N	NR10	2N346	P	JR30X	2N571	P	AT10H	2N1295	P	PT30	GT761R	P	HF12M	T0041	P	AT30M	1124A	P	PT25	2SA204	P	HF6M	2SD64	P	JR15	2T89	N	NA20
2N167A	N	NR10	2N350	P	PT40	2N572	P	AT10H	2N1297	P	PT30	GT762R	P	HF12H	T1000	P	AT30M	1329	N	NA20	2SA205	P	HF6M	2SD65	P	JR15	2T201	P	JR30
2N168	N	NR5	2N350A	P	PT40	2N573	P	AT20M	2N1299	N	NR10	GT762	P	HF20H	T1003	P	AT30M	3435	P	HF12M	2SA206	P	HF12M	2SD75	N	NR5	2T203	P	JR30
2N168A	N	NR5	2N351	P	PT40	2N576	N	NR5	2N1299	N	NR10	GT762R	P	HF12H	T1005	P	AT30M	3504	P	AT20M	2SA207	P	HF20M	2SD77	N	NR5	2T204	P	JR5
2N169	N	NR10	2N351A	P	PT40	2N577	N	NR5	2N1300	P	HF12M	GT763	P	AT30H	T1006	P	AT30M	3544	P	HF12M	2SA208	P	HF6M	2T311	N	NR10	2T312	P	JR15
2N169A	N	NR10	2N352	P	PT40	2N578	P	HF6M	2N1301	P	HF12M	GT766	P	HF12H	T1007	P	AT30M	3600	P	AT30M	2SA209	P	HF6M	HJ15	P	JR5	2T313	P	JR5
2N170	N	NR5	2N353	P	PT40	2N579	P	HF6M	2N1301	P	HF12M	GT766A	P	HF12M	T1008	P	AT30M	4247	P	PT25	2SA210	P	HF12M	HJ15D	P	JR5	2T314	P	JR5
2N172	N	NR5	2N353	P	PT40	2N580	P	HF12H	2N1313	P	HF6M	GT772	N	NR10	T1010	P	HF6M	4315	P	AT30M	2SA211	P	HF6M	HJ17	P	JR15	2T315	P	JR15
2N173	P	PT501	2N356	N	NR5	2N581	P	HF6M	2N1316	P	HF12H	GT904	N	NR5	T1012	P	HF6M	4366	P	PT25	2SA212	P	HF6M	HJ17D	P	JR15	2T321	P	JR15
2N174	P	PT501	2N357	N	NR10	2N582	P	HF20H	2N1317	P	HF12H	GT948	N	NR10	T1033	P	HF6M	4367	P	AT30M	2SA236	P	JR10	HJ22	P	JR10	2T322	P	JR15
2N174A	P	PT515	2N358	N	NR10	2N583	P	HF6M	2N1318	P	HF12H	GT949	N	NA30	T1232	P	HF6M	4367	P	AT30M	2SA237	P	JR10	HJ22D	P	JR10	2T323	P	JR15
2N175	P	AT10H	2N359	P	AT30H	2N584	P	HF20H	2N1343	P	HF6M	MN25	P	PT25	T1233	P	HF6M	100-36	P	AT30M	2SB21	P	JP40	HJ23	P	JR30	2T324	P	JR15
2N176	P	PT25	2N360	P	AT30H	2N584	P	HF20H	2N1344	P	HF12H	MN29	P	PT25	T1233	P	HF6M	100-37	P	AT20M	2SB22	P	JR15	HJ23D	P	JR30	2T513	N	NR10
2N178	P	PT25	2N361	P	AT30H	2N585	N	NR5	2N1345	P	HF12M	MN29	P	PT25	T1299	P	HF6M	112-001	P	HF12M	2SB23	P	JP40	HJ32	P	JR30	2T514	N	NR5
2N179	P	PT25	2N363	P	AT20M	2N586	P	HF12M	2N1346	P	HF12H	MN29	P	PT25	T1299	P	HF6M	112-002	P	HF6M	2SB25	P	JP40	HJ34	P	JR15	2T520	N	NR5
2N180	P	AT30H	2N364	N	NA30	2N587	N	NR5	2N1347	P	HF6H	MN29	P	PT25	T1300	P	AT20M	112-003	P	AT20M	2SB26	P	JP40	HJ34A	P	JR15	2T521	N	NR5
2N181	P	AT30H	2N365	N	NA30	2N587	N	NR5	2N1352	P	AT30H	MN53	P	AT20M	T1305	P	HF12M	112-004	P	AT20M	2SB27	P	JP40	HJ35	P	JP40	2T522	N	NA20
2N182	N	NR5	2N366	N	NA30	2N591	P	AT30H	2N1353	P	AT30M	MN73	P	PT25	T1306	P	HF12M	112-003	P	AT30M	2SB28	P	JP40	HJ37	P	JR30	2T523	N	NR5
2N183	N	NR5	2N367	P	AT30M	2N592	P	HF3M	2N1354	P	HF6M	Q1																	

SEMITRON

SEMITRON QUALITY ELECTRONIC PARTS

TRANSISTORS

REPLACEMENT AND INTERCHANGEABILITY GUIDE

SEMITRONICS Corp.

American Made Replacements

New York 13, N. Y.

American
Made
Replacements

No. Type Semitron			FOREIGN SUBSTITUTES																										
2N34	P	AT30M	2N207	P	JR30	2N392	P	PT150	2N634	N	NR10	AO1	P	JR30	R119	P	HF12M	TS619	P	AT20M	2NJ8A	P	JR30	2SB73	P	JR15	HJ226	P	JR30
2N35	N	NR5	2N207A	P	JR30	2N393	P	JR30X	2N634A	N	NR10	AR5	P	PT25	R135	N	NR5	TS627	P	AT20M	2NJ9A	P	JR15	2SB74	P	JR15	HJ228	P	JR10
2N36	P	AT20M	2N207B	P	JR30	2N394	P	HF6M	2N635	N	NR10	AR6	P	PT40	R136	N	NR5	TS629	P	AT30M	2N9D	P	JR5	2SB75	P	JR15	HJ230	P	JR5
2N37	P	AT20M	2N211	N	NR5	2N395	P	HF6M	2N635A	N	NR10	AR7	P	PT40	R137	N	NR5	TS672A	P	HF12M	2S12	P	JR30	2SB76	P	JR10	HS15	P	JR5
2N38	P	AT20N	2N212	N	NR10	2N396	P	HF6M	2N636	N	NR10	AR8	P	PT40	R163	P	AT20M	TS672B	P	HF6M	2S13	P	JR10	2SB77	P	JR15	HS17D	P	JR15
2N39	P	AT20N	2N213	N	NA20	2N396A	P	HF6M	2N636A	N	NR10	AR9	P	PT40	R164	P	AT30M	TS673A	P	HF12M	2S15A	P	JR15	2SB78	P	JR5	HS22D	P	JR10
2N40	P	AT20H	2N213A	N	NA20	2N397	P	HF12H	2N637	P	PT40	AR10	P	PT40	R186	P	HF6M	TS673B	P	HF6M	2S22	P	JR15	2SB85	P	JP40	OC34	P	JR5
2N41	P	AT30H	2N214	N	NA20	2N399	P	PT40	2N637A	P	PT50	AR11	P	PT40	R202	N	NR10	TS1007	P	AT10M	2S24	P	JR5	2SB87	P	JP40	OC38	P	JR15
2N42	P	AT30M	2N215	P	AT30H	2N400	P	PT40	2N638	P	PT40	AR12	P	PT40	R203	N	NR10	WTV-Pwr40	P	PT40	2S25	P	JR10	2SB89	P	JR15	OC44	P	JR30X
2N43	P	AT30M	2N216	N	NR5	2N401	P	PT40	2N638A	P	PT50	AR13	P	PT40	R227	P	HF12M	WTV-Pwr25	P	PT25	2S30	P	JR30	2SB91	P	JR15	OC45	P	JR10
2N43A	P	AT30M	2N217	P	AT30H	2N402	P	AT20M	2N638B	P	PT50	AR102	P	AT20M	R244	P	HF12M	WTV-Pwr12	P	PT12	2S31	P	JR10	2SB97	P	JR15	OC46	P	JR10
2N44	P	AT30M	2N218	P	HF12H	2N403	P	AT20M	2N639	P	PT40	B1017	P	PT12	R255	P	AT20M	WTV-Pwr6	P	PT6	2S32	P	JR5	2SB100	P	JR15	OC47	P	JR10
2N44A	P	AT30M	2N219	P	HF12H	2N404	P	HF6M	2N639A	P	PT50	CK721	P	AT20M	R290	P	AT20M	WTV-99Pwr	P	PT6	2S33	P	JR5	2SB101	P	JR15	OC47	P	JR10
2N45	P	AT30M	2N220	P	AT10H	2N405	P	AT20M	2N639B	P	PT50	CK722	P	AT20M	R291	P	AT30H	WTV-299Pwr	P	PT501	2S34	P	JR15	2SB102	P	JR15	OC65	P	JR15
2N46	P	AT30H	2N222	P	AT20M	2N406	P	AT20M	2N647	N	NA30	CK725	P	AT30H	R428	P	AT30H	WTV-BE6	P	HF12M	2S36	P	JR10	2SB107	P	JP40	OC66	P	JR15
2N47	P	AT30M	2N223	P	AT30H	2N407	P	AT20H	2N649	N	NA30	CK727	P	AT30H	RS684	P	HF12M	WTV-BA6	P	HF6M	2S39	P	JR5	2SB110	P	JR15	OC70	P	JR5
2N48	P	AT30M	2N224	P	AT30H	2N408	P	AT20H	2N650	P	AT30H	CK751	P	AT30H	RS685	P	HF12M	WTV-B5	P	AT30M	2S40	P	JR15	2SB111	P	JR15	OC71	P	JR5
2N49	P	AT30M	2N225	P	AT30H	2N409	P	HF12H	2N651	P	AT30H	CK759	P	HF12H	RS686	P	AT20M	WTV-AT6	P	AT20M	2S41	P	JP40	2SB112	P	JR15	OC72	P	JR15
2N54	P	AT30M	2N226	P	AT30H	2N410	P	HF12H	2N652	P	AT30H	CK759A	P	HF20H	RS687	P	AT30M	WTV-B5A	P	AT30H	2S42	P	JP40	2SB113	P	JR15	OC76	P	JR15
2N55	P	AT30M	2N227	P	AT30H	2N411	P	HF12H	2N653	P	AT30H	CK760	P	HF12H	RS1192	P	AT30H	WTV-SK7	N	NR5	2S43	P	JR5	2SB114	P	JR15	OC77	P	JR15
2N56	P	AT30M	2N228	N	NA30	2N412	P	HF12H	2N654	P	AT30H	CK760A	P	HF20H	RS1513	N	NA20	WTV-SQ7	N	NA20	2S49	P	JR10	2SB115	P	JR15	OC139	N	NR5
2N59	P	AT30H	2N229	N	NA30	2N413	P	HF6M	2N655	P	AT30H	CK872	P	AT30H	RS1531	N	NR10	WTV-1.6	N	NA30	2S52	P	JR30	2SB116	P	JR15	OC140	N	NR5
2N59A	P	AT30H	2N231	P	JR30	2N413A	P	HF6M	2N669	P	PT40	CK875	P	AT20M	RS1533	N	NR10	WTV-3MC	P	HF3H	2S53	P	JR10	2SB117	P	JR15	OC304	P	JR5
2N59B	P	AT30H	2N232	P	JR30X	2N414	P	HF12H	2N677	P	PT150	CK878	P	AT30H	RS1533	N	NR10	WTV-6MC	P	HF6H	2S54	P	JR15	2SB120	P	JR15	OC307	P	JR15
2N59C	P	AT30H	2N233	N	NR5	2N414A	P	HF12H	2N679	N	NR5	CK882	P	AT30H	RS1533	N	NR10	WTV-12MC	P	HF12H	2S55	P	JR15	2SB122	P	JP40	OC308	P	JR15
2N60	P	AT30H	2N233A	N	NR5	2N415	P	HF12H	2N680	P	AT20M	CK888	P	AT30H	RS1534	N	NR10	WTV-20MC	P	HF20H	2S59	P	JR15	2SB123	P	PT50	OC330	P	JR5
2N60A	P	AT30H	2N234	P	PT25	2N415A	P	HF12H	2N1007	P	PT25	CTP1104	P	PT12	RS1537	N	NR5	WTV-20VMG	P	AT10M	2S92	P	JR30	2SB124	P	PT50	OC331	P	JR10
2N60B	P	AT30H	2N234A	P	PT25	2N416	P	HF12H	2N1008	P	AT20H	CTP1108	P	PT6	RS1538	N	NR5	WTV-15VMG	P	AT10M	2S92A	P	JR30	2SB125	P	PT150	OC340	P	JR15
2N60C	P	AT30H	2N235	P	PT40	2N417	P	HF20H	2N1008A	P	AT20H	CTP1109	P	PT6	RS1539	P	HF12M	WTV-20VVG	P	AT20M	2S93	P	JR30	2SB126	P	PT50	OC341	P	JR10
2N61	P	AT30M	2N235A	P	PT40	2N418	P	PT50	2N1008B	P	AT20H	CTP1117	P	PT40	RS1540	P	AT20M	WTV-20VHG	P	AT20H	2S93A	P	JR30	2SB127	P	PT50	OC342	P	JR10
2N61A	P	AT30M	2N235B	P	PT40	2N419	P	PT50	2N1009	P	AT20H	CTP1124	P	PT40	RS1541	P	AT20M	WTV-30V1G	P	AT30H	2S94	P	JR30	2SB128	P	PT150	OC343	P	JR10
2N61B	P	AT30M	2N236	P	PT40	2N420	P	PT50	2N1010	N	NA30	DS1	N	NR5	RS1542	P	AT20M	WTV-30VMG	P	AT30M	2S109	P	JR30	2SB129	P	PT150	OC350	P	JR15
2N61C	P	AT30M	2N236A	P	PT40	2N420A	P	PT50	2N1014	P	PT40	DS2	N	NR5	RS1543	P	AT20M	WTV-30VHG	P	AT30H	2S110	P	JR30	2SB131	P	JP40	OC351	P	JR10
2N62	P	AT30M	2N236B	P	PT40	2N422	P	AT20H	2N1017	P	HF20H	DS3	P	AT20M	RS1544	P	AT20M	34-6000-3	P	HF12M	2S112	P	JR30	2SB132	P	JP40	OC360	P	JR5
2N63	P	AT20M	2N238	P	AT20H	2N425	P	HF3M	2N1021	P	PT50	DS4	N	NR5	RS1545	N	NR5	34-6000-18	P	HF6M	2S141	P	JR30	2SB140	P	JP40	OC361	P	JR10
2N64	P	AT20M	2N426	P	HF6M	2N426	P	HF6M	2N1022	P	PT50	DS5	N	NR5	RS1546	P	AT20M	34-6000-19	P	HF6M	2S142	P	JR30	2SB141	P	JP40	OC362	P	JR10
2N65	P	AT20H	2N427	P	HF6H	2N427	P	HF6H	2N1023	P	PT25	DS6	N	NR5	RS1547	N	NR5	34-6001-16	P	AT20M	2S143	P	JR30	2SB142	P	JP40	OC363	P	JR10
2N77	P	AT30H	2N428	P	HF12H	2N428	P	HF12H	2N1033	P	PT25	DS7	N	NR5	RS1548	P	AT20M	34-6001-28	P	AT30M	2S145	P	JR30	2SB143	P	JP40	OC390	P	JR10
2N78	N	NR10	2N438	N	NR5	2N438	N	NR5	2N1038	P	PT30	DS9	N	NR5	RS1549	N	NA20	34-6001-33	P	AT20M	2S146	P	JR30	2SB143P	P	JP40	OC410	P	JR30
2N79	P	AT30H	2N438A	N	NR5	2N439	N	NR5	2N1039	P	PT30	DS11	N	NR10	RS1550	P	HF12H	34-6009	P	AT30M	2S150	P	JR10	2SB144	P	JP40	OC602	P	JR15
2N80	P	AT30H	2N439	N	NR5	2N439A	N	NR5	2N1040	P	PT30	DS12	N	NR10	RS1551	N	NR5	814044A	P	AT30M	2S151	P	JR30	2SB144P	P	JP40	OC603	P	JR15
2N81	P	AT20M	2N440	N	NR10	2N440A	N	NR10	2N1041	P	PT30	DS14	P	AT30H	RS1552	P	HF12M	815020	P	HF12M	2S160	P	JR30	2SB145	P	JP40	OC604	P	JR15
2N82	P	AT20M	2N440A	N	NR10	2N441	P	PT501	2N1046	P	PT30	DS16	P	AT30H	RS1553	N	NR5	815021	P	HF6	2S163	P	JR15	2SB146	P	JP40	OC612	P	JR10
2N83	P	HF6H	2N441	P	PT501	2N442	P	PT501	2N1058	N	NR10	DS19	P	AT30H	RS1554	P	HF12M	815022	P	AT20	2S178	P	JR30	2SB147	P	JP40	OC613	P	JR30
2N84	N	NR10	2N442	P	PT501	2N443	P	PT501	2N1059	N	NA30	DS21	P	HF12H	RS1555	P	AT20M	815023	P	AT20	2S179	P	JR15	2SB149	P	PT150	ST28A	P	JR10
2N94	N	NR10	2N443	P	PT501	2N444	N	NR5	2N1086	N	NR10	DS22	P	HF12H	RS1556	P	AT20M	815024	P	AT20	2S182	P	JR30	2SB151	P	PT50	ST28B	P	JR10
2N94A	N	NR10	2N444	N	NR5	2N445	N	NR5	2N1086A	N	NR10	DS23	P	HF12H	RS1557	P	AT20M	815025	P	HF12	2S183	P	JR30	2SB152	P	PT50	ST28C	P	JR10
2N96	P	AT20M	2N445	N	NR5	2N446	N	NR5	2N1087	N	NR10	DS24	P	HF12H	RS1558	P	AT20M	815026	N	NR5	2S184	P	JR30	2SB153	P	JP40	ST28D	P	JR30
2N97	N	NR5	2N446	N	NR5	2N447	N	NR5	2N1087A	N	NR10	DS25	P	HF12H	RS1559	P	AT20M	815026A	N	NR5	2S185	P	JR30	2SB154	P	JP40	ST37C	P	JR30
2N97A	N	NR5	2N447	N	NR5	2N448	N	NR5	2N1089	N	NR10	DS26	P	HF12H	RS1560	N	NR10	815026B	N	NR5	2S186	P	JR30	2SB155	P	JP40	ST37D	P	JR30
2N98	N	NR5	2N448	N	NR5	2N449	N	NR10	2N1091	N	NR10	DS27	P	HF12H	RS1561	N	NR5	815026C	N	NR5	2S187	P	JR30	2SB156	P	JP40	ST122	P	JR15
2N98A	N	NR5	2N449	N																									

HERE IS YOUR NEW

SEMITRON

TRANSISTOR REPLACEMENT AND

INTERCHANGEABILITY GUIDE

Tear out and hang this chart near your workbench for instant reference. This guide contains important reference on replacements for foreign transistors, special factory types and standard EIA Transistors.

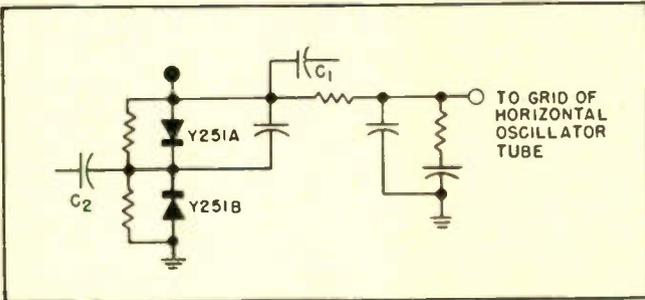
Look for Semitron "service designed" products and service aids at your favorite electronic distributor.

TV MANUFACTURERS TECHNICAL DIGEST

GENERAL ELECTRIC

M4, M5, M6, U4 and U5 Chassis—Testing Diodes phase detectors

Defective diodes in these chassis is evidenced by soft or complete loss of sync even though the horizontal hold control affects frequency. After horizontal



Phase detector circuit used in recent G-E chassis.

circuit tubes are tried in this circuit, the voltage across both diodes should be checked. The normally operating receiver should have about 1 v present. If six to eight volts positive or if 10 to 12 v negative is found, the B section of the Diode pair is open or shorted respectively. If the reverse of these conditions is found, A section of the diode is open or shorted respectively.

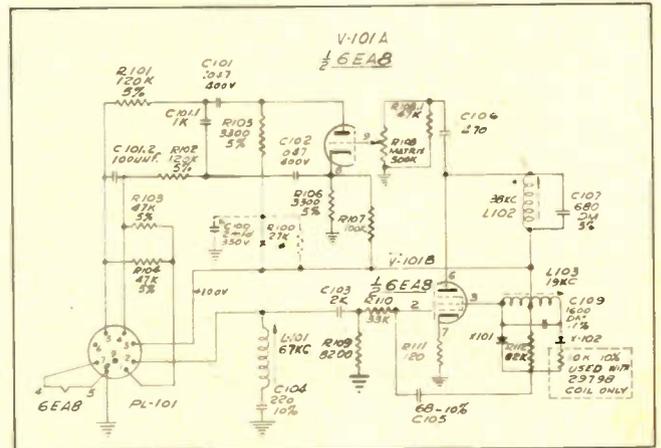
To test the oscillator section of these receivers, place a short across both diodes. If it is possible to obtain one picture (though not in sync), the oscillator section is operating normally.

PACKARD BELL

Multiplex Decoder—Improve stability, separation, distortion and noise.

The following changes should be made to increase separation and prevent the occurrence of oscillation: Add a 47 k resistor across matrix control R-108. This part has been designated R-108.1. If the unit has a 29798 coil, add a 10 k resistor in series with diode X-102.

A decrease in distortion may be obtained in these sets by increasing the 19 kc pilot carrier amplitude. This may be accomplished as follows: Change R-111 from ohms to 120 ohms. Add a 1000 pf capacitor between the junctions of R101 and C-101 to R-102 and C-102. The value of R-110 should be raised from 27 k to 33 k.



Packard Bell's MPX-2 and MPX-2-1 showing modification to improve performance.

If it is desirable to reduce noise in weak signal areas, a 100 pf capacitor may be added between terminal 4 and 5 of PL-101.

PHILCO

Chassis TT-82, -83, -84—Hot Cabinet Check

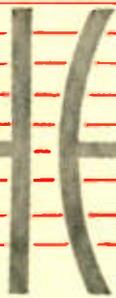
The following procedure should be used for Philco models with this chassis to check for line leakage:

Cold check: Remove plug from line and short prongs together. Measure the resistance between the shorted prongs and exposed metal parts. Receivers employing power transformers should measure between 1.2 and 3.2 meg. Series sets should measure between 1.5 and 3.5 meg.

Hot check: Connect the receiver to an a-c outlet and turn the receiver on. Connect a 1500 ohm, 10 w-resistor across the terminals of a 1k/v a-c voltmeter. Touch one lead to earth ground and the other to exposed metal parts. The voltage measured should not exceed 0.4 v rms. Reverse the a-c plug and repeat the procedure.

IF YOU CHANGE YOUR ADDRESS

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



TUNING IN

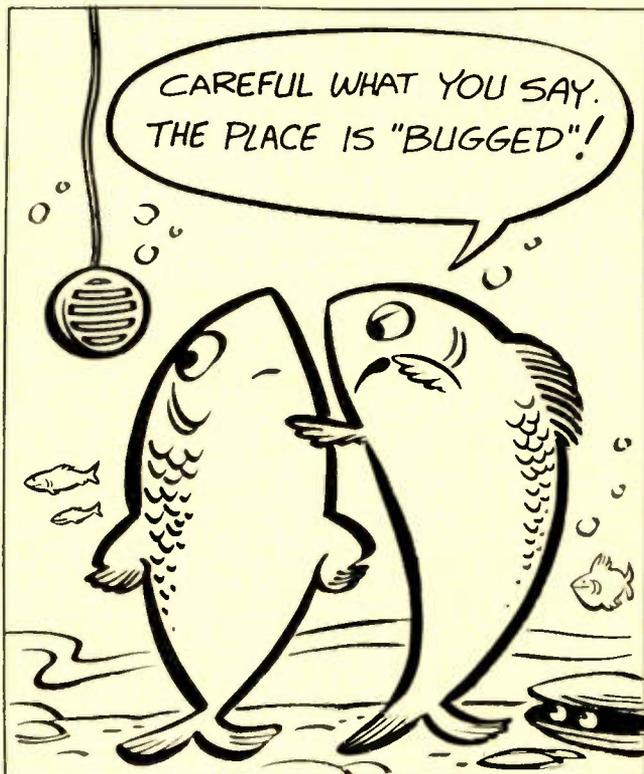
EIA reports that the electronics industry set a 28-year high in financial embarrassments during the 12-month period ended April 30. The record was surpassed only during the depression peak of 1932, with the trend closely following the pattern set by commercial failures. There were approximately 17,000 failures in the industry on a national basis, as compared with 15,450 a year before. Liabilities hit a new peak, with the total estimated at almost \$28 million, compared with \$19,229,000 a year ago.

A MOBILE COMMUNICATIONS LAB designed for demonstrating, checking and testing CB equipment has been developed by e.c.i. Electronics Communications. The mobile unit will be employed for

checking, measuring and demonstrating modulation, power output, d-c current, standing wave ratio and other characteristics of any CB unit from any manufacturing source. It is reported that the traveling "Mobilab" will be made available to any bona fide CB club group or association for inspection, use and education at rallies, shows, meetings and special events.

MICRO-THIN COATINGS can now be measured accurately and non-destructively, and read directly from a dial without calculations, with the new Micro-Derm instrument developed by Unit Process Assemblies. It can be used for the measurement of metallic or non-metallic coatings on almost any kind of base material, without special skills or training. The instrument is capable of measuring from a fraction of a millionth-of-an-inch to many thousands-of-an-inch of coating thickness. Rapid reading of the coating thickness, without calculation, is made possible when the thickness indicator meter is equipped with various direct-reading scales.

'TONGUES-AND-SOUNDS'



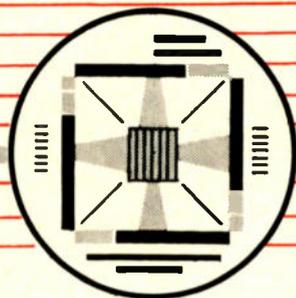
Mr. Fish might add that stainless steel diaphragms, similar to those used in standard telephone receivers, are now being used to listen to the latest gossip down in the "silent deep." McWilliams Forge Co., Inc. makes the units from Allegheny Ludlum Steel Corporation's Type 316 stainless steel. Persons experienced in listening to "fish talk" can identify many individual species just by listening to what may be everyday conversation down on the ocean floor.

A SPECIAL WELDERS COURSE in the operation of precision electronic welding equipment was successfully completed by six women and four men who were having difficulty finding jobs. Hughes Aircraft Company's vacuum tube products division conducted the course for people selected by the Vocational Rehabilitation Service of the California State Dept. of Education. Those chosen had suffered industrial accidents, had no skills or their skills were obsolete. The equipment they learned to operate is manufactured by Hughes for the assembly of electronic circuit components.

THE TALLEST MANMADE STRUCTURE in the world is completed in Columbus, Ga. TV programs of WTVM and WRBL-TV are being transmitted from antennas located almost a third of a mile high. Work on the tower, which consisted of extending the original 1260-ft. tower and antenna structure, was completed in less than two months, and without loss of air time for either station. The 215 ton, triangular structure employs tubular material for simplicity, low wind loading and greater structural strength. Broadcast coverage is expected to increase substantially.

NERVE FINDER, an instrument the size of a transistor radio, with only one dial and one switch to operate, was developed by Dr. Louis Kolodner, a surgeon

THE PICTURE



on the staff of Baltimore's Sinai Hospital, in cooperation with Electronic Aids, Inc. Dr. Kolodner stated that facial tumor removal frequently resulted in nerve tissue damage, and sometimes caused partial paralysis of the face. The "Nerve Finder" operates on the principle that nerve tissues will respond to electrical stimulation. The instrument is easy to handle and can be sterilized through normal hospital techniques.

ELECTRONIC BEAUTY ANALYSIS is now possible with "Beauty Brain," a solid state Univac computer. It will provide women with a scientific, individual, skin care and make-up analysis and recommendations based on the answers to a personalized questionnaire. Answers to the 51-question form will provide the "brain" with clues to a woman's personality. It then registers and analyzes to produce recommendations specifically tailored to the individual. The questionnaire forms will be available in selected department stores, published in local newspapers and mailed to charge account customers to answer in confidence.

ELECTRONIC TEACHING BLOCKS are designed to teach complicated theories of electronics. Together

'WISP-EAR'



Said to be the smallest hearing aid in the world, the Sonotone "Wisp-Ear," weighs under 1/5th of an ounce with battery. It is light as a nickel, small as a dime in diameter and houses more than 100 components. The device is worn in the ear with no outside cords, tubes or wires and is controlled by a three-position volume lever (high, low and "idling"). According to the company it can help seven out of 10 persons with hearing deficiencies.

COMING EVENTS

- October 1-3: 8th National Communications Symposium, Hotel Utica & Municipal Aud., Utica, N. Y.
- October 8-10: National Electronics Conference, McCormick Place, Chicago, Ill.
- November 12-14: Radio Fall Meeting, King Edward Hotel, Toronto, Ont., Canada
- November 13-15: NEREM (Northeast Res. & Engineering Meeting), Boston, Mass.
- December 6-7: PGVC (PG on Vehicular Communications) Conference, Mayfair Hotel, Los Angeles, Calif.

with a text prepared by the manufacturer, Electronic Aids, Inc., the blocks provide a complete course in basic electronics. The interlocking blocks are made of strong clear plastic and circuits and component parts essential to the experiment are imbedded in them. Each circuit is color-coded to enable the student to trace it without difficulty. According to the company this is the first unified system for teaching electronics and a student's advancement is determined by the number of blocks he has just finished studying.

A POCKET-SIZE TRANSISTOR is powered by thermoelectricity from the human body. The process was developed by Sanyo Electric Co., Ltd., Osaka, Japan. A spokesman, explaining the principle for Sanyo, said a pair of N-type semiconductors and P-type semiconductors are fitted into a holder device. When a temperature difference is attached to both ends of the device, the electrons and positive holes in the N-type and P-type semiconductors undergo thermal diffusion from the high-temperature side to the low-temperature side and the current flows from the positive to the negative side.

INDUSTRY TV SALES at the distributor level are up 10.5 percent through May for this year. But Edward R. Taylor, president of Motorola Consumer Products, Inc., sounds a note of warning. He points out that TV inventory at the factory and distributor level is also up 35.5 percent for the same period. "If production continues at present levels figures forecast an inventory glut of TV and radio products before year's end at the factory and in the hands of distributors. This condition could only result in liquidation at no profit to everyone along the marketing pipeline."

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. . . for more details circle 35 on page 50
 ELECTRONIC TECHNICIAN

Transistors Are Here to Stay

"If the TV and radio technician is going to stay in business, he'd better do something to improve his knowledge of transistors and transistor circuitry."

This statement was recently made by a spokesman for a large radio and TV manufacturer. He was talking about the thousands and thousands of technicians who evidently feel that transistors are only a fad and have no place in TV equipment.

Three years ago transistorized TV was a baby, with only one set on the market. There are at least three now and we think a lot more will come. Although manufacturers of transistorized consumer-product equipment also make tube products, it is mostly a matter of gaining public acceptance and developing less expensive production methods before the deluge begins.

Transistors are less expensive and more trouble-free. They are a manufacturer's dream. Transistors are also the dream of alert service technicians. Will you be around when this dream comes true? It's up to you.

A wealth of material is available on transistors and transistor circuitry. But you must want to absorb it.

Most of you have been in business long enough to know that events crystalize suddenly. The chances are good that transistor sets will come into your shop en masse. Don't say you weren't reminded.

Transistors may also make it more difficult for do-it-yourselfers. Do you think customers will snip transistors out of their TV sets and bring them to the corner drug store to be checked on a DIY transistor tester?

Do-It-Yourself Tube Testers

And that brings us to the loss of over-the-counter tube sales to hardware, drug, and corner candy store do-it-yourself tube testers.

Many suggestions have been made to counteract this loss of tube sales. Abortive head-on attacks made in some areas have proven ineffective. But some technicians have taken the bull firmly by the horns and installed DIY type tube testers in store and shop fronts.

The self-styled "TV repairman"—customer checks his tubes where he can get sage advice from the technician. DIY tube testers can't talk—yet!

The technician can frequently make suggestions to save the do-it-yourselfer unnecessary expense and em-

barrassment. Some of these set owners are appreciative and become good customers.

Moreover, if one or more new tubes fail to correct the do-it-yourselfer's complaint, he usually returns to the shop and requests service. This approach to DIY tube testing also eliminates much of the "free" tube testing which takes up a lot of the technicians valuable time.

We believe this approach to the problem has many valid points. Some technicians who have tried it have regained a substantial portion of lost tube sales and have picked up additional business. It deserves a closer look by technicians.

■ There is some indication that a storm is brewing between equipment manufacturers and replacement semiconductor marketers. The question in argument is how many transistors are necessary to properly replace most original equipment types.

Several original equipment manufacturers market their own replacement line. One side says this is to more nearly meet original equipment specifications; the other says that OEMs are only hungry for a

electronic items, we strongly recommend that original types be used for replacement whenever possible. However, this unit can be used as a replacement for the following transistors in most radio applications . . ." A total of 83 types follow the statement.

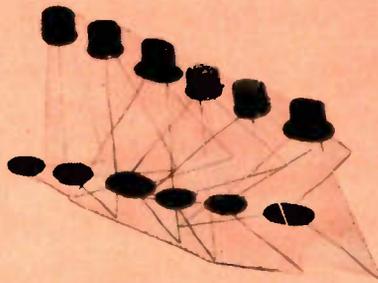
On an identical statement, the same manufacturer lists 118 transistors replaceable with a single unit. In all, this manufacturer claims 268 replacements are possible with only three transistors. Two more transis-

by another: Twelve transistors are classified by types. One each NPN and PNP type is used for mixer/oscillator converter replacements. Two others are used for i-f applications, and a total of five are used for 6 v, 9 v, 12 v and various NPN-PNP audio amplifier combinations. Most automobile radio transistors, they claim, can be replaced from a selection of two, and one additional transistor is listed for low power, high frequency applications.

The list seems infinite. Other



Power transistor used in the output stage of some auto radios. Most "universal" marketers use one transistor to replace the five most commonly used types.



Array of six transistors used by G-E to replace almost all r-f and i-f transistors employed in domestic type radios.



Many popular power transistors used in entertainment equipment take the form shown in this picture. About 70 popular types are used.

share of the transistor sales.

If the universal replacement concept is valid, the advantages are obvious: low inventory allows the average dealer to stock all the necessary transistors; lower prices available through production quantities and package buys. If a few transistors can replace several hundred, then there are no disadvantages—but the battle rages on. The facts can be presented; deciding is difficult and up to you, who must make the buying decision.

What Manufacturers Say

One original equipment manufacturer who has gone into the replacement market issues a statement with some transistors: "As a manufacturer of auto radios and other

tors are included in their line for high power audio applications.

Another manufacturer markets five transistors for power outputs only. Each of these transistors is rated according to its power and gain. The fifth of these transistors, listing at a considerably higher price, is said to replace three of the others. If this is true, then only two transistors would be required to replace virtually any other power transistor used "for general purposes in auto radios, power amplifiers, farm radios, marine radios, etc."

It must be assumed that the wide range of replacements possible with a few transistors is justified by extreme over-rating in some replacements and exceptional parameters.

Still a different philosophy is used

manufacturers use 8, 9, 13 and even 35 types to replace popular transistors. Those who have a larger number of replacements maintain that the wide range of parameter requirements can't be met with only a few transistors. At least one manufacturer has announced plans to bring out additional transistors in their line to cover more replacements.

Considerations For Replacements

The following considerations are involved when installing transistors in a given circuit:

1. Power dissipation; if the transistor has the capacity to dissipate sufficient power, that requirement is met.

2. The circuit must be designed

to allow the transistor to draw proper current for specified bias.

3. Gain in the replacement should be as nearly alike the original as possible.

4. Circuit voltages must not exceed the transistor element breakdown ratings.

5. Frequency response should be similar to the original transistor.

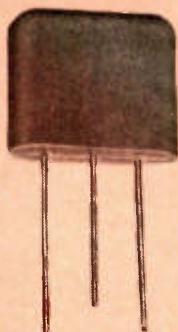
6. In certain r-f circuits, capacity of the Collector must be considered.

7. And, of course, the transistor must be designed to be mounted

Know what to look for in a universal replacement transistor before you stock up

UNIVERSAL REPLACEMENT TRANSISTORS

by J. S. McGregor



Case style used for some r-f and i-f transistors. Incompatibility of size and shape may be a problem in some installations.

or contained in the same space as the original.

Now, the next logical question is what happens if one or several of these requirements are not met. Some of the answers are obvious: If the power rating is too low, the power output will be low—until the transistor fails prematurely. When voltage specifications are not met, breakdown may occur or insufficient gain may result. Importance of size and shape need not be itemized.

Improper bias because of different Ico ratings may cause a variety of problems: low gain, distortion, and poor frequency response to list a few.

Too little gain from a replacement transistor would, of course, simply

depreciate the output. Too much gain, on the other hand, may, or may not be troublesome. In i-f and r-f circuits it will almost invariably cause feedback or instability which evidences itself in radio circuits with a chorus of birdies, whistles, putt-putts or other faulty alignment symptoms.

Insufficient frequency response in r-f and i-f circuits can spoil sensitivity. Also, the r-f transistor with narrow frequency response may not cover the entire band with the same sensitivity or may even cut off a portion of the band. In the i-f, a frequency cutoff which is too high may cause all the symptoms of misalignment because of mixing in the i-f and other station interference.

Tuned circuits in some r-f appli-

cations may be detuned if the collector capacity of the replacement transistor is not nearly the same as the original unit.

Since size is the most obvious requirement which must be met, it seems logical that it should be offended less frequently than electrical specifications. This is not true, however, but fortunately most consumer-product applications can tolerate 50 percent to 100 percent increase in component size. If some of these transistors were used for certain industrial replacements, they simply would not work.

What Can Be Done

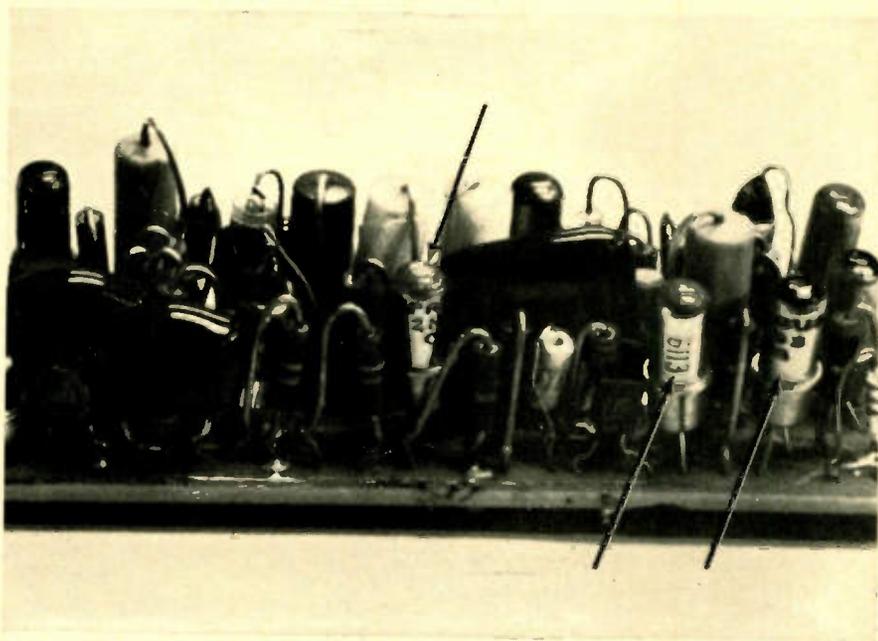
Without a doubt, most of the Universal Replacement transistors will do the job which they are speci-

UNIVERSAL REPLACEMENT TRANSISTORS

Continued



Transistor display board for distributor use offers widest range of universal replacements available.



Portion of industrial module shows compactness of transistor circuitry. Most transistors listed as replacement for transistors shown with arrows are not physically small enough to be mounted on the Printed Circuit board.

fied to do. In a large number of cases this is simply not true. This does not seem to be misrepresentation on the part of the manufacturer or marketer. Applying a replacement transistor in critical circuits or where size limitations exist creates the problem.

In this respect, marketers who are increasing the number of transistors in their universal replacements seem to have the right idea. The quality of the units and the care with which they are selected is still another story, and is dependent on the integrity of the manufacturer.

One industrial semiconductor manufacturer is trying to establish a relatively small number of transistors to do a wide variety of jobs. The manufacturer is quick to point out that these would not be universal replacements, but that circuits could be designed around these units which would perform as well as any other transistor presently available. If the manufacturer is successful in getting this idea across to the design engineer, it may be the answer.

An additional thought which is often overlooked in using replacement transistors concerns the quality of the original unit. Transistors which were used a few years ago in entertainment products had very broad parameter tolerances. Transistors with tight specifications for domestic equipment use were too expensive.

Materials and production methods have improved since then and for the same price a better transistor can be bought. Universal replacement transistors are, generally speaking, high quality. They must be high quality in order to replace a wide range of other transistors.

Original equipment transistors on the other hand, were often units which did not meet specifications as a higher grade unit. The replacement transistor, in such instances is certainly more for the money. ■

TRANSISTORS

In Hi-Fi Equipment

Knowledge of operating principles of basic transistor amplifiers and special control circuits can simplify Hi-Fi repairs

by Eino Niemi

■ Although transistors have been used in experimenter's audio equipment for several years, it is only recently that major manufacturers have been building transistorized Hi-Fi equipment. The transistor lends itself well to Hi-Fi since there is no inherent hum and microphonics as encountered in vacuum tubes. Since transistors are low impedance devices, they are also easier to match to pickups and loudspeakers for maximum power transfer.

The quality of transistorized Hi-Fi components now on the market is about equivalent to similarly priced tube counterparts. Stage-for-stage, transistor functions can be compared to tube functions in a conventional amplifier. But this is where similarity ceases. If you know the basic ins and outs of tube type Hi-Fi equipment, however, you should have little trouble learning how special transistor circuits operate.

The Basic Amplifier

Few technicians are totally unfamiliar with the basic transistor amplifier. A schematic diagram of a single transistor audio amplifier stage is shown in Fig. 1. Unlike the tube equivalent, note that the base is biased with a voltage divider network between the collector supply and ground. Actual bias, (emitter

to base voltage) is determined by the current drawn through the 1k emitter resistor. About 1 v appears at the emitter, in this case.

Since the transistor is a current operated device, the familiar 0.05 μ f coupling capacitors found in tube circuits are replaced by large electrolytics which range up to 2000 μ f at the output stage. As signal strength increases in each succeeding stage, larger coupling capacitors are sometimes used to handle increased current.

Many experimental amplifiers have been designed which are directly coupled and use capacitors only for bypassing and for speaker coupling. These will probably start to appear on the dealers shelves soon and in repair shops a little later.

Transistors have a very high gain in most configurations, lending themselves to feedback for increased frequency response and decreased distortion. Several feedback loops are often used rather than one large loop. High frequency stability is therefore maintained, since phase shift over a large number of stages could cause the feedback to become positive at high frequencies.

Output Circuits

Two types of output circuits are presently being used in most Hi-Fi

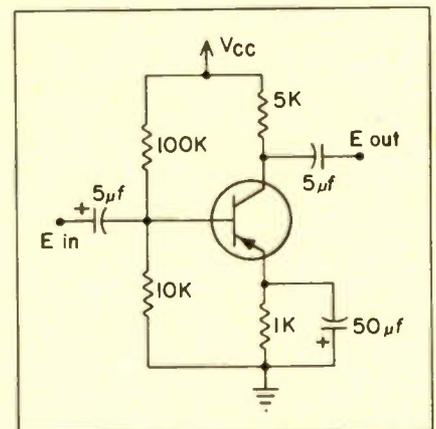
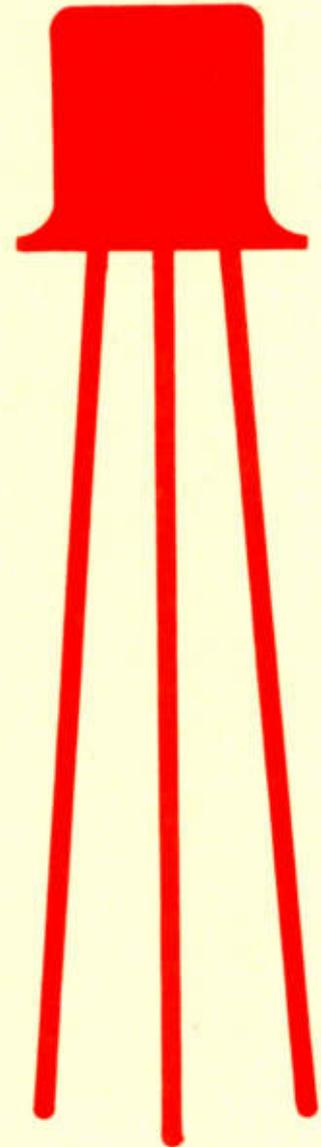


Fig. 1—Basic PNP transistor amplifier using voltage divider type bias network. A Hi-Fi circuit of this type without feedback can have a gain of more than 150.

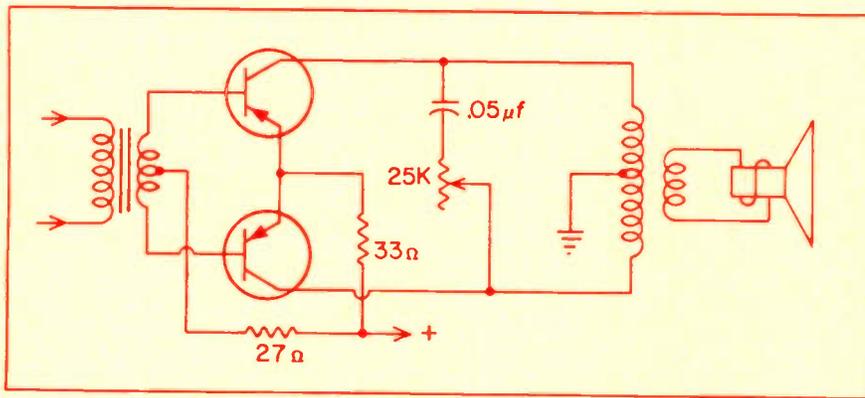


Fig. 2—Output stage employing input and output transformers. Treble cut is utilized for tone control and spike damage prevention to output transistors.

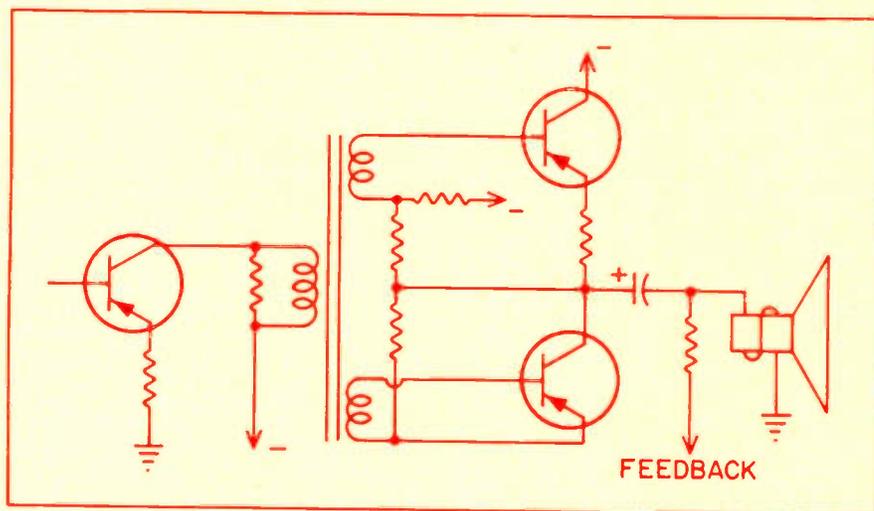


Fig. 3—Capacitor coupling to speaker prevents power supply currents from flowing in voice coil while maintaining impedance match. Capacitors for this purpose may be as large as 2000 μ f.

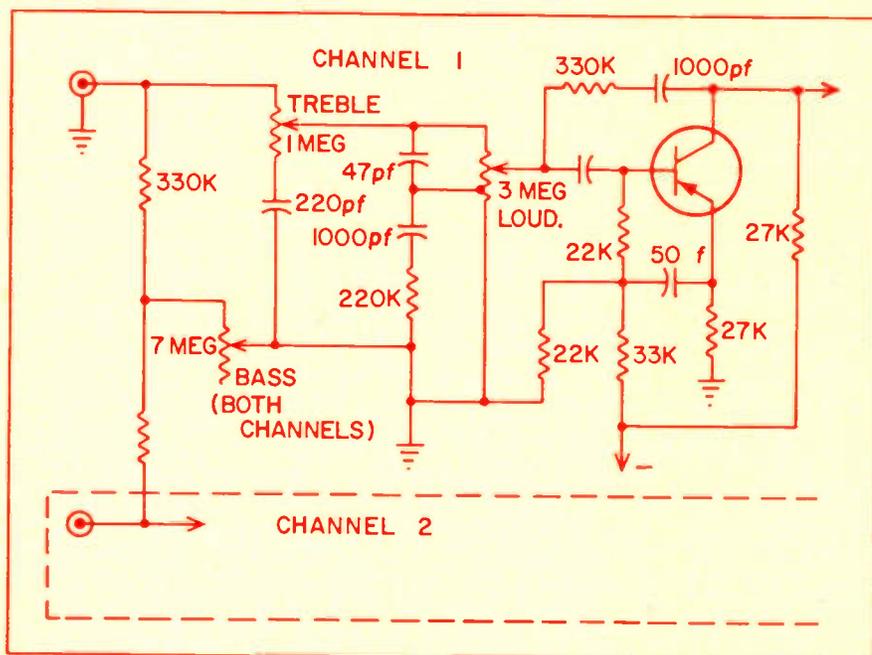


Fig. 4—Treble, bass and volume control circuit used in Magnavox 501 series chassis. Note that all controls are isolated from the transistor to prevent bias shift.

amplifiers: Transformer output and capacitor output. The first is employed in a conventional push-pull configuration. Single ended outputs are avoided in transistor equipment as in tube equipment because of high harmonic distortion. Although transistors lend themselves to direct coupling because of their low impedance, this is also avoided because of supply currents which flow in the voice coil. The complimentary transistor output can be employed to eliminate d-c voice coil currents but expense and distortion then become a problem.

Typical output systems are shown in Figs. 2 and 3. The trend is toward capacitor coupling, though in more expensive units transformer coupling is used. When an amplifier is brought in for repair special attention should be given to the output coupling capacitors, even if the complaint is not associated with them. Gradual deterioration of these capacitors may go unnoticed until the sound becomes very weak and frequency response begins to suffer.

Troubleshooting the output stage will usually be limited to location of distortion. Finding the cause of distortion should not be difficult and elaborate distortion measuring equipment is not a necessity. An accurate VOM or VTVM is the only required test instrument. Voltage readings which are out of tolerance indicate faulty components which can then be pin-pointed with the ohmmeter.

Inexpensive audio amplifiers often use a "tone control" circuit in the output stage to adjust treble frequencies. The entire circuit consists of only two components: a capacitor and a potentiometer. A typical circuit is incorporated in the output stage in Fig. 2. This circuit should not be altered in an effort to increase high frequency response because the network also suppresses spikes induced from the speaker which could damage output transistors.

Preamplifiers

As in tube amplifiers, the pre-amplifier increases low level signals from magnetic pickups, microphones or tape recorders to about one volt so the power amplifier can handle them. It also incorporates

necessary control circuits: volume, loudness, bass, treble, balance or equalization.

Some of these circuits are similar to types used in tube circuits. That is, tuned circuit feedback and voltage divider volume controls. These "standard" circuits must be isolated from the transistor by a blocking capacitor, since changing the control setting affects the transistor bias. Some of these circuits appear to be something else at first glance.

For example, Fig. 4 shows a transistor circuit treble control which would at first glance, appear to affect the volume in a tube circuit. Following the treble control is the volume control which is isolated from the succeeding stage. The series R-C network around that transistor stage compensates for human hearing losses (Fletcher-Munson curve) at low volumes by maintaining constant feedback at all volume settings. The proportionate feedback then becomes greater as the "loudness" control is decreased.

A bass boost circuit found in some amplifiers is shown in Fig. 5. The circuit is effectively inoperative when the boost control is at maximum resistance. As the control resistance is decreased, however, the choke passes more bass frequencies around the level control. The control becomes less effective at higher levels and therefore causes the level control to operate as a loudness control when the boost pot is advanced.

Treble controls are usually designed to feed back high frequencies

in-phase. This is accomplished most easily with a series potentiometer-capacitor network fed around two stages or from the collector of one stage to the preceding stage's emitter. Capacitor values depend on the amount of feedback required for a given stage. These values will be quite small compared to bass feedback circuits, typically $0.005 \mu\text{f}$.

Power Supplies

Since transistors operate from voltages which approach signal amplitudes, ripple content of the power supply must be minimized. This is not too difficult in transistor equipment because the power supply current drain is light.

High power amplifiers employ a bridge rectifier or some variation to supply about 50 v. This is less expensive where higher current drain is encountered because filtering is simplified. A typical bridge-type supply is shown in Fig. 6.

Repairing the transistorized amplifier is as simple as tube type amplifiers but a few precautions should be observed if call-backs are to be minimized.

Transistors can be damaged very easily if they are subjected to voltages which exceed their ratings or to extreme heat. When removing a

Continued on page 55

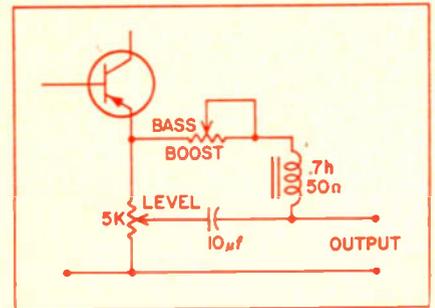


Fig. 5—Bass boost circuit doubles as a loudness compensation network when advanced for bass boost. Boost becomes less effective as level control is advanced.

Balance control used in stereo amplifiers is usually incorporated in driver stage prior to output.

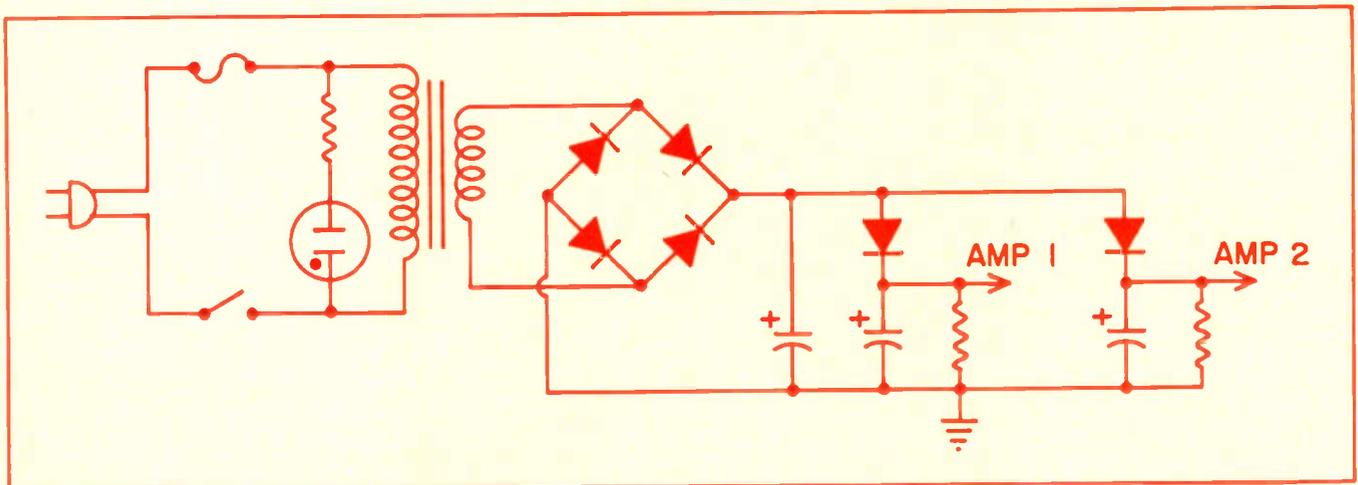
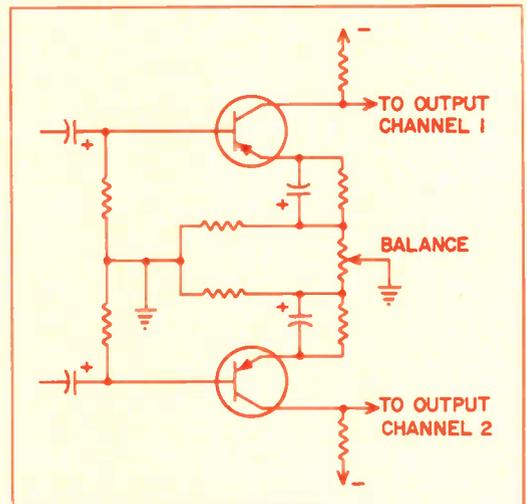
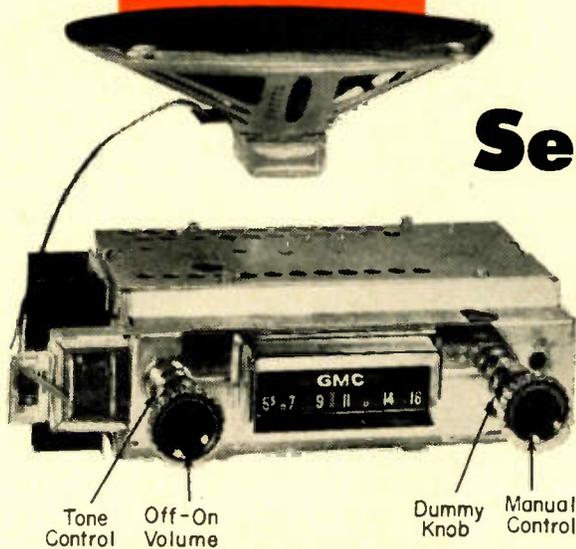


Fig. 6—Bridge type rectifier designed by G-E for stereo amplifier power supply.

Servicing Tran-

Typical hybrid radio for GMC trucks. Output transformer and output transistor are outboarded on the left of the radio case. The speaker is mounted separately.



by S. M. Henderson

■ Hybrid—combination tube-transistor radios—are still being used in new cars, but are now slowly giving way to all-transistor radios. Technicians will be faced with these hybrid units for some years to come, however. Moreover, radios manufactured a few years ago are only beginning to arrive for repair.

Money can be made repairing auto radios, and if you have the necessary patience to remove and install them, you can cut yourself in on some extra income. Many shops have found auto radio repairing lucrative enough to go into the business full-time.

Localizing Faults

Generally speaking, trouble symptoms observed in auto radios can be placed in three categories: No audio, weak audio, or distorted audio. The first step in repair is to localize the defective stage.

If broadcast stations are not heard, the set's output can be checked for operation without removing the radio. Simply turn the radio on and off. If a "thump" is heard in the speaker, it is assumed that the output stage is operating properly. The next step, is to change transistors, tubes or the speaker

in an effort to correct the fault.

A lot of time and trouble can be saved if the set is allowed to operate a short time to allow components to reach normal temperature. Since it is difficult to see tube filaments light, tubes and output transistors can be felt to roughly determine operation. A cold tube or output transistor should, of course, be replaced. An additional check before removing the radio from the car is to substitute all tubes or transistors.

The antenna should not be overlooked before the set is removed since this is also a major cause of

Use signal injection technique to
simplify tube-transistor servicing

Transistorized Hybrid Car Radios

trouble. When the antenna has become shorted or open, however, noise from the front-end of the radio can usually be heard in the speaker. A short length of insulated wire can be used to check the antenna by removing the antenna plug from the radio and inserting a bared end of the wire in the jack. The wire should be long enough to extend about 3 ft through the car window. If the antenna is at fault, the set should

now operate relatively normally.

When the set is turned off and on and no click is heard from the speaker, the audio output stage should be suspected. Depending on the type of radio and the installation, the transistors or the speaker may be substituted most easily. Pick the most accessible components first and then substitute the others. In some models, the radio must be removed for component substitution.

If the set is removed to the bench for further checks, the output transistors can be easily tested. If more than one transistor is used in the output stage, both should be replaced if one fails. Also, the speaker or resistive load should always remain connected to the set. Failure to keep the output stage loaded can cause burnout of the output transistors because of transient spikes.

Distortion and weak audio should

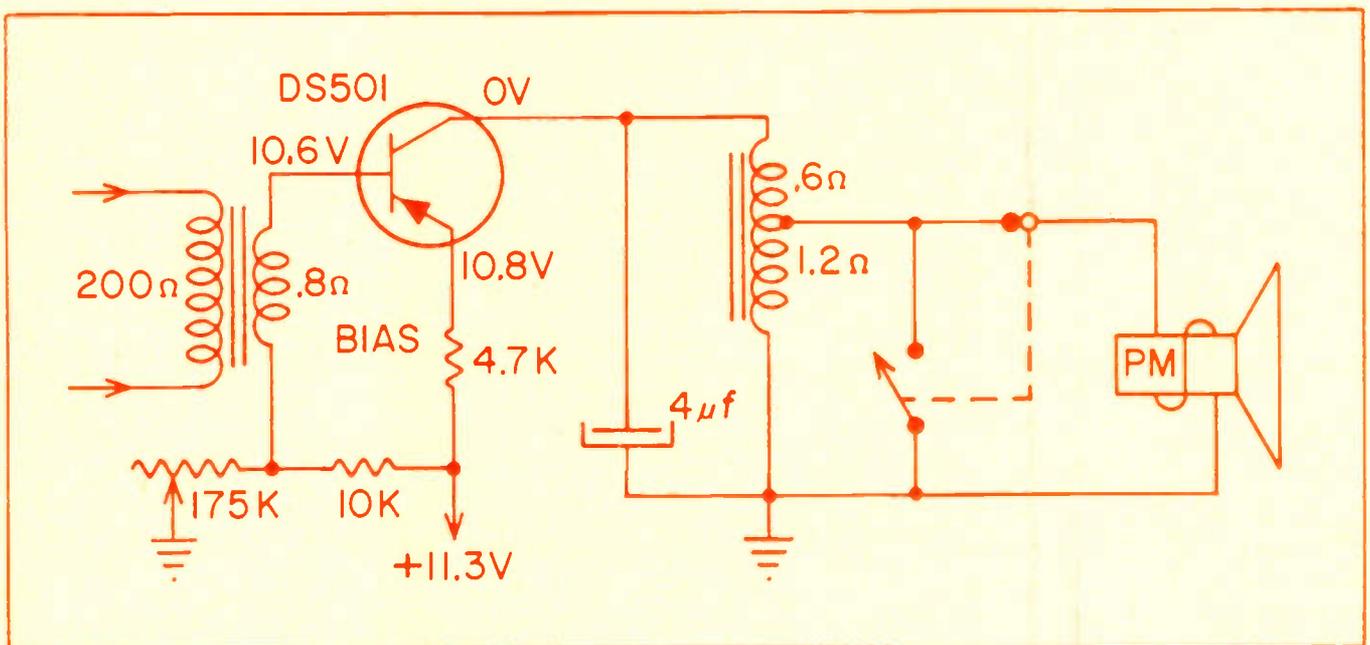


Fig. 2—Typical transistor output stage showing normal operating voltages. Drivers used in this type output are also transistorized.

Servicing Hybrid Car Radios *Continued*

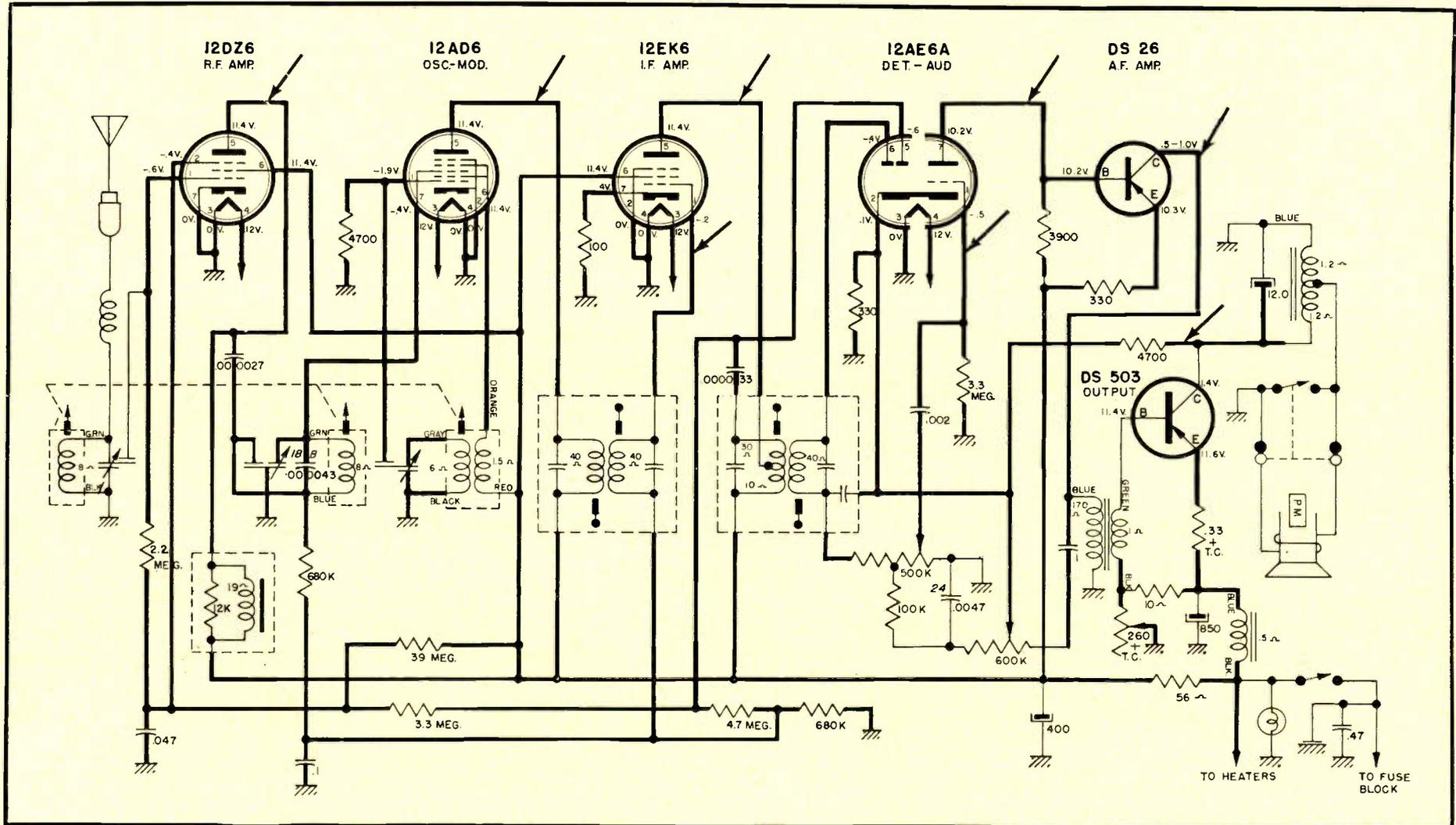


Fig. 1—Delco hybrid radio used in the 1960 Corvair. Arrows show test points for signal injection or signal tracing.

be treated alike when testing the set while it remains in the car. Attention should be directed first to the output stage and then to the speaker in cases of distortion. First to the front-end and i-f sections for weak audio. After all substitutions have been made while the set remains in the car, it should then be removed to the shop if it is still inoperative.

One word of warning: Don't overlook the speaker. Speakers in automobiles have a very high failure rate because of dampness and vibration. A warped speaker cone can cause distortion which is difficult to separate from that caused by output stage defects. Complete failure can also be caused by cone warping. In this case the coil form rubs on the pole piece.

Troubleshooting

The fastest way to isolate a malfunction to a particular stage is by methodical signal injection or signal tracing. Signal injection is generally employed although it is only a matter of preference—since either is equally effective.

Hit-and-miss voltage measurement will eventually help find the fault, but much time is wasted and this method should be avoided.

One of the new pencil type noise generators are a great help in troubleshooting a weak or dead set, but a pure audio tone should be injected to localize distortion. If a minimum amount of equipment is desired, a modulated r-f generator and a scope with a detector probe should be all that is necessary. The same equipment can be used for alignment. Of course, in pinpointing the defective component, a VOM or VTVM is almost invaluable.

A typical hybrid radio schematic appears in Fig. 1. Test points for signal tracing or signal injection are shown. To localize the trouble, the generator should be connected to the antenna input and the scope at test point prior to the output stage. If a signal appears, the fault would normally lie in the output stage. If no signal appears, tracing should continue toward the generator—until the signal is found.

A typical output stage with normal operating voltages are shown in Fig. 2.

The faulty component in the stage should be located with a VOM or VTVM. In the transistor output stages, voltage measurements should help pinpoint the trouble quickly. If a transistor has caused the set to go dead, associated circuits should be checked very carefully before a new unit is installed. When replacing transistors, care should be taken to insure that the insulators are properly installed and in good condition. A thin coat of silicone grease should also be applied to both sides of the insulator for better heat dissipation or, if no insulator is used, to the transistor or its mounting sink.

Auto radio output transistor kits are available from several manufacturers to simplify transistor inventory problems. These kits are inexpensive and a worthwhile investment.

Distortion will be found to be most frequently caused by faulty bias in the output section.

Not too long ago, the first thing a technician did when he brought a car radio into the shop was check the vibrator and rectifier. Even though hybrids have tubes, a search for the power supply will be fruitless. Tubes used in these sets operate from the same 12 v supply as the filaments. This low voltage operation is primarily accomplished by close spacing of the tube electrodes. It is perhaps needless to say that these close tolerances cause a multitude of failures with symptoms not found in older radios. Change the tubes first in case of trouble; suspicion is then directed away from tubes. You may then proceed with a logical trouble analysis.

Interference

One of the most troublesome problems found in servicing car radios is interference. It can originate from outside the car but is usually caused by the car's electrical system.

The first step in narrowing the cause of interference is to listen to the noise critically; with the motor off, then on and with the car moving and stopped. When the car is operated while moving, but with the engine off, to check for static discharges, owners manual should be

checked. Serious damage may result to some automatic transmissions when the car is moved in neutral.

When noise is present in the radio with the car engine not running and the car not in motion, external interference can almost always be suspected. Interference that is present when the car is idling may be caused by spark plugs, the coil, regulator, or generator. After a little experience you should be able to diagnose each of these. Spark plug interference can be identified as a clicking sound which changes speed with the speed of the engine.

Generator noise is almost siren-like when the engine speed is increased; the regulator produces a clicking sound which is more rapid than plugs and changes frequency in steps, if at all.

Noises that occur only when the car is in motion are usually static discharges. These may result from a broken antenna tip which causes a continuous corona-like discharge at high speed (a piece of tape over the antenna tip will correct this); tire static; hub cap static or a poor body connection at some point on the car.

Anti-static powder can be injected into tires to prevent tire static and springs are made especially for hub caps to eliminate hub cap noise. Noise which originates from loose body connections, however, can be most trying. Braided grounding straps between different sections of the body and the engine should eliminate it. Muffler pipes and the fire wall and dash should be prime suspects.

Special kits are available containing coaxial capacitors and resistors to suppress ignition noises. In addition, these capacitors should be installed on the brake light to prevent "popping" when the brake is applied.

Close attention should be paid to the installation of suppressors installed on the ignition system. A capacitor connected in the wrong place can burn out the generator, voltage regulator or cause rapid deterioration of distributor points. New cars have tags located on terminals where suppression capacitors are not desirable. ■

Know Your Transistorized Antenna Preamps

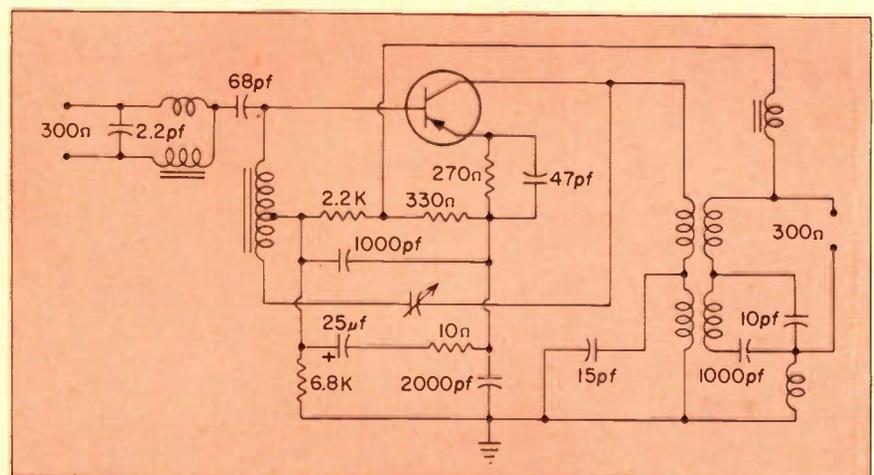
Details on power supplies, common base, emitter and feedback characteristics, can help you service these transistorized units

by H. H. Winters

■ A booming new antenna business has developed over the past year in TV and f-m fringe areas. Weak f-m stereo multiplexing broadcast signals have converted semi-fringe areas into deep-fringes and require special antennas for good reception. Manufacturers of VHF preamps and antenna-preamp combinations have put their image in the public's eye with

national advertising in newspapers and magazines.

It has become a familiar sight to see shiny gold, red or silver antennas, with little boxes mounted directly on the antenna or TV mast. Set-top boosters are slowly disappearing in these areas and technicians are faced with a new service problem. Chances are that you haven't had a transistorized pre-



Schematic of Blonder-Tongue transistorized antenna preamp uses common emitter arrangement. Variable capacitor controls feedback.

amp on your bench yet. Boning-up now will prevent having to learn "all about preamps" when you bring the first unit into the shop. You'll probably be swamped with rush jobs by then.

Preamp Considerations

Two general types of transistor preamps are being manufactured by about six different companies: Common emitter and common base configurations. Each type has advantages and disadvantages.

Since the preamps are designed to handle relatively high frequencies (54 to 216 Mc), care must be taken to prevent the output signal from interfering with the input signal. This is particularly important in common base configurations where the signals are in phase and can cause instability; in-phase feedback is the key to building an oscillator—not an amplifier.

The common base configuration has the advantage of high gain and low noise. Replacement transistors in this circuit may have to be specially selected to insure maximum stability.

Common emitter circuits are by far the most popular in use. Although these preamps have a generally lower gain, they have great stability (any stray feedback is negative) and transistors with varied parameters may be used with good results.

Most of these preamps use some type of neutralization (negative feedback) to improve stability. With ample feedback provided, the replacement transistor becomes less of a problem. Extremes of tempera-

ture must also be considered. In common base amplifiers, the emitter resistor provides thermal degeneration for stable gain with widely varying temperature.

The inherent stability of common emitter circuits is usually increased by bypassing the emitter resistor with a suitable capacitor.

Transistors presently being used in these antenna boosters are MADT (micro alloy diffused transistor) and PADT (post alloy diffused base transistor) types. Both of these types possess exceptional high gain-to-noise ratios.

Power Supplies

Power supplies used with antenna preamps now available can be classified in three types: Built-into-the-antenna battery operated; battery powered from the set location; and a-c powered from the set location. Remote powered models utilize the signal carrying lead-in to transfer the power and are isolated from the set by capacitors.

One manufacturer employs a transformer and dropping resistor at the set to feed a silicon diode in the preamplifier located on the antenna. Problems in any of these power supplies should be rare. In the event of failure, troubleshooting will probably be limited to isolation and filtering capacitor checks, and continuity checks on r-f chokes.

Most preamps have provisions to couple two to four sets to the preamp output, although the signal strength is reduced when operating more than one set. Matching connections on some units allow full preamp output for one set but re-

duced outputs when two or more sets are coupled to the system.

Battery powered units operate from standard flashlight batteries which are replaceable by the owner on remote units, but must be serviced by a technician on mast or antenna mounted models. Battery power is usually 6 v, although a-c powered models run as high as 30 v. Care should be exercised on a-c powered units to avoid shock when working at the antenna. Although all of these units are isolated from the line, a simple malfunction at the power source could put you between the power line and ground if the antenna is properly installed.

The best procedure is to remove the unit and perform bench checks with both feet firmly on the floor.

Failure Symptoms and Repair

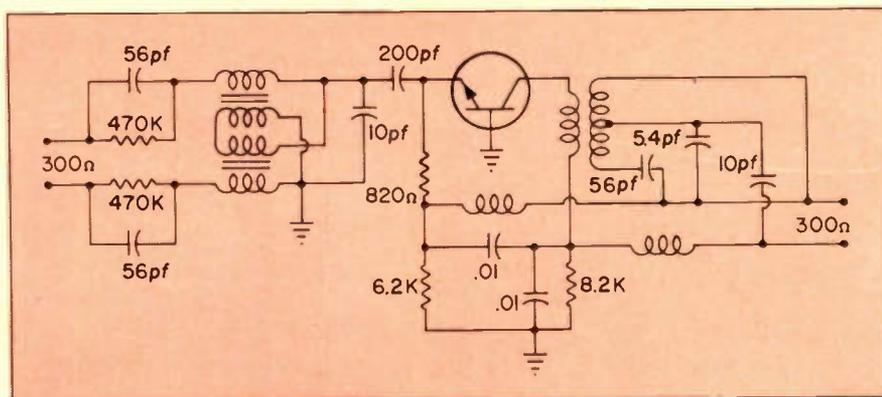
Symptoms of failure can be alike or very different from failure found in TV tuners. Some of the more common troubles are snow, low volume; no picture or sound, snowy raster; or any of these intermittently.

On most of these units the first and easiest check is usually the power supply voltage since this is most frequently located at the set. If the preamp is a-c operated, the voltage can be measured. Actually changing the batteries is the best and most conclusive test for battery powered models, although a voltage check is still in order to determine if loading at the preamp is a problem.

Checking the lead-in for continuity should be second on the list. Measuring the voltage at the preamp terminals is the best method, since removing or shorting the wires for a continuity check may temporarily correct an intermittent.

If the power checks do not reveal anything meaningful, the next step should be to remove the preamp. Since transistors are very hardy, and do not fail as frequently as tubes, they should not be suspected first. Moreover changing transistors on the roof will be difficult since they are soldered in the circuit.

In changing preamp components.



Channel Master uses a common base amplifier with phase reversal network for proper feedback. Balun coil at input is twin lead wound on ferrite core.

as with other high frequency equipment, extreme care should be exercised in making replacements to assure that only comparable quality components are used. Also, particular attention should be given to lead length and dress to make sure they are as nearly the same to the original as possible. Failure to do this may cause instability, continuous oscillation, high noise, or low gain.

Troubleshooting The Preamp

Troubleshooting the preamp will consist primarily of making voltage checks to determine the malfunction. This should present no problem if a few basic rules are kept in mind: In the common base amplifier, the signal is applied between the emitter and base. A negative voltage is applied to the collector to

provide reverse bias (PNP) and a portion of that negative voltage is applied to the base in order to make it more negative than the emitter, thus providing a forward bias. Of course, a positive voltage could be applied to the emitter to provide this bias. NPN transistors would be connected in reverse polarity with respect to the PNP transistor.

In the common emitter configuration, the signal is applied between the base and emitter. A reverse bias potential is applied to the collector and forward bias for the base is obtained through a voltage divider network from the collector supply.

Usually, the forward bias on either type of transistor stage is only a few tenths of a volt. Variations, or reverse bias applied to the base, of course, will result in failure of the circuit to operate.

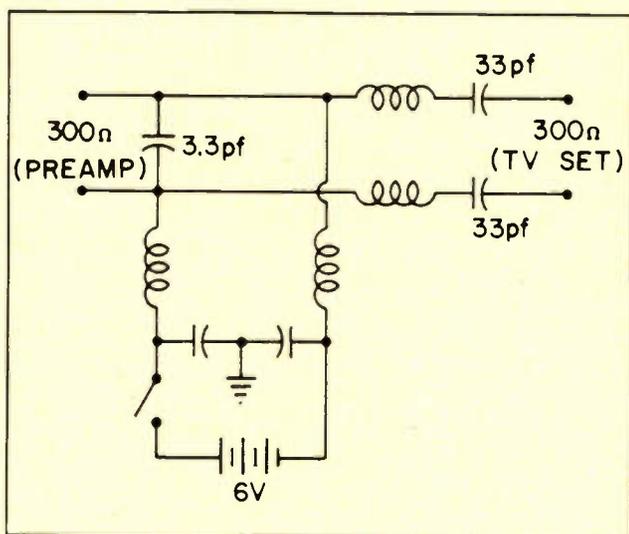
Feedback for neutralization in these units will usually be a single capacitor from the output of the stage back to the base. In the common base arrangement, two capacitors and a coil are sometimes employed. One capacitor and the coil are connected in series, with the junction connected to ground with the second capacitor. This produces a 180 degree phase shift necessary for neutralization of grounded amplifiers.

Impedance matching is a very important consideration in preamps. The input impedance is controlled in most cases by a series and shunt capacitor arrangement just ahead of the transistor stage. Output impedance is usually matched with a transformer.

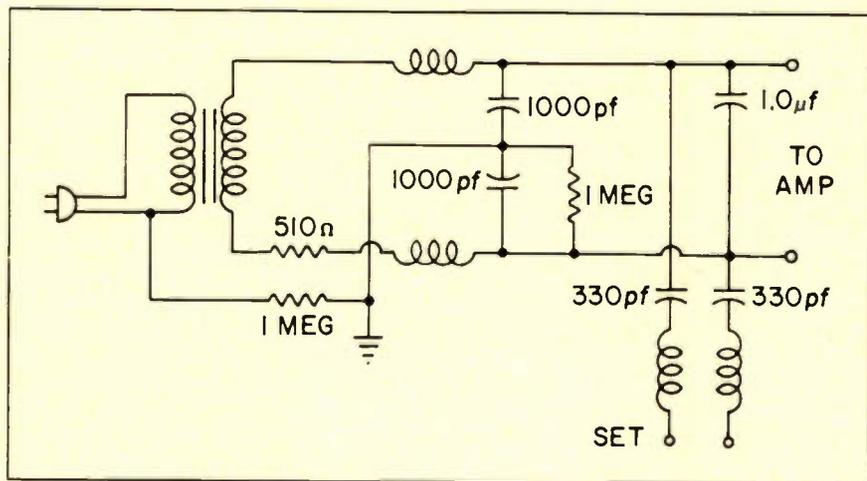
A high pass filter located in the front end of these units to prevent unwanted signals, such as TV, f-m oscillator and some amateur radio harmonic interference. Some of these preamps which are specially designed for TV may include f-m filters which would make them unacceptable for f-m reception.

Since the transistors used in these preamps are required to amplify only microwatt signals, the base-emitter breakdown ratings are low: from 0.5 to 5 v. The units must not be tested with an ohmmeter. Failure to observe this precaution will probably result in a damaged or ruined transistor.

None of the units now on the market use more than one transistor, so troubleshooting is simplified. Fees for making repairs on these units are generally high because of the roof-top work involved. If there aren't any of these units in your area yet, get to work and sell them—sales and installation profits are worthwhile. In fact, it is a good idea to sell the antenna with the unit so a complete antenna system guarantee can be offered. ■



Typical battery powered supply. Four flashlight cells provide 6 v to preamp.



Part of Jerrold's in-the-house a-c power supply unit (simplified). A silicon rectifier is located in the preamp. Winegard uses a similar setup, but employs a rectifier in the transformer unit.



Technician hands out "stop" card from door of mobile shop which customers place in their windows when they need his services.



If the TV cannot be repaired here Mr. Houser moves it to his mobile repair shop at the curb and returns set quickly.

TV Doctor Makes 'House' Calls in Florida Trailer Parks



Diminished overhead results in lower-than-normal repair charges

by Dave Blans

■ In 31 trailer parks in the St. Petersburg, Fla. area, owners of a TV, stereo, Hi-Fi or ordinary radio can have repairs or adjustments made on the spot. When equipment must be removed from a trailer it goes only as far as a truck parked a few feet from the owner's trailer.

Frank K. Houser planned and

Mr. Houser calls on customer with tube caddy and test equipment.

TV Doctor *Continued*

operates this unique service. His truck is equipped with all the essential tools and equipment found in a conventional shop. He drives through each of the 31 parks twice each week. His customers all have cards, asking him to stop, which they can place in a window when they need his services.

In regular homes when a TV set begins acting as if it had laryngitis or fading eye-sight a TV owner can expect to be without his set for two or three days while a regular repairman takes it to his shop. When he returns it the accompanying bill must of necessity include pick-up and delivery charges, a

service call, labor and general overhead.

Customers living in one of the trailer parks, however avoid much of the usual expense. With no rent to pay, no electricity, salesmen, drivers, shop labor or clerks, Mr. Houser's expenses are small and these savings are reflected in his charges.

He calls his business "On The Spot Repairs." It is based on the theory by old-time push cart peddlers or the ice man, who, in the days before electric refrigeration, delivered ice direct to the ice box

BEAT THE RENT 'SQUEEZE'

TV-Radio technician builds solid business foundation while co-operating with paint merchant

by Harry J. Miller

■ After graduating from technical school and accumulating a few hundred dollars, many TV-radio technicians purchase minimum equipment and replacement supplies and sail into business by opening a store or working from the house basement or garage. And the technician's wife frequently devotes many hours of unpaid time to the operation. A large percentage of these technicians eventually "close up shop," for one reason or another, before they really learn what the business is all about.

A major cause of business stagnation or failure (if we may paraphrase a humorously oversimplified cliché of some economists) is "a major discrepancy between income and outgo." Every TV-radio technician is fully acquainted with this principle and knows what to expect



Paint store operator and TV-technician strike pose characteristic of their cooperative venture.

in your kitchen. These old-time merchants had certain things in common. They conducted a cash business with customers in a concentrated area, brought their goods and service to the user's door on a regular basis and they had very low operating costs with little overhead expense.

Low Repair Charges

On the Spot Repairs makes no service call charge. It has a minimum and maximum labor charge. Parts prices are competitive. The total bill is generally a pleasant sur-

prise to the customer.

Mr. Houser has been working in electronics for 25 years, is a skilled technician with a good sales personality and has a common sense interest in people. We inquired whether others were operating similar repair businesses in this area and were told that there were none.

"I think it would be a good thing if a number of others started," Mr. Houser said. "There are 250 trailer parks in this country and I can't furnish regular service to many more than I have now. Of

course, a technician doesn't have to apply this method strictly to trailer-park service. He could block out a good residential section of any city in the country and likely do as well as I. But I like the neighborly atmosphere of trailer parks. There are a lot of people in a small area. They know each other and tell their friends about me and my methods. That helps."

When asked if he sold TV sets and other appliances, Mr. Houser answered emphatically: "No! Let the other fellow make a living selling sets. I just repair 'em." ■

when too much negative voltage appears on the grids of vacuum tubes!

One factor creating "a major discrepancy between income and outgo" is the over-all cost of renting a suitable shop. Although the house basement or garage appears to be a solution, it has many obvious disadvantages. It frequently results in "hiding the lamps" of many capable technicians under a bushel basket. Here's how Bill Kane, a Sarasota, Fla. TV-radio technician, eats his cake and still retains a reasonable portion of the slice.

Mr. Kane made a mutually satisfactory deal with the Sarasota City Paint Center. He rents a counter and one of the spacious show windows through which he can be seen at work. He also gets customers from the paint store's clientele.

As Mr. Kane says, "Why work out of your house or garage when you can be seen at work, become more widely known, and keep your business-building image constantly before the public?"

In this 2-way deal, the paint store also benefits from sales made

to TV-radio customers who may otherwise never have entered the store. Additionally, since both the paint store and Kane's operations are one-man affairs, when Mr. Kane is out on a service call the paint dealer takes phone calls, and when the paint dealer has a business rush, Mr. Kane stands ready to

pitch in and help. The two merchants have streamlined operations that squeeze out rental costs in a store that fronts a busy highway.

Mr. Kane says, "I'm building up an array of customers and a public image that will establish me on a firm foundation when I am prepared to open my own store." ■



Store front where TV-radio technician and paint merchant work together to cut costs and increase business volume.

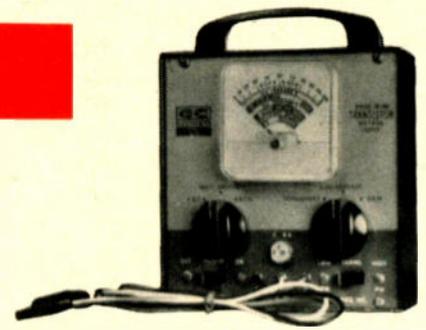
TRANSISTOR AND RECTIFIER TESTER

G C Electronics Transistor and Rectifier Tester Model 36-560 at \$19.95—Virtually all types of entertainment transistors can be checked for general performance with this midget transistor tester. The unit is only 5 x 5 x 1 $\frac{7}{8}$ in., but measures pnp and npn transistors, including power types, as well as rectifiers and general purpose diodes.

Most of you know by now that to service transistor equipment, some sort of transistor tester is a

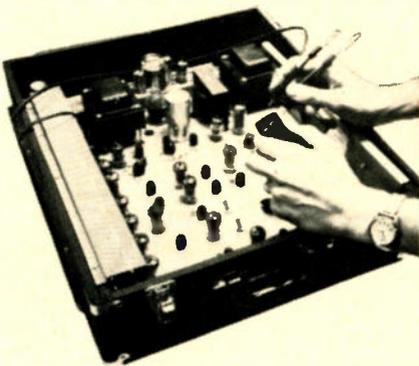
must. The ohmmeter serves the purpose in some instances, but is only half-safe in others. This unit tests for opens, shorts, and ICEO leakage; the most necessary measurements for normal transistor service work. It is simple to operate having only four controls: (1) Power; (2) Low and High (wattage); (3) pnp, Rect-Diodes npn (type of test); and (4) the function switch: Open-short, ICEO Leakage, and Gain.

Leads are used to check power



transistor or transistors which will not fit the multi-base socket. A "wide-angle" meter incorporates several colored good-bad scales and Beta gain calibrations from zero to 100.

TEST INSTRUMENTS



COLOR BAR GENERATOR

The unit is built suit case style for ease of adjustment, maintenance and to facilitate cooling. In addition to color bars, the set develops an extremely stable dot pattern. Controls are clearly marked and easy to understand. Typical control functions are: Primary color bar width (three controls); saturation of each primary color; and brightness of each primary color.

Alignment of the chroma section in a color set becomes a breeze after a few tries. The average technician, however, may have a little trouble the first time through. The output signal may be fed to the antenna terminals or directly into the video section.

The alignment process used is very simple: Colors are subtracted from the color bars which affects some while others remain constant. The tonal value of certain bars then become the same. Proper adjustment is obtained when the associated demodulator, etc. is adjusted to equate the proper color bars. The instruction book outlines the proper order for these steps including details of the switch positions for each step.

If you like to do all the color work possible in the owner's home, this is one instrument you can lug in with your caddy equipment and not have to worry about "forgetting something."

Hickok Color Bar Generator, Model 656XC, at \$549.50—Although the 656XC is not new it is the best color unit we have checked thus far. It is one of the few color generators on the market capable of producing a saturated NTSC color bar pattern.



TUBE TESTER

in radios, TV and Hi-Fi equipment.

The tester operates on the dynamic mutual conductance principle to determine tube quality. A good-bad scale is incorporated on the meter for some tube types, others are given in rated μ mhos of conductance. Two conductance ranges are given on the meter for maximum accuracy: 0 to 5000 and 0 to 25,000 μ mhos. Multiple sockets are used to simplify set up. A series of 13 three position switches are used in the setup procedure; often, only one or two switches

need to be positioned for a test.

Shorts and gassy tubes are also easily identified with a simple function switch. A single wired-in socket is used to check CRTs. The socket accepts large necked tubes on one side and small necked tubes on the other. All CRTs are checked in the same manner which can be memorized in a short time.

A booklet listing tube types which can be checked and the test set up is included with the tester. A clip in the lid prevents easy loss of the booklet.

Mercury Electronics Corp. Tube Tester Model 1000, at \$79.95— We found the mercury tube tester an easy-to-use accurate tester. The unit checks both small and large neck CRTs, and all tube types found

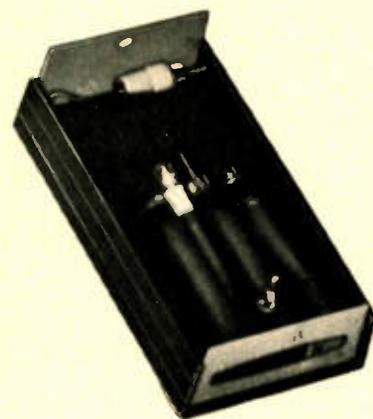
for Bench and Caddy

TUNNEL DIPPER

Heath Kit Tunnel Dipper Model HM-10 at \$34.94 Kit— Those of you actively engaged in two way radio service understand the value of a grid dip meter. Those who service TV only may think that it is only for radio amateurs and experimenters.

The grid dip meter can be used to great advantage in both TV and home radio service work. TV i-fs which are totally out of alignment are always easier to sweep if a static alignment is first made with a dip meter on each tuned circuit. Using this method, often no more than a touch up is required with the sweep generator.

There is no reason to wonder about the condition of an i-f or oscillator coil when a grid dip meter is available. Simply move the "dipper's" pick-up coil near the tuned circuit and dial the meter dip. If the dip is not in the general area of the tuned circuit's normal frequency, you know where to look without disassembling the circuit.



The model HM-10 is a departure from dip meters in that a tunnel diode is the oscillating element. The instrument uses meter indication which is driven by a three-transistor amplifier. Batteries power the unit so it can be used anywhere. A temperature restriction is placed on the instrument, however, it will not

operate below freezing temperatures.

A barrel type scale is used to obtain 7 in. of scale for each range. The coils are supplied to provide a frequency range from 3 to 260 Mc. Scales are color coded matching the coils for easy reading. The set's dimensions are 5 $\frac{3}{4}$ x 4 $\frac{1}{4}$ x 2 $\frac{3}{4}$ in.



Difficult Service Jobs Described by Readers

Shifty Capacitor

A Zenith Chassis 17 x 20 was brought into the shop with the complaint that channel 3 was snowy. The other two channels received in this area, 5 and 10, were snow-free.

After the usual tuner tube checks and visual inspection, all a-g-c components were checked as well as tuner voltages; all were within tolerance. The set's alignment was checked and found normal. The balun coil and input traps and antenna network were also rechecked. The tuner contacts were thoroughly examined and showed no signs of damage. The tuner was removed from the set and installed in another TV of the same type in good working order. Channel 3 was snowy while 5 and 10 were perfect.

The tuner was then sent to a tuner repair service. When it was returned and re-installed in the set channel 3 was still snowy. The tuner was re-checked in another set and appeared the same as before.

After quite a bit of checking and re-checking we found a 12 pf trap capacitor in the antenna input had changed value. A resistance reading showed the capacitor was not shorted or open. A new 12 capacitor was installed and the set

was perfect. Evidently, the capacity had changed enough to affect channel 3, but not the higher frequency channels.—*Wayne Butts, Brewton, Ala.*

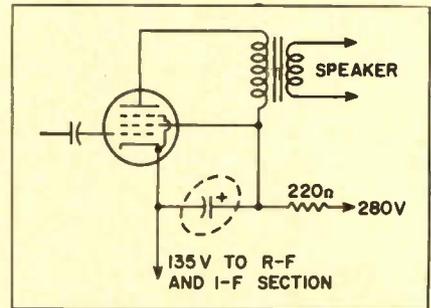
Faulty Filter

A call was recently made on a Magnavox, chassis 25-01, for poor pictures. Some channels had a lot of gain and interference lines running through the picture; others were dark and pulling. The r-f amplifier and i-f tubes were changed with no results so the chassis was taken to the shop.

The first peculiar thing I noticed while changing the r-f and i-f tubes was the heat generated by them. In fact, on close examination I could see the grids in the three i-f tubes glowing red.

On the bench, I started troubleshooting by checking the voltages at the i-f tubes. The reason for the excessive heat became obvious immediately. Instead of the 110 v called for on the i-f plates, they were over 200 v. I checked with the schematic again and started to figure out where this abnormally high voltage could come from.

The r-f and i-f tube plates all



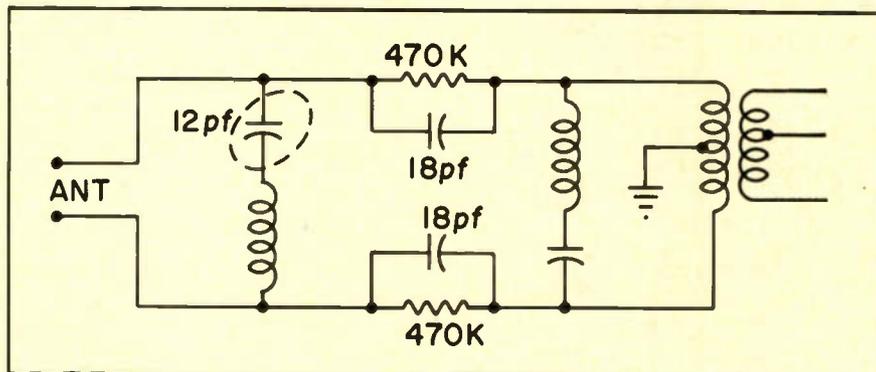
Filter capacitor short applied full B+ to r-f and i-f tubes in a Magnavox chassis.

derived their voltage from the 135 v line. A 20 uf filter capacitor between cathode and screen grid of the audio output tube if shorted, could apply full B+ voltage to the cathode and in turn to the amplifiers. Sure enough, a resistance check showed this filter was shorted. A new filter and 220 ohm resistor put the set back in shape.—*Frank A. Salerno, Long Island City, N. Y.*

Open Delay Kills Raster

Recently one of my regular customer's called for service on an RCA CTC5N color set. A quick check disclosed F-104 (3/10C type) fuse was blown, causing loss of high voltage. This is usually caused by the 63B5A arcing momentarily

Continued on page 79



Capacitor in r-f trap on a Zenith chassis changed value causing snow on one channel.

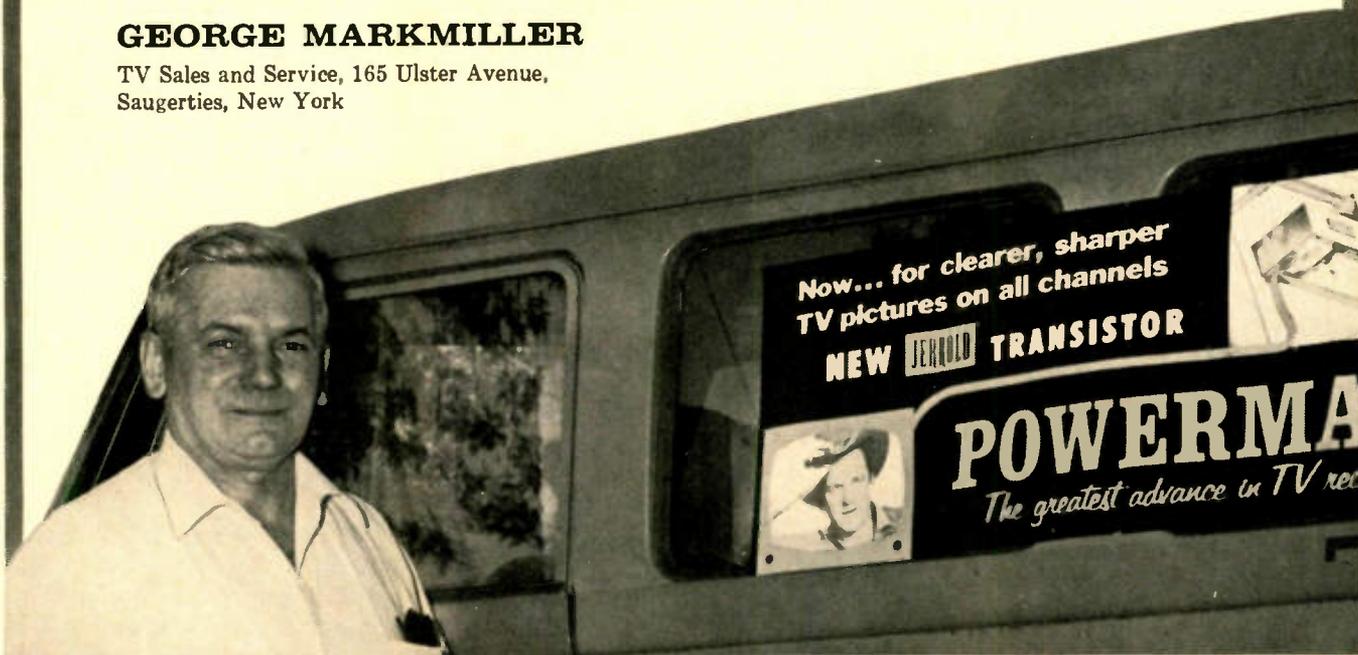
TOUGH DOGS WANTED

\$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.

"OVER \$12,000 WORTH OF POWERMATES SOLD...AND IT'S JUST THE BEGINNING!"

GEORGE MARKMILLER

TV Sales and Service, 165 Ulster Avenue,
Saugerties, New York



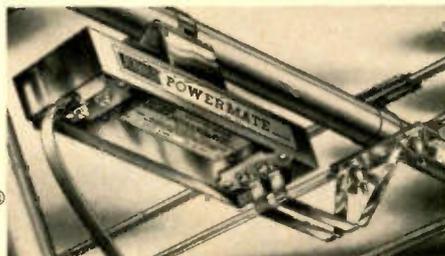
POWERMATE sells itself through its performance

George Markmiller's customers "were from Missouri" where TV reception was concerned. The products they had tried, in spite of high claims, had not produced snow-free TV from the distant New York stations. With the help of his Jerrold distributor, George used the potent promotional kit to tell his customers the POWERMATE performance story. Newspaper ads, truck banners, stuffers and store displays presold

POWERMATE because the promotion was *custom-designed* for his area.

The real clincher came after the demonstration when one customer began to tell the other about POWERMATE's amazing reception. The Saugerties area had never seen such clarity in black and white *and in color*. As George says, "The performance of this unit has been the best advertising that has helped to sell it."

Jerrold's ready to set up a POWERMATE promotion designed for *your local area*. You can repeat George Markmiller's success story as hundreds are doing—all over the country. Write for the name of your nearest Jerrold distributor.



JERROLD®

TRANSISTOR

POWERMATE

ANTENNA AMPLIFIER

\$3995
LIST

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A subsidiary of THE JERROLD CORPORATION
Philadelphia 32, Pa.

Jerrold Electronics Corporation
Distributor Sales Division, Dept. IDS-265
Philadelphia 32, Pa.

I want Jerrold to promote the PDWERMATE in my LDCAL area. Send me the name of my nearest distributor.

Name _____

Address _____

City _____ Zone _____ State _____

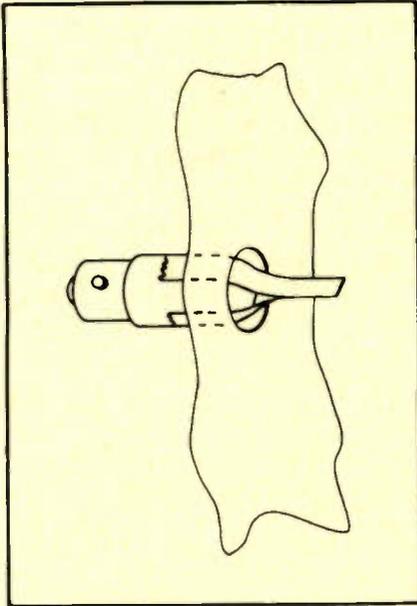
... for more details circle 37 on page 50

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Pilot Replacement

When replacing a recessed pilot bulb, where it is hard to grip, masking tape may be helpful. Press

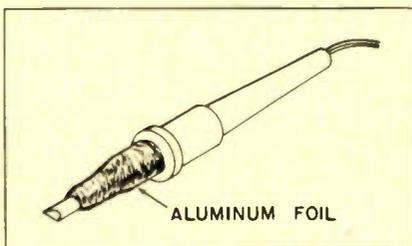


Pilot bulbs which are recessed can be replaced with a tape handle made of masking tape.

a short piece of tape to both sides of the bulb and press the left-over together for a handle. After the bulb is in place, just pull the tape off.—*Gordon E. Gregory, St. Louis, Mo.*

Quicker Heat

Wrapping a piece of aluminum foil around the element of a soldering iron reduces its heating time. It also makes the iron safer to work



Quicker heat for conventional soldering irons can be given by wrapping foil around the heating element.

with by impeding the iron's radiation except at the tip.—*Luis Morales, W. Paterson, N. J.*

PC Component Removal

Component removal from PC boards can be facilitated by forming special soldering gun tips. Several styles are commercially available, but you can form the odd ones yourself. Use about 12 in. of No. 12 bare copper wire for each tip. A pair of pliers can be used to bend them to any desired shape.

Place 2 nuts over the wire ends before making right angle bends for the gun connections.—*William R. Brown, Jr., New Orleans, La.*

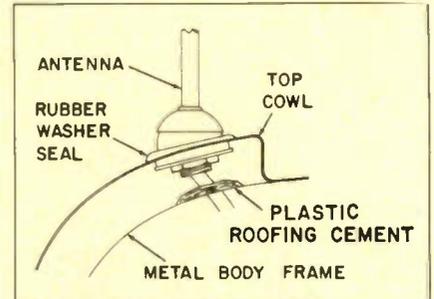
Ashes Remove Burn Marks

When someone has accidentally made a "heat mark" on a wooden TV or radio cabinet with a hot coffee cup or soldering gun, a customer hassle may ensue. Apply cigarette ashes to the scorch and add a drop of water to form a paste; rub lightly. Repeat until the mark disappears and wax the spot over.—*H. Josephs, Gardenville, Pa.*

Ford Antenna Installation

We had sold a customer a new radio for his new Ford car and to save money he installed it himself. Of course, many customers make their own installations, but the results from this installation were wet. After the car radio was installed, water leaked in on the floor near the driver. We took a quick look at the antenna installation and found the trouble.

The antenna water seal was installed properly but Ford has a double cowl fender piece. The antenna hole was drilled through both



Improperly installed Ford antennas can be repaired with plastic roofing cement. Proper installations should have wire routed through the firewall.

pieces and water was running through along side of the antenna lead-in. This lead-in should go out and in the motor firewall in Ford cars. The water leakage was stopped by using plastic roofing cement around the lead-in wire.—*Homer L. Davidson, Ft. Dodge, Iowa.*

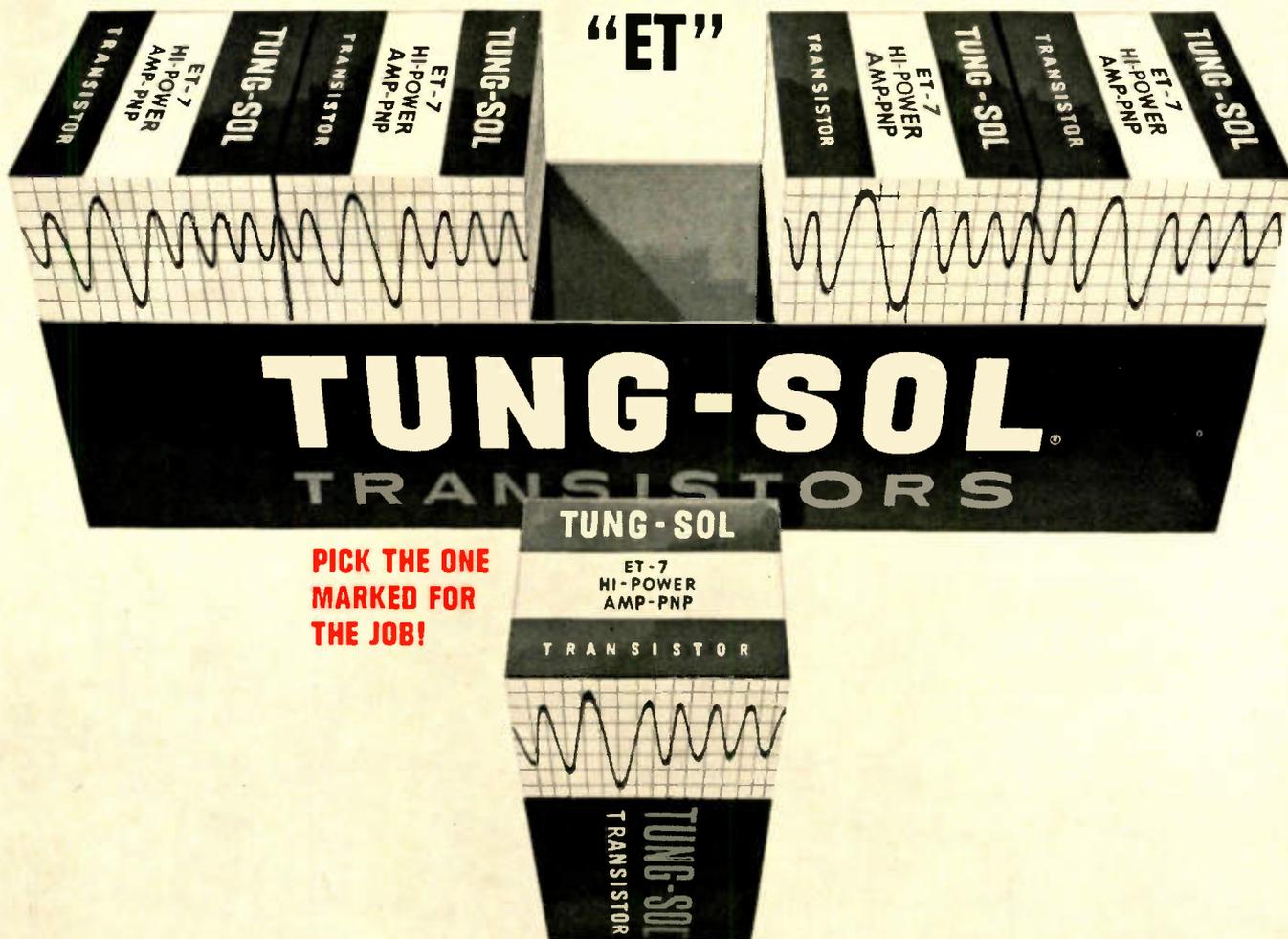
Asbestos Covered Iron

When soldering in tight spots where insulation or components can easily be burned, the iron's shank may be covered with asbestos to prevent damage. Asbestos "cloth" can be secured to the iron with a wrap of wire. If it is desirable to leave the asbestos on the iron, asbestos tape may be employed to hold the "cloth." The tape may be used alone by winding several layers around the iron.—*Allan N. Walker, San Diego, California.*

SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to Shop Hints Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.

EASY WITH "ET"



**PICK THE ONE
MARKED FOR
THE JOB!**

Tung-Sol "ET" transistor packages are marked to eliminate guesswork in selecting the correct replacement for every job. Type numbers, class of service and junction polarity is stamped on each end flap. This is a time saving feature as well as a safeguard against service slip-ups. Tells you at a quick glance where your inventory stands.

The compact "ET" line was engineered by Tung-Sol specifically to eliminate confusion in entertainment service resulting from almost endless similarity and duplication of types. Eleven PNP and NPN units replace hundreds of older transistors. "ET"

transistors measure up fully to Tung-Sol's one high standard of excellence and reliability. The most advanced quality evaluation techniques assure product uniformity, lot after lot.

When you order transistors, specify "ET." High turnover with low inventory and customer satisfaction will show that it's the profitable way to buy transistors. Tung-Sol Electric Inc., Newark 4, New Jersey.

 **TUNG-SOL®**

A TYPE FOR EVERY JOB

PNP TYPES

Low power

- ET1 Mixer/oscillator/converter
- ET2 IF amplifier
- ET3 AF amplifier 6v.
- ET4 AF amplifier 12v.
- ET5 AF amplifier 9v.
- ET12 High frequency RF amplifier, IF amplifier and Mixer/oscillator/converter

Medium power

- ET6 AF power amplifier

High power

- ET7 AF high power amplifier

NPN TYPES

Low power

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



Ask your Distributor for the Tung-Sol Transistor Interchangeability Guide

... for more details circle 66 on page 50

FREE LITERATURE

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

KNIVES

Precision hand tools including knives, gouges, punches and routers are reviewed in this catalog. Individual tools, sets and special purpose tools are covered. X-Acto Precision Tools, Inc.

--- for more details, circle 301 below

COMMUNICATIONS

Intercoms, telephones and PA amplifiers are discussed in this eight page booklet. Among the specialties listed are an automatic telephone exchange and sound distribution systems. Fanon Electronic Industries, Inc.

--- for more details, circle 302 below

TRANSISTORS

A Quick Reference Guide, Form T-481 contains reference information on five lines of transistors. The report covers high power types, power types, medium power audio and low speed computer types, medium power r-f and computer types and the "Dynaquad" line. Tung-Sol Electric Inc.

--- for more details, circle 303 below

DIODES

A germanium diode replacement guide equates domestic and foreign diode types

with this manufacturer's four replacement types. A total of 129 types are considered for replacement. Semitronics Corp.

--- for more details, circle 304 below

REPLACEMENTS

Catalog 62A highlights the manufacturer's line of replacement parts for transistor radios and phonographs. Capacitors, resistors, controls, tone arms and speakers are included. Components Specialties, Inc.

--- for more details, circle 305 below

SLIDE SWITCHES

A brochure highlighting a new series of low-cost miniature slide switches points out that the Series 200 slide button switches are generally 30 percent smaller in width and have seven fewer parts than comparable switches on the market. In addition, the brochure lists general features, choice of models, electrical ratings, operating characteristics, dimensions, performance tolerances, plus special options. Oak Mfg. Co.

--- for more details, circle 306 below

ANTENNAS

This condensed catalog illustrates a

line of commercial, amateur and citizens band antennas and accessories. Complete physical details as well as specifications are given. New-Tronics Corp.

--- for more details, circle 307 below

WORKLIFTER

An improved "Walkie Worklifter" is described in bulletin WSB-62. The unit has a four point wheel base which gives positive stability in tight turns. Capacity is 2000 lb. Economy Engineering Co.

--- for more details, circle 308 below

ANTENNAS

This catalog sheet provides specifications on the miniaturized TG-2-R VHF mobile antenna. The unit is designed to mount on top of vehicles or in other restricted spaces. Gam Electronics.

--- for more details, circle 309 below

TRANSLATORS

A 12 page brochure describes television rebroadcast translators. This booklet tells how translators are used to bring TV to TV barren areas and how they can be a project of various organizations. Electronics, Missiles & Communications, Inc.

--- for more details, circle 310 below

CUT HERE

10-62

Cut out and mail to **ELECTRONIC TECHNICIAN, 1 East First Street, Duluth 2, Minn.**

Use this coupon, or your letterhead, before **November 20, 1962**

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

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16	29	42	55	68
17	30	43	56	69
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21	34	47	60	73
22	35	48	61	

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206	213	220	227	

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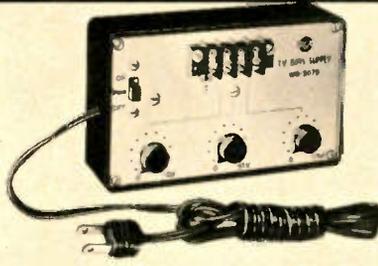
City..... Zone..... State.....

Note: If you have given your residence address, please enter your company name and address on this line:.....

SPEED AND SIMPLIFY YOUR WORK WITH RCA ELECTRONIC SERVICE ACCESSORIES



TV ISOTAP RCA WP-25A For better, faster and safer TV servicing. Provides high-medium-low line voltage testing. Adjustable to match line voltage of 105 to 130 volts in 5-volt steps. \$22.00*



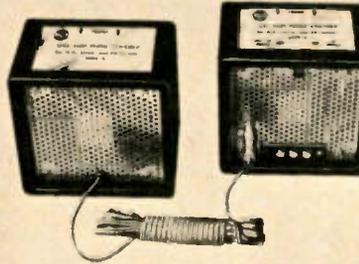
TV BIAS SUPPLY KIT RCA WG-307B (K) Three separate dc output voltages each adjustable from 0 to -15 volts provide bias voltages for aligning RF, IF and other circuits of COLOR and black and white TV receivers. \$11.95*



VIDEO MULTIMARKER RCA WG-295C Provides 7 simultaneous absorption-type marker signals at accurately preset frequencies for marking video response curves in COLOR receivers. \$32.50*



POWER LINE MONITOR RCA WV-120A Provides a constant check on incoming line voltage. Responds to every voltage fluctuation. Highly accurate ($\pm 2\%$ at 120 volts). Gives true rms reading. 5" wide meter. \$14.95*

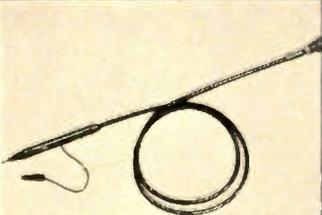


STEREO PHASE CHECKER RCA WG-360A A quick, simple, positive way to check phase alignment of low and mid-range speakers in stereo systems. Completely "sound-powered". Snag-proof recessed grille design. \$14.95*

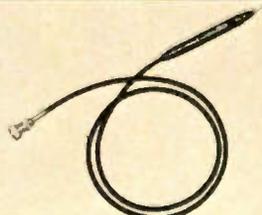


RF MODULATOR RCA WG-304B Used to check overall frequency response of TV receivers, including COLOR. Permits modulation of a signal from a marker generator by a signal from a sweep generator. \$12.50*

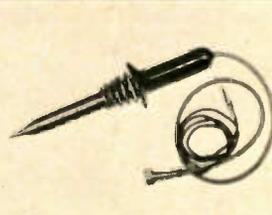
RCA ELECTRONIC PROBES



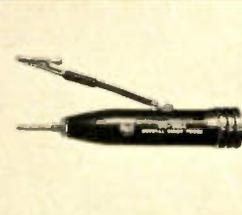
DIRECT/LOW CAPACITANCE PROBE WG-300B 48" cable. Switch provides instant selection of direct or low capacitance operations. For use with RCA scopes. \$9.95*



DC/AC-OHMSPROBEWG-299D Fingertip switch for instant selection of dc or ac/ohms. Insulated. For use with all RCA VoltOhmysts® except WV-77E. \$7.95*



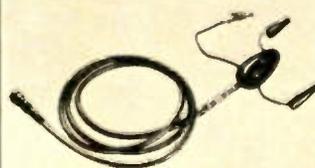
HIGH VOLTAGE PROBES WG-289 OR WG-297 Extend the DC range of RCA VoltOhmysts® to 50,000 volts. Either microphone-type or banana-plug connectors. \$7.15*



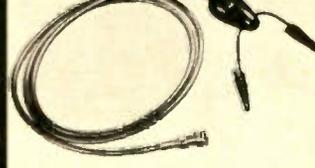
CRYSTAL-DIODE PROBE WG-301A "Slip-on" type for use with WG-299D. Extends frequency range of RCA VoltOhmysts® (except WV-77E) to 250 Mc. \$7.75*



RF/IF/VF SIGNAL TRACING PROBE WG-302A Slip-on hf probe for WG-300B and RCA oscilloscopes for troubleshooting radios, TV, IF and video stages. \$8.50*



DIRECT/LOW CAPACITANCE PROBE WG-349A A flexible 48-inch unit, fully shielded, designed for use with the RCA 3-inch oscilloscope (WO-33A). \$4.95*



DEMODULATOR PROBE WG-350A For use with RCA 3-inch oscilloscope (WO-33A) for demodulation and signal tracing of radio/TV RF and IF signals. \$4.95*



CRYSTAL DIODE PROBE WG-351A Extends the frequency range of the RCA WV-77E VoltOhmyst® to over 100 Mc. \$4.95*

RCA Electron Tube Division, Harrison, New Jersey.

SEE THEM ALL AT YOUR
AUTHORIZED RCA ELECTRONIC
INSTRUMENT DISTRIBUTOR



The Most Trusted Name in Electronics

*User Price (Optional)

STANDOFF!



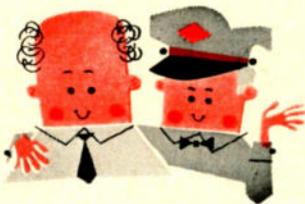
Most people think Standoff means "keep your distance" as a gadget to hold the lead-in away from the house . . . Any good Service technician knows a Standoff So . . . ?

Just this. Philco talks your language, Mr. Serviceman. We practically eat and sleep parts and service day in, day out—just like you! We know your problems intimately. We know that unless you make a profit, this Philco operation can never make a profit, either. Everything we offer must be of value to you.

This Standoff, for instance. It has been tested for heat . . . for cold. It is hot galvanized to be rust resistant, tested for tensile strength, for shear . . .

dozens of individual tests and inspections. It's typical of the pains that are taken to insure the quality of every part Philco makes or sells.

Look to Philco for Sales helps, Training aids, Programs, to help keep you the expert in your field. And look to Philco for parts that replace quickly and stay replaced. This means Quality! Your profits will follow as day follows night—and so will ours! Standoffs, anyone?



YOUR PHILCO DISTRIBUTOR has a complete selection of Philco tubes, Philco and universal capacitors, batteries, parts and accessories . . . for every service need. See him today!

PARTS & SERVICE OPERATIONS
PHILCO
A SUBSIDIARY OF *Ford Motor Company*

. . . for more details circle 48 on page 50
ELECTRONIC TECHNICIAN

AUDIO NEWS LETTER

HARMAN-KARDON introduces "Galaxy," a new series of public address and sound systems. It is said that the systems are ideally suited to conventional rack panel and console use, making possible custom installations of the highest order. At the same time, the components preserve the compactness and ease of installation of packaged sound equipment.

JENSEN INDUSTRIES reveals after a study, that the nation's 29 million Hi-Fi owners average 1-½ hours of Hi-Fi listening a day.

REEVES SOUNDCRAFT offers an exclusive collection of Hoagy Carmichael tunes — Stardust Moderne in Stereo—to "premium pack" purchasers. The Carmichael collection, which runs a full 30 minutes, is available in either two or four-track tape. Recording is on one of the two tapes in the premium pack, the other being blank.

SONOTONE announces a new pricing program which reduces cost and list prices on its full line of replacement phonograph cartridges and needles.

SOUNDOLIER introduces a new Hi-Fi loudspeaker and baffle kit mounted for self-display and packaged for immediate shipment. Each kit consists of an extended range, 8 in. Hi-Fi speaker, baffle mounting hardware, 50 ft. of wire, a template for cutting hole in wall or ceiling and complete instructions for installation.

UTAH ELECTRONICS CORP. shows a 5 in. deep two-way bookshelf system that fits size-wise and style-wise into almost every living room. Basically a bass reflex type cabinet with a tuned port, the system contains an 8 in. woofer and a 3-½ in. tweeter with an electrical crossover network.

ELECTRO-VOICE, INC. reports the highest earnings in its 32-year history. Consolidated sales for the year ending Feb. 28, 1962, increased to \$12,151,000, a gain of 21 percent over the previous year.

CRAIG-PANORAMA, INC. unveils the TR-401 "Pockette," a small hand-size tape recorder. It weighs 1½ lb and overall dimensions are 2 x 3½ x 2 in. It is powered by 4 pen-light batteries and has a built-in 2½ in. speaker, 4 transistors, 1 thermistor and a d-c micromotor. \$59.95.

FIDELITONE, INC. introduces its new 56-page catalog on phonograph needles. An added attraction is an article on "How to Sell Phonograph Needles."

SHERWOOD ELECTRONIC LABS, INC. unveils their SL-1 Stereo-lite for use with all f-m tuners. It gives instant identification of stations broadcasting f-m stereo programs.

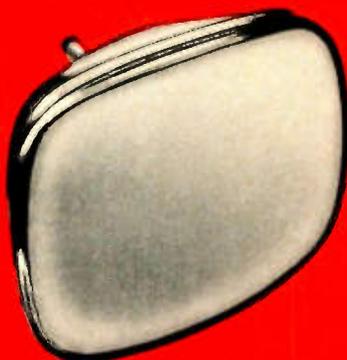
ROBINS INDUSTRIES CORP. announces two new patch cords for Revere, Wollensack and Webcor tape recorders plus a series of "Y" adapters for microphone, phono and pa.

ASTATIC CORP. expects to double its volume within the next 18 months. This will be implemented by the largest advertising program in many years.

BENJAMIN ELECTRONIC SOUND CORP. reports that effective July 1, 1962, price of the Miracord Model 10, with 4-pole induction motor, is \$89.50. It was previously priced at \$79.95.

TULANE STEREO HI-FI CO. announces publication of its new 92-page Stereo Hi-Fi Guide. The catalog contains complete product and pricing information.

PHILCO® MEANS QUALITY



PHILCO Star Bright 20/20 Picture Tube

Everything that goes into a Philco Star Bright picture tube is new . . . to make TV sets sit up and act like new. New Electron gun, phosphor coating, filaments, cathode, focusing anodes . . . even new Aquadag Shell Coating.

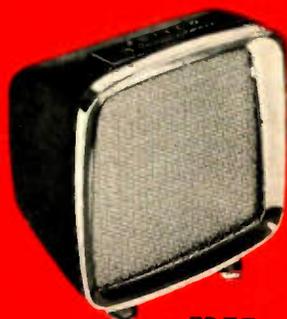
PHILCO

Quality Tested Receiving Tubes

Just like the quality tubes in a brand new Philco television receiver. Safe, sure and sensible for every replacement and they're engineered for long life.



4" Stereophonic Extension Speakers



Streamlined beige finished cabinet. 8 ohm voice coil impedance, .68 oz. Alnico magnet. Coaxial connector socket, cable connection plug included. With volume control (Part No. 326-5029-1) or without (Part No. 326-5029).

FREE 2 display cards with each dozen speakers.

For Over 30 Years . . . Providing a Better Future for America's Service Technicians

Philco product data mailings—direct to you every month! Tangible benefits including low cost group insurance. Practical business building ideas. These advantages are yours when you enroll in the Philco Factory-Supervised Service Association. Ask your Distributor.



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Please send me FREE, the Philco Calculator. (Saves you hours of time figuring out net costs and selling prices.)

Name _____

Address _____

City _____ Zone _____ State _____

Service only Retailer with Service Dept.

... far more details circle 49 on page 50

G-E reporter, Roland Kempton,
makes the rounds with
independent service dealers...

GE **ELECTRONICS**



Ben Follrath says, "It's like having 4 capacitors in each box when you stock G-E *SERVICE-DESIGNED* capacitors"

Because one G-E Service-Designed capacitor takes the place of four ordinary types... Ben Follrath, owner of BEN'S TV, Alameda, Calif., can carry about 20 types in stock and still meet approximately 70% of his replacement needs. That's because G-E Service-Designed capacitors are designed for, and marked with, an "application range" of capacitance (i.e. "40-60 mfd"). One capacitor serves all values within this application range.

To Ben Follrath, and service dealers throughout the country, this means it pays to stock G-E Service-Designed capacitors. They save time, reduce costs

of single-unit ordering and pickup, speed customer service. Like having 4 capacitors in each box.

Get your complete capacitor catalog and replacement guide from your G-E Electronic Components distributor. Ask for ETR-2600, or write to: General Electric Company, Room 1774, 3800 N. Milwaukee Ave., Chicago 41, Illinois.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

... for more details circle 32 on page 50
ELECTRONIC TECHNICIAN

TRANSISTORS

Continued from page 33

transistor for testing always use a heat sink between the transistor and the soldering iron. A pair of pliers clamped to the wire or one of the special tools made for this purpose work nicely. The same precautions, of course, apply to reinstalling the transistor or replacing it with a new one. Output transistors must be securely mounted to their heat sinks. A coating of silicon grease should be applied to mounting surfaces to assure good heat dissipation.

The best method to test transistors is to use a tester built for the purpose. In a pinch, an ohmmeter may be used if the battery voltage in the ohmmeter does not exceed the breakdown voltage of the transistor. The middle resistance range of most meters are usually satisfactory.

In testing the transistor with an ohmmeter, the transistor should be treated as two diodes, back to back, with the base as their common junction. There should be a high resistance between the emitter and collector with the meter connected in either polarity.

Bias voltages on transistors in Hi-Fi equipment are critical. Accurate readings must be made in order to properly deduce the cause of malfunction. As little as 0.2 v can mean the difference between "go" and "no-go." The amount of voltage present is not important on gross distortion or complete failure; voltage proportions however, are extremely important.

After repairing a few of these amplifiers on your bench you should become an expert. Fewer components are involved than in tube types and troubleshooting can be a lot easier. ■

Thermoelectric Ice Cube Maker

■ The York Division of Borg-Warner Corp. has announced the first commercial storage-type development of an ice cube maker that doesn't use a compressor, evaporator or condenser — it creates cold by passing current through special metallic compounds. Thus, the unit, said to be capable of producing thirty pounds of ice cubes per day, doesn't have any moving parts in its cooling system.

The ice cube unit employs thermoelectric modules to achieve cooling and heating for defrosting. The result of eliminating standard refrigerator equipment is: smaller size, lighter weight, silent operation, and essentially no maintenance or repair.

Maintenance is reduced to a minimum because of the absence of moving parts. The equipment requires only the power from a 115 v a-c outlet. Amount of power required is approximately that needed to operate a single floor lamp over a period of one month, according to the manufacturer. The unit freezes water into hexagonal ice cubes in about 38 minutes.

Thermoelectricity

The thermoelectric principle is not new; it's more than a century old. However, it was too inefficient to compete with more conventional forms of power conversion methods. The principle is well known to readers: current passing through two different metals produces heat from one metal and cold from the other. We know an item using this principle as a thermocouple.

As used in the cold-making unit, a material having low resistance to electrical current is used to minimize heat. Research over a period of several years resulted in development of a semiconductor thermocouple. Ice cubes are frozen when heat is removed by a cold junction and transferred to the hot junction.

The first production models will be on the market this year, says J. B. Elliott, president of the York Division. It's expected to list for about \$800-1,000: not too far above the list price of conventional units. Hotels and motels will be prime customer prospects for these ice cube makers. ■



Two Service Aids Included in New G-E Auto Radio Capacitor Kit

Kit K-202 contains 10 electrolytic twist-prong capacitors (8 most popular types) that will meet the majority of auto radio replacement needs. As a bonus, each kit contains a magnetic service light, tab adjuster and replacement guide... all at no additional charge.

The magnetic service light may be attached to auto dash or radio chassis and aimed where needed. The hollow-tip tab adjuster simplifies twist-prong servicing. Both Service Aids are included at no additional cost.

Get this extra-value kit now from your G-E Electronic Components distributor. Ask your distributor for a copy of the new General Electric Auto Radio Replacement Guide, ETR-3378, or mail coupon to Chicago warehouse address shown.

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Company, Dept. 1774
3800 N. Milwaukee Ave., Chicago 41, Ill.

Please send me a copy of the new G-E Auto
Radio Replacement Guide, ETR-3378.

Name _____

Address _____

City _____ Zone _____ State _____

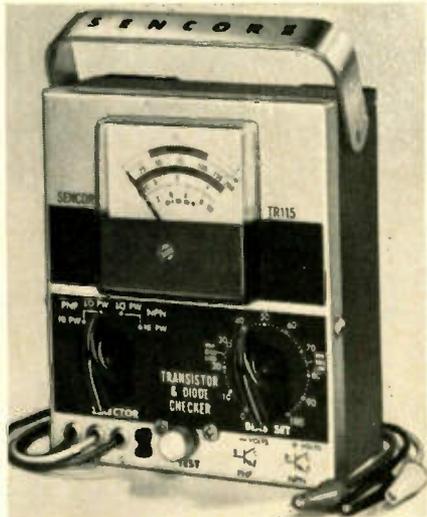
... for more details circle 33 on page 50

NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON PAGE 50

TRANSISTOR TESTER 200

The TR115K transistor tester checks for leakage, current gain, shorts, opens and allows the reading of beta direct



or on a good bad scale for service work. A special compartment in the rear holds set-up booklets and instructions. The transistor and diode checker kit comes complete with all parts and easy to follow instructions. Net price: \$15.95. Sencore, Inc.

TAPE RECORDER 201

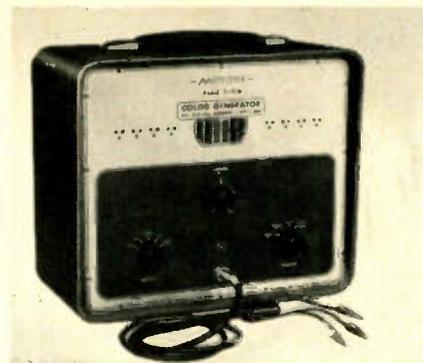
The TR-505 is said to give up to 4 hr recording time on extra thin tapes with two speeds, 1 7/8 and 3 3/4 ips. Tapes can be edited with stop-pause control. Battery power is by six inexpensive flashlight cells and the unit can also be operated on household electricity by means of a self-contained a-c adapter. The six transistor TR-505 features a-c bias recording speech and music tone control, radio-phonograph inputs, a 3 in. speaker, and a fast forward switch. It



weights 10 lb complete. Dimensions are only 5 x 12 x 10 1/2 in. The suggested retail price, \$159.95, includes earphone, microphone, full reel of tape, and an empty reel. Craig-Panorama, Inc.

BAR GENERATOR 202

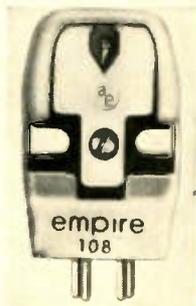
A color bar and white dot generator that is crystal controlled and voltage regulated is claimed to offer the serviceman the ultimate in ease of operation with one simple cable connection to the antenna input of the receiver under test and only three front panel controls. It combines the facilities to test and adjust the color phasing, matrixing, linearity and convergence circuits in all color TV receivers. Patterns include color bars, white dots, v-bars, h-bars and Crosshatch. R-F output of picture carrier is 50 mv



maximum and sound carrier is 10% of picture carrier. Price \$189.95. Precision Apparatus Co., Inc.

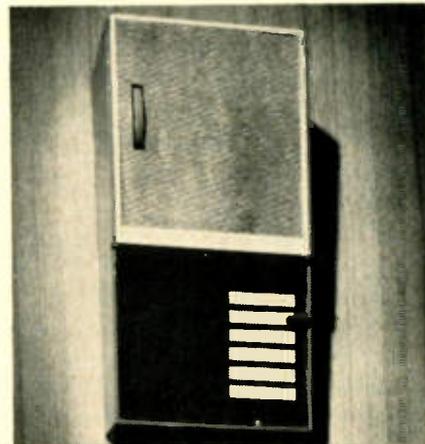
STEREO CARTRIDGE 203

The model 108 stereo-mono cartridge features frequency response of 15-20,000 cps within ± 2 db, with usable output to 30,000 cps. Output voltage is 7.0 mv per channel balanced to within ± 1 db; channel separation is more than 25 db and dynamic mass is less than $.7 \times 10^{-3}$ g. Weight is 10 g, vertical and horizontal compliance arc 6×10^{-6} cm/dyne and the recommended tracking force is 1.5 to 5 g. Price: \$35. Empire Scientific Corp



TRANSISTOR INTERCOM 204

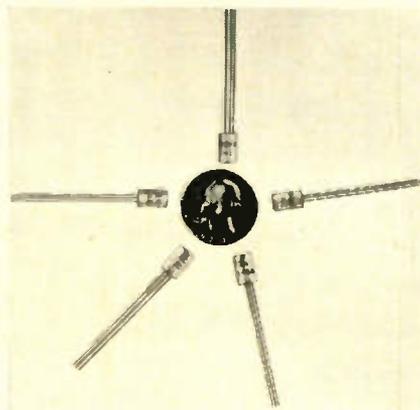
The "Signette" is said to be completely



transistorized for compactness, economical operation, and long, trouble-free service. The units are enclosed in a styrene case, styled in two-tone beige and brown to harmonize with any decor. The tapered rectangular case is only 8 x 4 1/4 x 2 3/8 in. It can be mounted in any position, on desk, wall or counter. A six-position sliding switch in the master unit permits the operator to call any other station in the system while a thumb wheel adjusts the sound volume. Each master station is plugged into a standard 110 vac outlet, while slave stations do not require an outside power supply. The master retails for less than \$50, and the slave for less than \$15. General Dynamics/Electronics.

UNIVERSAL TRANSISTORS 205

Manufactured by the recently developed ULT (Uniform Low Frequency Technique), these germanium alloy transistors are designed for transistorized radios and industrial applications. They reportedly feature exceptionally tight specs, which enables the engineer readily to design them into most audio circuits. They are all available in standard TO-1 cases. The type 2N2428 and 2N2429



NOW EVERYONE CAN QUICKLY Set up and Service Color TV



New! **B&K** Model 850 COLOR GENERATOR

**Most Complete, Most Versatile, Portable Instrument for Use in the Home and in the Shop
Makes Color TV Set-up and Service Easier, Faster than ever!**

Now every service technician can be ready to set-up and service color TV with amazing new ease and speed! New advanced design simplifies the entire operation, saves time and work in every installation. Eliminates difficult steps in digging into the color TV set. Gives you new confidence in handling color.

Produces Patterns, Burst, and Colors Individually—Provides dot pattern, crosshatch, vertical lines, horizontal lines, burst signal, and individual colors—one at a time—on the instrument panel as well as on the TV color set—for fastest, easiest check. Unique window-viewer on front of the instrument panel shows you each pattern and color as it should be—gives you an exclusive display standard to use as a sure guide for quick, visual comparison.

Provides Accurate, Individual Color Display—Produces Green, Cyan, Blue, B-Y, Q, Magenta, R-Y, Red, I, Yellow, and Burst—one at a time. All colors are crystal-controlled and are produced by a precision delay-line for maximum accuracy. Each color is individually switch-selected—no chance of error.

Provides Accurate NTSC-Type Signal—Color phase angles are maintained in accordance with NTSC specifications.

Makes Convergence and Linearity Adjustments Easy—Highly stable crystal-controlled system with

vertical and horizontal sync pulses, assures the ultimate in line and dot stability.

Simplifies Demodulator Alignment—The type of color display produced by this instrument provides the ultimate in simplicity for precise demodulator alignment.

Provides Automatic Deconvergence—Eliminates the necessity for continual static convergence adjustments. The instrument automatically deconverges a white into a color dot trio without digging into the color set to misadjust the convergence magnets. It also deconverges a white horizontal or vertical line into red, green and blue parallel lines. This greatly simplifies dynamic convergence adjustments.

Provides Exclusive Color Gun Killer—Front-panel switch control makes it easy to disable any combination of the three color guns. Eliminates continuous adjustment of the background or screen controls, or connection of a shorting clip inside the receiver. The switch also selects the individual grids of the color tube and connects to a front-panel jack to simplify demodulator alignment.

Provides Switch-Selected R.F. Signals—Factory-tuned, for channels 3, 4, and 5—for open channel use in your area.

Model 850 also includes other features that make it invaluable for home and shop use. Net, **\$199⁹⁵**

See Your B&K Distributor
or Write for Catalog AP20-T



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... for more details circle #16 on page 50

New TRANSISTOR RADIO ANALYST

makes it Easy and Profitable to Service all Transistor Radios



B&K Model 960

TRANSISTOR RADIO ANALYST

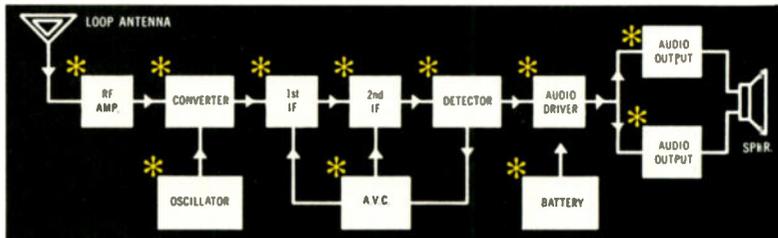
*with Exclusive DYNA-TRACE
Single-Point Probe—and Built-in
Metered Power Supply and VTVM*

**Complete Transistor Radio
Service Shop in One Instrument**

*Signal-Generator, Power Supply,
Milliammeter, VTVM,
Ohmmeter, and Both In-Circuit and
Out-of-Circuit Transistor Tester—
All in One*

Check all circuits - Pinpoint any trouble ... in minutes

Now you can profit from transistor radio servicing! This amazing new B&K "960" ANALYST gives you *everything* in *one* complete easy-to-use instrument. Makes transistor radio servicing *quick and easy*. Nothing else is needed except the transistor radios themselves waiting to be serviced. Brings you new customers for service, parts, and batteries. Makes this new business *yours*.



EASILY TROUBLE-SHOOT ANY STAGE BY UNIQUE POINT-TO-POINT SIGNAL INJECTION

The ANALYST gives you a complete signal-generating source for point-to-point signal injection. Easily enables you to trouble-shoot any transistor radio—check all circuits stage-by-stage—locate and pinpoint the exact trouble in minutes.

Supplies modulated signals, with adjustable control, to check r.f., i.f., converter, and detector. Supplies audio signal to check audio driver and audio output. Provides unmodulated signal to test local oscillator. Provides separate audio low-impedance output for signal injection into loudspeaker voice coils to check speaker performance.

BUILT-IN METERED POWER SUPPLY FOR EASY SERVICING

Makes it easy to operate radio under test, while you inject your own signals. Provides from 1 to 12 volts in 1½ volt steps. Supplies all bias taps that may be required.

SIMPLIFIES IN-CIRCUIT TRANSISTOR TEST WITH NEW DYNA-TRACE SINGLE-POINT PROBE

Unique single-point probe needs only the one contact to transistor under test. No longer are three wires required to connect to emitter, base, and collector. Gives fast, positive meter indication. Saves time. Makes trouble-shooting simple and easy.

BUILT-IN VTVM

Includes high-input-impedance vacuum-tube voltmeter, which is so necessary for transistor radio servicing.

TESTS ALL TRANSISTORS OUT-OF-CIRCUIT

Meter has "Good-Bad" scale for *both* leakage and beta. Also has direct-reading Beta scale, calibrated 0-150. Assures quick, accurate test. Also automatically determines whether transistor is NPN or PNP. Meter is protected against accidental overload and burn-out.

Model 960. Net, \$99⁹⁵

Solve Every Service Problem and Profit with a Modern B&K Service Shop. See Your B&K Distributor or Write for Catalog \P20-T



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... for more details circle 15 on page 50

Again **B&K** Makes Servicing
Easier... More Profitable!

NEW!

3-IN-1

DYNA-TESTER



Model 625

1 TUBE TESTER **2** VOM **3** CRT

Unique new B&K design now simplifies servicing in the home or in the shop. Combines Tube Tester, Volt-Ohm-Milliammeter, and Cathode Rejuvenator Tester in one compact, professional quality instrument—at low cost!

1 TUBE TESTER SECTION is fast and accurate. Tests the *newest* tube types as well as all of the *old* commonly used tubes in TV and radio sets. Tests the Nuvistors and Novars, the new 10-pin tubes and 12-pin Compactrons. Tests voltage regulators, thyratrons, auto radio hybrid tubes, European hi-fi tubes, and most industrial types. Checks for *all* shorts, grid emission, leakage and gas. Provides *adjustable* grid emission check with exceptional sensitivity to over 100 megohms. Checks *each section* of multi-section tubes separately. Checks tube quality and capability of cathode emission under current loads simulating actual operating conditions.

2 VOM SECTION provides the 7 most-used ranges for convenient TV testing:
3 DC Ranges: 0-10, 100, 1000 volts
3 AC Ranges: 0-10, 100, 1000 volts
1 Resistance Range: 3 k center scale

3 CRT SECTION spots picture tube trouble and corrects it in a few minutes right in the home, without removing tube from set. Tests and rejuvenates picture tubes at correct filament voltage from 1 to 50 volts. Checks for leakage, shorts, and emission. Removes inter-element shorts and leakage. Restores emission and brightness. (Checks and repairs color picture tubes with B&K Accessory C40 Adapter.)

Model 625 Dyna-Tester complete in handsome, lightweight, leatherette-covered carry-case.
Size: 11 3/4" x 15" x 4 1/2". Net, \$139⁹⁵

See your B&K Distributor, or Write for Catalog 4P20-T

Time-Saving, Money-Making Instruments Used by Professional Servicemen Everywhere



Model 960 Transistor Radio Analyst



Model 360 V O Matic Automatic VOM



Model 375 Dynamatic Automatic VTVM



Model 1076 Television Analyst



Model 440 CRT Rejuvenator Tester

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... for more details circle 71 on page 50



CADRE HAS A PLAN FOR YOU

CB means big business—and many service-technicians—particularly those who sell and service auto radios or who install P.A.—are equipped to enter this lucrative new field of communications equipment.

Cadre, leader in CB, offers you a sensible approach to selling this market—the most powerful all-transistor CB radio, backed up by sales aids that pave the way to big Citizens Band 2-way radio profits.

CADRE '510' ALL-TRANSISTOR 5-WATT CB 2-WAY RADIO

POWERFUL—Highest transmitter power authorized by FCC, 5-watts, provides maximum "talk" range—up to 20 miles (30 on water). Extra transmission punch through speech clipping. 5 crystal-controlled transmit/receive channels assure bull's-eye communications. Rugged microphone has "press-to-talk" switch and retractable cord. Audio power is a full 2.5 watts.

SELECTIVE—Dual-conversion superheterodyne receiver circuit with new tuned ceramic filters provides clear reception without adjacent channel interference. Automatic Noise Limiter suppresses external interferences. Adjustable squelch silences speaker for noise-free standby reception. Manually tunes in all 23 CB channels.

VERSATILITY—Built-in dual power supply, 12VDC/110-220VAC, for mobile or base station. Portable pack accessory with rechargeable batteries for field use.



ECONOMICAL—Approximately 20% battery drain of a tube unit. Low current drain prolongs vehicle battery life. Also costs less to operate on AC.

CADRE PROMOTION SUPPORTS YOU



MAILINGS—Cadre supports you with an effective mailing program consisting of letters specially tailored to specific markets, imprinted on your letterhead if you wish.

STUFFERS—Cadre will supply you with descriptive, colorful line stuffers which you can give away or mail to your customers and prospects. Fit into point-of-sale display.

BOOKLET—Informative booklet of interest to everybody who owns CB equipment or is contemplating purchase of CB equipment will be featured in national advertising.

AD MATS—Effective ad mats for hard-hitting local newspaper advertising.

Wire . . . write today . . . phone for further information.

CADRE INDUSTRIES CORP., COMMERCIAL PRODUCTS DIVISION, ENDCOTT, N.Y. AREA CODE 607 748 3373
 Canada: Tri-Tel Assoc., Ltd., 81 Sheppard Ave. West, Willowdale, Ont. Export: Morhan Exporting Corp., 458 Broadway, N.Y. 13, N.Y.
 . . . for more details circle 19 on page 50

NEW PRODUCTS

are PNP devices rated at 165 mw and 32 v. The 2N2430 is an NPN device with a beta spread of 65 to 190, and the type 2N2431 is a PNP medium power transistor capable of up to 2 w power output per pair. Amperex Electronics Corp., Semiconductor and Special Purpose Tube Dept.

PORTABLE RADIO 206

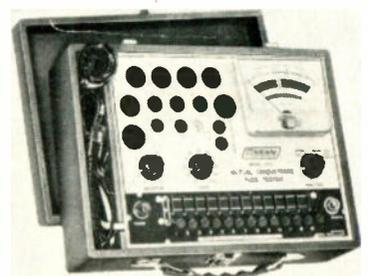
This model is a fully transistorized f-m/a-m shortwave portable receiver. Two telescopic f-m antennas, and an in-

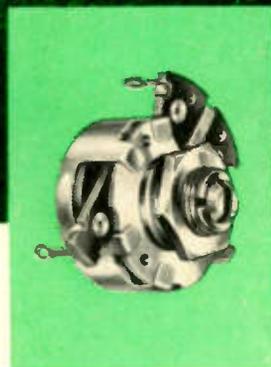
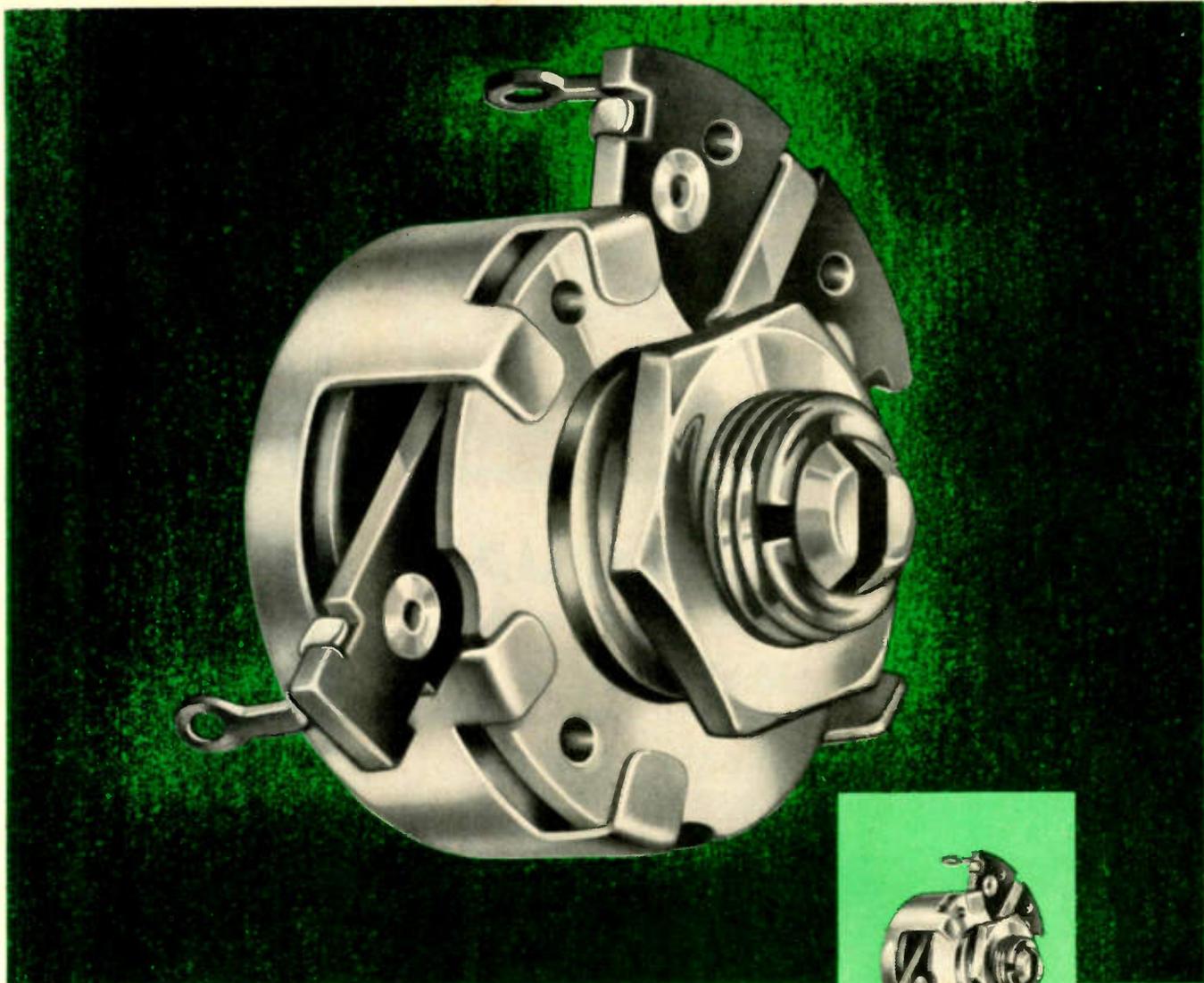


ternal ferrite rod a-m aerial are employed. Nine transistors and three diodes, with a 1 w push-pull output driving a 5 x 7 in. speaker, reportedly provide high sensitivity and adequate power, even in noisy surroundings. Shortwave coverage is 2 through 16 Mc, in two bands. An accessory slide-in dash mounting bracket will enable easy mounting for traveling, and with a standard automobile antenna and the proper suppressors, this portable doubles as a car radio, since regular automotive antenna plugs into the external aerial connection. Price \$149.95. Dynaco, Inc.

TUBE TESTER 207

The Model TC114, tube tester is now being released with two important changes. A D'Arsonval meter and a speedy set-up tube chart have been incorporated in all models. The improved meter affords increased reliability and will not stick, according to the manufacturer. The set-up tube chart, cemented inside of the removable cover, eliminates the need for referring to set-up booklet for most often used tube types. The "Mighty Mite" retains all of the previous circuit and performance





Quality...
IN EVERY DETAIL

It's not just a lot of sales ballyhoo—you can actually see the quality in every Clarostat potentiometer. Take a good close look at the finish, the construction, and then compare. Clarostat builds potentiometers for the most critical military and industrial applications, and the same careful attention to details—inside and outside—is found in every product of the company whether it is for the most expensive computer, or for replacement of a television control.

Do right by yourself and your customer.
Insist on the best—Clarostat.

DISTRIBUTOR SALES DIVISION



 **CLAROSTAT**

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

... for more details circle 24 on page 50

NEW PRODUCTS

features, checking all tubes including the new GE Compactrons; the RCA Nuvisitors and Novars, and the Sylvania 10 Pin Tubes. \$74.50. Sencore, Inc.

TAPE RECORDERS 208

Totally new styling concept featuring an all metal case, with "Royalite" lid, push button key board operation for all functions and pleasing blending of colors, are claimed for this tape recorder. Three



models are included in the line: The M-7 a mono record and play unit, the SR-7 with stereo play and mono playback and the all stereo FS-7. Pentron Electronics Corp.

OSCILLOSCOPE 209

The Model 427 is described as a gen-

eral purpose oscilloscope employing all the control facilities and performance quality demanded in general laboratory work, production testing, audio and ultrasonic development and servicing. Vertical amplifier is direct-coupled and push-pull throughout (6 stages in 3 push-pull pairs). Choice of direct or capacitive input is provided. The vertical amplifier is claimed to be flat from d-c to 500 kc, and down only 6 db at 1 mc. Sensitivity is 10 mv p-p or 3.5 mv rms per cm, direct or capacitive input coupling. The sweep circuit provides recur-



rent sweeps from 10 cps to 100 kc in four over-lapping ranges. List Price \$69.95 in kit, \$109.95 wired. Electronic Instruments Co. Inc.

IT'S NEW FROM QUAM

A mighty 8-inch ceramic magnet public address speaker!

Mighty narrow

(only 3 inches deep for in-wall mounting)

Mighty powerful

(easily handles 12 watts)

Mighty fine fidelity

(audible response from 55 to 13,000 cps assures perfect music and voice reproduction)

Now you can have a speaker with the shallow depth needed for in-wall mounting *PLUS* full range, response and angular coverage. Quam recognized the industry need for a speaker with these rigid specifications and developed the new 8C6PA which now joins the other fine ceramic and Alnico V magnet speakers in the Quam Public Address line.

Quam is the quality name in public address speakers well known for trouble-free operation, superior workmanship and engineering, and rigid quality control.

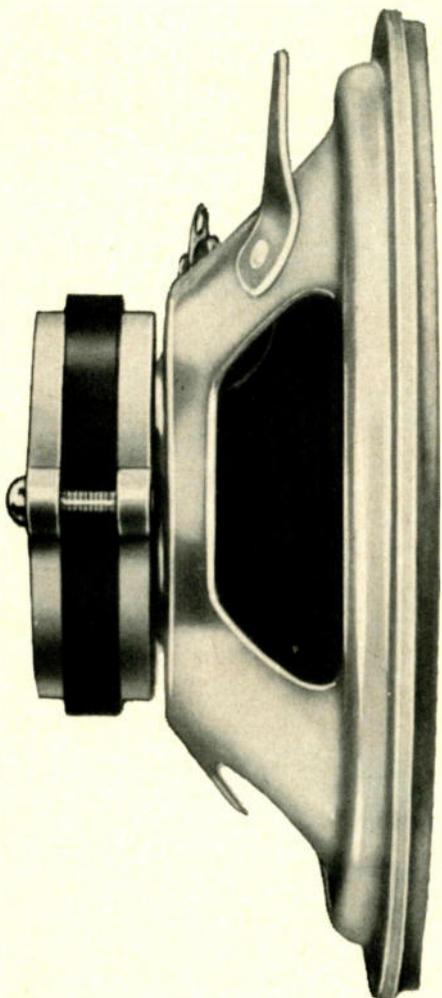
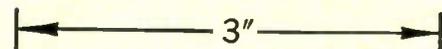
The brand-new up-to-date Quam Sound System Catalog gives full information on the 8C6PA and the other fine Quam Public Address speakers. Write for your free copy.

QUAM

QUAM-NICHOLS COMPANY

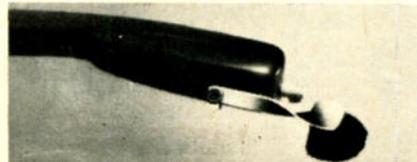
226 East Marquette Road • Chicago 37, Illinois

... for more details circle 50 on page 50



RECORD CLEANER 210

Made of genuine chinchilla fur, "SOF Touch" is claimed to virtually overcome all the problems encountered while using



ordinary record brushes on stereo systems. The grooves of records are very fine, approximately 0.001 in. wide. Most brushes are made of camel or goat hair which are 0.0015 to 0.002 in. in diameter, therefore they sweep the surface of the record clean but miss the dirt that lies in the grooves, according to this firm. Fur is 0.00002 in. dia or 1/100 the diameter of the most used materials, fine enough to easily reach deep into micro-grooves, according to the manufacturer. Price \$1.49 post-paid by the makers. White Lion Chinchilla Products.

DIODE DISPLAY 211

A distributor assortment of germanium crystal diodes, packaged in an attractive four drawer plastic counter display has been announced. The diodes have been selected to allow immediate substitution of more than 125 popular types from a stock of 300 diodes grouped into four



WILL THE REPLACEMENT ANTENNA YOU ARE NOW USING, COVER THIS HOLE? IF NOT, YOU ARE LOSING PROFITS, BIG PROFITS!

1 1/8"



TENNA EXACT REPLACEMENTS

GIVE YOU THE EXACT ANTENNA FOR EVERY CAR AND HOLE . . . EVEN FOR THOSE HARD TO FIT 1 1/8" HOLES!

OVER 100 DIFFERENT CAR MODELS REQUIRE BASES TO COVER 1 1/8" HOLES!

Chryslers, DeSotos, and Plymouths '57 thru '60 and 1960 Darts. Mercurys and Fords '52 thru '56, Thunderbirds '55 thru '57 and Buicks '61 and '62 all require large bases. You cannot afford to overlook such a huge market.



YOU LOSE PROFITS, BIG PROFITS WHEN YOU LOSE BIG HOLE SALES!

TENNA *Exact* REPLACEMENTS FIT ALL HOLES. NO SOLDERING, NO CEMENTING!

No matter how large the hole, you never have to solder, weld or cement rings around the hole before installing a Tenna Exact Replacement. Tenna Exacts save you countless hours of installation time.



YOU LOSE PROFITS, BIG PROFITS WHEN YOU TRY TO COVER BIG HOLES WITH SMALL MOUNTING BASES!

TENNA *Exact* REPLACEMENTS ARE FULLY ASSEMBLED, READY TO INSTALL!

To install a Tenna Exact Replacement all you have to do is remove from skin-wrapped package. Every part, everything you need is in the package.



YOU LOSE PROFITS, BIG PROFITS WHEN YOU MUST COLLECT PARTS AND THEN ASSEMBLE ANTENNAS!

TENNA *Exact* REPLACEMENTS WILL MULTIPLY YOUR ANTENNA PROFITS!

When you sell Tenna Exacts you have a replacement antenna for every car and every hole. You serve your customer in a more satisfactory manner . . . and make 3 times the profit or even more in so doing. It pays to sell Exacts.



YOU LOSE PROFITS, BIG PROFITS WHEN YOU SELL A UNIVERSAL INSTEAD OF AN EXACT REPLACEMENT!

WHEN YOU DISPLAY AND SELL

TENNA EXACT REPLACEMENTS

YOU ARE ASSURED OF BIGGER, BETTER, MORE BANKABLE PROFITS!



DEAL YOURSELF IN ON THE BIG TENNA FREE DEAL

. . . and start making bigger profits at once!

FREE!

HANDSOME, GOLD FINISHED, REVOLVING COUNTER DISPLAY STAND AND TENNA ANTENNA GUIDE WITH THE PURCHASE OF 12 TENNA EXACT REPLACEMENTS

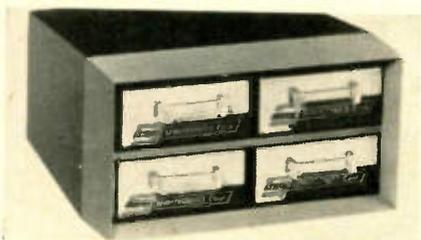


Tenna has not pre-selected or pre-packed the 12 antennas for you. You select the 12 Exact Replacements of your own choosing, the models best suited to your own local needs. Order your Tenna Exacts now and start enjoying bigger and better profits at once.

TENNA CORPORATION, CLEVELAND, OHIO

WHERE PROGRESS IS A HABIT AND SALES LEADERSHIP AN ESTABLISHED FACT!

NEW PRODUCTS



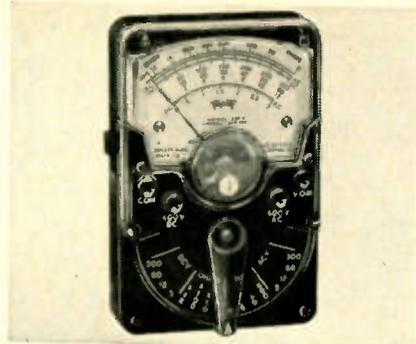
basic types. An easy-to-read one color marking system is used on each diode. A complete diode replacement chart list-

ing the most popular diodes used in a-m. f-m radio and television, and their replacement is included with each display. Substitutions for foreign-made diodes are also shown on the chart. Semitronics Corp.

VOLT-OHM-METER

212

Hand-size and light weight, the Model 310-C is a new addition to this firm's 13-tester line of Volt-Ohm-Milliammeters. Offering the features of a full-size VOM, this new miniature tester also has a fully enclosed lever range switch; 20,000 ohms/vdc; and 15,000 ohms/vac, according to the manufacturer. There is a reversing switch for d-c measurements.



A Probe-A-Test feature permits fitting a removable test probe into the top of the tester, freeing one hand. A Model 10 Adapter may be attached to the tester to permit clamp-on ammeter testing of all line loads quickly, accurately and safely. The 310-C in a fully insulated black molded case, measures 2 3/4 x 4 1/4 x 1-5/16 in. Triplett Electrical Instrument Co.

BE READY TO SERVICE COLOR TV



2596

Save \$4.60
Reg. \$26.50

2589

2548

2590

2595

Walsco Repair Kit no. 2599x puts you in business . . . For Only \$21⁹⁰

The 5 essential Service Tools all in one kit . . .

CAT. NO.	TOOL	USE
2590	Degaussing Coil	eliminates stray magnetic fields for easy purity adjustment
2595	Grid Grounding Box	grounds kinescope control grids . . . each switch and cord color coded for quick connection
2548	Interlock Cheater	protects you from shock hazard . . . permits insertion of a voltage probe
2589	Alignment Tool	two-in-one tool for alignment of concentric controls . . . saves time
2596	Color Viewer	three viewing filters simplify phase and matrix adjustments, let you handle many service calls in-the-home

and FREE! useful Color TV service book included with each kit

Zenith, and other leading color TV set manufacturers, recommend using Walsco Degaussing Coils and Color TV Accessory Tools in equipment servicing. And only Walsco is ready now to outfit you with all the tools you need!

For more information, write for Specification FR8554.



COLOR TV TUBE MICROSCOPE

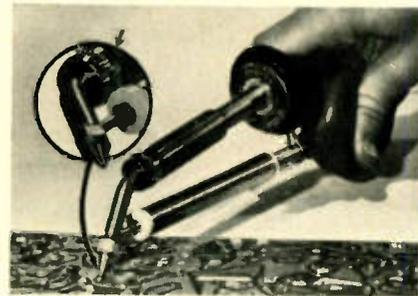
Precision pocket-size scope that magnifies dots 25 times for SIMPLE and ACCURATE adjustment of purity magnet, yoke, and rim magnets

CATALOG NO. 2594
DEALER NET 19⁵⁰

DESOLDERING IRON

213

A completely self-contained desoldering iron is said to be especially useful for removing components from printed-



circuit boards. The Model 100 "Desoldering Iron" uses a suction bulb to draw molten solder from the printed board through its hollow tip into a stainless steel solder-collection tube. A variety of tip styles will be available for the iron and tips can be changed, even while the iron is hot, merely by removing the old tip with a 5/16 in. nut driver and putting the new one in place. With components having many lead terminals, each connection can be unsoldered separately after which the component can be easily removed from the printed board. Price \$14.95. Enterprise Development Corp.

TV ANTENNA

214

The "Jet" indoor antenna is available in three designs; Model TA707 with aluminum dipoles, Model TA720 with brass dipoles and Model TA880 with chrome



WALSCO ELECTRONICS CO.

a division of GC-Textron Electronics, Inc.

400 S. WYMAN ST., ROCKFORD, ILLINOIS

. . . for more details circle 68 on page 50



YOU CAN BUY THAT NEW PANEL TRUCK WITH A FREE SIGNET SOUND CATALOG

Last year, several hundred electronic technicians earned enough spare-time income with their SIGNET SOUND Catalog to purchase new panel trucks...or new cars...or to make house improvements...or to take vacations. You can do the same. It's as easy as this. ■ First check your own neighborhood for prospects—places that could use top-quality, relatively low-cost sound components or complete sound packages. These you'll find in the SIGNET SOUND Series of STROMBERG-CARLSON® Communication Products, and you can sell them to churches, meeting halls, sports and social clubs, bowling alleys, taverns and restaurants. All you need to get started is the SIGNET SOUND Catalog, which is yours for the asking. ■ Selling SIGNET SOUND won't take up a lot of your time. There's no inventory for you to stock. You need no special knowledge or background to make the sale, and SIGNET SOUND is a cinch to install. Everything you need to make one extra-income sale after another is right in the catalog! Write for full details and your free SIGNET SOUND Catalog right now. You'll also receive a valuable booklet that shows how easy it is to install sound equipment. Write to General Dynamics/Electronics-Rochester, Box E, 1410 North Goodman Street, Rochester 1, N. Y.

G|||||D

GENERAL DYNAMICS | ELECTRONICS — ROCHESTER

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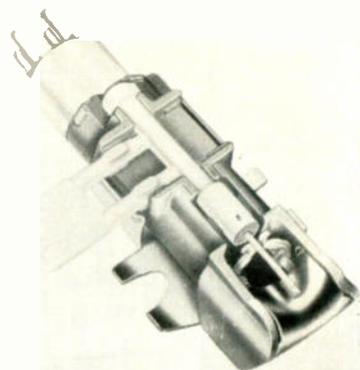
NEW PRODUCTS

dipoles. These antennas have a sculptured base, and feature telescoping dipoles which extend to 76 in. from tip to tip. As with all the firm's top-of-the-set antennas, the base section is weighted and tip proof. The companion Astro-Jet models also available in both aluminum (Model TA900) and brass (Model TA990) dipole design, consists of telescoping dipoles, plus an extra-sensitive electronic tuning channel selector permitting the user to tune the antenna electronically to the channel(s) to be re-

ceived. Four-section dipoles and tip-proof base are crafted to complement room decor. JFD Electronics Corp.

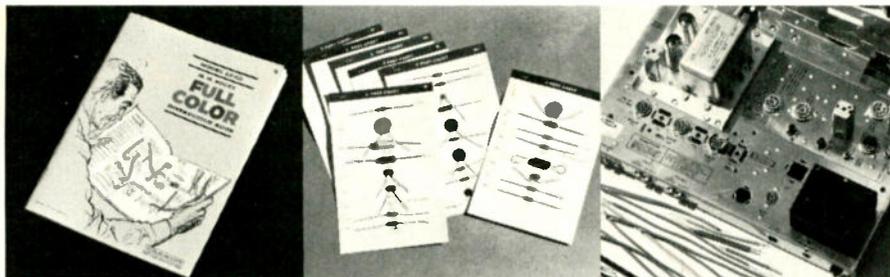
CERAMIC CARTRIDGE 215

This cartridge, the "916TA," does not supersede or replace any of firm's present models but is an addition to the jobber "pickups" now available. The 916-TA was designed as a low-cost stereo cartridge to rank between budget-priced stereo models and higher priced audiophile models. Response is ± 3 db of the RIAA characteristic from 20 to 15,000 cps with smooth rolloff at 20,000 cps. The output voltage is 0.42 mv. Compliance is 4.0×10^{-6} cm/dyne, reducing tracking pressure to as little as 3-5 g for



professional arms and 4-6 g for changers. For improved stereo definition, the "916-TA" channels are separated by 28 db. List price \$14.50 with sapphire tips and \$17.50 with diamond-sapphire stylus combinations. Sonotone Corp.

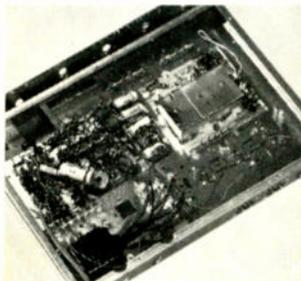
Here's why Audio Magazine says Scott® Kits are
"Simplest to build..." and have
"Engineering of the highest calibre"*



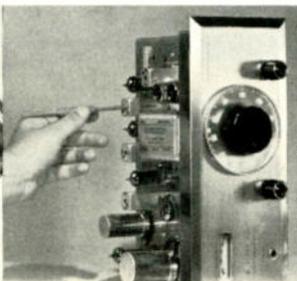
The exclusive Scott full color instruction book shows every part and every wire in natural color and in proper position. To make the instruction book even clearer, each of the full color illustrations shows only a few assembly steps. There are no oversized sheets to confuse you.

Each full color illustration is accompanied by its own Part Chart — another Scott exclusive. The actual parts described in the illustration are placed in the exact sequence in which they are used. You can't possibly make a mistake.

Much of the uninteresting mechanical assembly is completed when you open your Scott Kit Pak. All the terminal strips and tube sockets are already permanently riveted to the chassis. To insure accuracy all wires are pre-cut and pre-stripped to proper length.



There are certain areas in every professional high fidelity component where wiring is critical and difficult. FM front ends and multiplex sections are an example. In Scott Kits these sections are wired at the factory, and thoroughly tested by Scott experts, assuring you a completed kit meeting stringent factory standards.



Tuners are aligned with the unique Scott Ez A Line method using the meter on the tuner itself. This assures perfect alignment without expensive signal generators. Amplifier kits require no laboratory instruments for perfect balancing.



The new Scott Warrantee Performance Plan guarantees that your kit will work perfectly when completed. If you have followed all recommended procedures and your kit fails to work Scott guarantees to put your kit in working order at the factory at minimum cost.

* Audio — February 1961, Pages 54-56

SCOTT
 H. H. SCOTT INC., Dept. 140-10
 111 Powdermill Rd., Maynard, Mass.

Please rush me without charge your full color brochure on the complete line of Scott FM stereo tuner, stereo amplifier and speaker kits. A sample 36 page full color Scott Kit instruction book will be included if you enclose 50¢ in coin or stamps.

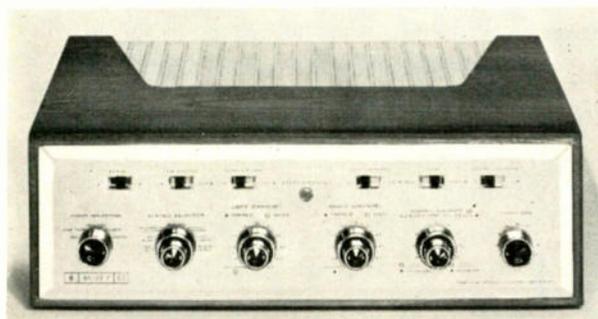
Name

Address

City State

If any of your friends would like a copy of the new Scott Kit brochure send us their names and addresses.

Export: Morban Exporting Corp. 458 Broadway, N.Y.C.
 Canada: Atlas Radio Corp. 50 Wingold Ave., Toronto



When you finish your kit you'll be delighted by its handsome good looks. And when you turn your Scott Kit system on you'll know for yourself why the expert editors of leading high fidelity magazines like Audio say "only the most sophisticated engineering thinking could design a kit as simple and foolproof as this."

DOOR OPERATORS 216

The all transistor receiver of this radio operated unit reportedly assures long life and reliability of the device for



opening and closing residential garage doors. In addition, a molded plastic case has been provided for the portable transistor transmitter. The portability of the transmitter allows the garage door to be operated from any authorized car with a single radio unit, although additional transmitters are available where the door will regularly be operated from more than one car. Unauthorized operation of the car door is said to be precluded by the availability of 72 coded radio channels. The garage light is also controlled by the unit and the light remains on for two minutes after the door has been closed, allowing the driver ample time to leave the garage in illuminated safety. Perma-Power.

CAPACITOR KIT 217

A 15-drawer capacitor "Servicenter," stocked with 144 of the most popular





"We received very few service calls until our ad in the Yellow Pages appeared," says H. Osowski (left), owner, Lamar Radio & Television Service, Memphis, Tenn. "When we first started in business, it was several months before the Yellow Pages directory containing our ad hit the streets. Then the calls really started coming in! We know our Yellow Pages program pays off because so many customers say they found us in the directory. Today we advertise under four different headings plus four trademarks to do a complete selling job."



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

T.V. SERVICE
BR 6-8482 OR BR 6-9151
LAMAR RADIO & TELEVISION SERVICE

DAY OR NIGHT SERVICE
 All Makes
TELEVISION HOME & AUTO RADIO
 "Repairs on All Makes"

1656 LAMAR AVE.
 SALES & SERVICE
 T.V., AUTO & HOME RADIOS
 HI-FI & STEREO SPECIALISTS

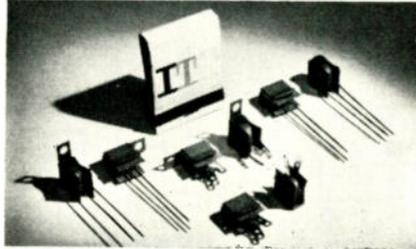
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NEW PRODUCTS

dipped Mylar-paper, high voltage silvered mica and disc ceramic types, is being offered in a special deal. Included in the kit are: 71 units of dp dipped Mylar-paper 600 vdcw ($\pm 10\%$) capacitors of 20 values ranging from $0.001\mu f$ to $0.25\mu f$, 41 vcm high voltage silvered mica 1000 vdcw ($\pm 5\%$) units, in 15 values from 47 pf to $0.001\mu f$ and 32 CCD disc ceramic 1000 vdcw ($\pm 10\%$) capacitors in nine values from 220 pf to $0.01\mu f$. Each capacitor value is stocked in its own section. \$29.95. Arco Electronics, Inc.

SELENIUM RECTIFIER 218

A clip-type selenium rectifier for home-entertainment electronic equip-



ment has a maximum rms input voltage of 130 v, maximum peak current is 650 ma and the maximum d-c output is 65 ma. ITT Components Div. of International Telephone and Telegraph Corp.

TUBE TESTER 219

The model 1000 mutual conductance tube tester is claimed to test for true dynamic mutual conductance (Gm), test for shorts and leakage between any tube elements, test for gas and grid emission with sensitivity over 100 megohms and test picture tubes. It also tests foreign and Hi-Fi tubes, voltage regulators, battery type tubes, auto radio hybrid tubes, thyratrons and most industrial tube types, according to the manufacturer. Automatic line voltage regulation



and a complete tube chart conveniently located in cover simplify use. Small compact size only $14 \times 9\frac{1}{2} \times 4\frac{3}{4}$ in. Price \$79.95. Mercury Electronics Corp.

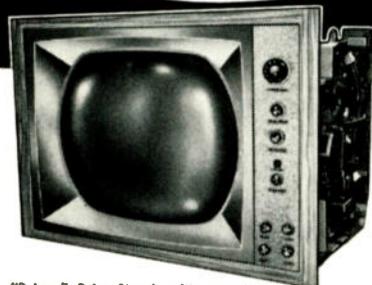
Build the finest professional color TV Set ever designed

WITH

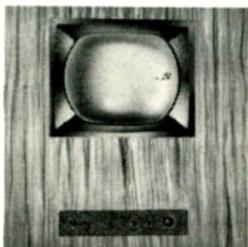
color

TV KITS

by **1 TRANSVISION**



"DeLuxe" Color Chassis with controls mounted on panel in a vertical position.



Custom wall installation of "DeLuxe" Color Chassis with horizontal controls separated from chassis.

LEARN AS YOU BUILD: Learn Color TV Theory, Practice, and Servicing. Complete course of study available for use in conjunction with the Kit—no technical background required to understand it.

INSTRUCTION MANUAL: Send \$5 for complete Assembly Manual, so that you can see how easy it is to build and service the Transvision TV Color Kit. Cost of manual refundable upon purchase of Kit.

TRANSVISION ELECTRONICS, Inc.

Grey Oaks Avenue, Yonkers, N. Y. Dept. ETC-10
Telephone: (914) YOnkers 5-6900

This Color TV Kit is designed around the most expensive, thoroughly engineered and newest RCA TV Color Receiver.

Transvision has added improvements, features, and heavy-duty parts to this RCA licensed receiver in order to accommodate those who seek better quality than is commercially available.

WITH or WITHOUT REMOTE CONTROL

All critical circuitry is wired, aligned, and pre-tested by RCA.

Anyone Can Assemble—No Special Knowledge Required Buy Assembly Manual and See Easy, Complete Instructions.

Exclusive Features: All controls are mounted separately from chassis for flexibility in custom installation. . . . Only the finest quality oversized, extra heavy-duty parts are used for long, trouble-free use, and they are **FULLY GUARANTEED** for ONE FULL YEAR.

The 21" Color Tube is RCA's newest and best tube. The safety glass is bonded to the tube face to reduce reflections and eliminate dust accumulation. . . . NEVER OBSOLETE—Your Transvision TV Color Kit is always up-to-date because circuit improvements in Kit form are passed on to the Kit builder as they occur.

Buy on Installment Plan. **PAY AS YOU WIRE:** \$50 gets you started on this fascinating TV Color Kit project.

CHOICE OF MODELS: From \$394.00 Up.

- With Hi-Fidelity Sound System, complete with Color Tube.....\$399.00 to \$439.00.
- With Special Circuit (no audio) for connecting into your Hi-Fi System, with Color Tube \$394.00 to \$419.00.
- Remote Control optional.....\$60.00 additional.

Also available as WIRED CHASSIS . . . Full line of Cabinets.

START NOW — MAIL THIS COUPON —

- Send FREE Catalog on Color TV Kits. . . I enclose \$5 for Assembly Manual, refundable on purchase of TV Color Kit.
 I enclose \$50 for Starting Package on pay-as-you-wire plan.

Dept. ETC-10

Name _____

Address _____

City _____ Zone _____ State _____

. . . for more details circle 65 on page 50

COLOR BAR GENERATOR 220

A compact, light weight, portable NTSC Color Bar Generator is designed for use on installation and maintenance



of color TV receivers in the home or shop. The new Model 661 "Chrom-Aligner Generator" weighs just 9 lb. The instrument produces 100% saturated color bars to NTSC standards as well as all standard alignment signals, white dot and crosshatch patterns. Similar in many respects to the company's Model 656XC-NTSC Standard Color Bar Generator, the Model 661 generates the following NTSC color signals, Yellow, Red, Magenta, Blue, Cyan, Green, as well as the following standard alignment signals: R-Y, B-Y, -(G-Y), G-Y at 90°. Price: \$349.50. Hickok Electrical Instrument Co.

VERSATILE STEREO 221

This compact unit is furniture styled,



Permohm[®] and Celluline[™]... TV lead-in cables give clearer, stronger color pictures

Here are two great Belden lead-in cables for color TV installations. Permohm 8285, which is encapsulated in cellular polyethylene, is specially designed for jobs where cables are exposed to salt spray, industrial contamination, and excessive ice, rain or snow. It improves fringe area reception and strengthens UHF and color TV reception.

Celluline 8275 eliminates all possible moisture between conductors . . . thus maintaining uniform electrical characteristics. The outer wall is of thick polyethylene which protects the cable from abrasion and sun damage. The result is a long lasting, efficient transmission line which gives you clearer color, and black and white images.

Order Permohm and Celluline from your Belden jobber. He also carries Weldohm[†], standard 300-ohm line, and Belden's ivory colored decorator lead-in.

power supply cords • cord sets and portable cordage • electrical household cords • magnet wire • lead wire

[®]Belden Trademarks and Patents—U. S. Patent No. 2782251 and 2814666

[†]Belden Trademark—Reg. U. S. Patent Office



Be a Cartoon
Gag Writer
Win a \$25.00
Savings Bond

Send us your gag ideas for future cartoons. For each of your gag ideas used, we'll send you a \$25.00 Savings Bond. Write Belden Manufacturing Company, Attention: Mrs. Madelsa Allison, 415 S. Kilpatrick Avenue, Chicago 80, Illinois.

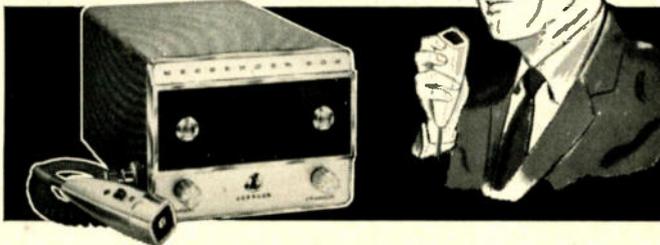
*This month's winner: Mr. Walter C. Downes, Jeannette, Pennsylvania.

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WIREMAKER FOR INDUSTRY
SINCE 1902 — CHICAGO

MAKE BIG PROFITS!

with 25 to 50 MC. Industrial

2-WAY RADIO



THE "MESSENGER 202" DELIVERS THE PEP AND PERFORMANCE NEEDED FOR SOLID COMMUNICATIONS—COMPLETE DEALER AID PROGRAM PUTS YOU INTO THIS PROFITABLE FIELD OVERNIGHT!

The "Messenger 202" sells for less than \$200.00—is priced within easy reach of any business! A complete 10-tube (including rectifier) crystal-controlled AM transceiver, the "202" is F.C.C. type accepted for use in the Industrial, Public Safety, and Land Transportation service. The "202" practically sells itself when you point out the savings that almost any business or municipal organization can make with this top performing, low cost industrial equipment! Highly selective and sensitive superheterodyne receiver, built-in "Squelch," and AVC, ANL circuits. Designed for easy operation—fast, smooth installation—and simplified maintenance. Available nationally from E. F. Johnson Company distributors. Powerful dealer aid program shows you how to make big money in sales and service in this highly profitable field—gives you everything you need to handle your own line of industrial 2-way radio equipment!

CONTACT YOUR DISTRIBUTOR
or WRITE TODAY
for Full Details



E. F. JOHNSON CO.

5607 Tenth Ave. S.W. • Waseca, Minn.

Manufacturers of World's Most Widely Used Personal Communications Transmitters

... for more details circle 39 on page 50

LEARN FM 2-WAY RADIO SERVICING AT HOME

- Earn More Money
- Build a Better Future

Advancement and increased earnings are waiting for you in the expanding communications field. The Motorola Training Institute's home study course in FM 2-way radio servicing can enable you to take advantage of these profitable opportunities now. Learn all about servicing the new transistorized equipment . . . learn advanced techniques for handling complex service problems easier and faster.

In addition to this wealth of practical application knowledge, you will also be preparing yourself for your 2nd Class FCC Radio-telephone License. For full details, send coupon today. There is no obligation and no salesman will call.

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Please send me full details on the Motorola Training Institute's planned home study program on FM 2-Way Radio Servicing.

I now hold _____ FCC License.

Name _____

Address _____

City _____ Zone _____ State _____

... for more details circle 45 on page 50

NEW PRODUCTS

and may be used as a standard console on legs or base, a wall-hanging unit, or as table, ledge or shelf stereo. According to a company spokesman, "Cabinette Stereo design gives us a versatile home entertainer that integrates easily in any room arrangement. It combines the beauty of furniture with space-saving compactness, and delivers full Stereo f-m sound, plus long distance a-m reception." The changer features the all-new Micro-Touch tone arm and "free-floating" ceramic cartridge. This arm puts only 2 g needle pressure on the records. Twin speaker units, with a 12 x 8½ in. woofer and 3½ in. high-fidelity cone type tweeter in each swing out from the sides of the instrument for "face-front" use. Speakers have a rated frequency response of 60 to 12,000 cps. The dual channel stereo amplifier has 24 w peak power output. Suggested retail price range from \$375.95 to \$399.95. Zenith Sales Co.

SPEAKERS

222

The "hidden magNet," a low silhouette, low cost speaker, features ceramic magnet mounted between the basket and the cone. Reportedly it offers true high fidelity performance and is designed to fit into any narrow area. Engineered for higher, more efficient output, the "hidden magNet" is perfect for narrow walls, stereo wings, picture frame mountings, according to the manufacturer. Available in both 12 in. and 8¼ in. sizes, it reportedly is electrically designed with special cones and magnetic circuitry to deliver full, flat speaker response and sensitivity normally found only in higher priced speakers. The

LUXO
illuminated
magnifiers
for visual
accuracy in
electronics
and industry.

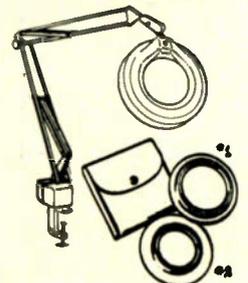


Ultronix, Inc., ultra-precision resistors under Luxo magnification.

The new, versatile Luxo Illuminated Magnifier combines magnification, large viewing area, cool Circline fluorescent light and provisions to increase magnification from 3 to 11 diopters.

OUTSTANDING FEATURES:

- 3 Diopter, distortion-free Bausch & Lomb (5 inch dia.) glass lens.
- Lightest touch adjusts magnifier to any position . . . and the lamp STAYS PUT without tightening devices. Leaves both hands free for the job.
- Magnifier can be mounted anywhere and turned out of way when not in use.



EXCELLENT FOR:

- Inspection and quality control
 - Assembling and servicing miniature components
 - Reading small parts numbers and checking fine measurements.
- There is a Luxo Lamp for every purpose. Contact your supply house or write for catalog #300.



LUXO LAMP CORPORATION
Chicago • Port Chester, N. Y. • San Francisco

... for more details circle 42 on page 50

New
SONY[®]
 RESEARCH MAKES THE DIFFERENCE
MICRO-TV



the epitaxial transistor has revolutionized TV

Here is the TV set that is destined to revolutionize television. SONY Micro-TV, with the advanced epitaxial transistor and a remarkably new concept in viewing, is truly Television of the Future. Let the specifications tell the story: • Only 8 lbs. and just a shade larger than a telephone • Fully transistorized, with 24 transistors and 20 diodes; power transistors are of the epitaxial type, used for the first time in home entertainment units • 70° picture tube deflection, with three times the scanning lines per centimeter of ordinary tubes • Operates on its own rechargeable power pack, 12v auto/boat systems or AC • New AGC circuit so refined it permits operation in electrically "noisy" environments, such as a moving auto, boat or airplane • Draws no more than a quarter the power

of an ordinary auto radio • Modular construction permits easy servicing. Now for the first time, television has become truly "personal." Micro-TV can be used anywhere, indoors or out, with nearly the freedom of a pocketable radio. It can be taken anywhere, on vacations, outings, to the office, the boat. With its inherently finer picture, it is normally viewed close-up, with all controls close at hand, and never any eyestrain. Servicing, too, becomes simplicity itself. Snap-out circuit boards allow quick removal of a defective component, permitting replacement in the shop or, at nominal charge, by authorized SONY service. SONY Micro-TV list \$229.95. Rechargeable battery pack \$39.95.

SONY CORP. OF AMERICA

514 Broadway, New York 12, N. Y.

Regional Offices

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

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

Gentlemen:

Please send me full details on the new SONY Micro-TV.

NAME

STORE

ADDRESS

CITYZONESTATE

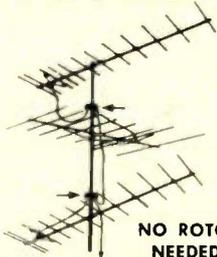
SONY CORP. OF AMERICA, DEPT. EF-1, 514 BROADWAY, NEW YORK 12, N.Y.

NEW PRODUCTS

unit employs solderless metal binding posts with green dot indication to show voice coil start for phasing. Oxford Electric Corp.

Winegard YAGI COUPLERS

The new low-cost way to tailor-make your own special antenna system using a single down-lead!



NO ROTOR NEEDED!

No interaction. No loss. Couple 2 or more cut-channel yagis to each other, or couple cut-channel yagi(s) with any other VHF broadband or all-channel antenna. Eliminates "mixing networks", rotors, switches. Convenient, automatic. Write for Fact-Finder #231.

WINEGARD COMPANY

3019-10 Kirkwood Ave., Burlington, Iowa

... for more details circle 72 on page 50

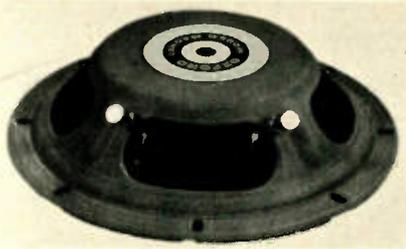
**IN AMERICA EVEN THE
WORKERS CAN BUY
JENSEN NEEDLES**



The Customer Reminder Plan is yours—**FREE!** Write

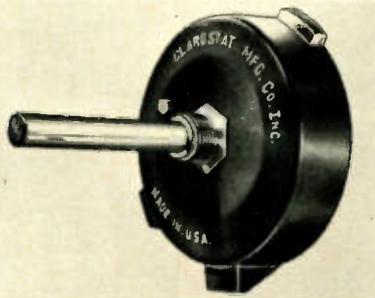
Jensen[®]
INDUSTRIES, INC.
319 Interstate Rd., Addison, Ill.

... for more details circle 36 on page 50



POTENTIOMETERS 223

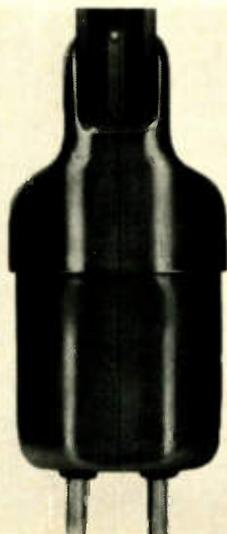
High voltage potentiometers, designed for use in radar, television and other high potential circuits are now available in the



Series 51. The carbon potentiometers are rated at 1 w at 40°C and provide a dielectric strength at working level of 4000 vdc across the end terminals. The Series 51 is available in a resistance range of from 5000 to 50 Mohms, with linear taper. Resistance tolerance up to 100,000 ohms, is plus/minus 20% and 30% above 100,000 ohms. Actual voltage breakdown between terminals and ground is 10,000 vdc for one minute. The unit measures 1-31/32 in. dia. Clarostat Mfg. Co., Inc.

CARTRIDGE 224

The 880p Cartridge is claimed to outlast any other cartridge made. The dynamic mass of less than 0.5×10^{-3} g is lower than that of any other cartridge, while the compliance of 30×10^{-6} cm/dyne achieves an unparalleled high, according to the manufacturer. Channel separation is more than 30db, and tracking force is as low as $\frac{1}{4}$ g. Not only does this remarkable low tracking force eliminate distortion, it virtually eliminates



record wear. In addition, the 880p cartridge boasts a performance frequency range rated at 6 to 30,000 cps. Empire Scientific Corp.

CRT TESTER 225

A true beam current type CRT tester and rejuvenator is said to be the only kit of its kind that not only tests but rejuvenates all picture tubes, and checks for screen brightness under high or low line-voltage conditions. The T63 is also claimed to be the only unit that will simulate the need of a booster and will also predict the probable life of a picture tube. It will test and rejuvenate all picture tubes at correct filament voltage from 1.5 v to 12 v, continuously variable, not subject to line voltage variations, according to the manufacturer. The T63 reportedly will test and rejuvenate: 110, 114 deg., low G., new 19 and 23 in. tubes and all color TV tubes, and will check for hot cathode and interelectrode leakage; leakage parts and/or shorts in gun structure at rela-



NEW REVISED "WORKING WITH TRANSISTORS"

By A. C. W. SAUNDERS
President of the
Saunders Electronic School

Author of the CBS
Transistor Course

HIGHLY RECOMMENDED HOME STUDY WITH:

- * Correction Service
- * Consulting Service
- * Monthly Supplementary Service

PRICE—\$25.00 complete

Also:

"COLOR TELEVISION HOME STUDY"

- * Correction and consulting service

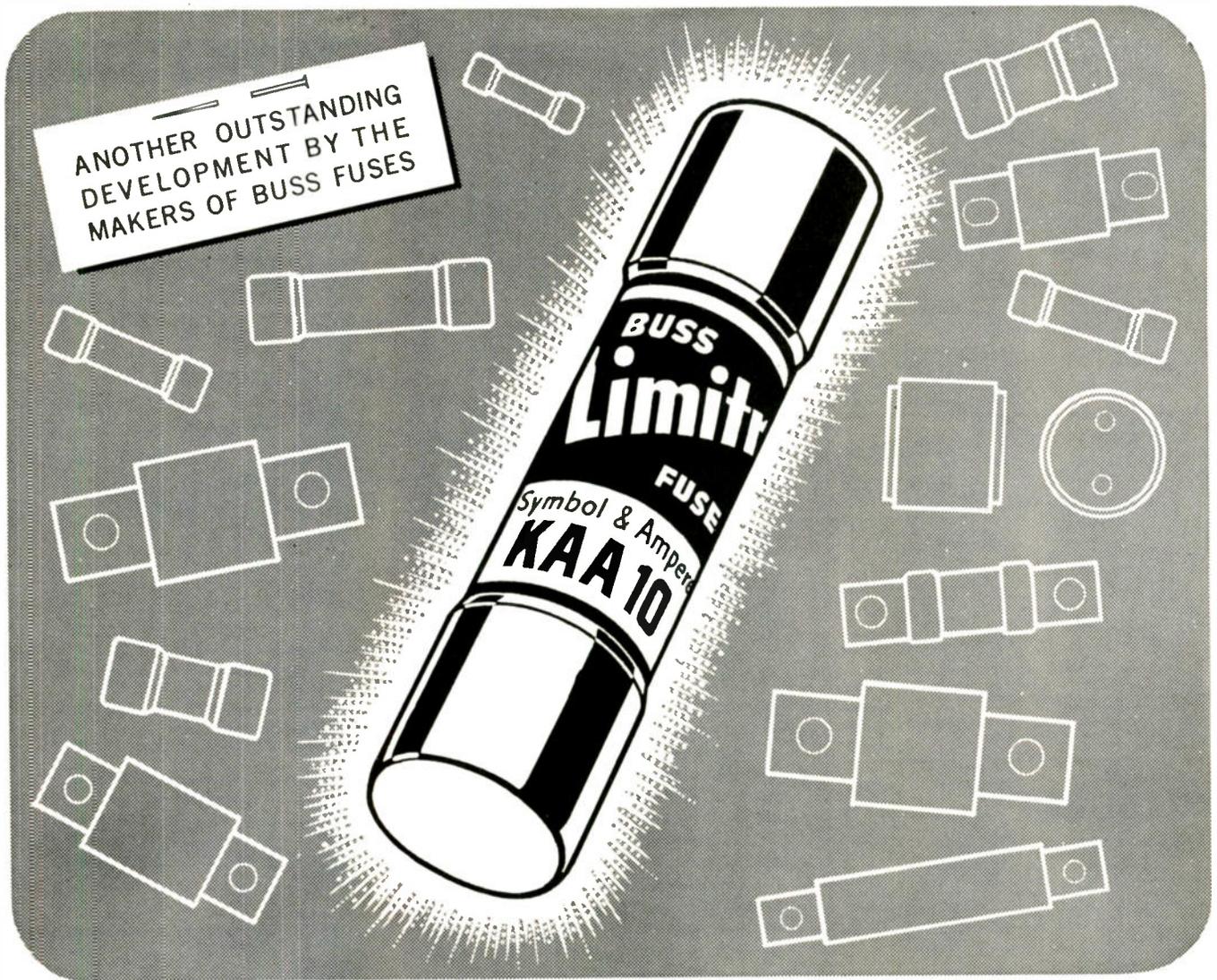
PRICE—\$10.00 complete

For further particulars write to:

**ELECTRONIC TECHNICAL
PUBLISHING COMPANY**

BOX 306, ASTOR STATION
BOSTON 23, MASSACHUSETTS

... for more details circle 27 on page 50



**For Protection of
Semi-Conductor Rectifiers –
BUSS designed special LIMITRON Fuses**

BUSS Limitron fuses are especially designed for the protection of semi-conductor rectifiers. They provide extremely fast opening on overload and fault currents, with a high degree of restriction of the let-thru current.

If each diode is protected by the proper size BUSS Limitron fuse, the fuse will open very quickly when the current drawn exceeds the rating of the diode.

Thus when a short-circuit occurs in a diode the fuse opens and takes that diode out of the circuit. This protects other good diodes in the rectifier which might otherwise be damaged.

For time-current characteristic charts ask for *BUSS Limitron fuse bulletin HLS*.

BUSS: one source for every electrical protection need

You can save time and trouble by relying on BUSS as your one source for fuses of unquestioned high quality. There is a complete line of BUSS fuses in sizes from 1/500 amperes up . . . plus a companion line of fuse clips, blocks, and holders.

BUSS fuses are electronically tested to assure proper operation under all service conditions

Every BUSS and FUSETRON fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

BUSS

BUSSMANN MFG. DIVISION

MAKERS OF THE COMPLETE LINE OF FUSES OF UNQUESTIONED HIGH QUALITY

McGraw-Edison Co. • St. Louis 7, Mo.

. . . for more details circle 18 on page 50

ATR PRODUCTS FOR MODERN LIVING



ATR PLUG-IN TYPE PORTABLE INVERTERS*

A.C. Household Electricity MODELS
 Anywhere in your 6-RMF (6 volts) 60 to 80
 own car, boat or plane watts. Shipping weight 12
 Operates Standard A.C. lbs. DEALER NET
 e Record Players PRICE \$33.00
 e Dictating Machines 12T-RME (12 volts) 90 to
 e Small Radios 125 watts. Shipping weight
 e Electric Shavers 12 lbs. DEALER NET
 e Heating Pads, etc. PRICE \$33.00
 *Additional Models Available



ATR "A" Battery ELIMINATOR

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

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

AUTO-RADIO VIBRATORS



By every test ATR Auto-Radio Vibrators are best! and feature Ceramic Stack Spacers, Instant Starting, Large Oversized Tungsten Contacts, Perforated Reed, plus Highest Precision Construction and Workmanship and Quiet Operation!

There is an ATR VIBRATOR for every make of car!
 Ask your distributor for ATR's Low Priced type 1400, 6 volt 4-prong Vibrator; and 1843 12 volt 3-prong; or 1840, 12 volt 4-prong Vibrator, THE WORLD'S FINEST!



ATR UNIVERSAL KARADIO

MODEL 600 SERIES
 Easily installed in dash or under-dash. Amplifier power-supply chassis may be separated from tuner chassis for installation flexibility and easy servicing. Utilizes 6-tube super heterodyne circuit (2 dual-purpose tubes) with 8-tube performance . . . pulls in those distant stations with good tone and volume. Supplied with separate 5" x 7" speaker which is installed in original automobile speaker compartment for high fidelity performance. Neutral gray-tan baked enamel finish. Over-all size 4" deep x 6 1/2" wide x 2" high. Tuner Chassis; with Amplifier Chassis, 2 3/4" deep x 6 1/2" wide x 3 3/4" high. Shipping weight 7 lbs. WILL OUTPERFORM MOST SETS!
 Model 612—12 volt Dealer Net Price \$31.96
 Model 606—6 volt Dealer Net Price \$31.96

Airplane Style Overhead Mounting Under Cab Roof

NO PRINTED CIRCUITRY

ATR TRUCK KARADIO



Excellent Tone, Volume, and Sensitivity!
 Compact, yet powerful. Fits all trucks, station wagons, most cars, and boats—just drill a 3/8 inch hole in roof and suspend the one-piece unit (aerial, chassis and speaker) in minutes. Watertight mounting assembly holds antenna upright. Yoke-type bracket lets you tilt radio to any angle.
 Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls. 33-in. stainless steel antenna. Neutral gray-tan enameled metal cabinet, 7 x 6 1/2 x 4 in. high over-all. Shipping weight 10 1/2 lbs.
 Model TR-1279—12A for 12V Dealer Net Price \$41.96
 Model TR-1279—6A for 6V Dealer Net Price \$41.96

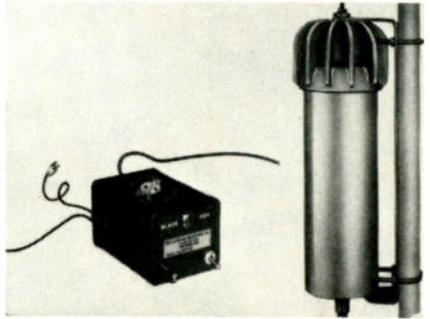
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ATR ELECTRONICS, INC.
 Formerly American Television & Radio Co.
 Quality Products Since 1931
 ST. PAUL 1, MINNESOTA—U.S.A.

NEW PRODUCTS

tively high sensitivity. Price: \$44.95 (kit), \$59.95 (wired). PACO Electronics Co., Inc.

ANTENNA AMPLIFIER 226

A citizens band base station antenna amplifier is said to maintain 100% of legal power at the antenna in order to



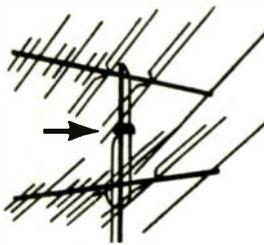
increase the received gain by 20 db and the transmitted modulation gain by 10 db. Known as the M-82 Black Box CB Antenna Amplifier, it is reported to eliminate line loss and reduce inherent mobile interference while increasing the clarity and volume. A relay "fail-safe" feature connects the antenna directly to the transceiver when the amplifier is turned off. There are no internal connections required to hook up the control box to the transceiver and the amplifier carries its own 30 vac power. Antenna Specialists Co.

SOCKET SET 227

Five interchangeable tiny socket wrenches, a handy magnetic chuck-type, swiveltop handle and a clear topped storage case comprise a tool set. The BW-5 socket wrench set contains socket wrench hex. sizes 5/64, 3/32, 7/64, 1/8

Winegard "TWO-TENNA" COUPLER

- Eliminates need of rotor
- Couples any 2 all-channel VHF antennas



Allows you to couple any two all-channel VHF antennas with negligible loss or interaction. Antennas can be pointed in separate directions if desired. 300-ohm. Mast mounted. Model CA-213, \$5.50 list.

WINEGARD COMPANY

3019-10 Kirkwood Ave., Burlington, Iowa
 . . . for more details circle 73 on page 50

SWITCHCRAFT AUDIO CONNECTORS

Audio Connectors

With "CAPTIVE DESIGN" INSERT SCREWS



From Switchcraft!
 Screws remain in inserts when removed for cable installation. EXCLUSIVE "GROUND TERMINALS" provide complete grounding provisions. Many other unique features in this 3-pin line.

- A3F—Female Plug—U.S.A. List—\$2.25
- A3M—Male Plug—U.S.A. List—\$1.90
- B3M—Male Single Hole Mount Receptacle—U.S.A. List—\$2.90
- C3M—Male Panel Mount Receptable—U.S.A. List—\$1.40

See Your Dealer Today or Write Us for Dealer Nearest You



. . . for more details circle 62 on page 50

GAM HIGH GAIN ANTENNAS CONTROLLED RADIATION
 Pattern is beamed toward the horizon for optimum response.
 Mounting Structure Does Not Affect Radiation Pattern

"TEAM-MATES"

TG-5-S (144-170 mc) TG-2-R

- | | |
|---|---|
| \$74.25 Net
3 ELEMENTS
Fixed Station
3X Power of
TG-2-R | \$18.00 Net
Half Wave
Element
Maximum
Possible Gain |
|---|---|

Although independent use of the TG-5-S and TG-2-R give amazing performance, their combined use as "Team-Mates" produce the ultimate in gain and efficiency. The engineered compatible characteristics of pure vertical polarization and matched feed points, with the elimination of horizontal polarization, make the "Team-Mates" leaders in the field of communication Gain Figures, Radiation Patterns and Catalogs Listing All Models are Available

EASY TO INSTALL no need to remove upholstery!

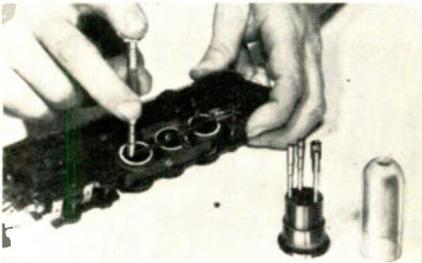


Mounts from outside by insertion through 3/8" hole. Mounts flat; only uses 3/8" inside through 3/8" hole.

SEE YOUR DISTRIBUTOR OR WRITE GAM DIRECT



. . . for more details circle 30 on page 50



and 5/32 in. A second wrench set, the SW-5, is identical to the BW-5, except that it has a non-magnetic handle. Retail price BW-5: \$3.95. SW-5: \$3.50. Moody Machine Products Co., Inc.

CAPACITOR TESTER 228



The "CAPPY" Model E-2 tester reportedly accurately tests paper, mylar and electrolytic capacitors. A three range selector switch facilitates leakage detection in conformance with manufacturer's minimum specifications and standards. "CAPPY" indicates leakages ranging from 1000 Mohms to 5000 Mohms. A "current" leakage test for a large capacitance and high working voltage electrolytics reportedly will indicate leakage ranging from 0.3 ma. to 10. ma., depending on size and capacitance. Price \$10. Watsco.

MONITOR RECEIVERS 229

Designed the MR 51X (147 to 174 Mc on any single channel) and the MR 61X (25 to 54 Mc on any single channel)



these monitor-receivers complement the firm's higher priced MR 50X-MR 60X line. Both new units are crystal-fixed to any predetermined channel within their respective frequency ranges. If more than one channel is required, an optional channel selector kit may be added at the time of purchase, or at any time in the field—permitting the selection of up to six channels within 1% of channel frequency. Complete technical data available on request. Price is \$149.95 for single-channel unit. Hammarlund Mfg. Co., Inc.

ANTENNA COUPLERS 230

A series of VHF TV and f-m yagi antenna couplers enable the dealer to make up his own combination of antennas on the same mast with a single down-lead

I'd walk a mile...



for Centralab L & T Pad Attenuators



I'm not an ordinary camel—I'm a thinking man's camel—and I think highly of Centralab L & T Pad Attenuators.

These units work good—like an L & T Pad should—because of their small size, high wattage, and anti-backlash construction. Measuring less than 1 3/8" deep from the mounting surface, and with 1 3/32" diameter, they fit into any standard junction or switch box with room to spare.

In L & T Pads, though, it's what's in back that counts—and these Centralab units have exclusive "thermo-pass" insulation, which combines fast heat transfer with a high dielectric constant to achieve a conservative rating of 20 watts audio, 5 watts D.C., in a unit the size of conventional 2 watt controls.

Because of Centralab's anti-backlash construction, the "play" frequently found in dual controls is eliminated. The wiper contacts move in unison, so there's no alteration in frequency response due to variations in wiper position on the resistance tracks.

So hump down to your Centralab distributor and stock up on these L & T Pad attenuators. They satisfy!

B-62055



THE ELECTRONICS DIVISION OF GLOBE-UNION INC.
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In Canada: Centralab Canada Ltd., P.O. Box 400, Ajax, Ontario

**ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS**

... for more details circle 21 on page 50

NEW! WINEGARD NUVISTOR ANTENNA AMPLIFIER

ENGINEERED FOR TROUBLE-FREE,
LONG LIFE OPERATION...

NO CALL BACKS!



INSTALL IT AND FORGET IT... USES 2 NUVISTORS THAT WILL LAST FOR YEARS... COMPLETELY WEATHER-SEALED, WON'T CORRODE... RESPONDS TO WEAKEST SIGNALS BUT STRONG SIGNALS WON'T OVERLOAD IT (TAKES UP TO 400,000 MICROVOLTS INPUT)... NOT AFFECTED BY HEAT OR COLD... DESIGNED FOR COLOR TV... FITS ANY ANTENNA... FULLY PROTECTED FROM LIGHTNING FLASHES, PRECIPITATION STATIC AND LINE SURGES ON 110 VOLT LINES.

Uppermost in the minds of Winegard engineers in developing the new Colortron amplifier were two things—1. A new high in performance. 2. Long life and trouble-free operation. For example, a special "lifesaver" circuit gives the two nuvistors an expected life of 5 to 8 years at top performance. This is possible because of a heat sink to control operating temperature and an automatic voltage control.

Winegard's revolutionary new circuit enables the Colortron to overcome the service problems and limitations of other antenna amplifiers. Colortron will not oscillate, overload or cross modulate because it takes up to 400,000 microvolts of signal input. *This is 20 times better than any single transistor amplifier.*

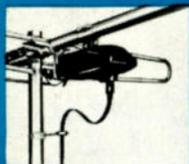
The Colortron amplifier will deliver clean, clear, color pictures or black and white, sharp and bright without smear. It can be used with any good TV antenna but will deliver unsurpassed reception when used with a Colortron antenna.

It has an ultra low noise circuit... high amplification... flat frequency response... accurate impedance match (VSWR 1.5 to 1 or better, input and output)... and no phase distortion. Can drive 6 sets or more easily.

Nothing on the amplifier is exposed to the elements—even the terminals are protected. A rubber boot over the twin-lead keeps moisture out. Colortron comes complete with an all AC power supply with built-in 2 set coupler. Colortron (model No. AP-220N) lists at \$39.95. Twin transistor model AP-220T also available. Input 80,000 microvolts without overload—\$39.95. For FM model, AP320 twin Nuvistor, 200,000 microvolts input—\$39.95.

Colortrons will be heavily promoted this fall with big ads in Life, Family Weekly, Parade and other consumer publications. Order now—ask your distributor or write for technical bulletin.

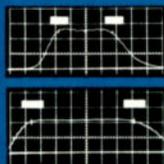
You get an extra bonus of quality and performance in all Winegard products.



AMPLIFIER WORKS ON ANY ANTENNA.



SPECIALLY DESIGNED AMPLIFIER CLAMP SNAPS ON COLORTRON ANTENNA IN SECONDS.

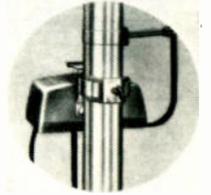
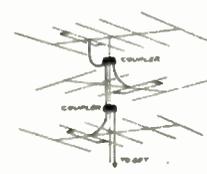


UNRETOUCHED PHOTO OF AMPLIFIER GAIN CURVE—FLAT RESPONSE ALL CHANNELS.



COLORTRON POWER UNIT WITH BUILT-IN 2 SET COUPLER.

NEW PRODUCTS



running to the TV set or amplifier. In many areas, yagi couplers will eliminate a rotor or switches, providing a convenient, automatic antenna system. The units are available in 12 VHF models (each individually tuned to a single channel) and in one f-m model. The f-m antenna coupler makes it possible to connect an f-m antenna with a TV antenna(s) on the same mast, running a single 300-ohm downlead. The f-m coupler can also be used as a "signal splitter" inside the house to branch the downlead to individual lines for TV and f-m receivers. VHF Models CA-2 through CA-13 list at \$5.50 each; Model CA-FM at \$4.50. Winegard Co.

POWER TRANSISTORS 231

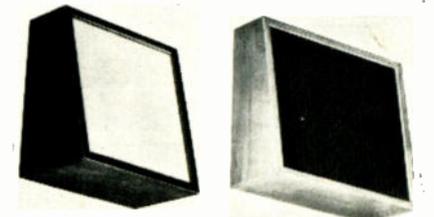
Non-uniform distribution of impurities in "Nu-Base" germanium power transistors reportedly provide low output re-



sistance and high cut-off frequency while maintaining a high voltage breakdown. Collector diode ratings to 120 v are available in the 2N1073 family. The series is designed for applications requiring fast switching speeds, low saturation voltages and high current capability. The common emitter cut-off frequencies (30 kc at I_c of 500 ma and V_{ce} of 6 v) reportedly make the devices ideal for audio output circuits. "Nu-Base" types available are the 2N1073, 2N1073A, and 2N1073B. Delco Radio Div., General Motors Corp.

WALL BAFFLES 232

Manufactured to strict specifications, these baffles reportedly are made of the finest hardwood available. The seven-



ELECTRONIC TECHNICIAN



Winegard
ANTENNA SYSTEMS

3019-10 Kirkwood Boulevard
Burlington, Iowa

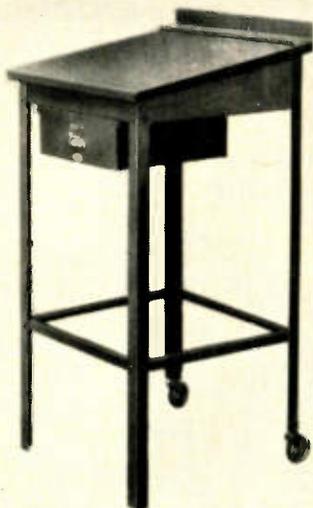
... for more details circle 69 on page 50

ply construction adds up to a half-inch thickness, and all corners are grooved and interlocked to assure vibration-free performance. Baffles are available in walnut or blond veneers with harmonizing grille cloth, rated for acoustical quality. Two "Quick-Mount" wall hangers and four Speed-Nuts for tool-less speaker installation are supplied with each baffle. Quam-Nichols Co.

SHOP DESK

233

This semi-portable shop desk is said to be especially useful where space is limited in shops, factories or warehouses.



The Model #995CD is constructed of heavy gauge steel and has an over-all height of 42 in. in front and 48 in. in back. The hinged top is 24 in. square. The drawer is 14 x 20 x 5 in. and is equipped with a cylinder lock. Parent Metal Products, Inc.

RECTIFIER TUBE



A half-wave no-vari vacuum rectifier tube, 6DW4, is designed especially for damper service in horizontal-deflection circuits of color and BW TV sets. It is rated to withstand a maximum peak plate current of 1300 ma and a maximum d-c plate current of 210 ma. Has insulation between heater and cathode to withstand negative peak pulses between the heater and cathode of 4500 v with a d-c component up to 900 v RCA, Electron Tube Division.

For more New Product information circle the number of the product on page 50 and mail in the coupon.

MORE INFORMATION

For more New Product information circle the number of the product on page 50 and mail in the coupon.



NEW VERSATILITY & COMPACTNESS in PROFESSIONAL TEST EQUIPMENT



AC VOLT-WATT METER #261

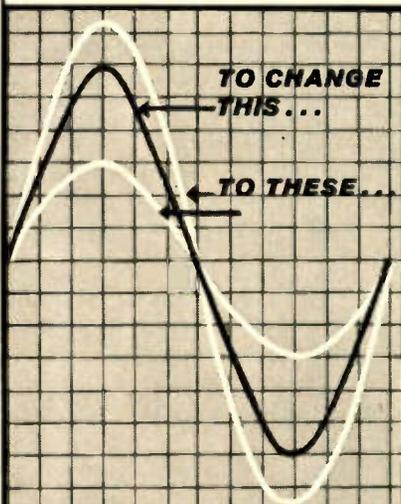
Formerly designated as #260
Kit \$49.95 Wired \$79.95



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

VOLTMETER: Ranges: .01, .03, .1, .3, 1, 3, 10, 30, 100, 300, 1000 RMS volts. Frequency Response: ± 0 db 10c to 150kc. Accuracy: $\pm 5\%$. Input Impedance: 2 megohm shunted by 15mmf. Accuracy: $\pm 4\%$.

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



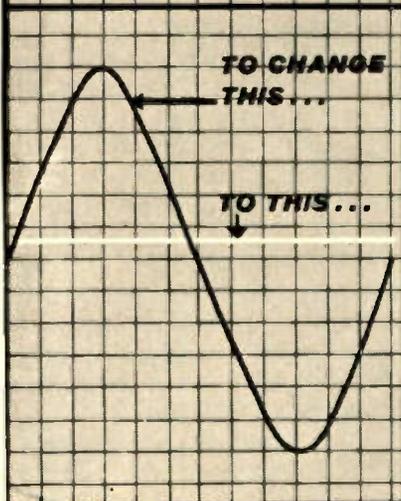
...USE THESE!



METERED VARIABLE AUTO-TRANSFORMER AC BENCH SUPPLIES

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

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



...USE THIS!

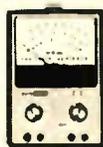


Extra-Low-Ripple 6- and 12-Volt BATTERY ELIMINATOR AND CHARGER #1064

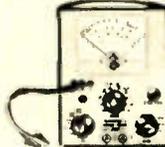
Kit \$43.95 Wired \$52.95

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

Also New From EICO:



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



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



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

For complete catalog of over 106 EICO kits and wired units—hi-fi, test equipment, citizens radio, ham gear—plus name of nearest distributor, write to dept. ET-10.



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

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

VISIT EICO ROOMS 518 & 522 — NEW YORK HI-FI & MUSIC SHOW, OCT. 2-7

... for more details circle 25 on page 50

GOLDMINE OF PRACTICAL INFORMATION

helps you get the most out of test equipment



192-page goldmine of practical information on electronic test equipment shows you how to select and use this equipment to the best advantage in many many applications. Only up-to-date book covering all the basic test instruments. Of benefit to both the newcomer to servicing and the old "pro".

- 1 Saves you money on the purchase of new equipment because you'll know what features to look for. You avoid buying equipment you don't need.
- 2 Saves you money in keeping your own test equipment in top condition because you're more familiar with what makes it tick. No more sending equipment back to the factory for adjustment or repair when you can do the job yourself.
- 3 Makes your present equipment more valuable by showing you new ways to use it.
- 4 Opens new fields of servicing profit because it makes you familiar with instruments used for radio and TV servicing, and industrial and audio.

Equipment covered is from simple VOM's and VTVM's through signal generators, oscilloscopes and other test equipment and helpful accessories. #308, \$4.00.

NEW! FOR EVERY SERVICEMAN

REPAIRING TV REMOTE CONTROLS by Leon Cantor & Harry Horstmann. Here's how TV servicemen can successfully meet the challenge of repairing different types of TV remote control systems! This single volume offers servicemen a comprehensive repair guide for every popular TV remote control system. Includes detailed descriptions of each type's circuit operation, repair methods and alignment techniques. Covers one, two, three and four button transmitters; power-line, lights, vacuum tube and transistor-operated types, and their respective remote receivers. Armed with this book, professional TV servicemen can turn "dogs" into simple house calls. #308, \$2.50.

INTERNATIONAL TRANSISTOR SUBSTITUTION GUIDEBOOK by Keats A. Pullen, Jr. Eng. D. (Scientific Staff, Ballistics Research Labs., Aberdeen Proving Grounds) direct substitutions only "possible substitutions deemed doubtful", that is they work only in some cases, were omitted... thus, substitution guide is a 'safe' guide." — INDUSTRIAL ELECTRONIC ENGINEERING AND MAINTENANCE. #276 — \$1.50.

At your bookstore, parts distributor or direct

10 DAY MONEY-BACK GUARANTEE

John F. Rider Publisher, Inc.
A Division of Hayden Publishing Co., Inc.
116 West 14th Street, New York 11, N. Y.

- Enclosed is \$_____ Please send:
- It's Easy to Use Electronic Test Equipment, #308, \$4.00
 - Repairing TV Remote Controls, #303, \$2.50
 - International Transistor Substitution Guidebook, #276, \$1.50

Name _____
Address _____
City _____ Zone _____ State _____

... for more details circle 52 on page 50

Short Service Business Directory

by Ernest W. Fair

Advertise: What to do when business is hardest to find; not when it is everywhere.

Business: A profession in which men knock themselves out to meet payrolls and taxes and taxes and taxes and taxes.

Cash: Customers having it are so few and far between that every possible credit accommodation should be made available.

Debt: What to avoid as much as possible; cause of many bankruptcies in the electronic service business.

Economy: Never to be instituted in place of quality repair work in an effort to secure more business.

Familiarity: To be diligently avoided with even the very best customers.

Goodwill: The asset which has no fixed cash value, but invaluable to the service business.

Happiness: What the good customer receives from the completely satisfactory repair job.

Inventory: Accumulation of parts and supplies which, if not watched constantly, can stay too long in stock.

Jerk: Term applied to the shop owner so anxious to do business he sacrifices all profit to obtain it.

Khrushchev: Name of the fellow to blame when business slackens off for any reason whatsoever.

Loss: Condition brought about by bad purchasing of parts, supplies, etc.

Money: Commodity which the average service shop owner takes from customers to give to suppliers.

Name brand: Term applied to the CRT you replace, but seldom used by competitors.

Optimist: The shop owner who believes his own personality is sufficient to make customers beat a path to his door.

Profit: A vanishing commodity when eaten up by increasing costs and higher taxes without the protection of rising prices.

For information, write Department MR552
... for more details circle 46 on page 50

PROFESSIONAL technicians
use *Dave Rice's* **OFFICIAL ORDER BOOKS**
for every **TV-RADIO service**
call

This is the businesslike approach to service record keeping. TriPLICATE forms serve as order form, invoice and office record, with spaces for complete information on every job. Separate listings for receiving tubes, pix tube, parts, serial numbers, labor and tax charges, signatures, etc. 75c a book, \$6.50 for dust-proof box of 10. In stock at your distributor.

FREE

Write for your free folder describing Dave Rice's OFFICIAL ORDER BOOKS, including an actual size sample copy of the handy order form.

ELECTRONIC PUBLISHING CO., INC.
133 N. JEFFERSON ST.
CHICAGO 6, ILLINOIS

Quandry: Condition of shop owners when competitors' activities leave them befuddled.

Resolution: Step taken each time one makes a business mistake and too often forgotten an hour later.

Supplier: The shop owners' dearest friend in an emergency; one to be tolerated otherwise.

Thank You: Term used at conclusion of every contact with a customer; whether business is transacted or not.

Unpaid: When applied to bills owed by shop owner, it's time for changes in business operation.

Volume: Extent of business sought by every shop owner but valueless unless also profitable.

Worry: A condition brought on by forgetfulness of basic principles in any business transaction.

Xmas: Abbreviation for a period at year's end when everyone hopes customers will bail them out of business mistakes.

Yesterday: That past period when it is easiest to recognize one's business mistakes.

Zero: Symbol used to denote profit on deal cut very low to keep business from a competitor.

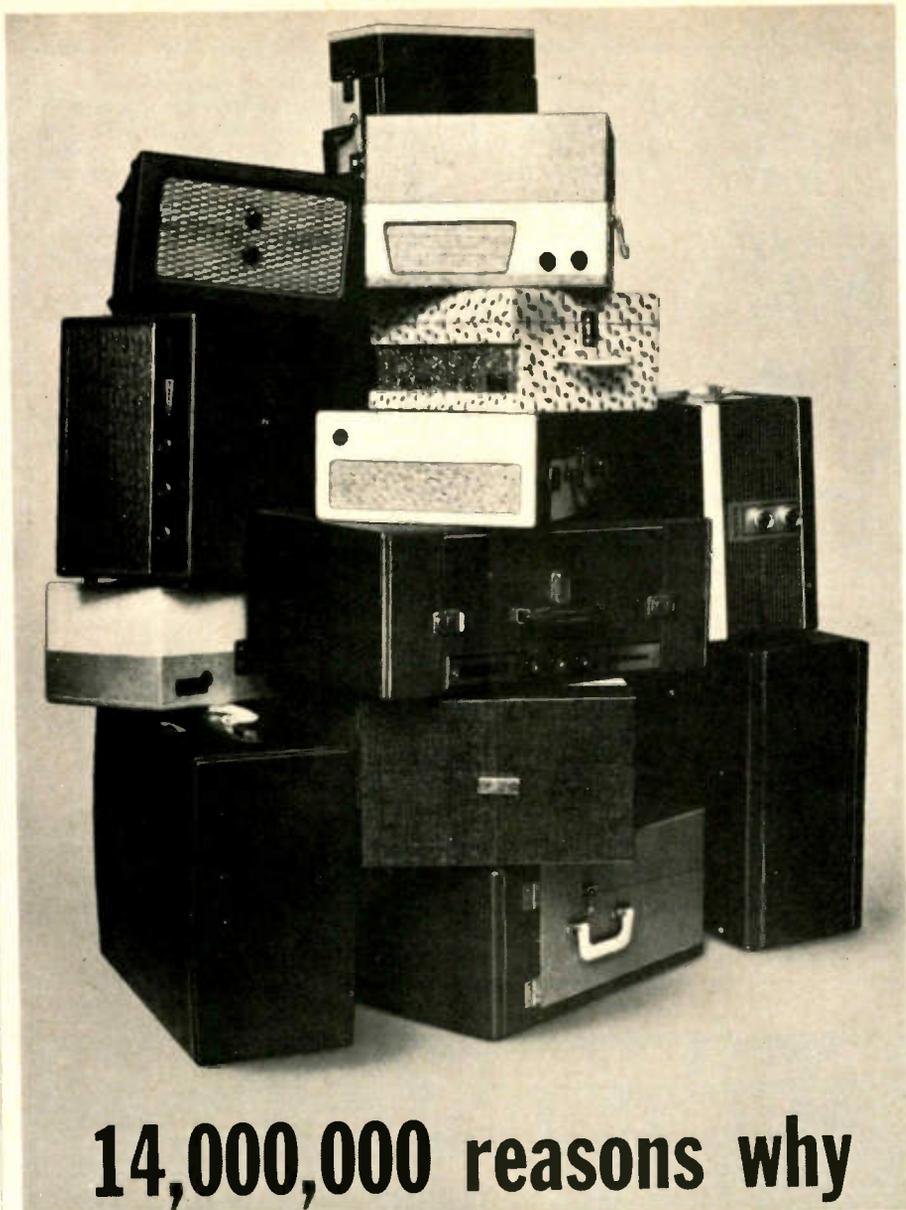
TOUGH DOG

Continued from page 46

when the set is turned on. Two 6CB5A's and fuse were replaced and I returned to the shop.

The following morning another call was received with the same complaint.

On the bench a check showed high voltage and B+ throughout the set was about normal. Voltages on the 12BY7 2nd video amp. tube, however, were approximately 100 v high on the plate and screen. Hooking up my scope, I found video on pin 7 of the 6AW8 (1st video amp) but nothing on pin 2 of the 12BY7A (2nd video). The best way to check the 2nd video amplifier is with a color bar generator feeding in a heavy signal and a scope. Circuit analysis showed the only feed from the 1st video amp to the 2nd video amp was through the delay line (DL101). An ohmmeter check showed no continuity through the delay line. The manufacturer's schematic indicated resistance should have been 70 ohms. A new delay line cured the trouble.—*F. A. Nichols, Appleton, Wisconsin.*



14,000,000 reasons why

fewer cartridges ✓ replace more models
✓ tie up less capital ✓ mean greater profits

Leading record player manufacturers—from the low-price mass producers to the well-known high fidelity manufacturers—have chosen to protect the quality of their products with Sonotone—*more than 14 million times!* That's the number of Sonotone cartridges incorporated as original equipment in the products of the nation's leading producers. And, that's also the number of *genuine* direct replacements you can make with Sonotone cartridges.

Normally, it would take a large inventory of cartridge models to provide replacements for 14 million record players. Not with Sonotone. Sonotone has so engineered its line that just a few models make it possible for you to offer a direct *genuine* Sonotone replacement to your share of 14 million potential customers. What's more, with only a few models the Sonotone line replaces the most frequently used cartridges of other manufacturers.

Sonotone has just released a series of new stereo and mono high fidelity ceramic cartridges with the same standard physical dimensions as cartridges now used in over 14,000,000 record players.

Rely on Sonotone—the line that requires fewer cartridges to replace more models. Now available in the handy 6-Pak at your distributors.

SONOTONE® CARTRIDGES

Sonotone® Corporation • Electronic Applications Division • Elmsford, New York
Cartridges • Needles • Speakers • Tape Heads • Mikes • Electron Tubes • Batteries • Hearing Aids

... for more details circle 59 on page 50

SOUND WAYS TO EXTRA PROFITS

Get into the all-year-round commercial sound trade and do away with seasonal repair work slumps! This steady-profit business — sales, installation and service — is available right in your own neighborhood! Factories, restaurants, schools, offices, bowling alleys... outdoors, athletic fields, swimming pools, etc... all are prospects for you.

Atlas Sound products, built to quality standards and backed by over 25 years of "know-how", are insurance for your reputation. Your Atlas Distributor can supply you with a complete line of performance-proven job-rated equipment: speakers, mike stands and related accessories for a professional sound installation.



... for more details circle 13 on page 50

WANTED

The following "Fugitive Wanted" notice is published as a public service at the request of the Federal Bureau of Investigation.

HARRY ROBERT GROVE, Jr., a dangerous ex-convict believed to be armed, is on the FBI's list



Harry Robert Grove



Nancy Grove

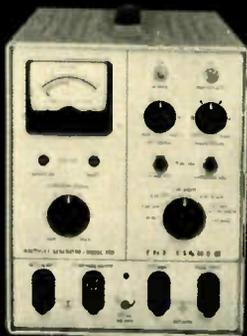
of the Ten Most Wanted Fugitives. He is sought for unlawful flight to avoid prosecution for armed robbery. Grove was last employed as a radio-TV repairman at Toledo, Ohio, and often discussed opening his own business. He may be accompanied by his wife **NANCY**, wanted on a harboring charge.

Grove is described as white, male, American, age 34, 5 ft. 8 in., 140 to 152 lbs, light brown hair, graying and receding, blue-green eyes, cut scar back of left hand, 6 in. burn scar on right leg, wears reading glasses. He has used these aliases: William Bryant, Willie Cawthorne, John Elmsfield, Harold Grove, Harold Robert Kelley, George Gordon Marcus, Jerry Miller.

Nancy Grove is white, female, American, age 34, 5 ft, 112 lbs, dark hair and eyes, appendectomy scar. She is also known as Nancy Bryant, Nancy Durfey, Nancy Mary Grill.

If you have information concerning this couple, please contact your local FBI office.

Who says Multiplex servicing is complex? All you need besides your 'scope is this!



The Fisher Model 300 all-in-one Multiplex Generator with built-in FM Signal Generator.

Only Fisher could have designed this unique instrument — because only Fisher has the engineering depth in FM Stereo Multiplex tuners and receivers to create the ideal test equipment for servicing them. The future of high-fidelity radio unquestionably belongs to FM Stereo and the Model 300 is the instrument for the service technician in search of new business. It is compact, fully portable and completely self-contained. It has its own built-in FM signal generator. In addition to a composite MPX signal, it also generates low-distortion, stable audio signals. Thus it requires no companion instrument other than an oscilloscope for professional alignment of Multiplex equipment. Best of all, **THE FISHER** it costs only \$495.

USE THIS COUPON FOR DETAILED INFORMATION

FISHER RADIO CORPORATION 091017
21-24 44th Drive, Long Island City 1, N. Y.

Please send me complete data and technical specifications on the Fisher Model 300.

Name _____
Address _____
City _____ Zone _____ State _____

09917

... for more details circle 29 on page 50

IF YOU CHANGE YOUR ADDRESS

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

Stephens Trusonic Inc., announces what is claimed to be the longest and most heavily-promoted product guarantee in the high fidelity component industry. According to the firm's sales manager, the new warranty plan was dubbed "10-Year-Plus" because of its 10 year guarantee and unique renewal provision. The warranty, issued with Stephens products, is effective for 10 years and may be renewed by the original owner every 10 years for life.



Range

Altec Lansing Corp., announces appointment of **Charles L. Range** as regional sales manager for the company's diversified product line of stereo high fidelity sound products, commercial and industrial sound system equipment, telephone communication products, microphone and broadcast equipment in the Mid-Atlantic states. Mr. Range's experience began in the radio broadcasting field in 1930 with NBC and later with CBS for a total of 15 years. He also served for two years as an American advisor to the Korean Broadcasting System in Seoul, Korea.

TraVler Radio Corp. choose three new vice presidents "to meet the executive needs created by the company's recently-launched expansion program." The newly-elected vice presidents are **D. J. Cameron**, in charge of production, **Richard Strand**, director of purchasing, and **Hubart Larson**, sales department. Also announced was the election of **Ralph Hanna** as vice president and general manager of the recently-acquired Hoosier Cabinet Corp.

JFD Electronics Corp. files a complaint in the U. S. District Court, Eastern District of New York, against **Voltronics Inc., Metaplast Co., Inc., Metaplast Process Co., Inc.,** and **James Stein** for alleged infringement of Barnes Patent 2,607,826 for Trimmer Capacitor under which JFD is licensed with a provision granting it the right to bring suit. The complaint charges that James Stein, the president of each company, operates through the companies for his own benefit as well as for the benefit of the companies; that the three companies are jointly owned, operated and controlled with their activities integrated and intermingled and that all three companies and their common president have infringed the patent. In aid of the infringement

50 new Lafayette Associate Stores now going strong

Are You Ready for Your Big Break?

For the independent serviceman who wants to be truly independent—a most unusual opportunity to own your own business:

If you have a basic knowledge of radio, television or electronics, and if you have ambitions for true independence and security, a Lafayette Radio Electronics Associate Store can be the beginning of a profitable and respected career. ■ Within the past year, Lafayette Radio Electronics began to explore the possibility of expanding on a nationwide basis. Fifty men such as you (some with established stores, some with little or no business experience) were granted associate store franchises. They have been given the benefit of Lafayette's many years of experience selling stereo kits, citizen band radios, recorders, science and electronics kits, tools, components, hobby supplies, television repair equipment and all the other things that make this the fastest-growing industry in the country. Today, every one of these men is the owner of a thriving business and is well on his way to a better way of life. (A list of these successful associates is available on request.) ■ As a result of this success, Lafayette has decided to expand the program. We are now looking for a limited number of men who are willing to invest from \$10,000 to \$20,000 to get the things they've always wanted out of life: travel, new home, new car, education for the children, security of their own business. ■ For more information on how you can own a profitable business, fill out and mail coupon below. Find out more about Lafayette's:

Protected Territory Yours will be the only franchised Lafayette Radio Electronics Associate Store in your marketing area. This means that when your customers want the advertised and branded merchandise supplied by Lafayette, they'll come to you. **Marketing Direction** With the knowledge gained from past successes, we will help you set up a complete program, from choosing the right location, to designing your store for maximum profits, to setting up your inventory. **Executive Guidance** Our program will help you function effectively in the day to day operations of your store. We'll show you how to deal with customers, how to establish a large, loyal following, how to build public relations. In short, Lafayette will show you how to be the kind of responsible executive who is a success in business, a leader in the community. **Advertising Support** Millions of dollars have been spent to establish Lafayette Radio Electronics and its franchised dealers as the primary source for electronics radio and science equipment. The Lafayette sign in front of your store will indicate to everyone that you are associated with a multi-million dollar organization, one of the largest of its kind in the world. Furthermore, all-year 'round advertising, public relations and promotion campaigns will continue to send customers to your store. ■ Fill out and mail this coupon today. This can be the beginning of a new way of life.

Lafayette Radio Electronics Corporation

111 Jericho Turnpike, Dept. ET-102, Syosset, L. I., New York

Mr. Robert Laub: Please send me full information on how I can own my own profitable business. I understand there is no obligation.

NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

... for more details circle 41 on page 50



QUICK and LASTING

When You Use
HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

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

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

EVER-QUIET®

Since 1949

VOLUME CONTROL AND CONTACT RESTORER

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

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



CHEMICAL ELECTRONIC ENGINEERING, INC., Matawan, New Jersey

... for more details circle 23 on page 50

NEWS OF THE INDUSTRY

and in preparation therefore, the complaint charges Metaplast Co., acting or purporting to act as supplier of parts to JFD obtained from JFD proprietary confidential unpublished technical information on JFD's trimmer capacitor to facilitate entry by defendants into the manufacture of infringing trimmer capacitors. The complaint demands injunction, accounting and treble damages.

General Electric Co. selects Peter H. Bliss as manager of product planning for personal and portable two-way radio and tone signaling equipment at the Communications Products Department in Lynchburg, Va. A radio technician with the Cleveland, Ohio, police department from 1951 to 1953, Mr. Bliss joined GE in Cleveland as a communications engineer and later held district sales posts in Columbus and Pittsburgh.

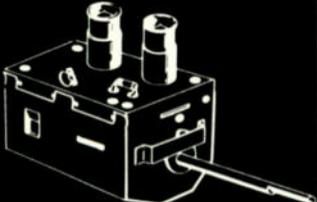
Erie Resistor Corp. appoints Ivan L. Brandt as vice president of research and engineering. Mr. Brandt who has been associated with the company since the latter part of 1961 as director of research and development will continue to advance a broad program of research and development in all phases of electronic components.

Utah Radio Products Corp. advises that its manufacturing and warehousing facilities were completely destroyed by fire. Total damage has been estimated at approximately \$2,000,000. Officers of the company report that they will start rebuilding immediately. The new wing, which has been under construction for several weeks, will house the first assembly operations sometime in July. Every effort will be made to start shipments immediately thereafter.

Jerrold Corp. acquires Analab Instrument Corp., Cedar Grove, New Jersey, electronic test instruments manufacturer. Operations will continue under the name "Analab Instrument Corporation" with **Morton G. Scheraga**, president, and **Clee**

TV TUNERS * REBUILT OR EXCHANGED

* ALL TYPES



\$9.95

including parts and labor
(broken parts at our cost)

- Normally shipped same day received
- 90 day full guarantee
- U/V combinations \$17.95

FREE—If Mailing carton sent to you on request

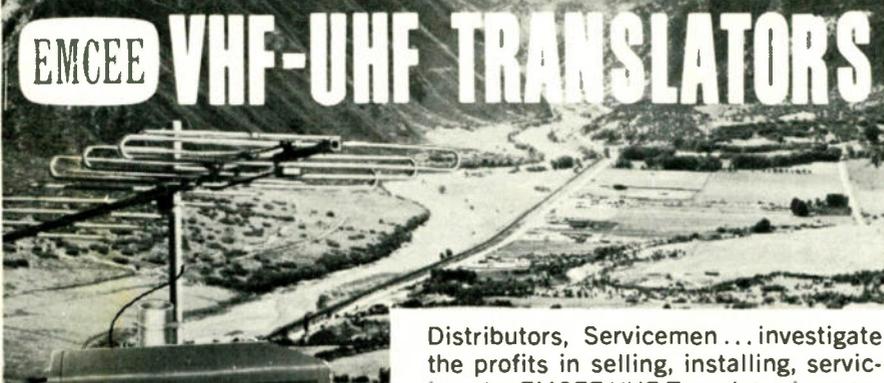
Phone REpublic 3-9189
4611 West Jefferson Blvd.
Los Angeles 16, California

L. A. TUNER EXCHANGE

... for more details circle 40 on page 50

NOW! Profits for you bringing better TV to problem areas.

EMCEE VHF-UHF TRANSLATORS



Distributors, Servicemen... investigate the profits in selling, installing, servicing, the EMCEE VHF Translator in areas that lack good direct TV reception.

You also profit from increased TV set sales, service customers and sales of replacement parts.

- **CONVERSION FLEXIBILITY**... any input channel to any non-adjacent output channel.
 - **FREEDOM FROM INTERFERENCE**... no internal signals which coincide with input to any other translators.
 - **EASY OPERATION UNDER FCC RULES**... simple control and identification unit minimizes maintenance and reduces cost... no operator required.
 - **EASY-INSTALLATION**... available for cabinet/rack mounting or in weatherproof housing.
- TRANSLATORS MAY BE RUN IN TANDEM TOO!



ELECTRONICS, MISSILES & COMMUNICATIONS, INC.
266 E. Third Street • Mount Vernon, New York

Gentlemen:

— Please rush free planning package including data sheet, complete installation check list, coverage calculation form.

— Please send free reprint of FCC rules covering translators.

NAME _____

ADDRESS _____

CITY _____ STATE _____

ELECTRONICS, **M**ISSILES AND **C**OMMUNICATIONS, INC.
266 E Third Street • Mount Vernon, New York

... for more details circle 28 on page 50

IF YOU CHANGE YOUR ADDRESS

☆ Notify us at 1 East First St., Duluth 2, Minn.

☆ Try to let us know in advance — (because 30 days should be allowed for the change to go into effect.)

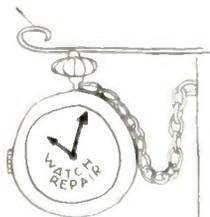
☆ Notify us in writing — and include the address label from one of your recent issues, showing your old address and code line.

Marsh, vice president, the two men who founded the company about three years ago. Jerrold Electronics Corp., will continue to direct the corporation's over-all test instrument engineering, development, and marketing program.

Korting Recorder Sales Corp. announces publication of a new monthly Technical Service Bulletin designed to acquaint service organizations with the Korting line of stereo and Hi Fi tape recorders, special accessories and electronic devices, from both the technical and consumer point of view. Since its purpose is to keep service organizations abreast of new products and information in their field, the bulletin is available to all, whether or not they handle Korting products. It is said to be a valuable addition to the service file that many organizations maintain on current products. Korting feels that by keeping you properly informed of their products, it can help provide ultimate customers with the finest in service facilities.

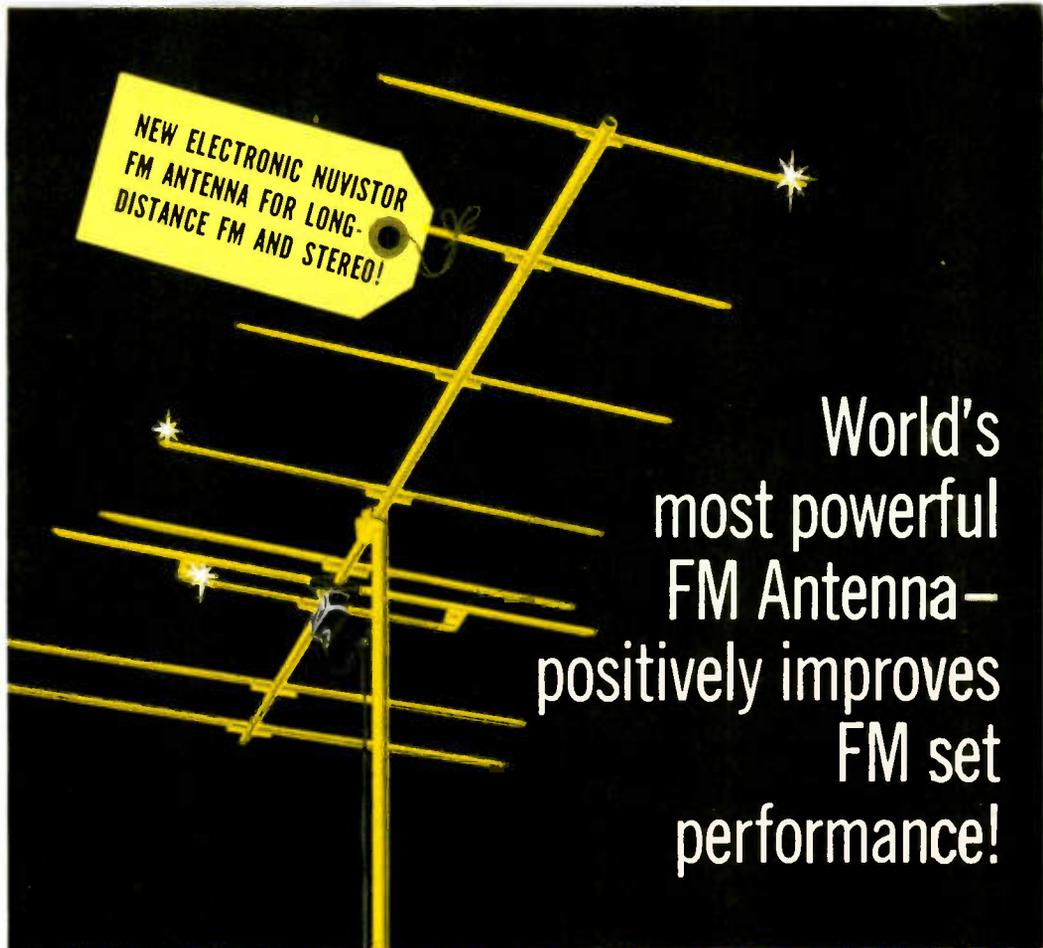
Realtone Electronics Corp., reports that net earnings on the sales of their transistor radios for the fiscal year ending March 31, 1962, rose to record high of \$255,772, an increase of 178 percent over last year's figure of \$89,025. This is equal to 30 cents a share as against 14 cents per share last year. The current earnings were adjusted to include the additional 200,000 shares of stock sold to the public during the latter part of 1961. Net sales totaling \$5,489,470 exceeded the record established the previous year of \$3,430,775.

Raytheon Company receives an order from the U. S. Coast and Geodetic Survey, for 35 fathometer depth sounders to be used in graphing the ocean floor. Depths of more than a half-mile can be accurately measured in inches, according to the company.



Simclair

"Hey, Mac. What do you know about chronistors?"



World's most powerful FM Antenna—positively improves FM set performance!

Winegard

STEREOTRON

WITH ELECTRONIC AMPLIFIER

Responds to Weakest Signals But Strong Signals Won't Overload It

(Takes Up to 200,000 Microvolts of Signal Input)

This is the world's most powerful antenna for FM or FM stereo. With the Stereotron and Stereotron amplifier, Winegard GUARANTEES unexcelled performance, GUARANTEES you will receive 85% of all FM stations in a 200 mile radius. The Stereotron, with powerful nuvistor amplifier, has a minimum gain of 26 DB over a folded dipole, with a flat frequency response of $\pm 1/4$ DB from 88 to 108 MC.

With nuvistor amplifier, Stereotron is so sensitive it will pull a 1 microvolt signal out of the noise, yet signals as strong as 200,000 microvolts will not overload the amplifier and cause it to cross modulate. This extraordinary performance is due to a unique amplifier circuit employing 2 RCA nuvistors.

Uppermost in the minds of the engineers in developing the Stereotron amplifier were two things—1. A new high in performance. 2. Long life and trouble-free operation. For example, the life of the 2 RCA nuvistors will be 5 to 8 years at top performance. This is possible because of a heat sink to control operating temperature and an automatic voltage control. A completely weather-sealed

case protects all amplifier parts from rust and corrosion. The antenna is beautifully gold anodized—100% corrosion proofed. Available both for 300 ohm or 75 ohm coax.

SF-8 Stereotron FM Antenna \$23.65

AP-320 Stereotron Nuvistor Amplifier \$39.95—amplifier can be purchased separately to use with any FM antenna.

READ WHAT USERS SAY—

"The results have been so outstanding under less than ideal conditions, I felt you might be interested. It was truly amazing how a previously blank dial sprang to life."

C. M. S. Elmira, New York

"I now get as strong a signal from out-of-town stations as I get from 'locals'. I told a radio and TV man in Hollister about my reception and invited him over to hear it".

M. J. D. Hollister, Mo.

Write for information or ask your dealer for spec sheets on Stereotron and other Winegard FM and TV antennas and accessories. Get FREE Station Log and FM map of U. S.



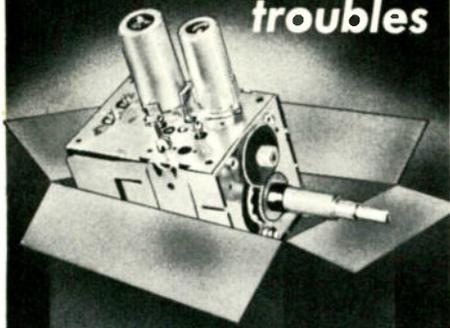
Winegard

ANTENNA SYSTEMS

3019-10 Kirkwood Boulevard • Burlington, Iowa

... for more details circle 70 on page 50

Pack up your troubles



and send them to
CASTLE

Ask yourself

... do you have the time to fool around drilling, sawing, filing ... trying to make a "Universal" replacement tuner fit in place of the original? Do you have all the expensive instruments and equipment to complete the alignment so essential after each tuner repair or replacement? Can you spare the time repairing and adjusting your own TV tuners and can you charge enough to justify the time spent?

A Castle Overhaul eliminates every one of these problems.

Castle replaces all defective parts (tubes and major parts are extra at net prices) and then aligns your tuner to the exact, original specifications. Simply send us your defective tuner complete; include tubes, shield cover and any damaged parts with model number and complaint.

ALL MAKES ONE PRICE

VHF TUNERS
UHF TUNERS
UV COMBINATIONS*

9.95

*UV combination tuner must be of one piece construction. Separate UHF and VHF tuner with cord or gear drives must be dismantled and the defective unit sent in. 90 Day Warranty.

Send for FREE Mailing Kit and complete details

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TV TUNER SERVICE, INC.

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Pioneers in  TV Tuner Overhauling

... for more details circle 20 on page 50

REPS AND DISTRIBUTORS

Communications, Inc. appoints 12 sales representatives throughout the U. S. The company's product lines include citizens band and amateur communications equipment. The reps and territories are David S. Linz Co., Philadelphia, Pa.; J. W. Lehner Co., Columbus, Ohio; Lawrence F. Zaffina Co., Detroit, Mich.; William J. Doyle Co., Chicago, Ill.; Business Radio Co., Minneapolis, Minn.; Arthur K. Elliott Co., Kansas City, Mo.; Jack Geartner Co., Miami Beach, Fla.; Dick Bellew Sales Co., El Dorado, Ark.; Ivan Harrison, Dallas, Tex.; Dave M. Lee Co., Portland, Ore.; Logan and Logan Co., San Mateo, Calif., and Paul Ewing Assoc., Los Angeles, Calif.

Philco Corp. adds 12 independent distributors to the National Philco Distributor Council. Named to the council are: Eastern region, Don Farquhar, Piedmont Distributors, Baltimore, Md., and Steve Demchuk, Luckenhack and Johnson, Allentown, Pa.; northeast region, Frank Lyons, Roskin Distributors, Albany, N. Y., and Frank Cowan, W. Bergman Co., Rochester, N. Y.; southern region, Cy Shobe, Shobe, Inc., Memphis, Tenn., and Buddy Dixon, Brown-Rogers-Dixson Co., Winston-Salem, N. C.; Texas region, Garland Medaris, Medaris Co., Dallas, Tex., and Randolph Reed, The Reed Co., Beaumont, Tex.; Midwest region, Bud Sunderlin, Radio Equipment Co. of South Bend, South Bend, Ind., and Larry Wheeler, Hardware Products Co., Sterling Ill., and Western region, Ed Bonnet, Graybar Electric Co., Los Angeles, Calif., and Harry Ahlstrom, Strevel-Paterson Hardware Co., Salt Lake City, Utah. The distributor council will meet at least three times a year.

Sylvania Electric Products Inc. selects Robert H. Wheeler as a sales rep for the southeastern district, southern region for the Electronic Tube Div. Mr. Wheeler is located in Orlando, Fla. In another action the firm appoints Thomas E. Blackwell as Atlanta district sales manager. Mr. Blackwell, joined Sylvania in 1955 as a technician in the Electronic Defense Laboratory, Mountain View, Calif., was promoted to senior technician in 1957 and since 1959, has been a senior salesman with headquarters in Charlotte, N.C.

Hughes Aircraft Company's semiconductor division announces that Robert G. Braden, of Braden Engineering Co., Dallas, Texas, has been named sales rep for their semiconductor division. Braden will represent Hughes' semiconductors throughout Texas, Okla., Ark., La., and Miss. He formerly worked for Hughes' industrial systems division as a sales engineer in Dallas during 1960 and 1961. He also represents the Hughes microwave components div., tube products division and the aerospace group.



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... for more details circle 34 on page 50

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Exact Replacement Needles/Cartridges

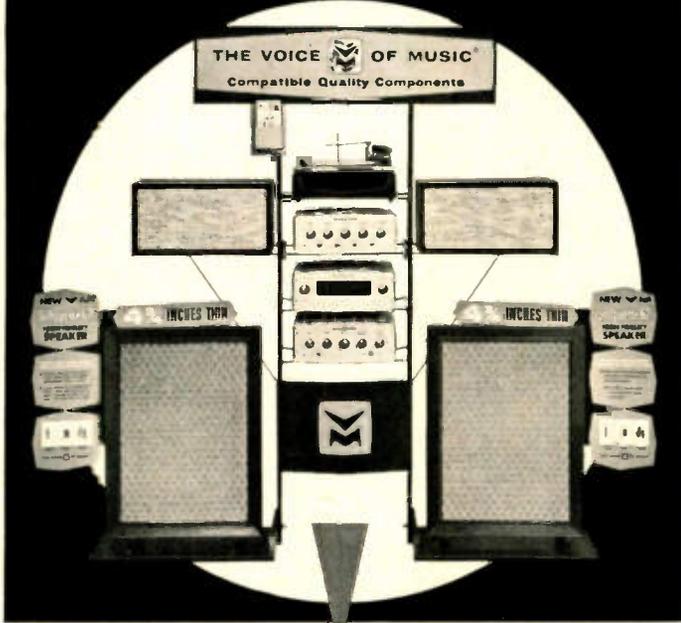


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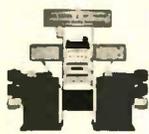
Electro-Voice

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- Convenient one-source buying . . . backed by V•M's national network of Service Centers.



The store display fixture is complete with literature dispenser and the "Silhouette 62" speaker posters. It actually displays nine V•M component products!



High-Fidelity FM Stereo. FM, AM Component Radio Tuner Model 1465.



"Stere-O-Matic"® 4-Speed Automatic Record Changer Model 1571 11" turntable. Automatic Manual-Play, Extra-long, dynamically balanced, non-resonant Tone Arm. Diamond Needle. Shadowlite stylus pressure.



Precision-Built AC Stereo Amplifier Model 1448. 40 watts (peak); 20 watts per channel. Frequency response, 40-25,000 cps.



Changer Base Model 1438. For "Stere-O-Matic"® Changers. Pre-wired receptacles.



"Silhouette 62" High-Fidelity Component Speaker System. Three speakers: 10" woofer, 6" mid-range, 3.5" tweeter. Frequency response, 30-16,000 cps.



Stereophonic High-Fidelity Component Amplifier Model 1428. 60 watts (peak); 30 watts per channel. Frequency response, 20-30,000 cps.



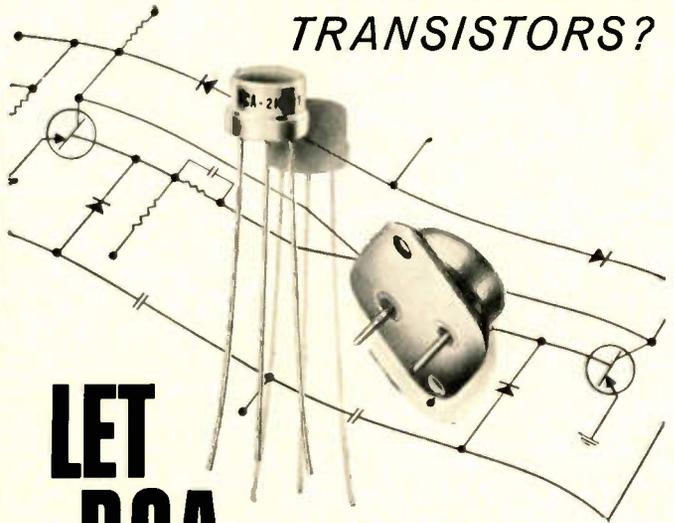
High-Fidelity Component Speaker Model 32. Three speakers: Two 6" and one 3". Frequency response 60-12,000 cps.

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1T4	5BR8	6EAB	12BH7/A
1U4	5CC8	6EBB	12BQ6
1U5	5CL8A	6E85	12BW7/A
	5CZ5	6ES5	12CA5
	5J6	6F6GT	12CR6
	5T8	6GM8	12CUB/12CS
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	5U4CA/B	6J5	12D4/A
	5U8	6J6	12DB5
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	5X8	6N7	12M7CT
	5Y3GT	6L6CA/B/C	12L6GT
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	6AW8/A	7A5	25C5
	6AX4CT/B	7A7	25CD6CA/B
	6B56	7A8	24C06
	6B6	7AC7	25D06
	6B8A	7AU7	25D06
	6B85	7B05	25L6GT
	6BC8	7B7	25W6GT
	6BE6	7C5	25Z6GT
	6BG6G/A	7C6	35A5
	6BM6	7F8	35W4
	6BH8	7M7	35C5
	6BJ6/A	7N7	35L6GT
	6BK5	7Y4	35W4
	6BK7A/B	8AW8/A	35Y4
	6BL7CT/A	8BQ5	35Z4
	6C06	8B8	35Z6GT
	6C56	8C5	50A5
	6D6	8C7	50B5
	6D6GTA/B	8CM7	50CS
	6E07/A	8C8	50E5
	6E8	85N7GTB	50L6GT
	6E85	8AV5CA	50V6GT
	6E87	8B6	50Y6GT
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 ELECTRONIC TECHNICIAN

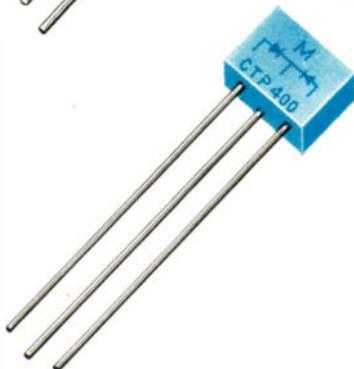
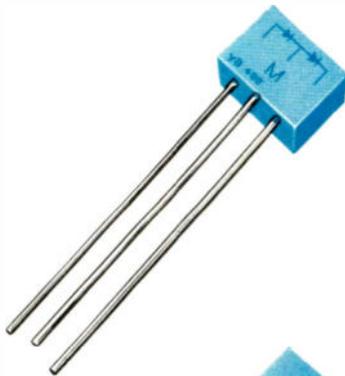
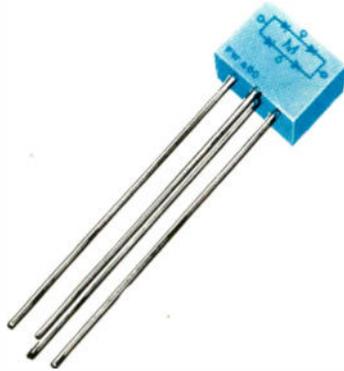


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Tips for Technicians

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Rectifier "packages" save time and space



When you're putting together a DC power supply, these little Mallory packaged rectifier circuits can spark a lot of time-saving, space-squeezing ideas.

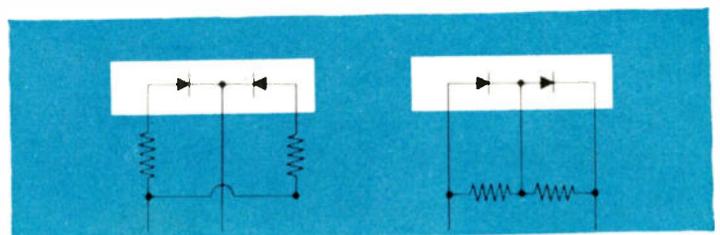
Each package is a complete rectifier circuit . . . bridge, doubler or center-tap . . . that does the job of two or four separate rectifiers. So you've only got *one* component to wire in place. The individual rectifier cells are factory-connected in the package.

You can get the exact rectifier you want in this compact form. And we mean compact. Less than $\frac{3}{4}$ " by $\frac{1}{2}$ ", and $\frac{1}{4}$ " thick. Cold case design, too; you can mount 'em anywhere without worrying about case-to-ground shorts.

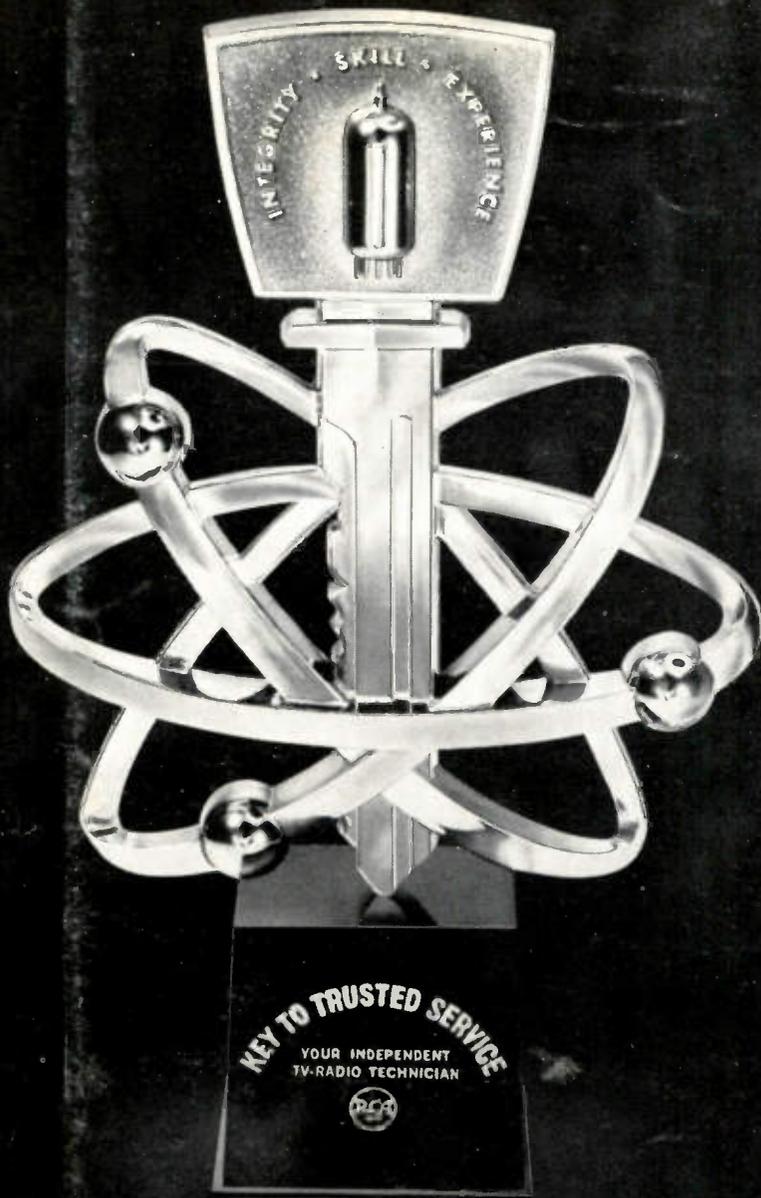
PRV ratings on all three types go as high as 600 volts. And there's plenty of current capacity. The FW full wave bridge models are rated 1.5 amps. DC at 50°C. ambient, 1.0 amp. at 100°C. Doubler Type VB and center tap Type CT are rated 0.75 amp. at 50°C., 0.5 amp. at 100°C.

If you need more current rating, you can parallel the two sides of the type CT package, using 0.5-ohm equalizing resistors in series with each leg. And you can get a high PRV unit at low cost by using a type VB double package as a series-connected half-wave rectifier, connecting a one-megohm resistor across each cell for voltage equalization.

As if all this weren't enough, you save money, too, because our packaged circuits cost less than individual rectifiers. Get them from your Mallory Franchised Distributor. He's a good man to call on for Mallory capacitors, switches, controls, batteries, resistors and vibrators . . . and for any other components you need.



. . . for more details circle 43 on page 50



RCA's Key to Trusted Service...

YOUR KEY TO MORE AND BETTER BUSINESS

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This symbol is the focal point of a major RCA promotional program to identify and "boost" outstanding service dealers in each community.

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

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RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



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