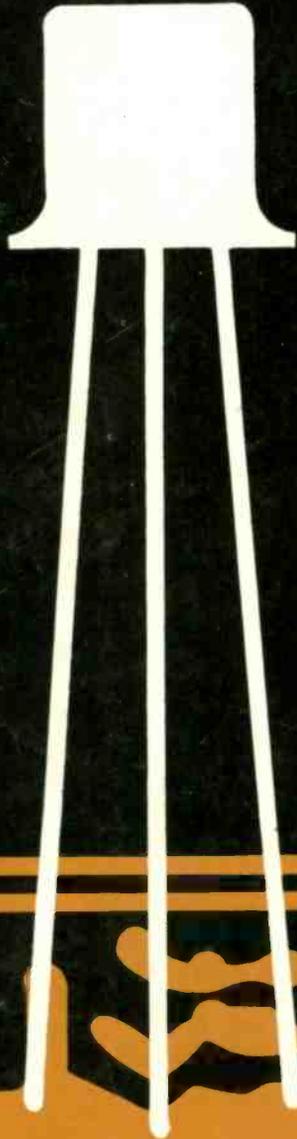
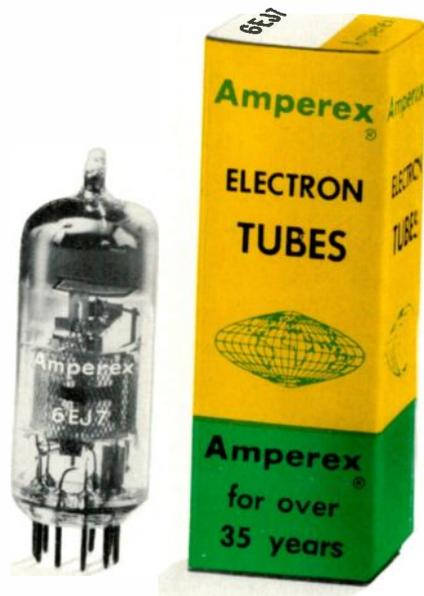


ELECTRONIC TECHNICIAN



- *MAKE TRANSISTOR RADIO REPAIRS PAY . . .*
- TV R-F Alignments
- Eliminating Hi-Fi Hum
- Field Strength Meter Applications
- Japanese Transistor Radio Guide
- Tools For Transistor Radio Repairs

JULY 1962 60¢



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 "Ampliframe" tubes originated by Amperex.

For some time now, designers have been using many Ampliframe 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 Ampliframes 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

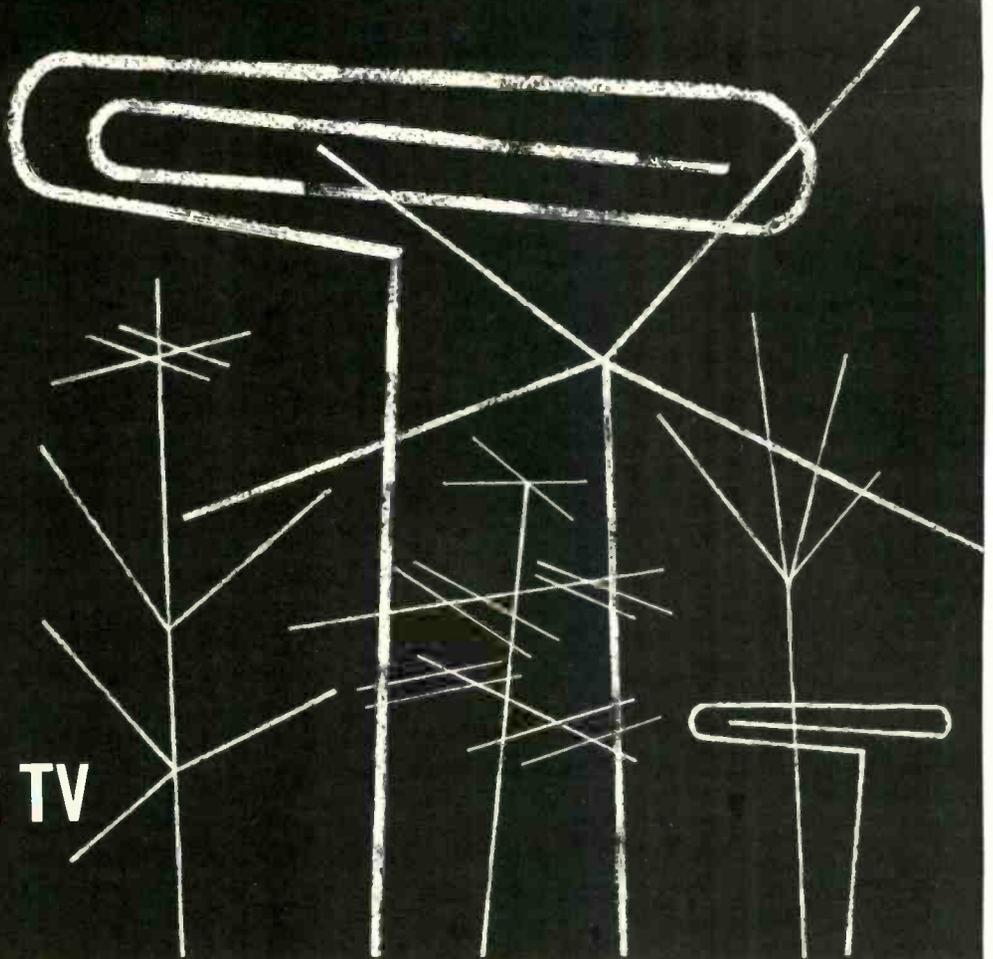
eliminates time-consuming realignment when you replace tubes.

About the only way, then, that you can be sure of optimum satisfaction for your customers and maximum profit operation for yourself is to make room in your caddy right now for the identical, matchless-quality tubes that are being designed into the original sets... now available to you from your local distributor with the brand of the originator — the Amperex brand.

Next time you visit your distributor, look for the green and yellow box and ask about Ampliframe tubes for TV and other entertainment replacement applications. Amperex Electronic Corporation, 230 Duffy Avenue, Hicksville, L. I., N. Y.

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2 GREAT BELDEN CABLES FOR **COLOR** TV RECEPTION



CELLULINE 8275

* Maintains uniform electrical characteristics by eliminating all possible moisture between conductors. The thick outer wall of polyethylene protects the cable from abrasion and sun damage, and the round shape offers less resistance to wind. The result is a long lasting, efficient transmission line for clearer color and black and white TV reception.

AWG & (Stranding)	Color	Nom. O.D. (Inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft)	Nom. Attenuation per 100' mc db		Standard Package Lengths in ft
20 (7x28)	Brown	.300 x .400	80%	4.6	100	1.05	50' coils 75' coils 100' coils 500' spools 1000' spools
					200	1.64	
					300	2.12	
					400	2.5	
					500	2.98	
					700	3.62	
900	4.3						



PERMOHM 8285

* Conductors are encapsulated in cellular polyethylene. This exclusive design provides clearer TV pictures in all areas including areas where conditions of salt spray, industrial contamination, ice, rain, or snow exist. It further improves fringe area reception as well as strengthens UHF and color TV reception.

AWG & (Stranding)	Color	Nom. O.D. (Inch)	Nom. Velocity of Propagation	Nom. Capacitance (mmf/ft)	Nom. Attenuation per 100' mc db		Standard Package Lengths in ft
22 (7x30)	Brown	.255 x .468	73.3%	5.3	100	1.4	50' coils 75' coils 100' coils 500' spools 1000' spools
					300	2.8	
					500	3.8	
					700	4.8	
					900	5.6	



Belden Cable is Packaged in Standard Lengths for Display and Handling

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8-5-2

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INCLUDING

ALL PARTS
(EXCEPT TUBES)
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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.

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SERVICE MANAGER • TUNER DIVISION • DEPT. 3A



SARKES TARZIAN INC

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

... for more details circle 38 on page 46

ELECTRONIC TECHNICIAN

**WORLD'S LARGEST
ELECTRONIC TRADE
CIRCULATION**

ELECTRONIC TECHNICIAN

July • 1962

Vol. 75 • No. 7

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AN OJIBWAY
PUBLICATION

OJIBWAY PRESS, Inc.

1 East First Street
Duluth 2, Minn.
Telephone: RA 7-8511

Sales Offices:

NEW YORK: Ron Kipp, 480 Lexington Ave., New York 17, N. Y. TN 7-0011
CHICAGO: William Klusack, 221 N. LaSalle St., Chicago 1, Ill. CE 6-1600
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ELECTRONIC TECHNICIAN and Circuit Digests, published monthly at 1 East First Street, Duluth 2, Minnesota, by Ojibway Press, Inc., Marshall Reinig, president; Robert Edgell, executive vice president; Lawrence Rosenthal, vice president; H. B. Fryberger, Jr., secretary; E. A. Kuefner, treasurer. Single copies, 60c. Subscription rates: United States and Canada \$5 for one year; \$8 for two years; \$10 for three years. Pan American and Foreign countries, \$9 for one year; \$14 for two years; \$18 for three years. With subscription correspondence, include mailing label from most recent issue. Second-class postage paid at Waseca, Minn. Copyright 1962 by Ojibway Press, Inc., Duluth, Minn. Reproduction and reprinting prohibited except by written authorization of publisher.
POSTMASTER: SEND NOTIFICATION (Form 3579) TO ELECTRONIC TECHNICIAN, 1 EAST FIRST STREET, DULUTH 2, MINNESOTA.

FRONT COVER Transistor radio repairs are becoming big business, expert bench technician Ben Allen indicates. To understand how to convert those "shirt pocket" midgets into profit, read the article beginning on page 24. Making repairs on transistor radios can also be easier and faster with some of the tools especially designed for transistor work described in the article beginning on page 36.

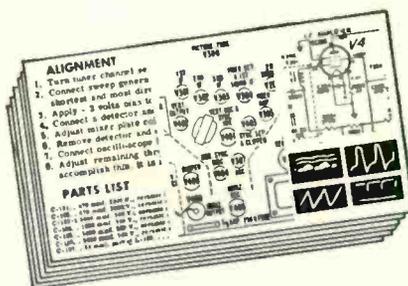
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CIRCUIT DIGESTS



PRECEDING BACK COVER

- GENERAL ELECTRIC: TV Chassis MW
- EMERSON: TV Chassis 120572-C, 120573-D
- MATSUSHITA: Transistor Radio, Model T-35
- ZENITH: Transistor Radio, Models 6JT40Z1, 6JT41Z1
- RCA: Stereo Adapter Chassis, RS-200, Model RK-295
- MAGNAVOX: TV Chassis 34-01, -02, -03, -04 -05, -07
- MOTOROLA: Ford Auto Radio Reverberator C20Z-18875-C, Model RV2F



NEW VERSATILITY & COMPACTNESS in PROFESSIONAL TEST EQUIPMENT



AC VOLT-WATT METER #261

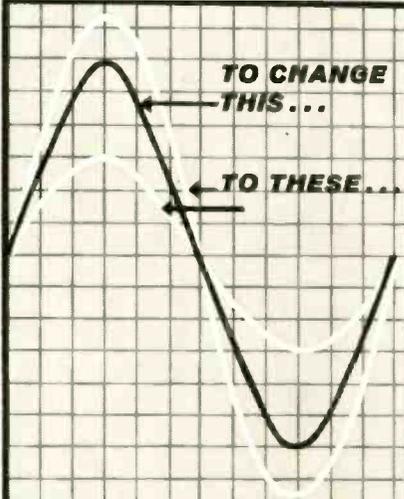
Formerly designated as #260
Kit \$49.95 Wired \$79.95



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, -3 db at 500 kc. 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).



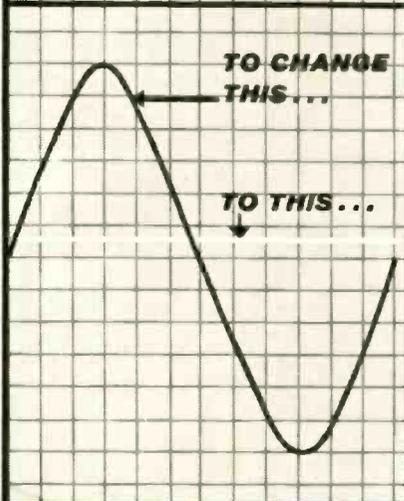
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Kit \$35.95 Wired \$47.95
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Connect to 60 cycle, 120 volt line and obtain any desired voltage between 0 and 140 volts. Highly efficient variable auto-transformer of toroidal core design gives you continuously variable output, linear versus rotation, with excellent regulation and negligible waveform distortion. Model 1078 permits either 50 or 60 cycle operation.



...USE THIS!



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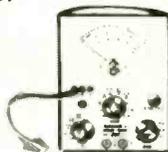
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Connect to 60 cycle, 120 volt line and obtain highly filtered low dc voltage continuously variable over two ranges 0-8, 0-16 VDC. Heavy-duty pi-type LC filter is rated to take the full rated current output continuously (10 amps on 8V range, 6 amps 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.

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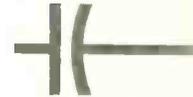


ELECTRONIC INSTRUMENT CO., INC.
3300 Northern Blvd., Long Island City 1, N. Y.

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



EDITOR'S MEMO



Class will come to order.

The subject for today is resistor color code. Will all students who know the color code as well as they know their own name kindly leave this column now and attend the advanced classes further along in this issue.

By the time you finish reading this column a few times, you should be thoroughly familiar with the resistor color code—even if you never remembered a single color before! I am not going to discuss how to read the color bands. You should know that the first two bands are the significant figures, the third band is the decimal multiplier, and the fourth band is the tolerance.

I want to give you a very simple system for remembering each color and what significant figure it stands for. The system was developed by Tor Laboratories, and it is based on psychology studies of the mind's ability to associate different kinds of information.

In your mind's eye get a mental picture of each of the following items:

- a FIVE dollar bill is GREEN
- ONE BROWN penny
- a WHITE cat has NINE lives
- SEVEN PURPLE seas
- a BLUE tail fly has SIX legs
- ZERO: BLACK nothingness
- a RED heart has TWO parts
- THREE ORANGES
- a FOUR legged YELLOW dog
- an EIGHTY year old man has GRAY hair

Are you concentrating? Read the list over several times, and try to burn that mental picture into your memory. Can you see that white cat with nine lives howling on a fence? Just look at the six legs on that blue tail fly crawling up your arm. And so on.

Now close your eyes and try to repeat them all. Notice that the numbers are not given in order, because the important thing is to associate the mental picture with the number.

You might also be interested to learn that this arrangement for memorizing 10 numbers is part of a 12-page multi-colored booklet on resistor color code training which will be available to ELECTRONIC TECHNICIAN readers without charge as long as the supply lasts. Tor has provided us with only a limited number of booklets, so it will be first come, first serve. Just drop me a note asking for a copy of the Resistor Color Code Booklet.

Al Forman

The "HIDDEN 500" wrote these 6 SUCCESS STORIES...

Service Technicians supply the happy endings!

Capacitor success stories are no novelty at Sprague. The "Hidden 500", Sprague's behind-the-scenes staff of 500 experienced researchers, have authored scores of them! And customers add new chapters every day. But none has proved more popular than the 6 best sellers shown here. Developed by the largest research organization in the capacitor industry, these 6 assure happy endings to service technicians' problems.

1 DIFILM® BLACK BEAUTY® MOLDED TUBULAR CAPACITORS



The world's most humidity-resistant molded capacitors. Dual dielectric—polyester film and special capacitor tissue—combines best features of both. Exclusive HCX® solid impregnant produces rock-hard section—nothing to leak. Tough case of non-flammable phenolic—cannot be damaged in handling.

2 DIFILM® ORANGE DROP® DIPPED TUBULAR CAPACITORS



Especially made for exact, original replacement of radial-lead tubulars. Dual dielectric combines the best features of both polyester film and special capacitor tissue. Exclusive HCX® solid impregnant—no oil to leak, no wax to drip. Double dipped in bright orange epoxy resin to beat heat and humidity.

3 TWIST-LOK® ELECTROLYTIC CAPACITORS



The most dependable capacitors of their type. Built to "take it" under torrid 185°F (85°C) temperatures—in crowded TV chassis, sizzling auto radios, portable and ac-dc table radios, radio-phono combinations, etc. Hermetically sealed in aluminum cases for exceptionally long life. Withstand high surge voltages. Ideal for high ripple selenium rectifier circuits.

4 ATOM® ELECTROLYTIC CAPACITORS



The smallest dependable electrolytics designed for 85°C operation in voltages to 450 WVDC. Small enough to fit anywhere, work anywhere. Low leakage and long shelf life. Will withstand high temperatures, high ripple currents, high surge voltages. Metal case construction with Kraft insulating sleeve.

5 LITTL-LYTIC® ELECTROLYTIC CAPACITORS



Ultra-tiny size for use in transistorized equipment. High degree of reliability at reasonable price. All-welded construction—no pressure joints to cause "open" circuits. Withstand temperatures to 85°C (185°F). Hermetically sealed. Extremely low leakage current. Designed for long shelf life—particularly important in sets used only part of the year.

6 CERA-MITE® CERAMIC CAPACITORS



Tiny, tough, dependable in practically every application. Low self-inductance of silvered flat-plate design gives improved by-pass action in TV r-f circuits. Higher self-resonant frequency than tubular ceramics or micas. Tough moisture-proof coating. Designed for 85°C operation.

Handy Hanging Wall Catalog C-457 gives complete service part listings. Ask your Sprague Distributor for a copy, or write Sprague Products Co., 65 Marshall St., North Adams, Mass.

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THE MARK OF RELIABILITY

Now take another look at

NEW MODEL 644

SOUND SPOT MICROPHONE • LIST \$110.00

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Electro-Voice[®]

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Detroit—KLA Laboratories, 7375 Woodward
Detroit—Michigan Music Company, 15900 Hamilton
Detroit—Radio Specialties Co., 12775 Lyndon
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1101 East Grand River Avenue

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Minneapolis—Harry Starks, Inc., 112 North 3rd Avenue
Minneapolis—Lew Bonn Company, 1211 LaSalle Ave.
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Kansas City—Burststein-Appiebee, 1012-14 McGee
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Lincoln—Scott Electronic Supply, 2201-07 "O" Street
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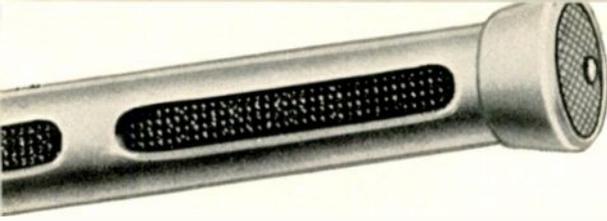
North Las Vegas—Electronics Specialties Company,
3420 "C" East College Street

NEW HAMPSHIRE

Concord—Evans Radio Co., Route 3A Bow Junction

NEW JERSEY

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Elizabeth—Jersey Radio TV Supply, 1068 Elizabeth

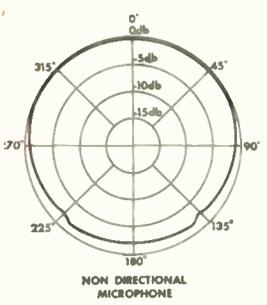


Now, after over 2 years of field testing, the 644 has thoroughly proved its ability to solve sound jobs previously thought impossible! If you haven't yet tried the 644, pick the job that other microphones couldn't "reach"... then find out for yourself why the 644 is the brightest new idea in microphones!

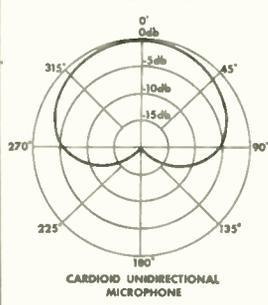
those "impossible" sound jobs!

compare polar patterns yourself

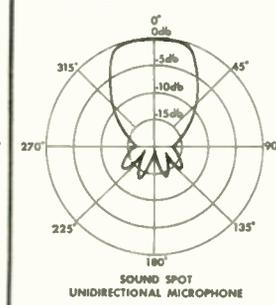
NON-DIRECTIONAL



CARDIOID



SOUND SPOT



- Four times greater working distance than the best cardioids, depending on acoustics
- Greatly reduces feedback
- Retains "on-mike" presence despite extended working distance
- Excellent outdoors . . . less wind noise
- Priced low to fit most budgets
- Lasts a lifetime

Another better product for better sound from . . .

ELECTRO-VOICE, INC.

Commercial Products Division • Loudspeakers-Microphones

BUCHANAN, MICHIGAN

... for more details circle 23 on page 46



these Electro-Voice Microphone Headquarters

Hackensack—Nidisco Hackensack, 55 State Street
 Jersey City—Nidisco Jersey City, Inc., 713 Newark Ave.
 Mountaineer—Federated Purchaser, Inc.,
 1021 U.S. Route 22
 Passaic—Nidisco Passaic, 294 Passaic Avenue
 Ridgefield—Nidisco-Cliffside, Inc., 484 Bergen Avenue
 Trenton—Nidisco-Trenton, Inc., 985 Princeton Avenue
 Union City—Nidisco Jersey City, 2812 Hudson Blvd.

NEW MEXICO

Albuquerque—Sound Equipment & Hi Fi House,
 3011 Monte Vista Blvd., NE

NEW YORK

Albany—Audio-Video Corp., 324 Central Avenue
 Albany—Fort Orange Radio, 904 Broadway
 Albany—Seiden Sound, Inc., 355 Central Avenue
 Bethpage, L. I.—S & R Electronics,
 4020 Hempstead Turnpike
 Binghamton—Morris Distributing Co., 195 Water St.
 Brooklyn—National Radio Parts Distributors,
 572 Albany Avenue at Rutland Road
 Buffalo—FM Sound Equipment, 1241 Main Street
 Buffalo—Genesee Radio and Parts, 2550 Delaware
 Buffalo—Radio Equipment Corp., 312 Elm Street
 Carle Place, L. I.—E. J. Korvette, Incorporated
 Glen Cove Road & Westbury Avenue
 East Meadow, L. I.—Sound Service Engineers,
 1788 Hempstead Turnpike
 Elmira—Stack Electronics, 306 Railroad Avenue
 Hempstead—Newmark and Lewis, 43 Main Street
 Hempstead—Standard Parts, 277 North Franklin St.
 Jamaica—Lafayette Radio Electronics, 165 Liberty Ave.
 Middletown—Certified Electronics, Incorporated
 Wickham Avenue Ext., Route 84
 Mineola, L. I.—Arrow Electronics, 535 Jericho Turnpike
 New York City—Airex Radio Corp., 85 Cortlandt St.
 New York City—Audio Unlimited, Inc., 190 Lexington
 New York City—Florman & Babb, 70 West 45th St.
 New York City—Horvey Radio Co., 103 West 43rd
 New York City—Leonard Radio, 69 Cortlandt Street
 New York City—Magic-Vue Television, 323 E. 13th St.
 New York City—Midway Radio & TV, 60 West 45th
 New York City—Murray's Audio Center, 12 East 42nd
 New York City—Sam Goody, Inc., 235 West 49th St.
 New York City—Sonocraft Corp., 115 West 45th St.
 New York City—Terminal Hudson, 48 West 48th St.
 Rochester—Rochester Radio Supply, 600 East Main St.
 Troy—Trajan Electronic Supply, 15 Middleburgh St.
 Tuckahoe—Baynton Studio, 10 Pennsylvania
 Utica—R. & H. Audio Visual Co., 227 Columbia Street
 Yorkville—Valley Electronic Labs, Truck Route 5A

NORTH CAROLINA

Asheville—Freck Radio & Supply Co., 38 Biltmore Ave.
 Durham—Womack Electronics Supply, 601 Ramseur St.
 Gastonia—Stroup Hi Fi Center, 112 Green Drive
 Raleigh—Southeastern Radio Supply, 414 Hillsboro St.

NORTH DAKOTA

Fargo—Walter Electronics Co., 402 North "P" Avenue

OHIO

Akron—Electronic Engineering Co., Div. of Solsound
 Industries, Inc., 362 West Bowery Street
 Canton—Burroughs Radio, Inc., 2705 Fulton Road, NW

Canton—Walkeradio, 1546 Fulton Road, NW
 Cincinnati—Economy Electronic Distributing, 629 Elm St.
 Cincinnati—Steinbergs, Inc., 633 Walnut Street
 Cincinnati—Trout Company, 4815 Whetsel Avenue
 Cleveland—Audiocraft Company, Inc., 2915 Prospect
 Cleveland—Broadway Electric Supply Company, Inc.,
 6207 Broadway Avenue, SE
 Cleveland—Grossman Music Corp., 740 Bolivar Road
 Cleveland—Olson Electronics, 6813 Pearl Street
 Cleveland—Olson Electronics, 2020 Euclid Avenue
 Cleveland—Pioneer Electronic Supply, 5403 Prospect
 Cleveland—Progress Radio, 565 East 185th Street
 Cleveland—Progress Radio, 13310 Miles Avenue
 Cleveland—Progress Radio Supply Co., 415 Huron Rd.
 Cleveland—Winteradio, 1468 West 25th Street
 Columbus—Anderson Hi Fi Center, 2244 Neil Avenue
 Columbus—Electrical Contractors, 1343 Holly Avenue
 Columbus—Electronic Supply Corp., 814 West 3rd Ave.
 Columbus—Hughes-Peters, Inc., 481 East 11th Street
 Columbus—Olson Electronics, 142 North High Street
 Columbus—Thompson Radio Supplies, 182 E. Long St.
 Columbus—Whitehead Radio, 124 North Grant Ave.
 Dayton—Custom Electronics, 1918 South Brown Street
 Dayton—Stappa, Inc., 314 Lea Street
 Dayton—Stotts-Friedman Co., 108 N. Jefferson Street
 Elyria—El-A-Company, 235 Lodi Street
 Lima—Hutch and Son, Roberts at Lenore
 Lima—Lima Radio Parts Co., 600 North Main Street
 Middletown—Hinkles Electronics, 5021 Roosevelt Av.
 Parma—Winteradio Electronic Supply, 5373 Ridge Rd.
 Toledo—Jamieson's Hi Fi Specialists, 3417 Dorr Street
 Toledo—Toledo Radio Specialists, 1215 Jackson St.
 Toledo—Worres Radio Company, 1002 Adams Street
 Youngstown—Armie's Electronics, 320 West Federal St.
 Zanesville—Thompson Radio Supplies, 110 South 6th

OKLAHOMA

Oklahoma City—Trice Wholesale Electronics,
 4701 North Stiles
 Tulsa—S & S Radio Supply, 537 South Kenosha

OREGON

Pendleton—The Town Shop, 142 South Main

PENNSYLVANIA

Altoona—Altoona TV Supply, Inc., 1720-22 Union Ave.
 Braddock—M. Leff Radio Parts Co., 223 Braddock Ave.
 Clifton Heights—Delaware Volley Electronics Supply,
 224 Baltimore Pike
 Cornwells Heights—Bucks County Sound and Recording
 Laboratory, 2002 Newportville Road
 Johnstown—Cambria Equipment, 17 Johns Street
 McKeesport—Barno Radio Company, 927 Walnut Ave.
 Philadelphia—AC Radio Supply, 1539 W. Passyunk
 Philadelphia—Alma Radio Company, 913 Arch Street
 Philadelphia—Barnett Brothers Radio, 622 Arch Street
 Philadelphia—Friend's, 614 Arch Street
 Philadelphia—Radio Electric Service Company,
 NW Corner 7th and Arch Streets
 Pittsburgh—Comcor Electronics, Inc., 937 Liberty Ave.
 Pittsburgh—Hamburg Brothers, 213 Golveston Avenue
 Pittsburgh—Rocio Parts Co., Inc., 6401 Penn Avenue
 Pittsburgh—South Hill Electronics, 1420 West Liberty
 Pittsburgh—Tydings Electronics, Inc., 3337 Penn Avenue
 Reading—George D. Barbey Co., 333 North Fourth St.

Wilkes Barre—Communications Engr., 41 N. Franklin
 Wilkes Barre—General Radio and Electronic Co.,
 396 South Main Street

SOUTH CAROLINA

Charleston—Radio Labs, 475-477 East Bay Street
 Columbia—Dixie Radio Supply Co., 1628 Laurel St.
 Florence—Southern Electronics, 355-65 North Irby St.

SOUTH DAKOTA

Aberdeen—Burghardt Radio Supply, 102 South Second
 Rapid City—Burghardt Radio Supply, 726 Jackson
 Sioux Falls—Burghardt Radio Supply, 208 N. Weber
 Sioux Falls—Warren Radio Supply, 196 E. Sixth St.
 Sioux Falls—Warren Supply Co., 115 S. Indiana Ave.
 Watertown—Burghardt Radio Supply, 621-4th St., SE

TENNESSEE

Memphis—Hirsh Electronics, 1658 Union Avenue

TEXAS

Corpus Christi—Wicks Radio Equipment, 513 Staples
 Dallas—Adleta Company, 1907 McKinney
 Dallas—Chandler Sound Equipment, 3407 Ross Avenue
 Dallas—Crabtree's Wholesale Radio, 2608 Ross Ave.
 El Paso—Midland Specialty Co., 500 W. Paisana Drive
 Fort Worth—Clifford Herring Sound Equipment,
 1705 West 7th Street
 Houston—Busacker Electronic Equipment, 1216 W. Clay
 Houston—Sterling Electronics, Inc., 1616 McKinney
 San Antonio—Vandergrift Audio, 4106 San Pedro Ave.

UTAH

Ogden—Bollard Supply Co., 3109 Washington Blvd.
 Ogden—Tri State Electronic Supply, 2763 Washington
 Salt Lake City—Deseret Book Co., 44 East S. Temple
 Salt Lake City—Electronic Sales, 175 Social Hall Ave.

VERMONT

Burlington—Radio Service Lab, 703 Pine Street
 White River Junction—Electronics Supply, Inc.

VIRGINIA

Danville—Womack Radio & Supply, 513 Wilson St.
 Hampton—Buckroe Electronics, Inc., 815 Buckroe Ave.
 Norfolk—Cain Electronics, 14th and Mantiello Avenue
 Norfolk—Electronic Engineering, 4201 Hampton Blvd.
 Norfolk—Priest Electronics, 6431 Tidewater Drive
 Richmond—Radio Supply Co., 3302 West Broad Street
 Roanoke—H. C. Boker Sales Co., Ltd., 19 Franklin Road

WASHINGTON

Seattle—Western Electronic Supply, 717 Dexter Ave.
 Seattle—Seattle Radio Supply, 2117 2nd Avenue
 Tacoma—C & G Electronics, 2502 Jefferson Avenue
 Yakima—Lay & Nord, 112 South Second Street

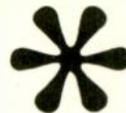
WEST VIRGINIA

Charleston—Electronic Specialties Company,
 Delaware of Randolph
 Huntington—Electronic Supply, Inc., 422 11th Street
 Wheeling—General Electronics Dist., 735 Main Street

WISCONSIN

Appleton—Valley Radio Distributors, 518 N. Appleton
 Madison—Sotterfield Electronics, 1900 South Park St.
 Milwaukee—Allied Radio, 5314 N. Port Washington
 Milwaukee—Taylor Electric, 4080 N. Port Washington
 Sheboygan—J. J. Koepsell, South 9th at Commerce

G-E SEPT TUNE-UP SPECTAC



Hugh Downs



Joe Garagiola



Mel Allen



8 G-E WORLD SERIES FEATURES



Full Lineup of 155 Local Stations
Covers 95% of U. S. Audience

Joe Garagiola hosts sports personalities on this timely show. Mel Allen, with unique "Test Pattern Commercial," sells immediate need for your service to your customers through your local station. Starts Sept. 10.

These commercials direct viewers to your name, address and phone number in your local TV Guide.

SEE AD AT RIGHT ▶

FULL-PAGE AD PLUS YOUR NAME, ADDRESS, PHONE NUMBER IN SEPTEMBER 29 ISSUE OF YOUR LOCAL TV GUIDE

Peer picture speaking the new fall shows, sports, World Series?

Now is ways to a PATTERN-PERFECT TV PICTURE EASILY, ECONOMICALLY

If you're not getting the best picture your set can deliver, do a week call one of the independent service dealers listed on the following pages. Right now, they are offering TV Tune-Up and Repair Specials. Start enjoying the new fall programs, sports and the World Series without irritation or distraction from faulty reception. A professional Tune-Up includes these 13 services—13 ways to a better TV picture:

- 1 Check horizontal circuit controls. Improper adjustment may cause "wavy" and picture instability.
- 2 Adjust horizontal and electrical components for maximum brightness and sharpness focus.
- 3 Make necessary adjustments for proper picture size, proportion and covering.
- 4 Calibrate range of line tuning control to minimize noise and picture "ramping."
- 5 Retest and check controls to assure best picture quality without overheat.
- 6 Check and correct alignment and high voltage range and leads. Distort and picture may occur strong or short circuits.
- 7 Inspect wiring for break. Insulation can become brittle and cause and cause short circuits.
- 8 Check picture tube screen face and safety glass.
- 9 Check picture tube's dust shield and mesh for proper fit. They might need adjustment or replacement.
- 10 Inspect lighting screen and various leads for correct installation or break.
- 11 Check antenna for sag, corrosion, loose connections and positioning.
- 12 Test overall performance of set to be sure service and labor are fairly charged.
- 13 Submit written recommendation for professional repair work, if needed.

FREE TV GUIDE RECIPE BOOK

It's a delicious collection of 27 taste-tempting, step-by-step recipes for soups, dips, salads, meats, seafood, desserts, drinks and more. It's yours for the asking. Get it from your local TV Guide distributor while the supply lasts.

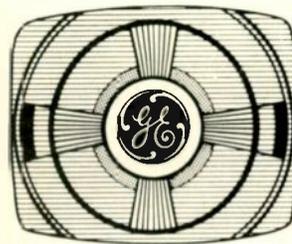
THIS WEEK, CHECK THE PICTURE QUALITY OF YOUR SET WITH THIS G-E TEST PATTERN. SEE IT ON THE G-E WORLD SERIES FEATURE OF THE TODAY SHOW ON NBC! SEPT. 28, OCT. 1, 2, 3, 4.

(Between 7:00 and 7:00 A.M., EST)

The independent service dealers listed here are offering TV TUNE-UP and REPAIR SPECIALS and also have a copy of our TV GUIDE RECIPE BOOK.

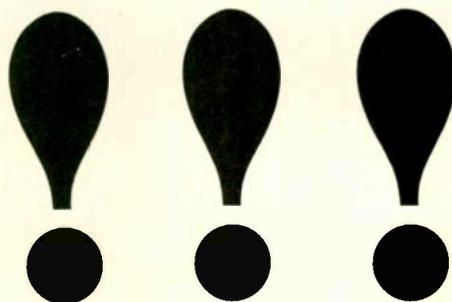
FOR YOUR ASSURANCE, BUY SATISFACTION ASIDE FOR DEPENDABLE GENERAL ELECTRIC TUBES.

EMBER



3-part program* sells immediate need for
your service before & during World Series

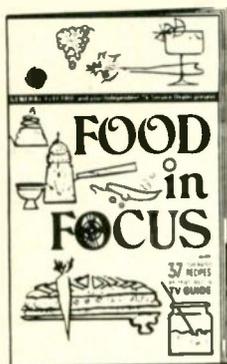
ULAR



COMPLETE PROMOTION AND DISPLAY KIT

TV GUIDE RECIPE BOOK

First time available—this exclusive collection of recipes as featured in TV Guide, plus professional tips for TV viewing enjoyment. Unique new premium is yours exclusively; helps you build goodwill and the need for your services.



Window Banners



TV Commercial Banner



Tube Pin Straightener



Ad Mats



G-E reporter, Roland Kempton, tells how September Tune-Up Spectacular

BUILDS BUSINESS FOR YOU 3 WAYS

1. Your customers prove to themselves the need for a tune-up and repair.
2. Through local television, local TV Guide and promotion materials.
3. In your city, your neighborhood, with your customers and prospects, you cash in on this TV TUNE-UP SPECTACULAR.

SEPTEMBER TUNE-UP SPECTACULAR is your campaign. It's easy to tie in. Proven effective. No red tape. Get full details from your G-E tube distributor, now. Names of participating dealers must be in by August 27. General Electric Company, Distributor Sales, Electronic Components Division, Room 1748, Owensboro, Ky.

Progress Is Our Most Important Product

GENERAL ELECTRIC

- - for more details circle 24 on page 46

I'd walk a mile...



Centralab *for* 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 $1\frac{3}{16}$ " deep from the mounting surface, and with $1\frac{3}{16}$ " 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-6205S

Centralab

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.
902G EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN
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 17 on page 46

LETTERS

TO THE EDITOR

Battery Dies Quickly

Editor, ELECTRONIC TECHNICIAN:

I'm having trouble with a Japanese tube type portable radio... The "A" battery lasts only about four hours... Can you help me?

(Name Withheld on request)

Inglewood, Calif.

• *Current drain for a four tube portable of this type is about 200 ma. Insert an accurate milliammeter in series with the radio's "A" battery circuit (with a new battery in the set). Any drain greater than 200 ma will indicate leakage in filament circuits. A quick way to check this is to pull all tubes from the radio and disconnect the battery. The hot side of the filament connections should read a very high resistance to ground. Since the filaments in these tubes are also the cathodes, any decoupling or connections to the suppressor grids should be investigated.—Ed.*

From Afar

Editor, ELECTRONIC TECHNICIAN:

We have read an issue of your ELECTRONIC TECHNICIAN Magazine and found the articles very interesting. Will you kindly advise us of subscription rates for this territory...

E. C. PADUA, JR.

Manila, Philippines

Phantom Model Corralled

Editor, ELECTRONIC TECHNICIAN:

I would like to apologize to Mr. R. J. deLaubell of G-E for stating the wrong model number on the G-E clock radio. He is correct, the model is C415, not F-22-100. The model numbers of two radios were confused hence the wrong number was given. I would like to say that we tried tape around the fishpaper holder but the holder sags in the middle and still drags. The method of repair stated in my shop hint works better.

HOMER L. DAVIDSON

Fort Dodge, Iowa

Japanese Transistor Radios

Editor, ELECTRONIC TECHNICIAN:

In the December, 1959 issue... you printed an article titled "Japanese Transistor Radio Guide" in which you listed a number of Japanese radios by brand name and the distributor of each brand. We are interested in a more up-to-date listing if it is available...

WALTER EVANS

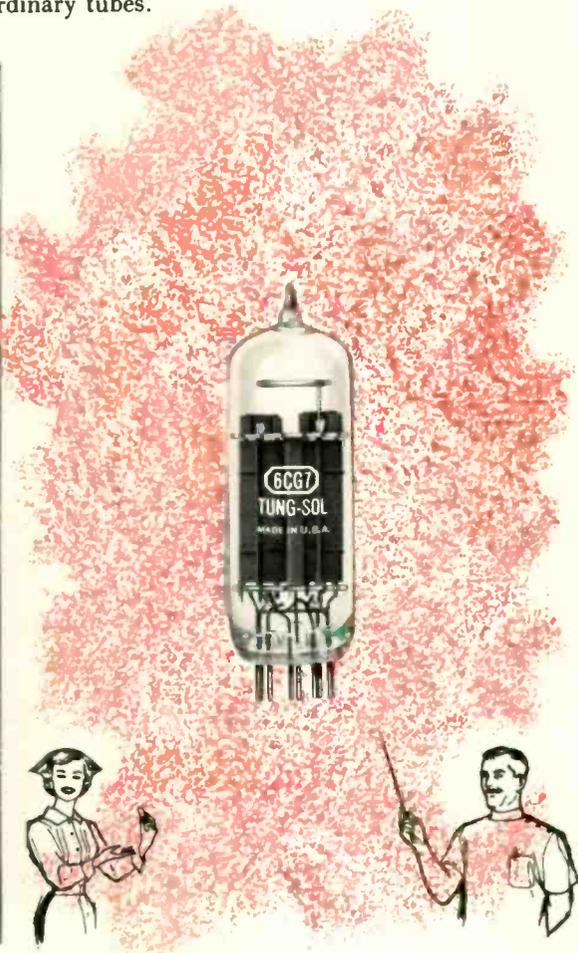
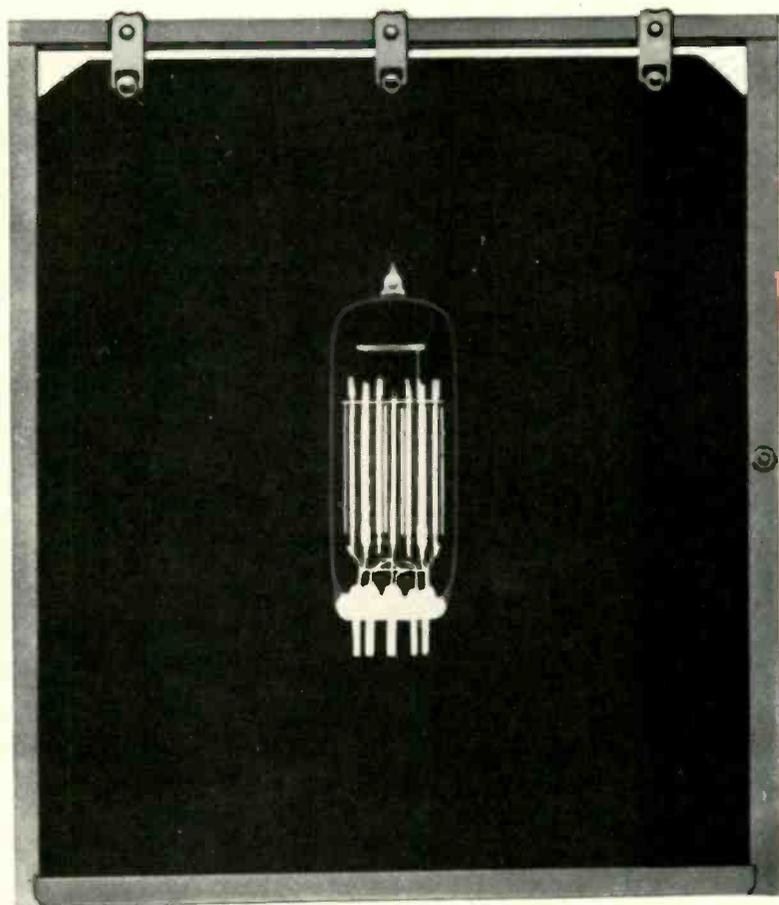
Cincinnati, Ohio

• *No sooner said than done. The latest Japanese radio listings, including brand names and distributors, appear in this issue.—Ed.*

ELECTRONIC TECHNICIAN

Controlled heater explains greater life expectancy of Tung-Sol series-string tubes

Prognosis—*excellent!* Examination of Tung-Sol series-string TV tubes reveals advanced design of heater and cathode structure, making possible *controlled warm-up time*. This explains the good health and longevity of Tung-Sol series-string tubes. Tung-Sol was a pioneer producer of 600 ma series-string tubes. But, not content merely to be among the first, Tung-Sol expanded this group to cover many applications and then added 450 and 300 ma series-string tubes for sets of more sophisticated circuitry. Time has proved Tung-Sol's diagnosis to be correct; the series-string principle radically improves tube life expectancy while retaining youthful vigor. Consultants on TV service agree that the family of Tung-Sol series-string tubes are far more immune to malfunctions of all kinds. Sets equipped with Tung-Sol series-string tubes require fewer visits and less hospitalization than sets with ordinary tubes.



R_x FOR A HEALTHY TV SERVICE BUSINESS

To avoid sluggish customer attitude, low profit levels and other complications symptomatic of poor components selection, always rely on Tung-Sol. Choose from more than 100 Tung-Sol series-string tubes to fill your prescriptions.



the first name to ask for when ordering



TUNG-SOL[®]

SERIES-STRING TUBES

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

... for more details circle 47 on page 46

TUNING IN

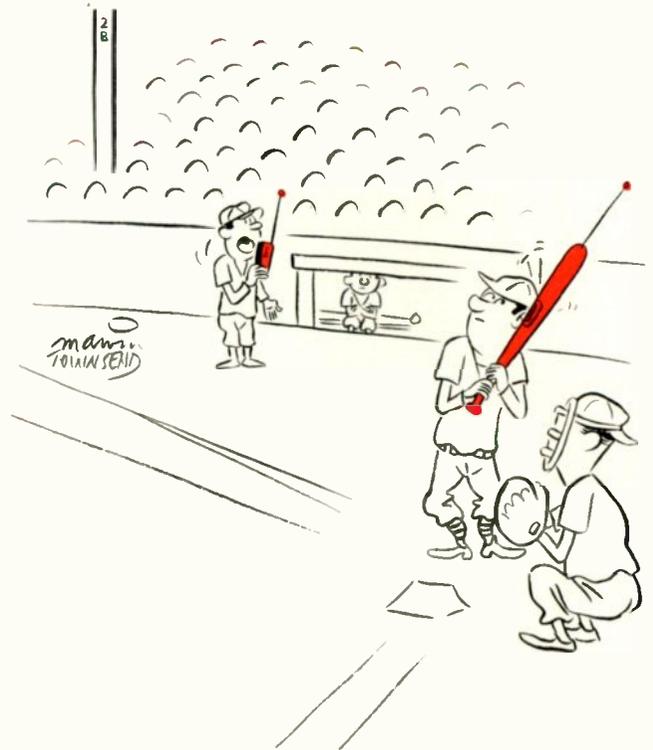
ANNUAL STEREO SALES ceased to rise in 1961, according to the EIA. The phenomenal rise of stereo started in 1958 when monophonic sales began to fall. Monophonic sales continued to fall through last year. A total drop of 534,705 phonographs was noted from 1960 to 1961. There were 3,988,680 phonographs of all types sold at factory outlets in 1961.

SOUND FREQUENCY COMBINATIONS forming "white noise" are being used to repel sharks. Tests conducted in shark-infested tropical waters with electronic equipment supplied by Solitron, show that the gentle "frying" noise can be amplified and projected through water over an effective radius of 400 yards. The equipment is controlled by a SCUBA diver in a sharkproof cage, who observes and films the effect of different white noise frequencies on sharks.

FOAM HOME



Space travelers of the future may have an easy chair and "igloo" similar to these which were formed from a new plastic foam material developed by Hughes Aircraft Co. for building light weight structures in space. Forms for the two structures were covered with thin discs that "sudsed" into a hardened mass after exposure to solar rays in a space chamber.

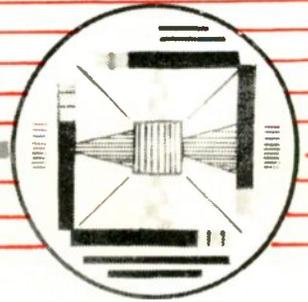


"Keep your bat a little higher—watch out for his knuckler."

TV AND RADIO workshop courses are being given for the 27th year by New York University's Division of General Education. The first six-week course was given in 1936. The rigorous, six-day-a-week schedule (minimum of 45 hours) includes training and instruction in TV production and direction, educational TV station programming and management, TV films, TV writing, and current concepts of radio programming. College students specializing in TV and radio, and men and women with experience in educational or commercial TV, study and personally operate each piece of studio equipment—including cameras, booms, lights, controls, film and slide projectors.

RADAR OVENS quickly thaw sub-zero fishing fleet catches prior to filleting and packing. Method may speed delivery of fresh fish as much as 24 hours. A specially-designed Raytheon Radarange oven has been adapted to assembly-line defrosting of frozen fish. The fish enter the deep-heating electronic device on a conveyor belt and emerge completely defrosted one minute later. Experiments are being conducted at Gloucester Technological Laboratory of the U. S. Bureau of Commercial Fisheries.

THE PICTURE

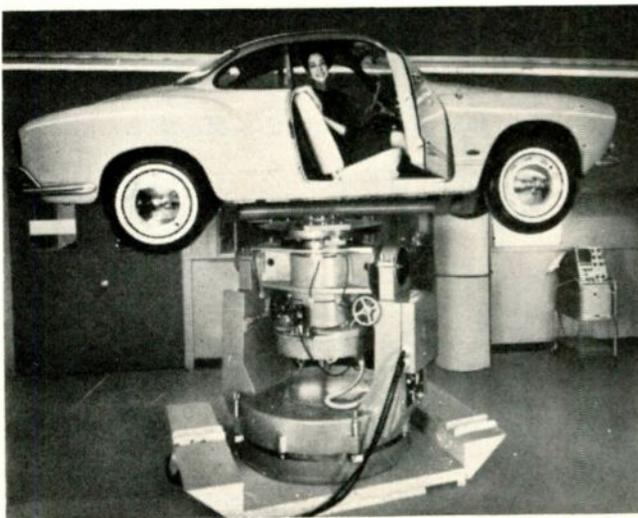


THE MIGHTY PIKE, the biggest little capacitor in the world, has been designed by the National Bureau of Standards. To be used primarily for determining the voltage ratio and phase angle corrections of instrument voltage transformers, the 1-pf capacitor is rated at 350,000 v. It was built in response to a request by the Ontario (Canada) Hydroelectric Power Commission for calibration of its 350,000 v instrument transformer. The capacitor will also serve for calibrating other instrument transformers up to 350,000 v for use as standards by public utilities and manufacturers.

ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology plans to expand its electronic data processing services with the addition of an IBM 7090 computer. "It will make the installation one of the most formidable data processing research facilities in the country," said Dr. Haldon A. Leedy, ARF director. The computer will be used for solving problems in connection with over 700 scientific research projects being carried out for both government and industry.

TRANSISTORIZED FISH ATTRACTORS are said to make it possible for any fisherman to dial a choice of bait. The device simulates the sounds of injured bait fish, minnows and insects. It was developed by elec-

IT FLOATS



A 2000 lb sports car and its attractive passenger literally floats on air to demonstrate the load capacity of a precision air bearing servomotor turntable. A similar type, designed and built by Dunn Engineering Corp., will test the inertial guidance system of the Saturn rocket. The turntable rotor rests on a thin film of compressed air, instead of the conventional ball or roller bearings.

CALENDAR OF COMING EVENTS

- August 14-16: International Conference on Precision Electromagnetic Measurements. PGI, NBS, IRE, AIEE. At NBS Boulder Labs., Boulder, Colo.
- August 15-17: Third Electronic Packaging Symposium. University of Colorado Campus, Boulder, Colo.
- August 21-24: WESCON, Western Electronics Show and Conference, Sports Arena, Los Angeles, Calif.
- August 28-30: EIA Annual Maintainability Conference, University of Colorado, Boulder, Colo.
- August 31-Sept. 9: 1962 World's Fair of Music, McCormick Place, Chicago, Ill.

tronic engineers to simulate underwater baitfish sounds. The battery powered instrument is claimed to attract various fresh and salt-water fish, including bass, trout, musky, bluegill, crappie, etc.

COMMUNITY ANTENNA SYSTEMS in 1000 areas in 45 states and the Virgin Islands made it possible for more than 3,000,000 more viewers—one out of every 54 TV equipped homes—to observe Astronaut Glenn's history-making orbital flight, according to William Dalton, president of the National Community TV Association.

UNUSED TV CHANNELS on sets in motels, hotels, hospitals, schools and apartment houses, can now be employed to furnish a-m/f-m music. The First Electronics Corporation has developed a radio type package called MICRO/MITTER which eliminates the need for inter-wall wiring. The device may also be used to transmit closed circuit or educational TV to a number of TV sets.

VEHICULAR COMMUNICATIONS is expected to benefit through the 13th National Conference of the IRE VC Professional Group to be held in Anaheim, Calif., Dec. 6-7. Manufacturers and users are urged to take advantage of this opportunity to share their experiences in this rapidly expanding communications field by submitting papers on subjects covering vehicular systems and equipment designs. Discussions on new or unusual system techniques, applications of new types of components or related circuitry, interference reduction or spectrum utilization are invited. An abstract of 500 words is required for review by the Papers Committee. Abstracts should be mailed to William J. Weisz, Motorola, Inc., 4501 West Augusta Blvd., Chicago 51, Ill., by Aug. 15, 1962.

TV MANUFACTURERS TECHNICAL DIGEST

GENERAL ELECTRIC

TV Color Chassis "CW" Series—Production Change

In VHF tuners ET6X125, and ET86X128, the 6CWR4 is replaced by a 6DS4 tube. Installation of this new tube requires removal of the agc bleeder resistor. The agc bleeder resistor is R20 in the ET86X125 tuner and R14 in ET86X128 tuner.

The dynamic convergence board, PW800 has also been turned around so that the controls face the rear of the receiver. "Touch-up" convergence adjustments can be accomplished without removing the set's back, by inserting a screwdriver or alignment tool through the holes in the back.

MAGNAVOX

Multiplex Adapter 70-01-10—Correcting Background Noise

Background noise which may be noticeable in some of these units is identified as a hiss or rumble. The trouble has been traced to modulation of the 38 kc carrier by atmospheric noise.

To correct this, R-24, which couples the 38 kc signal from L6 to the L-R detector should be changed from 33 k to 100 k. This change has been incorporated on units stamped 70-01-20.

MOTOROLA

TV Chassis TS-568 Code A-01—To reduce Vertical Frequency Drift

Vertical frequency drift caused by temperature change, can be corrected by changing the saw-tooth forming capacitor C-604 from 0.02 μf tubular type to 0.02 μf ceramic type.

PACKARD BELL

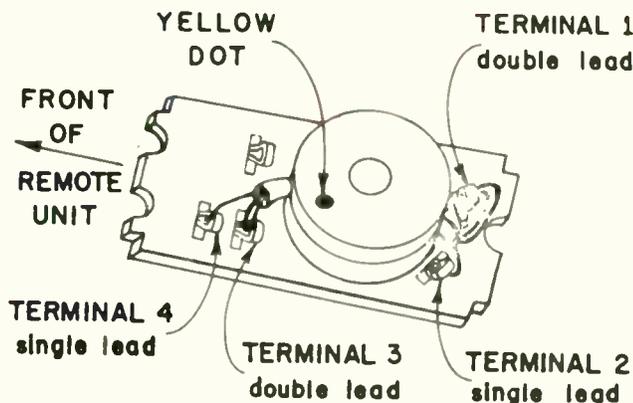
TV Chassis 88-13—Wrong Capacitor Installation

Service manual BC-95 correctly shows the value of C-79 as 100 v, 0.033 μf . Some sets were built with a 600 v unit by mistake. Sets which are being repaired should be checked to determine if they are equipped with a 1000 v capacitor. If not, the existing capacitor should be replaced with a 1000 v unit.

RCA

Remote Control Unit—Lead breakage on Oscillator Coil

Extreme care should be exercised when servicing this unit to avoid breaking the oscillator coil leads.



RESISTANCE READINGS OF OSCILLATOR COIL:	1-2	.5 ohms
	1-3	.3 ohms
	2-3	.8 ohms
	3-4	34.0 ohms
	2-4	34.8 ohms

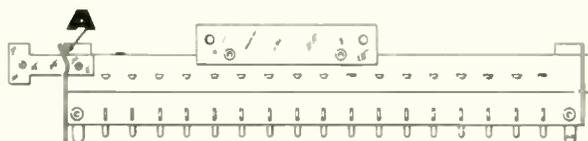
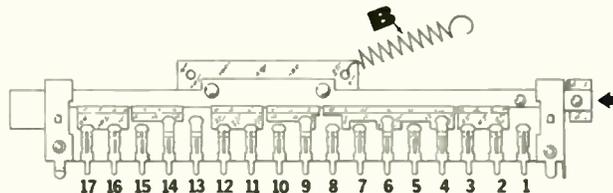
Remote Control Unit Oscillator Coil Used Should Be Wired As Shown.

If breakage should occur, the accompanying diagram is supplied to facilitate rewiring the unit. If the leads are too short to make good soldered connections, the coil should be replaced. The resistance readings are average measurements taken with the collector terminal of Q2001 disconnected. The mounting board is supplied with new replacement coils.

WEBCOR

Tape Recorders Model 2202 and 2202-1A—Possible Switch Arm Breakage

To prevent possible switch arm breakage, the assembly should be modified as follows:



Modification to Webcor tape recorder switch prevents possibility of breakage.



P. R. MALLORY & CO. Inc.
MALLORY

Tips for Technicians

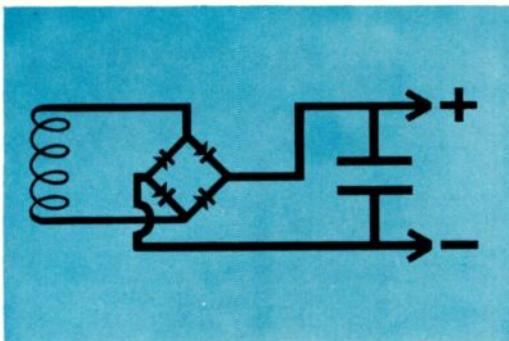
Distributor Division, P. R. Mallory & Co. Inc.
P. O. Box 1558, Indianapolis 6, Indiana

Hints on Reducing Hum . . .



In high fidelity sound systems . . . and in many kinds of commercial and industrial electronic equipment . . . reduction of 60-cycle hum is one of the toughest problems that a technician has to tackle. Most hum comes from 60-cycle voltage sneaking into the signal circuit. There are, of course, many well-known precautions that should be observed . . . using shielded or coax cable between major components, keeping cables short especially in the low-level portion of the system, making sure connectors are tight. Here are some other thoughts that may be useful.

Power supplies in sound systems . . . hi-fi or commercial . . . generally operate at higher temperatures than those encountered in radio or TV. So it pays to be particular about filter capacitors. It pays to use electrolytics rated at 85° C. Those rated at only 65° C start to run into trouble. Then too, because of the added heat, the vent construction is important. In other words, "How good is the seal?" Our tip is to always use Mallory FP-WP electrolytics . . . voltage ratings are conservative and dependable . . . they have excellent stability at high temperature . . . and they all have *etched cathode* construction. This latter is extremely important in avoiding hum. We covered the reasons in a previous TIP (remember?).

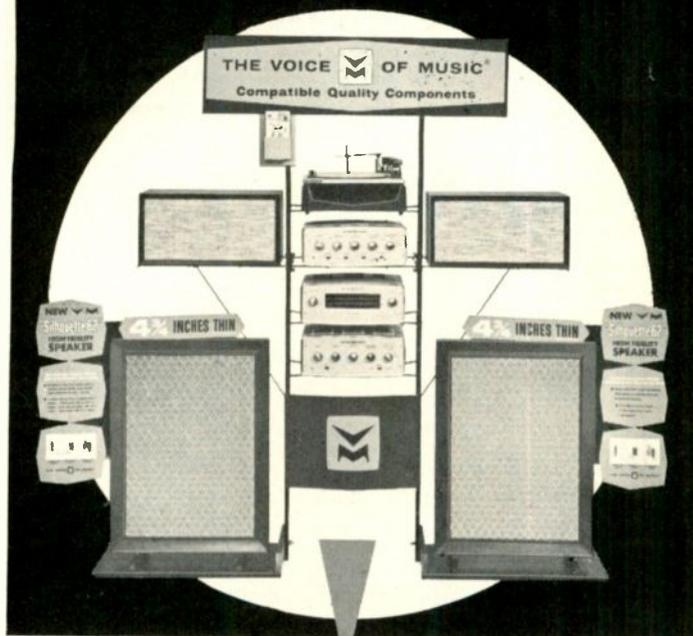


Here's another source of hum . . . filament circuits. Many of the highest quality sound systems use a DC filament supply in the preamplifier. It's easy to add this refinement to any system. All you'll need is a Mallory FW-50 "packaged" silicon rectifier circuit. It's encapsulated in a tiny plastic block and takes up very little space. Simply connect the FW-50 to the circuit, add a WP-042 electrolytic and filament hum disappears permanently. If you want more specific information, write and ask us.



Another tip: call on your Mallory Franchised Distributor for prompt service, at sensible prices, on Mallory capacitors, switches, silicon rectifiers, controls, and batteries . . . and for any other parts you may need.

ADD NEW PROFIT TO YOUR HI-FI COMPONENTS BUSINESS THE EASY WAY!



- Priced to attract *new* customers, this complete line of quality components is effectively displayed and demonstrated in only 5 square feet.
- 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 feature posters. It actually displays nine V·M component products!



'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.



Changer Base Model 1438. For 'Stere-O-Matic'® Changers. Pre-wired receptacles.



Stereophonic High-Fidelity Component Amplifier Model 1428. 60 watts (peak): 30 watts per channel. Frequency response, 20-30,000 cps.



High-Fidelity FM Stereo, FM, AM Component Radio Tuner Model 1465.



Precision-Built AC Stereo Amplifier Model 1448. 40 watts (peak); 20 watts per channel. Frequency response, 40-25,000 cps.



"Silhouette 62" High-Fidelity Component Speaker System. Three speakers: 10" woofer, 6" mid-range, 3.5" tweeter. Frequency response, 30-16,000 cps.



High-Fidelity Component Speaker Model 32. Three speakers: Two 6" and one 3". Frequency response 60-12,000 cps.

YOUR V·M DISTRIBUTOR IS READY NOW TO GIVE YOU ALL THE DETAILS AND POINT OUT THE MANY ADVANTAGES OF THIS NEW V·M COMPONENTS LINE. CALL HIM TODAY!

THE VOICE OF MUSIC



V·M CORPORATION • BENTON HARBOR, MICHIGAN
KNOWN FOR THE FINEST IN RECORD CHANGERS, PHONOGRAPHS AND TAPE RECORDER
- - - for more details circle 48 on page 46

TV MANUFACTURERS TECHNICAL DIGEST

1. Bend switch mounting frame as shown in A of the accompanying drawing.
2. With switch arm fully retracted, apply thumb pressure to the wiper arm as shown by arrow. This will position the bend in the mounting frame.
3. With the switch arm fully retracted, check for continuity between contacts 6 and 7. If continuity is found, relieve bend in mounting frame until there is no continuity.
4. Replace switch spring (B) with new spring No. 46P609. The replacement spring will be colored red to facilitate identification between new and old springs.

SYLVANIA

Code CO3 Revision—To Incorporate Latest Circuits

1. Remove C-411, 0.0047 Capacitor.
2. Plate-horizontal afc, PP400, changed to PP400-1. Sylvania part No. 190-0062.
3. Plate-horizontal oscillator, PP402, changed to PP402-1. Sylvania part No. 190-0061.
4. Change R-410, 10k to R-401-1, 3.9k.
5. Change R-414, 1k to R-414-1, 1.2k.

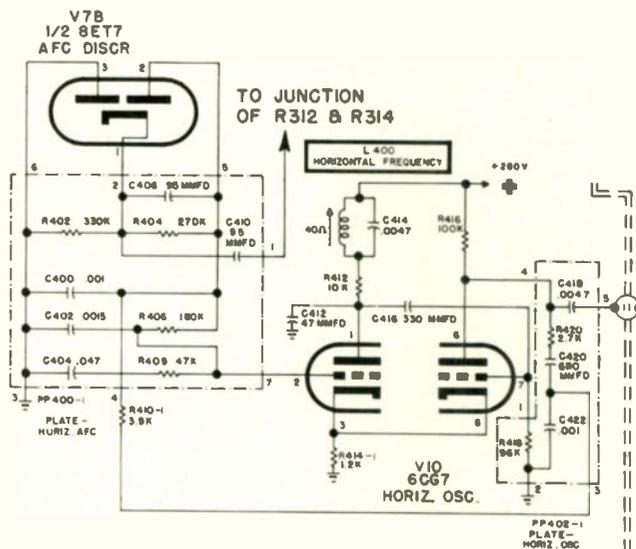


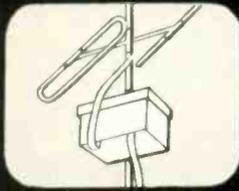
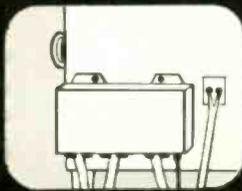
Diagram Shows Latest Changes for Sylvania Chassis, code CO3.

ZENITH

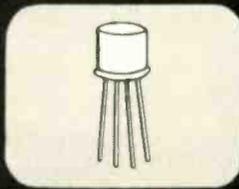
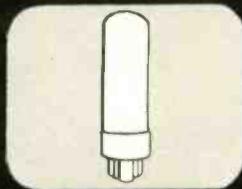
16H28 Chassis—Reject Switch

If adjacent channel interference is experienced in these chassis, a switch located at the rear of the chassis can be turned on to eliminate it. The switch is on the "out" position when the set is shipped from the factory. When maximum picture detail is needed and adjacent channel interference is not a problem, the switch should be left in the "out" or open position. In the open position, the 47.25 mc sound trap is removed from the circuit giving the i-f a wider pass band.

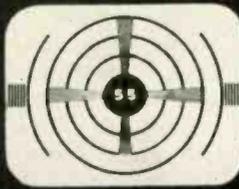
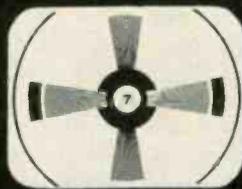
select the Blonder-Tongue home TV booster that's best for you



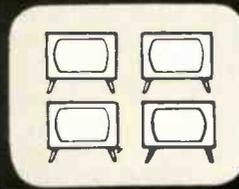
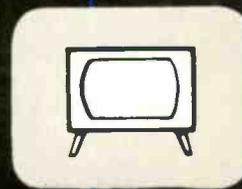
indoor or outdoor



tubed or transistor



VHF or UHF



1 set or 4 sets

*Stripless terminals on all these Blonder-Tongue TV amplifiers assure positive electrical connection with the turn of a screw.

new! IT-4 TRANSISTOR 4-SET TV/FM BOOSTER.



- excellent fringe area reception on 1 to 4 sets from a single antenna—low noise transistor circuit increases signal voltage from 3 to 8 times on a single set.
- A complete home TV system — improves reception on up to 4 TV or FM sets Exclusive built-in 4-set coupler.
- long term performance — long-life transistor means no heat dissipation problems, no tubes to burn out or replace.
- exclusive neutralizing circuit minimizes overload problems (in areas with strong local signals, however, use a tube powered booster such as the B-33 or B-24c).
- easy to install anywhere in the home.List \$33.00.

new! B-33 LOW COST 3-SET TV/FM BOOSTER.



- excellent fringe area reception — frame-grid tube circuit provides high gain, low noise — more than doubles the signal voltage for a single set.
- sharp, clear pictures on up to 3 sets from a single antenna — when 3 sets are used, each set gets as much signal voltage as is picked up by the antenna. Excellent inter-set isolation — amplifies color signals.
- ideal where there are both strong and weak channels — a tubed amplifier minimizes the problem of overload.
- easy to install anywhere in the home.List \$19.95.

4 PERFORMANCE-PROVED VHF & UHF BOOSTERS

MODEL AB-4-AC, Transistor Mast-Mounted TV/FM Booster w/remote AC power supply. Provides brilliant reception on up to 4 TV or FM sets from a single antenna. Mast-mounting 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 provide signal 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 \$15.70.

MODEL UB, UHF Booster. Brings in UHF where all other methods fail. 5 models cover all channels from 14 to 83.List \$88.00.



For better TV reception — anywhere — see your Blonder-Tongue service-dealer. Write for literature.

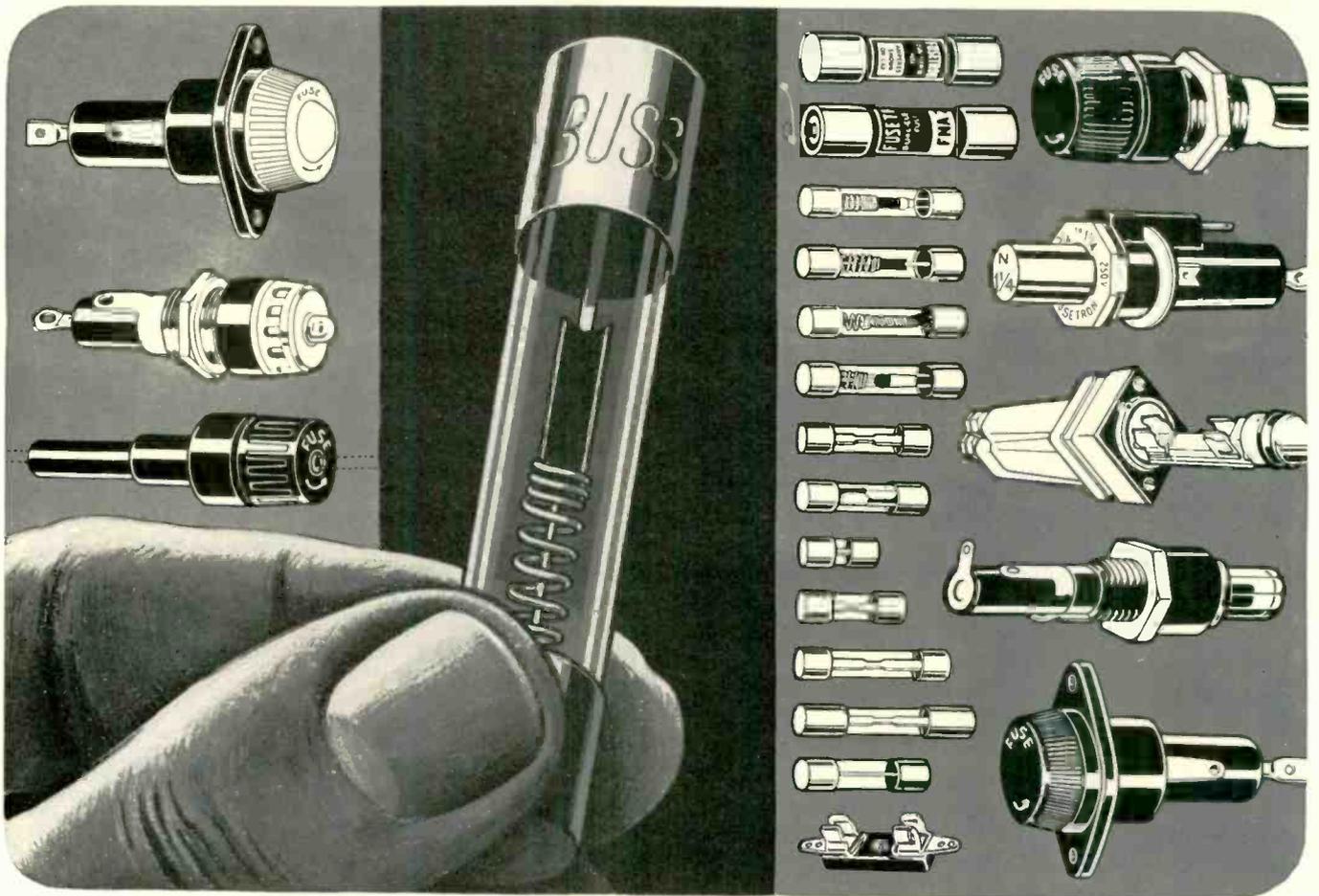
engineered and manufactured by

BLONDER-TONGUE

9 Alling St., Newark, N. J.

Canadian Div: Banco Television Assoc., Ltd., Tor., Ont, Export: Koche Int'l. Corp., N. Y. 16—CABLES, ARLAB home TV accessories • closed circuit TV systems • UHF converters • master TV systems

--- for more details circle 14 on page 46



For Every Electrical Protection Need

*there's a safe and
dependable BUSS or
FUSETRON Fuse!*

BUSS fuse engineers have consistently pioneered the development of new fuses to keep pace with the demands of the Electronic industry. Today, the complete line includes:

Single-element fuses for circuits where quick-blowing is needed;—or single-element fuses for normal circuit protection;—or dual-element, “slow-blowing” fuses for circuits where harmless current surges occur;—or indicating fuses for circuits where signals must be given when fuses open. Fuses range in sizes from 1/500 amperes up—and there's a companion line of fuse clips, blocks and holders.

Save time and trouble
by furnishing only BUSS fuses

It's more convenient to stock one line of fuses—stock handling, records and inventory problems are simplified. The unfailing dependability of BUSS fuses protects you against “kicks” or call-backs that might otherwise result from faulty fuses.

For more information, write for BUSS bulletin SFB.

**BUSS: The complete line of fuses and
fuse mountings of unquestioned high quality.**



BUSSMANN MFG. DIVISION
McGraw-Edison Co.
St. Louis 7, Mo.

... for more details circle 15 on page 46
ELECTRONIC TECHNICIAN

AUDIO NEWS LETTER

ALTEC LANSING has appointed W. H. Johnson as assistant marketing director with responsibility for coordinating the company's national marketing operations.

CBS LABS has developed Audimax, which acts as a well-trained, super-alert broadcast engineer in maintaining optimum modulation or recording level. Audimax I and II are designed for broadcasting, recording and background music systems; F-M broadcasting, TV, motion picture and public address.

EMPIRE SCIENTIFIC CORP. is conducting a "life-span contest" on its 880p mono/stereo cartridge and will announce the actual duration of the test soon.

FANON-MASCO adds a new a-m/f-m home radio-intercom, Model 5500, to its line.

FIDELITONE appoints Nation Wide Walker Jimieson, Inc., as an exclusive electronic parts distributor for Fidelitone products. Nation Wide has outlets in the Chicago Metropolitan area, Gary, Hammond and surrounding cities.

FISHER RADIO CORP. appoints Paul E. Bryant, formerly with Hoffman Electronics Corp., as General Sales Manager.

GOTHAM AUDIO CORP. control passes to Stephan F. Temmer as he acquires all of the outstanding stock interest formerly held by Hal Michael.

HARMAN-KARDON reports a new series of popular-priced tuner and amplifier kits. The new series consists of the Model A50K, a 50 w integrated stereo amplifier; the Model A30K, a 30 w integrated stereo amplifier, and the Model F50XK F-M stereo (multiplex) tuner.

HARTLEY PRODUCTS introduces its first 12 in. speaker, the Model 312, with a cast aluminum frame, a 5 3/4 lb Alcomax II magnet with 16,000 lines sq/cm. Impedance is 8 ohms and frequency response is 20-20,000 cps. In oil rubbed walnut enclosure \$155 in walnut \$215.

H. H. SCOTT offers an all-silicon solid state high power amplifier providing 300 w of continuous power from 20-25,000 cps. Known as type 255, the unit lists for \$2,800.

JENSEN INDUSTRIES announced that a survey indicates a total of 68 percent of all dealers now stock and sell the company's needles.

KEUFFEL & ESSER announces formation of an audiovisual division. The company will market its products through a national network of audiovisual distribution outlets.

LAFAYETTE unveils a 2 speed 4-track stereo playback which is reported to have a rugged positive action lever control mechanism for play, fast forward and rewind. Suggested retail \$89.50.

LANGEVIN announces a new compressor limiter designed for recording, background music applications and TV-broadcast use. The compressor-limiter, Model AM-5301, has 100 microsecond attack time with a compression ratio continuously variable up to 5 to 1.

ALL NEW
SENCORE
component
substitutor



MODEL RC121

All your favorite Sencore Substitution Time-Savers in One Compact Unit

A complete range of carbon resistors, wire wound power resistors, capacitors, electrolytics, and universal selenium and silicon rectifiers.

Imagine, all of these hard to locate parts at your finger tips for on the spot substitution. Say goodbye to messy, crumpled parts, unnecessary unsoldering and soldering of components for testing purposes only. Save valuable servicing time and be sure, by substituting.

NEW . . . each section operates independently with a value close enough for every substitution need. Components in each section are isolated from chassis and from the other sections. For example, a complete power supply can be constructed using the RC121 Components only.

NEW . . . dual electrolytics provided. A new circuit enables you to substitute up to 25 single electrolytic values or 9 duals. Exclusive surge protector provides protection on both singles and duals for both you and the circuit.

You save space and money. Equivalent Sencore substitution pieces purchased individually (H36, PR111, RS106, ES102) cost you \$54.00

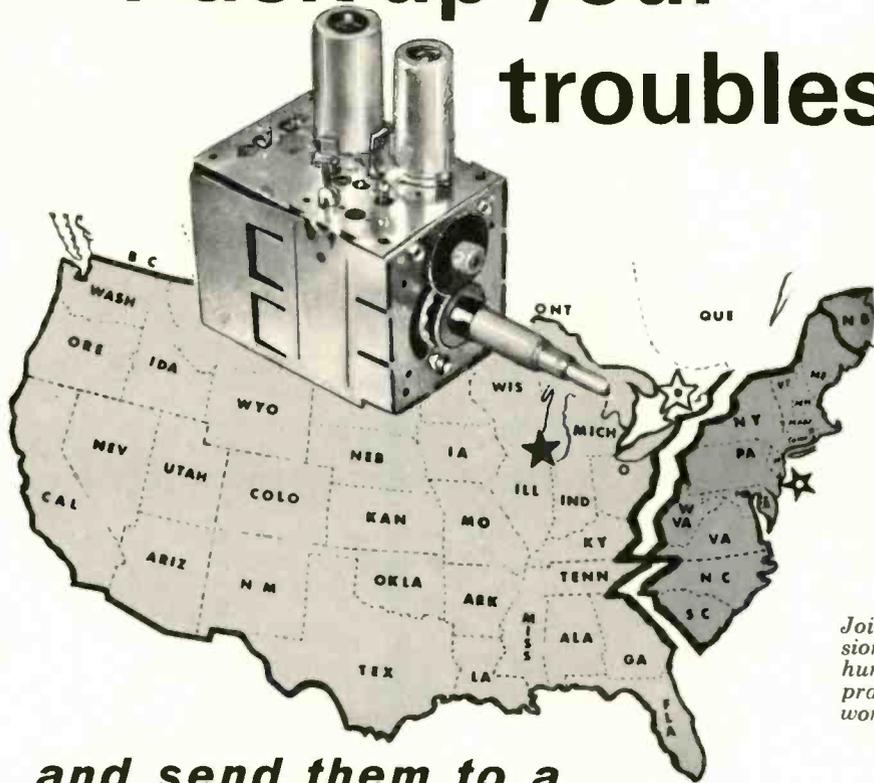
RC121 (all hand wired, all American made) only 3995
RC121K (Kit) 2795

Now in stock at your Sencore Distributor. See him today!

SENCORE
ADDISON 2, ILLINOIS

... for more details circle 39 on page 46

Pack up your troubles



Join the ranks of satisfied professional technicians who have sent hundreds of unsolicited letters praising the high quality of Castle's workmanship and service.

and send them to a

CASTLE TV TUNER SERVICE CENTER

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.

A Castle Overhaul assures you of the best Service available ... because overhauling your TV Tuner is our only business ... behind every Castle overhaul there is more than a decade of this highly specialized experience. We are proud of the work we do and at today's values our overhaul charge is a real bargain.

"Tough dog" TV Tuner troubles ... difficult or impossible for the serviceman ... are routine at Castle.

Send for **FREE** Mailing Kit and complete details.

ONE PRICE

9⁹⁵

ALL MAKES

**VHF TUNERS
UHF TUNERS
UV COMBINATIONS***

*UV combination tuner must be of one piece construction. Separate UHF and VHF tuners with cord or gear drives must be dismantled and the defective unit sent in.

90 Day Warranty

CASTLE TV TUNER SERVICE, INC.

CHECK MAP FOR THE
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SERVING YOU



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IN CANADA: 136 MAIN ST., TORONTO 13, ONTARIO



Pioneers in TV Tuner Overhauling

Keeping Service Independent

A number of TV-appliance retailers, particularly some of the larger outlets, have found servicing to be somewhat unprofitable. When a retailer decides to have someone else do his servicing for him, he has his choice of working with an independent service company, or in some areas with factory central service.

The National Appliance and Radio-TV Dealers Association has become sufficiently concerned with the problem as to pass a resolution which reads in part: "Be it resolved that independent appliance radio-TV dealers be urged to establish efficient servicing departments, either owned by them or controlled by them, so that the service rendered becomes their responsibility, for failing to accept this responsibility removes one of the main reasons for their continued existence."

NARDA's point should be well taken. Where a dealer is reluctant to carry the responsibility of service, his role in the economic channel from manufacturer to consumer is greatly reduced. Greater reliance on factory central service means that the independent dealer becomes little more than a merchandise outlet.

However, we assume that the NARDA leadership is realistic enough to recognize that a resolution does not carry the weight of economic necessity. When a retailer decides that service is an unprofitable expense which he cannot absorb in his overhead, it is difficult for this dealer to recognize that in the long run failure to give service is diminishing his role in the industry.

Our view is that retailers should have their own service department if they are able to render good service. But where a retailer decides against it, he should set up an arrangement with an independent service company. There are many good reasons for this. A working relationship with a service company which is not heavily engaged in TV-appliance sales can bring

TV Leads Telephone

If anyone has any doubts about the popularity of TV (you would have to be a hermit living in a cave), just listen to what the Census Bureau reports. Back in 1950, only five million households had TV. In 1960, TV households jumped to 46 million, out of a total of 53 million households in the country. This means that there are 4 million more households which have TV than the 42 million households which have telephones in or near their houses or apartments.

Lest we forget, that still small voice of radio beats out them all. Some 48,500,000 households in the country have one or more radios, says the Census Bureau.

referrals to the appliance retailer. Furthermore, the independent service company is frequently well known in the community, and the owner will often have many personal contacts with customers. A small independent is usually willing to go out of his way to accommodate a retail store which sends him business, while central service is less flexible and more impersonal.

Still another point is that factory central service is frequently more expensive than an independent service. A customer who realizes that he paid more for a repair by going to the dealer from whom he purchased the television set, for example, may build up enough resentment to take his next purchase elsewhere. Yes, independent service has many advantages.

Just as the man who built a better mouse trap should not expect people to beat a path to his door, independent service companies should not sit back and expect retail-only stores to come flocking to them. Get out and sell these merchandisers on the advantages of tying up with your service operation. Don't hide your light under a barrel.

Satellite TV Broadcasting

At this writing, Congress is considering a plan to establish a world-wide network for broadcasting television. This global communication system would utilize satellites in orbit to reflect signals from the transmitter to distant locations.

An example of what such a system can do was a demonstration on April 24th and 26th, this year. Under Air Force sponsorship, Massachusetts Institute of Technology transmitted a TV picture from California to Massachusetts, over 2700 miles away.

The signals went 1000 miles up to Echo I, the orbiting balloon which has been in space for two years. These signals were reflected to earth, travelling close to 4000 miles to make the 2700-mile jump.

The TV pictures were of poor quality because the received signals were weak. This is due to the fact that Echo I has passed its expected life in orbit, has become partially deflated and wrinkled. The result is a 50% reduction in reflection capabilities. Also, the 100-foot diameter balloon does not hold to its course as well as the heavy satellites, and so its orbit cannot be predicted accurately more than a few hours in advance.

For the TV technician, a new era of broadcasting is in the offing. At the same time, there may very well be new problems in terms of reception requirements, transmission schedules and interference. We will keep you posted on new developments.



Rapid trouble symptom diagnosis by visual inspections, proper voltage and current checks, is key to profitable repair

Making MONEY On Transistor



by Ben Allen

experience required for successfully troubleshooting new transistor TVs which are now appearing in rapidly increasing numbers.

The key to profitable transistor repairs, of course, is rapid service. This is frequently easier said than done. But if the radio cannot be repaired quickly, time is wasted and a profitable service charge may be too near the cost of a new radio. Rapid service is easily possible if you know all the "tricks" involved.

New Techniques

Methods used in servicing vacuum tube radios are not directly applicable to transistor radios. Although similar tests are used and circuit principles are the same, we already know that circuit operation is based on *current* principles instead of the familiar *voltage* characteristics of vacuum tubes. Therefore, methods of applying these tests are not the same.

"Rough" voltage checks will usually help the experienced technician pinpoint trouble in tube sets but a careful analysis of each voltage is required in transistorized radios. This is true primarily because smaller variations have a greater effect on operation since small signal and bias voltages are used in transistor circuits. One d-c volt, for example, in tube circuits may often be only 5 percent of the signal voltage. But 1v in transistor circuitry

can exceed the entire signal voltage.

Since voltages requiring accurate measurements in transistor radios are usually only a fraction of a volt to about 5 v, a VTVM with an accurate low voltage scale is an absolute necessity. Although a 20,000 ohm/v meter will not upset the circuit in some cases, when in doubt, use a VTVM.

Servicing Procedure

A simple check which frequently uncovers more faults than any other, is a thorough visual inspection. Small portables generally receive more abuse than other types of equipment and consequently have a high rate of mechanical failures. Breaks in the PC boards, broken components, (including i-f transformers) and corrosion from a leaky battery or from salt spray or other corrosive liquids and fumes, are only a few causes of failure.

After a preliminary visual check, the battery should be changed. A weak battery can cause a large number of symptoms which may seem highly improbable on first consideration. Change or check the battery to eliminate this trouble symptom. If the set still does not work, leave the new battery connected to the set (if there are no shorts in the set) or use a well regulated power supply for further testing.

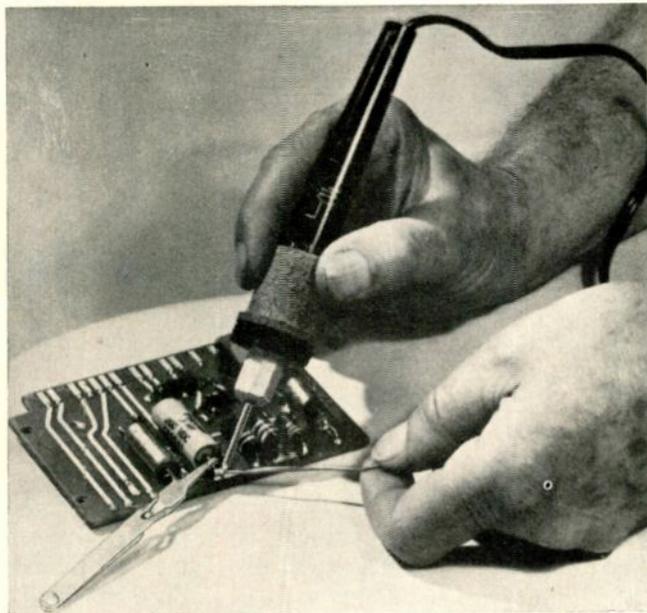
The radio will probably need to be removed from its case at this

■ Transistor radio servicing can make the difference between lingering failure or a profitable business. In many areas too, transistor radio servicing, including battery replacements, can compensate for seasonal slumps in regular TV service income.

Many TV-radio service technicians repair as few transistor radios as possible. They probably do not realize that regular TV service business can be lost by allowing competitors to service the transistor radios. Many customers feel that the technician who is too busy (or cannot) repair a transistor radio will not do a good TV repair job. Hence, they frequently take *all* of their business elsewhere. Moreover, technicians who repair transistor radios are obtaining vital technical

Radio Repairs

Heat sink is used to prevent damage to heat sensitive components used in transistor circuitry.



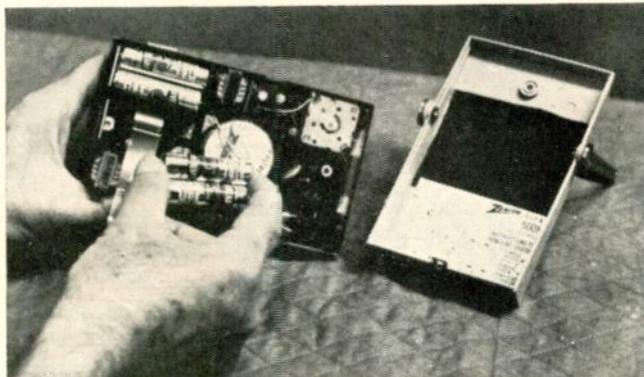
point. This is the time to make a more complete visual inspection. Resistors are seldom damaged in transistor radios since the power involved is limited. Don't wait till the last check, however, to test resistors—they do fail. Some manufacturers use low wattage resistors in low resistance emitter circuits which change value easily.

A check of the total current drain from the power supply should also be made at this time. Manufacturers' literature usually gives this information for no volume and for a specified output. Radios with class B output will draw considerably more current when operating at an increased volume than at little or no volume. The easiest way to check the current drain is simply to connect a milliammeter across the off-on switch with the set turned off. The meter completes the power circuit, and no wires have to be disconnected. This should be the first check if a customer complains of short battery life.

Shortened battery life will also be encountered when the radio refuses to operate on a lower than normal voltage. As the battery ages, its voltage under load decreases and causes the radio to stop operation prematurely. Poor operation at low voltage can be checked by inserting a 500 Ω rheostat in series with the battery.

A voltmeter is then placed across the supply terminals at the radio.

Many radios are built so that batteries can be installed with reverse polarity. Transistors may be destroyed if the radio is turned on with the battery polarity reversed.



By turning the rheostat till the radio stops operating, the cut-off point can be measured with the voltmeter.

Most well-designed transistor radios will operate with battery voltages near 70 percent of full rated voltage load. In no case should the radio fail to operate with less than 80 percent of rated battery voltage under load. The radio's converter stage is usually at fault when a new-battery or maximum voltage is required to make the radio operate. A new converter transistor often cures the trouble.

If the cause of a malfunction cannot be located after battery substitution and a complete visual check, a more sophisticated approach will be necessary to solve the problem. Signal injection or signal tracing will be necessary to isolate the defective

stage, and a VOM or VTVM may be used to locate the faulty component.

Troubleshooting

Technicians usually have pet procedures for troubleshooting vacuum tube radios; signal tracing or signal injection may be used. In either case, a capacitor should be placed in series with the test probe to eliminate the possibility of upsetting the circuit's d-c balance. In addition, a resistor—about 10K or so—should be connected in series with the test lead to prevent disrupting the circuit's a-c balance.

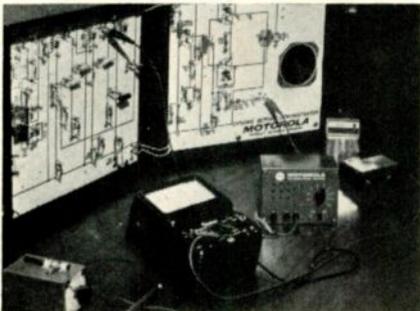
Injection and tracing techniques are similar to those used with tube receivers with test points being the base, collector and in some instances the transistor emitter.



MAKING MONEY



It will usually be of great value if the manufacturer's literature is available giving the voltages and resistances at various points in the set. When the defective stage is located, voltage checks will be found out-of-tolerance at one or more of the transistor elements in that stage.



Demonstrator designed by Motorola to be used with a booklet in their transistor radio troubleshooting program.

Biasing components, shorted and open components must be all taken into consideration in trying to deduce the fault.

Symptoms which are similar to those found in vacuum tube receivers are also found in transistor radios. Moreover, these symptoms are often caused by similar faults. Distortion, for example, is usually associated with the output stage. This is generally caused by faulty biasing or defective coupling in both vacuum tube and transistor radios.

After a transistor is replaced the radio may need realignment. Parameter variations from one transistor to another are generally greater than those in vacuum tubes and substitutions in r-f or i-f stages will often cause "whistles" until the set is realigned or neutralized.

When a "whistling" radio is brought in and alignment is not the

cure, a careful check may reveal a neutralizing capacitor which is open or reduced in value. Similarly, a new transistor may cause a radio to develop whistles as previously mentioned. Experimentation is usually the best method to find the correct value for a new or replacement neutralizing capacitor. These capacitors may range in value from 2 to 70 pf. A good quality replacement should always be used. Low battery voltage will cause similar oscillations. Check the battery first!

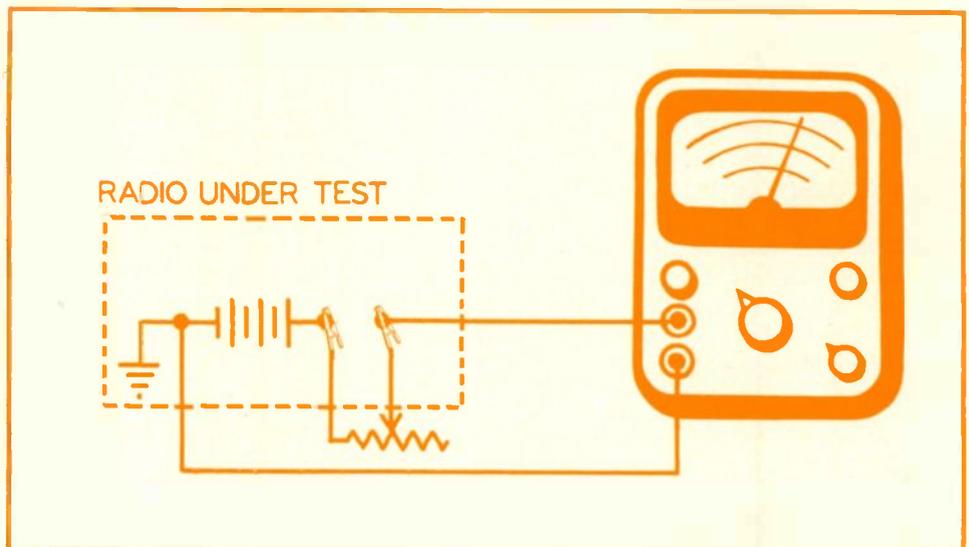
Precautions

Transistors are actually more rugged mechanically, than vacuum tubes. There are certain precautions, however, that should be observed to avoid damage to the transistor which would not occur under similar circumstances with a vacuum tube.

Leads of transistors are their most fragile parts. If these leads are bent several times without considering the point of stress, they may break off at the point of entry into the transistor case. Of course, transistors cannot be repaired when this happens.

Exercise care to keep test equipment voltage surges off transistors while making tests. Any test equipment leakage into the transistor

Minimum operating voltage can be checked quickly by connecting a 500 ohm rheostat in series with the battery. Connect the rheostat in one side of the battery line or across the on-off switch. The rheostat is adjusted until the radio stops operating; minimum operating voltage is then found by measuring with a VOM.



could prove fatal to the transistor. Soldering iron tips should be connected to an earth ground. Though an iron may exhibit excellent resistance to line leakage when cold, when heated, the leakage may be high enough to damage all but the toughest transistors.

Careless haywire set-ups can also prolong service time and result in transistor damage, particularly to audio output circuits. If the bias is temporarily removed from a transistor, for example, increased conduction through the output stage builds up a field in the output transformer. When bias is restored the collapsing field can cause a damaging surge. Similarly, if the battery connections are reversed, all transistors conduct heavily. If the transistors are not damaged by heavy conduction, when the battery is removed, collapsing fields in transformers may damage them.

When a bad transistor is found, the associated circuits should be carefully tested before replacing it. Since transistors are hardy, failures are likely to be caused by another component break-down in the circuit. Installing a new transistor at the wrong time will only decrease your profit margin by the price of one transistor and your wasted time.

Be sure to use a heat sink when

soldering transistor lead connections. A pair of needle-nose pliers or a special heat-sink clip should be used on the lead between the iron and the transistor.

Many technicians use "finger injection" in vacuum tube radios quite successfully. Indications are that the no-shock-hazard low voltages in transistor circuitry make this an even more desirable technique for transistors. A word of warning, however. Some low level stages in amplifier circuits can actually develop a large enough surge from this method to cause failure of the output transistors. Static charges built up on the body can also cause breakdown of transistors at the point of injection. If you've been moving around the shop and must touch the circuitry, touch a good ground first. This will remove the charge from your body. Always use leak-free, well grounded test equipment when probing or testing transistor circuits.

Damage can also result from poor testing methods. If a transistor tester is not available, an ohmmeter may be used; the transistor can be tested as two diodes back-to-back. The meter you use for this test should be checked to insure that battery voltages and series resistance of the meter will not exceed the voltage and current ratings of

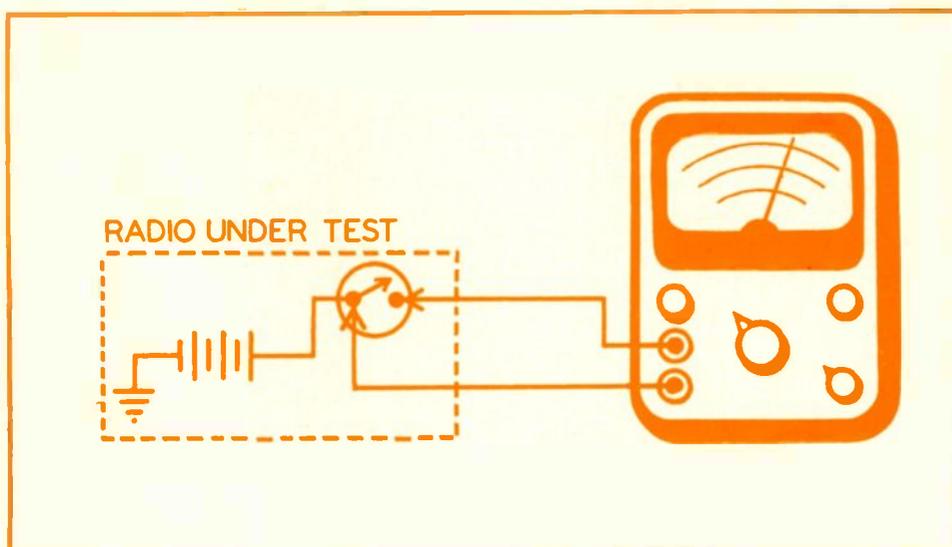
the transistor being tested. This is particularly important when testing base and emitter parameters.

Shop-Side Manner

Much has been said about technicians' manners in the customer's home, but little about shop attitudes. These are particularly important when the customer brings in his radio for a quick repair.

You can easily lose a future radio or TV customer when you "stumble" with an unfamiliar set. The large number of different imports, as well as the many varieties of domestic radios, make it difficult for technicians to be instantly familiar with all radios (there are over 1000 different kinds). Don't examine a set as if you've never seen one—whether you have or not! Take the radio to a private area of the workshop and figure out how the case opens.

If you're not thoroughly sure about the set don't work on it in the customer's presence. If the battery is not at fault, it may be better if you requested the customer to leave the radio for a thorough check. It's easier than you think for a customer to sense that you are puzzled. And he may jump to the erroneous conclusion that you do not know your business. ■



Current drain can be measured without breaking battery connections by inserting a milliammeter across the on-off switch with the set turned off.

Fig. 2 (A) — Schematic of a bias box for TV alignments to clamp the agc. (B) — Line an attenuator can be used to reduce signals to usable amplitude for r-f alignment. The network must be entirely shielded to prevent radiation pickup.

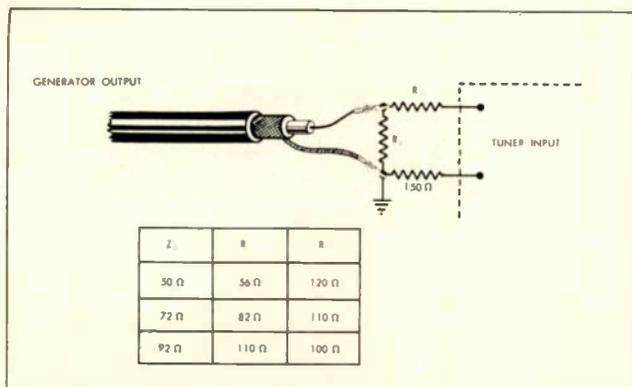
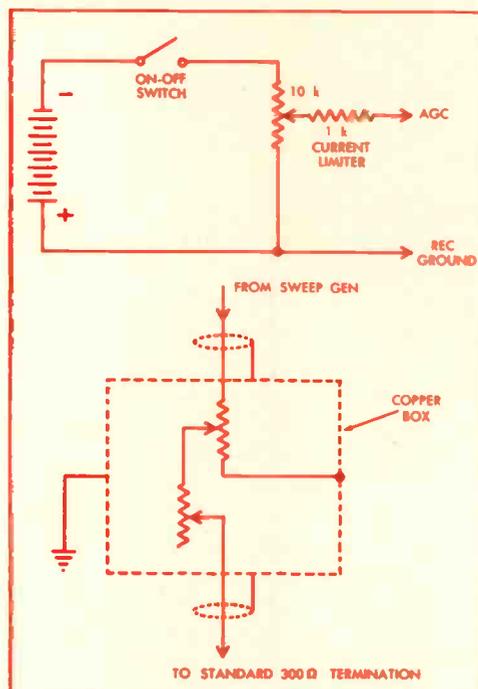


Fig. 1 — Network to terminate sweep generator output to 300 ohm input at the tuner. Z_0 is equal to the generator impedance. The inset chart shows network values for three common generator impedances.



Easy-to-understand alignment procedures for turret and wafer type tuners

TV R-F

■ Many TVs have been scrapped after a "do-it-yourselfer" opened the tuner and "worked" on it. Some technicians shudder at the thought of more than an oscillator slug adjustment. When faced with an r-f alignment they inform the customer that the TV isn't worth the repair expense.

This attitude is usually not well founded, since r-f alignments are as simple as i-f alignments although sometimes more lengthy. Manufacturers' instructions are usually complete in detailing proper frequencies and test points. But they naturally assume that the technician is experienced in alignment procedures. Those who haven't had an opportunity to gain this experience can't be expected to do an r-f alignment. The technician must also recognize trouble symptoms caused by faulty alignment, and confirm it through alignment checks.

Alignment

A long list of trouble symptoms can be associated with the r-f section which could also originate in other areas. Some of these symptoms include: Distorted sound, degraded picture quality, multiple images, poor sync, smear, ringing and picture overload. Multiple images caused by misalignment appear to be ghosts but can be moved by varying the fine tuning control. R-F overload is caused by over-peaked signals and appears the same as an exceptionally strong signal would on a properly aligned set. Of course, when these symptoms appear, we do not immediately align the tuner.

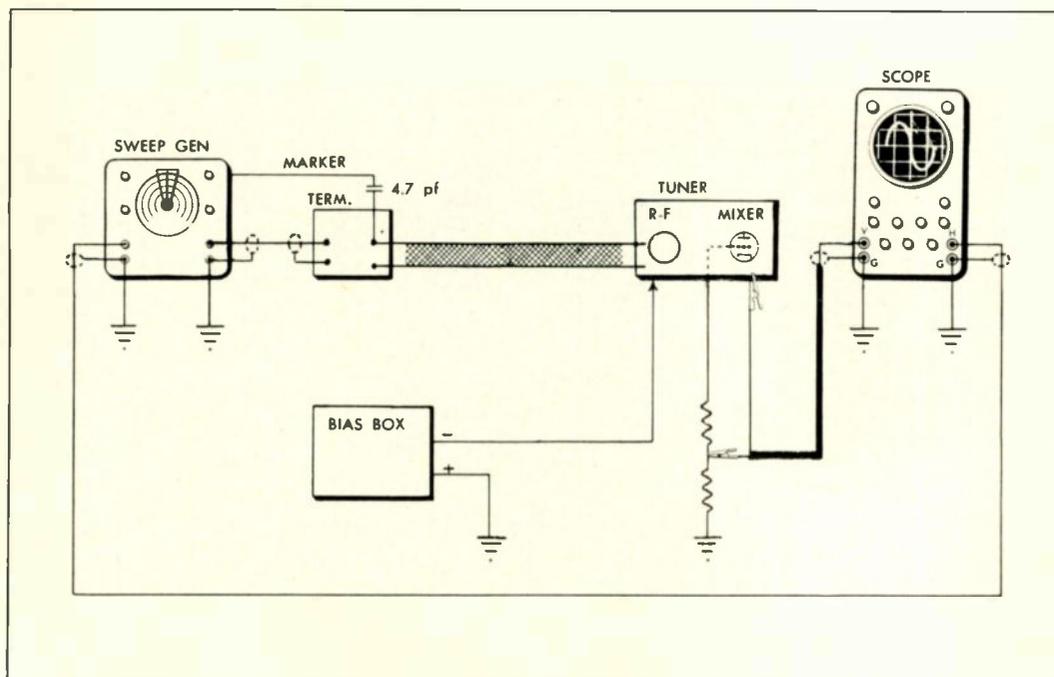
Tube substitution should always be the first step, keeping in mind that different inter-electrode capacitances in tubes may require readjustment of the fine tuning control

or the tuner's oscillator slugs may need touching up after a tube is replaced.

Although a snowy picture almost always points to a fault in the tuner, possibility of trouble in the i-f section should be considered at this point. The quickest way to isolate the fault to i-f or r-f components is to inject a substitute video signal at the i-f input. Signal injection can be accomplished with a regular video test generator or a signal can be "borrowed" from another TV set on the bench. Some shops use an old TV set for this purpose. If a signal is taken from an old TV set, however, the i-f frequency must be the same.

If the picture is good when a signal is injected at the i-f input, the tuner may be at fault. But suspicion must also be directed at the transmitting station or to the set's antenna.

Fig. 3 — Test equipment setup for an r-f response check. All leads must be kept as short as possible and equipment must be well grounded. Most tuners have a scope test point.



Alignment Techniques

by Enrique Shaw-Galvez

No effort should be made to align sets unnecessarily. If a good picture can be brought in on all channels by adjusting the fine tuning control, then the set does not require r-f alignment and no alignment should be attempted.

When the trouble has been definitely isolated to the tuner and tube "tapping," tube substitution, visual inspection, and voltage measurements do not uncover a fault, then alignment is in order.

Equipment and Setup

Test equipment used for r-f alignments is basically the same as that used for i-f alignments. A good stable marker generator is a necessity; the sweep generator must be capable of covering the wide r-f pass-band — about 10 mc — with no more than 5% tilt.

It will be necessary to use a ter-

mination box from the sweep generator output to the TV set's tuner input to match and balance the two impedances. Proper resistance values to match 50, 72, and 92 ohm generators to the tuner's 300 ohm input are shown in Fig. 1. The terminating hookup is also shown in Fig. 1.

Signal output amplitudes of many generators in use today are often too high for r-f alignment purposes. A simple attenuator can be rigged as shown in Fig. 2 which will give a variable output at proper levels.

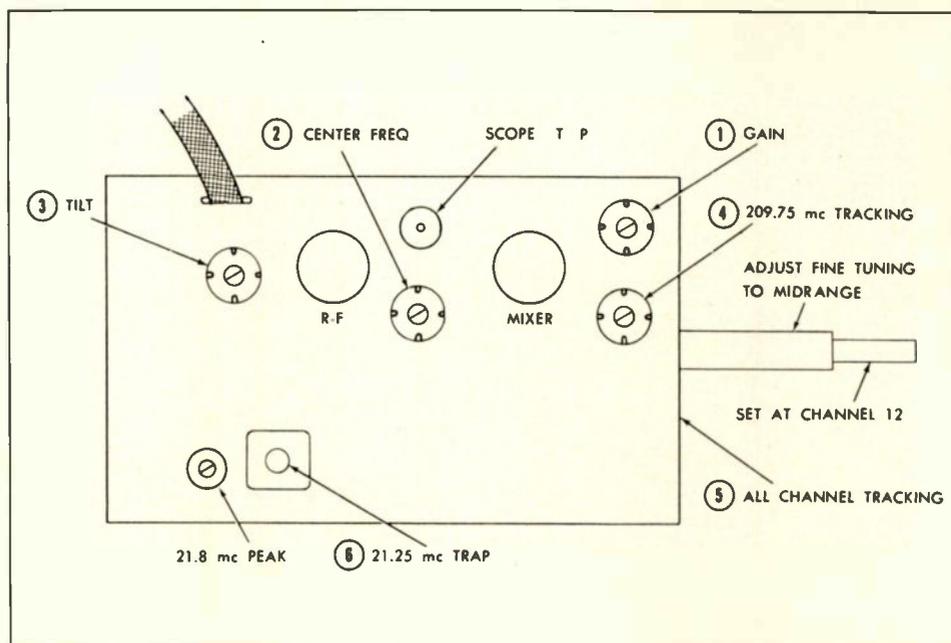
To align all receivers, you will need an assortment of alignment tools. Several companies make various types of alignment tools. The choice of a type is largely a personal matter. For tuner alignments, the best are probably plastic with hard metal blade tips. Some tuners use traps and oscillator slugs that

require a hex-head tool which should be made from a non-magnetic material.

An r-f response check equipment setup is shown in Fig. 3. The sweep generator output and marker inputs should be fed into the tuner antenna terminals through a proper matching network. Set the generator to sweep 10 mc on channel 13 for wafer or disc type tuners and to channel 12 for standard coil types. The marker frequencies should be set at the video and sound carrier frequencies. The frequencies for all 13 channels are shown in Table 1. As each channel is aligned, the next lower channel will be checked. Connect a bias box to the tuner a/c line and adjust to 1.5v or to the voltage specified by the set's manufacturer.

Most tuners have a built-in scope test point for r-f alignment. If the tuner you are working on does not

Fig. 4 — Adjustments for the Standard Coil tuner showing the proper alignment sequence. Tube shields should be installed during the alignment process.



have such a test point, connect the scope's vertical input to the center of the grid network on the mixer stage. In either case, use a 10K resistor in series with the scope lead. Keep the generator and marker inputs as low as possible. Excessive signal injection tends to distort the response curve.

The first i-f must be disabled before the scope waveform will be meaningful. In parallel heater sets, the first i-f tube can be removed and the grid resistor shunted with a 100Ω resistor. Series string sets are most easily disabled by shunting the first i-f grid with a 0.005 μf capacitor. The primary of the mixer/output coil should be detuned to prevent "kickback."

Alignment

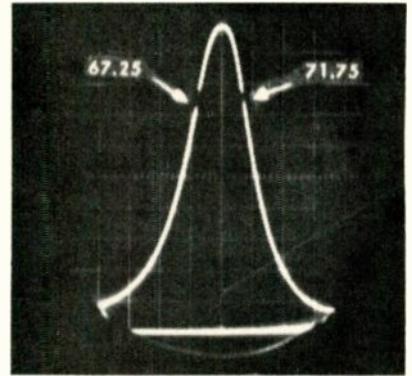
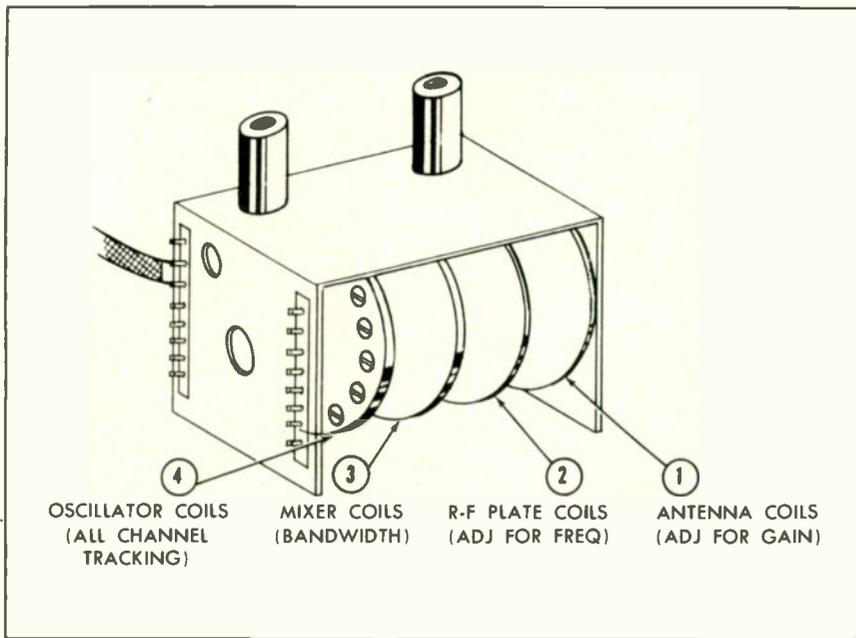
The type of tuner under align-

ment must now be considered to determine the location and sequence of the adjustments. Fig. 4 illustrates a Standard Coil tuner showing adjustments with alignment steps numbered. Adjustments are made in this order on channel 12 except for "all channel" adjustments, which are set for the best compromise between the other channels or for each channel.

A wafer type tuner is shown in Fig. 5 with the description of each wafer. Each adjustment is made in the order described for the standard coil tuner: Antenna, r-f plate coil, mixer and oscillator. These adjustments must be made, however, by flexing the coils (closing, opening turns or moving single turn coils in relation to wafer), for each particular channel. An invaluable time saving tool for aligning this type tuner is the tuning wand.

A tuning wand is a plastic pencil-shaped rod with a piece of ferrite in one end and a brass slug in the other. When the ferrite end is brought near a coil and the response becomes more nearly perfect, the inductance should be increased, so the coil's turns should be pressed closer together. The brass tip has an opposite effect. When neither end has a desirable effect, the coil is properly tuned and should not be adjusted. Without a tuning wand, trial and error must be used. Very small high frequency coils are adjusted by moving the coil nearer or further from the mounting wafer.

In any type tuner, except when the manufacturer gives other instructions, the r-f output curve should be as high and narrow as set design permits while maintaining good symmetry. After the r-f



Typical r-f response taken from a properly aligned tuner on channel four. Note the symmetry of the waveform.

Fig. 5 — Wafer type tuners are aligned in the same way as turret types. Coils for each channel are aligned in the order shown.

Alignment

coils have been adjusted, the mixer adjustments should be made. If the i-f has been previously adjusted, the scope can be connected to the detector load. Two adjustments are normally found in the mixer circuit. They should be varied for maximum amplitude and greatest symmetry.

Tuner oscillator adjustments are the simplest to be made. Although a signal generator can be used, the easiest method is with a broadcast signal. The oscillator adjustment slugs can be tuned without removing the tuner from the chassis in most sets. Access holes are located in the front side of the tuner to allow the technician to make adjustments with a long alignment tool. Some of these slugs are slotted, while others have hex' type heads. A non-magnetic tool should always be used for this adjustment.

The oscillator slug should be varied for best picture and sound on each channel. Be sure the fine tuning is centered before making this adjustment.

Service Tips

After returning an aligned set to a customer, you may receive a call back. For example, a drifting oscillator tempts you to realign the tuner, change the negative temperature coefficient capacitors first. These NTC units are frequently at fault and often necessitate tuner realignment anyway after their replacement.

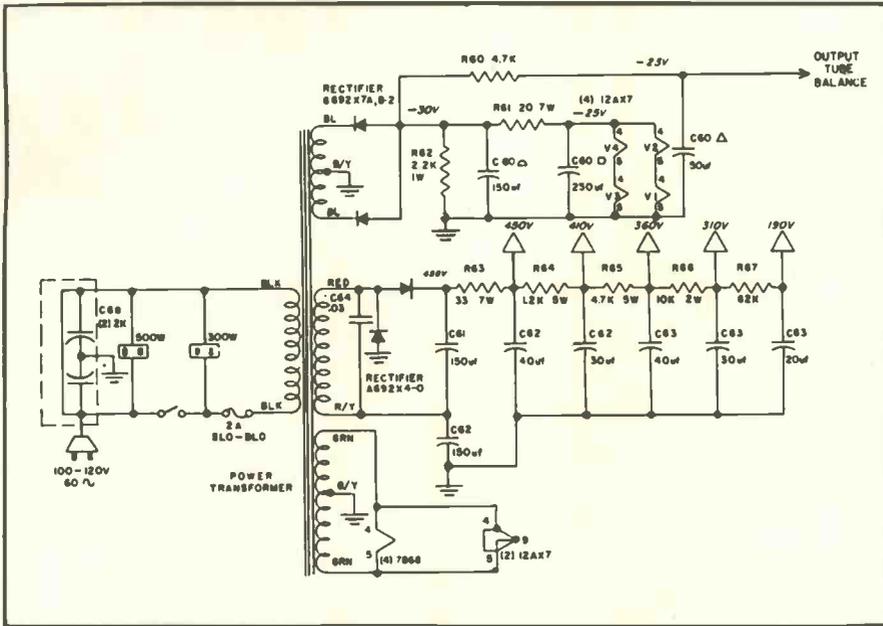
Frequent burn-out of the mixer tube may also indicate a fault which causes operation similar to poor alignment symptoms. Before you tackle this job, check the mixer

grid circuit resistor values very carefully. They are often the cause of frequent mixer tube burn-out and their replacement sometimes necessitates alignment.

Problems encountered in tuner alignments are almost invariably caused by faulty connections, or improper setting of the test equipment. Extreme care should be taken with every step of the alignment to eliminate these errors. The entire hookup should be accomplished with short coaxial leads.

Most professional alignment specialists use a tuner jig to hold tuners and simplify alignments. The jigs generally incorporate agc, B+, filament, and termination networks.

Alignment of the tuner should always be accomplished with the tube shields installed. The same principles for alignment are used for transistor and nuvistor tuners. ■



Power supply used in a Sherwood amplifier uses d-c to supply filament voltage for low level stages. Heavy filtering is used for both B+ and filament voltages. A small d-c voltage is also used in a balance circuit for the output tubes.

Eliminat

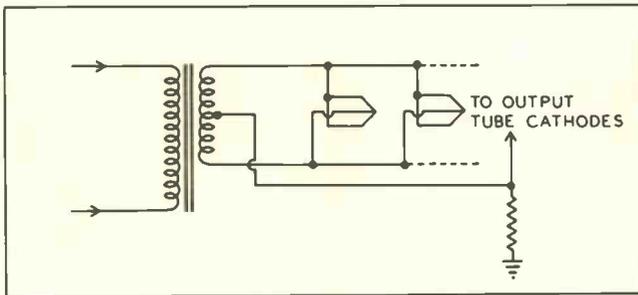


Fig. 1—Coupling of a-c between the filaments and cathodes of low level stages is greatly reduced by elevating the filaments with a positive d-c voltage. Often the d-c is supplied by the cathode voltage on the output tubes.

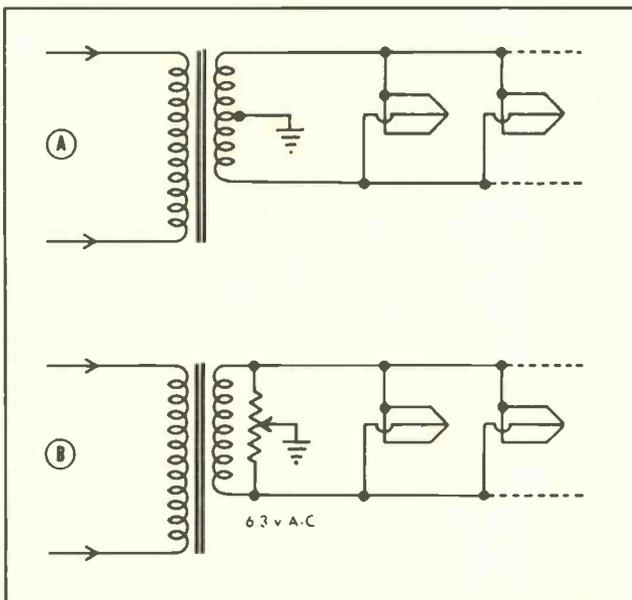


Fig. 2 (A)—Standard method of minimizing hum in low level heater circuits. (B)—A transformer without a center tap can be effectively center tapped with a potentiometer. This method has the advantage of being adjustable for a more precise balance.

High fidelity reproduction can be deteriorated by a number of factors. Audible hum is perhaps the easiest of these factors to detect, locate and correct. Distortion, poor transient response and others all require a trained listener or elaborate test equipment to detect. Yet methods used to reduce hum are still unknown to many technicians.

Hum can originate in several areas of a Hi-Fi system, though the most offending area is in low level-high gain preamplifier stages. Unbalance in the output or inverter stages, as well as ground loops within the amplifier and between the units are also common causes of excessive hum.

Inherently poor design must be considered when trying to track down hum, though a conscientious effort to minimize hum has been made by amplifier manufacturers for several years. More often, the cause can be traced to aging components which have caused amplifier unbalance or increased ripple in the B+. Also, minor repairs made with parts chosen or installed indiscriminately can increase hum many fold. "Component" systems may have excessive hum because of ground loops in inter-connecting wires which carry small audio signals. Hum is induced into these signals from potential differences between units.

Solve ground loop, faulty capacitor, capacitive and inductive hum problems with practical troubleshooting methods

The oscilloscope can also be used to detect the source of certain hum by its frequency. Hum which is introduced from the power supply will have a higher frequency than hum picked up from the filament circuits. Power supply hum is usually 120 cps, or the second harmonic of the line, while a-c filaments use the line frequency. Other rectifiers could cause ripple at the third or fourth harmonic of the line.

ing Hi-Fi Equipment Hum *by L. V. Winston*

Locating Hum Sources

Localizing the hum to a particular section of the Hi-Fi system should be the first step in tracing its source. Hum is most prevalent in amplifiers where small signal voltages pick up a-c from the power supply or through multiple ground connections, (ground loops). A larger amount of hum is usually more noticeable when the selector or function switch is in the "magnetic" or "phono" position where there is greater over-all gain. The selector switch should be turned to all of its positions and the amount of hum should be noted on each. If the hum does not change appreciably, it is probably being introduced in the stages following the preamp.

Since hum can originate in other areas of the system, a method to definitely localize the faulty area must be used. Shorting all inputs to ground directly at the amplifier input jacks is the quickest and surest way to accomplish this. The resultant hum can be quantitatively measured on a VOM set to the proper a-c scale and connected to the speaker terminals. If no speaker is used, a load should be placed across the output transformer.

To introduce the largest amount of hum—which will allow you to better judge corrective measures—the volume and bass controls should

be boosted to maximum. If the amplifier has a rumble filter, it should be turned off.

Isolation of amplifier stages can be achieved by shorting each stage with a wire loop between the grid and cathode. For example, if a short across the voltage amplifier grid-cathode reduces the hum content to a large extent, all stages beyond this point—toward the output—are no longer suspects. Of course, all stages have an inherent amount of hum. Hence, during these shorting tests, slight reductions in hum will be noted even in properly operating equipment. And since front-end stages contain signals which will be amplified a great deal more, hum is most likely to be picked up there.

Additionally, it should be noted that small amounts of hum in each stage of the amplifier can cumulatively become an over-powering amount of hum at the speaker. This problem is almost always caused by weak filter capacitors. Although the ripple from electrolytics can be quite easily measured with an oscilloscope, manufacturers seldom release any information giving the maximum allowable ripple content. The surest method is to replace each filter with one known to be good and of the proper value. On old amplifiers, all of the filters may need to be replaced before an acceptable hum level is obtained.

Heater Problems

Many preamplifiers now use d-c filament supplies in low level stages. Poor filters in these supplies may go unnoticed until they are almost open. Substitution of the filters while observing the ripple on a scope is one quick way to determine their condition. Other methods of reducing hum pickup in low-level stages include elevating the filament supply to some positive potential between 10 v and 50 v (Fig. 1); and several filament balancing techniques.

A positive voltage applied to a center tap on the filament transformer does not permit the flow of electrons from the heater to the cathode. Thus, eliminating most of the hum which is impressed on the cathode from the a-c filament supply.

A less expensive and somewhat less effective method of preventing hum pickup from the filaments is shown in Fig. 2. The grounded center tap on the filament transformer prevents the d-c potential of the transformer from floating and balances each half of the filament conduction with respect to ground. Filament transformers which do not have a center tap can be effectively center tapped and balanced with a potentiometer or two resistors.

Continued on page 70



Once again ELECTRONIC TECHNICIAN Magazine has rounded up the names and addresses of Japanese transistor radio importers and distributors. The list is up-to-date and should help technicians locate schematics, component replacement sources, and otherwise unavailable information.

Troubleshooting pocket receivers can be trying at times. The work is usually accomplished without the aid of a schematic because the actual importer's name and address cannot be located.

Brand names and addresses of importers and distributors are listed. One list gives brand names in alphabetical order with a code number. The second list gives addresses of the importer or distributors in code number order.

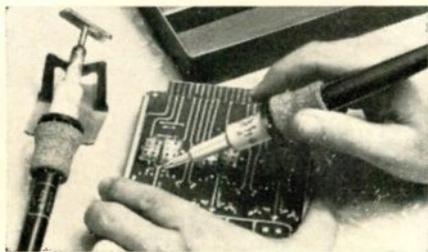
JAPANESE TRANSISTOR RADIO GUIDE

JAPANESE TRANSISTOR RADIO BRAND NAMES

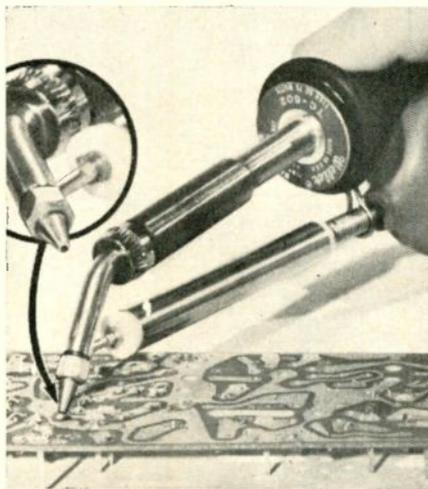
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Acme	41, 42	Fuji	19	Olympic	49
Alaron	6	Fujitone	3	Omscolite	50
Alpha	61	Fujiya	23	Onkyo	54
Americana	32	Futurian	24	Panasonic	45
Angel	3	General	65	Petite	60
Arrow	3	Global	44	Realistic	1
Aud-ion	5	Grand Prix	2	Realtone	52
Beniida	43	Halco	26	Ross	53
Best Tone	7	Harlie	27	Royce	20
Brenell	21	Harpers	28	Sampson	31
Brighton	1	Hi-Delity	51	Sansei	19
Browni	9	Hitachi	31, 56	Sharp	63
Candle	62	Imperial	28	Sheraton	8
Canton-Son	10	Intermark	30	Sony	57
Capri	47, 61	Invictor	63	Soverign	8
Channel Master	11	Jeb	29	Spica	32
Commodore	12, 47	Ken	34	3-Star	47
Constant	10, 51, 61	Kent	35	Star-lite	59
Continental	14	Kobe-Koyo	26	Ten	54
Coronet	3, 47	Kowa	19, 36	Toptone	25, 61
Craig	15	Lafayette	37	Toshiba	66
Crest	61	Lic	40	Trancel	66
Crestline	10	Linmark	38, 55	Twl	67
Crown	38, 55	Little Pal	41, 42	Universal	51
Daltone	16	Manhattan	42	Valiant	68
Delmonico	17	Mantone	41, 42	Viscount	13, 20
Ebner	21	Mark	61	Wilco	54
Empire	64	Marvel	41, 43	Windsor	69
Family	3	Mayfair	4	Yaou	61
Fen-Tone	21	Mitsubishi	39, 46	Yashica	70
Fleetwood	67	Monarch	58	York	60
Fountain	23	Nec	33, 26	Zephyr	18
Four Star	22	Nippon Columbia	19		

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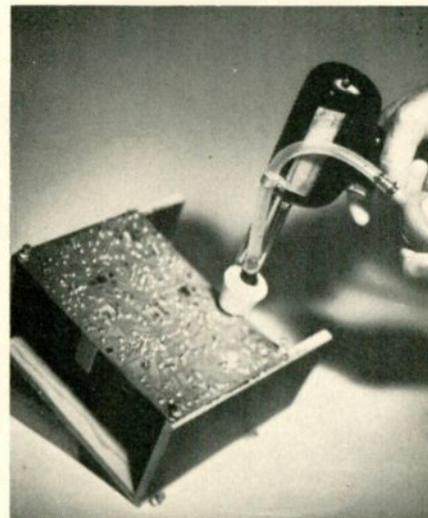
1. A & A Trading Co.
1140 Broadway
New York, N. Y.
2. A & S Trading Co.
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New York 1, N. Y.
3. Arrow Trading Co.
1133 Broadway
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1024 W. Randolph St.
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14. Continental Merch. Co.
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New York, N. Y.
15. Craig-Panorama
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Los Angeles, Calif.
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17. Delmonico International
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Corona, N. Y.
18. Eastern Associates
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San Francisco, Calif.
19. Eisenberg & Co.
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20. Elize Merchantile of New York
1140 Broadway
New York, N. Y.
21. Fen-tone Corp.
106 Fifth Ave.
New York, N. Y.
22. Fortune Star Products Co.
1207 Broadway
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23. Fujiya Electric Co.
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New York, N. Y.
24. Futurian Trends
132 Nassau St.
New York, N. Y.
25. Gosho Trading Co.
50 Broad St.
New York, N. Y.
26. Halco Associates
125 5th Ave.
New York, N. Y.
27. Harlie Transitor Prod.
393 Sagamore Ave.
Mineola, L. I., N. Y.
28. Harpers International
315 Fifth Ave.
New York, N. Y.
29. Imperial Impex Co.
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30. Inter-Mark Corp.
80-00 Coeper Ave.
Brooklyn, N. Y.
31. International Importers
2242 S. Western Ave.
Chicago, Ill.
32. Interocean Commerce Corp.
170 Broadway
New York, N. Y.
33. Kanematsu New York
150 Broadway
New York, N. Y.
34. Ken Electronics
500 Fifth Ave.
New York, N. Y.
35. Kent Overseas Inc.
14 W. 23 St.
New York, N. Y.
36. Kowa American Inc.
230 Fifth Ave.
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165-08 Liberty Ave.
Jamaica 33, N. Y.
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276 Park Ave. S.
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39. Lissner Trading Corp.
1111 N. Cherry St.
Chicago 2, Ill.
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263 Canal St.
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214 W. 14th St.
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41 E. 42nd St.
New York, N. Y.
46. Metropolitan Industries Inc.
216 W. Jackson
Chicago 6, Ill.
47. Nason Trading Co.
303 Fifth Ave.
New York, N. Y.
48. N. Y. Transistor Corp.
150 Fifth Ave.
New York, N. Y.
49. Nichimen Co.
39 Broadway
New York, N. Y.
50. Omscolite Corp.
Stockley and Roberts Ave.
Philadelphia, Pa.
51. Petely Enterprises
300 Park Ave.
New York, N. Y.
52. Realtone Electronics
71 Fifth Ave.
New York, N. Y.
53. Ross Electronics
216 W. Jackson Blvd.
Chicago 6, Ill.
54. Sanyo Trading Co.
149 Broadway
New York, N. Y.
55. Shriro Trading Corp.
276 Park Ave. S.
New York, N. Y.
56. Solo Electronics Corp.
190 Wash. St.
New York, N. Y.
57. Sony Corp. of America
514 Broadway
New York, N. Y.
58. Spera Electronics
3710 33rd St.
Long Island City, N. Y.
59. Starlite Electronics
37 W. 23rd St.
New York, N. Y.
60. Sterling Hi-Fi Co.
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62. Toyama & Co.
855 Ave. of America
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63. Toyomenka, Inc.
2 Broadway
New York, N. Y.
64. Trade Distrib.
260 Fifth Ave.
New York, N. Y.
65. Trans America Import
& Export Corp.
116 S. Mich. Blvd.
Chicago 3, Ill.
66. Transistor World Corp.
513 W. 24th
New York, N. Y.
67. Transworld Industrial Corp.
5404 Hudson Ave. W.
New York, N. Y.
68. Valiant Importers
1200 Sixth Ave.
New York 36, N. Y.
69. Windsor Pen Co.
88 Third Ave.
Brooklyn 17, N. Y.
70. Yashica, Inc.
5017 Queens Blvd.
Woodside 77, N. Y.



Low wattage iron equipped with slotted desoldering tip may be used to remove capacitor from printed circuit board. Iron at left is equipped with bar type desoldering tip.



ENDECO's desoldering and resoldering iron removes molten solder by vacuum pickup.



Oneida's desoldering attachment for guns can lift solder into a porcelain bowl when bulb is squeezed a few times.

by Don Henderson

Tools For Transistorized

Speed up transistorized circuit component desoldering and replacement by using proper iron tips, suction solder removers, and other specially designed tools

■ No array of fancy tools or testers alone can help technicians make money repairing transistorized radio and TV equipment. Something more is needed. This prerequisite is a thorough knowledge of transistorized circuitry and the techniques of "bread-and-butter" servicing. Still, without time-saving tools, even a "cracker-jack" technician can starve to death while attempting to service transistorized equipment.

Electronic measuring instruments are needed for testing transistors, batteries and other circuit components. And practical hand tools are also essential for quickly removing defective parts and for replacing

new components. Some of these tools include special desoldering tips for irons, suction type solder removers, square end cutters, soldering tweezers and others.

A major portion of total repair time is used to desolder, remove, and replace transistorized circuit components. Moreover, the time needed to remove a defective part is frequently twice as long as required for replacing and soldering in the new component. Total repair time *can be* substantially reduced, however, by applying the proper tools and techniques to each individual operation. These tools are available for almost every job.

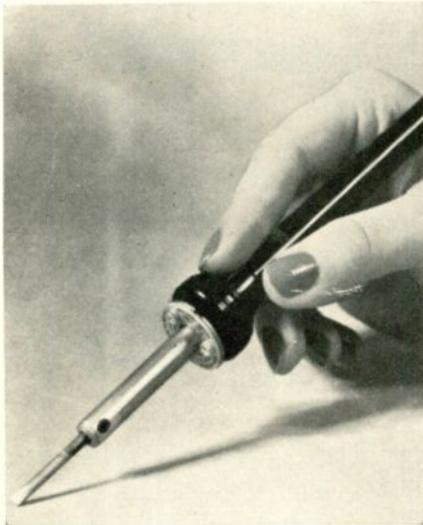
Desoldering Problems

A large number of technicians say that multi-lug component removal is one of their most time consuming repair operations. A number of methods have been used to solve this problem.

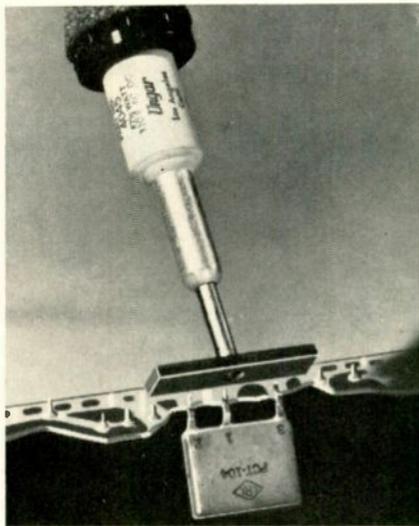
One approach, successful on larger components, requires the application of specially shaped detachable soldering iron "tiplets" which fit over and heat a number of lugs simultaneously. When all lugs are properly heated, the part is lifted out of the printed circuit board.

Some technicians prefer to heat one lug at a time and blow the solder out with a fine compressed air jet. This method is highly effective but other technicians are quick to point out that solder particles can be sprayed into other printed circuit areas if precautions are not taken.

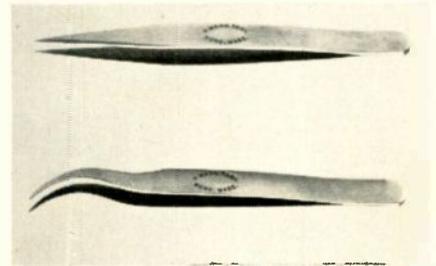
A number of other methods are used to remove excess solder, including the small wire-bristle brush. One of the latest effective methods employs a system of "vacuuming up" excess molten solder with a bulb-like suction device. These can



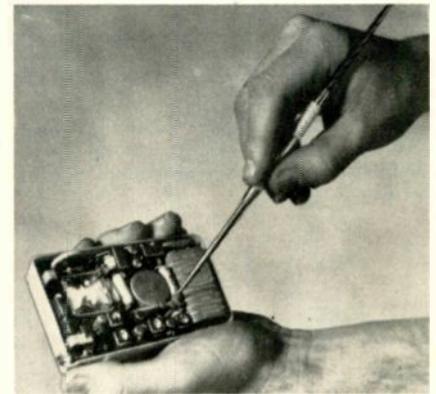
Wall's 25w general purpose transistorized circuit iron equipped with chisel type tip. Slim design allows working in close quarters.



Ungar's bar-type desoldering tip may be employed for easy removal of multiple inline-terminated components.



Mark Tool's straight and curved point tweezers can serve as needle nose plier on midget type transistorized radios.



Moody's HPS-2 hooked point scriber is another aid in checking transistorized circuit connections and general probing.

Circuit Repairs

be simple separate units or they may be designed as part of a hollow-tipped iron or arranged for attaching to a soldering gun.

Small soldering iron tip-cups or "pots" can also be used to dip-heat and remove or replace certain components. A regular iron tip can also be modified to serve as a pot by sawing off its end and then drilling a shallow well into the flat tip end.

Another desoldering problem arises with crimped or bent component leads. These can be handled easily in most cases by a soldering iron equipped with a slotted tip. When the component lead is brought to proper heat the tip functions as a regular slotted soldering aid and the lead end can be straightened. Round wooden tooth-picks also come in handy at times for opening up terminal holes after a component has been removed. The tooth pick is pushed into the terminal hole while the solder is molten.

Many components — capacitors, resistors and even known-to-be defective transistors—can be cut from the circuit or broken with diagonal cutters to facilitate replacement.

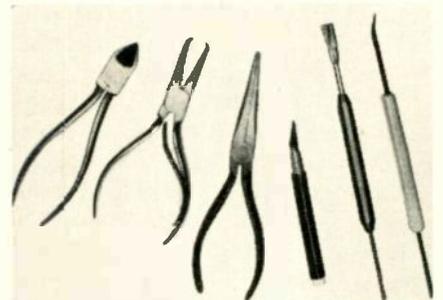
The new and old component lead ends are bent, crimped together and soldered. This eliminates time wasted in desoldering the old component and cleaning out the terminal holes.

Defective Plated Connections

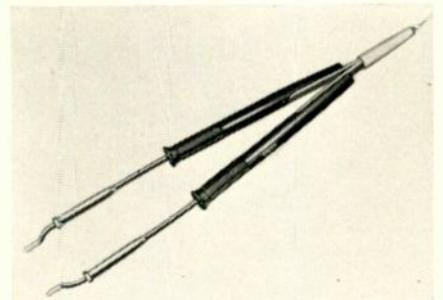
Another time-consuming problem arises with plated wiring which has become broken and detached from the board. Special adhesives are available for reattaching the plating to the board. The broken ends can usually be repaired with a low wattage iron and a spot of solder. But don't forget to carefully scrape the coating from the foil ends with a sharp pointed scriber, razor blade or special knife. In some cases it may be better and quicker to remove the two pieces of detached plating and replace with one length of tinned hook-up wire between the two terminals. Lead dress, however, should conform closely to the original.

Conductive epoxy paint can also be used for quickly replacing damaged plating. These silver-filled

Continued on page 69

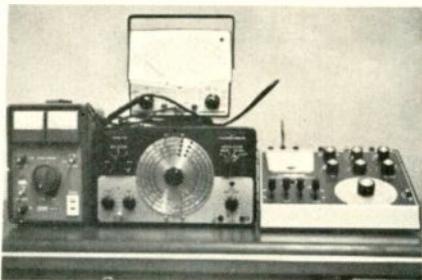


Some handy tools used by technicians when working on transistorized circuit equipment.



Oryx Company's 25w soldering tweezers has separate heating elements in each arm.

NEW TEST INSTRUMENTS



Instruments checked this month by ET editors were EICO's variable a-c supply, a Triplet VTVM, Heathkit's transistor tester and a Precision r-f signal generator. All are "tops" in their category.

Heathkit Portable Transistor Tester, model IM-30, at \$54.88—

More and more emphasis is being placed on transistorized equipment. It will probably not be too long before the transistor tester will be at least as valuable as the shop tube tester. If you don't have a transistor tester, here's one to consider. The unit is battery operated with provisions for feeding external voltages for special tests.

The IM-30 makes all the common tests needed for service work and also checks diodes. Each test is run under d-c voltage and current conditions identical to those in actual operation. Operation for a-c can be quickly found by testing the transistor under two d-c conditions and then calculating the desired a-c operating condition. The instruction book supplied with the test



Transistor tester by Heathkit checks all major transistor parameters.

For Bench and Caddy

set explains all tests in simplified terms and makes testing any transistor a routine job.

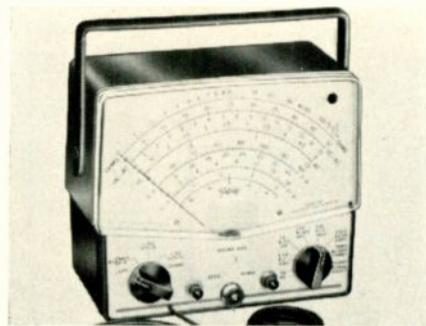
A four-lever, three-position switch selects the desired test: Base current; gain; collector voltage; collector current; leak voltage; short test; I_{cbo} or diode; and I_{cbo} . A universal transistor socket is mounted on the sloping panel which fits most transistors. Binding post and alligator clip connections are located on the top of the panel for diodes, other transistors, external bias and test leakage test voltage supplies.

The over-all size of the tester is $5\frac{1}{2} \times 10\frac{1}{4} \times 10\frac{3}{4}$ in.; weight 8 lb.

Triplet VTVM, model 850 at \$79.50 —

This VTVM has been made especially rugged by providing a shunt across the meter movement when the meter is turned off. The shunt damps the movement and prevents excess wear and possible damage to the meter needle. Eight ranges are provided for d-c measurements and seven separate ranges for a-c and resistance measurements. One probe is used for all functions: a-c, d-c, and ohms. The meter scale is calibrated for p-p, as well as rms.

A color scale is used to help make scale selections quickly. The



VTVM made by Triplet. Frequency response of this instrument can be extended to 250 mc with a special probe.

instrument's panel is made from etched aluminum and is equipped with a 7-inch meter. Input impedance is 11 and .83 megohms for d-c and a-c respectively. Frequency of the instrument is calibrated to 3 mc and can be extended to 250 mc with an accessory probe.

The meter comes with rubber feet and a handle which can be used to hold the meter at a 25 degree angle for easier reading. The meter weighs only 5 lb and measures $7\frac{5}{8} \times 6\frac{7}{16} \times 3\frac{3}{4}$ in.

Precision R-F Signal Generator, model E-75, at \$49.95 —

Here's an r-f generator with several interesting features and a frequency range from 160 kc to 240 mc. The unit should prove useful in a-m and f-m radio as well as TV work. The a-m band is located on one range of the generator which should save time in radio servicing.

The last band of the generator's range extends from 120 mc to 240 mc and is operated from calibrated harmonics. The dial calibration includes markings for most often used frequencies, including

Continued on page 68



Precision's model E-75 r-f signal generator for a-m, f-m and TV alignment.

■ The field strength meter is already well known for its usefulness in measuring signal voltages in TV receiving antennas, and in field intensity surveys for 2-way mobile radio, f-m and a-m broadcast stations. Signal intensities can be plotted at various distances from a transmitter to construct intensity contour maps.

The field strength meter can be portable and battery operated or operated mobile from a 115 v inverter working from a 6 or 12 v auto battery.

We seldom hear about the field strength meter's other capabilities, however. Actually, it is a versatile test instrument for the laboratory or TV work-shop bench.

When used with an oscilloscope, for example, a field strength meter can remove the "wraps" from a TV video signal. This video signal can then be observed, measured, and its characteristics tested for degradation. If degradation factors exist, the extent of noise, hum, interference, non-linearity, intermodulation, etc., can be measured and compared. Even when used alone, a field strength meter has many other applications. It is an excellent aid in locating RFI.

An Interference Locator

In TV fringe areas when an interference problem arises, the field strength meter is a "natural" aid in locating the interference source. As an example, the interference may be radiated from high voltage power lines. A U.S. Geodetic map is obtained covering the area for several miles surrounding the antenna site. The meter and map are loaded into the car and the main power line masts or poles are identified on the map. At the same time, signal level readings are recorded for each pole by directing the field strength meter dipole (Fig. 1) toward each, as the car passes by. The radiating mast will indicate a high reading. Corroded or loose washers on cross-arm braces or defective insulators often cause the trouble.

Interference radiation from dielectric, induction heating and other r-f equipment, can also be meas-

Instrument serves to measure antenna signals, plot intensity contour maps, locate RFI, analyze TV video signals and accurately indicate quarter wave open stub resonance

The Versatile Field Strength Meter

by Victor Nicholson

Chief Field Engineer
Jerrold Electronics Corp.

ured in the same way. The dipole is directed broadside toward the device to be measured. Readings will be in μv . It may be necessary to convert μv to $\mu\text{v}/\text{m}$ (microvolts-per-meter).

"Microvolts-per-meter" is a basic relative indication obtained at a specified distance from a transmitting antenna by dividing the field strength meter's reading in μv by the actual electrical length of the radiating antenna in meters. In RFI practice, however, FCC rules specify maximum permissible levels in $\mu\text{v}/\text{m}$ measured at a certain specified distance away from the radiating device. And maximum readings are generally specified over

a group of frequency ranges.

Field strength meter readings in μv can be converted to $\mu\text{v}/\text{m}$ by using the following formula:

$$E_r = .021 \times E \times f$$

where E = meter reading in μv
 f = frequency of RFI signal in mc
 E_r = field intensity in $\mu\text{v}/\text{m}$

Conversion factors for various VHF TV channel frequencies are shown in Table 1. Multiply field strength reading in μv by these factors.

The frequency meter can be used to measure interfering signals from any source, including f-m broadcast stations, police and amateur transmitters, adjacent TV sound and picture carriers, diathermy and others.

Master System Troubleshooter

The field strength meter is also invaluable in servicing master antenna or multiple-set distribution systems. Amplifier frequency response and gain can be approximated by measuring both the input and output signals on all channels of interest, at both video and audio carrier frequencies. The difference between input and output levels is the amount of operational gain. Measurement of gain at frequencies within the amplifier's pass-band will give an indication of its response.

When a distribution system is first installed, a record of signal levels can be made with the field strength meter. A chart showing these readings can be used for future maintenance. Comparison of signal levels with original readings will usually reveal important information. Any cable section or attenuation tap-off device can be checked quickly for loss by comparing input and output levels with original records. A db calibrated field strength meter is convenient in checking distribution system equipment. Signal level differences can

be read directly as equipment db gain or loss.

TV Video Analyzer

When used with a d-c coupled oscilloscope, a field strength meter can strip the r-f overlay from the composite video to permit thorough analysis.

The tuner of the field strength meter selects and amplifies incoming TV signals and then converts them to an i-f frequency. The signals are again amplified and detected. The detected output, fed directly to the vertical input terminals of an oscilloscope, shows up as composite video. Hence distortions in this composite signal are readily apparent and will show up at lower levels than on a TV receiver.

Hum is usually not noticed on a TV set, for example, until it is at least 10 percent of the composite total. Even then, it may be difficult to see because of the picture back-

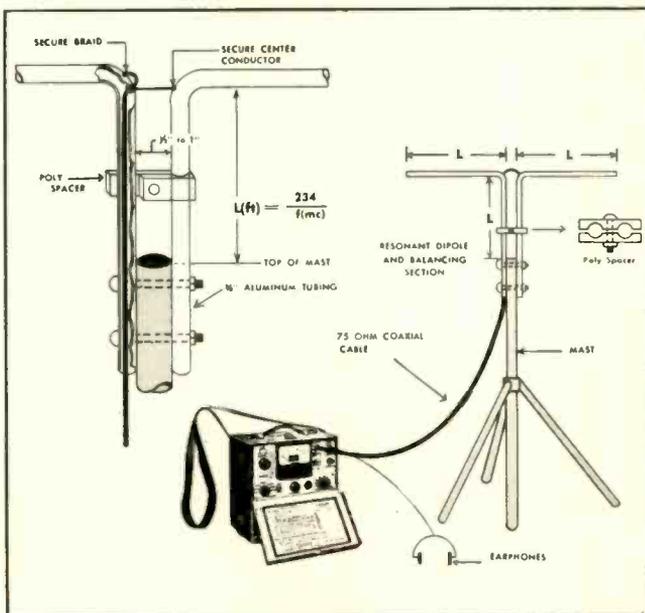


Fig. 1 — Specifications for dipole antenna used with field strength meter for intensity surveys and for RFI interference location. It can be altered for vehicular mounting.



Technician uses Jerrold's Model 704B field strength meter to measure TV signal at a master distribution outlet.

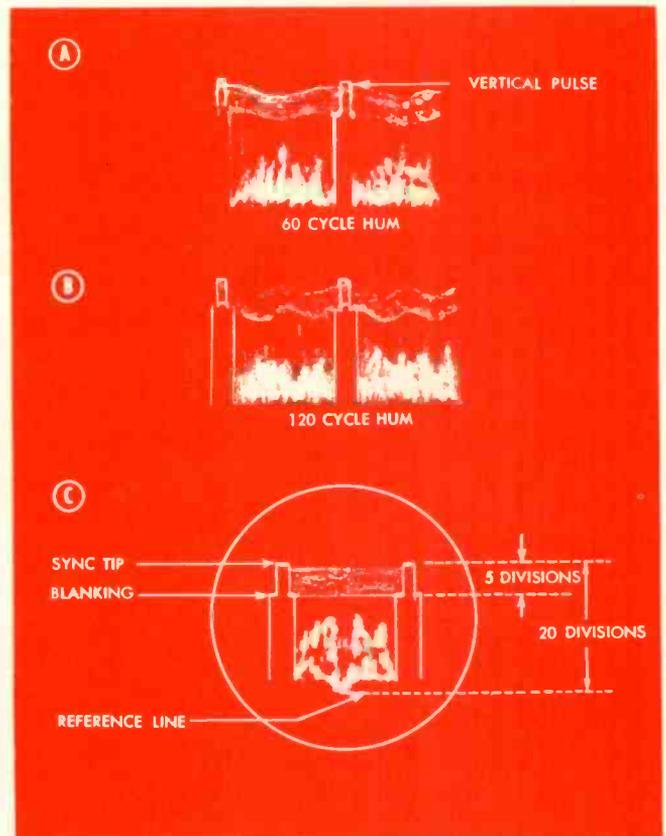


Fig. 2 (A)—60 cps hum on composite video signal as it appears on scope when d-c coupled from field strength meter. (B)—120 cps hum. (C)—Percentage of sync pulse height can easily be compared with total composite video amplitude.

ground. On a linear scope, this hum can be seen and measured at levels below 5 percent. Thus, it can be easily determined whether the hum frequency is 60 or 120 cps. This information can aid in locating the hum source. A 60 cps hum naturally points to cathode-heater leakage in a tube, while 120 cps hum indicates power supply trouble when full wave rectification is employed (see Fig. 2A and 2B).

Percentage of sync pulse height compared with the composite total or linearity can also be measured (see Fig. 2C). This becomes important in checking a CC-TV system where a camera output is fed to a regular TV set monitor which is tuned to an unused channel. The linearity and percent of modulation can be observed via the meter on a scope and either may be measured or compared with that of another TV signal received directly off the air.

Intermodulation or video modulation of an audio carrier can also be observed. The signal to be checked is fed into the field strength meter. The video output of the meter is connected to the scope's vertical input. The meter is then tuned to the signal's audio carrier. Audio modulation should include no sync pulses since these would be a symptom of overloading of one or more amplifiers. This problem is usually solved by reducing the offending amplifier's gain to make it operate within its rated output.

Another important consideration in TV signal quality is signal-to-noise ratio. This ratio is easily ob-

tained by first tuning the field strength meter to the video carrier of the channel to be checked. A note is made of the carrier level. The meter is then tuned to the lowest measurable signal midway between the video and sound carriers. This level is also recorded. The latter reading is primarily noise and the difference in db between the two readings is the signal-to-noise ratio.

The ratio of signal-to-noise across the entire 4 mc video passband can be computed by subtracting 6 db from the aforementioned reading. This correction factor compensates for the meter's 1 mc bandwidth since a 4.1 power ratio is equivalent to 6 db.

Stub Tuner

The characteristics and uses of quarter wave open stubs are well known to technicians. The field

strength meter is also a valuable aid in "tuning" these stubs.

Length of a stub is first calculated by the regular formula:

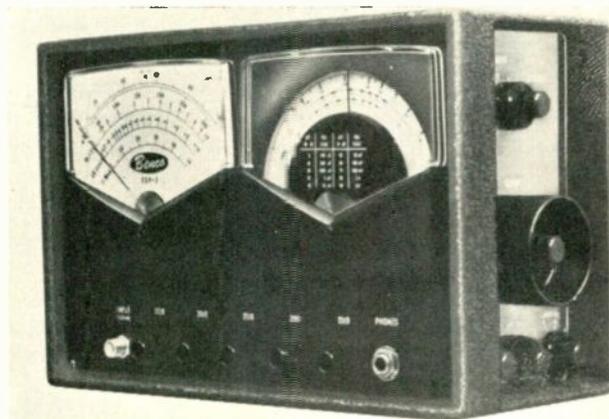
$$\text{Length (ft.)} = 246 \sqrt{\text{over } f}$$

where f = frequency in mc at which maximum attenuation is desired, and V = velocity factor (propagation constant) of the stub material to be used. The stub is then cut a few inches longer than calculated.

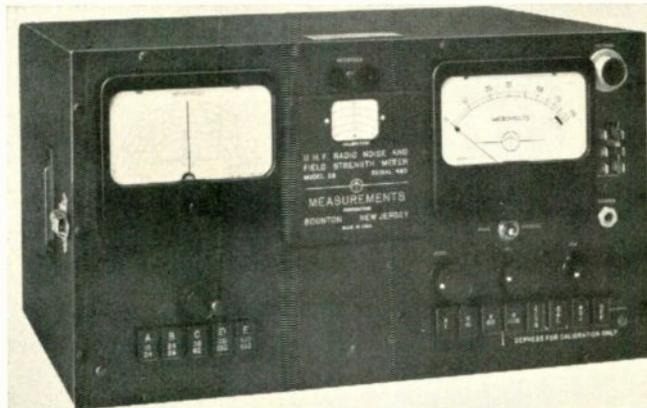
The stub can now be "tuned" to precise effective length in the following manner: Connect one end of the stub to the antenna down lead end. Connect this terminal point to the field strength meter's input. Tune the meter to the frequency at which maximum attenuation is desired. The unconnected stub end is now cut off, a quarter or half-inch at a time, until a minimum signal reading is observed on the meter.

Applications for field intensity meters are probably limited only by users' imaginations. ■

Benco (Blonder Tongue Labs) transistorized portable combination field strength and watt meter, Model FSP-3, weighs only 10 lb and covers the range from 52 to 220 mc.



Simpson's Model 498A calibrated field strength meter can be operated on 117 vac or on batteries.



Measurements Corporation's Model 58-AS noise and field strength meter operates on 117 vac, 6, 12 or 28 v batteries.



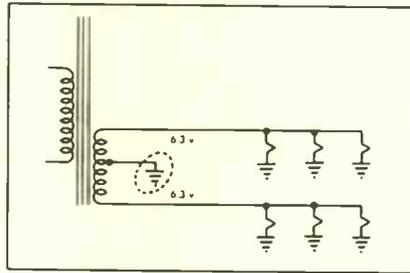
Difficult Service Jobs Described by Readers

A Dog's 'Dog'

I had to make a second service call on an Admiral model LS361 with a remote control which had developed the habit of changing channels by itself. The set was removed to the shop for a complete check, and no trouble was found with the remote control equipment. After the set had been returned for a short time, I received a third call. The set was changing channels again. Since it was a sonic remote receiver, I decided to check to see if any noise in the house could cause the set to change channels. After exhausting almost every possibility, it suddenly dawned on me that the owner's dog was in the room everytime the set changed channels. He had a dangling license tag which banged against his collar chain and created sound of proper frequency to activate the channel selector. — *Joe DeSabantonio, Jamestown, N. Y.*

Intermittent Ground Affects Sync and Sound

I recently received a call from a customer who complained of symptoms which were said to have existed since the set was new. It was a Westinghouse model H-867T21. Intermittent symptoms included sound buzz, horizontal bending, and complete loss of sync.



Intermittent ground in Westinghouse set caused sync and sound troubles.

After the agc and other tubes were checked and substituted without favorable results, the set was pulled into the shop. Key voltages were checked and all were within tolerance. After checking components in the front end, video amplifier, and sync section, I decided to go over the power supply.

I found the filament voltage to be fluctuating between 4 and 5 v; at times it dropped to as low as 2 v. The filament transformer used in this set is a 12.6 v type with a center tap. When the voltage on one side dropped the other side was raised by the same amount. I decided the transformer must be good since the total voltage was always 12.6, and that it must be the center tap ground. This tap was grounded through a terminal strip riveted to the chassis. Measuring the resistance, I found 10 or 15

Ω between the terminal and ground. A new lead was soldered from the terminal to ground, which cleared up all the symptoms.—*Paul Holiday, Maspeth, N. Y.*

Portable TV 'Ticks'

A 9-inch GE portable receiver, model 9T001 was brought into the shop for a check-up. The owner said the TV developed a slight "ticking" sound after it played about 30 minutes. Preliminary examination showed that the noise came from the speaker even when the volume control was turned completely down.

Shorting the audio tube's grid to ground quieted the ticking, and established that the trouble source was somewhere between the volume control and the grid of the first audio tube. The only component between them was a couplate, so the repair seemed simple enough. I theorized that there was internal arcing in the couplate, and I only had to bypass it with suitable external components.

I scraped away the foil from the couplate, removed the section that was of interest, and finished the wiring with conventional components. I planned to let the set "cook" for a while, but found the trouble was still present when it was turned on.

I concentrated on this area, still certain that the couplate was at fault. Then I noticed that the high voltage lead was dressed against the volume control. Thinking the high voltage could be leaking through the anode lead's insulation, I dressed the high voltage lead away from the volume control and slipped a length of insulation over it. The ticking disappeared. — *Frank A. Salerno, Long Island, N. Y.*

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\$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.

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... for more details circle 13 on page 46

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Handy Bench Mirror

An inexpensive medicine cabinet with a mirror front is a handy bench item when equipped with a handle. It may be used to view TV receivers for adjustments as well as hold small instruments and tools. The cabinet I have cost less than \$3 and measures 18 x 11 x 4 in. The cabinet with tools inside can be easily lifted off the bench by the handle.—*H. Leeper, Canton, Ohio.*



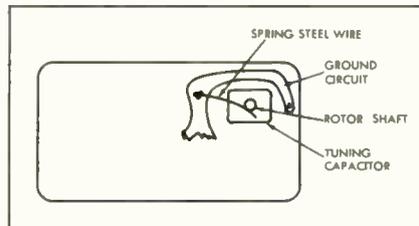
A handy bench mirror and tool cabinet can be made by attaching a handle to a standard medicine chest.

Steel Wool Holder

When cleaning soldering iron tips with steel wool, the fingers can be easily burned and small pieces of steel can stab the finger. To prevent this, a rubber tip used on furniture legs or crutch tips can be stuffed with steel wool and used as a holder. *John A. Comstock, Wellsboro, Pa.*



Steel wool used to clean soldering irons can be held in a rubber tip found on furniture legs.



Noisy variable capacitors can be repaired by soldering a spring steel strip to PC board ground. Other end of spring is tensioned against rotor shaft.

Variable Capacitor Contact Repair

I recently repaired a small transistor radio which was noisy when tuned. There were no shorts between the plates but the ground connection to the rotor was intermittent. A short piece of spring steel wire was tensioned against the shaft and soldered to the PC ground. The radio has worked fine since then.—*R. H. Rombough, Rugby, N. D.*

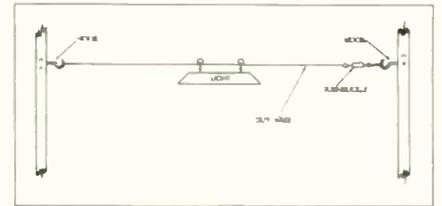
Solder Removal

Solder removal from printed circuit boards is facilitated with a short length of 1/2 in. copper braid. Simply tin the end of the braid and hold it against the area while heating the solder to be removed. The solder will be drawn into the braid by capillary action. The braid may be used over and over by heating the solder-filled portion and striking it against the end of the bench to expel the solder. Be careful not to splash the solder into the eyes or on unexposed parts of the body.—*G-E TV Engineering Dept., Syracuse, N. Y.*

Bench Light

I recently built a new bench which is 15 ft long but had the problem of how to light it. Though only one part of the bench is used at a time, light is needed wherever I work. As a solution, I mounted a four ft fluorescent light on pulleys hung on a length of guy wire strung

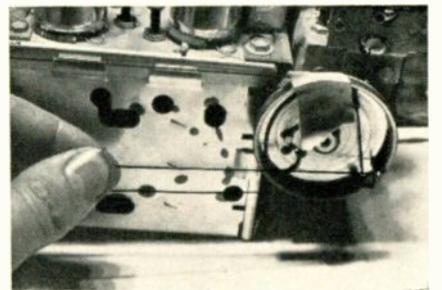
from wall to wall. I installed hooks in each wall with a turnbuckle near one end to keep the "trolley wire" tight. This idea has worked out very well, and has received many favorable comments from my customers.—*Frank M. Dickinson, Stony Point, N. Y.*



Bench light for long work table is hung from "trolley wire" and moved to any desired position over work area.

Tape Aids Dial Stringing

Cellophane or masking tape makes a good third hand when replacing dial cords on radios. The tape will hold the cord to the capacitor pulley while it is being looped around the tuning shaft and guide pulleys. If the dial assembly has to be removed to work on the set, the cord can be taped to all of the fixtures to save restringing time.—*H. L. Davidson, Fort Dodge, Iowa.*



Tape aids dial stringing or prevents unstringing if the dial assembly is removed.

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.

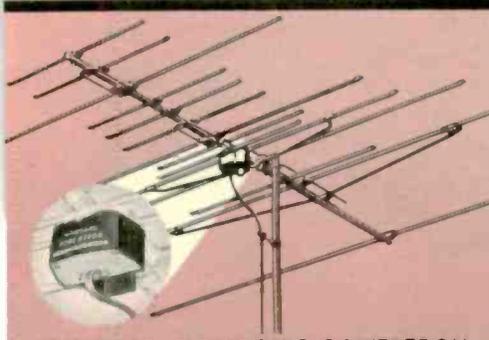
Winegard

ANTENNA SYSTEMS

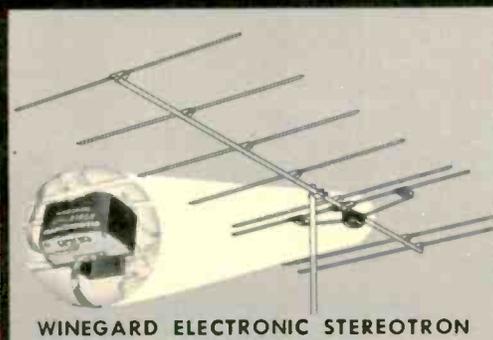
BRANDED!

THE BRAND NAME YOUR CUSTOMERS KNOW AND TRUST

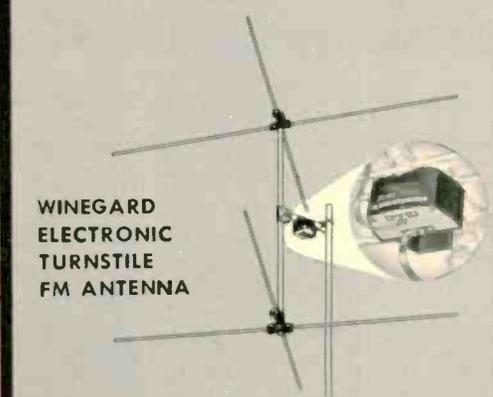
7 Winegard Electronic Products to Improve TV and FM Reception—nationally advertised month after month after month in magazines, newspapers & TV.



WINEGARD ELECTRONIC POWERTRON TV ANTENNAS—TUBE AND TRANSISTOR MODELS. World's first and most effective electronic TV antennas. More Winegard Powertrons have been installed than all other amplified TV antennas combined. Choose from 3 transistor or 3 tube models. Transistor models for **FRINGE** areas (nearest TV or FM station some distance away). Tube models for **MIXED** signal areas (locations with TV station close to set, and other stations far away). Both Powertrons come complete with built-in amplifiers, all AC power supply. Patented antennas have exclusive "Tapered T" driven elements, electro-lens director system. Six models, **GOLD ANODIZED** from \$74.95 to \$104.95 list. Excellent for color or black and white.



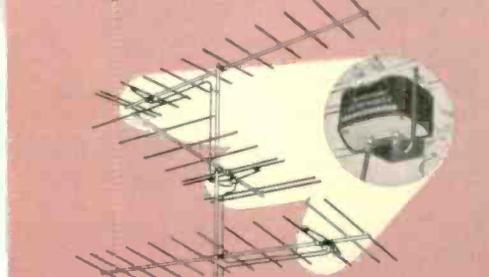
WINEGARD ELECTRONIC STEROTRON FM ANTENNAS. For the ultimate in long distance FM and STEREO, Stereotron is world's most powerful FM antenna. Comes with power supply and built-in transistor amplifier. Guaranteed to bring in 85% of all FM stations in a 200 mile radius over normal terrain with rotor. Has minimum gain of 26 DB over folded dipole. Recommended for use where signals are from 1 to 20,000 microvolts. **GOLD ANODIZED.** Model PF 8 (300 ohm) or PF 8C (75 ohm), \$64.25 list.



WINEGARD ELECTRONIC TURNSTILE FM ANTENNA

Non-directional, has 16 DB gain, receives in all directions to 125 miles... no rotor needed. Has built-in transistor amplifier and comes complete with power supply. **GOLD ANODIZED**, built to last for years of service. Complete with two 300 ohm terminals on amplifier; one for down-lead connection to the set and one for connection to a Powertron antenna.

Model PF-4 (300 ohm). \$55.80 list



ELECTRONIC CUT-TO-CHANNEL POWERTRON YAGIS. Where you require the finest installation, motels, hotels, hospitals, institutions, deep fringe locations, there is no antenna made that compares to Powertron cut-to-channel yagis. Highest gain (28 DB), powered by transistor amplifier peaked for perfect results. Six (8 element) cut channel and broad low band models—eight (12 element) cut channel and high band models. Run up to 8 antennas from one power supply. **ALL MODELS GOLD ANODIZED.** Perfect for color or black and white. Write for models no's. and prices.



WINEGARD TENNA-BOOST. Mounts on any antenna. Excellent antenna amplifier mounts on antenna, mast or wall. Has 19 DB gain. All AC power supply built-in two set coupler. Next best thing to Winegard Powertron.

Model MA-300, \$34.95 list.



WINEGARD "BOOSTER-PACK" Single Set Amplifier or Home System Amplifier. Demonstrate right at set with unique "convincer" switch that switches from antenna only, to half power and full power. See the picture improvement with the touch of a switch. Takes only a couple of minutes to install. Has 16 DB gain on low band and 14 DB on high band. Transistorized, costs only 27c a year to operate. Model AT 6X, \$34.95.



WINEGARD "BOOSTER-COUPLER"

Signal booster and set coupler combined. Has one tube, 4 sets of no-strip terminals, on-off switch, antenna disconnect plug. Runs 1-4 sets. All AC—no hot chassis. Installs anywhere. WBC-4X, \$27.50 list.



Winegard

ANTENNA SYSTEMS

For free technical bulletins, write today.

3019-7 Kirkwood Street
Burlington, Iowa

Originators of Gold Anodized TV & FM antennas—makers of the World Famous Color-Ceptor TV antenna.

... for more details circle 50 on page 46

FREE LITERATURE

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

SPEAKERS

This 23-page catalog, No. 1070-A, covers a professional loudspeaker series for special purposes and high fidelity. The line includes speakers for commercial, industrial, institutional and public address applications. Jensen Mfg. Co.
 - - - for more details, circle 300

KIT-BUILDERS GUIDE

A full-color kit builder's guide for the do-it-yourself fan, this brochure pictures the manufacturer's complete kit line of amplifiers and tuners. Specifications are listed for each kit as a guide in choosing the best kits for your needs. H. H. Scott, Inc.
 - - - for more details, circle 301

CONVERTERS CHARGERS

A line of 60 cycle mobile power converters, covered in literature, change battery current to 110 volt, 60 cycle a-c.

Frequency regulation accurate to 1 cycle with changing load and input voltage. Also described are heavy duty and standard battery chargers. Terado Corp.
 - - - for more details, circle 302

COMPONENTS

A catalog features electronic tubes, semiconductors, transformers, chokes, meters, wire, test equipment and other components and equipment for the industrial market. Barry Electronics Corp.
 - - - for more details, circle 303

ILLUMINATED MAGNIFIER

An illustrated catalog gives complete information on the Luxo Illuminated Magnifier, designed for visual accuracy during inspection and quality control, assembly, repair, and reading small parts numbers. Luxo Lamp Corp.
 - - - for more details, circle 304

EXTENSION CORDS

A six-page brochure, ED-62, describes a nearly flat rubber-encased cord which eliminates tripping. Ribbed bottom hugs the floor and requires no fastening. Electric Division, IDEAS, Inc.
 - - - for more details, circle 305

QUARTZ CRYSTALS

Handy reference catalog, #962, provides technical data on CB, Amateur, military and general purpose crystals for frequency control. Texas Crystals.
 - - - for more details, circle 306

ELECTRONIC PARTS

A general catalog lists batteries, capacitors, controls, resistors, switches, jacks and plugs, power supplies, vibrators, semiconductors, and microcomponents. P. R. Mallory & Co.
 - - - for more details, circle 307

CUT HERE

7-62

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

Use this coupon, or your letterhead, before August 20, 1962

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

ADVERTISED PRODUCTS				NEW PRODUCTS			
10	21	32	43	200	208	215	222
11	22	33	44	201	209	216	223
12	23	34	45	202	210	217	224
13	24	35	46	203	211	218	225
14	25	36	47	204	212	219	226
15	26	37	48	205	213	220	227
16	27	38	49	206	214	221	228
17	28	39	50	207			
18	29	40	51				
19	30	41	52				
20	31	42	53	300	302	304	306
			54	301	303	305	307
			55				

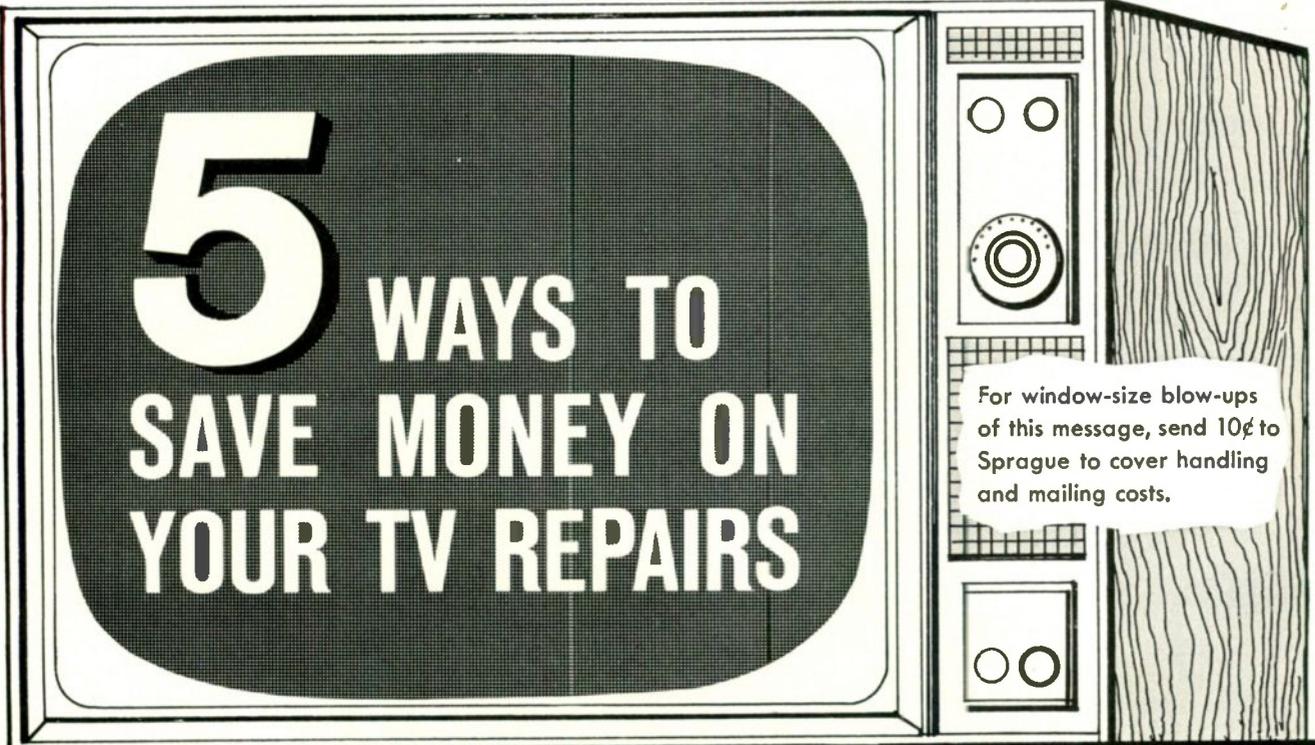
FREE LITERATURE, CATALOGS, BULLETINS

Name.....Position.....

Firm.....Address.....

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

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



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.

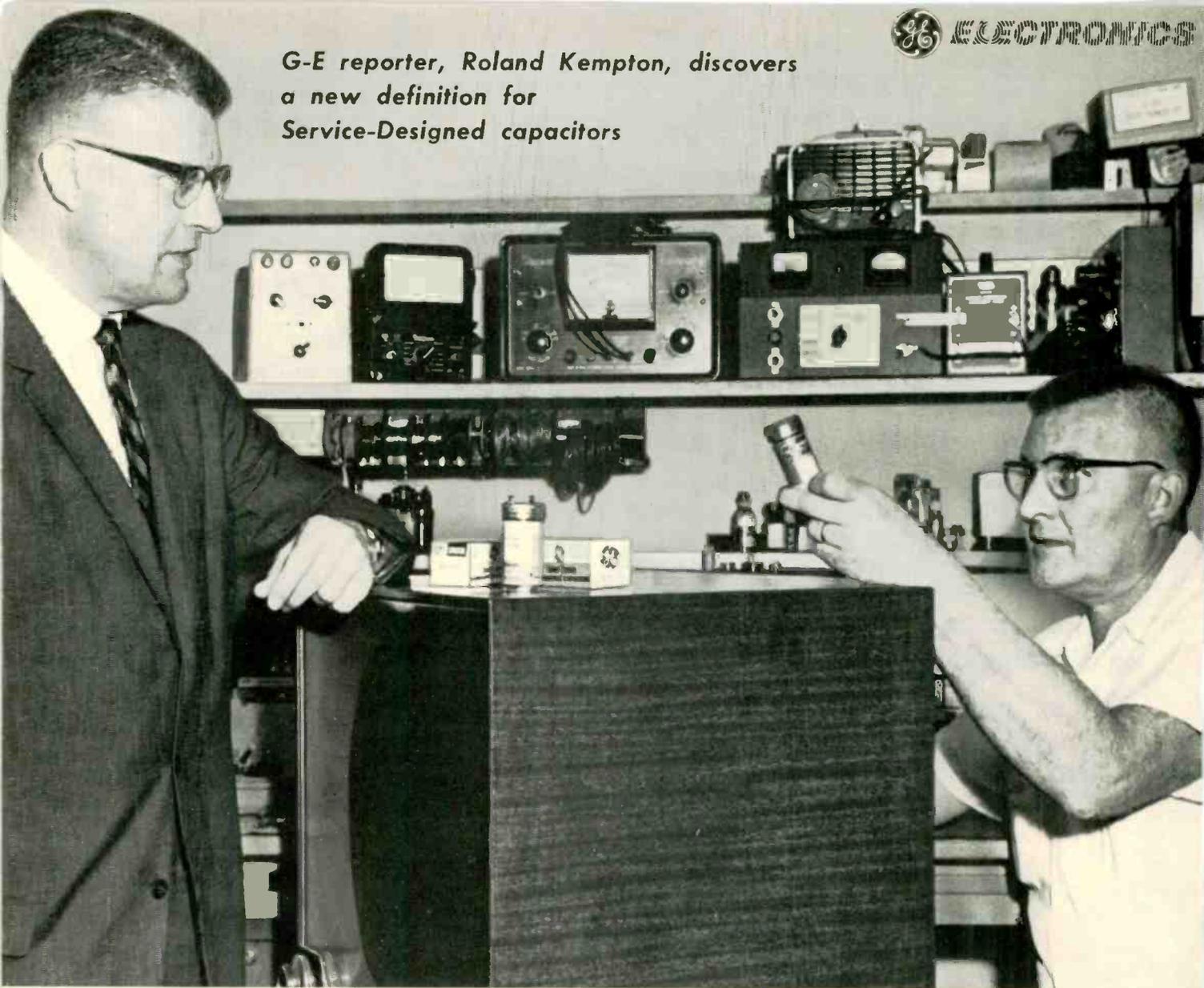
- 1 DON'T BE A "SCREWDRIVER MECHANIC."**
Every year, hundreds of "do-it-yourself-ers" damage or ruin their sets, pile up needless expense, and endanger their safety by trying to make their own TV repairs. Your TV is the most intricate piece of equipment you've ever owned—far more complicated than your 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 43 on page 46

*G-E reporter, Roland Kempton, discovers
a new definition for
Service-Designed capacitors*



“Gas Savers” . . .
that’s what John Crocker calls G-E
SERVICE-DESIGNED capacitors, because he can
fill 70% of his replacement needs with just 20 types

Here’s how John Crocker, owner of CROCKER TELEVISION AND RADIO SERVICE, Fort Wayne, Ind., figures the day-to-day advantages of G-E Service-Designed capacitors:

“In these days of watching each leak in overhead, we have calculated that G-E Service-Designed capacitors save us gas and time whenever we can just reach over to the rack and pull out the capacitor for the job. We call them gas savers. Our edge-of-town location means one hour of a man’s time, plus the wear and tear on equipment, whenever we have to rush to the distributor for an exact replacement. Over a period of months this can run into a lot of unnecessary expense.”

It pays to stock G-E Service-Designed capacitors. Save gas. Save time. Reduce costs and inventory requirements. Speed customer service.

Get all of the facts, including the most complete capacitor catalog and replacement guide ever published, from your G-E capacitor distributor. Ask for ETR-2600, or write to: General Electric Company, Distributor Sales, Electronic Components Division, Room 1754, Owensboro, Kentucky.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

--- for more details circle 25 on page 46
ELECTRONIC TECHNICIAN

NEW PRODUCTS

CB MICROPHONE 200

A small, light weight ceramic element CB transceiver microphone, Model 213, is announced. Available in three styles: with ceramic element, crystal type element and with an optional dpst switch. Features a high impact Polystyrene case to withstand the roughest treatment, an optional dpst switch wired for relay operation and a 5 ft extended, 11 in. re-



tracted, rubber cord with molded strain relief. Response 50-8000 cps. American Microphone Co., Division of GC-Textron Electronics, Inc.

WIDE BAND SCOPE 201

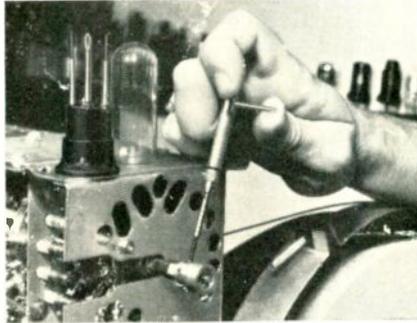
The PS120 portable wide band scope accurately reproduces any waveform from 20 cycles to 12 mc. It is said to be adequate for color TV and other complex electronic circuits. Has only two major controls. An automatic range indi-



cator on the vertical input control enables the direct reading of p-p voltages. \$124.50. Sencore, Inc.

TOOL KIT 202

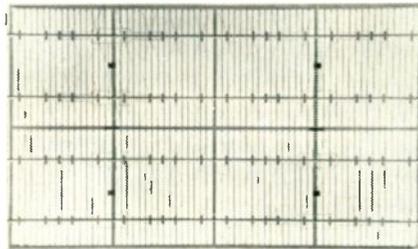
The PA-5 Phillips driver and Allen type wrench set, packaged in a clear topped kit, consists of five precision tiny tools and a chuck-type, swiveltop handle with torque hole. The No. 0 and No. 1 Phillips drivers and No. 4, No. 6, and No. 8 Allen type wrenches are interchangeable in the handle to allow easy



and accurate manipulation of the tools. Moody Machine Products Co., Inc.

BOW-TIE ANTENNAS 203

A high-grain ready-to-install UHF bow-tie antenna array uses heavy-duty screen reflectors to provide high signal-to-noise characteristics. Antennas may be used for systems requiring amplification for distribution or rebroadcasting, off-the-air rebroadcasting or as mast antennas for community or multi-dwelling television systems. In master antenna systems not



incorporating electronic amplification, it is said the high gain allows signal distribution through dividing networks with very satisfactory results. Technical Appliance Corporation.

MULTIPLEX ADAPTER 204

The MX100 f-m multiplex adapter can be used with practically all f-m tuners (both wide and narrow band types) that have either a tape recorder or multiplex output. Features a DIMENSION CON-



TROL for front panel control of stereo separation, and incorporates a high gain amplifier circuit. Output Level 1.5 v. Available as a kit or a wired unit. Kit \$49.95, wired \$69.95. Precision Apparatus Co., Inc.



John Crocker says:
"This New G-E Plastic
Tool Case Holds
Everything You
Need for Service Calls"

This original G-E Service Aid is big enough to tote the tools you need on service calls. Put your tools in this case and gain space for many more tubes in your tube case. Large bottom compartment measures 15 1/4" x 7 3/4" x 4" deep. Two compartmented, self-opening trays are cantilevered to put all tools right at your finger tips.

This durable two-color case is made of high-impact polystyrene. Won't warp. Resists grease, oil, salt water—even battery acid. Top cover overlaps to shed water. Over-all size: 15 3/4" x 8" x 8 1/4". Weight: 3 lb. 11 oz. Dealer list price: \$6.95. Ask your G-E electronics distributor for ETR-3280 or mail coupon to Chicago warehouse address shown.

Progress is Our Most Important Product

GENERAL ELECTRIC

General Electric Company, Dept. 1754
3800 N. Milwaukee Ave., Chicago 4, Ill.

Please ship prepaid:
____ ETR-3280 Plastic Tool Case, \$6.95 each.

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

Name _____
Address _____
City _____ Zone _____ State _____

for more details circle 26 on page 46

NEW PRODUCTS

VTVM KIT 205

Announced is a VTVM kit featuring 24 overlapping ranges for ac-dc ohms, and ac p-p measurements.

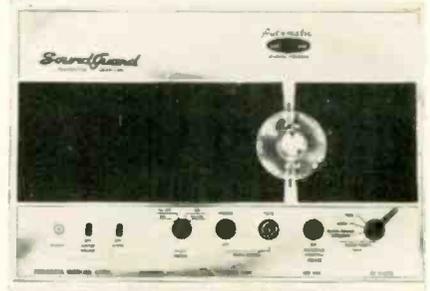
The model 311 jeweled D'Arsonval meter has full-view 6 in. meter with flat scales for accurate readings at a glance. Special circuit automatically protects meter against overloads and damage caused by transporting or vibration. Ranges: dcv-0-1200, rms acv-0-1200, Ohms-0-1000 megohms (10 meg center scale) p-p a-c-0-1200. Kit \$31.95



(plus postage), wired \$44.95 (plus postage). Conar Instruments.

RADIO-INTERCOM 206

A completely transistorized intercommunications system combined with AM/FM radio is available for both home and office. Known as the Sound Guard Director model SG-8407, the unit is easy to install and has only six basic



connections at the master station amplifier. Transistor operation eliminates heat build-up. Progress Webster Corp.

DYNA-TESTER 207

A three-in-one tester, model 625, is a VOM, and cathode rejuvenator tester in one compact instrument. This port-



able instrument 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 shorts, grid emission, leakage and gas. \$139.95. B&K Mfg. Co.

SIGNETTE 208

The "Signette" is a compact, completely transistorized intercom system designed especially for economical, high quality



service in small offices, stores, shops, homes, and similar installations requiring a maximum of seven stations. Case is only 8x4x2 in. A six-position sliding switch selects other stations in the system. A thumb wheel adjusts the sound volume. Each master station is plugged into a standard 110 vac electric outlet. "Slave" stations do not require an outside power supply. General Dynamics Electronics.

*Developed in the field
to pay off in performance
down the road*



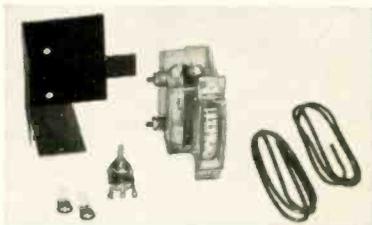
only **\$159⁹⁵**
(S-meter optional extra)



New
Littlephone
CB-3A
dual conversion
citizens band

TRANSMITTER/RECEIVER

New, improved version of Hallicrafters' high-performance CB-3 27-mc. transmitter/receiver—incomparable result of a 30,000-mile, continuous-operation field test under the most punishing conditions imaginable.



S-meter kit—easy to install as shown in photo above. \$8.95

Features:

- 8-channel, crystal controlled convenience
- Dual conversion
- Improved electronic squelch
- Provision for S-meter
- Built-in jack for remote speaker and future accessories
- Audio output over 2 watts
- 6 kc. selectivity
- FCC type-accepted.

the new ideas
in communications
are born at . . .



hallicrafters

5th and Kostner Aves., Chicago 24, Illinois
--- for more details circle 27 on page 46

FASTER THAN A SHORT CIRCUIT



SUB-MINIATURE MICROFUSES

and microfuse holders
for internal connection
and panel mounting.

1/500 AMP. thru 5 AMPS.
@ 125 volts. Will
interrupt 10,000 AMPS.
DC short circuit.



8AG INSTRUMENT FUSES

1/500 AMP. thru 5 AMPS.

For instrument and meter protection, Littelfuse
pioneered the design and
development of reliable fast-acting fuses.

LITTELFUSE

Des Plaines, Illinois

**"I've got
satisfied
customers
and
profits..."**



**by improving communications equipment reliability with
IERC Heat-dissipating Electron Tube Shields!**

Extra profits in contract servicing are yours with TR type heat-dissipating tube shields — at installation, of course, and from the 2 to 12 time increase in tube life and reliability they provide. Electron tube failures, caused by heat, account for almost 70% of equipment failures. Service profits go out the window when valuable work, other service calls or "off hours" time must be given to meet service contract requirements just to change a tube! You can eliminate this problem by increasing the tube life and reliability of your customer's communications equipment with TR's — time-proved in vital military, aerospace and precision electronic equipment applications. A complete installation of TR's in almost any equipment takes only a few minutes — reliability and profits are immediate!

patented



SERVICE TECHNICIANS —
Write today for complete data on
IERC TR shields.

IERC
heat-dissipating

DIVISION
electron tube shields.

International Electronic Research Corporation
135 West Magnolia Boulevard, Burbank, California
heat-dissipating tube shields for miniature, subminiature, octal and power electron tubes

... for more details circle 29 on page 46

NEW PRODUCTS

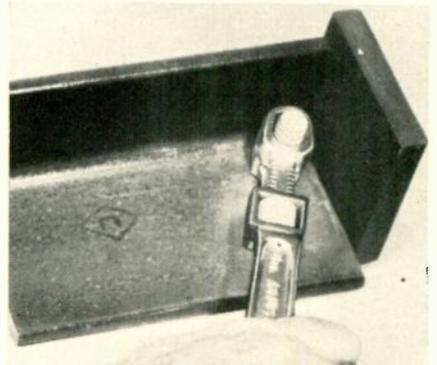
SPEAKER DISPLAY 209
Offered is a self-service speaker display for counter-top use, the Thin-Drive speakers are mounted in clear plastic



"bubbles" which are heat-sealed to attractive display cards. The base of the display is only 15 x 15 in. to conserve counter space. The triangular portion rotates at the touch of a finger to permit examination of the six models mounted on the various hooks. The model number, size, magnet weight, list and coded net prices are included on every package. Utah Electronics Corp.

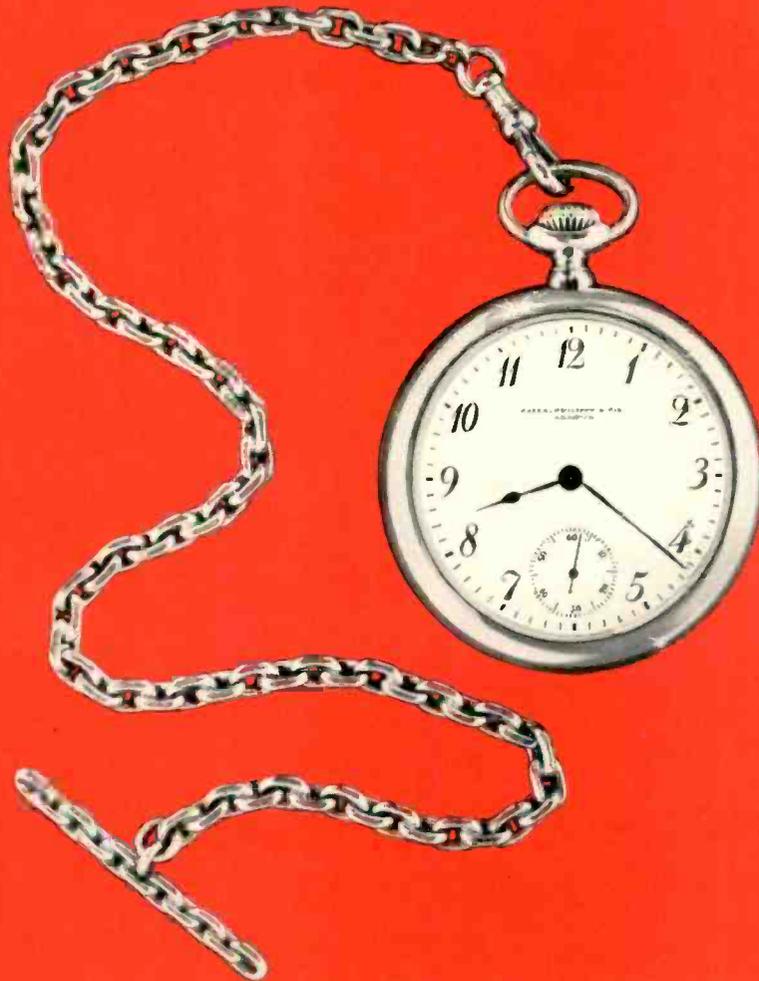
ADJUSTABLE WRENCH 210

A patented adjustable box wrench is designed to work in tight, confined places where regular adjustable and many open-end type wrenches cannot be used. Having an extremely slim contour, obtained without sacrificing strength, the 8 in. "Adjust-A-Box" requires 1½ in. less lateral operating space than a conventional adjustable wrench of comparable size and adjustment range. It has a



positive "four-sided jaw grip" on a hex nut or bolt head which it is said practically eliminates the possibility of rounding off or damaging the corners, and prevents slipping and injury to knuckles. \$3.98. Neff Enterprises, Inc.

FRIEND?...OR FOE?

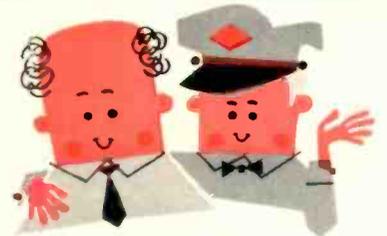


TIME . . . your most valuable asset! The people at Philco and at the Philco Distributor nearby know this all too well! For 30 years we've made it our business to understand your business . . . and to know your problems as well as our own. ■ TIME means money to you . . . and the TIME saved or wasted on a service call can mean a big difference in your earnings. To help you save TIME, we sponsor the Philco Factory-Supervised Service Association; the industry's finest, most complete program of technical information. Your membership in "PFSS" helps you service Philco products faster, easier . . . and at a greater profit. ■ We know that callbacks cost you TIME—and reputation . . . that's why we confidently recommend the use of Philco parts, tubes and accessories. All of them have passed the most rigorous tests of quality and performance. Products repaired with Philco parts stay repaired. ■ Yes, indeed—TIME can be Friend or Foe. We can help you call it "Friend."

We can save you buying-time, too. Your Philco Distributor has a complete selection of Philco tubes, Philco and Unversal parts, capacitors, batteries and accessories . . . for easy, one-stop buying.

PARTS & SERVICE OPERATIONS

PHILCO
A SUBSIDIARY OF *Ford Motor Company*



**WANT TECHNICAL INFORMATION
TO HELP SAVE MORE TIME?
MAIL THIS COUPON TODAY**



Philco Parts & Service Operations, Dept. B7
"C" and Westmoreland Sts., Phila. 34, Pa.

Please send me the latest Free technical information and my complimentary copy of the Philco Service-Businessman magazine.

Name _____

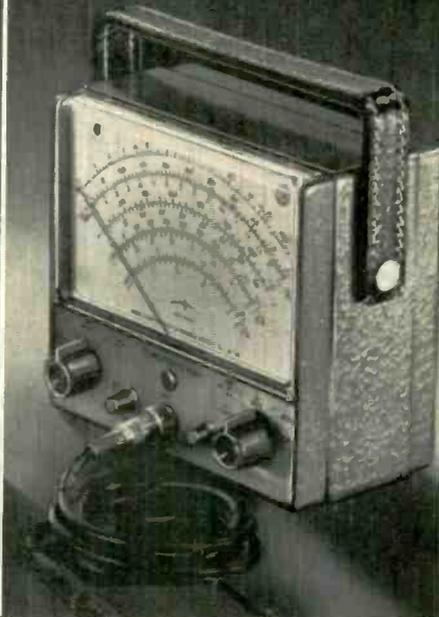
Address _____

City _____ State _____

Service Only Retailer with Service Dept.

- - - for more details circle 34 on page 46

Now with New Features For Added Versatility



RCA WO-91A 5-INCH OSCILLOSCOPE

New 2-Stage Sync Separator Simplifies Checking TV Horizontal and Vertical Sweep Synchronization

This popular RCA 5-inch scope now at your distributor's includes a new feature to simplify TV servicing: a built-in two-stage sync separator. This circuit, connected in the preset TV "H" and "V" positions, provides exceptionally solid lock-in action on composite TV signals.

Other "PLUS" Features:

- 5-inch screen with high resolution
- Dual bandwidth (4.5 Mc with 0.053 volt rms/in. sensitivity; 1.5 Mc with 0.018 volt rms/in. sensitivity)
- Internal calibrating voltage and calibrated graph screen
- Includes special direct/low capacitance shielded probe and cable

\$249⁵⁰*

factory-wired and calibrated

SEE THEM BOTH AT YOUR AUTHORIZED
RCA TEST EQUIPMENT DISTRIBUTOR.

*User Price (Optional)

RCA WV-98C SENIOR VOLTOHMYST®

New 0.5 Volt Full-Scale DC Range for Testing Transistor Circuits

Now you can check the low voltages used in transistor circuits even more accurately with the latest model of the famous RCA Senior VoltOhmyst.

The new "C" version of this time-tested instrument includes a high-sensitivity range that provides full-scale deflection at only one-half volt DC!

Other "PLUS" Features:

- Easy-to-read 6 1/2" meter face
- 200- μ a meter movement with less than 1% tracking error
- Precision multiplier resistors accurate to 1%
- Meter electronically protected against burnout
- Separate color-coded peak-to-peak and rms voltage scales
- Die-cast aluminum case with leather carrying handle

MEASURES:

DC volts, 0.02 to 1500 volts
AC volts, 0.1 to 1500 volts rms or 0.2 to 4200 volts peak-to-peak
Resistance, 0.2 ohm to 1000 megohms

\$79⁵⁰*

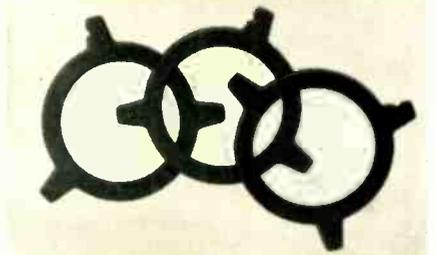
factory-wired and calibrated

NEW PRODUCTS

CRT MAGNETS

211

A loaded plastic material, which significantly reduces required scanning power for both line and frame in 110° TV picture tubes is announced. The Ferroxidure magnet is employed on the CRT



neck back of the deflection coils in place of the usual low percentage cobalt, chrome or tungsten steel materials. Ferroxidure Corp.

TRANSISTOR RADIO

212

Model 6523 is a three-band 10-transistor short wave radio, which receives the standard broadcast band and two short wave bands, 2-6 mc and 6-18 mc. The two short wave bands receive for-



eign and English language broadcasts, marine information, police and aircraft messages, and "ham" communications. Long-range power is provided by 10-transistors and one diode in the radio's superheterodyne push pull circuit. Channel Master Corp.

TRANSISTOR TESTER

213

A compact transistor tester has been developed for testing PNP, NPN, power transistors, diodes and rectifiers (semiconductors). The unit measures 5 x 5 x 1-7/8 in. and weighs only 1-3/4 lb. Fea-

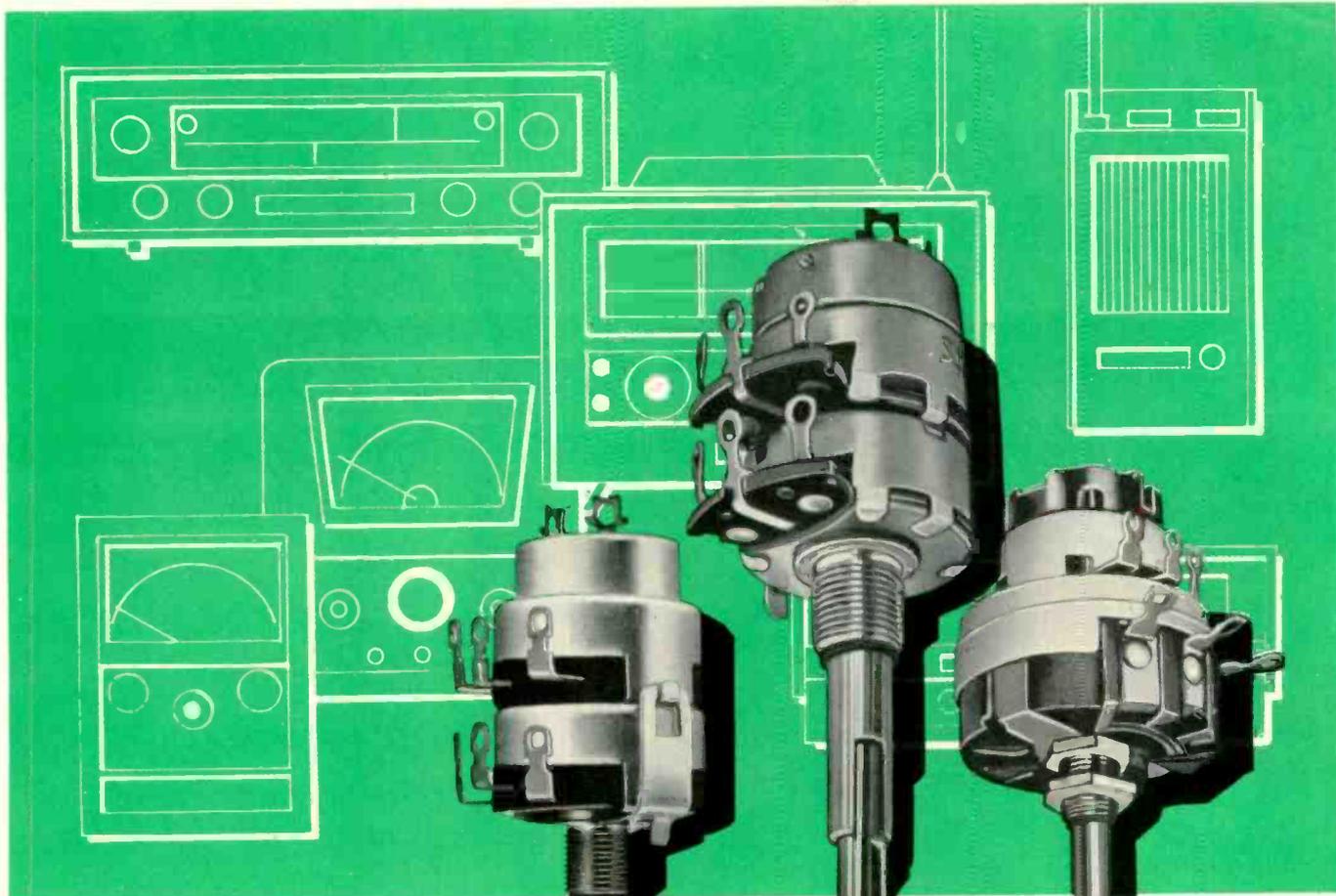


tures include a wide angle meter, three tests (shorts-leakage-gain), transistor socket for "out-of-circuit" testing and zero adjustments on meter. G C Electronics Co.



The Most Trusted Name in Electronics

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



wherever control is needed . .

**...USE
CLAROSTAT
REPLACEMENTS**

- ★
Dual and single carbon controls
- ★
Dual and single wire-wound controls
- ★
RTV exact-duplicate dual concentrics
- ★
Uni-Tite field-assembled dual concentrics
- ★
Switches
- ★
Sound system controls

Television, radio, auto radio, citizens' band, amateur equipment, hi-fi, multiplexers, stereo, marine equipment...and just about every place electronic control is required you'll find the right control at your Clarostat distributor.

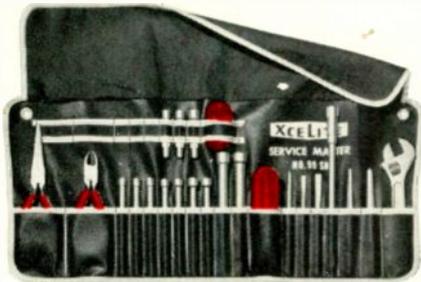
Clarostat specializes in controls for replacement purposes. These controls are designed to fit right, work right in every single case. They save you time, money and headaches. Always ask for CLAROSTAT controls in the green box and back your skills and knowledge with the very finest performances available.

ASK YOUR DISTRIBUTOR FOR CLAROSTAT CATALOG...

CLAROSTAT

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

SERVICE MASTER... EVERY TOOL YOU NEED 99% OF THE TIME



complete 23-piece kit for radio, TV,
and electronic service calls

2 HANDLES:

shockproof plastic. Regular 4" length... 2" Stubby. Interchangeable. Patented spring holds snap-in tools firmly in place.



9 NUTDRIVERS:

High Nickel chrome finish, 3/16" to 1/2"



3 STUBBY NUTDRIVERS:

1/4", 3/16", 3/8"



EXTENSION BLADE:

Adds 7". Fits both handles.



3 SCREWDRIVERS:

Two slotted... 3/16", 3/32", #1 Phillips



2 REAMERS:

1/8-3/8", 1/4-1/2"



ADJUSTABLE WRENCH:

6" thin pattern, 1" opening



LONG NOSE PLIER:

"Cushion Grip", 2 1/4" nose



DIAGONAL PLIER:

"Cushion Grip" hand-honed cutting edges



ROLL UP KIT:

Durable, plastic-coated canvas. Compact, easy-to-carry.

Ask your distributor to show you kit 99 SM



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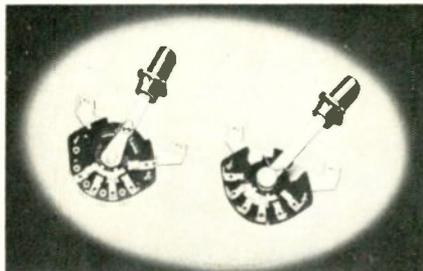
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

--- for more details circle 51 on page 46

NEW PRODUCTS

LEVER SWITCHES 214

Lever switches available with two, three, and four position indexing, with or without spring return have been announced. Designated the PA-700 series.



these switches are available as single units or as ganged assemblies with end brackets for mounting. Rated at 1.5 amp at 28 vdc, 230 ma at 115 vac, with a current carrying capacity of 9 amp. Clips and rotor contacts are silver plated brass and the clips will accommodate up to #18 wire. Silver alloy clips are also available. Insulation is laminated phenolic with a voltage breakdown of 1000 v rms. Centralab.

TAPE CARTRIDGES 215

Introduced are two models of continuous tape cartridges that are compatible with all current models of continuous cartridge playback equipment. SCA model S has a capacity of 225 ft of tape and is specifically designed for broadcasting, message repeaters, audio

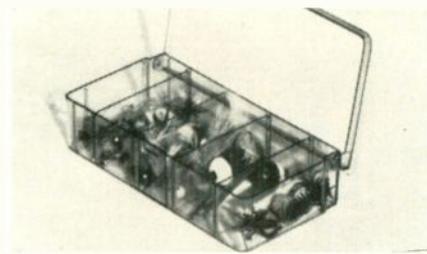


and visual display devices and language equipment.

SCA model L has a capacity of 1690 ft and is designed for background music, data retrieval or where longer tape lengths are required. Sound Corporation of America.

PLASTIC BOX 216

A free, reusable plastic parts box is offered with each purchase of four rolls of #29 plastic electrical tape. The clear plastic box is 7 x 3-1/2 x 2 in. and can be compartmented into five sections with plastic separations which are provided.



The box has a self-contained lid with reinforced hinges and closure. It can be used to hold small parts, hardware, household and office items, fishing flies and hooks, golf tees, etc. Permacel.

PLUG-IN RECTIFIERS 217

Silicon rectifiers have been designed to permit direct plug-in replacement of vacuum or gas type rectifier tubes. Available in ratings to 40,000 v PIV and 2.5



amp. This CP series of rectifiers permits replacement of 5U4, 6X4, 3B28, 866, 8008, and many others. Columbus Electronics Corp.

MINIATURE RECEIVER 218

Pagefone, a miniature personal paging receiver, operates indoors or out on any of 23 citizens' band channels. Ideal for low cost industrial radio paging. Measuring only 1 1/4 x 2 1/2 x 4 in. it will fit into any shirt pocket. Does not require a conventional telescoping antenna, and features an efficient squelch



control, automatic noise limiter, and standard third overtone plug-in type crystals. Weight 6 oz. \$49.50. U. S. Communications Corp.

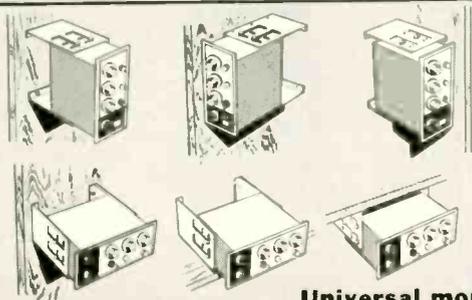
MORE INFORMATION

For more New Product information circle the number of the product on page 46 and mail in the coupon.

TR-1 15 watt mobile transistorized p.a. amplifier



Plug-in-accessories



Universal mounting

TR-2 30 watt portable transistorized DC or AC/DC p.a. amplifier



Plug-in-accessories



with LC-5 Carrying Cover

Harman-Kardon offers more operating features, more application versatility, more value than any other mobile or portable public address amplifier ever made... and they're transistorized!

With the new Troubador Series, Harman-Kardon introduces exciting new potentials for mobile and portable p.a. amplifiers. Never before has there been equipment offering the extra value, the operating facilities and the flexibility of these advanced new units. For rentals, for regular and unusual applications, the TR-1 and TR-2 provide dramatic performance and economy benefits. The TR-1 will find use in police, fire, marine, military, construction and other mobile commercial applications where battery or ignition power is available but AC is not. The TR-2, in addition, includes on-chassis provision for optional AC-to-DC converter to give it limitless applications in schools, hospitals, stores... anywhere an amplifier is needed regardless of power source. Automatic switch-over to DC in event of AC power failure makes this the only amplifier to offer uninterrupted service. It is also the long-awaited answer for emergency control work.

TR-1 • Simultaneous 2-channel operation: 1 mic, 1 music • Plug-In preamplifier module with equalization for tape head and mag phono • Universal mounting—TR-1 is free standing, also mounts flush on dashboards, panels, etc. Mounting brackets

permit installation on all surfaces in all positions. Removable without disturbing brackets • Provision to turn amplifier on or off from remote location or microphone • Constant voltage output in addition to voice coil impedances • Can't damage amplifier by grounding chassis or incorrect polarity • 4-position filter for maximum tone and acoustical control • And many other flexible operating features.

TR-2 • Simultaneous 4 channel operation—2 mic, 2 music • Provision for on-chassis AC-to-DC solid state converter • On-chassis facilities for operation from AC with optional plug-in converter • Plug-in accessory provides automatic switchover to DC in event of AC power failure • Plug-in preamplifier module with built-in equalization for tape head and mag phono • Facility to turn amplifier on or off from microphone or remote location • Master Volume Control • Separate Bass and Treble Controls • Constant voltage output (25v & 70v balanced & unbalanced) and variety of voice coil impedances • Can't damage amplifier by grounding chassis or incorrect polarity • De Luxe Carrying Cover • Many other valuable operating and installation features.

Built by Sound Men for Sound-Men

harman kardon

For full details, write: Commercial Sound Div.

Desk G-7, Plainview, L. I., New York.

for more details circle 28 on page 46

NEW PRODUCTS

TUBE TESTERS

219

A self-service tube tester designed to enable servicemen to promote in-shop do-it-yourself tube testing and also use on service calls has been announced. The ETA Model 88SS instrument is said to be a complete TV tube tester for all new tubes including nine-pin novars, 12-pin compactrons, 10-pin tubes and nuvistors plus all previous popular TV and modern radio tube types. Size 9x10-1/2 x 5-1/2 in. Specifications include: 12AU7



two stage d-c amplifier, selenium rectifier power supply, single 5 ma meter which indicates results for both grid circuit and tube merit tests. \$79.50 with self-service display. Seco Electronics, Inc.

REMOTE ROTOR CONTROL 220

A remote antenna rotor control unit permits armchair tuning of TV antenna direction without wire or other physical connection to rotor control unit. The Model-AK-122 consists of a small sonic transmitter the size of a cigarette pack and a receiver unit which forms an attractive base for the rotor control unit. The receiver unit can be easily installed by the set owner in the several models of rotor control units designed for this use. \$54.95. Cornell-Dubilier Electronics.

SCREW DRIVER DISPLAY 221



A "system" for inducing customers to purchase screwdrivers, and have fun doing it besides, has been devised. This "system" consists of the development of "Bull Driver," the screw driver with the 35 percent bigger handle, plus a colorful display with a built-in testing device which enables customers to make their own dramatic tests. Called "Compar-O-graph" this display measures 11-3/4 x 8-1/2 x 23 in. It holds 34 assorted drivers. Prices and sizes are clearly marked with tabs inserted in a special holder. Vaco Products Co.

CIRCUIT BOARD HOLDER 222

A printed circuit board holder, model 315, is designed to firmly hold any board at three points whether the shape be oblong, square, oval, or of special shape. When used with the model 300 Pana/Vise work positioner, the operator can rotate, tip or tilt the PC board up or



down for greatest accessibility for the work at hand. Model 315 PC board holder (complete with 10 in. holder arms. \$12.95. Wt. 1 lb. Colbert Die Cast Co.

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CUSTOMERS
MAKE
MONEY**

THE INDUSTRY'S STANDARD

Most Widely Used Today
by Professional Servicemen



FAMOUS
DELUXE



CRT 440



For Black & White and Color

"Most valuable and useful" . . . "Wouldn't be without it" . . . "Pays for itself over and over again" . . . servicemen say. Quickly checks and corrects television picture tube troubles in a few minutes right in the home without removing tube from set. Gives new life to weak or inoperative tubes. Checks for leakage, shorts, open circuits and emission. Removes inter-element shorts and leakage. Repairs open circuits and low emission. Restores emission and brightness. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new tube sales easier. Completely self-contained. Rich leatherette-covered carry-case. Net, \$74.95

TESTS AND REJUVENATES

all picture tubes at correct filament voltage from 1 to 12 volts

TESTS AND REJUVENATES

110° tubes and the new 19" and 23" tubes

TESTS AND REJUVENATES

color picture tubes. Checks each gun of color tube separately

UP-DATE YOUR B&K CRT WITH THESE ACCESSORIES

Model C40 Adapter. For use with previous Models 400 and 350 CRT's—to test and rejuvenate TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

Model CR48 Adapter. For use with previous Models 400 and 350 CRT's—to test and rejuvenate 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

B & K MANUFACTURING CO.

Division of DYNASCAN CORPORATION

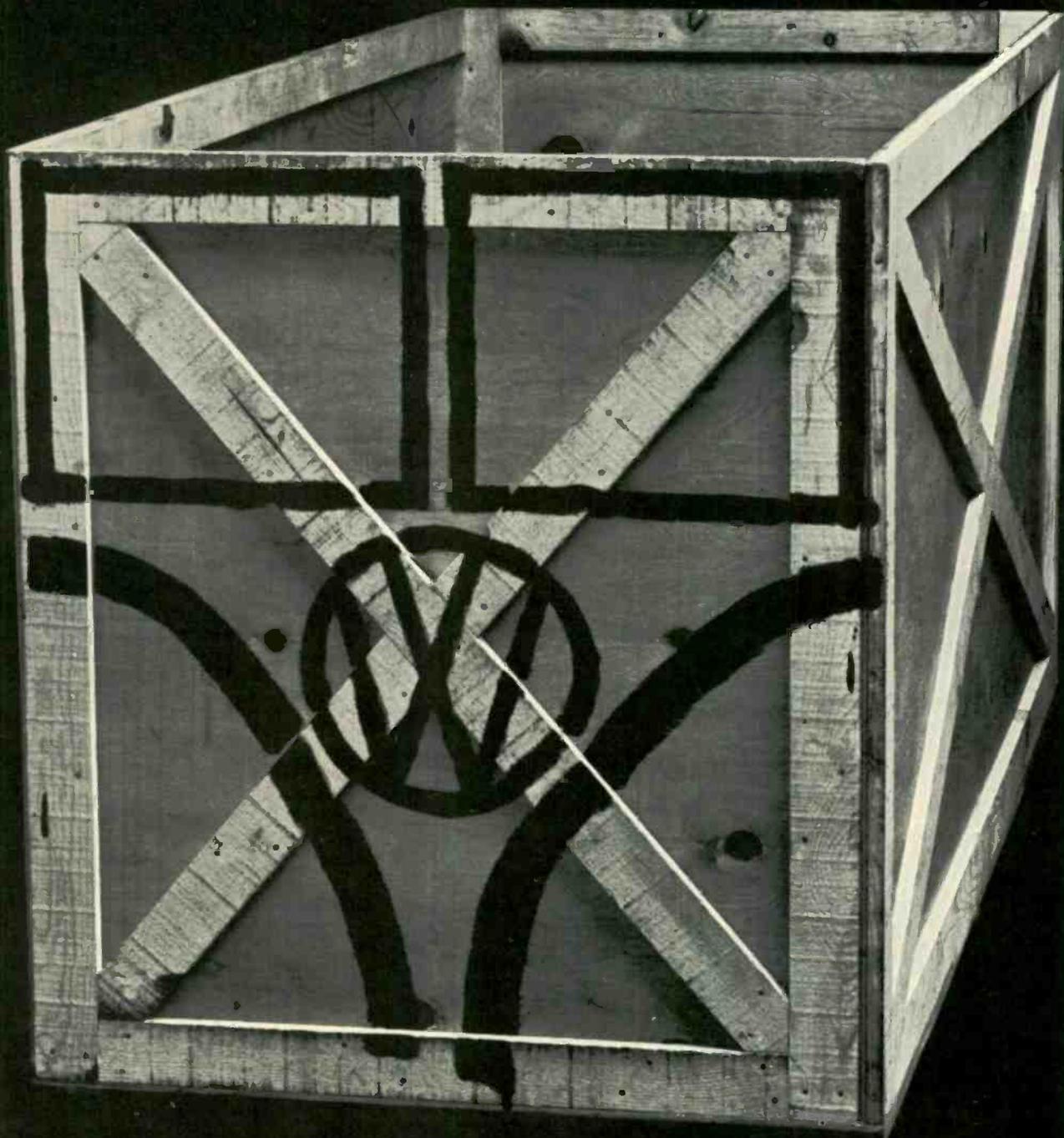
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Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



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Catalog AP20-T

--- for more details circle 54 on page 46



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A Volkswagen truck is a big crate.

Our truck holds 170 cubic feet of stuff. Without stuffing.

(Actual capacity: 1,830 pounds. About 800 more than a half ton.)

It's our crate of a shape that does it.

Outside, you don't see a long front hood. (Our engine's in the rear. For extra traction.)

You can park our truck in 3 feet less space than a conventional truck. (It's only 9 inches longer than our VW Sedan.)

Once you're parked, you've got a doorway 4 feet wide. And double doors. Right in the side.

So you can get everything in and out from the sidewalk.

There's also a lift-up door in the rear. For 80 bucks* more you can get another 4-foot-wide doorway. And double doors. Right in the other side.

And we haven't even mentioned the legendary VW economy. The extra tire wear. Etc.

Some crate.



--- for more details circle 49 on page 46

BUY THIS

GET THIS FREE

MASTER CARTRIDGE SUBSTITUTION GUIDEBOOK

by JACK STRONG

RIDER publication

POWERFUL PROFIT-PRODUCING COMBINATION—YOURS FROM SONOTONE

What a profit-making combination — the industry's finest replacement cartridges in the new, handy Sonotone 6-PAK plus the new Rider "Master Cartridge Substitution Guidebook" (regularly \$2.00), for the price of the cartridges alone. This guidebook, world's greatest source of cartridge replacement data, enables you to locate the exact or equivalent replacement for nearly every record player manufactured since 1930.

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Visit your distributor and select any 6 Sonotone cartridges. Or choose one of the pre-selected 6-PAK combinations that include the most needed cartridges for the most frequent replacements. With your purchase, your distributor will

give you a valuable coupon — one for every six Sonotone cartridges. Mail the coupon to Sonotone Corp., Electronic Applications Division, Elmsford, New York. You'll receive your free Rider "Master Cartridge Substitution Guidebook" by return mail. It will make your stock of Sonotone cartridges more valuable than ever before.

Visit your parts distributor today. Order a Sonotone 6-PAK — and receive your valuable "Cartridge Substitution Guidebook" Coupon. (This offer expires Aug. 15, 1962).

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SONOTONE® CORPORATION

Elmsford, New York • Canada: Atlas Radio Corp., Ltd., Toronto
Cartridges • Speakers • Tape Heads • Microphones
• Electron Tubes • Batteries • Hearing Aids

NEW PRODUCTS

STEREO CONTROL

223

The CC-1 stereo headphone control center connects to any stereo amplifier with an output of as little as 10 w/channel, and provides the listener with dimensional "audience-seat" feeling. The center provides private stereo listening for two. Headphones provide private stereo for the discriminating listener who



wishes to concentrate on music while others in the room are reading, studying, watching TV or sleeping. \$39.75, less headphones. Stereo headphones \$24.95. Jensen Manufacturing Co.

CAPACITOR ANALYZER

224

A capacitance tester that measures low-voltage capacitors without damage or creating any change in their characteristics is being offered. With applications in TV repair, laboratory and classroom work and manufacturer's assembly line testing, the model BF-71 analyzer is capable of testing all low-voltage capacitors as well as the usual higher-voltage types. \$129.75. Cornell-Dubilier Electronics.

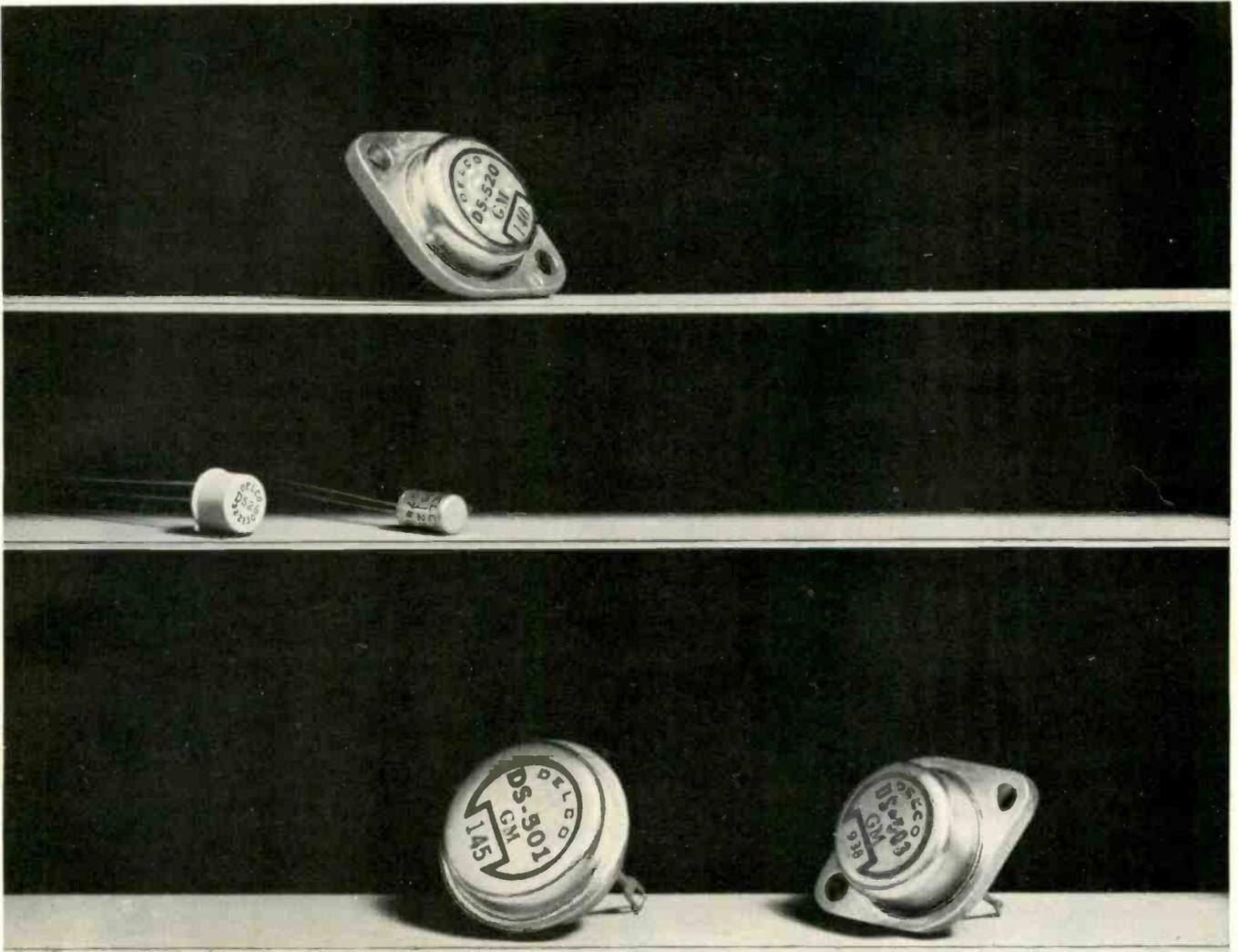
DEFLECTION AMPLIFIER

225

A space-saving compactron device for use as the horizontal deflection amplifier in TV receivers has been developed. Seated height of the single-ended com-



compactron type 6GE5 is 2.5 in. which is 1 3/16 in. shorter than the seated height of its conventional-tube counterpart, the 6DQ6B, or a reduction of 32.5 per cent in space requirement for the horizontal deflection amplifier. General Electric.



**YOU'RE LOOKING AT ALL THE TRANSISTOR INVENTORY YOU NEED
TO SERVICE EVERY TRANSISTOR CAR RADIO ON THE ROAD!**

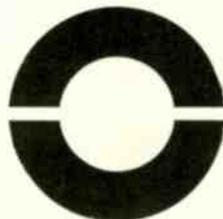
simply say **Delco**

There are millions of transistors in car radios today . . . and with just five Delco numbers in stock, you're ready to service this entire replacement market. Simply say Delco and get these advantages!

- Five transistor numbers service all PNP Transistor Auto Radios!
- Delco's DS-25 and DS-26 cover small signal transistor needs in all Delco radios!
- Delco's DS-501 and DS-503 cover audio output transistor needs in all Delco radios!
- Delco's DS-520 fits all non-Delco radios—actually improves performance (up to 1.5 watts)!
- DS-25 and DS-26 replace practically every PNP transistor used in *portable* radios!
- Application and cross reference charts are packaged with your Delco transistors!
- All these advantages are yours at a low cost!

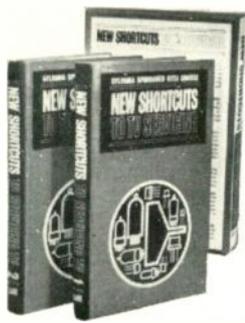
Cash in now on the coverage you get from top-quality **Delco Radio** Automotive Radio Service Parts and Electro-Mechanical devices, distributed nationally through **United Delco**.

DELCO RADIO, Division of General Motors, Kokomo, Indiana



... for more details circle 20 on page 46

Now . . .
New
Shortcuts
to
TV Profits



Yes . . . you can earn more money than you ever thought possible. Stop servicing the old-fashioned, time-consuming way. Learn hundreds of new shortcuts in this new way to television repair. Fixing just one TV receiver will more than pay for the cost of this new two-volume set. Work the troubleshooting chart way to faster repair, higher profits. We show you how in this new, complete two-volume set of the famous Sylvania sponsored NEW SHORTCUTS TO TV SERVICING.

FILL-IN the handy order blank below to get both deluxe bound volumes, only \$6.75 plus a special book-case binder. Send cash with order and we'll pay the postage.

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--- for more details circle 52 on page 46

NEW PRODUCTS

DUST COVER 226
A snug-fitting cover is now available

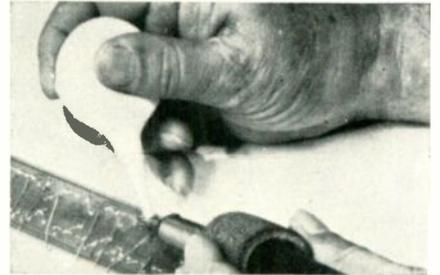


for the Miracord turntable. Known as the Miracover, this convenient dust protector need not be removed when playing records. It consists of two sections. The deck section mounts securely between the Miracord unit and its base. The lucite cover is hinged to the deck, and allows the cover to be raised whenever user wishes to place or remove records, or to operate the controls. Slip-hinge design permits complete removal of the cover, when desired. The Miracover also has provision for stowing spare spindle. Benjamin Electronic Sound Corp.

REPLACEMENT FLYBACK 227
Three exact replacement flyback trans-

formers for Motorola TV sets are announced. HO-342 replaces 24C740969 and 24C742676 in 50 Motorola models and chassis. HO-343 replaces Motorola 24C744042 in 119 models and chassis. HO-343 replaces Motorola 24K748397 and 24K754273-Z in 379 models and chassis. All three units are exact electrical and physical duplicates of the original Motorola parts and can be installed without circuit or chassis alteration. Stancor Electronics, Inc.

SOLDER REMOVER 228
"Little Joe", model 5R-25, is a device to prevent smearing solder over the rest of the circuit board when desoldering components. Has a removable Teflon tip which quickly sucks up the excess solder. Helps to eliminate possible damage to PC board from scratching or from



excess heat. Saves time and promotes neatness in solder work. Is effective in removing solder from hard-to-reach and otherwise inaccessible places. Solder pellets cool quickly inside the bulb. \$1.10. Macdonald & Company.

34¢ EACH
\$32 per 100

ELECTRONIC MARKET
1 YEAR GUARANTEED RADIO-TV TUBES

25¢ QUANTITY DISCOUNT per tube

When purchasing lots of 50 or more same type tube Applies to tubes below only

6SN7	114	12AX7	12CN5	6J6	50C5	6E90	12AT7	12BY7	6W4
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6AB4	6S4	6C87	12SN7	6X7	6AR6	12AR7	6AK5	6AC7	6AR5

ORDER SHIPPED SAME DAY RECEIVED.

SHIPPING INSTRUCTIONS: ELECTRONIC MARKET PAYS YOUR POSTAGE on orders of \$10 or more in U.S.A. and Territories. Send approx postage on Canadian and foreign orders. Any order less than \$10 requires 25c handling charge. Send 20% on C.O.D.'s. ANY RECEIVER TUBE NOT LISTED ALSO AVAILABLE AT 34¢ EACH!

74¢ EACH
\$49 per 100

SILICON RECTIFIERS ALL PURPOSE 500 MA - 'TOP HAT'
Epoxy construction

COMPLETE LINE OF INDUSTRIAL TUBES
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AN tubes not necessarily new, but may be electronically perfect factory 2nds or used. Each clearly marked. ELECTRONIC MARKET will replace FREE any tube that becomes defective in use within 1 year from date of purchase. All tubes individually boxed and marked. Partial Listing Only — Thousands More Tubes in Stock!

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1A7BT	5A24	6B8	6CL6	6SL7	12B06
1036T	5C6B	6BA6	6CM6	6SQ7	12CA5
1U5GT	5B4	6BC5	6CM7	6SR7	12D4
155	5T8	6BC8	6C08	6T8	12F6
174	5U4	6BB6	6C08	6U5	12K5
1U5	5U6	6BE6	6C66	6V5GT	12K7
1V2	5V45	6BF5	6CS7	6V6GT	12L6
1X2	5V6GT	6BG6	6C95	6V6GT	12L6
2A4F	5X8	6BH6	6C08	6X4	12Q7
2B4A	5Y3	6B16	6D6	6X6GT	12R5
2C95	6AB4	6BK5	6DE6	6X8	12S6T
3AL5	6AN4GT	6BK7	6D6GT	6V6	12S17
3BC5	6AR6	6BL7BT	6D6	12A6	12S6T
3BW6	6AL5	6BN6	6F5	12A85	12S87BT
3RZ6	6AR6	6BS6GT	6H6	12A85	12S87
3BC6	6AR6	6BT7	6J5	12A78	12V6GT
354	6AT7	6BR6	6J7	12A86	12W6GT
3V4	6AR5	6BS6	6KGT	12A95	12X4
4BQ7A	6AS5	6BY6	6J7	12A97	19A6GT
4B5	6AT6	6B26	6SGT	12A36GT	19B6
4B7	6AN4GT	6B77	6S7	12A37	19T8
4CD6	6AU6GT	6C4	6SD7GT	12B4	2520GT
5AM6	6AU6	6C4B	6S75	12B47	35A5
5AN6	6AY6T	6CDB	6S7	12B06	35B5
5AT6	6A5	6CDB6	6SN7	12B16	35C5
	6AX4GT	6CF6	6S7	12B16	39W4



YOU CHANGE YOUR ADDRESS

- ☆ notify us at 1 East First St., Duluth 2, Minn.
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- ☆ Notify us in writing—and include the address label from one of your recent issues, showing your old address and code line. (Just filing a change with the post office is not enough—for magazines are not usually forwarded)
- ☆ If your city uses a zone system, please include your ZONE NUMBER in your address. (You'll get faster, surer mail delivery).

--- for more details circle 22 on page 46

THE FINEST STEREO HEADPHONES

YOU'VE
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Jensen's new HS-1 Stereo Headphones are ready for you. We think you will agree with the experts who say they are the finest ever. Reasons? They cover the frequency range with extra smoothness because they have new fluid-damped transducers developed by Jensen. And they are good to look at, easy to adjust, comfortable to wear. Cord comes out one side . . . you don't get tangled up. Impedance 8 ohms. Complete with Jackbox for connecting to any stereo amplifier. Write for Brochure MH.

HS-1 With 3 conductor plug and accessory Jack box Net \$24.95
HS-1L With 4 spade lug terminals Net 22.50

Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 38, Ill. / Canada: Radio Speakers of Canada, Ltd., Toronto

... for more details circle 30 on page 46

EARN EXTRA SUMMER INCOME WITH RIDER BOOKS

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, light, 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. #808, \$2.50.

HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS by Jack Darr. "... covers the entire field of "Intercom" systems in sufficient detail to enable the reader to do installation and maintenance work on this type of electronic equipment."—ELECTRONIC SERVICING. #189, \$3.60.

HOW TO INSTALL AND SERVICE AUTO RADIOS (2nd edition) by Jack Darr. "Veritable gold mine for the newcomer... as well as the experienced hand."—ELECTRONICS WORLD. The 2nd edition of this extremely informative and practical book brings auto radio installation and servicing right up to date. All the new tricks of the trade are to be found here. The techniques applicable to the most modern auto radios — signal-seeking tuners, hybrid auto radios, transistor auto radios, conversion from 6 to 12 volt operation, are explained in great detail. #159, \$3.25.

HOME AIR CONDITIONING—Installation & Repair by J. Derman, F. Makstein, H. Seaman. "... practical and worth-while book on the subject..."—NAVY NEWS. This modern, completely practical text by three experts in the field of home air conditioning, enables anyone to understand the organization, operation, installation and repair of all types of home air conditioners. #211, \$3.50.

The exact or equivalent replacement for nearly every record player made since 1930
MASTER CARTRIDGE SUBSTITUTION GUIDEBOOK by Jack Strong.
"Indispensable service tool"—TRADE BUILDER.
1. Save time in locating the right replacement.
2. Save money by cutting down on the number of cartridges you need to stock. #288, \$2.00

More than 200 time-saving tips

USEFUL ELECTRONIC SHOP HINTS edited by the staff of *Electronic Technician Magazine*. Crammed full of practical, helpful and time-saving shop hints. A collection of nearly 200 of the best electronic shop hints which have appeared in *Electronic Technician Magazine* since 1953. Selections made by the magazine's staff, originally resulted from reader contributions. #295, \$1.95.

New 1962 edition—nearly 75,000 sold

TUBE CADDY-TUBE SUBSTITUTION GUIDEBOOK by H. A. Middleton. (Direct Receiving Tube Substitutions Only plus added new feature—1300 direct CRT substitutions.) This guidebook will • save you time • eliminate carrying needless tube types • enable you to select the best substitution • minimize sales losses because you don't have the right tube. #299... still only 90c.

Mail to your distributor or order direct.

John F. Rider Publisher, Inc. 116 W. 14th St., N. Y. 11
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Satisfaction guaranteed, or I can return within 10-days of purchase for full refund.

for more details circle 36 on page 46

NEW BOOKS

NEW SHORTCUTS TO TV SERVICING. By Leonard C. Lane. Published by Waterview Publishing Co., 226 Park Ave. S., New York 3, N. Y. Two volumes, 320 pages, hard covers. \$4.95 each.

In these two volumes, the author describes and helps you trace every TV malfunction you are likely to encounter. The first book contains chapters on front-end trouble, i-f, video detectors, agc, video amplifiers, and sync circuits. Volume two considers troubles in the CRT, high voltage, deflection, sound, power supply and contains a chapter devoted to miscellaneous troubles. The chapter is arranged in alphabetical order and is cross-referenced to specific trouble areas described in other portions of the book. Both books were originally prepared as a Sylvania correspondence course by Radio and Television Training of America. Reading these books in his spare time, the experienced technician should be able to add several more tricks to those that have taken several years to acquire. Technicians who are new to the business should profit greatly from the books. No effort has been made to blame a particular malfunction on a particular part in the receiver. Step by step logical procedures are followed throughout the book to assure an understanding of the malfunction rather than symptom-part relationships.

PRACTICAL TELEVISION

SERVICING, 2nd Edition. By J. Richard Johnson. Published by Holt, Rinehart and Winston, Inc. 302 pages, hard cover. \$7.95

With this updated edition, *Practical Television Servicing* catches up with the multitude of new TV circuit innovations introduced since its first printing in 1949. It's an excellent down-to-earth text covering the operation and repair techniques of TV receivers. After a chapter on fundamentals of television, the author details how each section of a TV set works, stressing a practical viewpoint. Chapters covering antennas, color TV, troubleshooting, alignment, and case histories are among the 17 chapters of the well-illustrated text. This is a comprehensive TV repair book keyed to apprentice as well as experienced electronic service technicians.

1962 Tube Caddy TUBE SUBSTITUTION GUIDEBOOK. By H. A. Middleton. Published by John F. Rider Publisher, Inc. 61 pages, soft cover. 90c.

This is a most useful up-to-date tube substitution manual for receiving tubes and picture tubes. It contains only direct substitutes that can be made without modifying wiring and which will yield excellent or good results, noted by E or G respectively. The manual is about 4" x 6" and is less than 1/8" thick; ideally suited for tube caddies. The manual's exceptionally high quality paper stock—a consideration which is normally overlooked — should permit it to withstand the abuse faced by continually-used manuals of this type.

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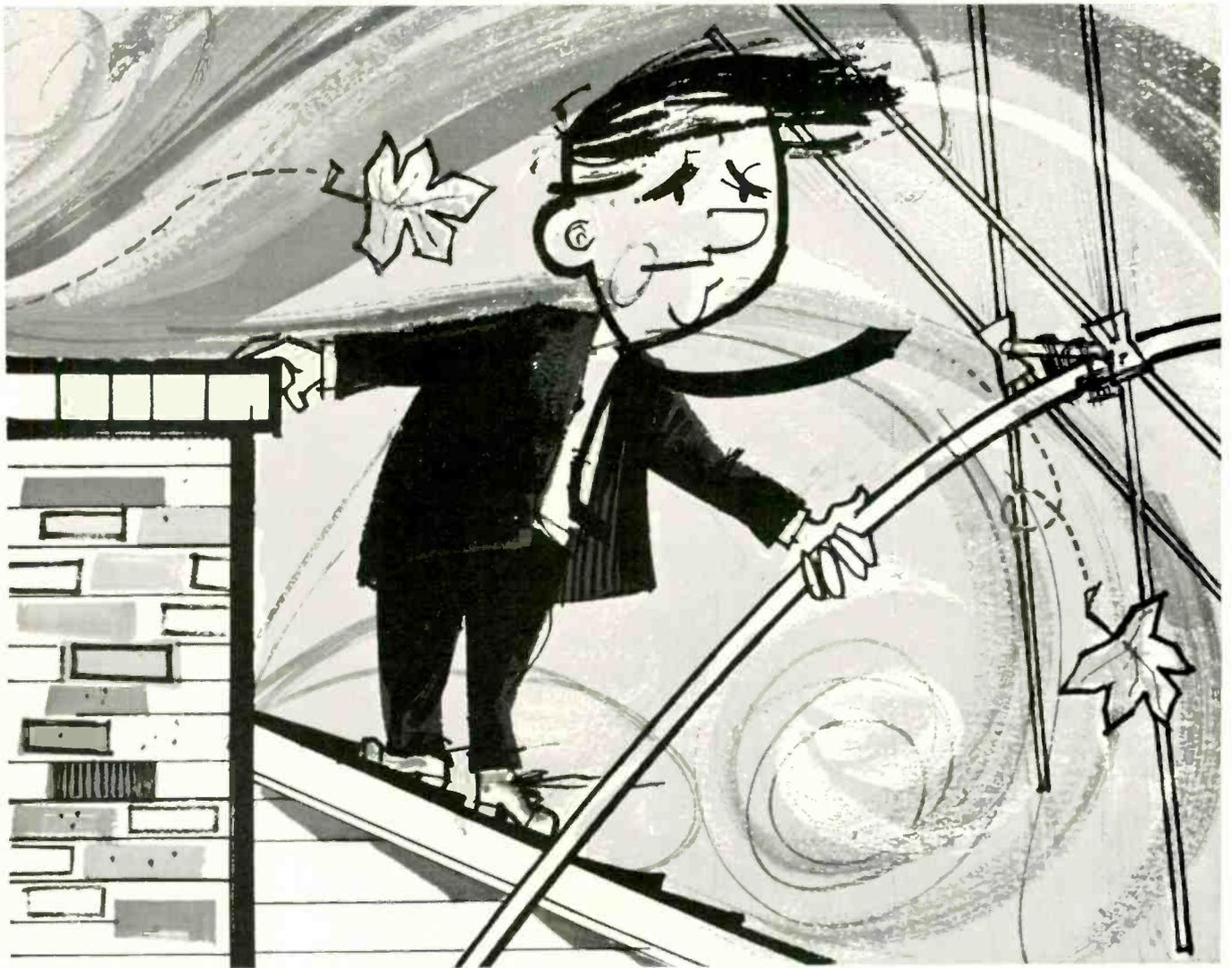
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for more details circle 55 on page 46

ELECTRONIC TECHNICIAN



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3rd overtone — .005% tolerance — to meet all FCC requirements. Hermetically sealed HC6/U holders. 1/2" pin spacing. .050 pins. (Add 15¢ per crystal for .093 pins).

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.486 pin spacing — .050 diameter — .005% tolerance
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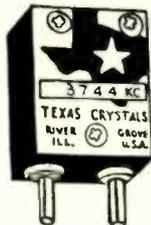
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any frequency, .005% tolerance — **\$3.50 ea.**

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All crystals made from Grade "A" imported quartz—ground and etched to exact frequencies. Unconditionally guaranteed! Supplied in:

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1001 KC to 1600 KC: .005% tolerance	\$4.50 ea.
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.01% Tolerance . . . \$1.50 ea. — 80 meters (3701-3749 KC) 40 meters (7152-7198 KC), 15 meters (7034-7082 KC), 6 meters (8335-8650 KC) within 1 KC FT-241 Lattice Crystals in all frequencies from 370 KC to 540 KC (all except 455 KC and 500 KC) — 50¢ ea. Pin spacing 1/2" Pin diameter .093

Matched pairs — 15 cycles	\$2.50 per pair
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100 KC Frequency Standard Crystals in HC6/U holders	\$4.50 ea.
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ASSOCIATION NEWS

INDIANA

IESA, Elkhart, announces the election of the following officers to the Television Bureau of Elkhart: Pres., Wayne L. Clem; V. P., Arden Gaerte; Secy., Dean R. Mock; and Treas., Hubert McAllister.

South Bend recently passed an ordinance requiring that all TV servicemen and antenna installers be licensed. The bill was passed with a 7 to 2 vote by the city council. Enforcement of the new law will be accomplished by the Division of TV Inspection, headed by the Chief TV inspector. The examining board for new licenses will be appointed by the mayor and the city council. It will consist of two TV technicians, one antenna installer, a businessman engaged in selling TV sets, and a layman. The Chief TV Inspector, an appointee with 5 years experience, must investigate all complaints registered with the board. The law contains a Grandfather Clause, allowing those in business for one or more years not to require examination.

IESA, Indianapolis, reports that the editor of the Hoosier Test Probe, Frank J. Teskey, had an injunction issued against him for a series of articles he was writing. The Test Probe is the official

paper of IESA. The series is called "Learn About The Real NATESA." In his last article, the editor told members that to deal with NATESA, the IESA should join to have a vote in what affects the entire electronics industry.

KANSAS

TESA, Salina, is taking part in a program sponsored by KFRM radio station. The station is supplying tags imprinted with the following: Your radio has been serviced by an expert TESA technician and left tuned to KFRM—55 on your dial—Mid-America's good music station. On the reverse side of the tag is an additional "plug" for the service technician and a place for his stamp.

MICHIGAN

TSA, Detroit, reports that the city has taken 60 TV repairmen to court in the last year and fined all but one for violations of good TV practice. Most of the fines were \$50, but some ranged to \$294.44.

MISSOURI

TESA, Kansas City, checked with local officials and found that TV serv-

R FOR "DOCTORS OF SERVICING"



on emergency calls...

Be sure to spray Shield on electrical contacts and switches. A few squirts of this trouble-shooter extraordinary before servicing cleans the set cleaner, lubricates it better—often cleans up the trouble at once. A "shot" after servicing provides sure-shot protection that lasts. Silicone Base means Total Cleaning Power. Write for handy guidebook to better cleaning. Channel Master Corp., Ellenville, N.Y.

The Professional Service Man's Cleaner

FREE! 7" extension tube with every can! Reach everything easy!

C 1962 CMC

for more details circle 18 on page 46

ELECTRONIC TECHNICIAN

ice is covered by a State Blue Law prohibiting sales transactions on Sundays.

WASHINGTON

TSA, Seattle, announces that attorneys for Better Radio and TV have issued a cease-and-desist order to a newly established firm calling themselves "Better TV Shops." Better Radio and TV has their name registered as a trademark with the county auditor. A few years ago, another firm was enjoined by a court from using the name "Always Better TV." Better TV Shops are said to be using multiple answering service numbers with ads in the local newspapers, TV Guide and the telephone directory.

NEWS OF THE INDUSTRY

Westinghouse—names W. H. EUTZY TV-Radio Division Operations manager. He will be responsible for manufacturing, purchasing, industrial relations, quality control and service functions of the division.

Zenith Radio Corp.—reports that ground has been broken for a new \$7 million plant near the company's main facility. The new plant will permit rearrangement to provide for expansion of research, engineering and manufacturing operations.

Sonar Radio — appoints JACK M. GUTZEIT as national sales manager for the Corp. He was formerly sales manager for Rogers Electronics.



Gutzeit



Malin

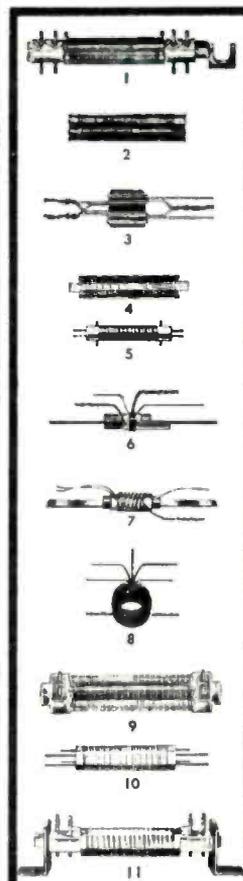
Sylvania—LARRY L. MALIN has been named district sales manager for Los Angeles. The appointment was announced by KENNETH W. CONNOR, vice president of national sales of Sylvania Home Electronics Corp.

Olympic—a division of the Siegler Corp. has signed an agreement with Nippon Columbia Co. Ltd. of Tokyo, Japan. The agreement calls for Olympic to supply design, engineering, and procurement of parts for TV manufacture. In turn, Nippon will offer these sets exclusively to Olympic for sale in the U. S. Olympic will receive a royalty for sets sold outside the U. S.

International Resistance Co.—appoints Kenneth R. Lewis as Chief Engineer of its Documented Reliability Division. Norman L. Kohl named Application engineer, Control Components Division.

Varian Associates — announces forma-

tion of a jointly-owned company with Compagnie Franchise Thomson-Houston of Paris, France, to supply microwave tubes to the European market. It is expected that majority interest in the new company will be held by the French company.



Balun

EXACT REPLACEMENT Coils

Antenna Matching Coils

Cal. No.	O.E.M. Part No.	Illustration
7301	1959 and 1960 R.C.A.	2
7302	Philco 32-4432-3	9
7303	Motorola 74420, Olympic, Silvertone	4
7304	R.C.A. 1955, 1956, 1957	4
7305	R.C.A. 1955, 1956, 1957	2
7306	R.C.A. 1955, 1956, 1957	6
7307	G.E. RLA-043, RLA-045, Hotpoint	6
7308	G.E. WT37X8, RLA-042	6
7309	G.E. WT37X10, RLA-044	6
7310	G.E. RLA-047, Hotpoint	6
7311	G.E. RLA-050, Hotpoint	6
7312	G.E. RLA-053, Hotpoint	6
7313	G.E. RLA-046, West* V-19024-7, -9, Truetone	8
7314	Philco 32-4799, General Electric, Standard Coil	3
7315	Philco 32-4725-1, -3	11
7316	Philco 76-11489-1, Silvertone, Sylvania, West*	1
6103	G.E. RLA-041	7
6104	R.C.A. 73591, 78396, Motorola 248720936	10
6200	Philco 32-4725-3, -5, -6	11
6202	Philco 32-4432-1, -2, -3, West* V-8621-1, -2, -3, -4	5

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... for more details circle 53 on page 46

Now... Tomorrow and for years to come!

Sonar CITIZENS BAND RADIO

- 8 Channels, crystal controlled transmitter and receiver
- Tunable receiver for 22 channels
- Transmitter 100% Class B modulated
- Adjustable squelch
- Automatic noise limiter
- R. F. Power indicator
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- Easy to install. Ideal for home, boat, car or business. Weighs only 9 lbs. . . 4¾ x 9½ x 11¼
- FCC Type accepted*

*in preference to only certification

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PRODUCTS FOR MODERN LIVING



ATR PLUG-IN TYPE PORTABLE INVERTERS*

A.C. Household Electricity Anywhere . . . In your own car, boat or plane Operates Standard A.C. Record Players Dictating Machines Small Radios Electric Shavers Heating Pads, etc.

MODELS
6-RMF (16 volts) 60 to 80 watts. Shipping weight 12 lbs. DEALER NET PRICE \$33.00
12T-RME (12 volts) 90 to 125 watts. Shipping weight 12 lbs. DEALER NET 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

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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!

There is a trim plate kit for YOUR CAR!



ATR CUSTOMIZED KARADIO

Vibrator-Operated with Tone Control
ATR KARADIO . . . is ideal for small import cars or compact American cars! Unit is completely self-contained—extremely compact! Powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. The ATR Customized Karadio comes complete with speaker and ready to install. Can be mounted in-dash or under-dash—wherever space permits! No polarity problem. Neutral Gray-Tan, baked enamel finish. Overall size, 7" deep, 4" high, and 6 1/2" wide. Shipping weight, radio set, 7 lbs. Model K-1279—12A for 12V Dealer Net Price \$33.57 Model K-1279—6A for 6V Dealer Net Price \$33.57

Airplane Style Overhead Mounting under Cab Roof NO PRINTED CIRCUITRY

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Excellent Tone, Volume, and Sensitivity!

Compact, yet powerful. Fits all trucks, station wagons, most cars and boats. Just drill a 1/2 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 overall. 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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BENCH & CADDY

Continued from page 38

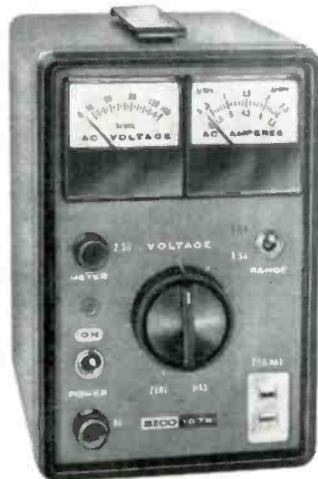
10.7 mc for f-m work, and others for TV alignment. Frequency ranges of i-fs are spread for easy reading and setting. Modulation and output are continuously variable.

A 400 cycle output is also available for audio tests. The audio output is continuously variable with a maximum output of about 15 v.

An instruction manual supplied with the instrument lists many hints for alignment of all types of receivers. The manufacturer suggests that the generator will also serve as a TV marker. A vernier scale on the frequency dial allows the user to return to previously used frequencies with a high degree of accuracy.

EICO Variable A-C Bench Supply, model 1078, at \$54.95 wired, \$42.95 kit — Though many shops are equipped with d-c power supplies, relatively few have variable a-c bench supplies. If your shop doesn't have one, here's one for your consideration.

The model 1078 has two meters which simultaneously indicate both voltage and current output. One meter measures from 30 to 140 v (the supply is variable from 0); the ammeter has a 2.5 and a 7.5 amp range for maximum reading accuracy. Voltage is continuously variable and is adjusted by turning a large knob on the front panel. Both the ammeter and the input circuit have fuses which can be changed from the front panel. A standard receptacle on the control panel



EICO's variable a-c power supply can be used as a troubleshooting tool or to check power consumption.



Turn ON the QUIET Turn OFF the NOISE

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The quality, proved lubricant for effective silencing of noisy controls and switches on TV, radio and electronics instruments. And the FREE EXTENDER TUBE makes those once pesky places easy to reach. Put quality QUIETROLE in your repair kit and see how quickly and easily you satisfy more of your customers.



6 Oz. SPRAY PACK CAN (with FREE Extender Tube)



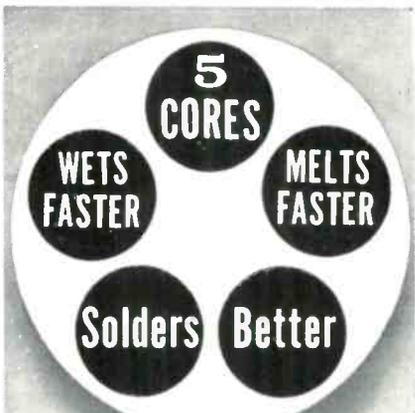
2, 4, 8 oz. Bottles (with Dropper)



QUIETROLE COMPANY

Spartanburg, South Carolina
in Canada: CROSS CANADA ELECTRONICS
12 Laurel Street, Waterloo, Ontario

for more details circle 35 on page 46



Multicore Sales Corp. Port Washington, N.Y.

For information write Department MG 552 for more details circle 33 on page 46

isolates the equipment from the line when the power switch is off. This simplifies testing while the equipment under test is still plugged into the line.

Uses for the instrument are almost unlimited. Over-voltage treatment will often show up intermittents which would otherwise require hours of troubleshooting. TV and other equipment performance can be checked under various line voltages to simulate actual use. Power consumption can be easily calculated from the meter readings. The over-all dimensions of the supply are 8½ x 5¾ x 7 in. Total weight of the unit is approximately 12 lb.

CIRCUIT REPAIR

Continued from page 37

"solder" paints make good low resistance contact and dry to a hard silver film. This material is especially useful in connecting broken leads near heat-sensitive component ends since no heat is required to remake the connection.

Soldering tweezers, with nickel-plated alloy tips, are especially helpful in soldering connections in some hard-to-get-to areas.

A wide variety of other tools, including hooked point scribes, curved and straight point tweezers, offer aid to technicians working on vest-pocket size midget transistorized portable radios. In addition, there are special bench mounted stands available for holding small radios, and large lens magnifying glass-lamp combinations which come in handy in speeding up repairs in assembly-line type operations. ■



"Nothing to worry about, M'am. I was expecting that result."



Tarzian 400 and 600 volt F and H series units are available in handy Ten-Paks, in Doubler Replacement Kits, and in bulk; M150 and M500 units are available in Conversion Kits and in bulk. Nine standard tube replacement rectifiers replace over 95% of all popular

vacuum tube rectifiers; S5347 replaces 6BW4 or 12BW4 in Citizen's Band radios; your 50 to 500 ma requirements are covered by four "condensed stack" selenium rectifiers, which Sarkes Tarzian has made more efficient—and smaller—than before.

Sarkes Tarzian

...the preferred* silicon rectifiers that mean fewer call-backs

**by service technicians — again in '62*

■ Tarzian silicon rectifier dependability virtually eliminates call-backs that waste your time and profits. Units are available immediately from distributors throughout the country... in the shapes, sizes, and specifications you need to do your work quickly and easily.

Tarzian's industry-wide reputation for high quality at a pace-setting low price is a basic reason why technicians like yourself prefer Sarkes Tarzian rectifiers by nearly as many votes as the next two brands combined.

That statement is based on the results of 1961 and 1962 mailings by Brand Name Survey, an independent research organization, to 23,000 service technicians in all major market areas of the United States, covering 36 states. You're in good company—and lots of it—when you make Tarzian rectifiers your first choice for replacement applications.

Free Tarzian "Distributor Line" Catalog is available now as your guide to replacement rectifier quality. Ask your nearest Tarzian distributor for your copy.



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World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices

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In Canada: 700 Weston Rd., Toronto 9 • Export: Ad Auriema, Inc., New York

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Miscellaneous Hum Sources

A large number of hum problems arise as a result of inexperienced kit builders' attempts: capacitive pickup from poor wiring techniques. Filament leads dressed near the grid circuitry, even in high level stages, can introduce objectional hum. Leads carrying a-c should always be paired—not grounded one side—and should be twisted around each other so their magnetic fields tend to cancel. These leads should be dressed as close to the chassis as possible, using clamps if necessary.

Poor lead dress can usually be corrected only by moving signal wires and filament wires with a non-conductive probe while checking the hum level. It may be necessary to secure the wires to prevent them from moving back to their old position.

Hum generated outside the amplifier is most often caused by bad cable connections or line cords which are not polarized (when more

than one a-c input is used). Proper polarization can be obtained by reversing the line cords for all possible combinations until minimum hum is obtained. A good ground connection between components will stop hum which originates from poor connections between units.

Pickup from the strong a-c fields around the phonograph motor can usually be corrected with a combination of shielding and grounding techniques. Leads used from the phono pickup to the amplifier should be well grounded and shielded.

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1-YR. GUARANTEED RADIO & TV TUBES
NEW LOW PRICE

\$30
per 100 TUBES



Factory Used or Factory Second Tubes! TRU-VAC will replace FREE any tube that becomes defective in use within 1 year from date of purchase! ALL TUBES INDIVIDUALLY BOXED! CODE DATED & BRANDED "TRU-VAC"

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

SPECIAL 1	6CB6	30	6CF6	30	6CQ6	30	6CY6	30	
0Y4	3C4	6AC7	6AT6	6CF6	6CJ7	6V6GT	7F8	12BA6	12V6GT
1Z4	3B4	6AZ4	6AZ6	6CK6	6W6GT	6W6GT	7C7	12BA7	12W6GT
1A7GT	3V4	6AG5	6AU4GT	6C8B	6M7	6W6GT	7H7	12BD6	12X4
1B3GT	4BQ7A	6AH4GT	6AU5GT	6C8E	6N7	6X4	7H7	12BE6	14A7/12B7
1NSGT	5B8B	6AM8	6AU8	6C16	6Q7	6X5GT	7Q7	12BF6	14B8
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1X2	5J6	6A8S	6B8GT	6C8N	6SF5	7B4	12C8S	12CA5	19K6
2A4	5R4	6A8S	6B8GT	6C8P	6SF7	7B5	12AD6	12D4	24A
2B4	5Y8	6BC5	6B8	6C8Q	6SG7	7B6	12AF6	12F5	25Z6GT
2C7S	5U6	6BC8	6B8S	6C8R	6SH7	7B7	12A05	12F8	27
3A5	5U8	6BD6	6BYSQ	6E5	6SJ7	7B8	12AT6	12K5	35AB
3AL5	5V4G	6BE6	6BZ6	6F5	6SQ7	7C7	12AT7	12K7	35BB
3AU8	5V6GT	6BF5	6BZ7	6F6	6SR7	7E5	12A06	12L6	35CB
3BC5	5X8	6BG6	6C4	6H6	6T4	7E6	12A07	12Q7	35W4
3BN6	5Y3	6BH6	6C4S	6H7	6T6	7A/XXL	12AV6	12R5	35Z5
3BZ6	6A8	6BJ6	6C5	6J5	6T7	7E7	12AV7	12S7	35Z6
3CB6	6A8A	6BS5	6CD6G	6J6	6U8	7E7	12AX4GT	12S7J	38
							12AX7	12S7K	39/44
							12AX7	12S7L	40
							12AX7GT	12S7M	41
							12B4	12S7N	42
								12S7P	43
								12S7Q	44
								12S7R	45
								12S7S	46
								12S7T	47
								12S7U	48
								12S7V	49
								12S7W	50
								12S7X	51
								12S7Y	52
								12S7Z	53
								12S7AA	54
								12S7AB	55
								12S7AC	56
								12S7AD	57
								12S7AE	58
								12S7AF	59
								12S7AG	60
								12S7AH	61
								12S7AI	62
								12S7AJ	63
								12S7AK	64
								12S7AL	65
								12S7AM	66
								12S7AN	67
								12S7AO	68
								12S7AP	69
								12S7AQ	70
								12S7AR	71
								12S7AS	72
								12S7AT	73
								12S7AU	74
								12S7AV	75
								12S7AW	76
								12S7AX	77
								12S7AY	78
								12S7AZ	79
								12S7BA	80
								12S7BB	81
								12S7BC	82
								12S7BD	83
								12S7BE	84
								12S7BF	85
								12S7BG	86
								12S7BH	87
								12S7BI	88
								12S7BJ	89
								12S7BK	90
								12S7BL	91
								12S7BM	92
								12S7BN	93
								12S7BO	94
								12S7BP	95
								12S7BQ	96
								12S7BR	97
								12S7BS	98
								12S7BT	99
								12S7BU	100

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12LP4	9.95	16KP4	9.95	17CP4	10.95	21AMP4	23.95	21FP4	17.95	21ZP4	23.95
14BP4	10.95	18LP4	10.95	17QP4	10.95	21AUP4	23.95	21MP4	27.95	24AP4	29.95
16AP4	12.95	18RP4	9.95	20HP4	17.95	21AVP4	23.95	21YP4	26.95	24CP4	29.95
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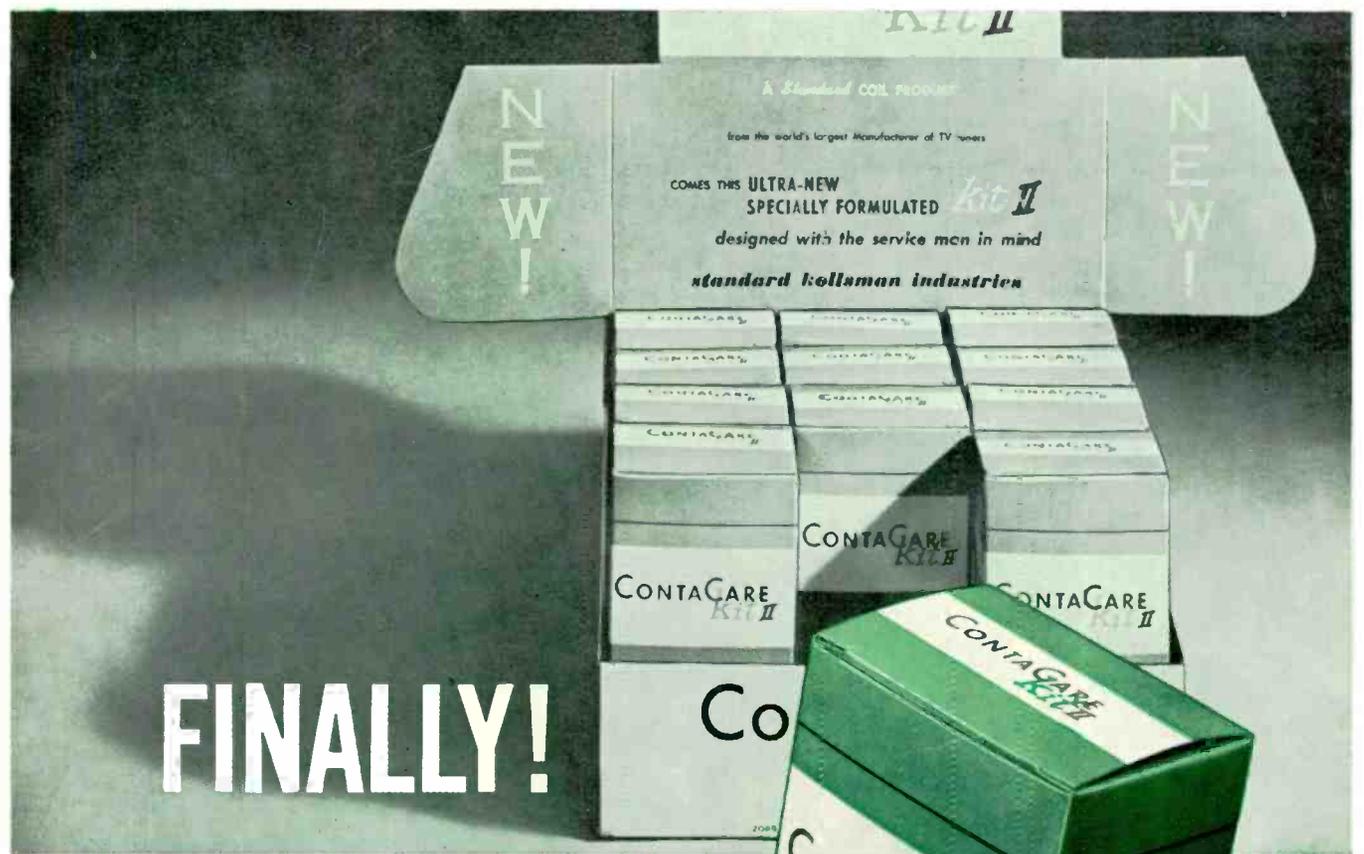
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21ATP4

21ATP4A

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