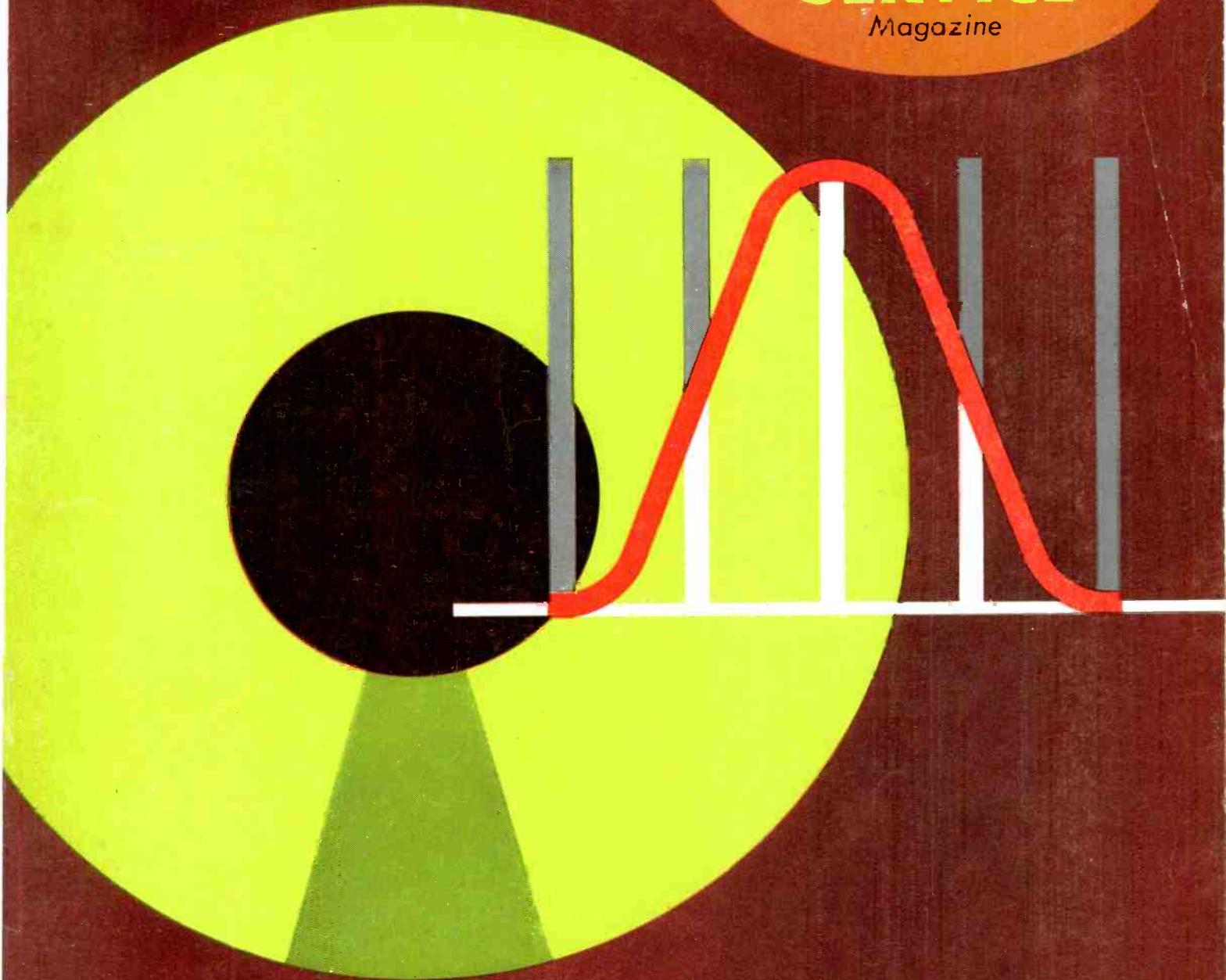


ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine



"MAGIC EYE"

INDICATORS

60
January • 1961

dealer-serviceman's fuse rack . . .

. . . for wall mounting

LITTELFUSE

most
needed



most
wanted

. . . **the FUSEMASTER!**



dealer-serviceman's fuse
requirements at a glance

ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

World's Largest Electronic Trade Circulation

ALBERT J. FORMAN *Editor*
ARTHUR P. SALSBERG *Managing Editor*
JACK HOBBS *Technical Editor*
B. V. SPINETTA *Assistant Editor*
HARVEY WETZLER *Assistant Editor*
ROBERT TALL *Washington Editor*
C. F. DREYER *Art Director*
M. FARRIS *Editorial Assistant*



Address all mail to
480 Lexington Ave., New York 17, N. Y.
Telephone YUKon 6-4242

HOWARD A. REED *Publisher*

BUSINESS DEPARTMENT

R. L. KIPP *Eastern Sales Manager*
N. McALLISTER *Production Manager*
M. RUBIN *Circulation Manager*
M. KANE *Accounting Manager*
A. MOYLAN *Accounting Supervisor*

P. H. DEMPERS JR. *Regional Manager*
10 E. Huron St., Chicago 11, Ill.
Telephone MIchigan 2-4245

CHRIS DUNKLE & ASSOCIATES
California Representative
740 S. Western Ave., Los Angeles 5, Calif.
Telephone DUmkirk 7-6149
420 Market St., San Francisco 11, Calif.
Telephone SUtter 1-8854

BERNIE EDSTROM *Regional Manager*
15605 Madison Ave., Cleveland 7, Ohio
Telephone LAkewood 1-7900

JOHN R. KIMBALL & CO.
Mountain States
420 Market St., San Francisco 11, Calif.
Telephone DOuglas 2-9183



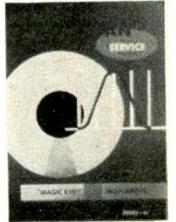
ELECTRONIC TECHNICIAN & Circuit Digests, including Service, January, 1961. Vol. 73, No. 1. \$.60 a copy. Published monthly by Electronic Technician, Inc. Publication Office, Concord, N. H. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone YUKon 6-4242.

Entered as Second-class matter at the post-office at Concord, N. H., October 19, 1960. Subscription rates: United States and Canada, \$5.00 for one year; \$8.00 for two years; \$10.00 for three years. Pan American and foreign countries: \$9.00 for one year; \$14.00 for two years; \$18.00 for three years; Copyright 1961 by Electronic Technician, Inc., New York. H. Reed, President, A. Forman, Executive Vice-President. Title registered in U. S. Patent Office. Reproduction or reprinting prohibited except by written authorization of publisher. Printed in U.S.A. by Rumford Press, Concord, N. H.

For more data, circle 1-C2-1 on coupon, p. 50

January, 1961

FRONT COVER "Magic Eyes," green fluorescent type tubes that indicate signal strength, are becoming increasingly popular due to the sales upsurge of FM tuners and tape recorders. Depending on the type "eye" employed, green patterns and shadows vary as the signal strength varies, permitting users to obtain optimum performance from their equipment. For a detailed description of this important component, including neon lamps, see article starting on page 30.



FEATURES and ARTICLES

"Tuning in the Picture"	16
The Business Picture; The Licensing Vote; Loyalty . . . Or Else (Editorials)	27
TV Manufacturers Technical Digest	28
Understanding "Magic-Eyes"	Herman Burstein 30
Service Industry Votes on TV Licensing	ET Research Dept. 32
Guide to Servicing Transistor Radio "Dogs"	L. E. Garner, Jr. 34
Servicing TV Remote Controls	Bernard Green 36
Installing Citizens Band Radios	Allan Lytel 38
Transistorized Wrist-Watch	40
New Components	41
"Tough Dog" Corner	L. C. Huneault, F. A. Salerno 42
Shop Hints	S. Clark, J. Darr, J. G. Gross, R. Rinaldi 44
Free Literature	50
1960 Electronic Statistics	51

DEPARTMENTS

Editor's Memo	4	Reps. & Distrib.	48
Letters to the Editor	8	Catalogs & Bulletins	56
Calendar of Coming Events	17	Audio Newsletter	59
News of the Industry	18	Association News	65
New Books	68		

CIRCUIT DIGESTS

Preceding Back Cover

IN THIS ISSUE

(16 pp. latest schematics & data)

ADMIRAL: TV Chassis 15H1 with Stereo Chassis 3Y1

GENERAL ELECTRIC: TV Chassis M575

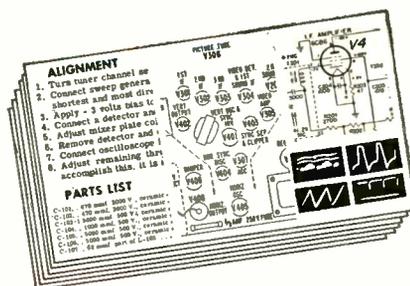
LAFAYETTE: Stereo Amplifier Model KT-236

PACKARD BELL: T

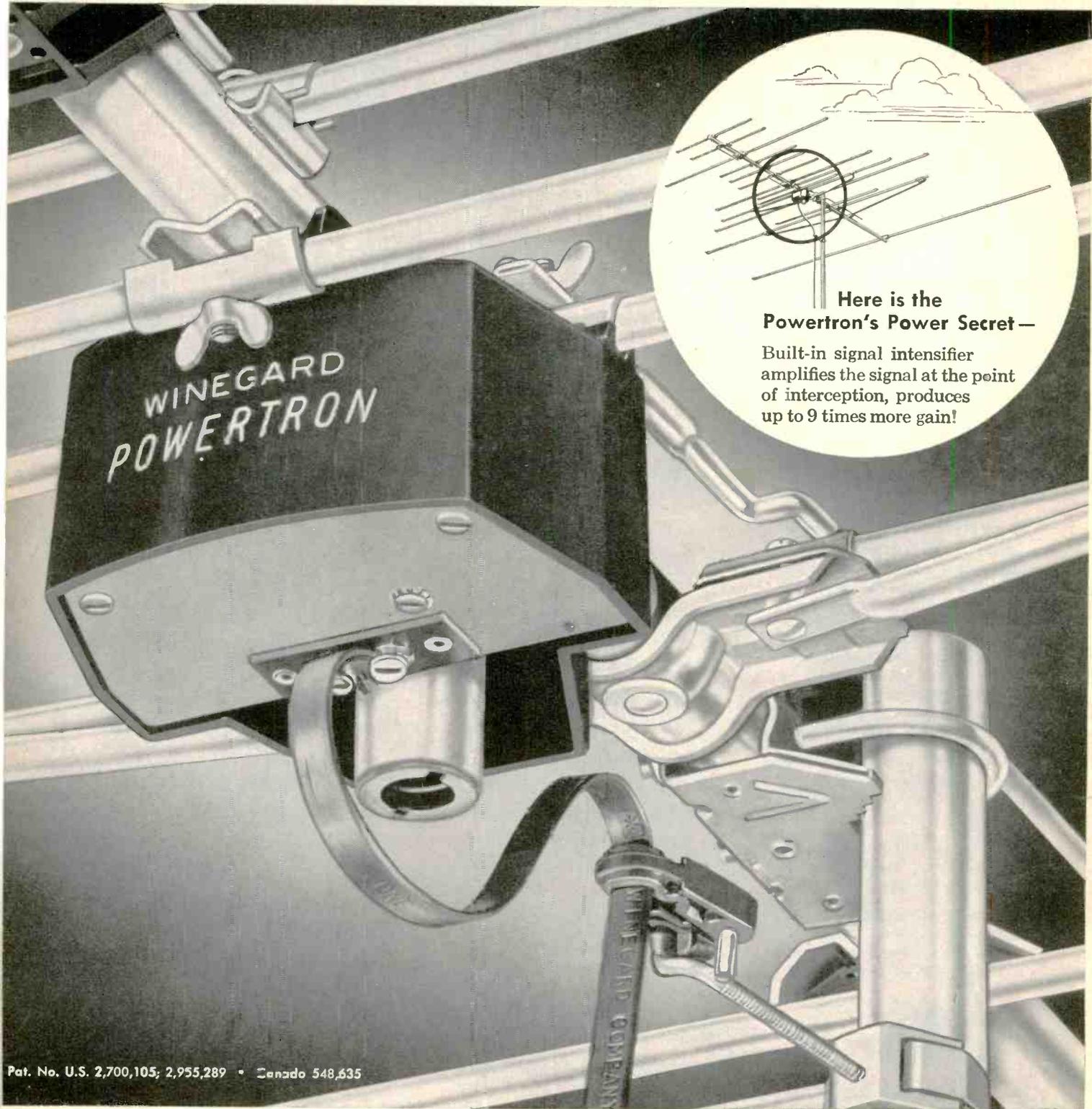
PHILCO: TV Chas

SHERWOOD: FM S-3000 III

SYLVANIA: TV Ch



World's first Electronic TV Antenna..



Pat. No. U.S. 2,700,105; 2,955,289 • Canada 548,635

NOW AN ANTENNA WITH 5-9 TIMES MORE GAIN THAN ANY TV ANTENNA EVER MADE!

Here's the antenna that will obsolete tens of thousands of old-style antennas, will give new life to old TV sets, will build new profits for TV Service Technicians.

ELECTRONIC TECHNICIAN • January, 1961

WINEGARD POWERTRON

POWERTRON AMPLIFIES TV SIGNALS AT THE POINT OF INTERCEPTION

Now Winegard engineers have designed a new high gain, all-channel yagi antenna incorporating a low noise, high gain RF amplifier in one integral unit! Because the input circuit of this amplifier *exactly matches* the characteristics of the new "Tapered T" driven elements to which it is *directly coupled*, every last particle of signal is amplified. The results are amazing.

We call this new electronic antenna the POWERTRON. The Powertron amplifier uses the frame grid 6DJ8 dual triode (12,500 MHOS) transconductance, in a radical new RF circuit, that allows this one tube to amplify all signals in the VHF TV band, 54 to 216 MC, with a gain of 5 times (14 DB). This gain is added to the gain of the antenna which is a high gain yagi design, quite superior to other all channel antennas.



The Powertron power supply lowers 117 VAC to a safe 24 volts which is fed up the lead-in to the Powertron antenna. Completely fused, the power supply is made shock-proof by an AC isolation transformer.

Imagine what this super-powerful electronic antenna can do! Weak signals become strong and clear—dim pictures bright and contrasty. Old-style tuners pull in snow-free pictures better than 1961 models on ordinary antennas.

You can do many things with this new antenna that are impossible with any other. You can drive up to 6 TV sets in deep fringe, 10 TV sets in normal areas without an additional amplifier. You can put TV outlets in every room of the house and all sets will have better pictures than any single set with a regular antenna.

Because of its extreme sensitivity, Powertron can be installed lower than other antennas. For instance, where 40-ft. masts are normally used, a Powertron can usually be installed at 25 ft., yet give better results!

Where desirable, the Powertron can be remot up to 1/4 of a mile and still deliver a perfect signal.

In large distribution systems (motels, apartments, etc.), Powertron makes the perfect antenna to use in conjunction with Winegard's 4-tube A-400 or 7-tube A-700 distribution amplifiers.

For critical color, Powertron's extremely linear frequency response makes it the ideal antenna for your "color" installations.

To sum it up, Powertron makes weak TV pictures good, and good TV pictures even better. It works equally well for color or black and white reception. It is the world's first all channel (VHF) electronic TV antenna, and is a tremendous step forward in the search for improved TV reception.



3 Gold Anodized Powertron Models —

Powertron Model P-44, 14 elements \$74.95 list.

Powertron with Power Pack Model P-44X, 21 elements, \$91.90 list.

Super Powertron Model SP-44X, 30 elements, \$104.95 list.

NEW TELETRONS, TOO! NON-ELECTRONIC, BUT 26% TO 484% MORE POWER INCREASE THAN COLOR'CEPTOR

Similar to the Powertron, but without the RF amplifier, Teletron embodies the same new WINEGARD "TAPERED T" DRIVEN ELEMENTS for proven performance superior to any other non-electronic TV antenna. Teletron is gold anodized, has the same fine quality construction and mechanical features as the Powertron.

3 Gold Anodized Teletron Models —

Teletron Model T4, 14 elements, \$34.95 list.

Teletron Model T-4X, 21 elements, \$51.90 list.

Super Teletron Model ST-4X, 30 elements, \$64.95 list.

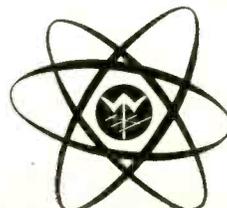
COMPARISON OF POWERTRON AND TELETRON MODELS TO WINEGARD COLOR'CEPTOR

Chart shows Gain and Power Increase over Color'Ceptor (CL-4) Antenna

Model		DB Gain Over CL-4	Power Increase Over CL-4	Voltage Gain Over CL-4
P-44	Powertron	14 DB	25.1 Times (2500%)	5.01 Times
P-44X	Powertron with Pack	15.8 DB	38.4 Times (3800%)	6.20 Times
SP-44X	Super Powertron	19.1 DB	81 Times (8100%)	9.0 Times
T-4	Teletron	1.0 DB	1.26 Times (26%)	1.12 Times
T-4X	Teletron with Pack	2.8 DB	1.9 Times (90%)	1.38 Times
ST-4X	Super Teletron	6.1 DB	4.84 Times (484%)	2.2 Times

GET IN ON THE POWERTRON — TELETRON PROFIT BANDWAGON!

Be first in your area to offer the superb Powertron performance to your customers. Take advantage of many new sales aids now available through your Winegard distributor . . . and watch for sales-making consumer ads in



Winegard

3019-1 Scotten Blvd., Burlington, Iowa

We're not much on
FLAT TIRES



But try us on Auto Radio Controls!

Although your CENTRALAB distributor is your best source for auto radio controls, he won't be of much help to the character with the flat tire. The comprehensive CENTRALAB auto radio control line only goes back to 1942 model automobiles.

From 1942 on, though, it's a different story. CENTRALAB is the *only* control manufacturer offering a complete line of *exact replacement* auto radio controls . . . not to mention SP on/off switches. They cover 202 different automobile models, domestic *and* foreign.

CENTRALAB auto radio controls are listed in COUNTERFACTS and PHOTOFACTS, as well as in the Sams Industry Control Guide.

Changing tires is man's work, but changing auto radio controls is child's play—with CENTRALAB exact replacements.

PHOTO: BETTMAN ARCHIVE



Centralab
B-6045

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.
902 EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN
CENTRALAB CANADA LIMITED—AJAX, ONTARIO

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

For more data, circle 1-4-1 on coupon, p. 50

Editor's Memo



Whether you are running a small business or directing the operations of an industrial giant, the old truism that you must spend money to make money certainly applies.

Spending money usually divides into two categories. One is internal expenditure to improve your product or service, or improve the efficiency of making such product or service available to customers.

The second category is external expenditure, which usually relates to sales and promotion costs. The sales minded person (particularly when he is trying to sell a promotion idea to financial management) may typically hold the view that a promotion resulting in only a few new customers will more than pay the cost.

The question then arises about how much of available funds should be used for internal improvement, and what percent to promote the company's services so that the improvement is not light hidden under a barrel.

The division between internal and external expenditure depends on the optimum point. That is, the proportion which will earn the largest return. For example, if you spent all of the money for internal development, chances are you would not get enough extra customers to justify it. Conversely, all the money spent on promotion (including ads, direct mail, window display) could bring more customers than you can handle efficiently. A happy compromise is in order.

The concept of spending money to make it is applicable in businesses requiring a large personal following. The story is told of a man sitting in front of a resort hotel. A generous fellow, he would always offer a cigar to whomever he spoke. A vacationer at the hotel asked him how many cigars he gave away.

"I give away about 20 cigars a day, and have been giving them away for over 25 years," the man said.

"What do you pay for them?"

"Three for a dollar."

"My goodness," the vacationer exclaimed. "Why at that rate, for 25 years you spent more than \$60,000 just giving away cigars. Imagine, you could own this whole hotel if you saved your money instead of giving away cigars."

The other man looked at him and asked, "Do you own this hotel?"

"No, I don't," he answered.

"It just so happens," said the cigar giver, "I do!"

Al Forman

RCA ELECTRONIC INSTRUMENTS

"PREFERRED BY PROFESSIONALS"

METERS and TUBE TESTERS



WV-38A VOLT-OHM-MILLIAMMETER THE V-O-M WITH THE EXTRAS!

Compare this superlative RCA V-O-M against the model you may have been thinking of buying. See if it doesn't check out better in these extra features:

- EXTRA! 1.0 volt and 0.25 volt ranges DC!
- EXTRA! Big easy-to-read 5¼" meter!
- EXTRA! Non-breakable plastic case; no glass to crack or shatter!
- EXTRA! Smart attractive modern styling—the V-O-M of the future!
- EXTRA! Red test lead has probe and slip-on alligator clip for added versatility!
- EXTRA! Orderly location of jacks below switches keeps leads out of the way!
- EXTRA! Spring clips on handle to hold test leads!

- EXTRA! DB scales clearly marked: no squinting!
- EXTRA! Rugged, scuff-proof, stain-resistant laminated vinyl carrying case, only \$4.95* extra!

Only \$43.95* complete with batteries, instruction book and all probes, clips and cables. (RCA V-O-M Kit only \$29.95*).



NEW! WV-77E VOLTOHMYST®

Measures AC and DC voltages to 1500 volts; resistance from 0.2 ohm to 1,000 megohms. Separate scales, 1½ volts rms and 4 volts peak-to-peak for low AC measurements.

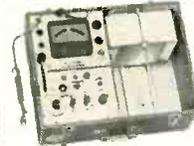
Only \$43.95* complete with probes, leads, instructions. (RCA VoltOhmyst Kit only \$29.95*).



NEW! WV-98B SENIOR VOLTOHMYST®

Measures AC and DC voltages (3% accuracy); resistance from 0 to 1,000 megohms. Measures peak-to-peak values of complex waveforms. Rugged cast aluminum case, field-tested printed circuits. Big 6½" meter.

Only \$79.50* with leads, clips, instructions.



WT-110A AUTOMATIC ELECTRON TUBE TESTER

Especially designed for TV and general service testing of electron tubes. Uses automatic punched-card selection of correct test conditions on wide variety of tubes. Checks vacuum-tube rectifiers under high-current conditions.

\$199.50* complete with 263 punched cards, 24 blank cards, card punch; instruction book.

SCOPES



WO-91A 5-INCH COLOR-TV OSCILLOSCOPE

High-performance, wide-band oscilloscope ideally suited for color-TV, black-and-white TV, and other electronic applications. Dual bandwidth (4.5 Mc, 0.053 volts rms/in. and 1.5 Mc, 0.018 volts rms/in.). Internal calibrating voltage and calibrated graph screen. Includes special direct/low-cap shielded probe and cable.

Only \$239.50* complete with ground cable, insulated clip, instruction book.



NEW! WO-33A SUPER-PORTABLE OSCILLOSCOPE

A low-cost all-purpose scope you can carry anywhere—only 14 pounds—ideal for in-the-home

servicing of black-and-white and color-TV, audio and ultrasonic equipment. High gain and wide bandwidth to handle the tough jobs! Rugged and compact—scaled 3" graph screen.

Only \$129.95* complete with low-cap direct input probe, cable, power cord, cord-carrying brackets, instructions. (RCA Super-Portable Oscilloscope Kit, only \$79.95*).

GENERATORS



NEW! WA-44C AUDIO GENERATOR

Generates sine and square wave signals for testing audio systems. Frequency range: 20 cps to 200 Kc. Used to measure intermodulation distortion, frequency response, input and output impedances, speaker resonance, speed of recording and playback mechanisms, transient response and phase shift.

Only \$98.50* with cable and instructions.



WR-69A TELEVISION/FM SWEEP GENERATOR

For visual alignment and troubleshooting of TV rf/lf/vf circuits and other electronic equipment. IF/video frequency ranges 50 Kc to 50 Mc, TV channels 2 to 13, plus FM range—88-108 Mc. Sweep width continuously adjustable to 12 Mc or more.

Only \$295.00* with cables, instruction book.



WR-99A CRYSTAL- CALIBRATED MARKER GENERATOR

To supply a fundamental frequency rf carrier of crystal accuracy for aligning and troubleshooting color-TV, black-and-white TV, FM receivers and other electronic equipment operating in 19 Mc to 260 Mc range.

Only \$242.50* complete with output cable, two phone tips, instruction book.



WR-49B SIGNAL GENERATOR

For alignment and signal tracing of AM/FM receivers, low-frequency signal tracing and alignment of TV vf/lf amplifiers. Six ranges—85 Kc to 30 Mc. Internal 400 cps modulation. Low rf signal leakage!

Only \$79.50* complete with shielded cable for rf and af output, instruction book.



WR-70A RF/IF/VF MARKER ADDER

To be used with WR-69A or similar electronic equipment. Eliminates waveform distortion due to receiver overloading during visual alignment by adding markers after the rf signal is demodulated.

Only \$74.50* with cables, instruction book.

There's an RCA test instrument to help you do every job better, and easier—and to save you valuable time. A comprehensive line of test accessories: video multi-markers, TV isotaps and bias supplies, probes and cables. See your Authorized RCA Electronic Instrument Distributor for complete information.

RCA Electron Tube Division, Harrison, N.J.

*User Price (Optional)



The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

NOW...4 GREAT "SALESMEN" SELLING FOR YOU!

Look at this parade of selling power! Sylvania advertising will make an average of over 9 million sales calls each week—thousands in your area—52 weeks of the year. The top stars of radio, the largest-selling weekly magazine in the country... all selling for you in 1961.

Yes, Sylvania is going all out to help you build profits. All new streamers, in-store display and direct mail are available from your Sylvania tube distributor. See him today. Stock up on Silver Screen 85 picture tubes and Sylvania quality receiving tubes. Do it now for a fast start to more profits in 1961.

Electronic Tubes Division, Sylvania Electric Products Inc., 1740 Broadway, Dept. 121, New York 19, New York.



IMPACT

ALL YEAR LONG

TV GUIDE



FAVORITE OF 7,250,000 TV OWNERS

TV GUIDE selling you and the Silver Screen 85 picture tube wherever TV sets are in use! Hard-hitting ads telling set owners how to make their old TV's work better than new, with a Silver Screen 85.



NBC

MONITOR WITH NICHOLS & MAY

Star talent like Nichols & May sell the Silver Screen 85 picture tube and you — the local independent TV service dealer — on the biggest network weekend show in radio.



CBS

"ARTHUR GODFREY TIME"

52 weeks of the old redhead telling his millions of radio listeners to specify the Silver Screen 85 when it's time to replace their old picture tube.



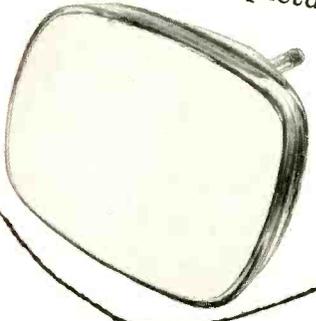
ABC

DON McNEILL'S "BREAKFAST CLUB"

Don McNeill, M.C. of the longest-running weekday program in radio, selling his millions of loyal listeners on the advantages of Sylvania Silver Screen 85 picture tubes.

SILVER SCREEN 85

The "pre-sold" picture tube



Sell the profit leader SYLVANIA!

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS** 

RECTIFIERS THAT MEAN PROFITS FOR YOU!

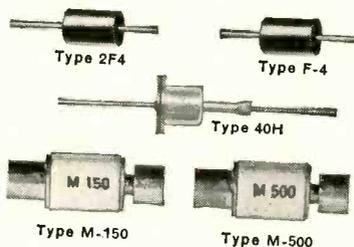
TARZIAN TUBE REPLACEMENT SILICON RECTIFIERS



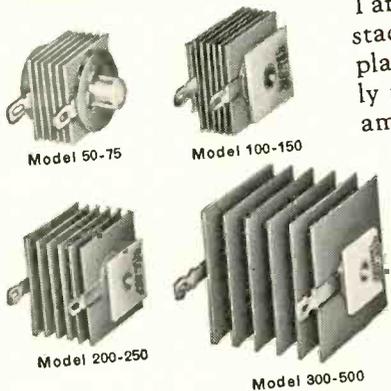
Tarzian's 9 standard models of tube replacement rectifiers are directly interchangeable with over 95% of all popular vacuum tube rectifiers. An added plus is the new Sarkes Tarzian Full Wave Silicon Rectifier (S5347), replacing 6BW4 or 12BW4 in Citizen's Band radios where maximum performance in reception quality and range is desired.

TARZIAN SILICON RECTIFIERS (PLUS CONVERSION KITS)

Sarkes Tarzian silicon rectifiers are made in production quantities by a special Tarzian process that provides optimum forward to reverse ratios, extremely low voltage drop, high reliability and long useful life. Compact conversion kits are available for both the M-150 and M-500 units.



TARZIAN "CONDENSED-STACK" SELENIUM RECTIFIERS



Tarzian's four "condensed-stack" selenium rectifiers—replacing the 20 types that formerly made up the 50 to 500-milliamperes line—not only cover your selenium rectifier needs, but their small size eases both your application and inventory problems. Improved production processes have substantially reduced watt losses by as much as 50%.

Tarzian "Distributor Line" Rectifier Catalog

The new "Distributor Line" Rectifier Catalog is now available on request. It contains complete details on ratings, dimensions, electrical specifications. For additional information write Section 5353.



SARKES TARZIAN, INC.

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

SEMICONDUCTOR DIVISION • BLOOMINGTON, INDIANA

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

For more data, circle 1-8-1 on coupon, p. 50

LETTERS

To the Editor

Who's To Purchase?

Editor, ELECTRONIC TECHNICIAN:

From all the decisions and letters, it seems that the service dealers are the only people who are entitled to the distributors' wholesale prices. I think this cannot be farther from the truth. I work as an industrial electronic technician. I have maintained and serviced more equipment than the average dealer would ever think of seeing. I bring this point up only for the reason of the following.

I do an occasional repair job in radio and television and have done this for 11 years. However, I do these repairs only grudgingly for members of my family. I do not care for repair work as such, because it interferes with my other activities. Now then, this is my point: my hobby happens to be radio controlled aircraft models, which has held my interest for the last seven years and which I will probably continue for a long time to come. The point is, what would become of me and a hundred thousand more in this hobby alone, who like to build their own equipment? Retail selling would prohibit us from further participation. I would also like to know what would happen to the hundreds of thousands of ham radio operators who also like to buy their parts and build equipment for their own use. How about the average experimenter also?

WILLIAM TOTTEN

Bridgeport, Conn.

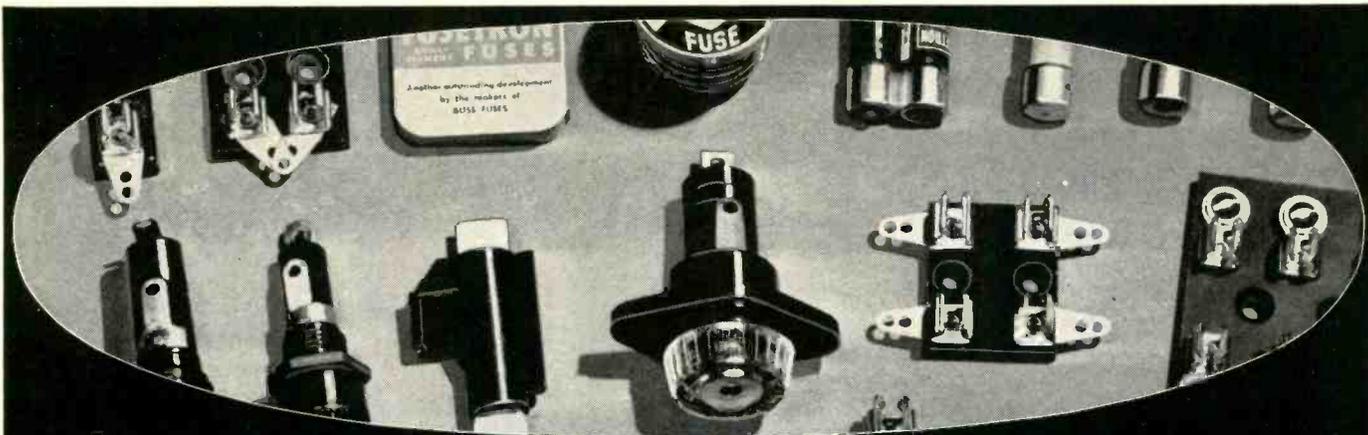
• We have never advocated that distributors should not sell to hams, experimenters, and industrial companies. Historically, these groups have always purchased from distributors. What we oppose is the distributor who by-passes his own customer—the service dealer—to get the retail consumer sale in the radio-TV replacement field.—Ed.

Licensing

Editor, ELECTRONIC TECHNICIAN:

We feel that all technicians, members, and non-members of associations should get behind this drive to enlighten the people all over this country about the benefits of licensing to the consumer directly or indirectly. If we small technicians and dealers cannot fight now, I am sure it will be too late later as more schemes are encountered. Various other ways, such as better and more qualified service, can be obtained if we get a license bill. Then the public will not have to fear the gyp artist as much as he is feared today. A license bill will punish the

(Continued on page 12)



You'll save time, trouble..



... by turning FIRST to BUSS for fuses of unquestioned high quality

By relying on BUSS as your source for fuses, you can quickly and easily find the type and size fuse you need. The complete BUSS line of fuses includes: dual-element "slow-blowing", single-element "quick-acting" and signal or visual indicating types . . . in sizes from 1/500 amp. up — plus a companion line of fuse clips, blocks and holders.

BUSS fuses are made to protect —not to blow needlessly

When you install BUSS fuses — you are sure your customers receive maximum protection against

damage due to electrical faults. And just as important, your customers are safeguarded against irritating, useless shutdowns caused by faulty fuses blowing needlessly.

It pays to rely on dependable BUSS fuses because there are no 'kicks' or complaints from users about their operation . . . and you avoid costly, unnecessary call-backs.

Capitalize on the BUSS trademark

The universal trade and consumer acceptance of BUSS fuses

is based on the millions upon millions of BUSS fuses used in homes, on farms and in industry over the past 46 years. Handling BUSS fuses — and other KNOWN items — helps safeguard your reputation for service and quality.

For more information on BUSS and Fusetron small dimension fuses and fuseholders . . . Write for bulletin SFB.

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

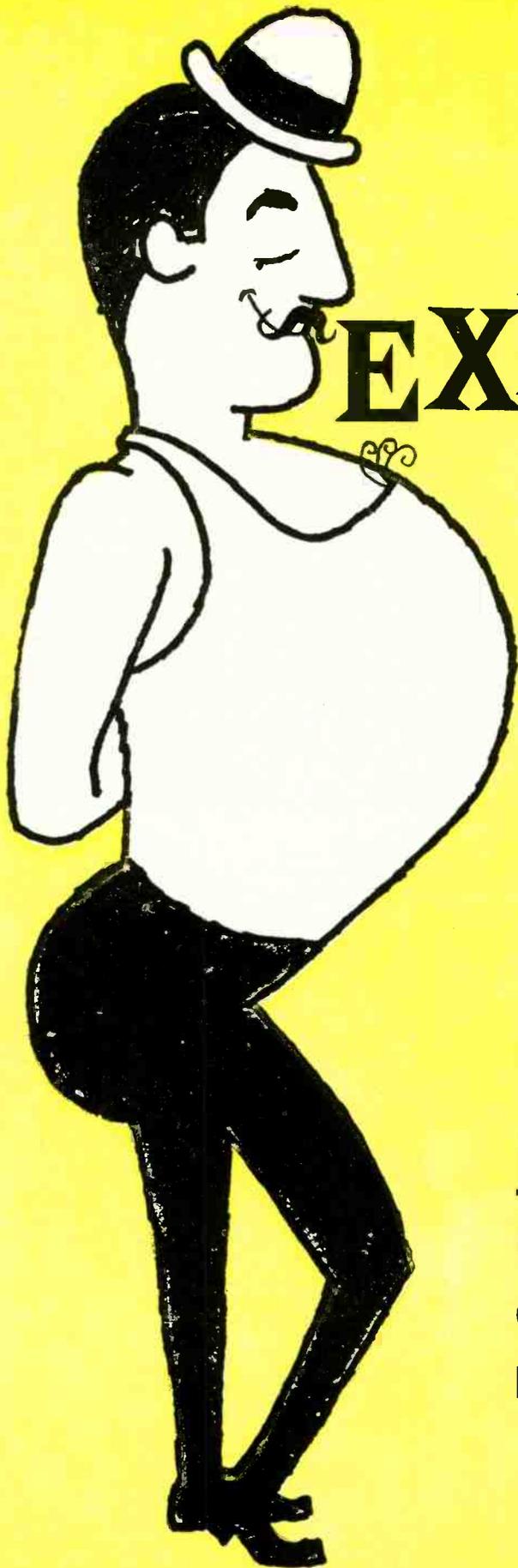
161

BUSS fuses are made to protect - not to blow, needlessly.

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



For more data, circle 1-9-1 on coupon, p. 50

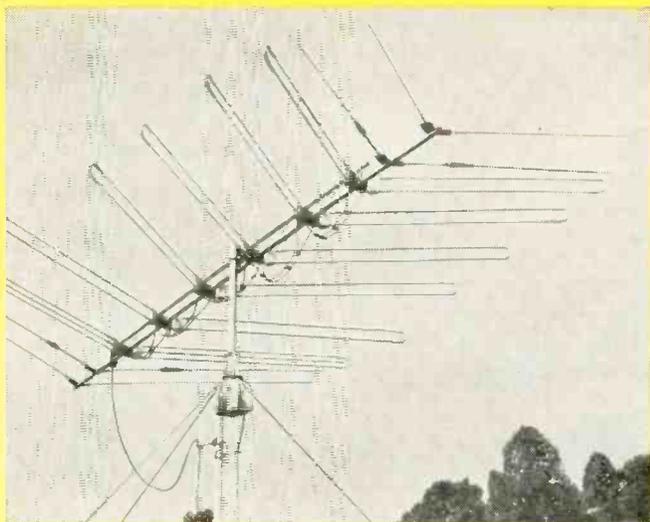


START EXPANDING, MISTER!

you make more with

***CHANNEL
MASTER***

because
Channel Master
builds in more
of what your
customers
need and want!



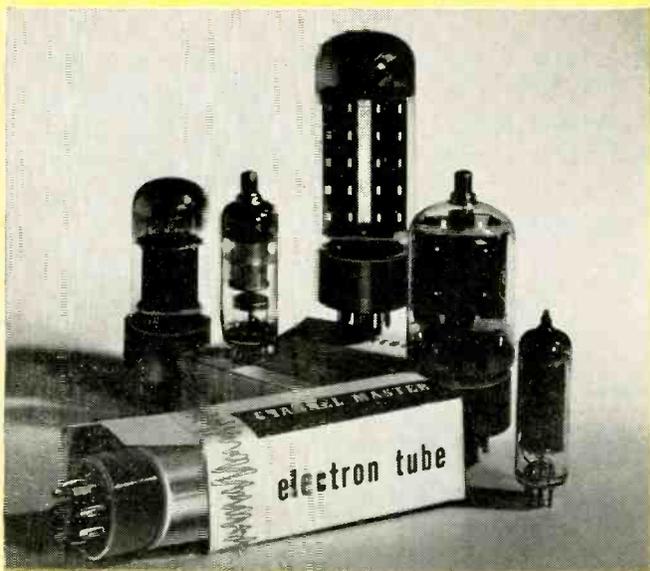
78% more Picture-Power[®] in CHANNEL MASTER

T-W ANTENNAS! The unique Traveling Wave principle—already fully proved and approved in deep-fringe areas—is now further **improved!** The new Super 10, with 10 elements, pushes the fringes back even farther—provides unsurpassed super-fringe performance for “picture-poor” homes. Up to 78% more gain than the famous 7-element T-W. Greater front-to-back ratio, exceptional mechanical strength. Another fringe-area powerhouse is the new Super 8—with 4 driven elements, 4 parasitic elements.



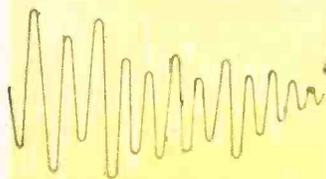
More accuracy in CHANNEL MASTER

AUTOMATIC ROTATORS! For best reception, an antenna must be aimed **accurately**—not in **jumps** of 10 or 15 degrees. The Channel Master Tenn-A-Liner is the only automatic rotator that can be aimed within **ONE DEGREE** of the required direction. And is so easy to operate even a child can do it! Greater turning power, fool-proof control box, elimination of solenoids means quieter operation. No other rotator compares with this one!



Extra Dependability in CHANNEL MASTER PREMIUM QUALITY TUBES!

Longer life, unfailing uniformity, completely dependable performance—are what your customers expect of their tubes. And Channel Master Premium Quality Tubes give them all three of these qualities to spare! The Channel Master tube line also takes care of over 75% of your service calls. America's fastest-growing line?...You bet!



CHANNEL MASTER

works wonders in sight and sound

Ellenville, New York

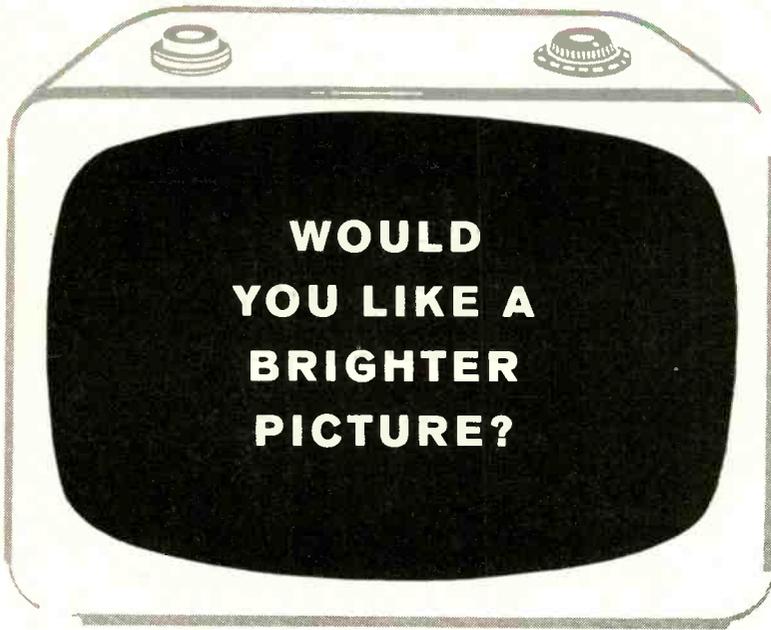
For more data, circle 1-11-1 on coupon, p. 50

BOOST YOUR BRITENER SALES

with these

SIX MAGIC WORDS

from **Perma-Power**



That's a question with only one possible answer—YES. Every customer wants a better, brighter picture... but doesn't realize how easy it is to get one.

When you say you'll brighten the picture—When you quote the low cost—you've sold the customer.

Don't sell Briteners—sell Brighter Pictures!

On every service call, remember to use Perma-Power's 6 Magic Words—Would You Like A Brighter Picture? You'll sell a 12-pack of Briteners almost as fast as you can say Perma-Power!

Perma-Power COMPANY—3104 N. Elston Ave.—Chicago 18

For more data, circle 1-12-1 on coupon, p. 50



SERVICEMEN KNOW!

Here they pay less and get the best

HUSH®

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

Also available—2 oz., 6 oz. Spray can **\$2.25** net
8 oz., 32 oz. containers

EVER - QUIET®

Since 1949

VOLUME CONTROL AND CONTACT RESTORER

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

Also available—
32 oz. containers 6 oz. Spray can **\$1.59** net
2 oz. Bottle & dispenser **79c** net



CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

For more data, circle 1-12-2 on coupon, p. 50

(Continued from page 8)

unqualified and save lives, save us from higher and double repair bills.

We can help each other by contributing to ESFETA's Fund for getting a license bill passed. We can help matters by having another state to be evaluated and act to follow the footsteps of Louisiana, the pioneer, so other states will have it easier to have their bills passed in time. Many members, as I myself, who were financially struggling six or seven months ago gave freely, but many more who could afford to do so, have sat back and done nothing financially or even by word of mouth to help this licensing and eventually enable everyone to benefit by this worthy cause. You will be Plank-owners so to speak, on the first boat in New York State in the eyes of your child and future generations.

So contribute what you can and send checks to ESFETA's Fund, c/o Herbert F. Fitch, 315 North Fourth St., Mechanicville, New York. As Chairman of ESFETA's License Fund Committee, I will forward it to our State Treasurer, Mr. Joseph Marotta. This money will be used to obtain a license and to inform the consumer public and all technicians of what a license bill does and just how it benefits them and how to best act to get this bill passed. It will not be used for individual expenses or pockets, but solely for disseminating information to all who will benefit and to inform the public especially of this good for themselves.

HERBERT D. FITCH, *Chairman*
License Fund Committee

ESFETA
Mechanicville, N.Y.

• See "Service Industry Votes on TV Licensing" in this issue.—Ed.

Ear Radio

Editor, ELECTRONIC TECHNICIAN:

I would appreciate it if you can send me information on the "ear radio" in the Random Noise section of ET, Oct. 1960 issue, page 31. Where can I purchase it?

J. SCAGLIONE

Jersey City, N.J.

• *Micro-Ceiver, Inc., 24 North Van Brunt St., Englewood, N.J. is the manufacturer—Ed.*

We Missed

Editor, ELECTRONIC TECHNICIAN:

I happened to be re-reading the Sept. 1960 issue of your magazine. Page 90 has a review of stereo cartridges. And lo and behold the fair name of Fairchild was missing in your evaluation and data tables. For shame. But you should be encouraged. The magazine, as you can see, is used as reference.

D. PLUNKETT,
President

Fairchild Recording Equipment Corp.
Long Island City, N.Y.

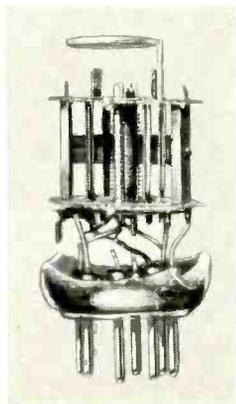
(Continued on page 54)

Try this CBS Tube FREE



see how CBS 6BZ6 and 3BZ6 POSITIVELY CUT CALLBACKS!

Here's Total Reliability



In the CBS 6BZ6 and 3BZ6, you get . . .

NEW! PRECISION WOUND CONTROL GRID assures proper set operation under the widest variety of signal conditions.

NEW! ANTI-GAS BULB COATING stops gas leakage caused by electron bombardment of bulb. Eliminates degradation of i-f gain.

NEW! HIGH TEMPERATURE ANTI-SAG SCREEN is made of molybdenum . . . like transmitting tubes. Can't deform, short and burn out screen resistors.

NEW! DIRECTIVE RING GETTER prevents undesirable current leakage caused by deposits on mica and elements. Eliminates residual gas, lengthens tube life.

PROVE the superiority of CBS tubes right on the job! Try out your free CBS 3BZ6 and discover for yourself what CBS Electronics means by Total Reliability.

These new CBS tubes are the closest you can get to complete callback protection! They have been specifically engineered for utmost dependability. And CBS Electronics wants you to prove this to yourself at its own expense.

You get a free 3BZ6 with every purchase of four 3BZ6 and five 6BZ6 tubes . . . a total of ten tubes, *but you pay for only 9*. Call your CBS distributor now! Offer expires January 31st.

CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

For more data, circle 1-13-1 on coupon, p. 50

Two Great Names In
TV/FM Signal Distribution

BLONDER-TONGUE LABORATORIES INC.
BENCO TELEVISION ASSOCIATES LTD.

*combine their engineering and manufacturing resources
to bring you the broadest line of TV amplification, conversion
and distribution equipment in America*

Now Blonder-Tongue distributors and installers in the United States and Canada are in the number one position to cash in on any master or community TV project. The combined resources of two noted engineering and manufacturing organizations, Blonder-Tongue in the United States and Benco in Canada, make it possible for you to offer the most complete and most ingeniously engineered line of:

AMPLIFIERS

*(transistor and tubed, broadband
and single-channel models)*

CONVERTERS

*(widest selection of crystal-
controlled units in the field)*

TRANSLATORS

*(a completely new product
category for Blonder-Tongue)*

TAP-OFFS, SPLITTERS, FILTERS, HOUSINGS, ACCESSORIES

*(providing the utmost in
flexibility in any installation)*

HOME TV ACCESSORIES

*(broadest line of amplifiers, couplers,
converters for all signal areas)*

CLOSED CIRCUIT TV

*(a complete system from transistor-camera
to video monitor-projection or direct view)*

**YOU DRAW UPON THE VAST ENGINEERING SKILL
OF BLONDER-TONGUE AND BENCO**

Blonder-Tongue, leading United States producer of equipment for community and master antenna systems, has many important electrical and mechanical patents in signal amplification, distribution, conversion and closed circuit TV. Blonder-Tongue has been the leading profit line in its field for distributors throughout the United States.

Benco, Canada's oldest and largest firm in the community and master system field, is responsible for many important engineering advances in TV signal amplification and distribution. Benco is a participant in the only successful Pay-TV project of its kind today in Canada. Like Blonder-Tongue, Benco has been in the electronics field for 10 years, and its entire operation rests upon original engineering developments.

**MANY BENEFITS FOR BLONDER-TONGUE DISTRIBUTORS
AND INSTALLERS**

In addition to offering its distributors and installers in the United States the well-regarded line of Blonder-Tongue and Benco equipment, Blonder-Tongue is supporting these products with all the services necessary to make master and community TV profitable for its distributors and installers. Blonder-Tongue offers field engineering assistance, technical literature, and of course, a strong advertising program directed to the installers and users of master and community TV equipment. Catalogs of Blonder-Tongue and Benco equipment are available. New, free layout service is now also available to help in planning a master TV system. For details, write Department HC. Ask your Blonder-Tongue sales representative or write: Dept. ET-1

engineered and manufactured by

BLONDER TONGUE

9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc., Ltd., Toronto, Ont. Export: Morhan Export Corp., New York 13, N. Y.
home TV accessories • UHF converters • master TV systems • industrial TV systems • FM-AM radios

AVAILABLE FROM BLONDER-TONGUE

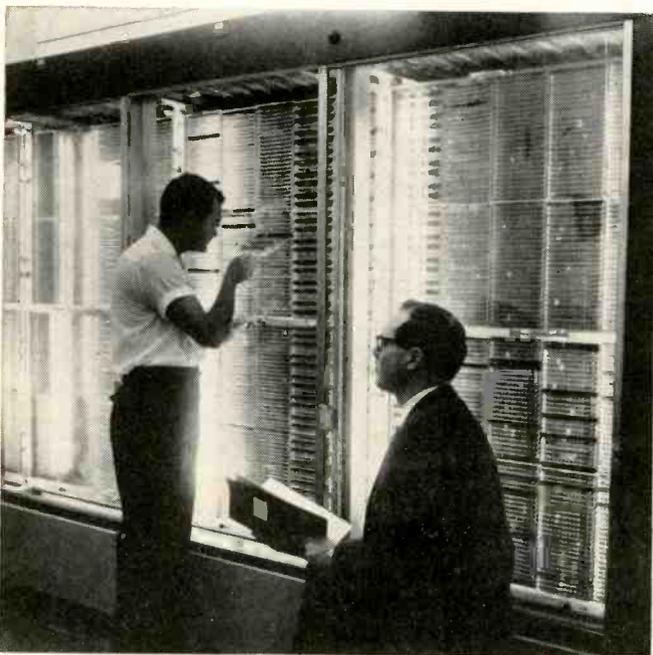


For more data, circle 1-15-1 on coupon, p. 50

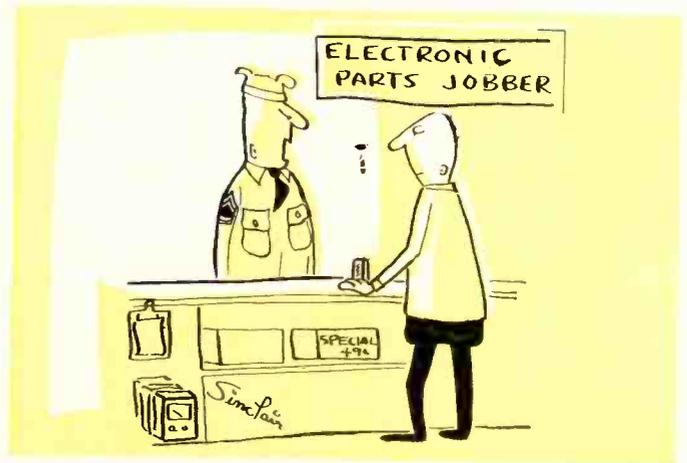
Tuning In the

"ELECTRONIC DEMOCRACY" with network systems enabling American citizens to vote directly on bills before the Congress could possibly be one result of the new technology of the 1960's, according to Stahrl W. Edmunds, Manager of Hughes Aircraft Marketing Analysis. Ballots could be cast through a home voting transmitter tied into a central broadcast, control and data processing center. The predicted boom of the 1960s will depend largely upon consumer acceptance of new electronic technology, according to Mr. Stahrl, such as an "electronic chef" which would employ a computer's memory to duplicate dishes from haute cuisine and an automatic budgeteer enabling all bills to be paid through the bank by inserting a punch card into a scanning machine attached to the telephone line. An actual electronic vote tallying system, which reads and counts the votes marked on paper ballots at a rate of 600 minute, has been officially accepted for use in Los Angeles County. Developed by the Norden Division's Data Systems Dept., the new system is not a voting machine but a device to read paper ballots at high speed and count votes marked on each ballot.

ELECTRONIC CENTRAL OFFICE



Voices of telephone customers in Morris, Ill., are carried through neon gas tubes that make up the "switching network" shown above. Part of an electronic central office, the tubes are used to connect one telephone with another, a task that until now has been performed by relays. At left an installer of the Western Electric Co. removes a tray of the tubes while a Bell Labs. engineer observes. Dots of light at the right are tubes being used at the moment to set up telephone connections.

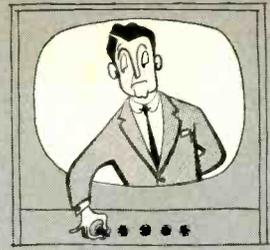


"Of course I'm a serviceman."

ELECTRICAL SIGNALS representing coded messages have been sent over 100 miles from a transmitting station buried in a mine shaft of the Pacific Coast Boron Co. According to engineers of Space Electronics Corp., conducting experiments for the Air Force in the subsurface propagation of electromagnetic signals as a possible communications link between buried sites, this is the greatest distance ever achieved by this technique. A transmitting station below the earth sends out signals from a buried antenna pointed in the direction of the receiver. From the antenna, electromagnetic waves are generated which can travel in several directions, including upward to the earth's surface. The channel formed by the discontinuity between earth and air enables effective transmission. The transmitter and receiver can remain safely buried, suggesting military and commercial applications immune to ice and snow storms, hurricanes and tornadoes, vandalism and other hazards.

SPACE MAIL TEST conducted by Adler Electronics for the Post Office, beamed the message "Shop and Mail Early" by microwave at the Echo satellite orbiting 1000 miles above the earth. The signal was "bounced" off the passive reflector and picked up at the Holmdel, N. J. station of Bell Telephone Labs. by a sensitive tracking antenna. A wire line carried the letter to the Postmaster's Office in Newark, N.J. where it was converted to its original form by a facsimile transmitter. The system is capable of simultaneously transmitting up to 50 letters in a three minute period.

Picture



FTC charges Budco, Metropolitan Electronics Distributors, K.M.K. Corp., Theta Electronics, Tube Mfg. Corp., Kriss Electronics, National Television Tube, National Tube Corp., Televideo Corp. of America, and Ultravision Manufacturing Corp. with misrepresenting the quality of TV picture tubes they manufacture and distribute, principally failing to note that all parts actually were not new. Signing consent order, which does not constitute admission of violation of the law, are Budco, Metropolitan Electronics Distributors, K.M.K. Corp., Theta Electronics, Inc., and Tube Mfg. Corp. Kriss Electronics, National Television Tube, and National Tube Corp. are granted time to file an answer to the complaint. Televideo Corporation of America did not answer the complaint or appear at the hearings, thus the examiner's order was issued against them in default. Ultravision Manufacturing Corp. answered the complaint that their tubes are known not to be new tubes, and not represented as such.

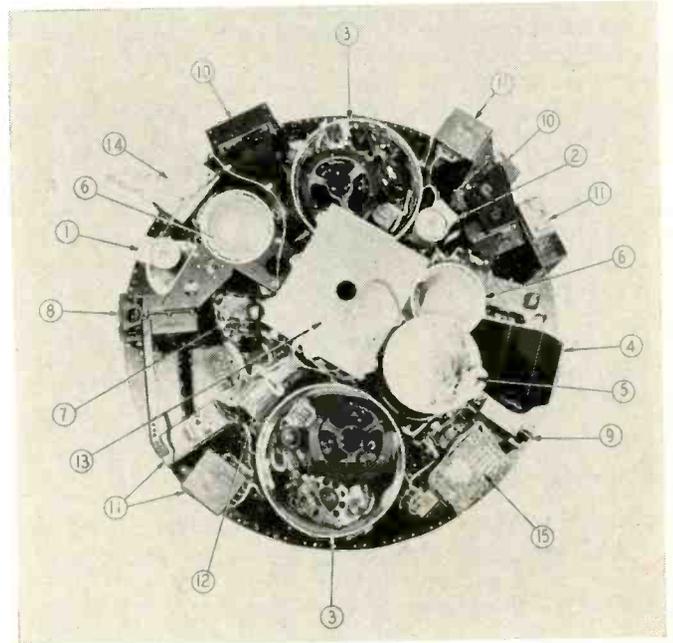
CALENDAR OF COMING EVENTS

- Jan. 22-26: 1961 Southwestern Electronic Conference, Fort Clark Guest Ranch, Brackettsville, Texas.
- Feb. 26-28: Pacific Electronic Trade Show, Great Western Exhibit Center, Los Angeles, Calif.
- Mar. 20-23: IRE International Convention, The Coliseum and Waldorf-Astoria Hotel, New York, N. Y.
- Apr. 19-21: 13th Annual Southwestern IRE Conference & Electronics Show, SWIRECO, New Memorial Coliseum and Baker Hotel, Dallas, Texas
- Apr. 26-28: 7th Region Technical Conference & Trade Show, Westward Ho Hotel, Phoenix, Ariz.

500,000,000th RECEIVING-TYPE ELECTRON TUBE was produced at the RCA Electron Tube Div. plant in Indianapolis, Ind. John L. Burns, RCA Pres., commented "If we could place end-to-end the half billion tubes produced here during the past 23 years, they would cover a distance of 23,674 miles, or nearly reach around the earth."

MISTRAM, Missile Trajectory Measurement System, is being developed for the Air Force by G-E's Defense Systems Dept. to check with extreme accuracy the guidance performance of missiles launched down the Atlantic Missile Range. Key to the precise measurement system is use of the interferometer principle which, if it can successfully be enlarged to the scale of a giant radar network will represent a major advance in the field.

INSIDE THE TIROS II SATELLITE



Interior of Tiros II TV infrared observation satellite developed by RCA for NASA, shows: (1) Wide-angle TV camera; (2) Narrow-angle TV camera; (3) TV tape recorders; (4) Infrared radiometer; (5) Infrared electronics; (6) Electronic clocks; (7) Relays for magnetic stabilization system; (8) Control box; (9) Infrared horizon scanner; (10) Cameras circuits; (11) Recorders; (12) Telemetry switches; (13) Antenna diplexer (covering batteries); (14) Automatic signal generator; (15) Fuse board and current regulator.

TRANSISTOR located in the abdominal cavity of eight year old Larry Graves, Boston, will give him a good chance for a normal life. The transistor sends electrical impulses to the heart through stainless steel wires to keep the heart beating at a normal rate.

"THE ELECTRONIC DISTRIBUTING INDUSTRY—Where It Stands Today" was discussed by Wm. A. Duvel, Vice Pres. of National Credit Office, Inc., at the Electronic Industry Unity Conference, Oct. 24th. "For the past ten years sales of these distributors have grown steadily with about an average increase of 10% each year," stated Mr. Duvel. "It was slightly more than this in 1959. For example, in 1955 total distributor sales were \$525,000,000 . . . \$815,000,000 in 1959. The trend towards concentration of sales among the larger distributors has continued in 1960 and may be accelerated as more distributors 'go public', which provides financing for growth and expansion. In the last year, 12 distributors have 'gone public'—the majority were already sound financially."



The "Big Picture"

...informative shop talks

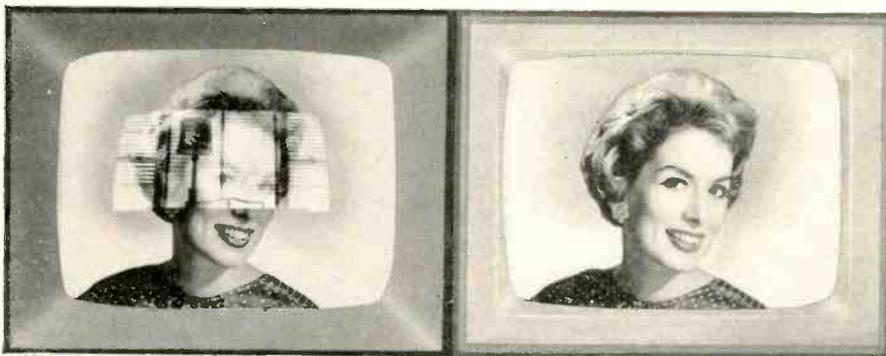
by AL MERRIAM

Sylvania National Service Manager

"Out front" feature reflects nothing but quality

All the latest developments for faster, easier servicing on the new Sylvania TV's I've shown you so far are behind the set . . . back on the "service side." But big, important news is taking place "out front," too. You know what I mean . . . Reflection-Free TV!

Here's the newest, most exciting development in the industry! For the first time, your customers can place their sets anywhere and enjoy a TV picture free of all those irritating, mirrorlike reflections from lamps, windows or bright objects. You'll have to see for yourself that Reflection-Free TV is nothing short of sensational, but this comparison will give you a good idea.



ORDINARY TV reflects light from windows, interiors.

NEW SYLVANIA TV is Reflection-Free! Bright and clear—indoors or out.

This unique method of producing a true, reflection-free screen is possible only with another successful "first" from Sylvania . . . the Bonded Shield picture tube. A fine mist of glass particles fused on the Bonded Shield faceplate creates an amazing, reflection-free "satin finish." Today, only Sylvania offers the new, reflection-free screens in both 19" and 23" tubes . . . but you can bet the industry will follow, just like they did when Sylvania introduced the 23" squared screen!

SERVICE TIP OF THE MONTH

Symptom (Effect)—Squegging (horizontal oscillator "takes off" at some odd frequency) accompanied by a squealing sound.

Cause—Antenna picks up radiated pulses from scanning system which disrupts AFC network.

Cure—Increase the value of the cathode resistor of the horizontal oscillator from 1000 ohms to 1200 ohms or slightly higher.

Sylvania Home Electronics Corp., Batavia, N. Y.

SYLVANIA

Subsidiary of GENERAL TELEPHONE & ELECTRONICS 

News of the Industry

BELDEN MFG. has elected LES. A. THAYER as Vice Pres.-Sales.

SIMPSON ELECTRIC has named LEROY E. TICE as Chief Field Engineer.

ARCO ELECTRONICS has been listed on the American Stock Exchange with the symbol AELA.

PYRAMID reports the appointment of JOSEPH W. YUHAS as Mgr. of the Distributor Div. in Darlington, S.C.

CLAROSTAT has named DOUGLAS HAYNES as Production Manager and JACOB J. REPETTO as Marketing Mgr. of the company.

B & K MFG. has announced 300 servicemen from the Chicago area attended a Television Servicemen's Seminar sponsored jointly by ALLIED RADIO CORP., Nov. 2nd.

DR. W. R. G. BAKER, pioneer in radio and development of television, has died. Dr. Baker was Pres. of the Syracuse University Research Corp., after retirement as Vice Pres. of G-E.

BLONDER-TONGUE reports the newly created position of Field Sales Mgr. has been set up in three regions: JOSEPH GIBBS, Mid-West; PAUL PUSECKER, East; and JACK WEL-LINGTON, West Coast.

INSTITUTE OF RADIO ENGINEERS announces the IRE 1961 awards to be presented at the Convention banquet next March 22nd, Waldorf-Astoria, New York City, among them the following: RALPH BOWN, Founders Award; and ERNST A. GUILLEMIN, Medal of Honor.

CBS ELECTRONICS announces realignment of its marketing and sales organizations with the following appointments: ROY JUUSOLA, Mgr. of Marketing Services, a new post; LEE BALLENGEE, Mgr. of Equipment Sales, electron tube operations, now is responsible for all government and military marketing, will report to MICHAEL CALLAHAN, Vice Pres. and Gen. Mgr.; KENNETH WALDRON continues as Mgr. of Government and Industrial Marketing; LOU NIEMANN, Dir. of Government Relations, a new post with headquarters in Wash. D.C.; RICHARD SAXTON, Dist. Mgr., government and industrial sales with headquarters in Dayton; JOHN HAUSER, Gen. Mgr., distributor sales, a new post; ROSS YEITER, Sales Mgr., Semiconductors; and DONALD CHRISTIANSEN, new post of Mgr. of Publications.

(Continued on page 22)

the only one of its kind!



NOW ... THE *First* ANALYZER DESIGNED EXCLUSIVELY FOR TESTING TRANSISTOR CIRCUIT CAPACITORS!

SPRAGUE MODEL TCA-1 TRANSFARAD*

THERE'S NOTHING LIKE IT ON THE MARKET ANYWHERE . . . AT ANY PRICE!

Here, for the first time, is a precision-made instrument which is specifically designed to *safely* test low-voltage aluminum and tantalum electrolytic capacitors, film and paper capacitors, and ceramic capacitors. *No laboratory or shop working with transistor circuit capacitors can afford to be without one!*

CAPACITANCE BRIDGE: 1 μ f to 2,000 μ f in five overlapping ranges, with laboratory accuracy.

INSULATION RESISTANCE: 50 megohms to 20,000 megohms. Only 25v d-c is applied, permitting measurements on low-voltage ceramic, paper, mica, and film capacitors. For ceramics rated below 25 volts, IR may be calculated from leakage current measurements at exact rated voltage.

POWER FACTOR: Measured by Wien Bridge from 0 to 50%.

LEAKAGE CURRENT: 0.6 μ a to 600 μ a in 7 ranges. Measured directly on meter at exact rated d-c voltage of capacitor. No guessing on eye-width or counting lamp blinks!

A-C BRIDGE VOLTAGE: Only 0.5v is applied to the bridge. The voltage across the capacitor is less than this applied voltage, the amplitude depending upon capacitance being measured. No danger of overheating and ruining even a 1-volt electrolytic or a 3-volt ceramic.

POLARIZING VOLTAGE: Continuously adjustable, 0 to 150v.

STABILITY: Dual regulation of the power supply assures short-time reliability, while specially processed etched circuits and complete encapsulation of the critical meter amplifier insure long-time stability.

MAGIC-EYE TUBE: Simplifies bridge balancing for capacitance and power factor measurements.

HIGH GAIN AMPLIFIER: Sensitivity control for magic-eye null detector permits accurate measurements of small capacitances.

CAPACITANCE DIAL: Latest design jet black dial with brilliant white calibrations for quick, accurate readings from any position.

BINDING POSTS: Shielded for protection against pick-up of strays, assuring greater accuracy during low-capacitance measurements. 5-way connection feature for use with all types of test leads.

SAFETY DEVICES: Automatic discharge of capacitor after testing. Three-wire line cord grounds instrument case.

OPERATING PROCEDURES: Easy-to-follow operating procedures clearly shown on pull-out slide at base of instrument. Always handy for ready reference.

MODERN CASE: Handsome grey Hammerloid finish on heavy-gage steel. Measures 8 $\frac{1}{8}$ " high, 14 $\frac{3}{8}$ " wide, 9 $\frac{1}{2}$ " deep. Weighs only 21 pounds.

See the remarkable new TCA-1 TRANSFARAD at your Sprague distributor or write for descriptive folder M-792a to Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

ONLY
\$197.50
NET

*Trademark

SPRAGUE®

world's largest capacitor manufacturer

For more data, circle 1-19-1 on coupon, p. 50

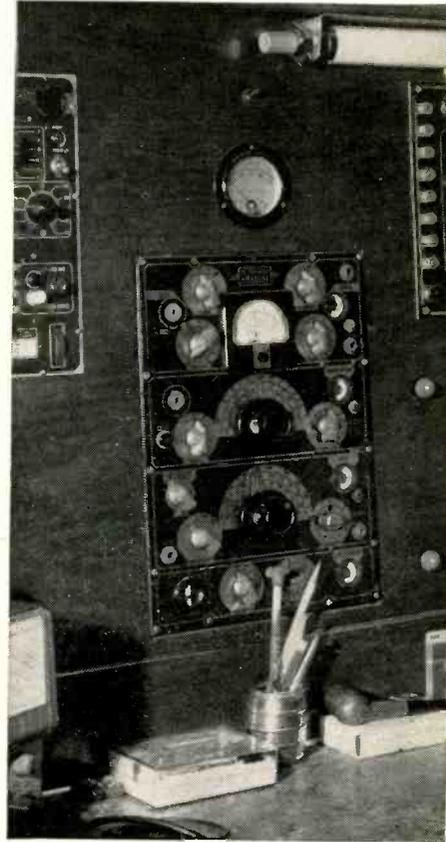
"Mallory replacement parts guarantee

says *Radio-TV service owner*

JIMMY HULL "For over 35 years, I have built my business on customer satisfaction—with a money-back guarantee. It's a safe offer—I personally check all sets . . . use only the most dependable replacement parts. I prefer Mallory components because their performance always backs up my guarantee."



Like many other service technicians, Jimmy Hull knows there's dependable quality throughout Mallory's wide line of components. For instance, the Gem tubular capacitor: unequalled in coupling, buffer, filter, and by-pass service . . . moisture-proof case . . . locked-in leads . . . conservative ratings . . . reliable, long life. In handy "Five-Packs" that keep stock clean, leads kink-free. Whatever your need, see your Mallory distributor—for the widest line of quality Mallory components at sensible Mallory prices.



Put an end to call-backs with these quality Mallory products . . .



RMC DISCAPS®

Quality standard for original equipment. From the world's largest producer of ceramic disc capacitors. 3" x 5" file card package.



TC TUBULAR ELECTROLYTICS

Economical filter capacitors. Hermetically sealed. Also special TCX type for -55°C. Twin pack keeps leads free from kinks.



FP ELECTROLYTICS

Original 85°C capacitor, now better than ever. Etched cathode gives hum-free performance. Chassis or printed circuit mounting.

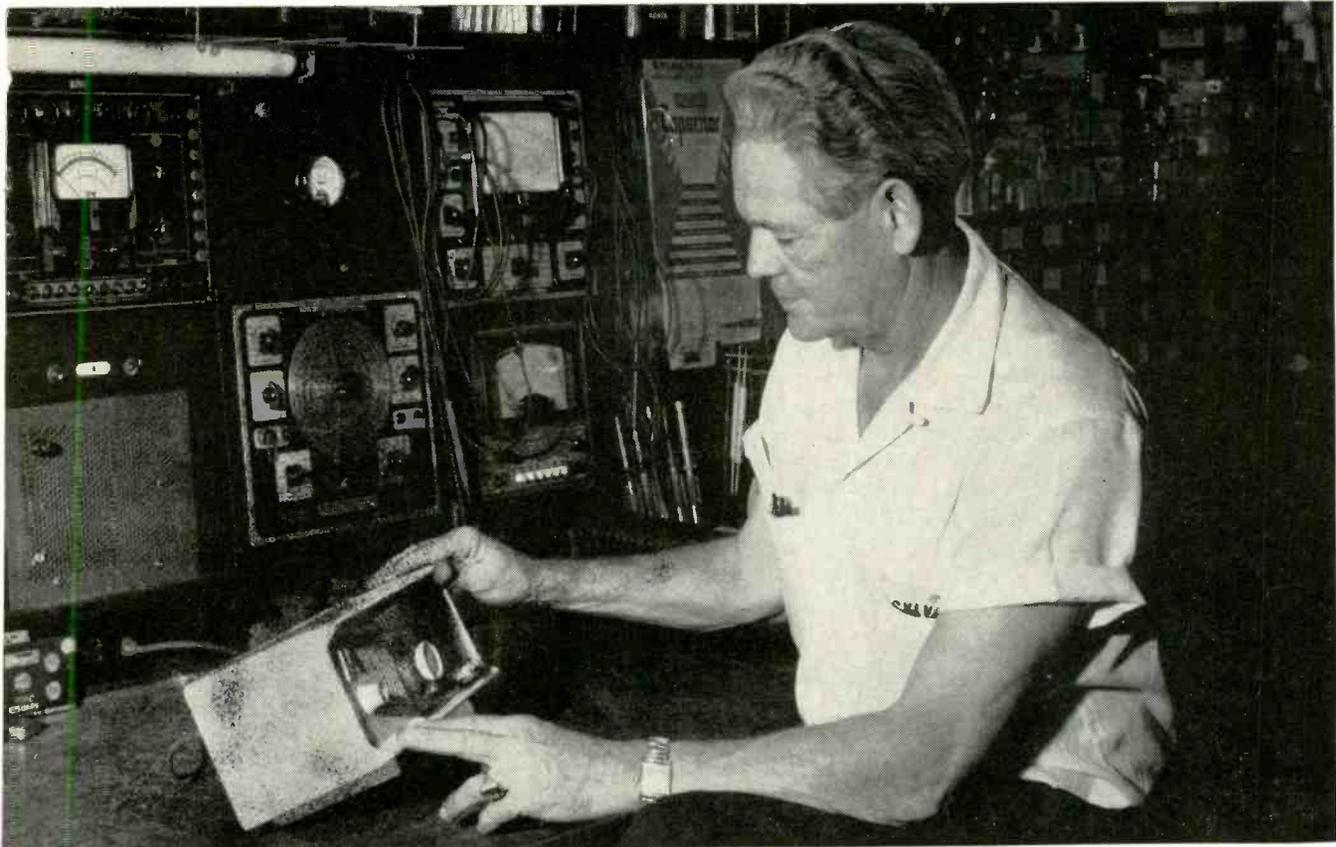


STA-LOC® CONTROLS

No searching, no waiting. Any of over 38,000 types of single or dual controls custom-built by your distributor in just 30 seconds.

© Trademark Radio Materials Company, a Mallory division.

my customers' satisfaction''



Jimmy Hull owns and manages Hull's Radio & TV Service, Evansville, Indiana, serving an area within 60 miles of the city. An early wireless operator, Jimmy has been in service work from crystal sets to color TV. Before opening his own business, he spent eight years as Sears, Roebuck & Company's only radio service man within 100 miles of Evansville.

Distributor Division, Indianapolis 6, Indiana



GOLD LABEL® VIBRATORS

Quietest vibrator ever made . . . for the best in auto radio servicing. Buttonless contact design gives longest life, surest starts.



MALLORY PVC CAPACITORS

New, blue Mylar* coupling and by-pass capacitors. Dunk 'em, bend 'em, overload 'em, overheat 'em . . . they can take it.

*Reg. Trademark E. I. du Pont de Nemours & Co., Inc.



MALLORY MERCURY BATTERIES

Unmatched for transistor radios . . . give steady power, last up to 3 times longer, stay "alive" for years when idle. Guaranteed against leakage.

P. R. MALLORY & CO. Inc.
MALLORY

Quality you can count on
EVERY SINGLE TIME!

AEROVOX ELECTROLYTIC CAPACITORS

Year after year Aerovox electrolytic capacitors lead the way to dependable performance and satisfied customers.

Continuous research and product development by Aerovox engineers, coupled with advanced manufacturing techniques, all add up to quality you can count on every single time! It's no wonder that you use the most popular and most complete electrolytic line in the TV-radio service industry when you use Aerovox—it's a matter of experience.

And what's more, Aerovox offers you the widest selection of top-quality capacitors with the latest technical advances available. Take a look at just a few of the highlights:

PTT-PWE...miniaturized tubular 'lytic for repair of personal transistor radios, portable TV sets, and all space-tight requirements. Feature "Polycap" plastic cases with exceptional humidity resistance characteristics.

PRS...compact "Dandee" units for trouble-free repair of series-string TV and AC-DC table radios. Aluminum cans with cardboard insulating sleeves. Available in singles, duals, and triples as well as AC rated and non-polarized units.

SRE... "Bantam" metal tubular 'lytics hermetically-sealed in aluminum cans with cardboard insulating sleeves. Smaller than the PRS but capable of handling full size loads to 85°C.

AFH...twist-prong 'lytics featuring 85°C operation...improved sealing...high-purity aluminum foil construction throughout...rugged prongs and mounting terminals. Tops for filter audio bypass applications in TV-radio and amplifier equipment.

HCB...high-capacity-low voltage 'lytics designed especially for applications such as motion picture sound equipment, electric fence controls and other low voltage applications. Feature bakelite case which eliminates need for cardboard outer insulating tubes.



Remember . . . your local Aerovox Distributor is your one-stop source of supply. Call him today for all your capacitor needs—it pays to use Aerovox!

AEROVOX CORPORATION

DISTRIBUTOR DIVISION

NEW BEDFORD, MASSACHUSETTS

For more data, circle 1-22-1 on coupon, p. 50

(Continued from page 18)

CENTRALAB has announced the appointment of J. B. HOLTZ as Marketing Mgr., New Products, a new position.

PHILCO announces the appointment of JACK FRIETSCH as Product Mgr. for all electronic product lines in the Consumer Products Div.

RAYTHEON Distributor Products Div. awarded prizes to 23 radio and TV service dealers who won the "Mailbag Sweepstakes" for its Bonded Dealers. First prize, a complete two-unit Ray-Tel Citizens Band communication system, was won by ALLIED ELECTRONICS, Coos Bay, Ore.; second prize, a Fathometer depth sounder, was won by RANDALL's RADIO & TV, Hobe Sound, Fla.

CHANNEL MASTER has launched a radio promotion, "Radio Reaches Everywhere," designed to demonstrate that with transistor radios, listeners are everywhere. The initial contest in Washington, D.C. awarded Channel Master radios for the best completions of the statement, "The most unusual place I ever listened to WGMS was. . ."

GENERAL ELECTRIC Radio Receiver Dept. announces a new subscription service for servicemen which will include comprehensive service manuals on each new G-E radio and portable phono, plus each issue of "Radio Service Shop" and "Techni-Talk." Subscriptions are handled through the Technical Publications Section at \$2.50 per year. Also announced is the "Price Finder Index" available at G-E Servicecenters and authorized service stations at \$2.95. The Distributor Sales Operation announces the appointment of JOHN C. FITZMAURICE as Metropolitan New York Sales Mgr. for electronic components.



"There, that one. That's the part I replaced. Satisfied?"



In the years to come, this symbol will continue to identify tubes of the highest quality and most advanced design.

DISTRIBUTOR PRODUCTS DIVISION • 411 PROVIDENCE TURNPIKE • WESTWOOD, MASS.



RAYTHEON COMPANY

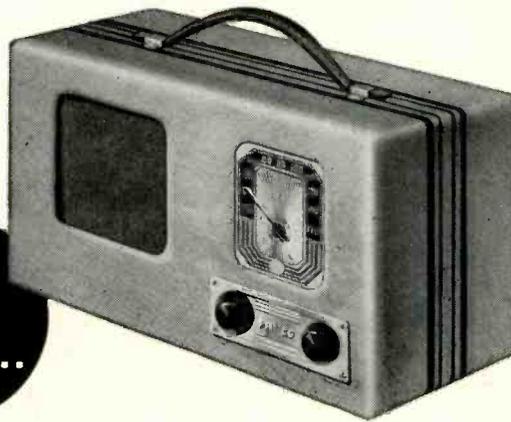
DISTRIBUTOR PRODUCTS DIVISION

For more data, circle 1-23-1 on coupon, p. 50

The growth of the entire Electronic Service Business
is reflected in famous

PHILCO Industry Firsts

Here's
just one
example...



1st Portable Battery Radio Introduced by Philco in 1938

Philco opened up a whole new business by inventing the first self-powered Portable Battery Radio, introduced 22 years ago. Today, 30 million portables in use represent a giant service market that is typical of the many increased profit opportunities for you, resulting from famous Philco Firsts! Similarly, the proven reliability of Philco parts, tubes and accessories protects your profits, and builds good will.

For all your servicing needs, look to **PHILCO**
THE FIRST NAME IN ELECTRONICS... THE LAST WORD IN **QUALITY**



SEE YOUR PHILCO DISTRIBUTOR

PHILCO Accessory Division

WORLD-WIDE DISTRIBUTION
Service Parts • Power-Packed Batteries • Universal
Components • Long-Life Tubes • Heavy-Duty Rotors •
Star-Bright 20/20 Picture Tubes • Long-Distance An-
tennas • Appliance Parts • Laundry Parts • Universal
Parts and Accessories

PHILCO®



Famous for Quality the World Over



PHILCO
Sweetheart Offer!
 FOR YOUR VALENTINE

EACH ITEM
 INDIVIDUALLY
 GIFT-BOXED

Interlude Hinged
 Bracelet
 AD3811

Interlude Clip-
 Ease Earrings
 AD3813

Interlude Safety-
 Clasp Pin
 AD3812

FAMOUS **TRIFARI** JEWELRY
FREE
 WITH YOUR PURCHASES
 OF PHILCO
 TUBES

White Madrid
 Hinged Bracelet
 AD3808

White Madrid
 Clip-Ease Earrings
 AD3810

White Madrid
 Safety-Clasp Pin
 AD3809

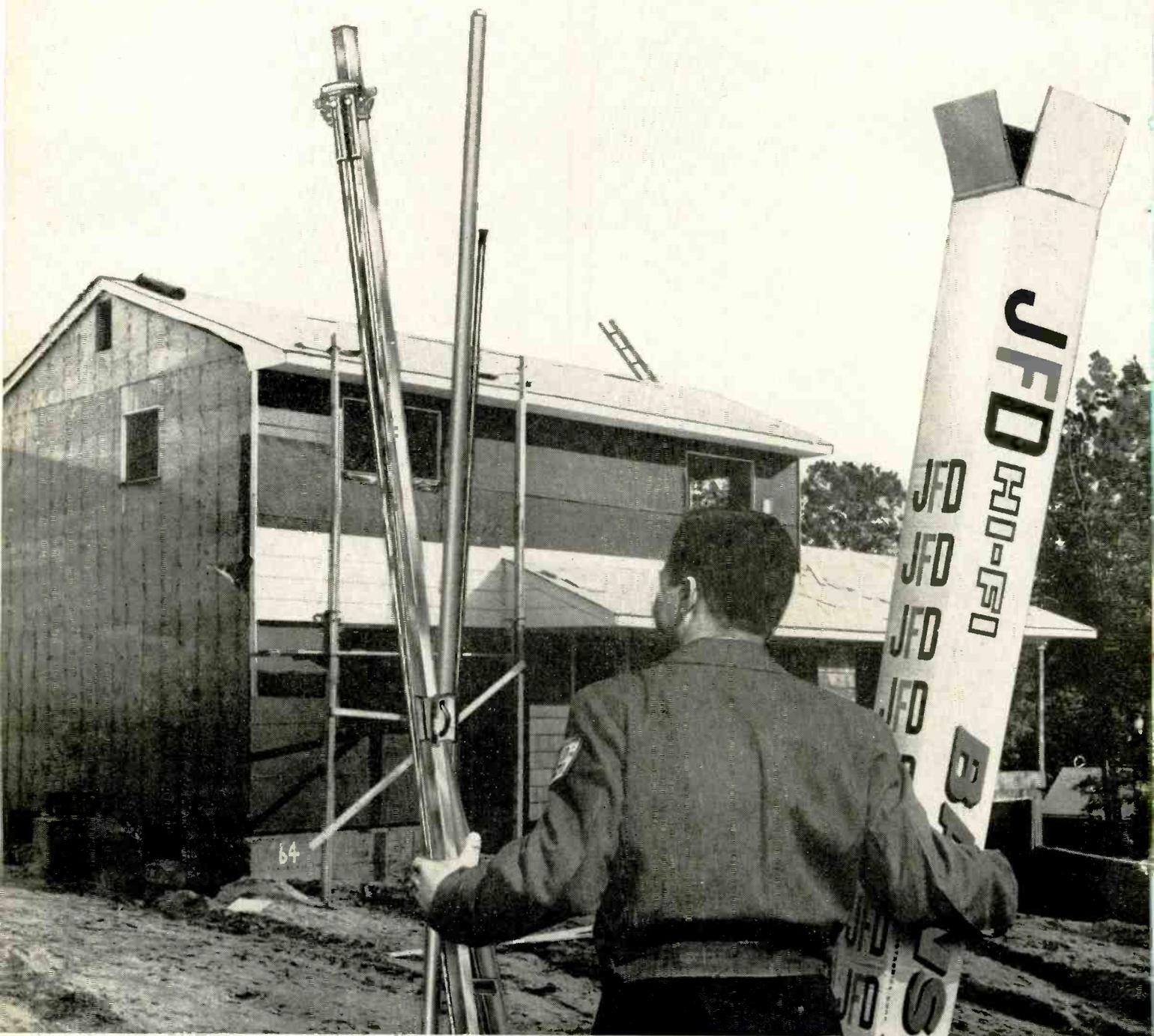
TRIFARI jewelry—the perfect Valentine gift! Both sets designed with matchless quality in new fashion-first styling! INTERLUDE, at top, features the soft glow of richly-textured satin gold finish. WHITE MADRID set sparkles with the beauty of gleaming white and brilliant gold finish. Use only genuine quality-first Philco tubes—thrill your sweetheart with both sets!

Either Set of Earrings
FREE
 with your purchase of
 50 PHILCO TUBES

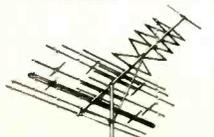
Either Pin
FREE
 with your purchase of
 50 PHILCO TUBES

Either Bracelet
FREE
 with your purchase of
 75 PHILCO TUBES

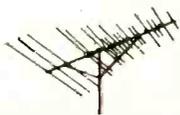
LIMITED TIME ONLY! SEE YOUR **PHILCO** DISTRIBUTOR



The Businessman in the Serviceman suit knows 1,400,000 new houses* mean unlimited opportunities in new antenna installations. He intends to get his share of this profitable business. His antenna brand? . . . JFD, of course—for performance that delights his customers and confirms their confidence in his technical ability.



HI-FI HELIX



HI-FI BANSHEE



HI-FI FIREBALL

THE BRAND THAT PUTS YOU

JFD

IN COMMAND OF THE MARKET

JFD ELECTRONICS CORPORATION
BROOKLYN 4, NEW YORK

*Source — American Builder

ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

The Business Picture

The overall business picture in the electronic servicing industry has been following the trend of business generally. For example, steel production has been down, and so has electronic replacement business.

One cause of this moderate dip has been cautious capital investments by industry. In some areas unemployment has become serious. Generally speaking, buying has been cautious, with inventories kept to a minimum.

From what the economists and business experts say, we don't expect too much of a change during the next couple months. However, the fact that dealers' shelves are not overstocked, the fact that consumer spending continues strong and construction is expected to rise, makes us look forward to an upturn in the electronic service industry a few months hence.

It looks like 1961 will be a better year than 1960 by a small margin.

The Licensing Vote

Readers will recall that our October 1960 issue contained a "ballot" for service dealers and technicians to vote for or against the licensing of TV servicing. The compilation of these ballots represent a survey of the electronic service industry's national attitude.

The results are published in this issue in the article, "Service Industry Votes on TV Licensing." It shows that the industry favors licensing, but by a small margin.

Of notable interest is the statistical analysis of licensing attitudes on the basis of association membership, earnings, hours worked, experience, population distribution, and even politics.

We believe this study to be the first of its kind

to cover such a wide cross-section of the industry, including 45 states, Puerto Rico and Canada.

It has been enlightening to us, and we hope you will find it interesting reading.

Loyalty . . . Or Else

On numerous occasions we have stated our unqualified support of independent service dealers who insist that their parts distributors should sell wholesale to the trade only. The injustice of a distributor bypassing his own dealers to sell directly to the consumer is self evident. We will not belabor this point with repetition of our oft stated unambiguous statements on the subject.

But there is another side to the coin. That is the obligation of a dealer to go out of his way to patronize a distributor who sacrifices his retail sales to serve dealers more effectively.

One case has come to our attention where a distributor did just this. After establishing a profitable business of selling to both dealers and hobbyists, this distributor gave up his retail sales with the expectation that the dealers in the area would flock to him. As a matter of fact, a great many did. But there are still too many who have failed to reward with their patronage the distributor working for them. If service dealers hope to win more distributors to their side—and it can be done in most areas where electronic distribution chaos does not reign—then they had better get on the ball. If going out of your way is too much of an inconvenience, don't expect distributors to go out of their way to support your economic fight.

In all fairness, we must heap praise on the many dealers who have shown their support in dollars and cents for distributors cooperating with them. But for those other fellows who yelled loud and long that distributors were cutting their throats, and then neglected to support a distributor who was ready to cut his own throat to work with them, such dealers have our scorn.

TECHNICAL DIGEST

some sets having early type vertical linearity controls. The control is included in a unit (PC501) which also contains height and age controls. Early triple-type controls are stamped 973927-1. Circuits using this early control should have a 680K or 560K resistor connected between point 9 of PC501 and pin 7 of the 6DR7 tube. If a jumper is encountered here instead of a resistor, the resistor should be installed. Later chassis contain a triple control numbered 973927-4 which does not require a resistor. This chassis should have a jumper between the points indicated in the diagram. If replacement of early type triple controls becomes necessary, the late type control should be used. If a resistor is present it should be replaced by a jumper.

23" TV Series—Tilt Caution

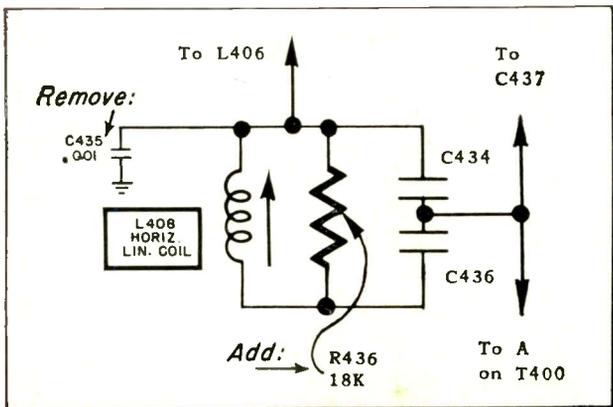
When servicing a receiver of the 23" series, the servicing caution label attached to the cabinet's interior must be observed if the chassis is being removed from the cabinet. Removal of the chassis in these sets disturbs the weight distribution, leaving the CRT's weight at the front of the cabinet, without a counterbalancing weight. This presents the possibility of the cabinet tipping forward. It can be prevented by removing the rear casters of sets so equipped, or blocking up the front legs of sets without casters before removing the chassis.

SYLVANIA

Chassis 550-1,-2,-3,-7,-8,-9 Code 05— Drive Line Elimination

To eliminate possibility of a drive line being vis-

Sylvania modification to eliminate visible drive line.

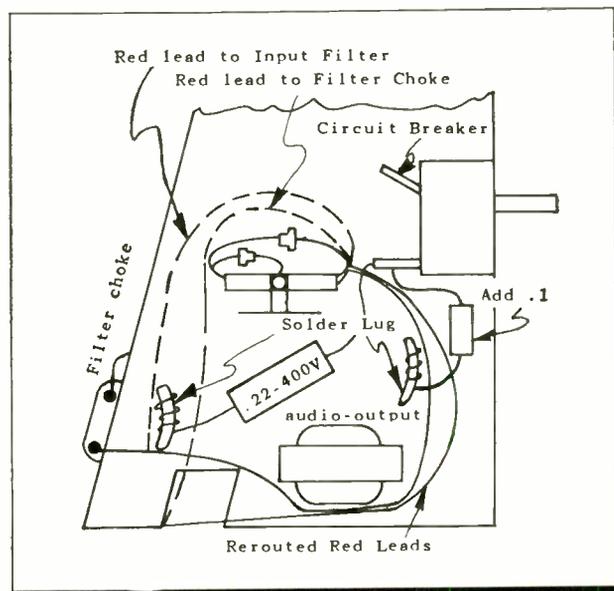


ible, the following modification was accomplished: (1) Removed C435 (0.001 μ f) capacitor. (2) Added R436 (18K) resistor.

Model 19T01—Self-Interference

Some of these receivers will exhibit a black or white horizontal bar through the picture when the set's built-in antenna is used. This is caused by radiation from the power supply being picked up by the antenna circuit.

This condition may be corrected by the follow-



Modification for Sylvania Model 19T01 TV receivers that exhibit a black or white horizontal bar through the picture when the set's built-in antenna is employed.

ing modifications: Reroute the red lead to the input capacitor and the B+ choke as shown. Add a 0.1 μ f capacitor if necessary. Do not allow the speaker lead slack to bunch up near the power supply. Keep the extra lead length tied under the speaker lance.

THIS NEW MONTHLY SECTION complements the basic schematic data published in Circuit Digests. It brings you the latest revisions, circuit modifications, and service data from manufacturers of TV and radio receivers.

Understanding "Magic-Eyes"

How FM Tuning & Tape Record-Level Indicators Work

HERMAN BURSTEIN

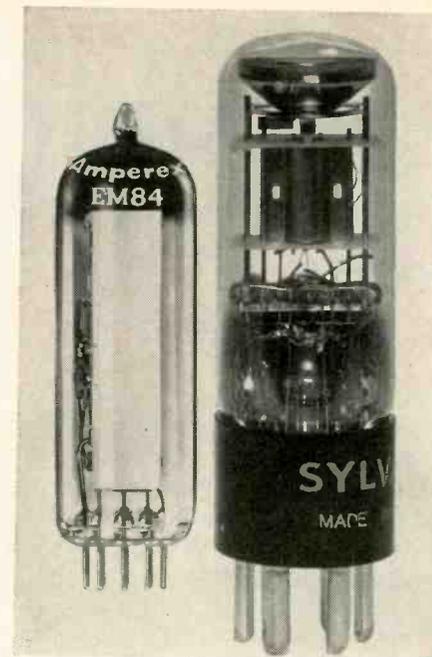
• In addition to meters, there are two basic electronic devices employed as level and tuning indicators. They are the magic-eye (electron ray) tube and the neon lamp. Both are used in tape recorders as record level indicators, and the magic-eye tube, in various forms, is employed as a fine tuning indicator in radios, particularly f-m broadcast receivers.

The tape recordist must use a record level indicator or thread his way between two perils: recording at a high, excessive distortion level, or recording so low that a poor signal-to-noise ratio results. The f-m listener can tune stations to receive

optimum fidelity; less distortion, maximum bandwidth. How well the indicator performs depends upon its type, accuracy of calibration, connection methods, stability, bias pickup, and the operator's skill.

Tuning Eyes

Essentially, a tuning eye tube has a wilomite coated screen which fluoresces when a beam of electrons strike it. By connecting a signal from a receiver or tape recorder to its grid, the tube can be used to indicate relative carrier or audio levels. "Magic-eye" tubes are available in various forms, presenting circular, rectangular, and other fluorescent patterns.



The circular-patterned 6E5 tuning-eye tube has been one of the most popular types for years, though newer type indicators are rapidly becoming popular. The shadow area in the 6E5 reduces when a signal is fed to the tube's grid. The eye is just barely open when maximum permissible recording level has been reached, as illustrated in Fig. 1B. When used as a tuning indicator the same condition prevails when the radio receiver is tuned to maximum carrier level of a broadcast station, except that strong signals close the eye more completely than shown in Fig. 1B. Excessive signal is indicated by a thin line or overlapping, as shown in Fig. 1C. Another popular type indicator is

Fig. 1 (top)—Simplified schematic of 6E5 type tuning "eye" tube. (bottom)—"Eye" opens or closes with signal variations at tube's grid.

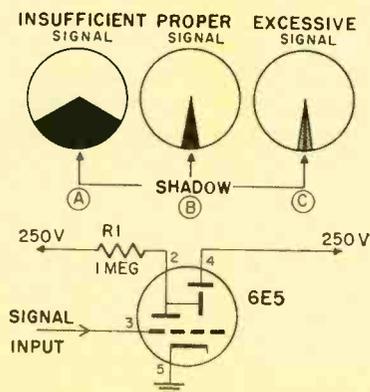


Fig. 2—Schematic and indicating pattern of 6BR5 (EM80) type tuning indicator tube.

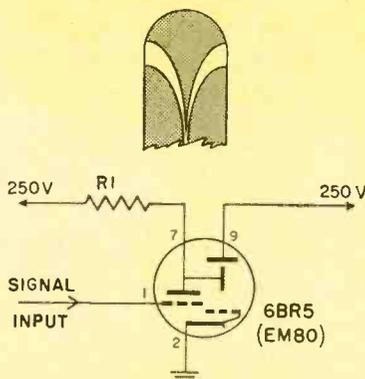
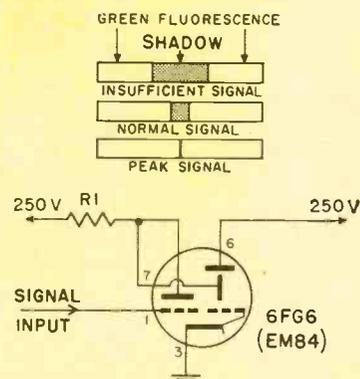


Fig. 3—"Micro-ray" type 6FG6 (EM84) indicator tube pattern with basing diagram.



the 6BR5 (EM80). Its simplified basing connections and indicating pattern is shown in Fig. 2. Still another frequently used type is the 6FG6 (EM84), shown in Fig. 3. It is sometimes called a "micro-ray" indicator and presents two rectangular bars that vary in length with signal variations. Maximum audio signal or carrier level is indicated when the two bars lengthen and come together in the center area.

One versatile tube, the 6AF6-G, is frequently found in combination AM/FM receivers. One of its two indicating sections is employed for AM tuning and the other for FM.

The older type 6AL7 tube functions on the same basic principles as other type indicators, although its pattern indications vary widely with circuit applications.

Practically all top grade FM and combination AM/FM radio receivers manufactured today are equipped with some form of fine tuning indicator—either meter or "magic eye" tube. Tuning meter circuits vary as widely as do magic-eye type tuning indicator circuits. Most highly accurate FM tuning adjustments are performed with a meter driven by an FM discriminator output signal. A one tube triode amplifier is generally required to boost the metering signal. This is sometimes done in a double triode meter amplifier/cathode follower F-M tuner output stage, or in a circuit variation as shown in Fig. 4. A center zero indicating meter is frequently employed for tuning FM, with maximum (right) meter needle reading indicating proper tuning for AM signals. The meter shown in Fig. 4, however, indicates maximum reading when the F-M station is properly tuned.

A 6FG6/EM84 tuning-eye tube circuit, driven from an FM receiver's 1st limiter grid input, appears in this issue's Circuit Digests.

How They Work

In the simplified 6E5 schematic of Fig. 1, note that positive voltages are applied to both the plate and fluorescent screen. Also observe that the rod-like ray control electrode opposite the fluorescent screen is connected internally to the tube's plate and remains at the same potential. Since the control electrode

is nearer the cathode than the fluorescent screen, it exerts a stronger pull on the electrons with a given positive potential.

Signal voltage applied to the tuning eye tube's grid varies, and hence the amount of current passing through R-1. In turn, the voltage drop created varies the plate and control electrode voltage. For example, when an f-m receiver is tuned closer to a station's center frequency, electron flow increases from the tuning eye tube's cathode to its control electrode and fluorescent screen. The screen is lighted all around except directly opposite the control electrode which absorbs those electrons directly in its path. This leaves a thin shadow on the fluorescent screen, as the "eye" closes. When less signal is applied to the tuning eye tube's grid it becomes less negative, and more current flows through R-1. The plate and control electrode now becomes less positive than the fluorescent screen. Electrons are deflected away from the electrode at wide angles on their way to the fluorescent screen. Less of the screen is lighted and the "eye" now opens wider.

Since receiver avc voltage varies with the carrier signal in AM receivers, tuning eye tubes can be operated by feeding avc voltage to the indicator tube's grid. Maximum avc voltage corresponds to maximum carrier signal, thus the tube's eye closes when the receiver is tuned to the center of a station's carrier.

In f-m receivers the tuning eye tube's grid is generally driven by a signal from the limiter grid input or discriminator output. In AM/FM receivers, one grid of the 6AF6-G tuning eye can be driven by an a-m i-f output signal and the other grid by the f-m limiter output. A number of slight circuit variations prevail in different designs.

Record Level Circuits

A typical magic-eye record level indicator circuit, using a 6E5 tube, is shown in Fig. 5. The magic eye tube's grid is driven by an audio voltage from an appropriate stage of the recording amplifier. A voltage divider, consisting of R-1 and R-2, employ values of resistance calculated to cause full closure of the eye at a maximum permissible re-

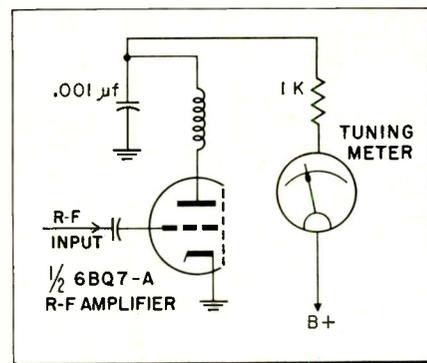


Fig. 4—Tuning indicator meter inserted in 1/2 6BQ7-A r-f amplifier circuit of f-m receiver.

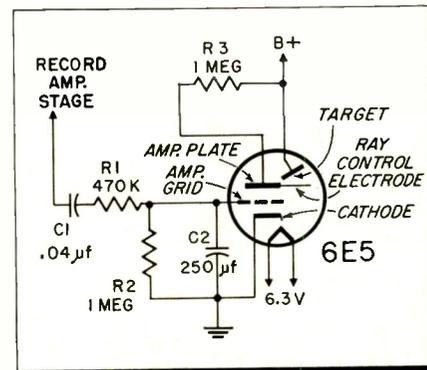


Fig. 5—6E5 magic-eye tube circuit used in a tape recorder for record level indicator.

ording level. A significant change in one of these resistors will result in faulty record level indication—leading in turn to excessive distortion or noise.

When connected in this circuit, however, the "eye" flickers rapidly in following the signal and it is difficult for the recordist to interpret indications. Therefore a number of tape recorders employ a "floating action" circuit. In this arrangement the "eye" remains closed briefly at peak readings. It closes quickly but does not open rapidly enough to prevent the human eye from observing its action.

Neon Lamp Indicators

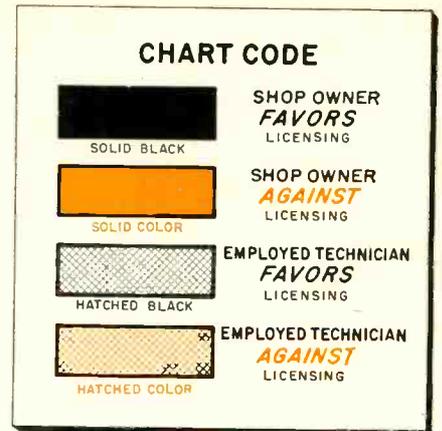
The neon lamp can also be used to indicate relative levels—although it is not as accurate as a magic-eye tube. The neon lamp is not employed as a receiver tuning indicator.

A typical neon lamp indicator circuit appears in Fig. 6. About 65 volts a-c or 90 volts d-c is needed to ignite the lamp—although appreciably less is often sufficient. Audio voltages of this magnitude may or may not be available. They are some-

(Continued on page 60)

Service Industry Votes on TV Licensing

Service Dealers and Technicians Across U.S. Favor Licensing by Small Margin



ELECTRONIC TECHNICIAN

Research Dept.

- Do TV service dealers and technicians favor or oppose regulation of the service industry through licensing laws?

To find the answer to this hotly debated question, ELECTRONIC TECHNICIAN undertook a national survey by including a "ballot" in the October 1960 issue. Readers could vote by filling in the ballot form and returning it to the magazine, thereby providing a national sampling of opinion.

As the returns poured in, tabulations were made to determine the number of votes which would have to be counted to assure an adequate

sampling. By the time the first 600 replies were analyzed, a definite and essentially unchanging pattern was established. Additional ballots were counted, and no further modification of the percentages was noted, so the count was cut off after the first 701 ballots, in order to bring the results to you promptly.

To our knowledge, this is the first study of licensing attitudes to include such a broad national cross-section, including samples from 45 states in the U.S., Puerto Rico, and Canada.

For easy reading, the results are presented on the bar charts shown here. As it is indicated on the chart code, a solid bar represents the votes of shop owners, while the hatched bar that of employed tech-

nicians. Furthermore, a black bar represents votes favoring licensing, while a color bar stands for votes against licensing.

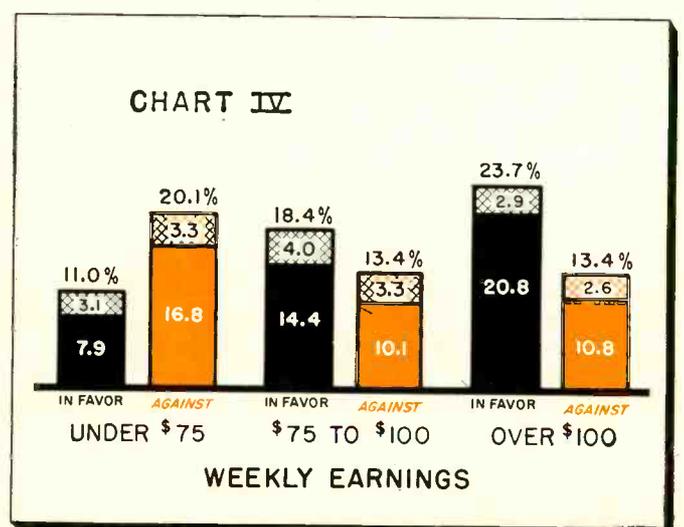
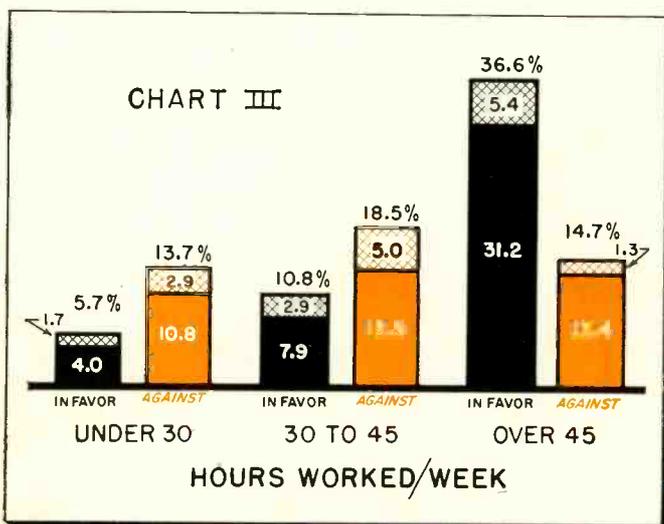
Total Replies

As shown on Chart I, 53.1% were in favor of licensing, while 46.9% of all replies were against. It should be noted that the large number of shop owners, 80.9% of all replies, reflect the large proportion of this occupational group among ELECTRONIC TECHNICIAN subscribers. 19.1% of all replies came from employed technicians.

In all the charts shown, the numbers represent percentages of the 701 replies tabulated.

Association Membership

Chart II points up two interest-



ing facts. First, a majority of people professionally engaged in the TV-electronic service industry, 73.1%, are not members of service associations.

Second, while non-members are generally more inclined to oppose licensing, association members are overwhelming in favor of such licensing.

Hours Worked

Chart III presents the differences in attitudes on licensing based on the number of hours worked per week. There is a definite sentiment against licensing among those people who work under 45 hours a week in TV servicing. This may reflect either or both of two conditions: these people may be operating a part-time business, or they may have excellent working conditions where a shop owner puts in a short week.

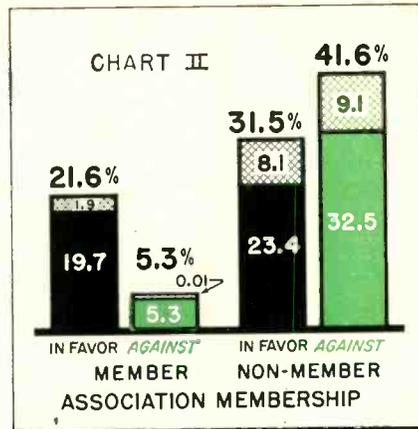
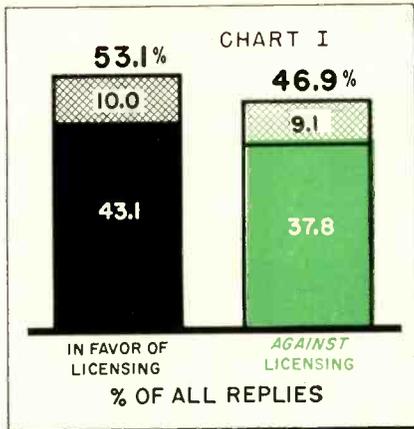
On the other hand, those working over 45 hours are very strongly in favor of licensing.

Weekly Earnings

Chart IV shows that the minority earning under \$75.00 per week firmly opposes licensing. This may reflect part-time business. However, as earnings increase over \$75.00, particularly over \$100.00, sentiment turns strongly in favor of licensing, possibly tying in with the same people who are working longer hours.

Experience

Chart V offers an interesting examination of licensing attitudes based on years in TV-radio work. It appears that irrespective of years of experience, there is a preference for licensing.



ference for licensing. Relatively, the preference is strongest among those people with the fewest number of years in the business.

Population Distribution

Chart VI divides those in favor and against licensing on the basis of the population of the towns in which the respondents work. In population areas under 1,000,000, there is a stronger preference for licensing, while in the big cities over 1,000,000, the opposition has a very slight edge.

Politics

Respondents were asked to volunteer their preference for Nixon or Kennedy for the presidency. The vote was 3-to-2 in favor of Nixon. The percentages were almost identical among those favoring and opposing licensing.

Comments

A great many comments were volunteered by people casting ballots. We have selected comments from those state and local areas in which licensing is in effect in order

to show how service dealers and technicians have reacted to such laws.

INDIANA:

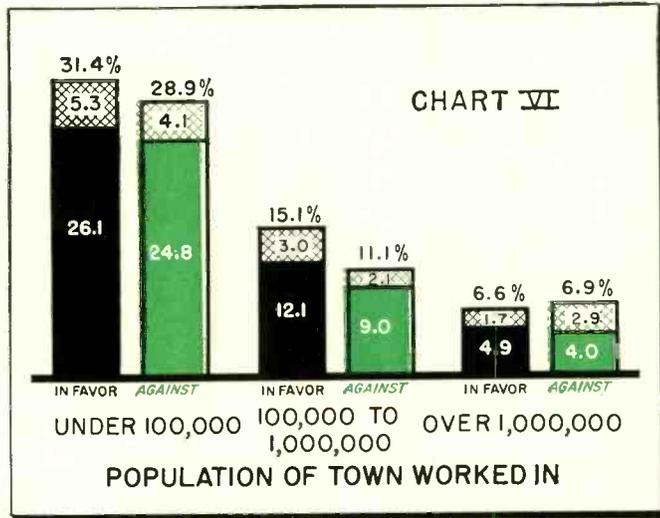
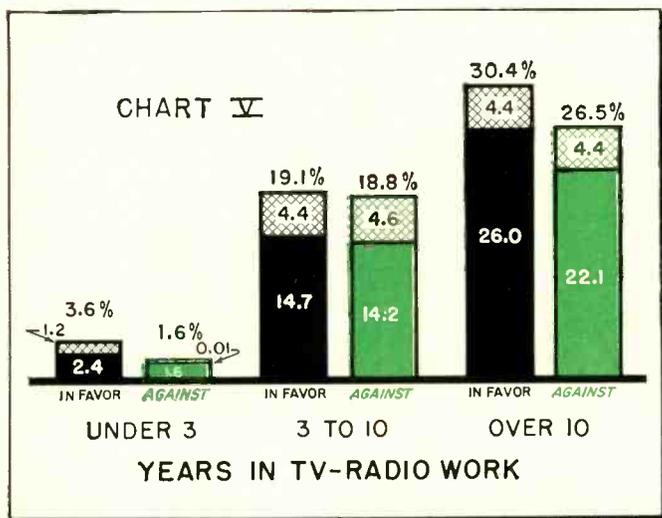
"Licensing was once in this area. However, the ones that wanted to be licensed raised prices to a point that they lost customers by the dozens. Three were put out of business."

LOUISIANA:

"In our first encounter with licensing, the technicians were of the opinion that this should cure a great part of their evils. Especially problems with part-timers. We found at the inception of our licensing law that everyone and his cousin had applied and received a license. However, now our second year of state licensing is almost behind us and we begin to see a marked change. Many not actually engaged in television servicing have not renewed their license. It is gradually becoming a technician's law. Here's to a rosy future."

"They take your money and that's all you hear from them. Everyone in this community can buy parts, TV sets and anything else wholesale."

"It has not been in effect too long but
(Continued on page 45)



Guide To Servicing Transistor Radio "Dogs"

Simple Routines To Shorten Repair Time Of Non-Routine Defects

LOUIS E. GARNER, JR.

• While the majority of transistorized receiver defects will yield readily to routine tests and conventional service methods, the occasional "dog" can be a real heart-breaker.

Too often, an otherwise simple job becomes tough when . . . (a) it fails to yield to preliminary tests, (b) an error in technique or meter reading is overlooked and accepted as accurate, (c) tube-oriented thinking draws an invalid conclusion from test results, and (d) a "short-cut" based on limited experience fails. In each case, a frequent result is that the technician becomes bogged down in a series of repetitious tests which are essentially *simple variations of the same technique*.

The answer to the "dog," of course, is the use of more sophisticated techniques *as soon* as it becomes apparent that a job is more than "routine."

Receiver Operation

The schematic wiring diagram of the Continental Model TR-300 receiver is given in Fig. 1. While the circuit variations encountered in transistorized receivers are great, the TR-300 has most of the elements found in transistor AM Broadcast-Band receivers, and thus

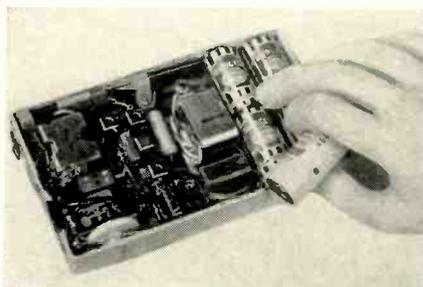


Fig. 2.—A large bypass electrolytic can be shunted across the receiver's power pack to help isolate some types of defects.

is ideal for reference purposes. Since servicing "dogs" is simplified by a thorough knowledge of receiver operation, let's refer to the set's schematic. This receiver uses eight p-n-p transistors in a conventional superhet arrangement. The common-emitter configuration is employed in all stages. Operating power is supplied by a single 9-volt dry battery, controlled by an SPST switch ganged to the set's Volume control, R15.

A separate local oscillator, TR1, is used, with its output coupled through C5 to the mixer's (TR2) emitter electrode. The i-f signal developed by the mixer is coupled through T1 to a two-stage i-f amplifier, TR3-TR4. A neutralized circuit arrangement is used in the i-f amplifiers, with C13 and C17 serving as feedback capacitors. A variable base bias for avc is obtained

from the second detector and coupled back through R10 to the 1st i-f stage, TR3. The mixer, TR2, and 2nd i-f amplifier, TR4, are operated with fixed bias, supplied by voltage dividers R1-R2 and R12-R13, respectively.

The amplified i-f signal obtained from TR4 is coupled through T3 to a conventional diode detector, D, with the demodulated audio signal appearing across the diode load resistor, Volume control R15, coupled through C23 to a two stage audio amplifier, TR5-TR6. The second audio stage, TR6, is coupled through T4 to the Class AB push-pull power amplifier, TR7-TR8. The push-pull stage, in turn, is coupled to and drives the PM loudspeaker through impedance matching output transformer T5. The small base bias required for Class AB operation is supplied by a temperature-compensating network which includes voltage divider R25-R26 and thermistor TH.

Ignoring power supply defects for the moment, complaints of *poor sensitivity, improper tuning, poor selectivity, and oscillation* (squeals or motorboating) are often the result of defects in the r-f or i-f sections, TR1, TR2, TR3, and TR4. Complaints of *poor quality sound* (accentuated highs or lows), *garbled sound* (distortion), *low power output* (lack of volume), and so on, generally are due to defects in the

audio section, TR5, TR6, and TR7-TR8. *Intermittent* troubles, *weak* operation, and *failure to operate* (dead) may be caused by defects in almost any part of the receiver.

Initial Tests

Normal servicing technique follows a relatively simple routine. First, confirm the customer's complaint. Second, check the power supply (battery); here, a quick check of overall set current requirements may give a good clue. Excessive current, for example, may be caused by a leaky transistor or one or more leaky or partially shorted capacitors. A lower than normal current may be caused by an "open" transistor or by a circuit defect which removes base bias from one or more stages. Third, isolate the defect to a specific stage, watching for common defects which can cause the complaint. Conventional Signal Tracing or Signal Injection techniques may be used for stage isolation, followed by stage voltage (or current) tests to isolate the defective part. Fourth, check the transistors.

When trouble is encountered with this "standard" test routine, it's a good indication that you've run into a "dog." Therefore, it is best to shift tactics.

For example, one of the first steps in checking a tube-operated receiver is to check the tubes. This is generally the last step when checking transistor-operated sets, for transistors are less likely to "burn out" when used properly.

However, a clue from the customer or from the set's operation might indicate that a quick check of the transistors should be one of the first steps. If the customer has inadvertently installed the wrong battery in the set . . . or connected a battery with improper polarity, one or more of the transistors may be damaged. Similarly, leaving the receiver in a closed car during an exceptionally hot day may result in transistor damage. In either case, checking the transistors may speed isolation of the defect.

Use caution in your tests, however. Don't assume blithely that the results of a single test have completely eliminated a possible source of trouble. R-f transistors, for ex-

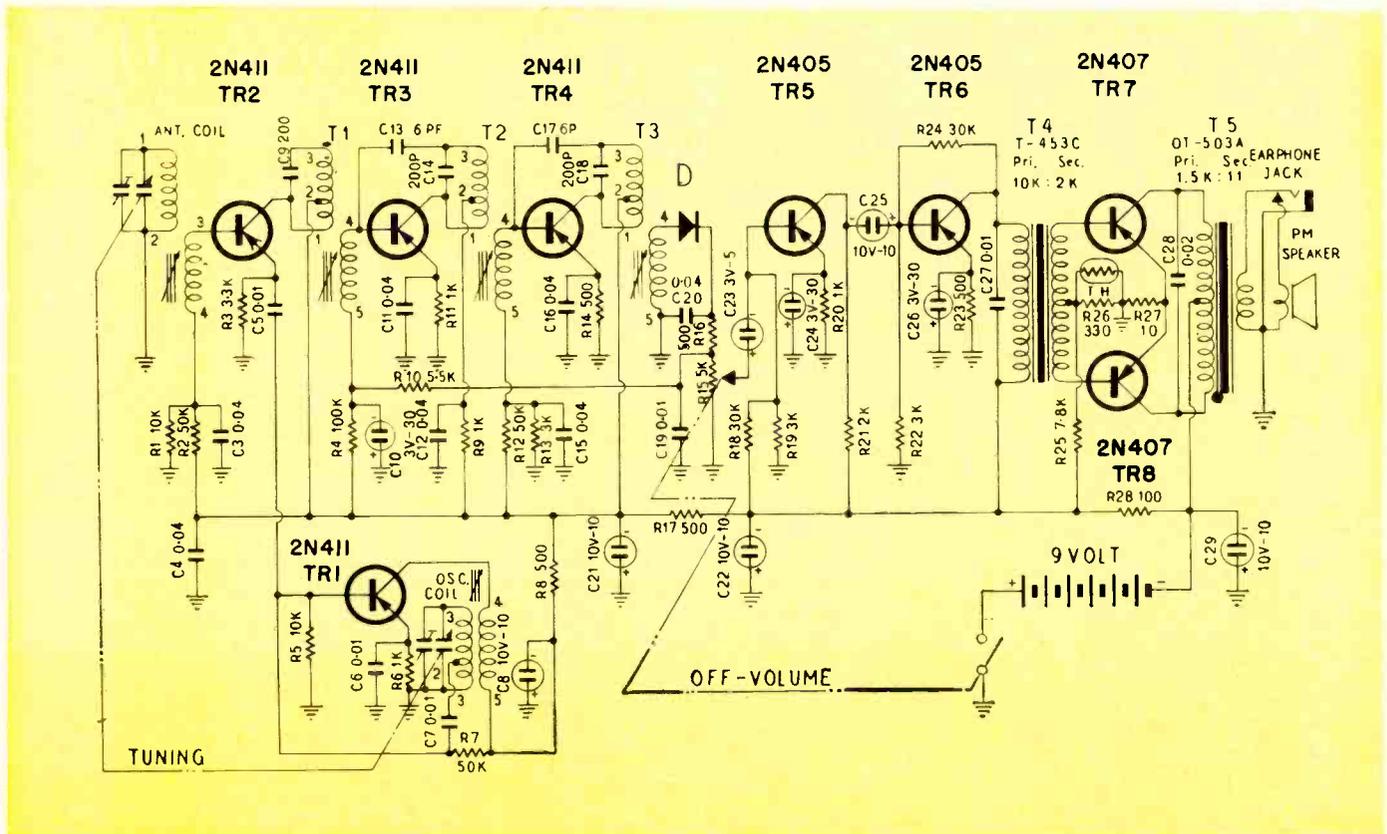
ample, may check *good* in some testers, yet may fail to operate as local oscillators or converters.

To see how common defects may give misleading test results, let's take a closer look at our typical receiver. Since a high percentage of customer complaints are caused by weak batteries, it is common practice to check a set's battery before using more advanced tests. Too often, however, this check is a rather cursory one . . . the battery voltage is checked under "load," or a "new" replacement is tried in the set. If the complaint isn't cleared up, it is assumed that the trouble lies elsewhere.

But sometimes such a conclusion leads one astray, for in most transistor sets battery voltage is not as important as the power supply's internal resistance. This is particularly true in midget sets where a battery by-pass (C29, Fig. 1) has been omitted to save space or to reduce costs. Since most transistor circuits will continue to operate on much lower (or higher) than their "rated" voltages, a battery may check "good," even under a moder-

(Continued on page 70)

Fig. 1.—Schematic of a Continental Model TR-300 transistor portable has most of the elements found in transistor-operated AM broadcast units.



Servicing TV Remote Controls

Operation & Repair Of Wireless Remote Transmitters And Receivers

BERNARD GREEN

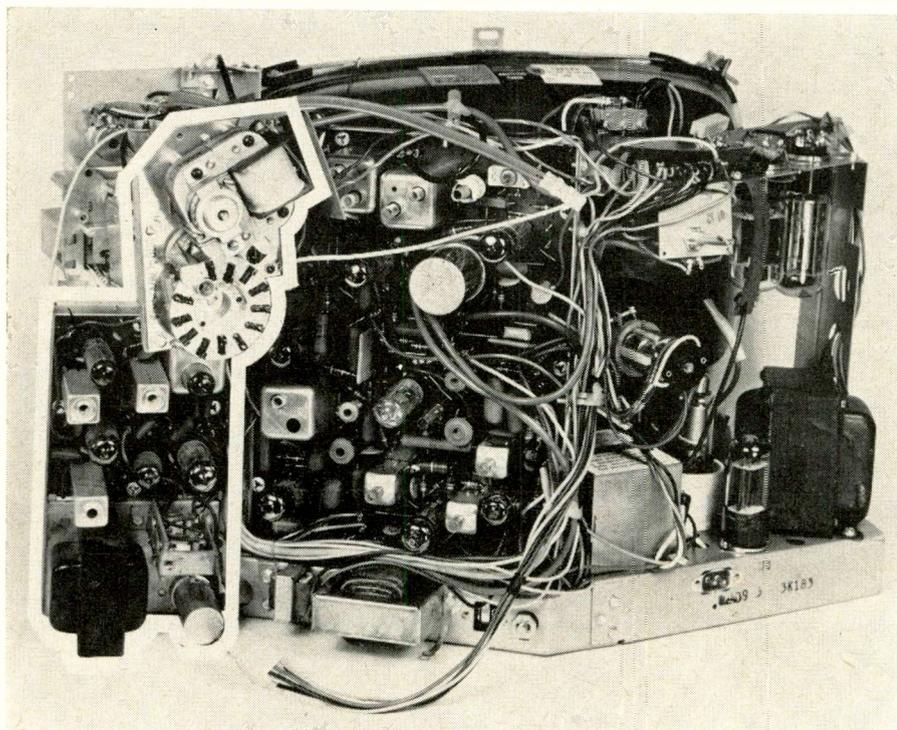


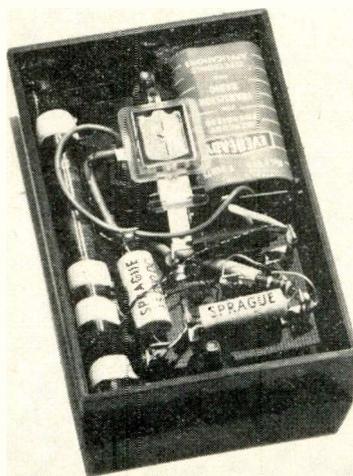
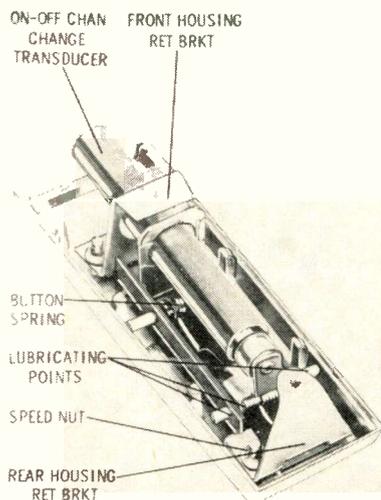
Fig. 1—Westinghouse V-2409 TV chassis, illustrating remote control receiver assembly, including relay and motor, in outlined area on extreme left.

• Controlling a TV set from a distance has been a desirable feature since “big picture” TV required audiences to sit beyond reach of the channel selector. The luxury of not getting up to change channels, volume, or what-have-you is obvious. Consequently, it’s not surprising to find remote control a prominent optional feature on most television sets; wireless remote control, that is.

Wireless remote controls are simply transmitter/receiver combinations with a mechanical assembly doing the physical work. The transmitter is diminutive in size, permitting it to be held in the hand of the user; the receiver is in the main chassis cabinet, frequently secured directly to the main TV chassis as shown in Fig. 1. It employs a motor-drive mechanical assembly to control television operation when activated by the transmitter. Depending upon the particular device, functions may include: changing channels, volume, brightness, or any other adjustments.

Fig. 2—Motorola rod-type transmitter assembly showing lubricating points.

Fig. 3—Sylvania’s battery-powered transistorized “wireless” remote transmitter.



Remote Transmitters

Remote wireless transmitters, illustrated in Figs. 2 and 3, can be divided into two basic categories: electronic and mechanical. (1) The electronic transmitters are battery-operated transistor circuits that generally radiate inaudible signals generated by oscillatory circuits. (2) Mechanical devices radiate inaudible ultrasonic signals by mechanically striking metal rods through push-button release of a hammer; similar to the action of hitting a tuning fork. Some “mechanical” devices use a plastic-type bellows that emits a high frequency

harmonic when squeezed by hand. [In rare instances, even compressed aerosol type liquid dispensers can activate the remote mechanism if its frequency happens to coincide with the receiver's tuned frequency.]

Both types, mechanical and electronic, transmit usable remote frequencies far beyond human hearing capabilities, and are variously called: "supersonic," "ultrasonic," etc. These frequencies are picked up by the remote receiver's receiving element; either an antenna or a microphone.

Troubles in a mechanical transmitter are limited to defective springs, incorrect seating of metal rods, and other such mechanical-type problems. They are generally incurred through dropping or otherwise misusing the device. The bellows-type transmitter can develop an air leak.

The electronic transmitter shown in Fig. 3 is presented circuit-wise in Fig. 4. This is the more conventional type transmitter to an electronics man. Although circuit designs vary with the manufacturer, they all employ some form of oscillator circuit, whether Hartley, Colpitts, or other design, and a signal radiating element. A battery, frequently a cadmium-mercury type, and a transistor contribute to a transmitter's small size.

Fig. 4's circuit is a simple Hartley oscillator using a PNP transistor and powered by a nine-volt battery. PB600 is the pushbutton that activates the transmitter.

Remote Receivers

Remote receivers are mounted on the TV set's main chassis or in the same cabinet, with connecting cables to the main chassis. The motor assembly is physically close to the tuner, as indicated in Fig. 1. Since the remote receiver and transmitter are designed to complement each other, it's not surprising that as many circuit variations exist among receivers as transmitters.

Essentially, receivers pick up the signal sent by the transmitter. The complexity of a wireless receiver's remote circuitry depends on a transmitter's control functions. A different frequency is often needed for each function of the transmitter. Consequently, additional receiver

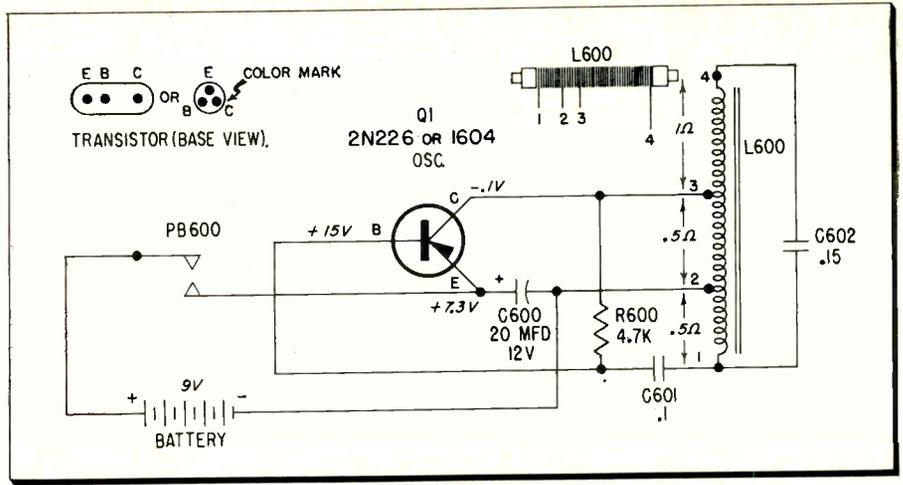


Fig. 4—Schematic diagram of the Sylvania transistorized remote control transmitter using one PNP transistor. Base view of transistor and typical operating voltages are included.

circuitry is needed to direct these signals.

Looking at the block diagram of Fig. 5, you'll suddenly be aware that television sets with wireless remote controls are beginning to resemble industrial controls, though more simplified. That is, electronic circuitry is mated to mechanical contrivances to physically control movement. The three relays and motor depicted in Fig. 5 are naturally more elaborate than shown.

The transmitter that operates the receiver illustrated in the block diagram has four basic functions: move channels up or down, move the volume-on-off control up or down. The remote receiver must receive signals from the transmitter, amplify, and direct these signals to

control the TV set.

The transmitter employs four signals to control four basic functions: a 41KC or 39KC signal, or either of the signals modulated by approximately 170 cps. A transducer, in this case, a crystal microphone, receives the transmitter's signal and converts it into an electrical signal. The signal is amplified by three 40KC stages.

If a CW signal is received, it is detected and causes a relay amplifier tube to conduct; K1 if it is a 39KC signal, K2 if a 41KC signal. Either relay energizes the motor drive: K1 causes the drive to rotate channels in a channels-up direction; K2 in a channels-down direction.

(Continued on page 62)

Fig. 5—Block diagram of components in remote control receiver employed on Westinghouse TV.

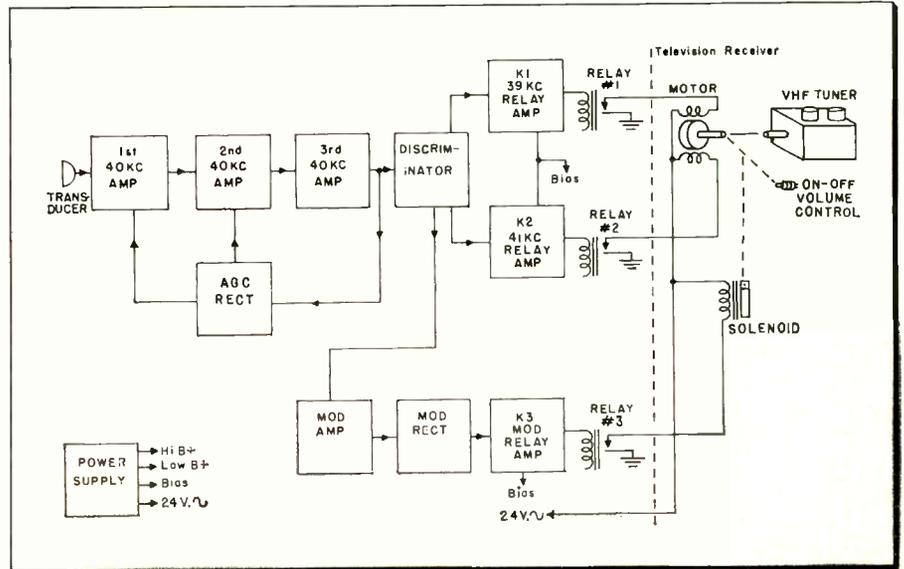




Fig. 1—Outside security guard contacts base station inside plant with Citizens Band Radio transceiver installed in automobile.

Installing Citizens Band Radios

Transceiver Mounting Techniques & Interference Suppression

ALLAN LYTEL

• Increased use of Citizens Band Radio at fixed stations, on autos and pleasure boats, has opened an expanding source of revenue for the experienced electronics specialist. Far too many radio-TV technicians, particularly those experienced in auto radio installation work, are not pursuing this substantial sales, installation, and service plum.

The Citizens Band radio user has a large number of reasonably priced units available to him—provided by many different manufacturers (see *ELECTRONIC TECHNICIAN*, May 1960, page 38).

Installations

Many technicians already have had experience securing auto radio shells to the side brackets provided by auto manufacturers. The CB radio unit is only a little more complex to install. A CB transceiver may come with an unassembled platform, a brace to be secured, or the technician may find it necessary to improvise as he often does on regular auto radio receiver installations. A conventional completed installation is pictured in Fig. 1.

A typical mounting plate and

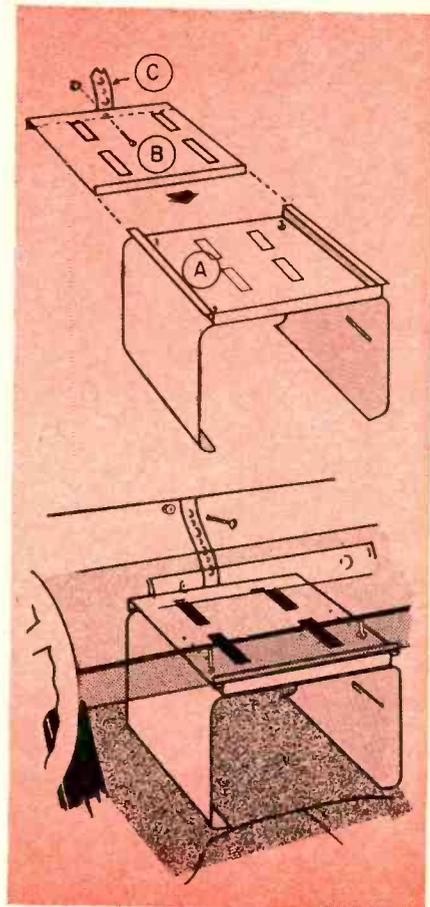
dash board assembly is shown in Fig. 2. This type may be assembled, as follows: Place the transceiver up-side down and remove the four rubber feet. Turn transceiver right side up, spread case at bottom and remove. Part A is placed on top of cabinet and four $\frac{3}{16}$ " holes are drilled. Using #8 x $\frac{1}{2}$ " screws, bolt part A to the case, placing screw heads on inside of case.

Use #8 x $\frac{1}{2}$ " screws and bolt strap C to part B. Position part B under dash, and drill two $\frac{3}{16}$ " holes. Use #8 x 1" screws and bolt part B under dash, as shown. Fasten part C to fire wall or a brace under dash using $\frac{1}{4}$ x 2" screw. Replace chassis in case.

This set can be removed by simply pulling it forward from its cradle and can be reinserted by lining it up and pushing forward until it is against the case rear. By adding a back support to the dash board mount (in the form of a battery braided cable) the installation is strengthened and a ground to the fire-wall is made.

In the event a mounting bracket or platform is not included with the set, a piece of aluminum about four inches wider than the transceiver can serve as an improvised mount. Preparations include mark-

Fig. 2—When two easily mounted plates are properly attached and the CB chassis installed, the entire unit can be quickly removed or replaced by sliding in and out of the under-dash mounted cradle.



ing the exact positions on the metal form for drilling two holes, followed by drilling two similar holes in the dash board mounting site. By securing the unit to the mount and then fastening the entire assembly to the dash board, a permanent installation can be made.

Small Craft Installation

Mounting a CB radio aboard a small craft is essentially similar to the aforementioned procedure. Four convenient mounting locations are illustrated in Fig. 3, while a completed installation is shown in Fig. 4. As shown: a unit may be mounted under the dash, behind the cockpit, under a seat, or against a bulkhead. Naturally it is important to install the water-craft unit in a protected location, convenient to the operator and near the vessel's battery power. Protection is necessary from rain as well as spray. Long cables and hard-to-reach operating controls are results of poor installation planning and should be avoided. The chassis assembly may be removed in most instances and its case is drilled and fastened for permanent installation.

Since the small craft hull is usually wood or fiberglass, a grounding plate below water line is required. Most larger pleasure craft (24 to 30 feet) are already provided with a metal hull plate as grounding protection from static electricity. This can be used for equipment grounding.

In the event the vessel does not have a metal hull plate a sheet of #20 copper three to four square feet ($1\frac{1}{2}' \times 1\frac{1}{2}'$) or larger, may be secured to the vessels hull below the water line. It is recommended that a low impedance, thin copper strap be connected between this plate and the ground terminal of the equipment. Engine frame should be grounded to this plate also.

In certain types of boats, especially those with outboard motors, it may not be desirable or practical to install a hull plate. In this event a large copper sheet should be laid in the bottom of the boat and bonded to the motor. Equipment should then be grounded to this plate with copper strapping. Lead covered cables are ideal from battery to equipment. Remember—leads should be as short as possible. The

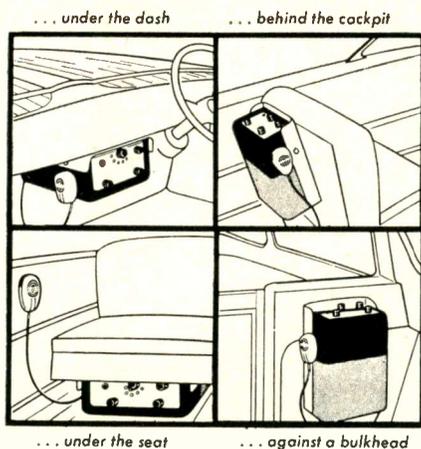


Fig. 3—Four typical positions for mounting CB transceiver on small boats.

transceiver should be properly fused in its battery supply line, and cable wiring from battery to instrument should be at least #6 size.

Antenna Installations

In all radio receiving and transmitting applications the antenna is a prime consideration. Efficiency of the equipment cannot be any better than the antenna to which it is attached. This applies to auto, boat, and base station. As we already know, the FCC has certain limits on CB antenna heights. They must not extend higher than 20' above the mounting base. Furthermore, if installed on a regular antenna mast or tower they cannot extend beyond the top of this tower.

The omnidirectional vertical "whip" type antenna is generally employed on mobile units. It may be base loaded to increase its electrical length and decrease its physical length. The omnidirectional vertical ground-plane antenna is ideal at a base station. Generally the antenna should be mounted as high as possible, within FCC regulations, and clear of all metal objects.

There are a number of antenna site choices on auto or truck. On the roof, front cowl, rear deck lid, rear bumper bar, or clipped to the rain gutter. For optimum results the truck antenna mounting site is on the upper portion of the rear cab assembly. Automobile antenna sites are generally on the rear bumper or rear deck. Primary objectives in choosing the mounting site include keeping the antenna away from

metal, and mounting the antenna securely.

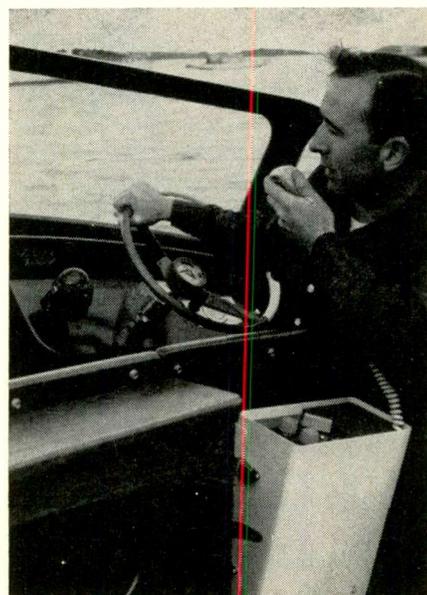
The truck cab mounting base is a symmetrical platform with a spring support that holds the antenna and absorbs road vibration. Mount this plate in the same manner as the antenna cowl by cutting a hole the same diameter as the antenna base, then applying pressure by tightening the nut attached to the inner section of the antenna mounting against the metal frame. If needed, sheet metal screws may be used to secure the antenna mounting to the cab after the nut is tightened. The antenna fits at a 90° angle into the mount.

Conventional front cowl mounts, usually seen in auto radio installations, are not generally used in CB radio. The CB antenna mount is either a roof, rear bumper or rear deck type. These are usually spring mounts, the spring absorbing vibration developed as the vehicle moves along the roadway. Roof mounted antennas are of the base loaded type since the regular types extend too far upward.

Should the antenna be mounted to an area close to the vehicle's body, with half its height obscured by the vehicle's steel structure, pickup and radiation will suffer. Rule of thumb directs the installation technician to mount an antenna as high as possible with as much space as possible between it and the steel body of the vehicle.

(Continued on page 46)

Fig. 4—Small boat transceiver mounted behind cockpit is operated by helmsman.



Transistorized Wrist-Watch

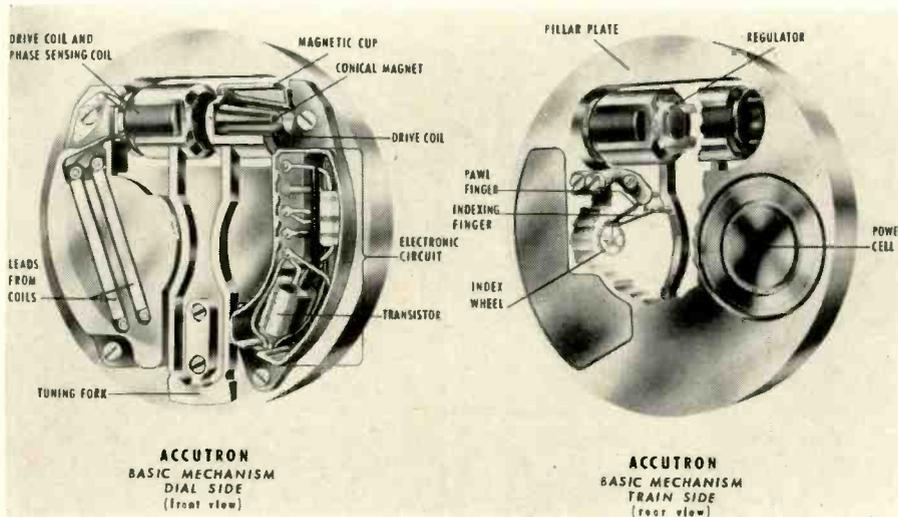


Fig. 1—Illustrations of Accutron showing principal components. Drawing at left shows dial side with tuning fork assembly and basic elements of the electronic circuit. Drawing at right shows the rear of the mechanism with its indexing components, power cell recess, and tuning fork frequency regulator.

• An electronic wrist-watch, called "Accutron," using principles employed in controlling Satellite radio transmitters, has been introduced by Bulova Watch Co., Inc. Replacing the "tick" of a standard watch is the "Accutron's" micro-sonic hum. The transistorized timepiece employs a tuning fork, electromagnetic coils, transistor circuitry, in place of the usual balance wheel and hair spring mechanism.

Operation

The timekeeping operation of the tuning fork and indexing assembly is an electro-mechanical function. A power cell, transistorized electronic circuit, and electromagnetic assembly control tuning fork vibrations (see Fig. 1). The button-sized 1.3 volt mercury cell is said to keep the timepiece running for at least one year. Power needed to operate the unit is about 0.000008 watts.

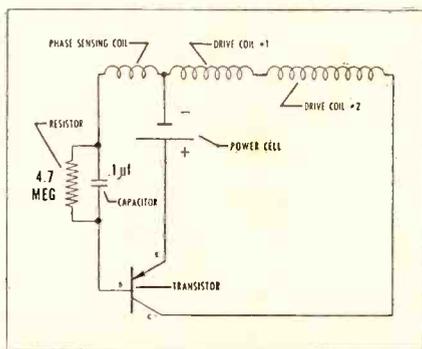
The transistor in the electronic circuit is used as a relay, delivering a current pulse for each cycle of tuning fork (360 cps). Electromagnet drive coils are used to deliver this pulse to the tuning fork.

The "Accutron" watch also contains a resistor, capacitor, and sensing coils, as shown in Fig. 2.

Three functions are served by the coils and magnets: (1) Drive the tuning fork by converting pulses of current delivered to the coils to mechanical energy. (2) Control the amplitude of the tuning fork by sensing the alternating voltages induced during each cycle. (3) Control the instant during the cycle when the driving pulse is to be delivered to the coils.

Assembly line production principles are employed in manufactur-

Fig. 2—Electronic circuit of the "Accutron" acts as an on-off switch. Drive pulses, delivered through a transistor, are applied to sensing coils to maintain the tuning fork vibration rate at 360 cycles per second.



ing these timepieces. Plant electronic equipment, besides typical voltmeter, ammeter test equipment, includes the following:

- Berkley Instrument
 - Model 5444 Counter
- Berkley Instrument
 - Model 550 Counter
- Radio Frequency Labs.
 - Model 1500 Magnet Charger
- DuMont Labs
 - Model 401 Oscilloscope
- Strobolac
 - Watch Rate Tester
- American Time Products
 - Watch Master

The "Accutron" is designed for normal performance within 20° to 120° Fahrenheit. Servicing these units is limited to replacing the battery or module units. The coil assembly and tuning fork unit can be removed separately and replaced as separate units.

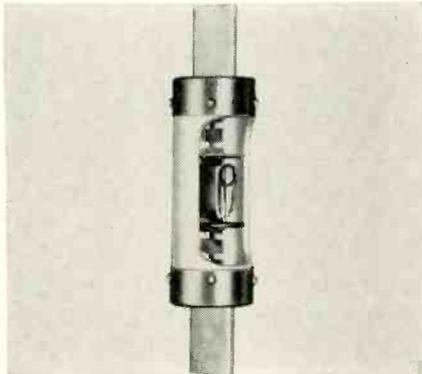
Accuracy is said to be approximately 10 times greater than fine hair-spring balance wheel movements. The electronic timepiece will be available in prices from \$175 to \$2500 (for the platinum model). Most of the dozen men's models are in the \$250 to \$400 range. •

NEW COMPONENTS

Fuseking FUSES

Announced is a complete line of dual element cartridge fuses in 250v and 600v range. Featuring unique mechanical construction, the thermal cut-out element provides most reliable control of overload currents. The snap-open jaws of the heat sinks are activated when heat from any source approaches 300°F. The thermal cut-out element also provides exceptional time-delay performance, useful in preventing needless blows from harmless overloads such as motor starting surges. Monarch Electric Div., El-Tronics, Inc., Jamestown, N. Y.

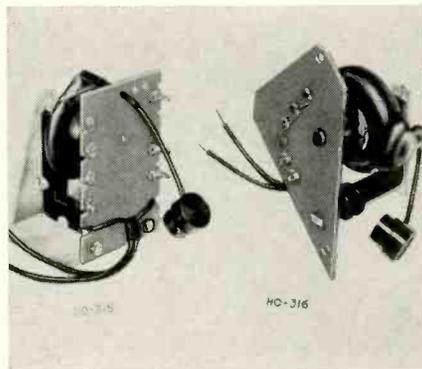
For more data, circle 1-41-1 on coupon, p. 50



Stancor TRANSFORMERS

Two new exact replacement flyback transformers for use in Olympic TV sets are now available. Stancor HO-315 is an exact replacement for Olympic part No. TR-3599-5, used in 42 chassis and 296 models, \$9.45. HO-316 replaces Olympic part No. TR-5598/B, used in 4 chassis and 14 models, \$8.95. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

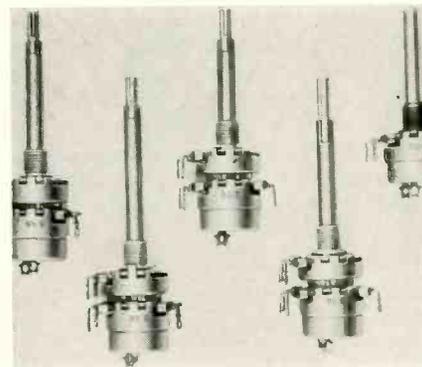
For more data, circle 1-41-2 on coupon, p. 50



Centralab CONTROLS

Announced, as additions to the firm's line of exact replacement controls, are five new units for Motorola radios. They have applications in 1957, 1958 and 1959 Chevrolets, and in 1959 Pontiacs, as well as several Universal applications covering the period between 1954 and 1959. Catalog numbers are: M/U-2, M/U-6, M/U-7, M/U-8 and M/U-9. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

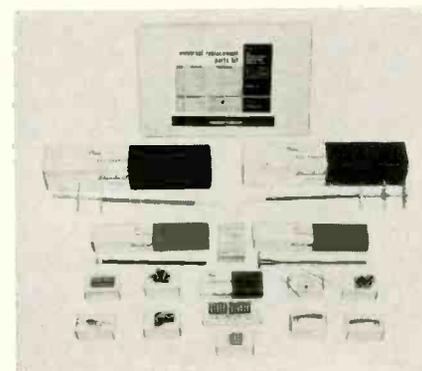
For more data, circle 1-41-3 on coupon, p. 50



Standard Coil TUNER PARTS

Model 31T 3890, for shop and field use in conjunction with Section II of the Standard Cross Reference Guide, contains replacement parts for Standard tuners manufactured from 1947-1957. These parts make up 90% of the replacement parts most commonly used in field service. Included free: popular special springs; detent springs and roller assembly; detent ball assemblies; etc., and a special i-f alignment tool for late model Standard TV and FM tuners. \$27.99. Standard Kollsman Industries, Inc., 2085 N. Hawthorne Ave., Melrose Park, Ill.

For more data, circle 1-41-4 on coupon, p. 50



Amperex TUBES

Offered free, with the purchase of an assortment of radio and TV replacement tubes, is a B. F. Goodrich ice bucket. Normally sold at \$11.95, bucket holds one gallon of ice or hot or cold food and keeps for up to 24 hours. Tubes, packed inside the bucket, are: 2ER5; 4ES8/ECC189; 6AQ8/ECC85;

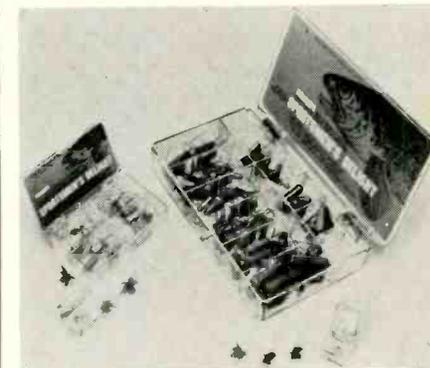


6AT6/EBC90; 6AV6/EBC91; 6BA6/EF93; 6BL8/ECF80; 6BM8/ECL82; 6BQ5/EL84; 6CA4/EZ81; 6CA7/EL34; 6ER5/EC95; 6EH7/EF183; 6EJ7/EF184; 6ES8/ECC189; 6FG6/EM84; 6FY6; 5V3/EZ80; 6X4/EZ90; 12AT7/ECC81; 12AU7/ECC82; 12AX7/ECC83; 6267/EF86; and 7025. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I. N. Y.

For more data, circle 1-41-5 on coupon, p. 50

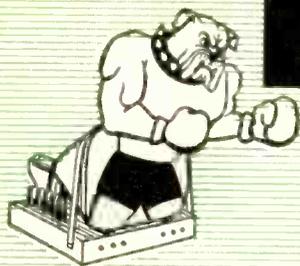
Pyramid CAPACITORS

Two new Sportsmen's Delight capacitor kits are: Gold Standard 111 tackle box with 75 assorted Mylar paper molded capacitors and 3 free colorful trout flies, packed in plastic box



which has 12 compartments. \$13.00; and the 515 Lytik kit containing 15 assorted true subminiature electrolytics, type MLV, and 3 free colorful trout flies. \$10.30. Pyramid Electric Co., Darlington, S.C.

For more data, circle 1-41-6 on coupon, p. 50



"Tough Dog"™

Corner



Difficult Service Jobs Described by Readers

Synchroguide Causes Poor Width

An RCA TV (Canadian Model 21TC142A) came in the shop with low brilliance and very poor focus. A high voltage check revealed only 7.5KV second anode voltage, yet the set had a full picture.

After checking and double-checking, I found that someone had wired a .01 μ fd. capacitor across the width coil. The manufacturer's

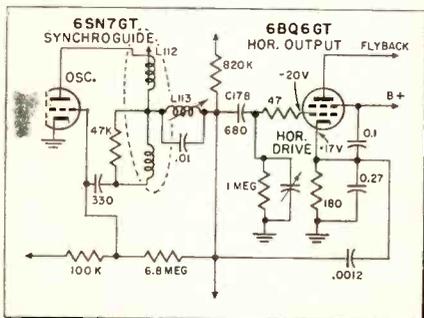


Fig. 1—Poor width and low high voltage was caused by a defective L112 synchroguide coil.

schematic didn't indicate a capacitor across this point. Removing the added component did three things: (1) high voltage shot up to 10.5KV, (2) raster shrunk on both sides about two inches, (3) CRT focus could be properly adjusted with the focalizer.

The cat was now out of the bag: whoever serviced the set before probably had a width problem and could not find the source of trouble. In despair he added a capacitor to the width circuit to fill the screen, but reduced brightness level.

Now the problem with the set was how to get more width. The schematic shown in Fig. 1 indicates -20 volts at the 6BQ6's grid, and +17 volts at the tube's cathode. The latter voltage was close enough (+15) but the grid was running at -7 volts. After disconnecting coupling capacitor C178 at the tube's grid, I fed in a horizontal pulse from my test equipment. Full

width was restored and the high voltage returned to 15KV. This obviously pointed the trouble to the synchroguide circuit. However, I felt that since the picture locked in the trouble couldn't be in the afc section. To double check, I scoped the waveforms of the oscillator section and measured the d-c voltages. All were close to those shown in the schematic.

After checking and substituting all questionable capacitors and resistors in the circuit, I concluded that the trouble had to be a defective synchroguide coil. As these coils were separate components (L112 and L113), I first obtained and replaced the L112 coil. Full width returned to the set and the horizontal drive measured -20 volts; the high voltage was satisfactory at 15KV.

The d-c resistances of the two coils were nearly identical and the faulty one produced a perfect waveform. A check with the customer confirmed our theory that her set had shown a dull, out-of-focus picture since it was last serviced.—*Lambert C. Huneault, Windsor, Ontario, Canada.*

Arcing Resistor Causes Spurious Pulses

A call was made on a Magnavox CT297 that had a bad case of horizontal jitters. The picture would be sharp and clear, wiggle a little from side to side and then go sharp and clear again. At times, when the jittering became severe, the horizontal frequency would fall out completely and then suddenly snap in again. When a new set of afc tubes failed to help, the chassis was brought to the shop.

On the bench I used a scope to observe waveforms, starting at the horizontal output tube and working back toward the tuner in an effort to localize the source of the jittering. Regardless of which test point

(see Fig. 2) I scoped there was a jumpy wave form. Even the composite signal at the video output tube showed signs of "noise" spikes. VTVM readings on the 6AL5 afc tube revealed some erratic voltages. From this point I went to the 6AU6 reactance tube and finally to the 12AU7 oscillator. Capacitors were clipped out and replaced; off-value resistors were substituted. Still the jittering persisted.

Back I went to the scope. I tried to determine which of the erratic wave shapes was the most erratic. With the scope probe attached to the first sync amplifier plate, I turned the set on and noticed the scope trace skittering rapidly up and down until the tubes warmed up. The trace then settled down. Turning the set off, placing the

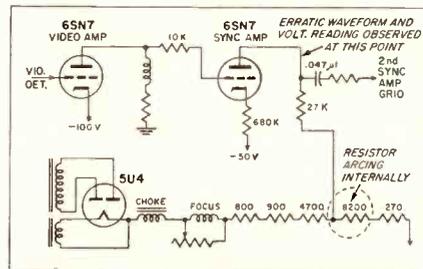


Fig. 2—Horizontal jitter was due to an arcing 8200 ohm voltage divider resistor.

VTVM probe at the same point, I found the voltage varied with the skittering effect until the set warmed up. Following this up further, I finally found the 8200 ohm B+ voltage divider resistor was arcing internally, accounting for the spurious pulses appearing throughout the entire video, sweep and sync systems.—*Frank A. Salerno, Long Island City 5, N. Y.*

TOUGH DOGS WANTED

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

MAKE COMPLETE TUBE TEST FASTER, MORE ACCURATELY



Model 650
DYNA-QUIK

Simply by checking all the tubes in the set, and testing each tube completely the Dynamic Mutual Conductance way, you can

**SELL MORE TUBES PER CALL
INCREASE YOUR INCOME*
SATISFY MORE CUSTOMERS
SAVE COSTLY CALL-BACKS
INSURE YOUR REPUTATION**

*Actual experience shows TV servicemen average 2 extra tube sales per call. 5 calls per day in 5 days means as much as \$50.00 more income per week.

Widely Used and Preferred by Thousands of Professional Servicemen Everywhere



Model 650 Dynamic Mutual Conductance PROFESSIONAL TUBE & TRANSISTOR TESTER

With multi-sockets and other B&K features, you can accurately quick-check most of the tubes widely used in television receivers, plus popular home and portable radio tubes. Includes spare sockets for new popular types. Tests each section of multiple tubes separately. Checks for Gm and all shorts. Makes highly sensitive grid emission and gas test. Checks for leakage and life. Shows true tube condition on "Good-Bad" scale and in micromhos. B&K patented bridge circuit. Also tests transistors.

Net, \$179⁹⁵

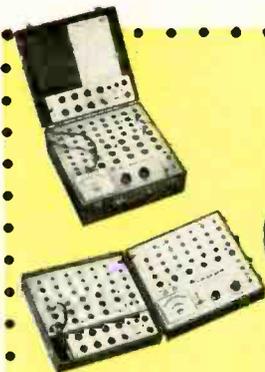
Model 550 Dynamic Mutual Conductance PROFESSIONAL TUBE TESTER

Real professional instrument for the limited budget. Provides 52 sockets to quick-check most of the TV and radio tubes usually encountered in everyday service work. Tests each section of dual-section tubes separately. Checks for Gm and all shorts. Makes highly sensitive grid emission, gas, and leakage test. Shows tube condition on "Good-Bad" scale and in micromhos. B&K patented bridge circuit.

Net, \$119⁹⁵



Model 550
DYNA-QUIK



NEW Model 610 ACCESSORY TEST PANEL

Increases Capacity of Model 500, 550, or 650 Dyna-Quik

TO TEST BOTH OLD AND NEW TUBE TYPES

including New TV Types, Thyratrons, Voltage Regulators, Auto Radio Hybrid Tubes, Battery Radio Tubes, European Hi-Fi Tubes, and most Industrial Types

Simply by adding Model 610 to the Dyna-Quik, you have all the advantages of fast multi-socket testing, plus freedom from obsolescence. Enables you to test all present plus future TV, radio, and other tube types. Measures genuine dynamic mutual conductance.

Net, \$49⁹⁵

Comes in 3 types:

Model 610-500 for use with Model 500 Tube Tester
Model 610-550 for use with Model 550 Tube Tester
Model 610-650 for use with Model 650 Tube Tester

Shows how easily the new "610" fits into Models 550 and 650

NEW TUBE INFORMATION SERVICE

Get test data on new tubes even before you encounter them in the field. Subscribe now to *New Tube Information Service* for owners of B&K tube testers. Issued every 3 months, at \$2.50 per year.



B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 1-43-1 on coupon, p. 50

SHOP HINTS



Heat-Sink Clip

Here is a very useful heat-sink idea made by using an alligator clip and two strips of copper. File a groove in the end of each jaw of the clip, and cut two pieces of heavy gauge copper, shaped as shown in Fig. 1. Insert the copper strips into the alligator clip and solder them in place.

When soldering in the copper strips, place the alligator clips in a vice, and hold the soldering iron on the back side of the jaw. Solder is then flowed into the jaw around the strip.

I have never had any trouble with diodes while using these heat sinks. The additional copper strips

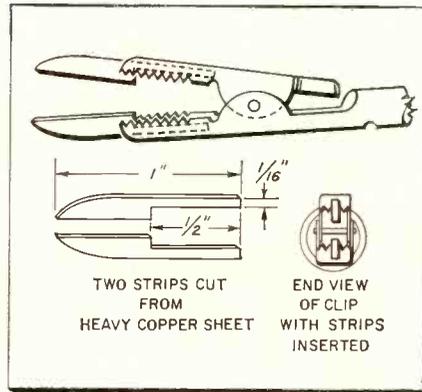


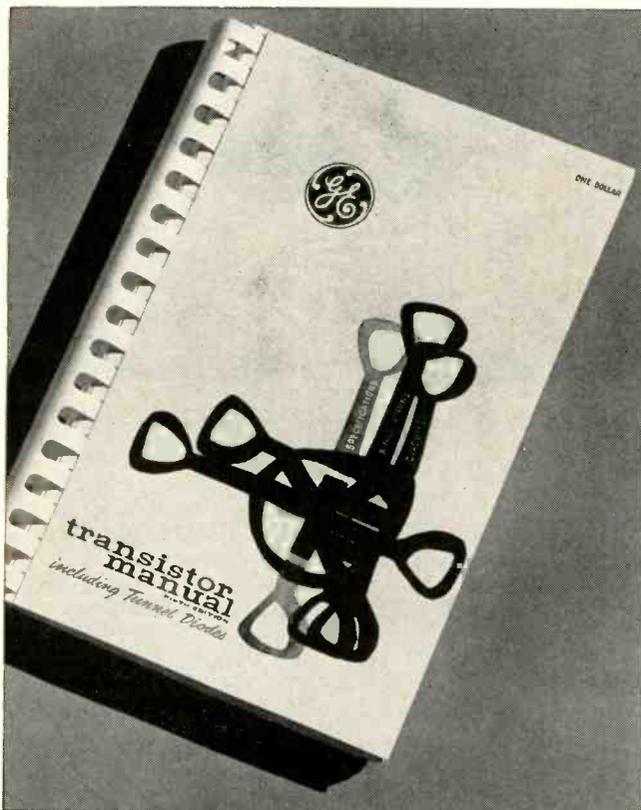
Fig 1—A heat sink with excellent dissipating capacity is made by filing grooves in alligator-clip jaw tips and soldering in two heavy copper strips, shaped as shown.

dissipate much more heat than a clip alone. I use them at my shop during chassis repair and keep a few in my tube caddy for use on home calls.—*Junior G. Gross, Colby, Kansas.*

Component Strain-Relief

Government and most commercial specifications require strain relief provisions on electronic components. A simple strain relief bend can be accomplished with a long nose plier. Bending the resistor, capacitor, or other component lead, as shown in Fig. 2A, allows for relief of stresses created by temperature changes, vibration,

(Continued on page 66)



LEARN TUNNEL DIODE THEORY:

General Electric Transistor Manual

New Fifth Edition of an Industry Classic

These days you hear a lot about the amazing tunnel diode—100 times faster than the fastest transistor. But do you know its basic theory of operation . . . how it performs a feat considered impossible in terms of classical physics?

You will after you've studied the new Fifth Edition of General Electric's famous Transistor Manual — one book that's indispensable for a working knowledge of the transistor field. New material in its 320 fact-filled pages includes tunnel diode switching circuits and amplifiers . . . hi-fi and radio circuits . . . feedback and servo amplifiers . . . silicon controlled rectifiers . . . and complete specs and JEDEC listings.

Get your copy today from your G-E Semiconductor Distributor or by mailing one dollar with the coupon below.

General Electric Company, Semiconductor Products Dept.,
Section 88A79, Electronics Park, Syracuse, N. Y.

Rush me the enlarged new 5th Edition of the General Electric Transistor Manual. I enclose \$1.00. (No stamps, please.)

Name _____

Address _____

City _____ Zone _____ State _____

GENERAL  ELECTRIC

TV Licensing

(Continued from page 33)

it seems to be working out good. It has stopped a lot of oil field workers from fooling in radio and television."

"The only bad thing about it was the Grandfather's Clause. It should improve in years to come when the border line boys drop out because of it."

"Improving distributor relations. Improving customer relations. BBB reports tremendous reduction of complaints."

MICHIGAN:

"The Detroit area has such, but many problems have presented themselves. One association has been working to get licensing through the State legislature but has thus far been unsuccessful."

"Has been beneficial, but is not a cure-all."

"People don't know enough to ask for a licensed technician. I'm throwing away \$25.00 a year for my dealer technician license."

"It is a shame what they can get away with. If the customer complains, oh, we are licensed and know what to do. It's just a shield for them."

"It has increased quality servicing, discouraged others not qualified. Reduced complaints to a minimum. Provides more servicing and profits for the shop owners."

"We have licensing now, but they are not pressing the situation. I do not see any difference in the situation with or without licenses."

MINNESOTA:

"Quite good. It does not eliminate all night or home operators, but at least part of them."

MISSOURI:

"We have a license law, again challenged by a bunch of opportunists and a very small minority that have either been frightened or actually threatened into opposing the bill. Jobbers are pushing the anti fight."

NEW YORK:

"Licensing has been in effect in Niagara Falls for one year. I believe it will aid the true electronic serviceman and the general public."

"It is working well in Long Beach, which is a nearby town, but if it is not enforced properly, it is worthless. Tests must be given."

OHIO:

"In our area, it is not working out to everyone's satisfaction."

"It is working out miserably."

OREGON:

"Some technicians like it, some don't. It hasn't added any money to their pockets. Patrons still buy wholesale. Licensing costs \$20 a year—for what?"

TEXAS:

"License costs \$5.00 in Texas, plus \$5.00 for \$500 Bond. After one year, it is working out well. It seems to me, it would be better to require an examination to obtain the license."

"Licensing in the state of Texas has not prevented anyone from working at TV repair. It merely is a racket to

bleed a little more tax from the people."

"The law passed here in Texas is the best for all technicians. Business is better for me, and almost everyone else that I talked to agrees with me."

"Texas license is only for purpose of tax collecting. Licensing will not make an honest technician out of a crook."

"Awful!"

VIRGINIA:

"Licensing is in effect. It would be good if properly enforced." •

Solve Rough Sweep Output Problems IN MINUTES INSTEAD OF HOURS!



NEW **B&K** DYNA-SWEEP CIRCUIT ANALYZER

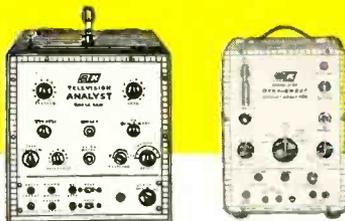
1. Provides composite synchronizing signals (negative or positive) to inject directly in each sync stage.
2. Provides plate drive signal to check complete vertical output circuit, including V.O. transformer.
3. Provides vertical yoke test signal to determine if vertical yoke windings are defective.
4. Provides horizontal plate driving signal to directly drive TV horizontal output transformer circuit.
5. Provides B+ boost indicator.
6. Provides unique high-voltage indicator.
7. Provides sensitive tests for each of the horizontal output components, including H.O. transformer and yoke. Immediately reveals their true condition, good or bad.

Quickly solves tough output servicing problems that have always plagued the TV serviceman. Provides horizontal and vertical sync and driving pulses that make it easy to check out every stage in the sync and sweep sections of a television receiver. Tracks down troubles in the horizontal and vertical output circuit, including defective output transformer and yoke. Checks for shorted turns, leakage, opens, short circuits, and continuity. Gives unique high-voltage indication. Eliminates trial and error replacements. Saves many hours of service work! Pays for itself over and over again.

Model 1070 Dyna-Sweep. Net, \$74⁹⁵

MODEL A107 DYNA-SWEEP CIRCUIT ANALYZER
for use with B&K Model 1075 Television Analyst

Functions like the Model 1070 above, but is designed as a companion unit for use only with B&K Model 1075 Television Analyst for driving source. Makes your Television Analyst more useful and valuable than ever. Net, \$54.95



See your B&K Distributor or Write for Bulletin AP17-T

B&K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont. • Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



For more data, circle 1-45-1 on coupon, p. 50

CUSTOMER SERVICE ENGINEERS



OUTSTANDING CAREER OPPORTUNITIES

Continued expansion of the PHILCO COMPUTER DIVISION has created a number of positions for persons with a minimum of 2 years of data processing equipment maintenance and/or installation experience.

Successful candidates will undergo advanced computer training in the PHILCO 2000 System at our Willow Grove, Pa. plant.

ASSIGNMENTS AVAILABLE IN MAJOR CITIES THROUGHOUT U.S.A.

Contact

Mr. John Felos

Professional Employment Manager

**COMPUTER DIVISION
WILLOW GROVE, PA.**

PHILCO
Famous for Quality the World Over®

For more data, circle 1-46-1 on coupon, p. 50

46

Citizens Band Radios

(Continued from page 39)

Antennas on small boats are usually mounted on the forecastle area, the bridge or side rail. They can also be mounted on masts providing they do not extend more than 20' above the mast top. Quarter-wave whip antennas are frequently mounted on the side rail forward, amidship or astern.

Interference Problems

Built-in noise limiters of CB receivers will not always eliminate ignition noise, generator whine, etc., caused by car, truck, boat, or tractor engines. Special precautions are frequently necessary to obtain satisfactory reception through this interference. Before it can be eliminated or reduced, however, its source must be identified.

Ignition noise persists only when the ignition switch is on. It will not be present when the ignition switch is off—even if the engine is still turning over. It may or may not vary with engine speed.

Generator noise will be present when the motor is turning over—even if the ignition switch is off. Removing the generator drive belt will kill it.

Wheel static will be present when the clutch is disengaged, with the ignition switch off, and the vehicle coasting. At speeds over about 15 mph on a smooth dry road it will have a steady popping sound.

Voltage regulator hash has a raspy, irregular noise.

There are no fixed formulas available for eliminating interference. Two or more types may also be encountered at the same time. General procedures are as follows:

For ignition noise:

1. Substitute resistor spark plugs for present plugs or install 10k ohm spark plug suppressors on plugs.
2. Check all high tension connections for arc gaps—especially the "pinch fit" terminal connectors commonly used.
3. Replace old high tension wiring if it appears to be leaky.
4. Reroute low tension wiring that may be cabled with or included in high tension wire conduit.

5. If necessary, a 10k ohm suppressor resistor should be inserted at the center tower, and a 5K ohm suppressor at each spark plug tower of the distributor.
6. In extreme cases install shielded ignition wire between coil and distributor, and distributor and each plug.

For generator noise:

1. 0.1 to 0.5 μ f coaxial type capacitors should be installed from the generator armature to the frame mount or the generator case. Make all connections as short as possible. A .001 μ f coaxial capacitor from armature directly to the case may help.
2. A parallel resonant circuit made with 8 to 11 turns of #10 enameled wire on a 1 inch diameter form, shunted with a 3-30 μ f compression type mica trimmer, may be inserted in series with capacitors employed in step 1. Connect at armature point. Trimmer is adjusted for minimum noise.
3. Check commutator for wear and replace brushes if interference persists.

For regulator hash:

1. Install a 0.1 to 0.25 μ f coaxial capacitor between battery terminal of the regulator and the battery as near the regulator as possible. Securely ground the capacitor case.
2. Connect an identical capacitor between the generator terminal of the regulator and the generator.
3. Connect a 0.002 μ f mica capacitor, with a 4 ohm carbon resistor in series, between the field terminal of the regulator and ground. Keep leads short.
4. If necessary shield the lead between the generator and regulator with double braid shielding.

For wheel static:

1. Install front wheel static collectors in the dust cap of the front axle. Use collectors specifically designed for the car, truck, etc. If not available, use the universal type.
2. Inject anti-static powder into the inner tubes of all tires—through the valve stem.
3. If necessary, install rear wheel static collectors. These may have

to be ordered from the factory through a local automobile dealer.

Interference from boat engines may present some special problems. Complete grounding with all metal parts bonded together is a good start. Especially if noise is originating from propeller shaft or stuffing box. Plastic shell motors may require shielding with bronze screening. Inboard motors may require complete bonding and shielding precautions. •

Illustration credit: Kaar Engineering Corp., Palo Alto, Calif., Raytheon Co., Waltham, Mass., International Crystal Mfg. Co., Inc., Oklahoma City, Okla., Allied Radio Corp., Chicago, Ill.

G-E CAPACITORS

Offered, in a complete line of "application rated" replacement electrolytic and paper-mylar capacitors, are 275 twist-prong and tubular types. It is reported the new line permits 50% inventory reductions. A new concept of replacement application provides one unit for a series of μf ratings and reportedly competes with other brands that require distributors to stock as many as 1217 different types to meet



all demands. Cited as two examples of unit interchangeability: the new XC1-2 single-section twist-prong capacitor, rated at 20 μf at a maximum of 500v, can replace 11 capacitors in a current brand in terms of size, rating and voltage range; the QT1-8 single-section tubular capacitor, with a rating of 16 μf at a maximum of 450v, can be used in any of six applications. General Electric Co., Distributor Sales Operation, Owensboro, Ky.

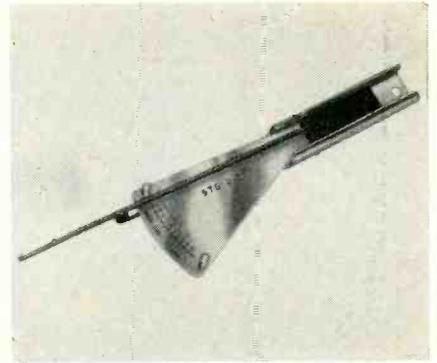
For more data, circle 1-47-3 on coupon, p. 50

For More Information On
NEW PRODUCTS
Circle Code Numbers, p. 50

Neuses GAUGE

The STG-2Z spring tension gauge, to check tensions of relay or other springs and to determine settings, has a range of 0 to 1200 grams in 100 gram steps. Previous models had a range up to 150 grams only. On the new unit the range is also shown in ounces and pounds avoirdupois from 0 to 2 3/4 lbs. Reported to be extremely accurate, with accuracy remaining constant. Easy to hold while making readings. Scale, calibrated on front and back. Satin chrome steel frame, 6 3/4" long. Overall length, 9 1/2". \$8.40. P. K. Neuses, Inc., 511 N. Dwyer St., Arlington Heights, Ill.

For more data, circle 1-47-2 on coupon, p. 50



Now Completely SELF-CONTAINED

For Testing & Rejuvenating
BLACK AND WHITE and COLOR including 110° TUBES

NEW CRT 440

CATHODE REJUVENATOR TESTER

TESTS AND REJUVENATES
all black & white and color picture tubes at correct filament voltage from 1 to 12 V.

TESTS AND REJUVENATES
110° tubes with 2.34, 2.68, 6.3 and 8.4 volt filaments.

TESTS AND REJUVENATES
color picture tubes. Checks each color gun separately same as black & white tubes.

*Used by Thousands of Professional Servicemen
MAKES NEW PICTURE TUBE SALES EASIER*

Gives you more value than ever—all-in-one. Quickly checks and corrects most TV picture tube troubles in a few minutes right in the home without removing tube from set. Gives new useful life to weak or inoperative tubes. Checks leakage. Restores emission and brightness. Repairs inter-element shorts and open circuits. Life test checks gas content and predicts remaining useful life of picture tube. Completely self-contained in leatherette-covered carrying case. Net, \$74.95

ACCESSORIES for USE ONLY with FORMER B&K Models 400 and 350 CRT

Model C40 Adapter. For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

Model CR48 Adapter. For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

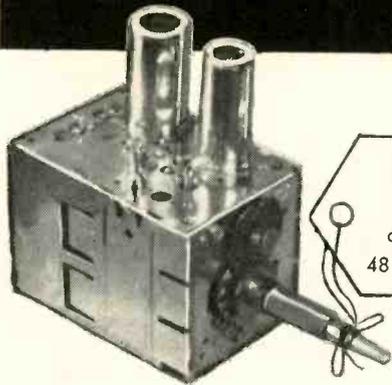
See your B&K Distributor
or Send now for Bulletin AP17-T

B & K MANUFACTURING CO.
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.
Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 1-47-1 on coupon, p. 50

Professional Technicians Use CASTLE'S

Complete TV TUNER OVERHAUL



**SAME DAY
SERVICE!**
on Popular Types
48 Hours most Others

Castle overhaul charge includes all labor and minor parts and written 90 day warranty. Tubes and major parts are extra at net prices. Tuner to be overhauled should be shipped complete; include tubes, shield cover and any damaged parts. Write down model number and state complaint. Pack well and insure.

Write for Special Quantity Rates and Discounts

CASTLE TV TUNER SERVICE, INC.

5710 N. Western Ave. • Chicago 45, Ill.

IN CANADA

136 Main Street • Toronto 13, Ontario

ALL MAKES
ONE PRICE
\$9⁹⁵

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 only sent in.

Overhauling TV tuners is our only business. We do not manufacture and sell you a so called "universal" replacement tuner. When the original equipment tuner is overhauled by Castle you are assured that it will fit properly and the electrical specifications, set by the receiver manufacturer, will be met exactly.

Castle



For more data, circle 1-48-1 on coupon, p. 50

ATTENTION: Dealers, Servicemen, Purchasing Agents!

IF YOU NEED
RADIO-TV
SPECIAL PURPOSE
OR TRANS-
MITTING TUBES

DISCOUNTS UP TO 80%
ON BRAND-NEW AND
GOVT. JAN TUBES

We carry all types of tubes, including Hard-To-Get and obsolete numbers. Write for a quotation!

Send for **BULLETIN "C"**

UNITED RADIO CO.

Box 1000-C, Newark, N. J.

If you have a stock of brand-new, Unused tubes, we will purchase them! We buy all types, Large or Small Quantities. No Seconds, Pulls or Used tubes, though! Highest Cash Prices Paid!

For more data, circle 1-48-2 on coupon, p. 50

Reps & Distributors

SOUTH RIVER reports the appointment of **DAVE MILLER SALES CO.** as reps for the Pacific Northwest.

UTAH RADIO announces the appointment of **CHARLES L. THOMPSON, LTD.** as rep in the Western Canada area.

FEDERATED ELECTRONICS has announced availability of its 1961 340-page catalog published by **ELECTRONIC PUBLISHING COMPANY, INC.**

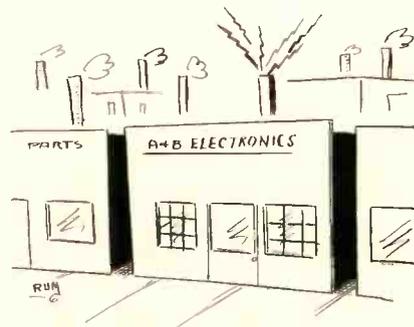
SYLVANIA Electronic Tubes announces its annual distributor sales meeting December 6-10 at the Americana Hotel, Bal Harbour, Fla. attended by about 150 sales, factory, and field reps from the U.S.

ERA announces the 2nd annual Electronic Representatives Assoc. Convention will be held in the Ambassador Hotel, Los Angeles, Calif., Feb. 1-4, 1961. ERA is offering members without charge \$2000 all-purpose accidental death insurance coverage.

PACIFIC ELECTRONIC TRADE SHOW has named **DON CASSIDY**, Pres. of **WESCO ELECTRONICS**, to head the Committee for Sponsorship of the 1961 event to be held in Los Angeles' Great Western Exhibit Center, February 26-March 1st 1961.

STANDARD RECTIFIER has announced the appointment of the following four distributors: **LAFAYETTE RADIO CORP.**, Boston; **ALMO RADIO CO.**, Philadelphia; **HOLLYWOOD RADIO & ELECTRONICS**, Hollywood; and **TERMINAL-HUDSON RADIO**, New York.

SLATE & CO. held its first annual "Audiorama" for servicemen and dealers in the company Showroom November 11th. Four of the distributor's manufacturers cooperated with the program by premiere showings of the Gonset business communicator, Toshiba's 1961 line of portable transistor radios; V-M's 1961 line of hi-fi systems and recorders; and Utah's new reverberation unit.





You can buy your second car with a Signet Sound catalog

Within one year you can earn enough spare-time profits to buy your wife that badly needed second car. All you need is a Signet Sound Catalog and a sharp eye.

Take a good look around your neighborhood. There are hundreds of profit opportunities right there—in meeting halls, churches, sports and social clubs, fraternities, taverns, restaurants . . . all ready to be sold on the convenience, effectiveness and comparatively low cost of good sound equipment.

Take along a Signet Sound Catalog and you will have all

you need to make a sale. Without major time involvement, risk or investment, you can offer a complete choice . . . size and price-wise . . . of pre-planned, easy-to-install Signet Sound Packages backed by the greatest name in sound—Stromberg-Carlson. In addition to a good profit on the equipment, you can earn a good service fee for installing it. For detailed information and your copy of the Signet Sound Catalog write:

Commercial Products Division
Dept. H, 1401 North Goodman Street
Rochester 3, New York

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

For more data, circle 1-49-1 on coupon, p. 50

FREE LITERATURE

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

Cut out and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

1 Test Equipment: A new colorful catalog, No. AP16, features a specialized line of money-making professional test equipment. Includes the new model 1076 TV Analyst. B&K Mfg. Co.

For more data, circle 1-50-1 on coupon

2 Chemicals, Tools, Etc.: A colorful 64-page catalog, FR-61-G, covers TV and radio chemicals, alignment tools, service aids and hardware. It lists thousands of products. GC Electronics Co.

For more data, circle 1-50-2 on coupon

3 Capacitors: A three-section 69-page catalog details the interchangeability features of a new "application rating" capacitor line. Also announced: a "surprise package" available to distributors. It contains varieties of fried grasshoppers, and other exotic foods with 10 of the most widely used capacitors. General Electric Co.

For more data, circle 1-50-3 on coupon

4 Home Study Course: Literature provides complete details and the sequence of study for a new home study course called "Principles of Semiconductor-Transistor Circuits." International Correspondence Schools.

For more data, circle 1-50-4 on coupon

5 Electronic Organs: A colorful 16-page booklet on organ kits describes two models and shows how to assemble them. Schober Organ Corp.

For more data, circle 1-59-2 on coupon

6 Repair Shafts: Catalog covers model A.G.C. repair shafts. Five-second repairs restore adjustability without replacing the coil. Superex Electronics Corp.

For more data, circle 1-50-6 on coupon

7 Antenna Systems: Technical literature, catalogs, and free layout service are available to

help in planning a master TV system. Blonder-Tongue Labs.

For more data, circle 1-15-1 on coupon

8 Stereo FM-AM Receiver: Complete specifications are available for model 800. The receiver is reported to offer unlimited flexibility for every application. Fisher Radio Corp.

For more data, circle 1-62-1 on coupon

9 Home Study Course: A catalog describes a new NRI home study course in electronic principles, practices and maintenance. National Radio Institute.

For more data, circle 1-63-1 on coupon

10 Intercommunications: Literature is available covering the new, complete Challenger series intercom line. The line now includes intermix units. Bogen-Presto.

For more data, circle 1-50-10 on coupon

CUT HERE

Use this coupon, or your letterhead, before February 20, 1961

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

Note: Code 1-3-1 means January issue, Page 3, 1st item on page.

1-3-1	1-23-1	1-47-2	1-53-1	1-58-3	1-62-1	1-67-3	1-72-1
1-4-1	1-24-1	1-47-3	1-54-1	1-58-4	1-62-2	1-67-4	1-72-2
1-7-1	1-26-1	1-48-1	1-55-1	1-58-5	1-63-1	1-67-5	1-72-3
1-8-1	1-41-1	1-48-2	1-56-1	1-58-6	1-63-2	1-68-1	1-72-4
1-9-1	1-41-2	1-49-1	1-56-2	1-58-7	1-64-1	1-69-1	1-72-5
1-11-1	1-41-3	1-50-1	1-56-3	1-58-8	1-64-2	1-69-2	1-72-6
1-12-1	1-41-4	1-50-2	1-56-4	1-58-9	1-64-3	1-69-3	1-C2-1
1-12-2	1-41-5	1-50-3	1-56-5	1-58-10	1-64-4	1-69-4	1-C3-1
1-13-1	1-41-6	1-50-4	1-56-6	1-59-1	1-64-5	1-70-1	
1-15-1	1-43-1	1-50-6	1-56-7	1-59-2	1-65-1	1-70-2	
1-19-1	1-45-1	1-50-10	1-57-1	1-60-1	1-66-1	1-70-3	
1-21-1	1-46-1	1-52-1	1-58-1	1-61-1	1-66-2	1-71-1	
1-22-1	1-47-1	1-52-2	1-58-2	1-61-2	1-67-1	1-71-2	

Name Position

Firm Address

City Zone State

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

1960 Electronic Statistics

TELEVISION

New sets	6,400,000
\$ volume at retail	\$1,300,000,000
Sets scrapped	3,300,000

TELEVISION SETS IN USE

U.S. homes* with b & w sets	45,600,000
Secondary sets in above homes	7,700,000
Sets in business places, institutions	2,900,000
Color sets (including above)	470,000
Total TV sets in U.S.	56,200,000

RADIO

New sets (including 1.4 million FM)	15,000,000
\$ volume at retail	\$ 510,000,000

RADIO SETS IN USE

U.S. homes* with sets	54,100,000
Secondary sets in above homes	59,800,000
Sets in business places, institutions	14,000,000
Automobile sets	44,100,000
Total radio sets in U.S. (including 16,600,000 FM)	172,000,000

*Includes all dwellings such as apartment hotels, etc.

ANNUAL RETAIL BILL FOR SERVICING

178,000,000 replacement receiving tubes	\$ 330,000,000
7,400,000 replacement picture tubes	\$ 280,000,000
Antennas, components, parts, instruments	\$ 930,000,000
Labor	\$1,400,000,000
Total servicing bill	\$2,940,000,000

INDUSTRIAL ELECTRONICS

Industrial electronics, factory sales	\$1,820,000,000
Industrial electronic & communications maintenance ..	\$ 620,000,000

TV-ELECTRONIC TECHNICIANS

Major service outlets	64,100
Parts jobber business accounted for	64%

TUBES MANUFACTURED

Picture Tubes	
Number made (including rebuilds)	13,200,000
% used for replacement	56%
Receiving Tubes	
Number made	415,000,000
% used for replacement	43%

(Continued on page 52)



Abraham Marcus, co-author of famous best-seller "Elements of Radio" makes amazing offer!

TRY MY TV and RADIO REPAIR COURSE FREE FOR 1 MONTH

"If you haven't earned at least \$100 in spare time during that period you pay not a cent."

Here it is! The most amazing guarantee offered on any radio-TV course anywhere! We'll send you Abraham Marcus' course to use FREE for one full month! If in that time you haven't actually made \$100 fixing radios and TV sets, just return the books to us and pay not a penny!

Why do we make this sensational offer? First, because these books are so easy to use. They are written in the same clear, easy-to-understand language that made the author's "Elements of Radio" a 1,000,000-copy best-seller. Second, because these books get right to the point—tell you what to do in 1-2-3 fashion. For example, once you master the first few chapters of the TV book you are ready for business—ready to do service jobs in the field—jobs that account for over 80% of all service calls.

DON'T WAIT! You risk nothing when you send the coupon at right. You don't have to keep the books and pay for them unless you actually make extra money fixing radios and TV sets. Even when you decide to keep them, you pay on easy terms. Mail the coupon now.

WHAT YOU GET IN THESE 3 GIANT VOLUMES

ELEMENTS OF TELEVISION SERVICING. Analyzes and illustrates more TV defects than any other book, and provides complete, step-by-step procedure for correcting each. You can actually SEE what to do by looking at the pictures. Reveals for the first time all details, theory and servicing procedures for the RCA 28-tube color television receiver, the CBS-Columbia Model 205 color set, and the Motorola 19-inch color-receiver.

RADIO PROJECTS. Build your own receivers! Gives you 10 easy-to-follow projects, including crystal detector receiver—diode detector receiver—regenerative receiver—audio-frequency amplifier—tuned-radio-frequency tuner—AC-DC superheterodyne receiver—etc.

RADIO SERVICING Theory and Practice. Here is everything you need to know about radio repair, replacement, and readjustment. Easy-to-understand, step-by-step self-training handbook shows you how to locate and remedy defects quickly. Covers TRF receiver; superheterodyne receivers; shortwave, portable, automobile receivers, etc. Explains how to use testing instruments such as meter, vacuum-tube voltmeters, tube checkers, etc., etc.



MAIL THIS COUPON

Prentice-Hall, Inc., Dept. 5214-A1
Englewood Cliffs, New Jersey

Please send me Abraham Marcus' TV & RADIO REPAIR COURSE (3 volumes) for 10 days FREE examination. Within 10 days I will either return it and owe nothing, or send my first payment of \$5.60 plus a few cents postage. Then after I have used the course for a FULL MONTH, if I am not satisfied I may return it and you will refund my first payment. Or I will keep the course and send you two more payments of \$5.60 a month for two months.

Name

Address

City Zone State

from **EICO**... a completely new

CITIZENS BAND TRANSCEIVER

that meets
FCC regulations*



Model 760: 117 VAC
Kit \$59.95 Wired \$89.95
Model 761: 117 VAC & 6 VDC Kit \$69.95
Model 762: 117 VAC & 12 VDC {Wired \$99.95
incl. mtg. bracket (Pat. Pend.)

*EICO premounts, prewires, pretunes, and seals the ENTIRE transmitter oscillator circuit to conform with FCC regulations (Section 19.71 subdivision d). EICO thus gives you the transceiver in kit form that you can build and put on the air without the supervision of a Commercial Radio-Telephone Licensee!

Highly sensitive, selective SUPERHET (not regenerative) receiver with 5½ dual function tubes and RF stage. Continuous tuning over all 23 bands. Exclusive Super-Hush® noise limiter. AVC-3" x 5" PM speaker. Detachable ceramic mike. 5-Watt crystal-controlled transmitter. Variable "pi" network matches most popular antennas. 12-position Posi-Lock® mounting bracket. 7 tubes and 1 crystal (extra xtals \$3.95 each). Covers up to 20 miles. License available to any citizen over 18—no exams or special skills required, application form supplied free. Antennas optional.

YOU PROFIT WITH EICO

Everything in top-quality
TEST EQUIPMENT for Shop
and Field—at savings of 50%.



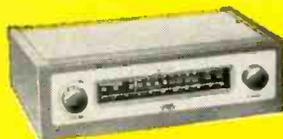
COLOR & Mono DC-5MC
Lab & TV 5" Oscilloscope #460
Kit \$79.95, Wired \$129.50
5" Push-Pull Oscilloscope #425
Kit \$44.95, Wired \$79.95



Peak-to-Peak VTVM #232 & *UNI-PROBE®
Kit \$29.95, Wired \$49.95
*U. S. Pat. No. 2,790,051
Vacuum Tube Voltmeter #221
Kit \$25.95, Wired \$39.95

More typical EICO values: Signal Generators from \$19.95, Tube Testers from \$34.95, Sweep Generators from \$34.95, Power Supplies from \$19.95, VOMs from \$12.90.

Everything in CUSTOM HI-FI:
finest quality at 1/3 the cost.



FM Tuner HFT90
Kit \$39.95, Wired \$65.95
Cover \$3.95. Includes FET.

AM Tuner HFT94
Kit \$39.95, Wired \$65.95
Includes Metal Cover and FET.

FM/AM Tuner HFT92
Kit \$59.95, Wired \$94.95
Includes Metal Cover and FET.



Stereo Dual Amplifier-Preamp HF81
Kit \$69.95, Wired \$109.95
Includes Metal Cover.

Stereo Dual Amplifier AF4
Kit \$38.95, Wired \$64.95
Includes Metal Cover.

Write for free catalog ET 1 and name of nearest distributor.
Most EICO distributors offer budget terms.



3300 N. Blvd., L.I.C. 1, N. Y.
Add 5% in the West

(Continued from page 51)

TRANSISTORS

Number made 134,000,000
% used for replacement 6%

TELEVISION STATISTICS 1946-1959

Year	Sets Manufactured	Total Sets in Use	TV Stations on Air
1946	10,000	8,000	5
1947	250,000	230,000	20
1948	1,000,000	1,000,000	44
1949	3,000,000	3,800,000	100
1950	7,500,000	10,500,000	107
1951	5,600,000	15,750,000	108
1952	6,300,000	21,800,000	123
1953	7,300,000	28,000,000	350
1954	7,300,000	33,000,000	440
1955	7,800,000	39,000,000	485
1956	7,300,000	43,900,000	512
1957	6,800,000	47,240,000	521
1958	5,100,000	50,300,000	546
1959	5,900,000	53,100,000	570
1960	6,400,000	56,200,000	588

AUDIO

Home Hi-Fi Service (75% of outlets)	\$ 140,000,000
PA Installation & Repair (37.1% of outlets)	\$ 63,000,000
Phonographs sold	4,600,000
Phonographs \$ volume at retail	\$ 480,000,000
Phonographs in U.S.	40,000,000
Tape recorders sold	520,000
Tape recorder \$ volume at retail	\$ 100,000,000
Hi-Fi audio \$ volume	\$ 260,000,000

ELECTRONIC TECHNICIAN statistics are an industry reference, used each year by such authoritative sources as the *World Almanac*.

TRU-VAC 1-YEAR GUARANTEED RADIO and TV 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!

65N7GT..... 30¢ 6W4GT..... 30¢

0Z4	5T8	6BR8	6SR7	12AX4GT
1A7GT	5U4	6BS8	6T4	12AX7
183GT	5U8	6BY5G	6T8	12AZ7
1H5GT	5V4G	6C6	6U5	12BD6
1R5	5V6GT	6BZ7	6U8	12BE6
155	5X8	6C4	6V6GT	12BA7
1T4	5Y3	6CA8	6W6GT	12BD6
1U4	6A4	6CB6	6X4	12BE6
1U5	6A4F	6CD6G	6X5GT	12BH7
1V2	6AH4GT	6CF6	6X8	12BQ6
1X2	6AH6	6C8	6Y6G	12BR7
2A4F	6AM5	6CH8	7A4/XL12	12BY7
2BN4	6AL5	6CL6	7A5	12CA5
2CY5	6AN8	6CM6	7B6	12DA4
3AL5	6AN8	6CM7	7B4	12F8
3BC5	6AQ5	6CN7	7B5	12H3
3BN6	6AQ6	6C8	7B6	12K7
3BZ6	6AQ7	6CR6	7B7	12L6
3CB6	6AR5	6CS7	7B8	12Q7
354	6AS5	6CU5	7C5	12R5
3V4	6AT6	6CU6	7C6	12SA7
4BQ7A	6AU4GT	6DE	7C7	12S7
4BS8	6AU5GT	6DE	7E5	12SK7
4BZ7	6A8	6DG6GT	7E6	12SN7GT
4CB6	6AV5GT	6DQ6	7E7	12SQ7
5AM8	6AV6	6F6	7F7	12W6GT
5AN8	6AW8	6H6	7F8	12W6GT
5AT8	6AX5GT	6J5	7G7	12X4
5AV8	6B8	6J6	7H7	12Y4GT
5AZ4	6BC5	6J7	7Q7	19B6GT
5CG8	6BC8	6K7	7S7	19T8
5R4	6BD6	6N7	7X6	25Z6GT
	6BE6	6Q7	7X7	
	6BF5	6S4	7Y4	35B5
	6BG6G	6S6GT	7Z4	35C5
	6BH6	6SD7GT	12A8	35W4
	6BJ6	6SF5	12A85	35Z5
	6BK5	6SG7	12AQ5	50A5
	6BL7	6SH7	12AT5	50B5
	6BL7GT	6SJ7	12AT7	50C5
	6BN6	6SK7	12AU6	50L5
	6C07	6SL7	12AV6	11T23
	6C6GT	6SQ7	12AV7	

\$33 Per 100 TUBES

SPECIAL!
TO READERS OF
TECHNICIAN ONLY!
1c SALE ON
TRU-VAC

1 YR. GUAR. TUBES IN BE-
LOW LIST ONLY
* 2 TUBES FOR PRICE OF 1
PLUS 1c
* 35c EACH 33c EACH
PER 100 TUBES
Buy all you want for 35c each
get extra tubes for 1c each.
Buy 100 tubes for \$33; get 100
extra tubes for \$1.

Pick Any Type
Size If You Want!

6AC7	6SA7
6AG5	7A7
6AU6	7C4
6AX4GT	7N7
6BA5	12AU7
6C07	12BF6
6K6GT	12CN5

TRU-VAC pays your postage — on orders of \$5 or more in U.S.A. & territories. Send approximate postage on Canadian and foreign orders. Orders less than \$5 require 25¢ handling charge. Send 25¢ on C.O.D.'s.

TRU-VAC Dept. No. 11

Harrison Avenue • Box 107 • Harrison, N. J. Humboldt 4-9770

TUBES

ARRIVE



SAME DAY! DAY!



Shipping parts or entire sound units? Remember, speedy shipment of delicate goods is a specialty of Greyhound Package Express. Shipments going hundreds of miles can arrive *the same day they're sent!*

Whatever the destination of your shipment, chances are, a Greyhound is going there anyway...*right to the center of town.* Greyhound travels *over a million miles a day!* No other public transportation goes to so many places—so often.

You can ship anytime. Your packages go on regular Greyhound passenger buses. Greyhound Package Express operates twenty-four hours a day...seven days a week...*including weekends and holidays.* What's more, you can send C.O.D., Collect, Prepaid...or open a charge account.

**CALL YOUR LOCAL GREYHOUND
BUS TERMINAL TODAY...OR MAIL
THIS CONVENIENT COUPON TO:**

GREYHOUND PACKAGE EXPRESS

Dept. A-17, 140 S. Dearborn St., Chicago 3, Illinois

Gentlemen: Please send us complete information on Greyhound Package Express service...including rates and routes. We understand that our company assumes no cost or obligation.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

IT'S THERE IN HOURS...AND COSTS YOU LESS!

For more data, circle 1-53-1 on coupon, p. 50

(Continued from page 12)

Japanese Parts

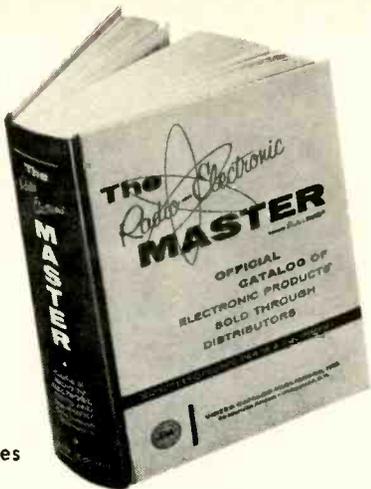
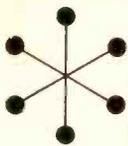
Editor, ELECTRONIC TECHNICIAN:

I have read with interest Mr. O'Neills' views (Oct. letters) on my letter to you referring to Japanese parts and equipment. It is obvious from reading his remarks that the full meaning and thoughts of my statement were not properly taken up. I do not, or have I ever condemned the purchasing of foreign parts, equipment, or tubes by the layman who knows no better and thinks that they are saving a buck. We can charge that up to ignorance. What I do condemn is the ethics involved in putting into peoples' equipment, inferior parts and tubes WHICH WE KNOW TO BE INFERIOR at standard American prices without notifying the consumer that this type of merchandise is being used. When we consider that the amount saved on each job can be measured in pennies, it strikes me as extremely petty. Though I myself have never knowingly bought or used Japanese or any other foreign make goods, equipment, etc., I do not condemn people that prefer it. I also condemn the use and purchase of the above mentioned items if no tariffs have been paid on it, which permits these cheaper and inferior goods to compete unfairly for American purchase power. As I have stated before, these inequities are the result of a series of stupid agreements with the Japanese government which permits them to send almost anything here tariff free.

L. CYBULSKA

Lincoln Radio
Brooklyn, N. Y.

Correspondence from readers is always welcome. Name and address, which must accompany letters selected by the editor for publication, will be withheld on request. Anonymous letters go right into the wastepaper basket.



1600 pages



- ✦ IT'S NEW. Covers all the latest products for servicing radio-TV-hi-fi and industrial equipment: • miniature and sub-miniature components • printed circuit components • silicon rectifiers • stereo equipment • automatic test equipment • citizens band, SSB and mobile ham gear, etc.
- ✦ IT'S THE WORLD'S BIGGEST ELECTRONIC CATALOG. 1600 pages—more than 175,000 items—with specifications, illustrations and prices. Contains hundreds of items not found in smaller catalogs.
- ✦ IT'S THE EASIEST TO USE. Quickest way to get current catalog data on the products of more than 330 manufacturers. Systematically organized in 32 product sections for rapid reference.
- ✦ SAVES TIME AND MONEY FOR SERVICE TECHNICIANS. Whether you're servicing radio, TV, audio or industrial electronic equipment, you find the right part to do the job best in The MASTER. The reason: you're shopping in the electronic supermarket. The MASTER is easy to sell from because it contains list prices. It's easy to buy from because your distributor has it and all you need do is select the item you want and order by part number. No matter what product or component you require, you'll find it faster in the 1961 MASTER.

AND IT'S NOW AVAILABLE AT
YOUR LOCAL DISTRIBUTOR

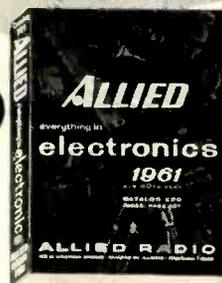
1961 MASTER

\$3.95 at parts distributors
\$4.95 in Canada

FREE from your distributor: New Foreign Tube Interchangeability Guide, or write direct, enclosing 25c.

RADIO-ELECTRONIC MASTER — 60A MADISON AVE., HEMPSTEAD, N. Y.

free



send for
the big
444-page

ALLIED 1961 ELECTRONICS CATALOG

PACKED WITH VALUE—everything in electronics at money-saving prices for Service Technicians and Engineers:

- Largest selection of Electronic Parts, Tubes, Transistors • Test Instruments, Meters • TV Tubes, Antennas, Accessories • Knight-Kits® — Best in Build-Your-Own • Everything in Stereo Hi-Fi Music Systems & Components • P. A. Systems • Tools • Service Books • Everything for Service Work.

ONLY \$2 DOWN
on orders
up to \$50

Save most at ALLIED.
Write for FREE 1961
Catalog today!

ALLIED RADIO free

ALLIED RADIO, Dept. 25-AL
100 N. Western Ave., Chicago 80, Ill.

Send FREE 1961 ALLIED Catalog.

Name _____

Address _____

City _____ Zone _____ State _____

For more data, circle 1-54-1 on coupon, p. 50

ELECTRONIC TECHNICIAN • January, 1961

READY TO SERVE YOU!

OVER
1500

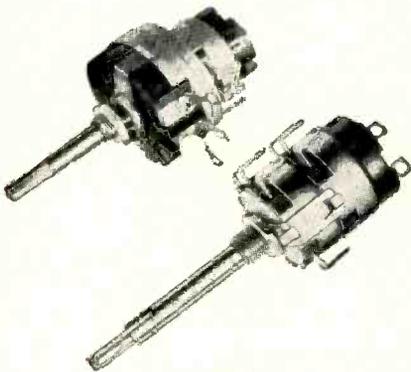
CLAROSTAT
DISTRIBUTORS

with

CLAROSTAT
"Right Replacements"

RTV CONTROLS

Completely factory-made and assembled — ready for use right from the carton — eliminates all fuss, bother and cussing because they fit right and work right just as you get them.



GREENOHM RESISTORS

King of them all — for price and dependability. Available in all popular values. Ideal for replacement purposes especially where overloading burns out less rugged resistors.



PICK-A-SHAFT CONTROLS

Pick the one you need — wire-wound or carbon — from the many popular values available. Then choose your shaft — snap it in. Need a switch? Ad-a-Switch attaches to control in seconds — no sweat, no bother...



WRITE FOR COMPLETE CATALOG, OR ASK YOUR DISTRIBUTOR

CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE

In Canada: CANADIAN MARCONI CO., LTD., Toronto 17, Ont.

For more data, circle 1-55-1 on coupon, p. 50

Catalogs & Bulletins

RESISTORS: Catalog covers new Coldite 70+ Series of cold molded carbon resistors. G-C Electronics Co., 400 S. Wyman St., Rockford, Ill.

For more data, circle 1-56-2 on coupon, p. 50

TUBES, COMPONENTS, INSTRUMENTS: Catalog No. 161, 92 pages, covers firm's complete line. Well illustrated. Includes prices. Zalytron Tube Corp., 220 W. 42nd St., New York 36, N. Y.

For more data, circle 1-56-3 on coupon, p. 50

CAPACITORS: Literature covers Type BMT miniaturized tubular electrolytic capacitors. Size ranges for all transistor applications. Illinois Condenser Co., 1616 N. Throop St., Chicago 22, Ill.

For more data, circle 1-56-4 on coupon, p. 50

TOOL CARRYING CASE: Bulletin 1060 introduces new executive type, 40-tool capacity, carrying case. Made of genuine top-grain leather with full-perimeter zipper. Xcelite, Inc., Thorne Ave. & Bank St., Orchard Park, N. Y.

For more data, circle 1-56-5 on coupon, p. 50

PACKAGED CIRCUITS: Literature covers five new replacement PEC's: PC-405, a compentrol network; PC-406, an audio network; PC-407 and PC-408, integrator networks; and PC-409, phase detector network. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 1-56-6 on coupon, p. 50

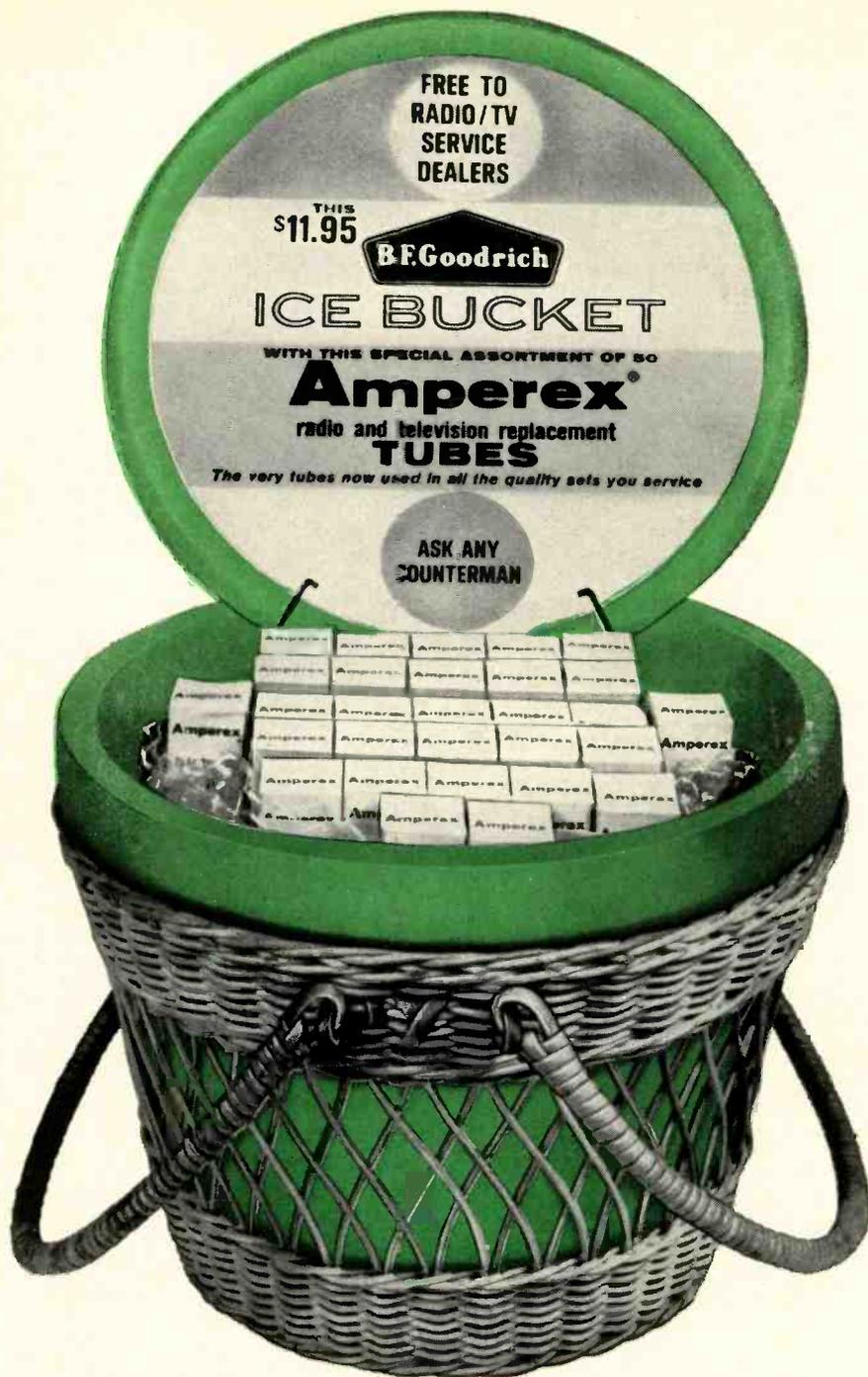
FLUORESCENT LIGHTING: Catalog sheet describes four new Magniflex swing-arm lamps, featuring 5" crown glass optically ground magnifying lens. Acme Lite Products Co., Congers, N. Y.

For more data, circle 1-56-7 on coupon, p. 50

TUBES: A 6-month inventory guide for over 800 tube types provides a monthly inventory record. Price, \$0.35. From distributors, or order direct from Westinghouse Electronic Tube Div., Elmira, N. Y.

PHOTOSENSITIVE DEVICES: 36-page brochure, CRPD-105B, "Photosensitive Devices and Cathode-Ray Tubes," contains technical information on phototubes, photocells, image-converter tubes, camera tubes, storage tubes, cathode-ray tubes, and special-purpose kinescopes. Price, \$0.50. Send your order direct to RCA Electron Tube Div., Harrison, N. J.

MASTER TV SYSTEMS: "Designing and Installing Master TV Systems," is a well-illustrated manual of 24 pages and 11 chapters. Some subjects are: Types of Master TV Systems; Antenna Installations for all TV Systems; The "Head-End" of Master TV Systems, etc. Price, \$0.75. Order direct from Blonder-Tongue Labs., 9 Alling St., Newark 2, N. J.



The very tubes now used in all the quality sets you service, *plus* . . . the famous B. F. Goodrich NICER BUCKET . . . *both* yours for the price of the tubes alone! The 'Nicer Bucket', made of miracle PVC won't rust, scratch or break. From the night before to the morning after, it keeps hot food hot or cold beer cold. Smart, simple design . . . no fragile liner to break . . . in fact for food - hot or cold . . . for ice . . . there's no other bucket like it at any price! Pick up this 2-for-1 offer today. You'll service your customers with the best, pocket the profits, take home the bucket! Act today, supplies are limited.



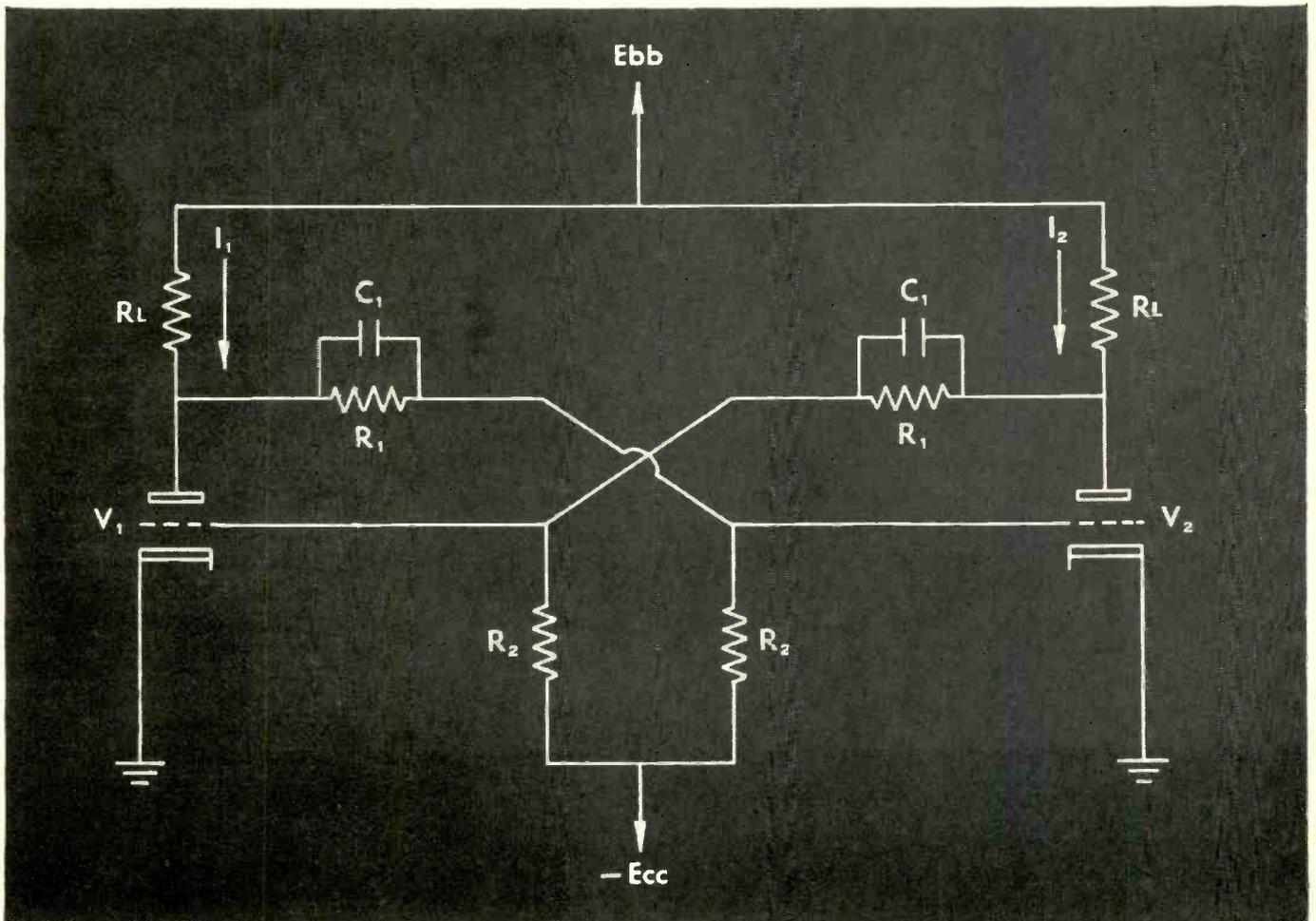
GET YOUR FREE GOODRICH 'Nicer Bucket' from any Amperex replacement tube distributor. Ask Amperex for the name of the franchised distributor in your neighborhood.

AMPEREX ELECTRONIC CORPORATION
230 Duffy Avenue, Hicksville, Long Island, New York

For more data, circle 1-56-1 on coupon, p. 50

Latest Issue of TUNG-SOL TIPS

tells you what you should know about
MULTIVIBRATOR CIRCUITS



HERE is a typical multivibrator circuit. It's just one of several which perform many basic functions in computers and electronic counters and which find wide use as waveform generators. For the serviceman planning to expand his business to industrial equipment servicing, a thorough knowledge of these devices is a "must".

To give you this fundamental grounding in multivibrators, Tung-Sol has devoted the latest issue of its monthly series, *Tung-Sol Tips*, to a vigorous, down-to-earth treatment of these important circuits.

In issue #13, you'll find a compre-

hensive, fast-reading analysis of all the multivibrator circuits which you can expect to find in your industrial work. These include: the bistable multi, the cathode coupled binary, monostable, astable and high speed multivibrators.

The operation and application of each is carefully defined. Many circuit diagrams are included to round out your understanding.

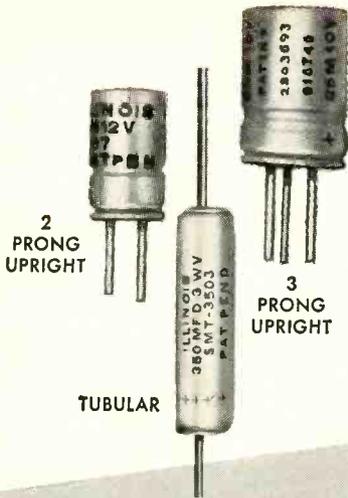
There's more! The author has also included a special section that gives you maintenance and servicing clues that you can put to practical use immediately. Or write directly Tung-Sol Electric Inc., Newark 4, New Jersey.

For more data, circle 1-57-1 on coupon, p. 50

Don't miss out on this really important issue of Tung-Sol Tips. It's yours merely for the asking. Just drop into your Tung-Sol distributor. Or write directly to Tung-Sol.

 **TUNG-SOL®**

SALES OFFICES: ATLANTA, GA.; COLUMBUS, OHIO; CULVER CITY, CALIF.; DALLAS, TEXAS; DENVER, COLO.; DETROIT, MICH.; IRVINGTON, N. J.; MELROSE PARK, ILL.; NEWARK, N. J.; PHILADELPHIA, PA.; SEATTLE, WASH. CANADA: TORONTO, ONT.



NOW!
In stock at your distributor

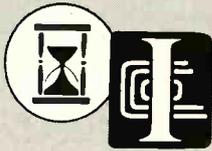
SMT

SUB-MINIATURES

For all transistorized electronics

Unsurpassed where size is essential in countless replacement applications. Available in full range of capacities and voltages . . . SMT, SMTU (up-right), upright common positive, upright common negative and non-polarized.

Order from your distributor now. Our new SMT catalog is available upon request.



ILLINOIS

CONDENSER COMPANY
1616 North Throop
Chicago 22, Illinois
Phone EV 4-1300

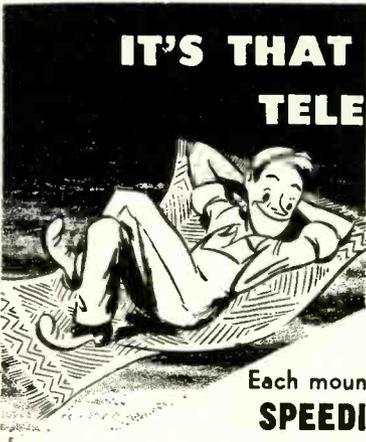
For more data, circle 1-58-1 on coupon, p. 50

IT'S THAT EASY TO INSTALL TELEVISION ANTENNAS

with

South River

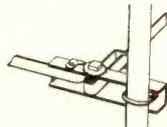
ANTENNA MOUNTS



Each mounting is designed to make the Installer's job **SPEEDIER, SAFER, MORE CONVENIENT**

take for example

FASTEST, SIMPLEST, MOST CONVENIENT EVER MANUFACTURED — Mounts in 2 simple steps. Completely factory assembled with no eye-bolts, banding clips, nuts, etc., to handle. Furnished with flat-lay, non-colling banding, heavy gauge embossed, welded steel construction. Forged, heat treated Alum. ratchets.



TWO TO A SET

RATCHET TYPE CHIMNEY MOUNT

Model RT (Galv. Banding)
Model RT-ST (Stainless Banding)

the wise Installer insists upon **ANTENNA MOUNTS**

Made by

South River

METAL PRODUCTS CO., INC., South River, N. J.

Pioneer and Outstanding Producer of the Finest Antenna Mountings

EXPORT: JOSEPH PLASENCIA, INC., N. Y. 13, N. Y.

For more data, circle 1-58-2 on coupon, p. 50

CAPACITORS: Bulletin describes Series 9FM film tubular capacitors, with Mylar dielectric and plastic cases. John E. Fast & Co., 3598 N. Elston Ave., Chicago 18, Ill.

For more data, circle 1-58-3 on coupon, p. 50

CONTROLS: Four new exact replacements for Bendix and Motorola auto radio controls are described in literature. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 1-58-4 on coupon, p. 50

SPEAKERS: A new, 2-color, 8-page, catalog covers the firm's line of speakers. Includes illustrations and specifications. Oxford Components, 556 W. Monroe St., Chicago 6, Ill.

For more data, circle 1-58-5 on coupon, p. 50

CARTRIDGES: An 8-page phonograph reference chart and service guide lists the firm's line of stereo and mono ceramic cartridges and includes a new crystal stereo cartridge. Sonotone Corp., Elmsford, N. Y.

For more data, circle 1-58-6 on coupon, p. 50

TUBES: Condensed catalog covers full line of tubes including: cold cathode trigger; entertainment and audio; indicator; power, ignitrons, klystrons, magnetrons, etc. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L. I., N. Y.

For more data, circle 1-58-7 on coupon, p. 50

REFERENCE VOLUME: 1961 edition of The Radio-Electronic Master lists more than 175,000 items with specs and prices. Over 12,000 illustrations. 1,600 pages. Products of more than 330 manufacturers organized into 32 product sections. United Catalog Publishers, Inc., 60 Madison Ave., Hempstead, N. Y.

For more data, circle 1-58-8 on coupon, p. 50

TAPE RECORDING HEADS: Newly-revised version of the firm's 16-page "Tape Recording Head Reference Guide," is announced. Features cross-reference data, specifications and illustrations. Robins Industries Corp., 36-27 Prince St., Flushing 54, N. Y.

For more data, circle 1-58-9 on coupon, p. 50

LOUDSPEAKERS: A new 24-page high-fidelity stereo loudspeaker catalog, No 165-F, contains a guide for planning stereophonic and monophonic high-fidelity systems as well as converting existing mono systems to stereo. Also complete descriptions, specifications and illustrations of the firm's line. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.

For more data, circle 1-58-10 on coupon, p. 50

HIGH FIDELITY: "Guide to Hi-Fi" is a 36-page booklet explaining the fundamentals of monophonic and stereophonic high-fidelity. Some subjects are: Factors Comprising High-Fidelity; Component Parts of High-Fidelity Systems; The Meaning of Stereo; How to Convert a Mono System to a Stereo System. Price, \$0.25. Order direct from Eico Electronic Instrument Co., 33-00 Northern Blvd., Long Island City, N. Y.

how often
could you
have used...

an Xcelite "Seizer"?

Handy as an extra
hand or helper.
Clamps lightly
or tightly . . . for
moments or minutes.

two-position
snap-lock

slim, serrated jaws

Outreaches, out-holds needle-nose pliers. Hardly a spot too small for it. Approx. 6" long. Dozens of uses: Holds and positions wires for soldering . . . retrieves small parts from inaccessible places . . . it's a heat sink. Two-position snap-lock won't slip, yet releases with a twist of the fingers. All stainless steel—precision machined and tempered for smooth action and years of service.

2 Models: No. 43H curved nose and No. 42H straight — Ask your distributor to show you Xcelite Seizers today.

XCELITE

XCELITE, INC. • ORCHARD PARK, N. Y.
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

For more data, circle 1-59-1 on coupon, p. 50
ELECTRONIC TECHNICIAN • January, 1961

Audio NEWS LETTER

TELEX issues literature sheet describing the Dyna-Twin headset.

M. A. MILLER MFG. acquires the synthetic sapphire phono needle business of Linde Co.

SARGENT-RAYMENT introduces Model SR-1040 FM tuner/stereo amplifier, output per channel 10 watts.

HARTLEY PRODUCTS announces its 220 MS speaker featuring "Magnetic Suspension", response down to 16 cps. Price \$135.00.

ALLIED announces the Knight Super-Power 70-watt stereo hi-fi amplifier kit featuring frequency response ± 1 db from 20-35,000 cps at 35 watts/channel, harmonic distortion under 0.5%, @ \$119.95.

BOGEN-PRESTO introduces SoundSpan RP 40, 40 watt FM/AM mono/stereo sound center, able to choose any two sound sources, play each separately at the same time, and distribute each of them to speakers in one or more rooms. \$329.50.

HEATH announces addition of five authorized service centers to handle local repairs: Applewood Electronics, Denver; Radio Electronics, San Francisco; Scherrer Instruments, St. Louis; Sound Service Co., Los Angeles; A & R Service Co., Seattle.

QUAM NICHOLS announces a new Inventory Guarantee Plan for distributors to protect against excess inventory of any slow-moving merchandise which may be returned if currently catalogued by Quam. Credit is given, and usual 10% handling charge is waived.



The Beautiful Schober CONSOLETTE

—only small organ with two full 64-note keyboards and 22 stops. Requires only 2'x3'2" floor space! Commercial value approximately \$1600 or more.

BUILD THIS SUPERB Schober ORGAN FROM SIMPLE KITS and save over 50%

Give Your Family A Lifetime of Musical Joy With A Magnificent Schober Electronic Organ!

Now you can build the brilliant, full-range Schober CONSOLETTE or the larger CONCERT MODEL with simple hand tools! No skills are needed; no wood-working necessary. Just assemble clearly marked electronic parts guided by step-by-step instructions. You build from kits, as fast or as slowly as you please . . . at home, in your spare time — with a small table serving as your entire work shop.

Pay As You Build!

Start building your organ at once, investing just \$18.94! The superb instrument you assemble is as fine, and technically perfect, as a commercial organ . . . yet you save over 50% on quality electronic parts, high-priced labor, usual store mark-up!

Free Booklet

Send for 16-page booklet in full color describing Schober organs you may build for home, church or school — plus articles on how easy it is to build your own organ and how pleasant it is to learn to play. Also available is 10" LP demonstration record (price \$2.00 — refundable on first order). Send for literature. No obligation and no salesman will call.

THE GREAT
CONCERT
MODEL
meets
specifications of
American
Guild of
Organists

Mail This Coupon For FREE Schober Literature And Hi-Fi Demonstration Record TODAY!

The Schober Organ Corp., Dept. TE-3
43 West 61st St., New York 23, N. Y.

Please send me FREE Color Booklet and other literature on the Schober organs.

Please send me the 10" hi-fi Schober demonstration record. I enclose \$2.00 (refundable on receipt of my first kit order).

Name.....

Address.....

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

For more data, circle 1-59-2 on coupon, p. 50

"Magic Eyes"

(Continued from page 31)

times available as a result of using a high impedance head.

If sufficient a-c voltage is lacking, the neon lamp can be "biased" by d-c obtained from the power supply, as shown in Fig. 6. The audio signal's positive voltage is then merely required to supply only the difference between firing and d-c bias voltage. R-2 and R-3 is a voltage

divider supplying the correct d-c lamp bias.

When a neon indicator circuit employs two lamps, a "normal" lamp is used to indicate whether the recording level is high enough to produce a good s/n ratio. Circuit values are adjusted to cause the "normal" lamp to fire at an audio level about 6 db lower than that required to fire the "distort" lamp. A voltage divider is employed to reduce the audio voltage reaching the "distort" lamp, and a d-c bias voltage is not used. Instead, the lamps

are maintained near the firing point by feeding high-frequency bias current, and audio signal to the lamps. It may be interesting to note that the extinction voltage of a neon lamp is appreciably less than the firing voltage—providing built-in floating action.

Load Distortion

To prevent serious audio signal loading and consequent distortion, the record level indicator circuit impedance should be at least 10 times higher than the audio circuit impedance. When indicator circuit changes are made, care should be taken not to disrupt circuit impedance.

In the circuit illustrated in Fig. 4, a positive-going magic-eye tube grid voltage causes electron flow from cathode to grid, because the cathode is at ground and therefore negative bias does not exist on the grid. In effect this current flow means that the magic-eye tube has low impedance during positive signal swing. When the signal is nega-

Transistor Radio Servicing CAN be Highly Profitable



The ONLY Complete Transistor Radio Service Lab Everything you need for less than \$50

Check Transistors, Diodes, Rectifiers . . .



SCENCORE TRC4 TRANSISTOR CHECKER

Accurately checks all transistors in hearing aids, radios and power transistors in auto radios. Tests for opens, shorts, leakage, current gain. Measures forward-reverse current ratio on all crystal diodes. Measures forward and reverse currents on selenium rectifiers. With set-up chart for accurate checking of each transistor. Size, 5x4½x2½". With batteries. DEALER NET..... 1995

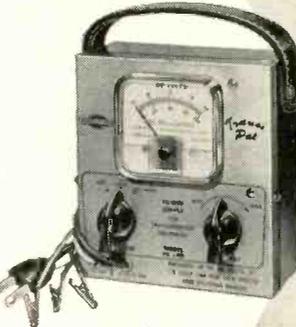


Replace Batteries During Repair . . .



SCENCORE PS103 BATTERY ELIMINATOR

All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a "must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust IF slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4½x2½". 1995 DEALER NET.....



Find Defective Stage in a Minute . . .



SCENCORE HG104 HARMONIC GENERATOR

New signal generator designed primarily for fast signal-tracing of transistor radio circuits. No need to unsolder all transistors. Provides RF, IF and audio signals *simultaneously*, drastically cutting service time. Traces from speaker to antenna. Clear 1000 cycle note signal is heard in speaker from all good stages. Signal weakens or stops at defective stage. Equally as effective for testing TV, hi-fi and other audio circuits also. Size, 3½x4½x1¾". 995 With batteries. DEALER NET.....



Turn page for other

SCENCORE
Time Savers

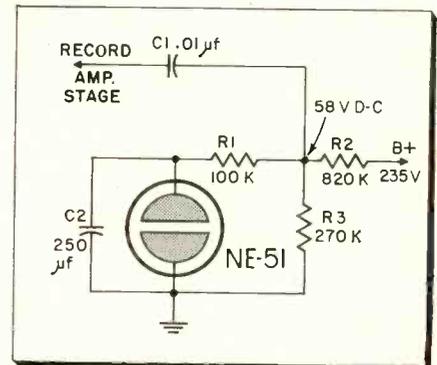


Fig. 6—Neon lamp circuit employed as record level indicator in a tape recorder.

tive-going, however, effective resistance between cathode and grid is infinite because no current flows. Thus the magic-eye tube's load impedance varies with positive and negative audio signal swing. This condition would cause serious distortion except for the intervening impedance of R-1 (Fig. 5). This resistor prevents the tube's varying impedance from disrupting total load impedance.

A similar problem occurs in the case of the neon lamp. When the lamp fires, its effective resistance is about 100,000 ohms. When extinguished its effective resistance is infinity. R-1 (Fig. 6) prevents audio circuit loading.

ALL PARTS

SCENCORE

MADE IN AMERICA

SCENCORE

ADDISON 2, ILLINOIS

For more data, circle 1-60-1 on coupon, p. 50

Indicator circuits usually include a filter to prevent a-c bias current (for the record and erase heads) from reaching the indicator and producing a false reading. The filter consists of C-2, R-1, and R-2 (Fig. 5), and C-2 and R-1 (Fig. 6).

Advantages & Disadvantages

Compared with meters, the electronic indicator has the advantage of much lower cost. And the neon lamp is even less expensive. Functionally, electronic indicators have an advantage in reading true peak signal levels. Because of mechanical reasons a meter cannot respond fully to the sudden, large transients that occur in music and speech. A minor advantage is less space requirements.

Electronic indicator characteristics are generally less uniform and stable compared to meters—particularly a VU meter which is designed for audio purposes. Varying tolerances in magic-eye tubes and neon lamps can cause significantly different recording level indications. For example, one NE-51 may fire at 65 volts a-c, and another at only 45 volts. When a magic-eye tube or neon lamp is replaced, maximum permissible recording level may change several db, resulting in greater distortion or a lower signal-to-noise ratio.

The experienced recordist knows that different kinds of music or speech, depending upon complexity, frequency content, transients, etc., must be recorded at relatively different levels to avoid undue distortion. A meter provides db readings and permits closer adjustment of recording level. The magic-eye tube allows only a rough adjustment, and the neon lamp is even more limited.

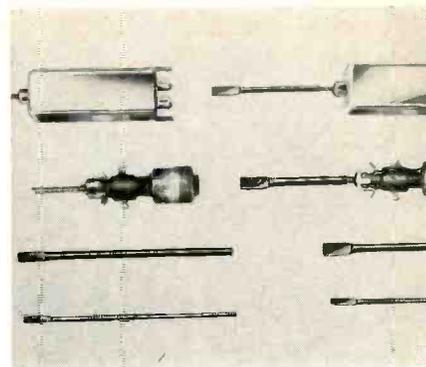
Another disadvantage of electronic indicators is their greater driving voltage requirements. Whereas 1.23 volts can drive a VU meter to "O" VU, between -6 and -8 volts are needed to completely close the eye of a 6E5, for example. A neon lamp requires at least 65 volts d-c to ignite—averaging about 80 volts d-c.

Illustration credits: H. H. Scott, Inc., Maynard, Mass., Sylvania Electric Products, Inc., New York, N. Y., Amperex Electronic Corp., Hicksville, L. I., N. Y.

Superex REPAIR SHAFTS

With the new model A.G.C. repair shafts, 5 second repairs restore adjustability without replacing the coil. Repairs broken slotted tuning studs on i-f transformers, age coils, horizontal oscillator coils, width coils and linearity coils. Shown: left, broken studs; right, repaired studs. Both 4-40 and 6-32 sizes, available in assortment of 6 most needed sizes. Assortment, \$0.79. Superex Electronics Corp., 4 Radford Place, Yonkers, N. Y.

For more data, circle 1-61-2 on coupon, p. 50



FIND TUBE TROUBLES OTHERS MISS!

A New Dynamic Approach

Check over 1300 tubes for

- Cathode Emission
- Grid Emission
- Leakage
- Shorts
- Gas

SENCORE "MIGHTY MITE" TUBE CHECKER

Answers the needs of the fast moving, profit minded serviceman who hates time consuming call backs. A "mite" to carry but a whale of a performer that spots bad tubes missed by large mutual conductance testers.

New unique "stethoscope" approach tests for grid emission and leakage as high as 100 megohms, yet checks cathode current at operating levels. Special short test checks for shorts between all elements. The MIGHTY MITE will test every radio and TV tube that you encounter (over 1300!) plus picture tubes, foreign, five star and auto radio tubes (without damage). As easy to set up as a "speedy tester" from easy to follow tube booklet. New tube charts free of charge.

AND check these added Sencore servicing features: • Meter glows in dark for easy reading behind TV set • Stainless steel mirror in cover for TV adjustments • Rugged, all steel carrying case and easy grip handle • Smallest complete tester made.

Model TC109.....DEALER NET **59⁵⁰**

Ask your distributor for the "MIGHTY MITE" with the mirror in the cover



SENCORE

ADDISON 2, ILLINOIS

For more data, circle 1-61-1 on coupon, p. 50

**MOST
SENSITIVE
MOST
POWERFUL
BEST
SELLING**



**THE
FISHER
800**

STEREO

FM-AM RECEIVER

■ *Twice as sensitive* as any competitive stereo receiver—and easily the *most powerful*, with a conservative rating of 60 watts *distortion-free* music power! The FISHER 800 incorporates the famous Golden Cascade Front-End for the outstanding FM sensitivity of 0.7 microvolts (20 db of quieting with 72-ohm antenna!) The AM signal is of FM calibre, for perfect FM-AM Stereo. The 800 offers *unlimited flexibility* for every application, including Center Channel, Tape Monitoring and Multiplex Stereo! Truly, here is an instrument you'll be proud to own and recommend to your friends! **\$429.50**

Write Today For Complete Specifications!

FISHER RADIO CORPORATION

21-24 44th Drive • Long Island City 1, N. Y.

For more data, circle 1-62-1 on coupon, p. 50
62

TV Remote Controls

(Continued from page 37)

Extreme versatility in controlling the channel selector from a distance is therefore obtained. If the viewer wishes to change from channel 13 to channel 11, he can move in a channels-down direction, rather than moving from channel 13-to-2 through all other channels, until 11 is reached. This luxury is only achieved with the more sophisticated (and more expensive) remote units. Less expensive units operate only in one direction.

When a modulated signal is received, K3 is activated in addition to the appropriate CW relay, K1 or K2. Relay K3 energizes the solenoid, which results in disconnecting the motor from the tuner and transferring it to the volume-on-off switch. The control's rotating direction depends on whether the modulated signal is 39KC or 41KC.

Servicing

Servicing an electronic remote transmitter is fairly simple. The most frequent trouble encountered is caused by defective batteries, battery contacts, and switches. The transistor and circuitry can be repaired in a manner similar to servicing the oscillator section of a transistor radio.

Be sure to remove batteries when making continuity tests to avoid damaging transistors.

A quick check of a transmitter's output can be made by employing a wide-band oscilloscope and an ordi-

nary radio receiver antenna attached to the vertical and ground terminals of the scope. Bringing the transmitter close to the antenna and depressing one of its buttons should result in some visual display. This display indicates output; either modulated or CW, as the case may be.

A scope across the output transducer, which may be a crystal, will enable the technician to observe the output, also. Of course, the easiest method to check output—and frequency—of a suspect transmitter is to use another transmitter known to be good.

Alignment problems are rare, though they do occur. In at least

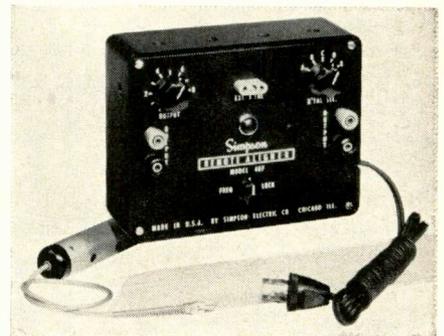


Fig. 6—Simpson's model 407 crystal-controlled TV remote alignment generator.

one instance, alignment is necessary—even if the transmitter is operating properly. This requirement could occur if a neighbor's transmitter is interfering with your customer's wireless remote-controlled set. In this case, shifting the carrier within the manufacturer's specified center frequency tol-

PHONE
ED 9-9653

\$7.50

plus parts,
C.O.D. and postage charges

Precision Tuner Service

ALL TYPES T.V. TUNERS REPAIRED AND ALIGNED TO FACTORY SPECIFICATIONS ON CRYSTAL-CONTROLLED SWEEP GENERATORS

24-HOUR SERVICE ON MOST TUNERS

UHF - VHF COMBINATIONS — \$13.50

See your local distributor or send to:

P.O. Box 272, 601 N. College
BLOOMINGTON, INDIANA

State make and model. Send
all parts, tubes and shields.

For more data, circle 1-62-2 on coupon, p. 50

ELECTRONIC TECHNICIAN • January, 1961

erance will correct the situation. Alignment of both transmitter and receiver is required.

An accurate audio signal generator can be employed or an instrument, as shown in Fig. 6, which is specifically designed to align remote equipment.

Remote receiver servicing requires more than just repairing basic electronic circuitry. The service technician must, in addition to understanding the "block circuitry," as shown in Fig. 5, separate mechanical difficulties from electronic ones.

Isolating the defect may depend on sight and sound, as well as instruments. For example, depressing

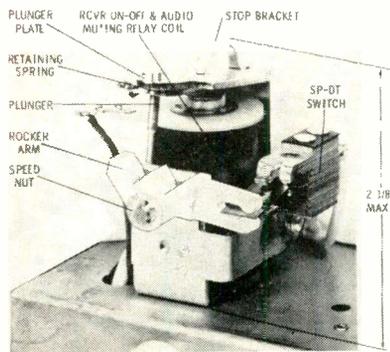


Fig. 7—Relay, rocker arm, and switch assembly on Motorola remote control receiver.

the transmitter button can evoke a "click" from the receiver's relay (the technician would naturally be close to the receiver), indicating that the electronic receiver is operating properly, but perhaps a disengaged or frozen shaft is causing the difficulty.

A frequent mechanical offender is the remote receiver's relay or switching mechanism, (see Fig. 7). Checking contacts here can often locate the reason for improper mechanical operation. Actuating the control manually may check this suspected area. (Since 110 volts are carried by some contacts, use insulated tools when effecting manual tests). •

MOVING?

If you plan to change your address, please notify us at least 8 weeks prior to moving in order to assure uninterrupted service. Write to Circulation Dept., ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y., stating both your present and future addresses.

NOW READY!

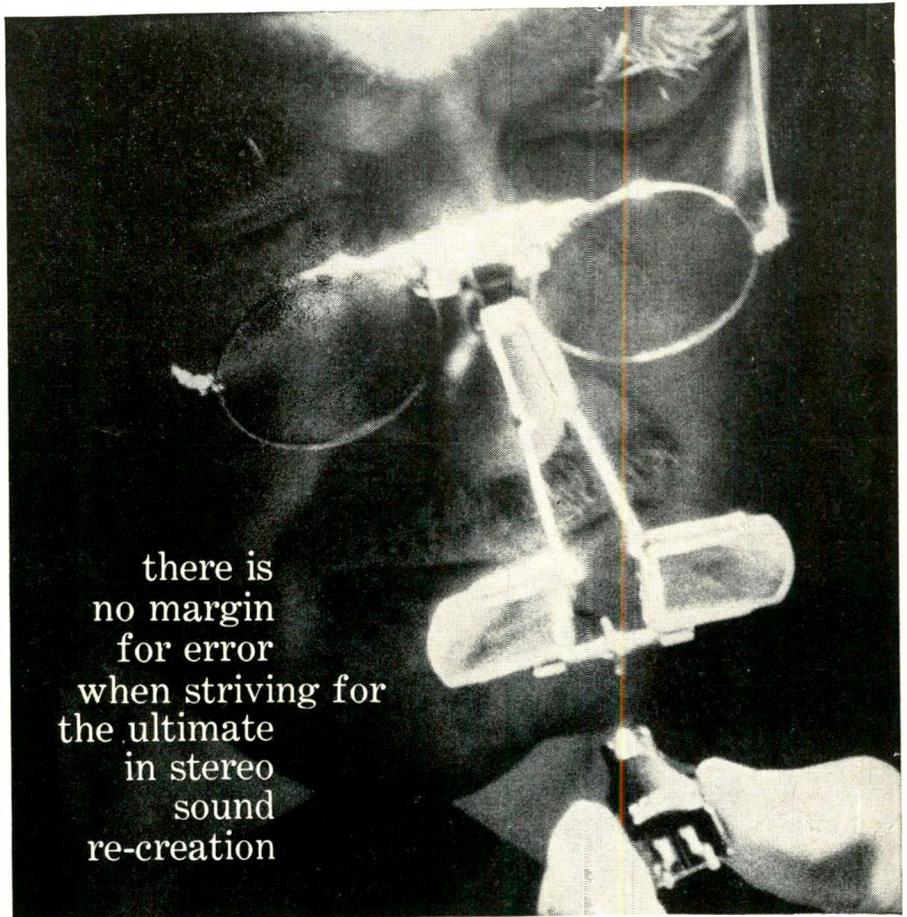
NEW NRI HOME STUDY COURSE IN ELECTRONICS

- Principles
- Practices
- Maintenance

CASH IN ON THE AGE OF ELECTRONICS

For every graduate engineer, Electronics needs 4 to 7 trained technicians. New, comprehensive NRI course prepares you for high pay, interesting jobs, exciting future. Big demand for trained Electronic technicians. Advancement opportunities great. Train quickly at home in spare time. Special training equipment included at no extra cost. Write for FREE catalog. National Radio Institute, Dept. 1AE8, Washington 16, D.C.

For more data, circle 1-63-1 on coupon, p. 50



there is
no margin
for error
when striving for
the ultimate
in stereo
sound
re-creation

SHURE

Stereo Dynetic

HI-FI PHONO CARTRIDGES

Tiny though it is, the cartridge can make or break a stereo system. For this breathtakingly precise miniaturized electric generator (that's really what it is) carries the full burden of translating the miles-long undulating stereo record groove into usable

electrical impulses... without adding or subtracting a whit from what the recording engineer created. Knowing this keeps Shure quality standards inflexible. Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois.

CARTRIDGES

Standard M8D. A superb blend of quality and economy... \$16.50
Custom M7D. Widely acclaimed; moderately priced... \$24.00
Professional M3D. Overwhelming choice of the critics... \$45.00
Laboratory Standard Model M3LS. Individually calibrated, limited quantity... \$75.00



TONE ARMS

Studio Dynetic. Integrated arm and cartridge. Cannot scratch records... \$89.50
Professional Independent Tone Arm. For any quality cartridge... stereo or mono... \$29.95



For more data, circle 1-63-2 on coupon, p. 50

ASSOCIATION NEWS

California

RTA, San Jose, reports the following officers were elected to the Santa Clara and Santa Cruz County chapters of CSEA: Pres., M.L. Peterson; V.P., Don Brown; Sec'treas., Clyde McCool.

APA, Los Angeles, reports the California Assembly Interim Committee on Government Efficiency and Economy has voted favorably on a petition to license appliance and TV servicemen. APA is said to have testified that 6,000 sales and service organizations, representing \$300 billion annual sales and service, are being hurt by sales and service activities of tax paying sundowners and backyard garage operators. It is expected that the 1961 State Assembly will adopt legislation on appliance and TV licensing.

Indiana

IESA, Indianapolis, reports that the Southwestern Indiana Electronic Technicians Association, serving Dubois County, have become members of the State organization. Charles Lamberson was elected president of the group.

Michigan

TSA, Detroit, queried an editorial appearing in TEAM News alleging that "The Detroit License Ordinance, 110F, is an admitted failure," by asking: "Who admits failure?" TSA pointed out many good reasons why service dealers of Detroit did not wish to add to their difficulties by repealing the ordinance. TEAM was requested to allow Detroit's service dealers to judge and/or amend the ordinance if their collective experiences indicated the necessity.

Missouri

TESA, St. Louis, relates that the local TV shop owners association in St. Charles, Warren and Lincoln counties have applied for affiliation with TESA & NATESA.

\$320,000 Libel Suits

TESA, Kansas City, reports that libel suits for injunction and dam-

ages totaling \$320,000 have been filed by eight persons, against TESA, Kansas City and TESA of Greater Kansas City. Six local service dealers and two employee technicians are plaintiffs in the cases. The suits were said to result from a circular allegedly accusing plaintiffs of opposing the Kansas City licensing ordinance.

Ohio

TESA, Columbus, Ohio has elected the following officers: Pres., Vern LaPlante; 1st V.P., Paul Lecoy; Treas., Vic Felton; Sec'y., Gregory Barkoukis.

Pennsylvania

TSA, Delaware Valley, relates a program underway to upgrade technician relations with consumers. Service calls are to be sectionalized under a "Gold Bond" program using a pooling system to distribute service calls. Through the medium of newspaper ads, the consumer is asked to call a central office number and Gold Bond registered technicians will perform the service required. It is not neces-

sary to be affiliated with any technician organization to qualify as a "Bond" member.

LVEA, Allentown, forwards information that they are circulating a petition asking the voting public in Pennsylvania to request TV service industry licensing.

Proposed License Bill Approved

FRTSA, Harrisburg, advises that their most recent meeting, attended by more than 100 technicians and servicemen, including association delegates, voted unanimously to approve a draft licensing bill. This new measure is expected to be presented early in the State Legislature's 1961 term.

During the proposed board's first year of operation all current technicians would receive a license. After the second year all technicians would take an examination and those failing would be given temporary licenses, good for only 30 to 60 days. At the end of that period a new test would be taken. A charge of \$25.00 per year was set for the service dealer employing one or more technicians.



Type "CTC" . . . cardboard tube electrolytics especially designed for exact replacement in television sets . . . one end closed . . . long insulated leads out other end . . . sealed with high melting point wax . . . guaranteed for one year . . . individually packaged.

Write today for complete information.

PLANET SALES CORPORATION
225 Belleville Avenue Bloomfield, New Jersey

For more data, circle 1-65-1 on coupon, p. 50

TUBES YOUR CUSTOMERS CAN TRUST

Give your customers tubes they can trust. Give them Sonotone miniaturized electronic tubes. Produced under the highest quality-control standards... rigorously tested to assure superior performance even under extreme conditions. In fact, Sonotone reliable tubes are being used right now in space and military vehicles. Over 150 different types available... for commercial, entertainment and military purposes. Sonotone, for quality tubes you can rely on.

Sonotone CORP.

Electronic Applications Division, Dept. T9-11
ELMSFORD, NEW YORK
 Leading makers of rechargeable batteries, phono cartridges,
 speakers, microphones, tape heads and electronic tubes.
 In Canada, contact Atlas Radio Corp., Ltd., Toronto

For more data, circle 1-66-1 on coupon, p. 50
 66

Shop Hints

(Continued from page 44)

and other mechanical causes.

A patent application for modified pliers (see Fig. 2B) for easily performing this operation, has already been made by a manufacturer.—*Ralph Rinaldi, Saddle Brook, N. J.*

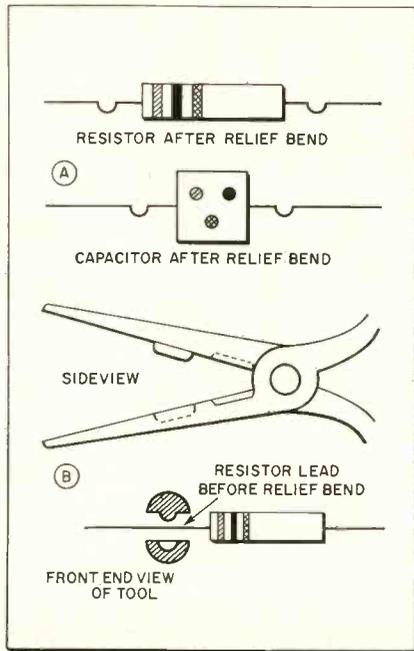


Fig. 2 (A)—Half-circle bends in each component lead will provide relief for strain caused by temperature changes, vibration and other stresses. (B)—Manufacturer has requested patent on this long nose combination plier and crimper which makes a half-circle strain relief bend in component leads.

Auto Static Elimination

We've effectively eliminated annoying radio noise caused by static electricity on many auto radios by using a 20-inch web type battery strap. One end of the strap is attached to the front "U" bolt of the left rear spring. Before attaching, clean the surface of the frame just above the "U" bolt. Then fasten the other end of the strap to the frame using sheet metal screws.—*Stanley Clark, East Bradenton, Florida.*

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, 480 Lexington Ave., New York 17, N. Y.

MAIL COUPON TODAY!

Find out how you can
get this book

free!



the V.T.V.M. by Rhys Samuel published at \$2.50—contains a wealth of information on how the V.T.V.M. works... how to use it. Send for particulars on how to get this valuable book.

Mail to Dept. ET-1
 General Techniques, Inc.
 Manufacturers of Quality Electronic Kits
 1270 Broadway, New York City 1, N. Y.

NAME _____
 ADDRESS _____
 CITY _____ ZONE _____
 STATE _____

For more data, circle 1-66-2 on coupon, p. 50

BINDERS FOR YOUR ELECTRONIC TECHNICIAN

... to keep your copies for
convenient reference
 \$3.75 each—Postpaid

Canada and Foreign—please add
50¢ for additional mailing costs

ELECTRONIC TECHNICIAN

480 Lexington Ave.
 New York 17, N. Y.

Please ship . . . "ELECTRONIC
 TECHNICIAN Magazine Bind-
 ers." I enclose \$

(please print)

Name

Street & No.

City Zone State

B&K TV ANALYST

New model 1076, combining the features of models 1075 and A107 in one compact instrument, checks all circuits and pinpoints any TV trouble. Signals, instantly available on front panel are: complete r-f and i-f; video test pattern; composite sync; FM modulated

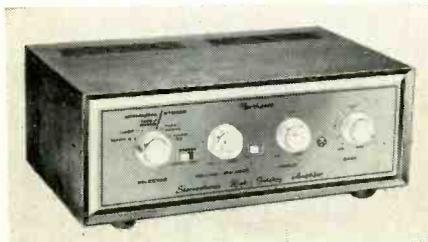


audio; color patterns; horizontal and vertical plate drive; B+ boost indicator, and high-voltage transformer test. New unit includes switch-type tuner, negative bias supply, agc keying pulse; and picture tube modulation. \$299.95. B&K Mfg. Co., 1801 Belle Plaine, Chicago 13, Ill.

For more data, circle 1-67-3 on coupon, p. 50

Shell AMPLIFIER-PREAMP

Northport series 210P consists of 2 identical 10-watt amplifiers with a d-c filament, equalized preamps and a self-contained a-c power supply integrated into a single unit. Combined output, 20



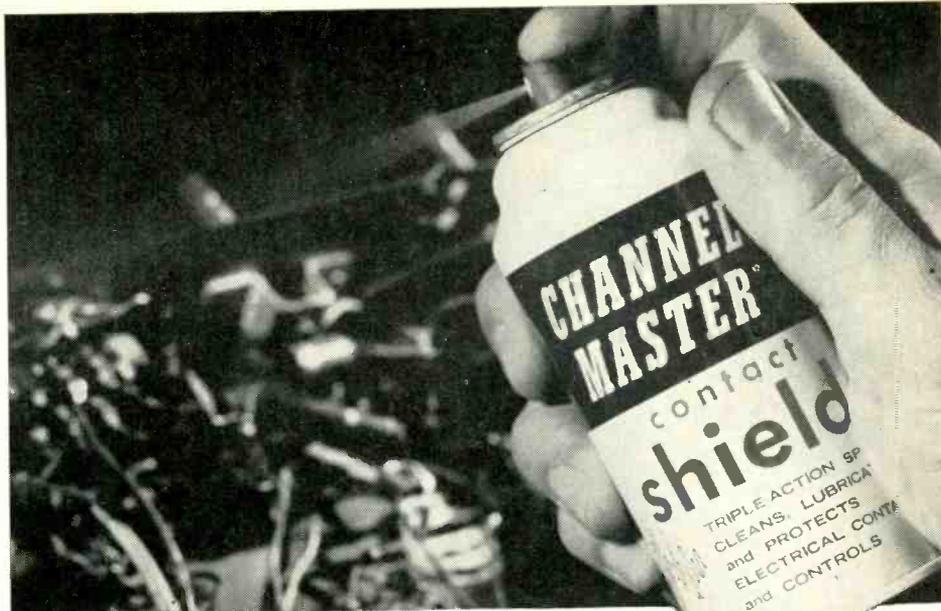
watts or 30 watts peak. Frequency response, 2 db 30-20,000 cps. Distortion, less than 2%. Hum-noise, -60 db. Has a total of 6 inputs and 2 speaker outputs. Shell Electronics Mfg. Co., 112 State St., Westbury, N. Y.

For more data, circle 1-67-4 on coupon, p. 50

Motorola AUTO RADIOS

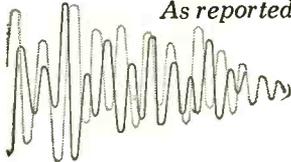
Introduced are three new custom designed auto radios for after-market installation in 1961 Chevrolets and Buicks. Two of the three receivers, one for Buicks and one for Chevrolets, are completely transistorized; a second Chevrolet radio combines 2 transistors with vacuum tubes. The all-transistor radios incorporate 5 transistors, 3 diodes and a thermistor. 3 μ v sensitivity; fully variable tone control. Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.

For more data, circle 1-67-5 on coupon, p. 50



BEST OF ALL CONTACT SPRAYS

As reported by independent product-testing laboratory



Triple-action Contact Shield cleans, lubricates, and protects electrical controls and switches in seconds. Most effective, safest product of its kind as proved by laboratory tests.

CHANNEL MASTER works wonders in sight and sound

Ellenville, New York

For more data, circle 1-67-1 on coupon, p. 50

Superior's New Model 77

VACUUM TUBE VOLTMETER WITH NEW 6" FULL-VIEW METER

Compare it to any peak-to-peak V. T. V. M

made by any other manufacturer at any price!



- Extra large meter scale enables us to print all calibrations in large easy-to-read type. • Employs a 12AU7 as D. C. amplifier and two 9006's as peak-to-peak voltage rectifiers to assure maximum stability. • Meter is virtually burn-out proof. The sensitive 400 micro-ampere meter is isolated from the measuring circuit by a balanced push-pull amplifier. • Uses selected 1% zero temperature coefficient resistors as multipliers. This assures unchanging accurate readings on all ranges.

SPECIFICATIONS

- DC VOLTS—0 to 3/15/75/150/300/750/1,500 volts at 11 megohms input resistance. • AC VOLTS (RMS)—0 to 3/15/75/150/300/750/1,500 volts. • AC VOLTS (Peak to Peak)—0 to 8/40/200/400/800/2,000 volts. • ELECTRONIC OHMMETER—0 to 1,000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms. • DECIBELS: -10 db to +18 db, +10 db to +38 db, +30 db to +58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.75v). • ZERO CENTER METER—For discriminating alignment with full scale range of 0 to 1.5/7.5/37.5/75/150/375/750 volts at 11 megohms input resistance.

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

AS A DC VOLTMETER: The Model 77 is indispensable in Hi-Fi Amplifier servicing and a must for Black and White and color TV Receiver servicing where circuit loading cannot be tolerated.

AS AN AC VOLTMETER: Measures RMS values if sine wave, and peak-to-peak value if complex wave. Pedestal voltages that determine the "black" level in TV receivers are easily read.

Comes complete with operating instructions, probe, leads, and streamlined carrying case. Operates on 110-120 volt 60 cycle. Only

\$4250 NET

SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C. O. D.

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

MOSS ELECTRONIC, INC.

Dept. D-852, 3849 Tenth Ave., New York 34, N. Y. Please rush one Model 77. I agree to pay \$12.50 within 10 days after receipt and \$6.00 per month thereafter. Otherwise I may return, cancelling all further obligation.

NAME _____ ADDRESS _____ CITY _____ ZONE _____ STATE _____

All prices net, F.O.B., N.Y.C.

Mr. Service Technician:

Want to service transistor radios rapidly
—accurately? You can with

REPAIRING TRANSISTOR RADIOS

by S. Libes (Director Technical
Publications, Bogen-Presto)

The man who wrote this book knows his subject well and provides practical procedures that you can apply to faster troubleshooting and to finding those elusive 'dog troubles'.

Basic theory is presented in a way that you will understand easily, quickly. Operation and service of the latest transistorized circuit designs are covered. All new ideas about transistors as used in current transistor radios are explained. Also included are the latest design practices in transistor portable AM, multi-band, imported, all-transistor, auto-hybrid and FM radio receivers. High power transistorized public address power amplifiers and current high fidelity applications are covered.

Service is explained on a step-by-step basis including trouble check points and charts, instruction of handy-to-use test equipment (e.g. signal source, power supply). And, there's another feature—transistor and diode substitution charts. Also included is information on how to select test equipment and tools for repairing transistor radios. #270, \$3.50

TV SERVICING

MASTER RECEIVING — PICTURE TUBE SUBSTITUTION GUIDEBOOK, H. A. Middleton, \$7.45
RECEIVING TUBE SUBSTITUTION GUIDEBOOK 4th suppl., H. A. Middleton, \$1.35
TUBE CADDY-TUBE SUBSTITUTION GUIDEBOOK, H. A. Middleton, 90c
HOW TO TROUBLESHOOT TV SYNC CIRCUITS, I. Remer, \$2.90
REPAIRING TELEVISION RECEIVERS, C. Gluckstein, \$4.40

AUDIO & HIGH-FIDELITY SERVICING

HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS, J. Darr, \$3.60
HOW TO SERVICE TAPE RECORDERS, C. A. Tut-hill, \$2.90
REPAIRING HI-FI SYSTEMS, David Fidelman, \$3.90

TEST EQUIPMENT

HOW TO USE METERS (2nd ed.), J. F. Rider & S. Prenska, \$3.50
HOW TO USE TEST PROBES, A. Ghirardi & R. Middleton, \$2.90
OBTAINING INTERPRETING TEST SCOPE TRACES, J. F. Rider, \$3.00
HOW TO USE SIGNAL & SWEEP GENERATORS, J. Richard Johnson, \$2.40
HOW TO USE GRID-DIP OSCILLATORS, R. P. Turner P. E., K6AI, \$2.50

RADIO SERVICING

RADIO RECEIVER LABORATORY MANUAL, A. W. Levey, M. S., \$2.00
RADIO TROUBLESHOOTING GUIDEBOOK, VOL. 1, Rider & Johnson, \$2.40
HOW TO INSTALL & SERVICE AUTO RADIOS (2nd ed.), J. Darr, \$3.25
REPAIRING PORTABLE & CLOCK RADIOS, B. Crissee & D. Gnessin, \$2.75

PROFITABLE SERVICING AREAS

HOME AIR CONDITIONING, Installation & Repair, J. Derman, M.S., F. Makstein, H. Seaman, \$3.50
BASICS OF FRACTIONAL HORSEPOWER MOTORS & REPAIR, Gerald Schweitzer, soft cover \$3.90; cloth \$4.90
INDUSTRIAL CONTROL CIRCUITS, Sidney Platt, \$3.90

Prices subject to revision.

At distributors or order direct!
Write for new catalog. ET-1



JOHN F. RIDER, PUBLISHER, INC.
116 West 14th Street, New York 11, N.Y.
Canada: Chas. W. Pointon, Ltd.,
66 Racine Rd., Rexdale, Ont.

For more data, circle 1-68-1 on coupon, p. 50

68

New Books

TRANSISTOR MANUAL. Prepared and published by General Electric Co., Semiconductor Products Dept., Syracuse, N.Y. 330 pages, soft cover. \$1.00.

One-half million copies of this popular manual have already been distributed throughout the world. Here, in its fifth edition, four new chapters have been added, expanding the manual by 115 pages over the fourth edition. In addition to a very complete description of transistor specifications, applications, and circuitry operation, the new manual adds new chapters on: Tunnel Diode Theory and Switching Circuits, Tunnel Diode Amplifiers, Feedback and Servo Amplifiers and Test Circuits. The tunnel diode chapters are particularly welcome, in view of its potential importance and heretofore sparse R & D oriented information. Other chapters have been expanded and revised. A current listing of transistor types and interchangeability information is included.

ELEMENTS OF TELEVISION SERVICING. By Abraham Marcus & Samuel E. Gendler. Published by Prentice-Hall, Inc., 590 pages, hard cover. \$8.65.

This is the third printing of an excellent guide for television field and bench servicing. Commencing with basic principles of TV transmission and reception, the remainder of the book describes practical field and bench TV service methods, including: Selecting the TV Antenna, Installing the Receiver, Field Troubleshooting, Set-up for Bench Servicing, and a section-by-section receiver analysis and troubleshooting. Three chapters are also devoted to the theory and service of color TV receivers. Though not covering late TV circuitry (first printing 1955), the text can serve admirably as a TV repair guide for students and inexperienced technicians, as well as a reference guide for more advanced technicians.

GETTING THE MOST OUT OF YOUR TAPE RECORDER. By Herman Burstein. Published by John F. Rider Publisher, Inc. 176 pages, soft cover. \$4.25.

This book is directed toward enabling the tape recorder user to achieve optimum performance from his equipment. The author divides the text into four basic parts: (1) Various features available in different types of tape recorders—heads, level indicators. (2) Accessories—adding tape to audio equipment, microphones, tape splicers, demagnetizers, cleaners, and raw tape analysis. (3) Electrical performance—permitting users to understand basic performance, such as—signal to noise ratio, distortion,

frequency response, including modifications to improve performance. (4) Performance checks—head height, bias, azimuth, frequency response, equalization, and noise. Illustrations are adequate. A final chapter discusses stereo tape considerations, including conversions. The volume should make tape recorders a more comprehensible piece of equipment to readers.

UNDERSTANDING RADIO. By H. M. Watson, H. E. Welch, and G. S. Eby. Published by McGraw-Hill Book Co., Inc. 708 pages, hard cover. \$8.25.

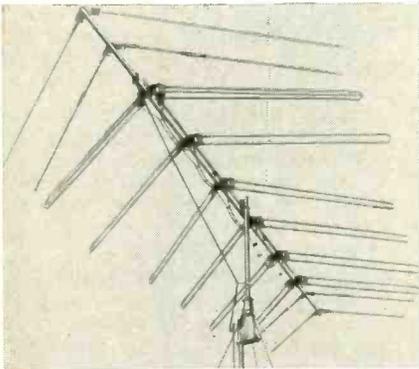
This is the third edition of a volume concerning radio receiver principles for readers having a limited technical background. Beginning with basic electricity principles, for example, "What are atoms and molecules," the authors progress deftly into vacuum tubes, crystal sets and an excellent, if simplified, description of various circuitry and components of radios. How-to-build experiments accompany each radio section chapter. Other chapters cover antennas, short wave and FM receivers, transmitters and diodes and transistors. Though obviously intended for secondary school use or for students or hobbyists, the text can serve as a review course for technically-educated readers, as well as clarifying some radio fundamentals.

PRACTICAL AUTO RADIO SERVICE & INSTALLATION. By Jack Greenfield. Published by Gernsback Library, Inc. 160 pages, soft cover. \$2.95.

As many readers know, auto radio servicing can demand unusual electronic know-how and physical dexterity from service technicians. This book should go a long way to simplify repairs and removal-installation problems that exist when repairing these units. The author initially covers the type of radios prevalent in automobiles, such as: vibrator-powered, transistor-powered, all-transistor, FM, etc. Details concerning how to set up a shop with tools and component stock follow. From here on, the remaining seven chapters discuss practical installation and repair information as indicated by the following typical chapters: Installing & Removing Auto Radios, Installing Rear Speakers, Troubleshooting & Repair, Interference Suppression. A chapter covering search tuners and pushbutton tuning offers a detailed mechanical analysis of this difficult-to-repair section. Illustrations are numerous and excellent. If you repair—or intend to repair—auto radios, this guide is *must* reading.

Channel Master ANTENNAS

Two new traveling wave antennas for all-channel, far-fringe areas are: Super 10 T-W, 10-element antenna, combining 6 of the firm's T-W hairpin driven dipoles, with 4 parasitic low band and co-linear high band elements

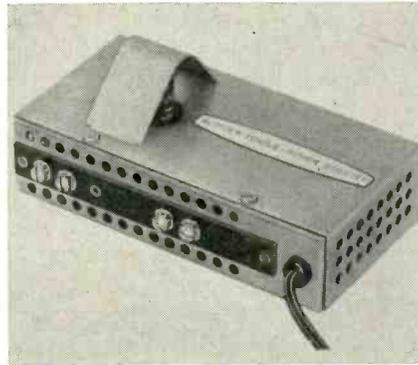


for new performance highs in gain and front-to-back ratios; and Super 8 T-W featuring 4 driven and 4 parasitic elements. Super 10 T-W, model 358, \$59.95. Super 8 T-W, model 359, \$44.95. Slightly higher in Canada. Channel Master Corp., Ellenville, N. Y.

For more data, circle 1-69-3 on coupon, p. 50

B-T TV/FM SIGNAL AMPLIFIER

Power Booster model BTA, a new low-cost signal amplifier, improves TV (black and white or color) and FM reception. It can be installed easily at the antenna terminals of a TV set. Installs in minutes with only a screw-



driver. It achieves 7-9 db gain on channels 2-13, and 3-8 db on the FM band. Features include: stripless 300-ohm terminals at input and output; on/off switch; and a single frame-grid tube. \$18.95. Blonder-Tongue Labs., 9 Alling St., Newark 2, N. J.

For more data, circle 1-69-4 on coupon, p. 50

ONLY
\$2
DOWN

puts any of
these quality

knight-kit[®]
A PRODUCT OF ALLIED RADIO

TEST INSTRUMENTS
on your shop bench



only \$2 down

5" GENERAL-PURPOSE HIGH-GAIN SCOPE KIT

Top value: 25 mv/inch vertical sensitivity; phantastron-type sweep generator; immediate proper centering with no overshoot; retrace blanking. Printed circuit board and laced wiring for easiest assembly. Shpg. wt., 27 lbs.

83 YU 146. Only... \$44.95



only \$2 down

FAMOUS-FOR-VALUE ELECTRONIC VTVM KIT

Measures DC voltage (11 meg input) and resistance; AC voltage, rms and peak-to-peak; 4½" meter; p-p balanced bridge circuit; film-type 1% resistors. Shpg. wt., 7 lbs.

83 Y 125. Only... \$25.75



only \$2 down

QUALITY RF SIGNAL GENERATOR KIT

160 kc to 112 mc on fundamentals; provides modulated, unmodulated and 400-cycle output; high stability Colpitts circuit. Shpg. wt., 11 lbs.

83 Y 145. Only... \$19.75



only \$2 down

MODEL 600 DELUXE TUBE CHECKER KIT

checks over 700 types; 16 filament voltages; tests cathode emission as well as shorts, open elements, etc. Provision for future tube types. Shipping weight, 15 lbs.

83 YX 143. Only... \$32.95

ORDER YOURS TODAY!

free 1961 ALLIED CATALOG

See it for the complete line of KNIGHT-KITS—plus the world's largest stocks of electronic parts and equipment for service work. Send for FREE copy.



ALLIED RADIO

ALLIED RADIO, Dept. 192-AL
100 N. Western Ave., Chicago 80, Ill.

Ship the following Knight-Kits:

- 83 YU 146 83 Y 145
 83 Y 125 83 YX 143

Send Free 1961 Allied Catalog

Name _____
PLEASE PRINT

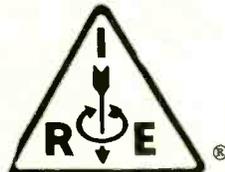
Address _____

City _____ Zone _____ State _____

For more data, circle 1-69-2 on coupon, p. 50

69

For that



NEW IDEA

visit the

IRE SHOW

March 20-23, 1961

New York

Coliseum and Waldorf-Astoria Hotel

Members \$1.00, Non-members \$3.00

Age limit—over 18

For more data, circle 1-69-1 on coupon, p. 50



CITIZEN BAND CLASS "D" CRYSTALS

All 22 Frequencies in Stock
3rd overtone .005% tolerance—to meet all FCC requirements. Hermetically sealed HC6/U holders. 1/2" pin spacing
\$2.95 EACH
—050 pins. (.093 pins available, add 15c per crystal).

The following Class "D" Citizen Band frequencies in stock (frequencies listed in megacycles): 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225.

Matched crystal sets for Globe, Gonsel, Citi-Pone and Hallcrafters . . . \$5.90 per set. Specify make.

RADIO CONTROL CRYSTALS IN HC6/U HOLDERS

Specify frequency. 1/2" pin spacing . . . pin diameter .05 (.093 pin diameter, add 15c) \$2.95 ea.

FUNDAMENTAL FREQ. SEALED CRYSTALS

in HC6/U holders
From 1400 KC to 4000 KC .005% Tolerance . . . \$4.95 ea.
From 4000 KC to 15,000 KC any frequency .005% Tolerance . . . \$3.50 ea.

SEALED OVERTONE CRYSTALS

Supplied in metal HC6/U holders
Pin spacing .486, diameter .050
15 to 30 MC .005 Tolerance . . . \$3.85 ea.
30 to 45 MC .005 Tolerance . . . \$4.10 ea.
45 to 60 MC .005 Tolerance . . . \$4.50 ea.



QUARTZ CRYSTALS FOR EVERY SERVICE

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

FT-243 holders MC-7 holders
Pin spacing 1/2" Pin spacing
Pin diameter 3/8" Pin diameter
.093 .125
DC-34 holders FT-171 holders
Pin spacing 3/8" Pin spacing
Pin diameter 3/8" Pin diameter
.156 .156
Banana pins

MADE TO ORDER CRYSTALS

1001 KC to 2600 KC:
.01% tolerance . . . \$2.00 ea.
.005% tolerance . . . \$2.75 ea.
2601 KC to 9000 KC:
.005% tolerance . . . \$2.50 ea.
.005% tolerance . . . \$3.00 ea.
Specify holder wanted

Amateur, Novice, Technician Band Crystals
.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) 50c ea.

Pin spacing 1/2" Pin diameter .093
Matched pairs ± 15 cycles \$2.50 per pair

200 KC Crystals, \$2.00 ea.; 455 KC Crystals, \$1.50 ea.; 500 KC Crystals, \$1.50 ea.; 100 KC Frequency Standard Crystals in HC6/U holders \$4.50 ea.; Socket for FT-243 crystal 15c ea.; Dual socket for FT-243 crystals, 15c ea.; Sockets for MC-7 and FT-171 crystals 25c ea.; Ceramic socket for HC6/U crystals 20c ea.

Write for new free catalog #860 complete with oscillator circuits

YOUR PARTS DEALER HAS TEXAS CRYSTALS

See big red display . . . If he doesn't stock them, send us his name and order from our Florida plant.

Now! Engineering samples and small quantities for prototypes now made either at Chicago or at Ft. Myers Plant. 24 Hour Service.

IN CHICAGO, PHONE GLADSTONE 3-3555

RUSH YOUR ORDER TO OUR NEW PLANT

Use coupon below for 1st Class shipment.

TEXAS CRYSTALS

Dept. T-11, 1000 CRYSTAL DRIVE, FORT MYERS, FLORIDA

For extra fast service, Phone WE 6-2100

ATTACH THIS COUPON TO YOUR ORDER FOR SHIPMENT VIA 1ST CLASS MAIL AT NO EXTRA COST

TERMS: All items subject to prior sale and change of price without notice. All crystal orders must be accompanied by check, cash or M.O. with PAYMENT IN FULL. No COD's. Dept. T-11

For more data, circle 1-70-1 on coupon, p. 50
70

Transistor Radio Dogs

(Continued from page 35)

ate load, and still have an unacceptably high internal resistance.

Excessive internal resistance in the battery may lead to a number of complaints, depending on individual set circuitry. These range from weak operation and distortion to oscillation and motorboating . . . the latter complaints as a result of common interstage coupling through the power supply. A good check, here, is to by-pass the battery with a large (500 to 1,000 µf) electrolytic capacitor (see Fig. 2). If the complaint is cleared, a fresh battery is indicated and, perhaps, a check of any by-pass capacitors in the power supply.

Occasionally, a defective power supply component will lead to just enough change in bias values to cause trouble in one amplifier circuit. Referring to Fig. 1, for example, excessive leakage in C22 can increase the voltage drop across R28, changing most operating bias values. Some stages are more tolerant of bias changes than others, however, and a stage-by-stage check with a Signal Tracer may lead to the quite erroneous conclusion that all stages but one are operating normally. Thus, a standard test leads one to suspect trouble in a single stage, while the defect is really in the power supply circuit. Here, bias checks to supplement signal tracing would isolate the defect. •

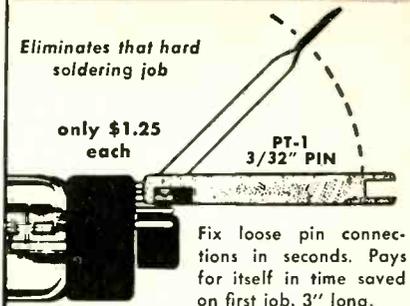
For Your Protection In Making Subscription Payments

Most readers obtain their new and renewal magazine subscriptions by sending payment directly to ELECTRONIC TECHNICIAN. Others deal with our field sales representatives. Either method is acceptable.

However, we have learned of a few cases where men fraudulently claiming to represent us pocketed cash or subscription checks made out to names other than that of the publication. To protect yourself, we urge all readers who purchase subscriptions from field sales agents to make their payments by checks payable to ELECTRONIC TECHNICIAN.

Picture-Tube Repair Tool

Eliminates that hard soldering job



only \$1.25 each

PT-1 3/32" PIN

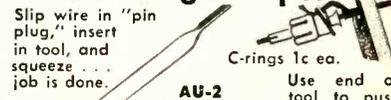
Fix loose pin connections in seconds. Pays for itself in time saved on first job. 3" long.

Patented

Intermittent operation of picture tubes due to defective solder connections easily corrected. Provides solid electrical connections, can also be used as channel-selector wrench and screwdriver. Pin keeps its original form. A 3-in-1 tool.

3 MODELS ELIMINATE SOLDERING

Makes Solid Electrical Connections
Pin-Plug Crimper



Slip wire in "pin plug," insert in tool, and squeeze . . . job is done.

C-rings 1c ea.

AU-2 1/8" PIN

Use end of tool to push on C-ring for ground connection.

Ant. plugs, hi-fi, multiple plugs, public address, radio and TV tubes, radar, speakers, and loop connections. Many, many more uses.

Model LC-3 for 5/32" pin diameter

At your parts distributor or write us

BERNS Mfg. Co.
9849 Chalmers, Detroit 13, Mich

For more data, circle 1-70-2 on coupon, p. 50

electronic chemical

new formula

EC-44

Economical! A little does a lot!



6 oz. \$3.50 spray can

with 5" Plastic Extender Push Button Assembly FREE

lubricates conditions cleans all

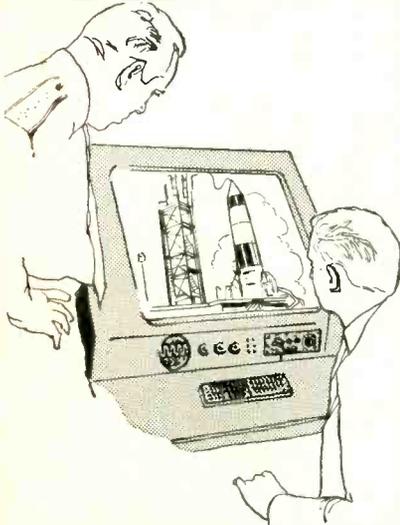
ELECTRICAL CONTACTS

Sold To Distributors Only

ELECTRONIC CHEMICAL CORP.
813 Communipaw Avenue Jersey City 4, N. J.

For more data, circle 1-70-3 on coupon, p. 50
ELECTRONIC TECHNICIAN • January, 1961

FIELD



ENGINEERS

For Univac Missile-Guidance Computers

Field engineers are now being selected for maintenance assignments on ultra-reliable Univac missile-guidance computers and other military electronic data processing systems.

Openings involve maintenance of the Univac ICBM guidance computer, first of its size to be completely transistorized.

Applicants must have at least 2 years of formal education in Electronics with 3 or more years in maintenance or maintenance-instruction. Experience should be associated with complex electronic equipment such as TV, radar, sonar or digital computing systems.

Before assignment, you receive 2 to 6 months training at full pay in our St. Paul, Minnesota, laboratories. Benefits include company paid life insurance, hospitalization, medical and surgical benefits, relocation expenses and living allowances at field sites.

Openings also for qualified instructors with backgrounds similar to above.

Send complete resume of education and experience to:

R. K. PATTERSON, Dept. J-1

Remington Rand
Univac

Division of Sperry Rand Corporation
2750 West 7th St., St. Paul 16, Minn.



INDEX TO ADVERTISERS

January 1961

Aerovox Corp.	22
Allied Radio Corp.	54, 69
American Television and Radio Co.	71
Amperex Electronic Corp.	56
B & K Manufacturing Co.	43, 45, 47
Berns Manufacturing Co.	70
Blonder-Tongue Laboratories, Inc.	14, 15
British Industries	64
Bussmann Manufacturing Co.	9
Castle Television Tuner Service	48
CBS Electronics	13
Centralab Division, Globe-Union Inc.	4
Channel Master Corp.	10, 11, 67
Chemical Electronic Engineering Inc.	12
Clarostat Manufacturing Co.	55
EICO	52
Electronic Chemical Corp.	70
Electronic Technician	66
Fisher Radio Corporation	62
General Electric Co.	44
General Techniques, Inc.	66
Greyhound Corp.	53
Illinois Condenser Co.	58
Institute of Radio Engineers	69
JFD Electronics Corp.	26
Littelfuse, Inc.	Cover II
Mallory & Co., Inc., P. R.	20, 21
Moss Electronic, Inc.	67
Multicore Sales Corp.	64
National Radio Institute	63
Perma-Power Co.	12
Philco Computer Division	46
Philco Corp.	24, 25
Planet Sales Corp.	65
Precision Tuner Service	62
Prentice-Hall, Inc.	51
Quietrole Co.	64
Radio Corporation of America ..	5, Cover IV
Raytheon Company	23
Remington Rand Univac	71
Rider Publisher, Inc., John F.	68
Sarkes Tarzian, Inc.—Semiconductor Division	8
The Schober Organ Company	59
Sencore	60, 61
Shure Brothers, Inc.	63
Sonotone Corp.	66
South River Metal Products Co., Inc.	58
Sprague Products Co.	19
Standard Kollsman Industries, Inc.	Cover III
Stromberg-Carlson	49
Sylvania Div., General Telephone & Electronics	6, 7, 18
Texas Crystals	70
Trio Manufacturing Co.	64
Tru-Vac	52
Tung-Sol Electric Inc.	57
United Catalog Publishers, Inc.	54
United Radio Co.	48
Winegard Company	2, 3
Xcelite, Inc.	59

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

PRODUCTS FOR MODERN LIVING



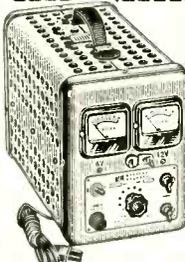


ATR PLUG-IN TYPE PORTABLE INVERTERS*

A.C. HOUSEHOLD ELECTRICITY Anywhere... in your own car!

Operates Standard A.C. • Record Players • Dictating Machines • Small Radios • Electric Shavers • Heating Pads, etc. In your own car or boat!

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



ATR "A" BATTERY ELIMINATOR

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

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

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

AUTO-RADIO VIBRATORS

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

There is an ATR VIBRATOR for every make of car!

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



ATR 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—12 for 12V Dealer Net Price... \$33.57 Model K-1279—6 for 6V Dealer Net Price... \$33.57

ATR TRUCK KARADIO

Excellent Tone, Volume, and Sensitivity!

Compact, yet powerful. Fits all trucks, station wagons, most cars and boats. Just drill a 3/8 inch hole in roof and suspend the one-piece unit (serial, chassis and speaker) in minutes. Watertight mounting assembly holds antenna upright. Yoke-type bracket lets you tilt radio to any angle.

Extra-sensitive radio has 6 tubes (2 double-purpose), over-size Alnico 5 PM speaker for full, rich tone. Big, easy-to-read illuminated dial. Fingertip tuning control. Volume and tone controls. 33-in. stainless steel antenna. Neutral gray-tan enameled metal cabinet. 7 x 6 1/2 x 4 in. high over-all. Shipping weight 10 1/2 lbs. Model TR-1279—12 A for 12V Dealer Net Price \$41.96 Model TR-1279—6 A for 6V Dealer Net Price \$41.96



NO PRINTED CIRCUITRY

SEE YOUR ELECTRONIC PARTS DISTRIBUTOR
WRITE FACTORY FOR FREE LITERATURE...



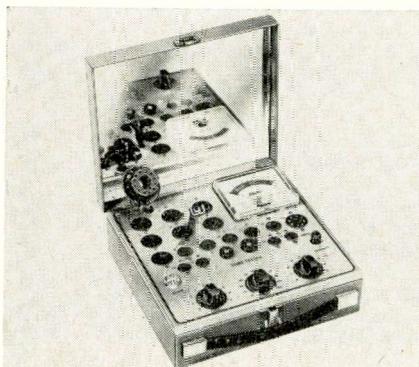
AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U.S.A.

New Electronic Products

Mercury TUBE TESTER

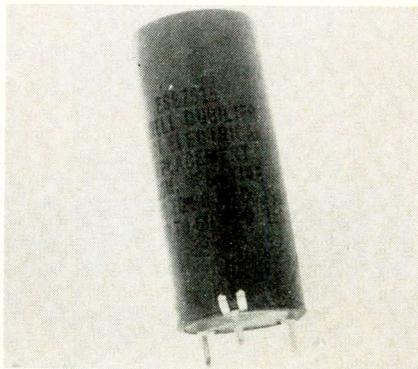
Model 103 spots hard-to-find tube defects in seconds and checks all radio and TV tubes including: newest series-string TV tubes; OZ4s; gas regulators; auto radio; hi-fi and foreign tubes. It checks for cathode emission, shorts, grid leakage and gas content. Accommodates new tubes. New tube listings, furnished periodically. Tests, in seconds, by setting only 3 controls, inserting tube into socket and pressing quality button. \$47.75. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y.

For more data, circle 1-72-1 on coupon, p. 50



CDE CAPACITORS

ESS-7515, designed especially for printed board mounting, is a compact, cardboard-sleeved, plug-in type capacitor. It provides an exact electrical and mechanical replacement for eight original standard 150 WVDC capacitors commonly used in printed circuit



radio and TV receivers. These are μ fd: 50-30; 70-30; 75-30; 60-40; 80-40; 50-50; 10-50; and 80-50. In addition, the versatility of the unit makes it an ideal replacement for many other combinations of capacitance within its ratings. \$2.00. Cornell-Dubilier Electronics, 333 Hamilton Ave., South Plainfield, N. J.

For more data, circle 1-72-5 on coupon, p. 50

Bogen TRANSCRIPTION PLAYER

Combining a full-fidelity 20-watt amplifier and speaker with the Bogen-Presto B50 professional turntable, the new portable VP20 features continuous speed control which permits playing each record at any desired tempo from 29 through 86 rpm, with instant speed selection of 16, 33 $\frac{1}{3}$, 45 and 78 rpm. To prevent creep and minimize wow and rumble, the rubber-padded turntable, taking discs up to 16" diam., is driven by a constant-speed heavy-duty 4-pole shielded motor. Bogen Presto Div., Siegler Corp., Paramus, N. J.

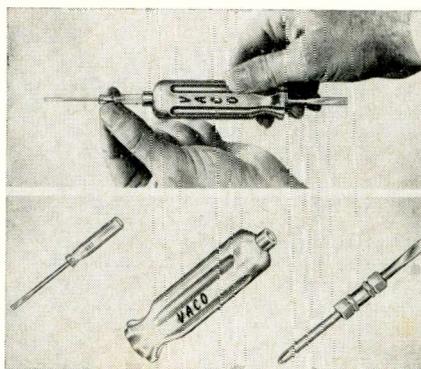
For more data, circle 1-72-2 on coupon, p. 50



Vaco SCREW DRIVER

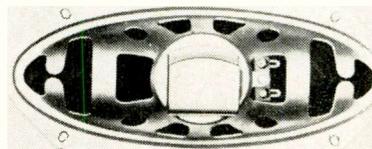
"Piggy-Back" screw driver offer, 4 tools in 1, includes: plastic handle, with $\frac{1}{4}$ " hex socket; reversible blade with one end a 3/16" regular blade and the other end a No. 1 Phillips bit; and midget instrument-type screw driver included free. This midget driver handle fits into the $\frac{1}{4}$ " hex socket "piggy-back" style for extra precision control in hard-to-get-at places. "Piggy-Back" set fits most screws and nuts. The free midget driver permits expert work. Complete set, \$1.60. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

For more data, circle 1-72-3 on coupon, p. 50



Quam-Nichols SPEAKER

Announced is the new model 410A2, 4"x10" replacement speaker. It features a 1.4 oz. Alnico V magnet; 6 watts power handling and is reported



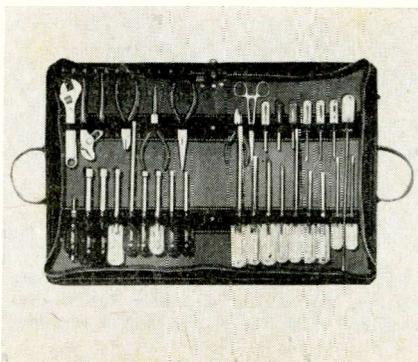
to meet the requirements for a large replacement market. This size speaker is in use in many Buick, Cadillac and Pontiac auto radios, as well as in other sets. Quam-Nichols Co., 226 E. Marquette Rd., Chicago 37, Ill.

For more data, circle 1-72-6 on coupon, p. 50

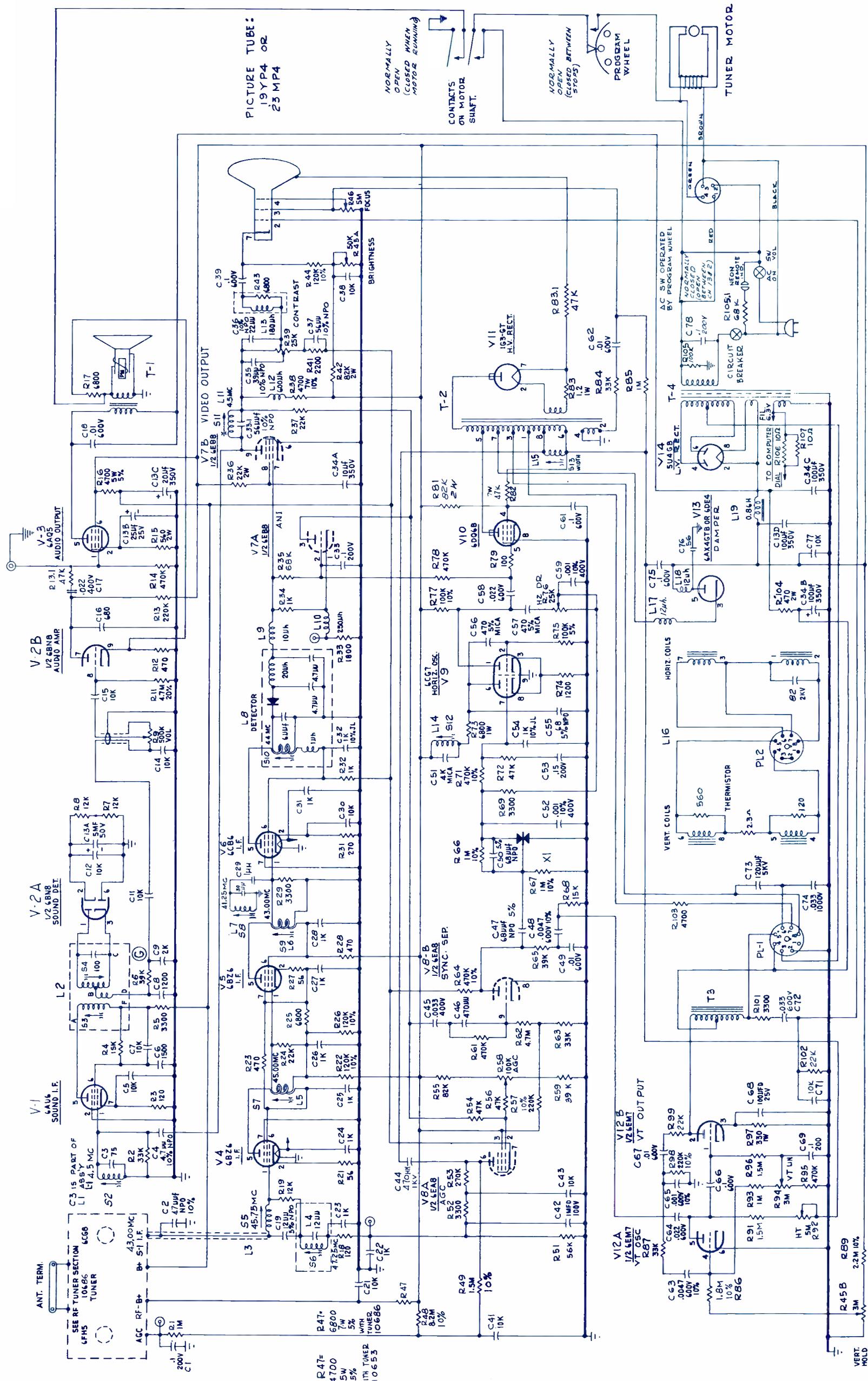
Xcelite TOOL CASE

Announced is a new executive-type service case. With a 40-tool capacity, this smart-looking, top grain leather case is capable of carrying practically every tool required for radio, TV and electronic repairs. Leather thongs hold tools neatly and firmly in place, yet permit quick, easy removal. Felt-type lining protects tool finishes and handles. Case is reinforced against rugged use. Black or brown models available. Xcelite, Inc., Thorne Ave. and Bank St., Orchard Park, N. Y.

For more data, circle 1-72-4 on coupon, p. 50

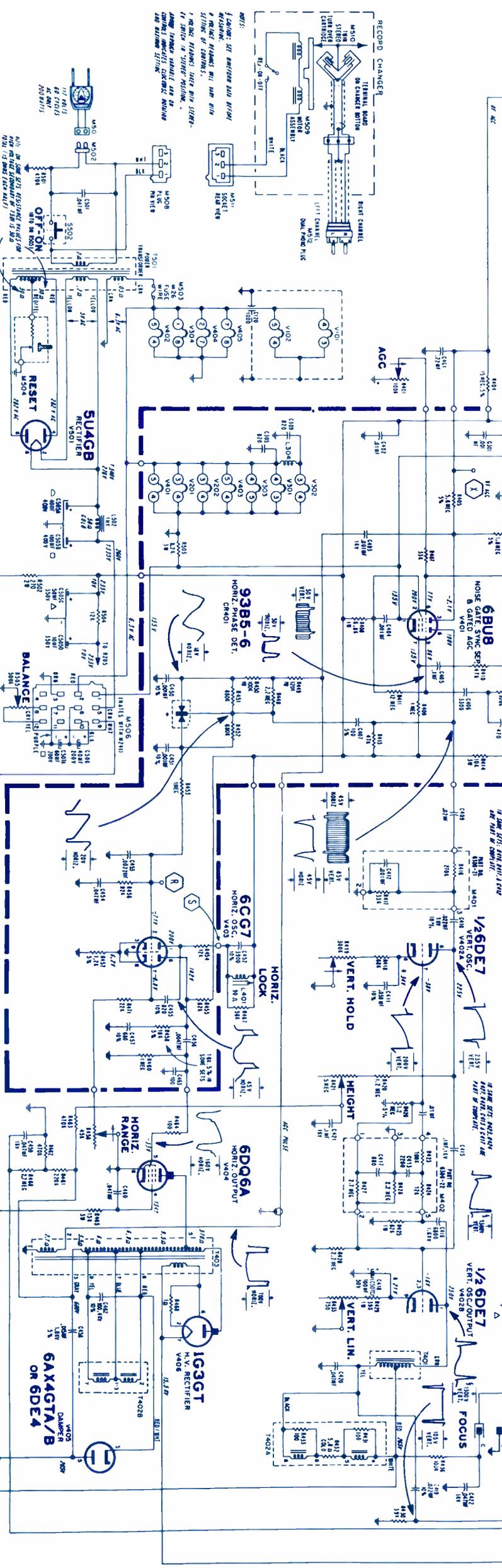
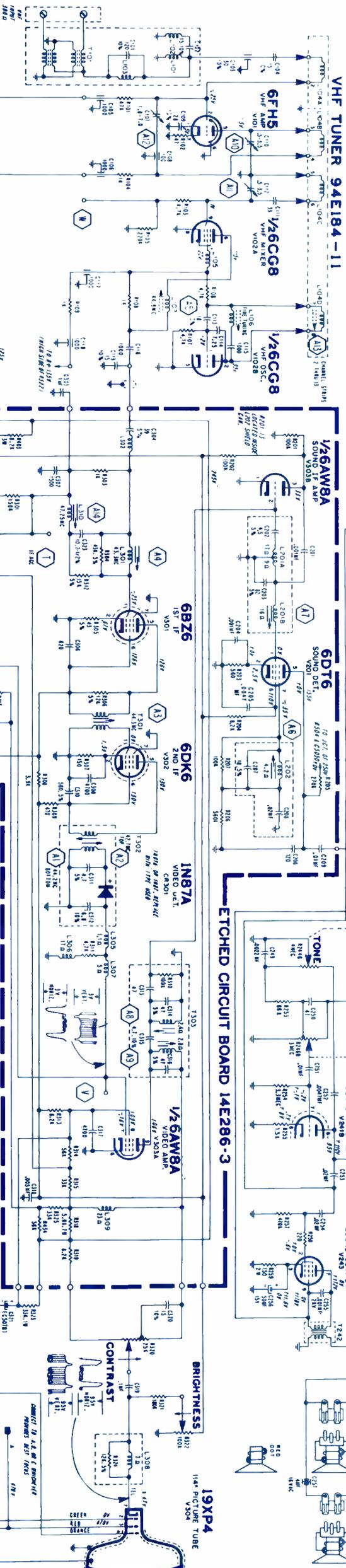
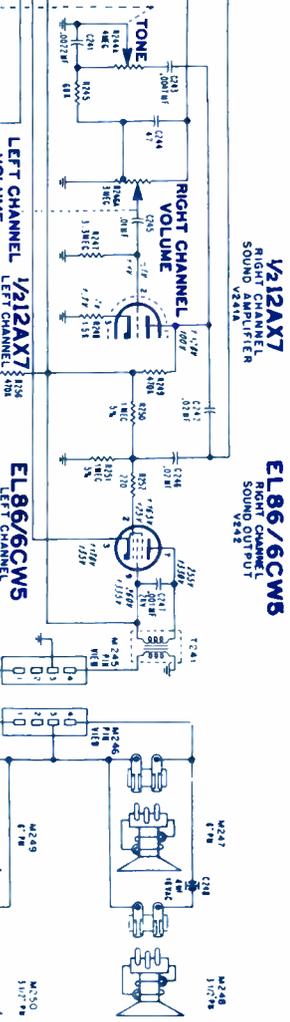
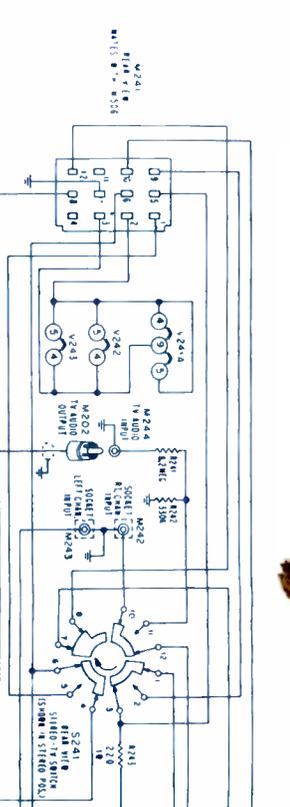
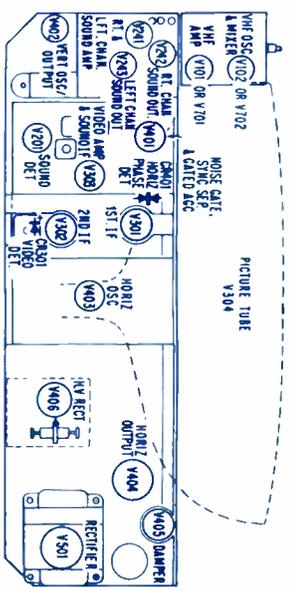


AUDIO SKT TO WR23



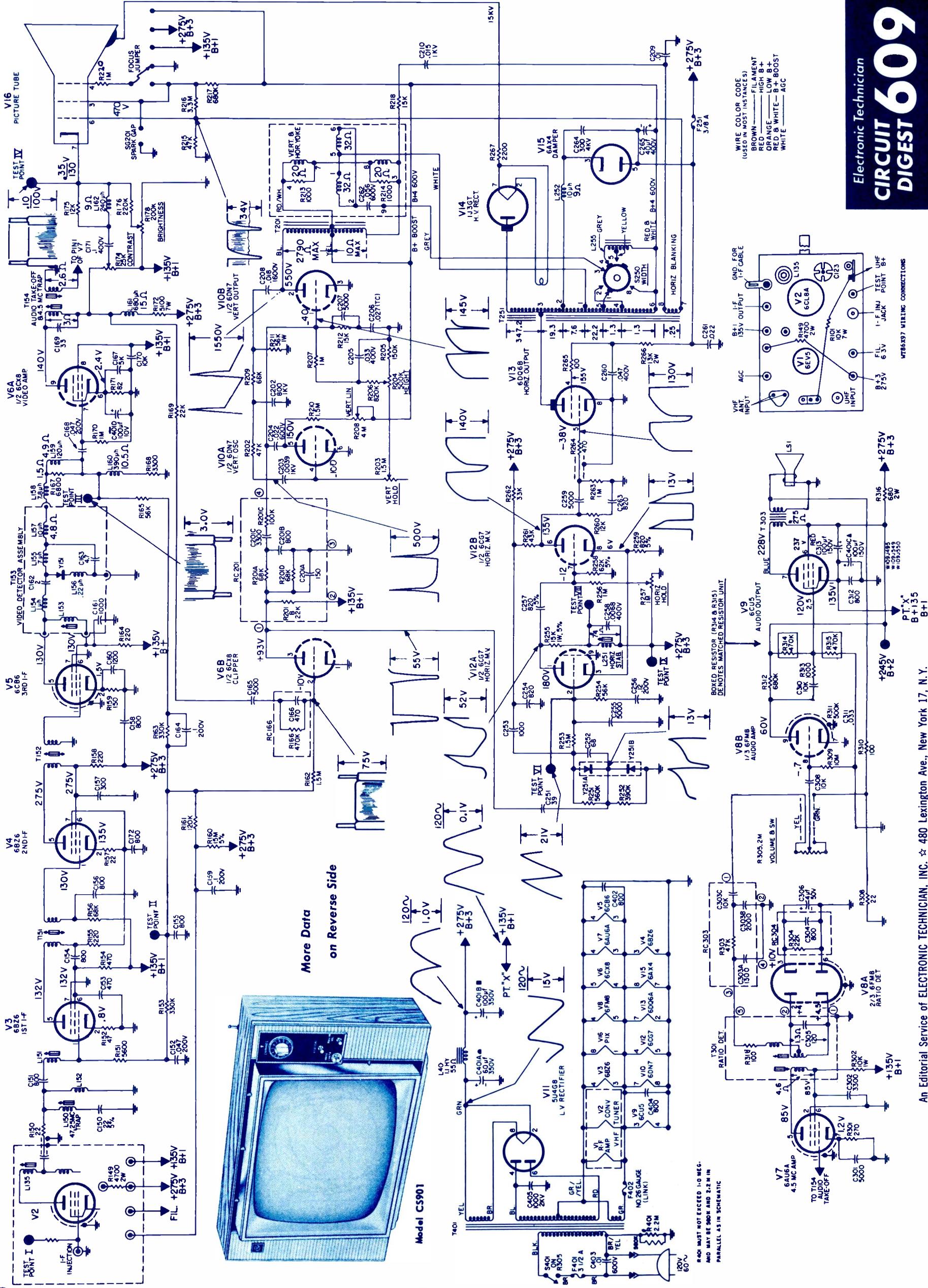
ELECTRONIC TECHNICIAN 608

ADMIRAL TV Chassis 15H1 With Stereo Chassis 3Y1



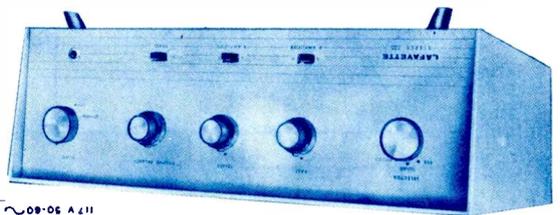
RECORD CHANGER
TERMINAL BOARD
STEREO SOUND
LEFT CHANNEL
RIGHT CHANNEL
DUAL POWER SUPPLY
WHITE
M501
M502
M503
M504
M505
M506
M507
M508
M509
M510
M511
M512
M513
M514
M515
M516
M517
M518
M519
M520
M521
M522
M523
M524
M525
M526
M527
M528
M529
M530
M531
M532
M533
M534
M535
M536
M537
M538
M539
M540
M541
M542
M543
M544
M545
M546
M547
M548
M549
M550
M551
M552
M553
M554
M555
M556
M557
M558
M559
M560
M561
M562
M563
M564
M565
M566
M567
M568
M569
M570
M571
M572
M573
M574
M575
M576
M577
M578
M579
M580
M581
M582
M583
M584
M585
M586
M587
M588
M589
M590
M591
M592
M593
M594
M595
M596
M597
M598
M599
M600
M601
M602
M603
M604
M605
M606
M607
M608
M609
M610
M611
M612
M613
M614
M615
M616
M617
M618
M619
M620
M621
M622
M623
M624
M625
M626
M627
M628
M629
M630
M631
M632
M633
M634
M635
M636
M637
M638
M639
M640
M641
M642
M643
M644
M645
M646
M647
M648
M649
M650
M651
M652
M653
M654
M655
M656
M657
M658
M659
M660
M661
M662
M663
M664
M665
M666
M667
M668
M669
M670
M671
M672
M673
M674
M675
M676
M677
M678
M679
M680
M681
M682
M683
M684
M685
M686
M687
M688
M689
M690
M691
M692
M693
M694
M695
M696
M697
M698
M699
M700
M701
M702
M703
M704
M705
M706
M707
M708
M709
M710
M711
M712
M713
M714
M715
M716
M717
M718
M719
M720
M721
M722
M723
M724
M725
M726
M727
M728
M729
M730
M731
M732
M733
M734
M735
M736
M737
M738
M739
M740
M741
M742
M743
M744
M745
M746
M747
M748
M749
M750
M751
M752
M753
M754
M755
M756
M757
M758
M759
M760
M761
M762
M763
M764
M765
M766
M767
M768
M769
M770
M771
M772
M773
M774
M775
M776
M777
M778
M779
M780
M781
M782
M783
M784
M785
M786
M787
M788
M789
M790
M791
M792
M793
M794
M795
M796
M797
M798
M799
M800
M801
M802
M803
M804
M805
M806
M807
M808
M809
M810
M811
M812
M813
M814
M815
M816
M817
M818
M819
M820
M821
M822
M823
M824
M825
M826
M827
M828
M829
M830
M831
M832
M833
M834
M835
M836
M837
M838
M839
M840
M841
M842
M843
M844
M845
M846
M847
M848
M849
M850
M851
M852
M853
M854
M855
M856
M857
M858
M859
M860
M861
M862
M863
M864
M865
M866
M867
M868
M869
M870
M871
M872
M873
M874
M875
M876
M877
M878
M879
M880
M881
M882
M883
M884
M885
M886
M887
M888
M889
M890
M891
M892
M893
M894
M895
M896
M897
M898
M899
M900
M901
M902
M903
M904
M905
M906
M907
M908
M909
M910
M911
M912
M913
M914
M915
M916
M917
M918
M919
M920
M921
M922
M923
M924
M925
M926
M927
M928
M929
M930
M931
M932
M933
M934
M935
M936
M937
M938
M939
M940
M941
M942
M943
M944
M945
M946
M947
M948
M949
M950
M951
M952
M953
M954
M955
M956
M957
M958
M959
M960
M961
M962
M963
M964
M965
M966
M967
M968
M969
M970
M971
M972
M973
M974
M975
M976
M977
M978
M979
M980
M981
M982
M983
M984
M985
M986
M987
M988
M989
M990
M991
M992
M993
M994
M995
M996
M997
M998
M999
M1000

January • 1961

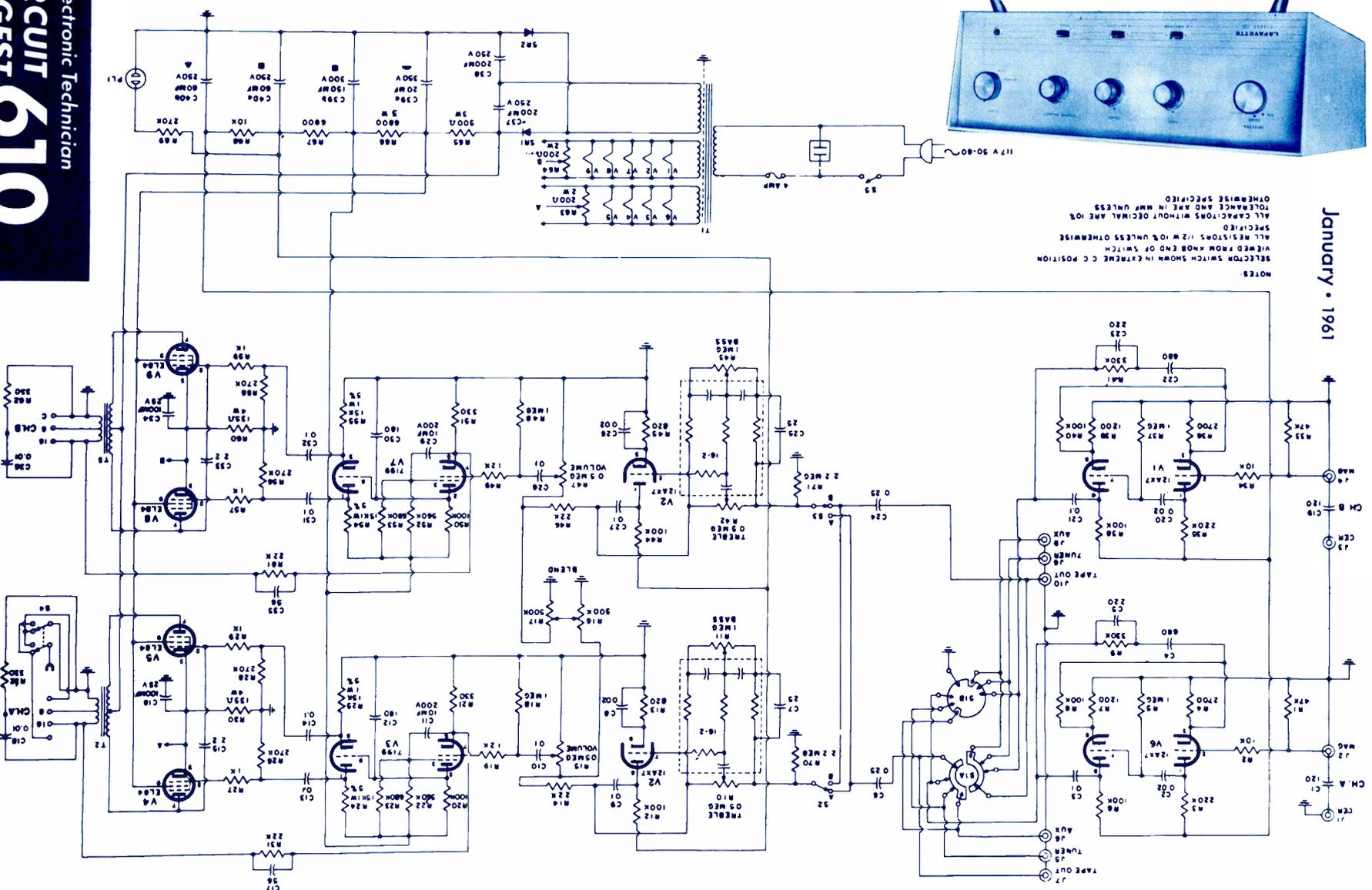


LAFAYETTE Stereo Amplifier Model KT-236

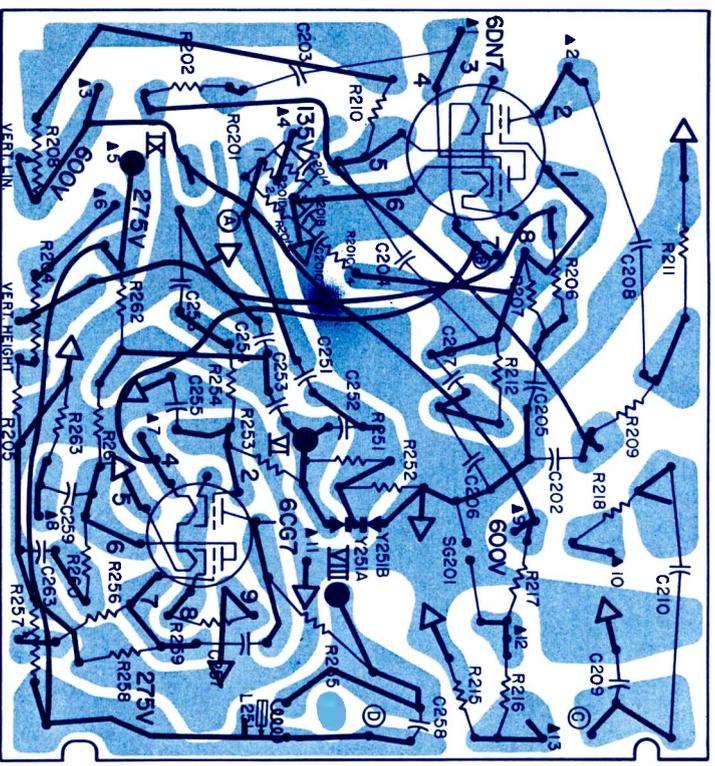
January • 1961



NOTES:
 SWITCH SHOWN IN EXTREME C POSITION
 ALL CAPACITORS WITHOUT DECIMAL ARE 10%
 TOLERANCE AND ARE IN MUF UNLESS
 OTHERWISE SPECIFIED
 ALL RESISTORS 1/2 W 10% UNLESS OTHERWISE
 SPECIFIED
 VIEWED FROM FRONT END OF SWITCH

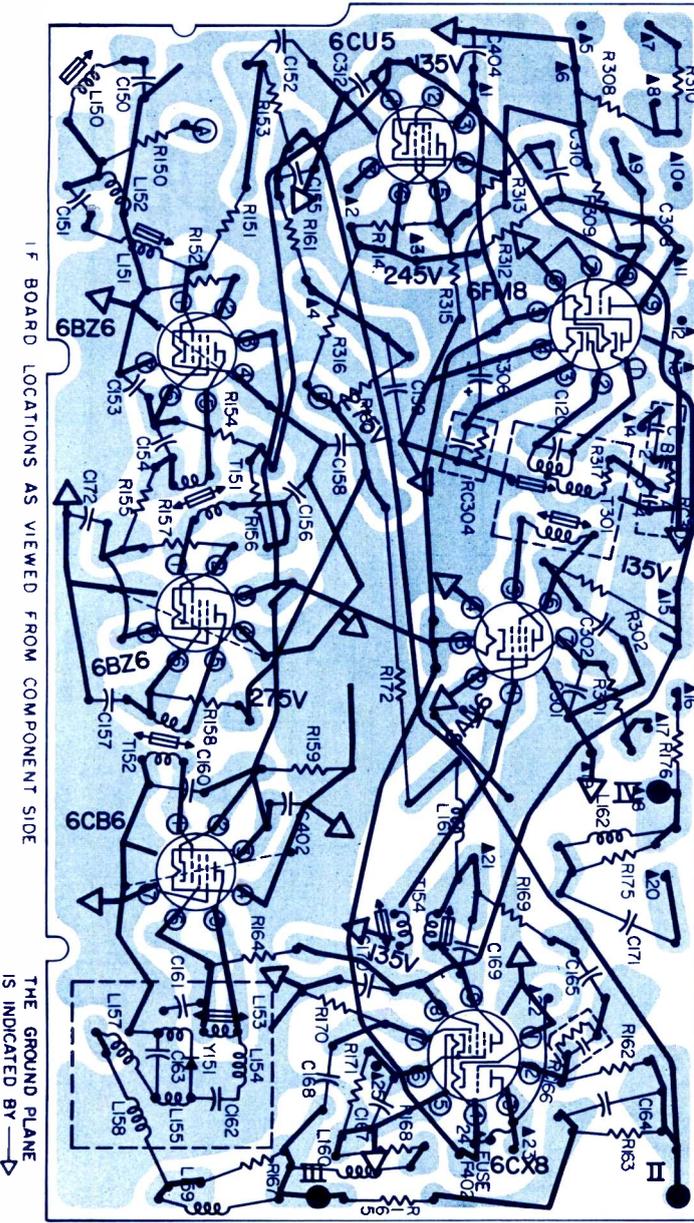


- ROMAN VIII NUMERALS**
 REPRESENT TEST POINTS
- CIRCLED A LETTERS**
 REPRESENT INTERCONNECTING WIRES
 SOLDERED INTO BOARD
- TRIANGLE (Δ) NUMBERS**
 DENOTE WIRE WRAP TERMINALS MOUNTED ON
 COMPONENTS TO CONNECT WIRES TO SW
 OTHER COMPONENTS
- More Data**
 on
Reverse Side



SWEEP BOARD COMPONENT LOCATIONS AS VIEWED FROM COMPONENT SIDE

- TRIANGLE (Δ) NUMBERS**
 DENOTE WIRE WRAP TERMINALS MOUNTED ON
 BOARD TO CONNECT WIRES FROM OTHER COMPONENTS
- ▲ 1 TO TUNER FILAMENT CONNECTION**
▲ 2 TO AUDIO OUTPUT TRANSFORMER
- ▲ 3 TO C313+**
▲ 4 TO TUNER AGC TERMINAL
**▲ 5 THRU A14, A17 & A19, SEE AUDIO CABLE AND
 CONNECTION DRAWING VARIATIONS**
▲ 15 TO C403 & C13-
▲ 16 TO BRIGHTNESS CONTROL ARM
▲ 18 TO PIN 7, V16 (CRT)

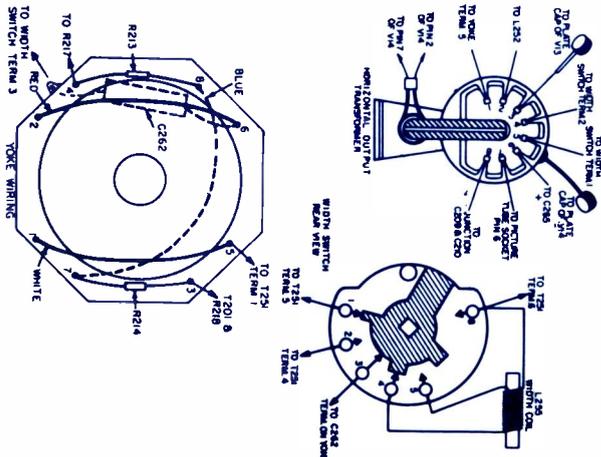


IF BOARD LOCATIONS AS VIEWED FROM COMPONENT SIDE

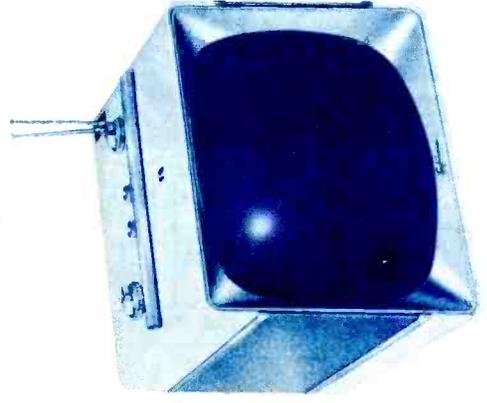
THE GROUND PLANE
 IS INDICATED BY →

GENERAL ELECTRIC
 TV Chassis M575
 Models CS733, CS734,
 CS901, CS902

Electronic Technician
CIRCUIT DIGEST
609



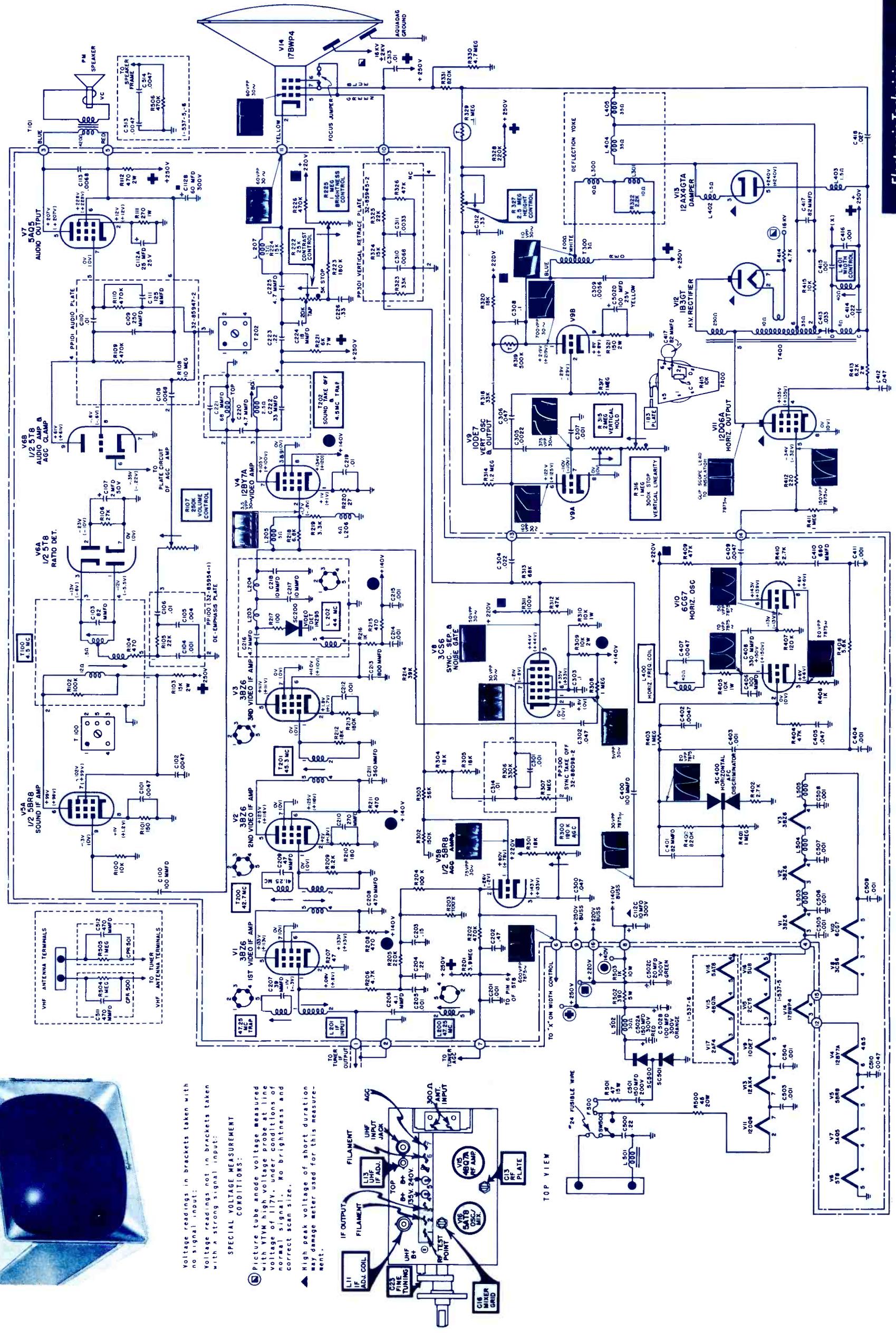
- ROMAN II NUMERALS**
 REPRESENT TEST POINTS
- ▲ 20 TO CONTRAST CONTROL ARM**
▲ 21 TO CONTRAST CONTROL
▲ 22 TO POWER TRANSFORMER T401
▲ 23 TO C403 ON SWEEP BOARD
▲ 24 TO C403 ON SWEEP BOARD
▲ 25 TO C400
- CIRCLED A LETTERS**
 REPRESENT INTERCONNECTING WIRES SOLDERED
 INTO BOARD
- ② TUNER IF LINK CABLE**
③ TO C401B

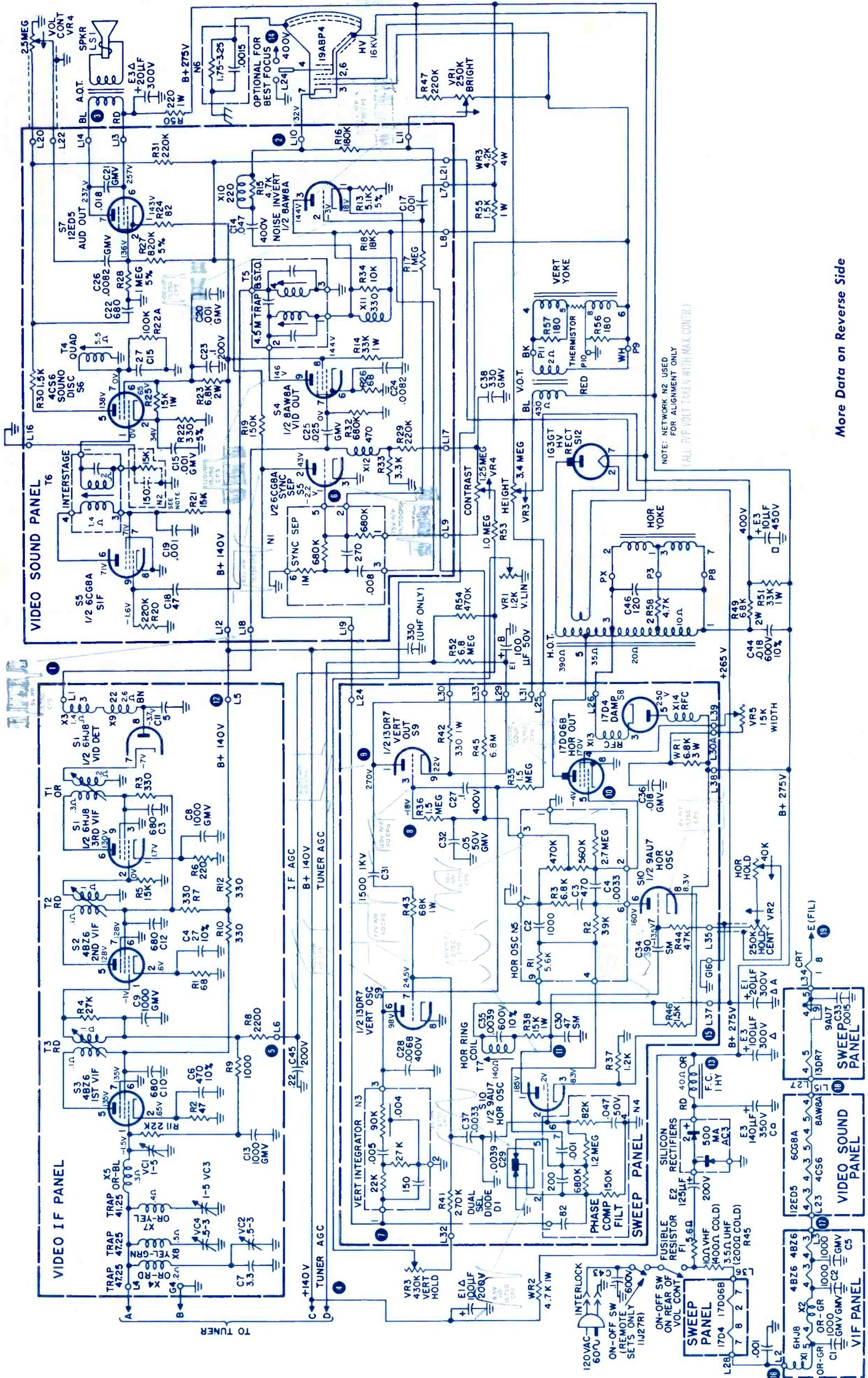


Voltage readings in brackets taken with no signal input;
Voltage readings not in brackets taken with a strong signal input:

SPECIAL VOLTAGE MEASUREMENT

- Ⓢ Pictures tube anode voltage measured with VTVM high voltage probe at line voltage of 177V under conditions of correct scan size.
- ▲ High peak voltage of short duration may damage meter used for this measurement.





More Data on Reverse Side

ELECTRONIC TECHNICIAN

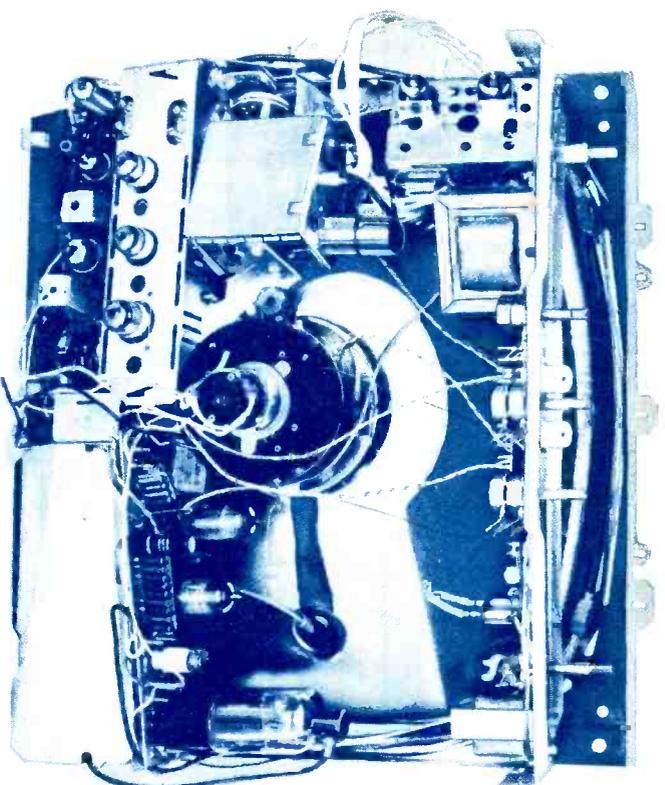
Trademark

CIRCUIT DIGESTS

In This Issue (No. 101)

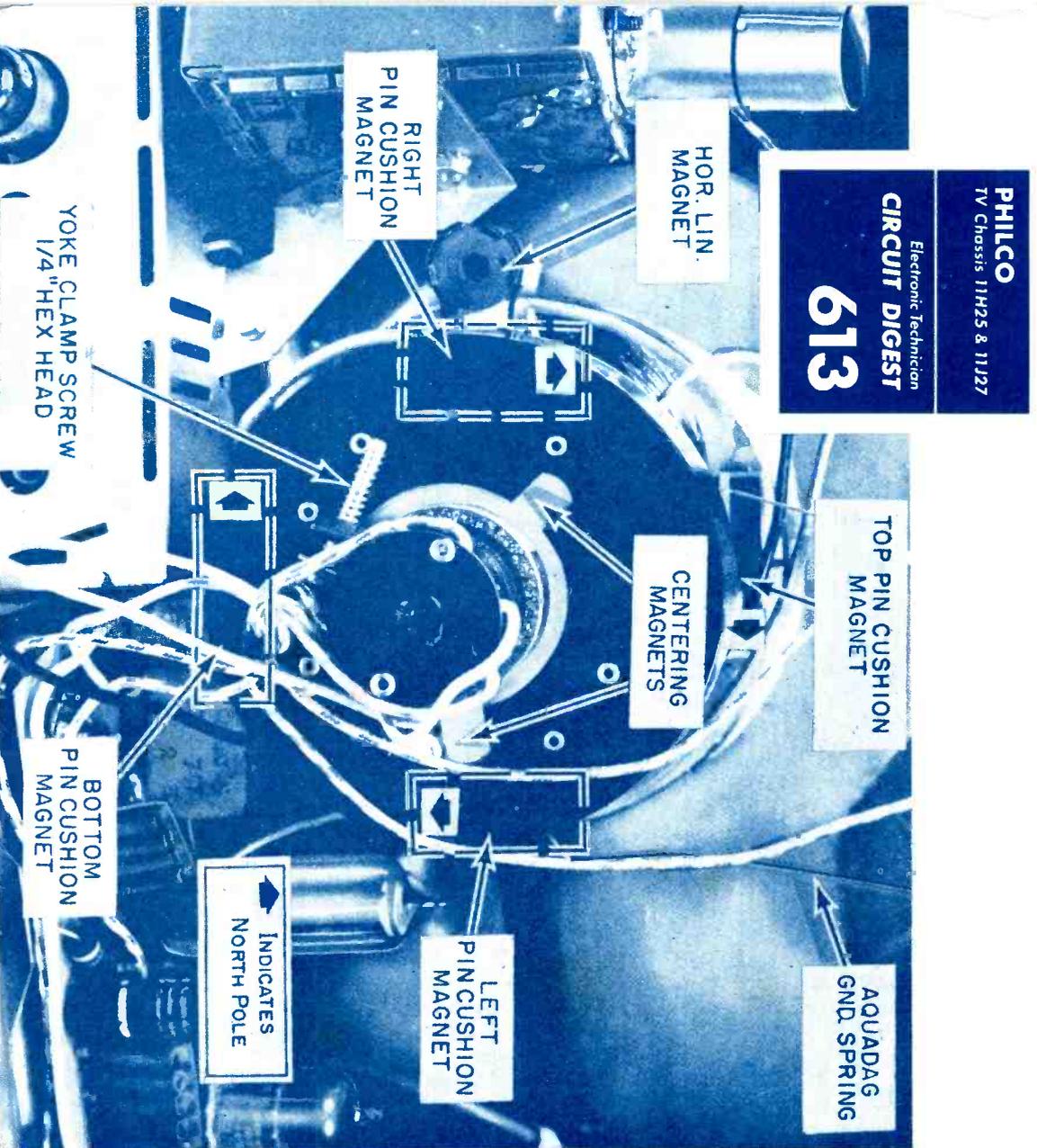
Circuit Digest Schematic No.

ADMIRAL TV Chassis 15H11 with Stereo Chassis 3Y1	608	PACKARD BELL TV Chassis 88-9 Models 19T3 & 23T3	607
GENERAL ELECTRIC TV Chassis M575 Models CS733, CS734, CS901, CS902	609	PHILCO TV Chassis 11H25 & 11J27	613
LAFAYETTE Stereo Amplifier Model KI-236	610	SHERWOOD FM Stereo Tuner Model S-3000 III	612
		SYLVANIA TV Chassis 1-537-5, -6 Models 17P Series	611

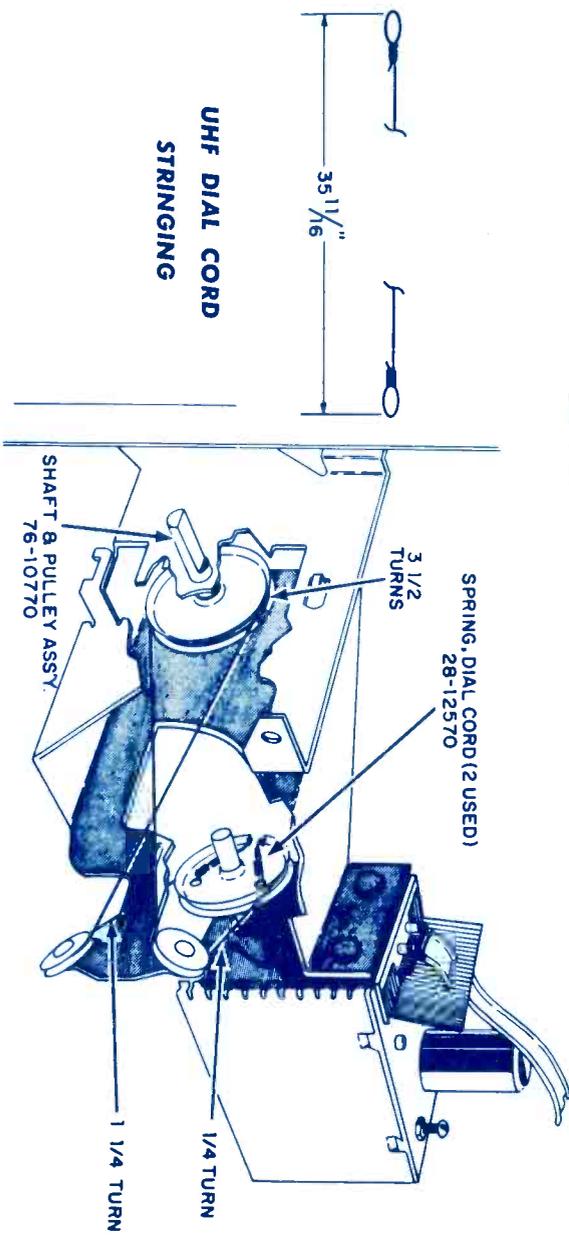


More Data on Reverse Side

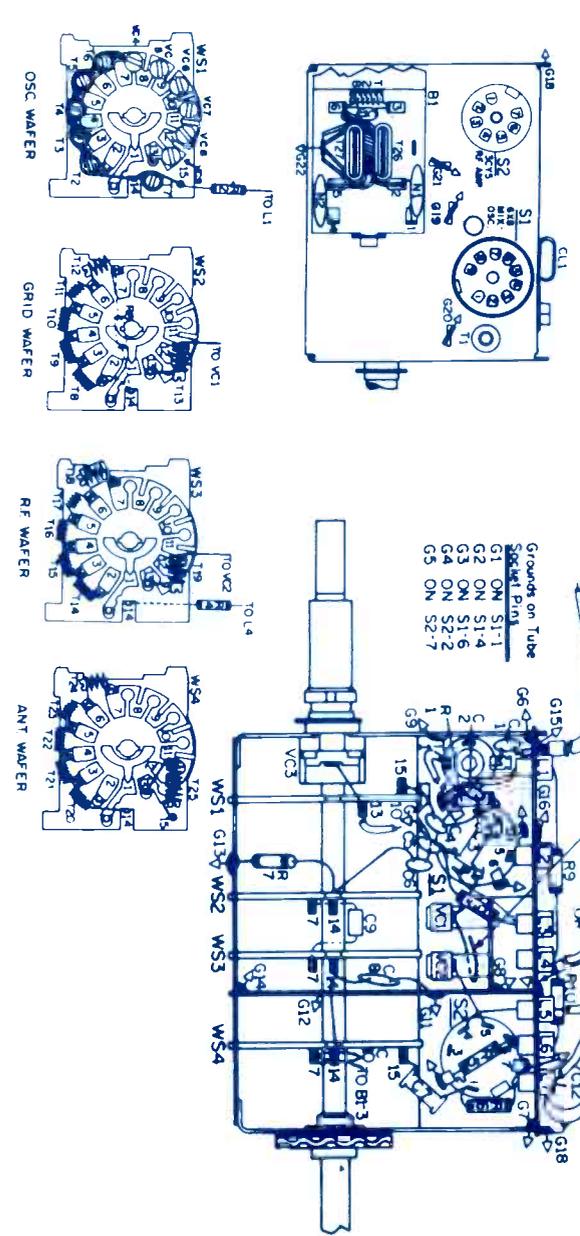
PHILCO
TV Chassis 11H25 & 11J27
Electronic Technician
CIRCUIT DIGEST
613



SPRING, DIAL CORD (2 USED)
28-12570



COMPONENT PLACEMENT,
TUNER T-102





PUZZLED

...no need to be

look to this sign of assurance!

The Distributor displaying this sign will solve your tuner problems at a profit to you.

He has available the New Standard Tuner Replacement Guide, including replacement parts listings. This is the only Guide of its kind in the world. Covers all Standard tuners produced through 1959. Includes replacements for many tuners not produced by Standard. He handles our 48-hour Factory Guaranteed Repair Service and Trade-In Allowance on unreparable Standard tuners.

See This Authorized Distributor Today

AUTHORIZED

Standard **COIL**

TV TUNER DISTRIBUTOR

GUARANTEED  **REPLACEMENT TUNER** - **FACTORY SERVICE** - **PARTS**

standard kollsman

INDUSTRIES INC. *Formerly Standard Coil Products Co., Inc.*
2085 N. HAWTHORNE AVENUE, MELROSE PARK, ILLINOIS

For more data, circle 1-C3-1 on coupon, p. 50

How do your customers rate you?



Your reputation is based largely on what happens *after* you leave the scene of each service call. For this reason the name on the tubes you install makes a world of difference. RCA tubes are designed and manufactured to assure customer confidence in you as well as in RCA.

RCA tube quality is your best insurance against call-backs due to premature tube failure.

RCA tube performance puts your workmanship in the best light and protects it through rigid quality control.

RCA's trademark symbolizes a name and reputation customers have respected for decades.

Your customers know that those red-white-and-black RCA tube cartons in your tube caddy represent the most trusted name in electronics. Remember, customer confidence is the cornerstone of your business.

To protect your service reputation before, during and after every service call, make sure your next tube order specifies... **RCA TUBES.**

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



SIGN OF A SERVICE JOB WELL DONE



The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

®