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July, 1961

FRONT COVER Transistor testers have become one of the basic test instruments used in radio-TV shops. Eight of these transistor testers are examined by ET's Editorial Staff, working with 52 transistors, two transistor radios, and a variable power supply. Based on the results of the tests, instrument test capabilities are compared, including their good and bad features. For a penetrating, exclusive study of eight low-cost transistor testers, see article starting on page 32.



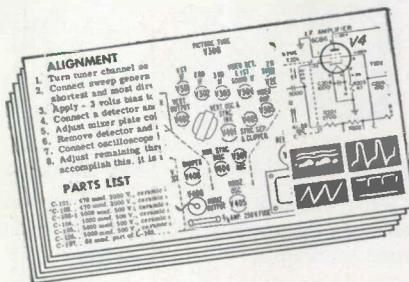
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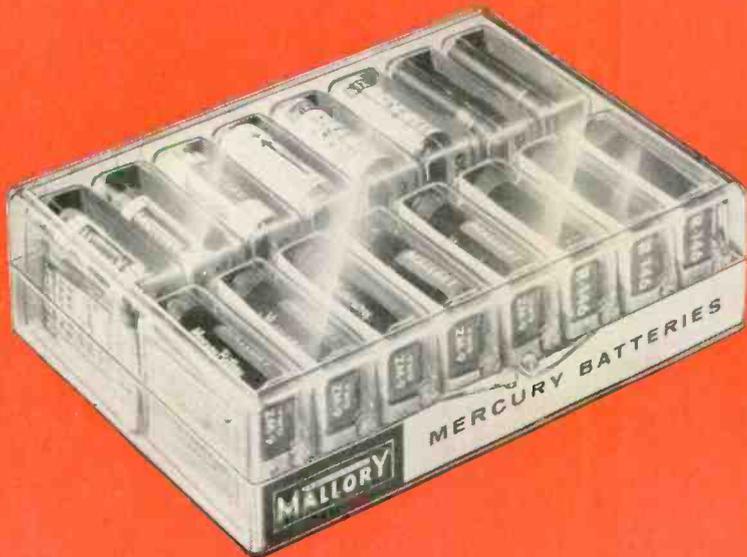
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RCA: Citizens Band Radio Model MARK VII "Radio Phone"
SYLVANIA: TV Chassis 552-1, -2, -9

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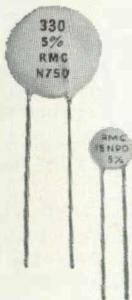
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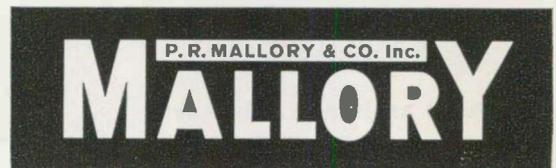
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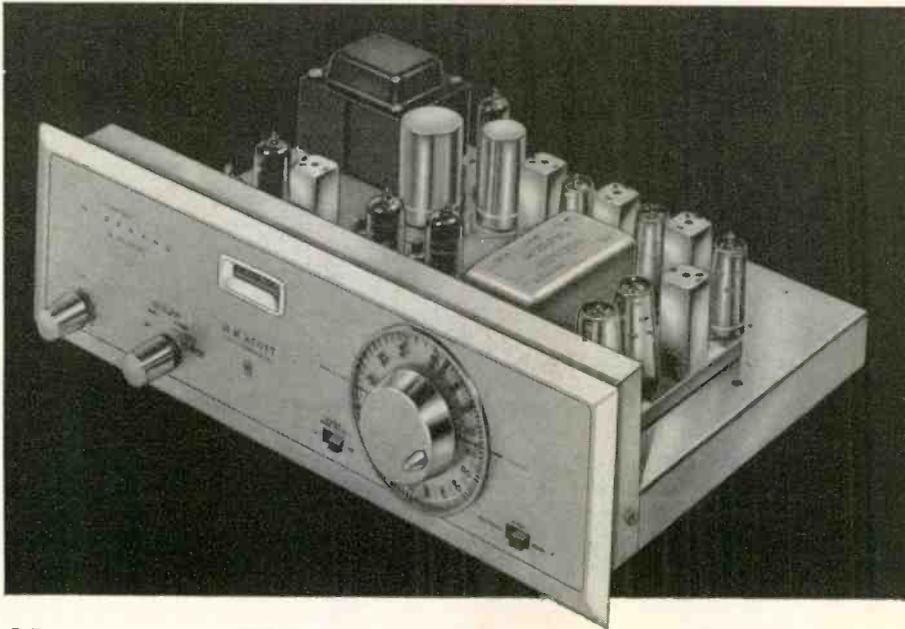
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New H. H. Scott FM Stereo Multiplex Tuner uses Wide-Band design for top performance

Here it is! No adaptor needed! The world's first Wide-Band tuner designed specifically for multiplex . . . H. H. Scott's new Model 350 FM Multiplex Stereo Tuner.

The FCC, in its recent acceptance of FM stereo multiplex, said that the approved system " . . . like any multiplex transmission system, will increase energy transmission at the edges of the channel involved. Accordingly, for optimum stereophonic reception, the (tuner's) bandwidth . . . must be considerably greater than that of monophonic (tuners) . . . "*

From our very first design . . . the revolutionary 310A . . . H. H. Scott incorporated substantially wider IF bandwidth than conventional tuners. This gave better selectivity and usable sensitivity. The new 350 incorporates this same exceptional circuitry allowing reception of even weak multiplex stations with amazing clarity. You get other benefits, too—the 2 MC Wide-Band de-

tor provides superior rejection of interference and complete freedom from drift. The Wide-Band design of the IF's and detector give the new 350 a remarkable usable sensitivity of 2.5 μv measured by stringent IHFM standards.

If you are considering a new tuner, or addition of an adaptor to a conventional narrow-band tuner, first listen to the new H. H. Scott Model 350 Wide-Band FM Multiplex Stereo Tuner. Its superiority in sound quality is so dramatically different that you will not want to settle for less.

Important Technical Information

Usable (IHFM) Sensitivity: 2.5 μv . 10 tubes, 11 diodes. Famous H. H. Scott silver plated front end. Tuning meter. Performance matches FCC transmission specifications. Can receive either monophonic or stereo multiplex programs. Special circuitry for perfect stereo tape recording. Dimensions in handsome accessory case 15 $\frac{1}{2}$ "W x 5 $\frac{1}{4}$ "H x 13 $\frac{1}{4}$ "D. Matches styling of all H. H. Scott amplifiers. \$199.95 **, case extra.

*see paragraph 36, FCC Report and Order, Docket no. 13506, 4/19/61. Emphasis ours.

** slightly higher West of Rockies.



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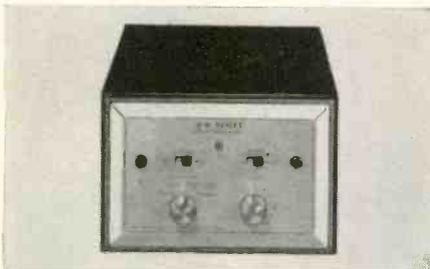
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Wide-Band Multiplex Adaptor

Important News for H. H. Scott Tuner Owners
H. H. Scott has once again protected your investment against obsolescence. Your tuner, regardless of age or model, can be quickly converted to multiplex with the new Model 335 Wide-Band Multiplex Adaptor. Because of H. H. Scott's unique no-compromise Wide-Band design, we can guarantee superior multiplex reception only when the 335 and an H. H. Scott tuner are used together. 5 tubes, 8 diodes. \$99.95, case extra.

Editor's Memo



It had to happen. I've just learned about a service utilizing electronics to help you select the right mate.

The Scientific Introduction Service, 186 E. 73 St., New York City, interviews and tests you. The resulting information on personality pattern, attitudes, preferences, age, race, religion and similar data are punched into a card. Then when you look for a wife, the electronic sorter goes to work and matches you up with some fair damsel in search of a husband.

I guess there's nothing wrong with the idea, except that it seems impossible to catalog all the intangibles which make for love.

Some people are attracted to similar personalities, others to opposites.

Did you ever know and like two people whom you thought would like each other? So you introduce them, and it turns out they can't stand each other. Interaction between individuals is not too predictable.

The problem of matching people brings to mind the story of the fellow who enters the fancy establishment of an oh-so-high-class TV dealer. He tells the salesman that he would like to buy a set. The salesman starts to pepper him with questions.

"What is your name, sir? Your wife's name? How many children do you have? Their ages, please? What do you do for a living? What school did you graduate from? How much money do you earn? Do you sleep in a double bed or twin beds?"

The exasperated customer says, "Hold on. What's the third degree for? All these personal questions. I just want to buy a TV set."

"Well, explained the salesman, "we never sell just any old set. Our sets are custom made to suit just your personality. The picture tube is selected in the East on the basis of your background. The coils are wound in the Midwest according to your personality. All the parts are sent Air Express to the West Coast for special assembly. Then the chassis is rushed to the South for insertion in a cabinet that is hand carved in tune with your psychological make-up.

"We then get it, and adjust it and adjust it until the audio and video reflect you—the real you."

"Listen," says the customer, "I want the set tomorrow for the World Series."

"Don't worry," replies the salesman, "you'll have it."

Al Foman

What Does F. C. C. Mean To You?

What is the F. C. C.?

F. C. C. stands for Federal Communications Commission. This is an agency of the Federal Government, created by Congress to regulate all wire and radio communication and radio and television broadcasting in the United States.

What is an F. C. C. Operator License?

The F. C. C. requires that only qualified persons be allowed to install, maintain, and operate electronic communications equipment, including radio and television broadcast transmitters. To determine who is qualified to take on such responsibility, the F. C. C. gives technical examinations. Operator licenses are awarded to those who pass these examinations. There are different types and classes of operator licenses, based on the type and difficulty of the examination passed.

What are the Different Types of Operator Licenses?

The F. C. C. grants three different types (or groups) of operator licenses—commercial radiotelePHONE, commercial radioteleGRAPH, and amateur.

COMMERCIAL RADIOTELEPHONE operator licenses are those required of technicians and engineers responsible for the proper operation of electronic equipment involved in the transmission of voice, music, or pictures. For example, a person who installs or maintains two-way mobile radio systems or radio and television broadcast equipment must hold a radiotelePHONE license. (A knowledge of Morse code is NOT required to obtain such a license.)

COMMERCIAL RADIOTELEGRAPH operator licenses are those required of the operators and maintenance men working with communications equipment which involves the use of Morse code. For example, a radio operator on board a merchant ship must hold a radioteleGRAPH license. (The ability to send and receive Morse is required to obtain such a license.)

AMATEUR operator licenses are those required of radio "hams"—people who are radio hobbyists and experimenters. (A knowledge of Morse code is necessary to be a "ham".)

What are the Different Classes of RadiotelePHONE licenses?

Each type (or group) of license is divided into different classes. There are three classes of radiotelePHONE licenses, as follows:

(1) **Third Class RadiotelePHONE License.** No previous license or on-the-job experience is required to qualify for the examination for this license. The examination consists of F. C. C. Elements I and II covering radio laws, F. C. C. regulations, and basic operating practices.

(2) **Second Class RadiotelePHONE License.** No on-the-job experience is required for this examination. However, the applicant must have already passed examination Elements I and II. The second class radiotelePHONE examination consists of F. C. C. Element III. It is mostly technical and covers basic radiotelePHONE theory (including electrical calculations), vacuum tubes, transistors, amplifiers, oscillators, power supplies, amplitude modulation, frequency modulation, measuring instruments, transmitters, receivers, antennas and transmission lines, etc.

(3) **First Class RadiotelePHONE License.** No on-the-job experience is required to qualify for this examination. However, the applicant must have already passed examination Elements I, II, and III. (If the applicant wishes, he may take all four elements at the same sitting, but this is

not the general practice.) The first class radiotelePHONE examination consists of F. C. C. Element IV. It is mostly technical covering advanced radiotelePHONE theory and basic television theory. This examination covers generally the same subject matter as the second class examination, but the questions are more difficult and involve more mathematics.

Which License Qualifies for Which Jobs?

The **THIRD CLASS** radiotelePHONE license is of value primarily in that it qualifies you to take the second class examination. The scope of authority covered by a third class license is extremely limited.

The **SECOND CLASS** radiotelePHONE license qualifies you to install, maintain, and operate most all radiotelePHONE equipment except commercial broadcast station equipment.

The **FIRST CLASS** radiotelePHONE license qualifies you to install, maintain, and operate every type of radiotelePHONE equipment (except amateur, of course) including all radio and television stations in the United States, and in its Territories and Possessions. This is the highest class of radiotelePHONE license available.

How Long Does it Take to Prepare for F. C. C. Exams?

The time required to prepare for FCC examinations naturally varies with the individual, depending on his background and aptitude. Grantham training prepares the student to pass FCC exams in a minimum of time.

In the Grantham *correspondence course*, the average beginner should prepare for his second class radiotelePHONE license after from 300 to 350 hours of study. This same student should then prepare for his first class license in approximately 75 additional hours of study.

In the Grantham *resident course*, the time normally required to complete the course and get your license is as follows:

In the **DAY course** (5 days a week) you should get your second class license at the end of the first 9 weeks of classes, and your first class license at the end of 3 additional weeks of classes. This makes a total of 12 weeks (just a little less than 3 months) required to cover the whole course, from "scratch" through first class.

In the **EVENING course** (3 nights a week) you should get your second class license at the end of the 15th week of classes and your first class license at the end of 5 additional weeks of classes. This makes a total of less than 5 months required to cover the whole course, from "scratch" through first class, in the evening course.

HERE'S PROOF that Grantham Students prepare for F. C. C. examinations in a minimum of time. Here is a list of a few of our recent graduates, the class of license they got, and how long it took them:

	License	Weeks
Richard C. Myers, 8404 Longview Rd., Kansas City, Mo.	1st	20
Ben L. Hunter, 370 Bielly Road, Lawrenceburg, Ind.	1st	12
Roy D. Barklind, Rt. #1, Box 18, Anacortes, Washington	1st	12
Keith D. Oyer, 4304 Holmes, Kansas City, Mo.	1st	13
Robert J. Dill, Box 136, Stoystown, Penna.	1st	12
David E. Sahadak, Killdeer, N. Dak.	1st	22
James C. Botkin, RR #1, Prescott, Iowa	1st	20
Bob Ament, 4088 E. 25th Place, Tulsa, Okla.	1st	12

Resident Classes Offered at Four Locations

To better serve our many students throughout the nation, Grantham School of Electronics maintains four separate schools—located in Hollywood, Seattle, Kansas City, and Washington, D. C.—all offering the same resident courses in F. C. C. license preparation. (Correspondence courses are conducted from Hollywood.)

For further details concerning F. C. C. licenses and our training, send for our FREE booklet, "Careers in Electronics". Clip the coupon below and mail it to the School nearest you.

Get your First Class Commercial F. C. C. License Quickly by training at



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 821 - 19th Street, N.W. Washington 6, D. C. (Phone: ST 3-3614)

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Please send me your free booklet telling how I can get my commercial F. C. C. license quickly. I understand there is no obligation and no salesman will call.

Name _____ Age _____

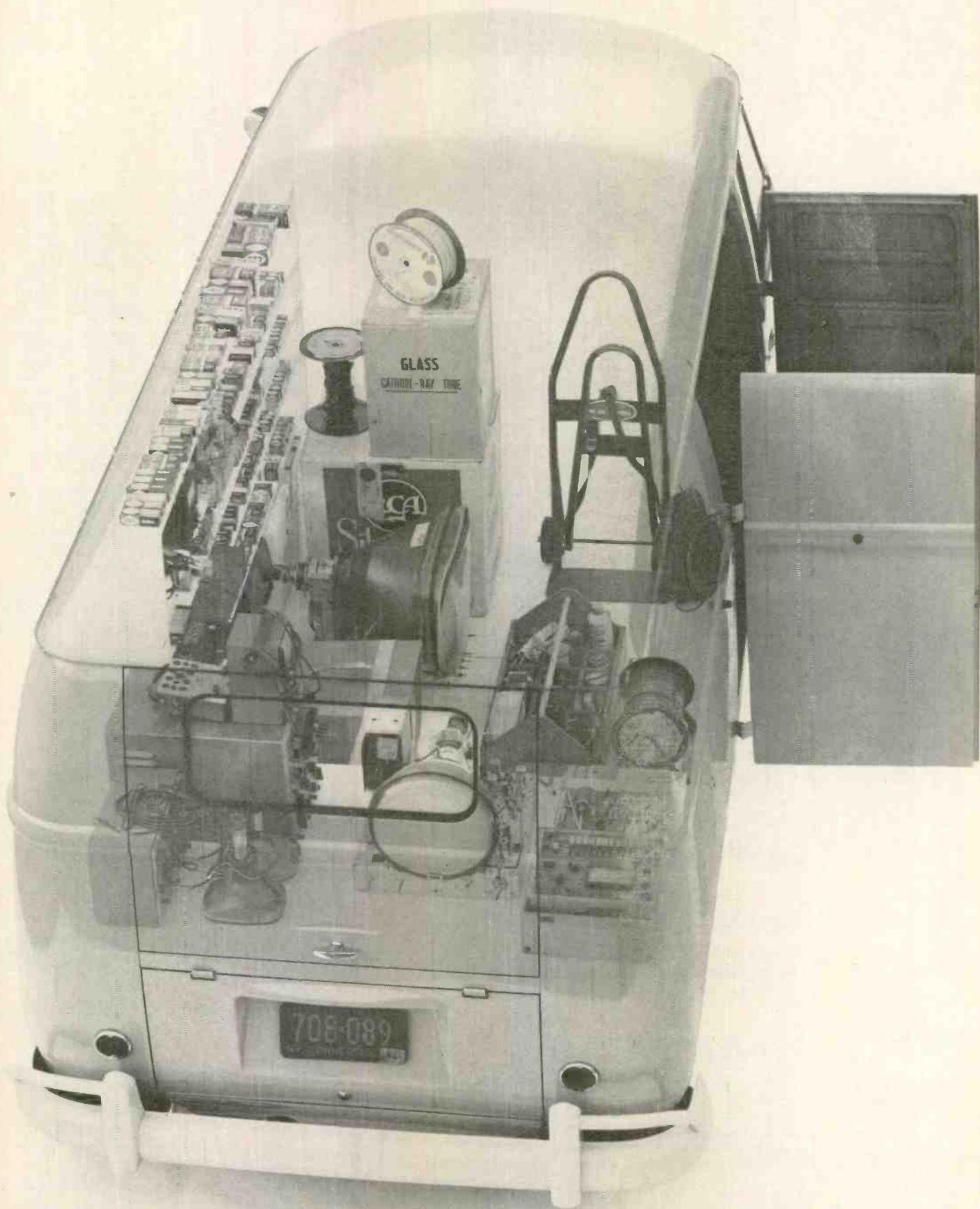
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City _____ State _____

I am interested in: Home Study, Seattle classes

Hollywood classes, Kansas City classes, Washington classes

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The savings come from gas, tires and service. Some people get 30 miles a gallon with our truck. (Almost all owners get over 20. General Electronics TV Service in St. Paul gets 22, all stop-and-go in town.) Our average is 24.

Tires last about 35,000 miles. Other trucks get about 20,000.

Parts? \$17.14† for a cylinder with piston and rings. \$22.15† for a rear corner panel. (Plus labor.) And VW parts are well-nigh perfect.

After all, we've been refining the same basic truck for 12 years now. Most parts are interchangeable from year to year. That's why it's easy for VW dealers to stock parts for every model, '51 to '61—and why VW truck service is almost always finished the same day.

Loading a Volkswagen is an experience.

Our side doors give you a doorway almost 4 feet wide in the middle of the truck. If you want doors on both sides, it's only \$85† more.

General Electronics finds the doors on one side ample. Our low loading height (19.7 inches) saves lifting on heavy consoles and the doorway makes big sets easy to get in without scratching.

If you wish, your Volkswagen dealer can also arrange to have special racks put on the roof for ladders (for antenna service) as well as interior shelves installed for spare parts.

Many owners put tool kits and testing equipment in the rear. We have a rear door, too. And if you want it, there's a swivel seat for reaching tools from the front. This is \$70.90.†

You can park our truck in 3 feet less space than other trucks take. And in bad weather, our engine in the rear gives you extra traction in mud or snow when other trucks are socked in.

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Front panel selection of one of 3 transmit crystals with continuous receiver tuning over all 23 CB channels, or a fourth transmit crystal with appropriate receiving crystal. Press-to-talk button on microphone; transmit-receive switching accomplished by high-quality relay with minimum capacity between contacts to prevent current leakage at RF frequencies. Superhet receiver with RF stage for high sensitivity & proper signal-to-noise ratio. 1750 KC IF strip for unequalled image rejection & freedom from oscillator "pulling" on strong signals. IF strip prealigned so that only "touchup" alignment without instruments is needed. Current metering jack in series in cathode circuit allows checking of input power to transmitter final & adjusting it to FCC limit. 13-tube performance (4 dual function tubes, 4 single function tubes, plus germanium diode). Adjustable squelch control (in addition to automatic noise limiter). Optimum adjustment to any popular CB antenna assured through use of variable pi network in output. AVC. 3" x 5" oval PM speaker. Supplied complete with 8 tubes & 1 transmit crystal (extra crystals, \$3.95 each).

The entire transmitter oscillator circuit and RF final in every EICO transceiver, kit and wired, is pre-mounted, prewired, pretuned, and sealed at the factory (about 3 hours of skilled labor, precision adjustments and testing), complying with FCC regulations (section 19.71, part d). This permits you to build the kit and put it on the air without the supervision of a commercial radiotelephone license.



**Standard 760 Series
of CB Transceivers
from
Kit \$59.95 Wired \$89.95**

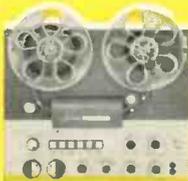
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**LETTERS
To the Editor**

Mandatory UHF-TV

Editor, ELECTRONIC TECHNICIAN:

Reference is made to your May 1961 editorial, in which you discuss the relative cost of mandatory installation by manufacturers of UHF-TV tuning facilities.

I represent the Associated Police Communications Officers, Inc., which is an organization established in 1935 to serve Police and Public Safety interests. Our members are connected with Public Safety organizations throughout the U.S. You are, no doubt, aware of the system of priorities in the communications field. They start with National Security, Safety at Sea, Safety in the Air, and then Public Safety which includes Police, Fire, Forestry, Special Emergency, etc.

From your editorial, I gather that you are of the opinion that there is sufficient spectrum space for all of the services in the present Federal Communications Commission allocations, and provided the VHF television band were vacated in the foreseeable future the FCC would have difficulty finding services to fill in the extra spectrum. We, in the Public Safety field, have a very difficult problem in metropolitan areas due to shortage of spectrum space. Recently, we were required by the FCC to split our channels into secondary and tertiary portions. Many areas have already exhausted these additional split channels and will require more in the near future in order to perform our basic function of protecting the life and property of people in the U.S. You state in next to the last paragraph in your editorial that, "Over-all allocation needs across the entire radio spectrum may make this necessary." We in the Public Safety field feel the need greatly of additional spectrum space and I am sure the FCC is cognizant of these shortages.

We are in favor of your suggestion of lifting the excise tax on all channel TV sets and, no doubt, this would offset some of the cost of the mandatory all channel tuners.

R. J. EVANS, President

Associated Police Communications Officers
East Lansing, Mich.

Fire Dept. Alarm

Editor, ELECTRONIC TECHNICIAN:

Re your May 1961 editorial comment on Mr. Marshall's letter, page 8, be advised that the Plectron Alerting System is used throughout the U. S. It is easily the widest used tone alerting equipment sold to fire departments at the present time. "Electralert" is a newcomer and has, at the present time, probably only half a dozen experimental installations in use, while Plectron systems are being used by more than 500 fire departments.

The Plectron equipment is of about the same sensitivity as the "Electralert," but is considerably more economical. In addition the flexibility and choice of tone circuits is much wider than is offered by "Electralert."

I am sure you are also aware that Motorola and General Electric have built such equipment for a number of years.

A. H. COLLINS,
Manager

Plectron Corp.,
Overton, Nebraska

(Continued on page 10)

SPRAGUE CERAMIC CAPACITORS

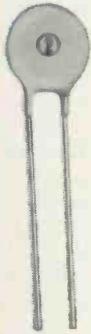
THE Complete LINE THAT OFFERS MORE THAN MERE "CAPACITY"

"Rated" capacitance is not enough . . . *actual* capacitance during operation is equally important. Excessively high or low values as well as capacitance change with temperature can foul up a TV or radio set. Therefore, characteristics such as Capacitance Stability, Capacitance Tolerance, and Temperature Coefficient of Capacitance must be considered in replacement applications.

That's why the Sprague Ceramic Line is varied and broad—it includes capacitors with electrical and mechanical characteristics to meet practically every replacement requirement.

See complete listings in the new Sprague Catalog C-614. Get your copy from any Sprague Distributor, or write to Sprague Products Co., 65 Marshall St., North Adams, Massachusetts.

CERA-MITE® CAPACITORS



Tiny, tough, dependable. Silvered flat-plate construction for high by-pass efficiency, high self-resonant frequency. Available in the following types to meet specific requirements:

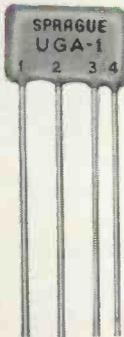
General Application, for by-pass and coupling
High-K, for applications requiring guaranteed minimum capacitance values
Temperature-Stable, for minimum capacitance change with temperature

- *Temperature-Compensating*, for applications requiring negative temperature coefficient
- *NPO*, for use where capacitance change with temperature is undesirable
- *AC*, rated at 125 VAC
- *Buffer*, rated at 2000 WVDC
- *Low-voltage*, for by-pass and coupling in transistorized circuitry
- *TV Yoke*, rated at 3000 and 5000 WVDC

HYPERCON® CAPACITORS

Ultra-miniature discs for use in transistorized circuitry. Designed for by-pass and coupling applications in low voltage circuits where high capacitance and low power factor are important considerations. Superior in size and performance to comparably-rated aluminum electrolytic capacitors.

"UNIVERSAL" CAPACITORS



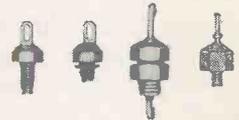
Have multiple leads. Quick-fix capacitors for on-the-spot repairs. By using certain leads for terminals, connecting certain leads together, and removing certain leads, various ratings may be obtained. Available in General Application as well as High-K types.

DOORKNOB CAPACITORS



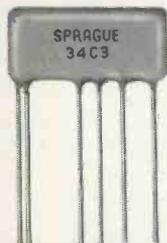
Available in 20 and 30 KV ratings. Molded guard rings lengthen surface creepage path. Complete with variety of screw-in terminals to meet all replacement requirements.

BUTTONHEAD CAPACITORS



Screw-mounting units with flat disc capacitor elements seated in hexagon head. This series includes feed-thru capacitors for filtering leads through chassis, as well as standoff capacitors for by-pass applications.

BULPLATE® CAPACITORS

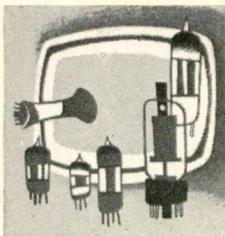


Rugged multiple-section units which combine in one compact assembly all the capacitors used in one or more stages of a radio circuit. These space-saving capacitors are ideal for miniature sets.

SPRAGUE®

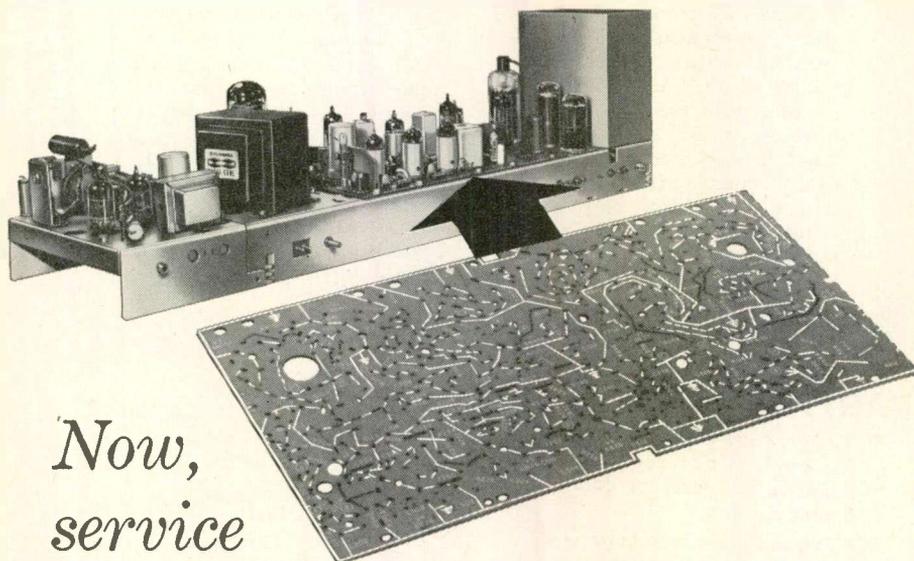
THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER



The "Big Picture"

...informative shop talk from
Sylvania Field Service Headquarters



Now,
service
information is built right in!

One glance at the new, service-designed GT-555 chassis by Sylvania tells you that the information you need for quick and easy service is clearly marked right on top of the chassis board.

Even the pin numbers for each tube are marked! Now, you can easily check out the grid and plate of each tube . . . without going through that "upside-down" translation process with the tube manual.

All parts are completely designated, too, and the new, color-keyed road map makes circuit-trouble-tracing a cinch. A different color identifies each circuit and its leads. Color-code information is printed right on the tube layout sticker for handy reference.

Still another great time- and trouble-saver on the GT-555 chassis is the "plug-in" feature. New modular design lets you separate and pull whole assemblies in a second . . . chassis, remote receiver, tuner cluster or speaker.

This new GT-555 chassis is the transformer-powered, modern version of the famous, performance-proved S-110 chassis. Ask your local Sylvania TV distributor for time and place of the Service Clinic in your area so you can see all the big electronic advances from Sylvania.

SERVICE TIP OF THE MONTH

To hold metal screws in nut driver for those hard-to-get-at places, a small piece of plastic wrap (the type used to package screws, etc.) inserted between the screw head and nut driver will hold the screw in place. Sylvania Home Electronics Corp., Batavia, N. Y.

SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS



(Continued from page 8)

... I think Mr. Marshall is overlooking a nice source of revenue. He mentions a radio system to alert volunteer firemen. I have been converting ordinary FM-AM radios to our Fire Frequency 46.10 mc for the past several years, netting myself a nice piece of change. The ordinary FM radio can be converted in less than an hour, and supplying a folded dipole made of 300 ohm line, I get \$8 to \$10 plus repairing the set if need be.

I am assistant chief of our department and 23 of our 40 men are radio equipped. On several occasions I have heard the alarm over the radio and have been at the scene of the fire ahead of the trucks. We have a base station and 3 of our 4 trucks are radio equipped.

Unless his department is considerably richer than ours, he will find the cost of supplying each man with radio quite prohibitive. Also, one word of warning, the siren or whistle cannot be dispensed with as the fireman is not always at home.

LEO ZIMMER

Radio & TV Service
Canisteo, N. Y.

May 1961 Directory Omissions

Editor, ELECTRONIC TECHNICIAN:

The Technician Association 1961 Roster did not include TELSA of Connecticut, Box 444, Meridan, Conn. President is Peter Lucas. This is the largest and most active association in Conn., and perhaps New England.

JEROME CHICHESTER

North Haven, Conn.

... As makers of electrolytic capacitors for the replacement market under the trade names of UneCap and Super-Cap for the last 11 years, we would appreciate being listed in any future directories.

CHARLES M. WOLF
President

United Electronic Mfg. Corp.
542 Thirty-Ninth St.
Union City, N.J.

... Although we are regular subscribers to your magazine, we do not find our name in the May 1961 Roster of Electronic Schools. Established in 1919, the R. I. Radio & Electronics School is one of the earliest schools of this type.

M. R. REYNOLDS
President

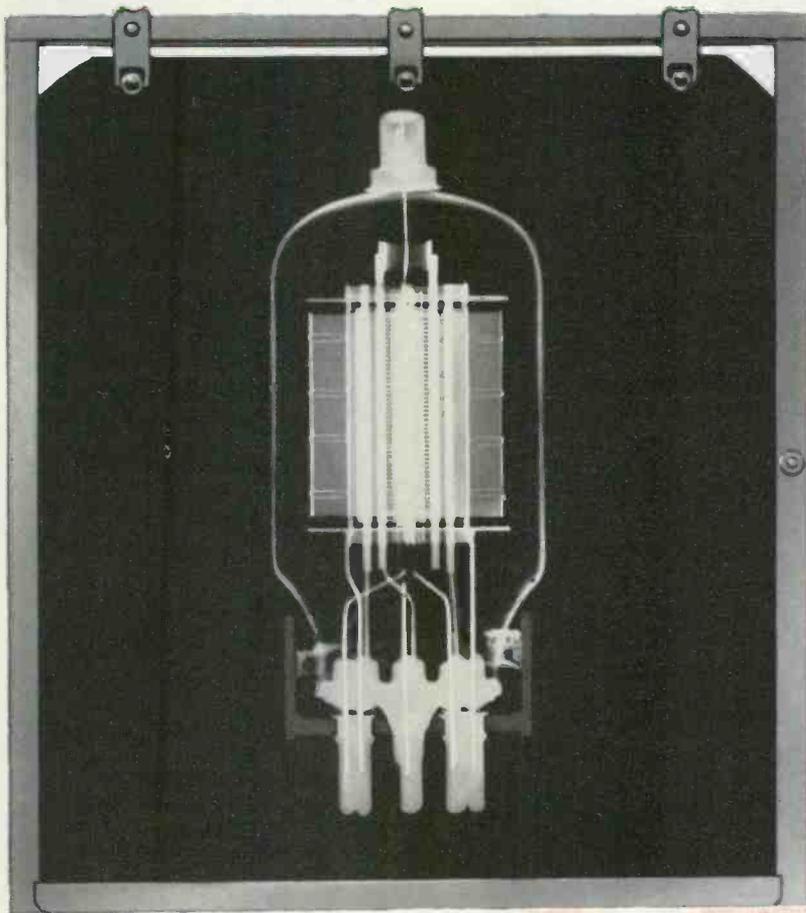
R. I. Radio & Electronics School
45 Mathewson St.
Providence, R. I.

... We were somewhat disappointed to note that your list of schools does not include us.

C. L. THACKER
Dean of Students

Electronic Technical Institute
4863 El Cajon Blvd.
San Diego 15, Calif.

(Continued on page 12)



HORIZONTAL DEFLECTION TUBE PROGNOSIS INDICATES STABLE EMISSION OVER LONG LIFE SPAN

Prolonged observation of Tung-Sol horizontal deflection tubes indicates a consistent behavior pattern: virtual immunity to chronic deflection tube illnesses. They exhibit a remarkable ability to withstand the high temperatures and high pulse voltages encountered in TV deflection service, which too frequently have a fatal effect on tubes of less hardy ancestry. Diagnosis shows unusual physical fortitude. The plate design, with special large area cooling fins plus high conductivity core aluminum-clad steel material, is a combination of ingredients that safeguards against "hot-spotitis".

Tung-Sol "circuit design"* approach has eliminated Barkhausen oscillations and snivets. Qualified specialists agree that continued use of Tung-Sol deflection tubes is certain to result in an epidemic of successful service work of very pleasing proportions.

PRESCRIPTION FOR PROFIT

When diagnosis of your customer's TV set reveals an ailing horizontal deflection tube, it's best to prescribe Tung-Sol. Customer satisfaction with the results is certain to be contagious. These are some of the more popular Tung-Sol horizontal deflection tubes:

*Designed by Tung-Sol to fit circuits already in use in the market.

6/12/17/25 BQ6G TB	6/12/17 DQ6B
6/12/17/25 CU6	6/25 DN6
6/12/25 BQ6GA	6CD6GA
25CD6GB	



the first name to ask for when ordering



TUNG-SOL®

DEFLECTION TUBES

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

(Continued from page 10)

License Effort

Editor, **ELECTRONIC TECHNICIAN**:

Again, this year, we are making the supreme effort to license TV servicemen. We are asking for help—help from every serviceman, from every association, from every member of our own Society, and from every associate Society. Ten dollars from every one to defray the cost of sending men to Albany, to print the necessary bulletins, to pay for the hundreds of telephone calls, for the fares and the food. This money should be sent to Mr. Warren Baker, 514 Second St., Albany 6, N. Y.

Receipts will be furnished upon request. We must have men in Albany to contact the legislators directly. We are all in the same bind, this is the way out. So let's do it immediately!

I shall not discuss the merits of licensing. I believe much has already been said. There is no doubt that the majority of the residents of New York State want licensing. Last year a flood of cards, telegrams, personal letters went to Albany. As a result we came within a hairsbreadth of success, passed through the Senate with a clearcut majority and defeated in the Assembly by a whisper. Because certain areas in the state were not contacted, it resulted in the defeat of the

Cooke-McCloskey Bill. The Attorney General has indicated his willingness to reintroduce similar legislation.

I am pleased to announce that Don Roberts, V.P., Syracuse; Warren Baker, Treas., Albany; O. Capitelli, Corresponding Sec'y, Long Island; Anthony Ferris, Recording Sec'y, Utica; Ben DeYoung, Sgt at Arms, Ithica; are the new officers of this organization.

DOUGLASS W. COOK,
President

Empire State Federation
of Electronic Technicians Assns.
Kenmore, N. Y.

Welcome Words

Editor, **ELECTRONIC TECHNICIAN**:

I have yet to get an issue of ET that isn't full of good reliable readable service information. I would recommend it to anyone interested or in the electronics business.

W. K. COCHRAN

Sunset Radio & TV
District Heights, Md.

Japanese Parts

Editor, **ELECTRONIC TECHNICIAN**:

The chief purpose of this letter is to get in my word on the use of Japanese (and other foreign) products and components. It seems to me that most of your correspondents are not quite getting to the main point in this discussion, which is this: You cannot service TV's and radios for Japanese workmen. Leaving out the question of quality, which I am told has become quite respectable, whenever you buy and sell a product which affords a job to a foreign workman, you are helping to keep unemployed a worker in this country who might be a potential customer for you! Any distributor or dealer who handles such products is in my opinion, helping to cust his own throat.

LEO FRUIT

Macks Creek, Mo.

Tough Dogs

Editor, **ELECTRONIC TECHNICIAN**:

Your Tough Dog department has always been interesting and quite often I meet some of the dogs in person and occasionally, have met one first. The best articles always point up the need for a complete set of symptoms and a logical trouble-shooting procedure regardless of how much of an oddball the job may be. In fact, I think that the crazier the job, the more necessary it is to keep our own sanity. In this respect, it does something the technical and theoretical articles do not. It takes us right on the bench and shows us the theory applied with all of the complications found in practice. Please keep it up.

FRANCIS C. WOLVEN

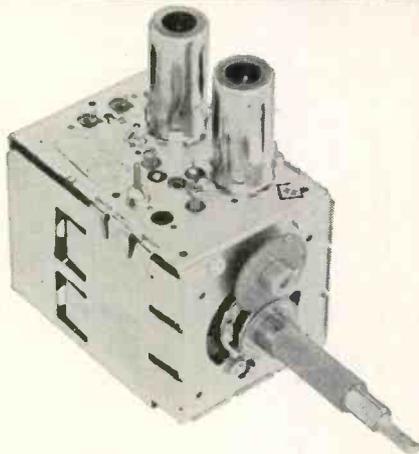
Saugerties, N. Y.

(Continued on page 16)

Tarzian offers

FAST, DEPENDABLE TUNER REPAIR SERVICE

ALL MAKES



ONLY \$850 INCLUDING

ALL PARTS and LABOR

24-HOUR SERVICE 6-MONTH WARRANTY

Tuners Repaired on Approved, Open Accounts

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

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

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

Tarzian-made tuners received one day will be fixed and shipped out the next. Cost is only \$8.50 and \$15 for UV combinations. That includes **ALL** parts and labor, and a 6-month guarantee against defective workmanship and parts failure due to normal usage. Replacements available at low cost on tuners beyond practical repair.

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

SERVICE MANAGER • TUNER DIVISION • DEPT. 28



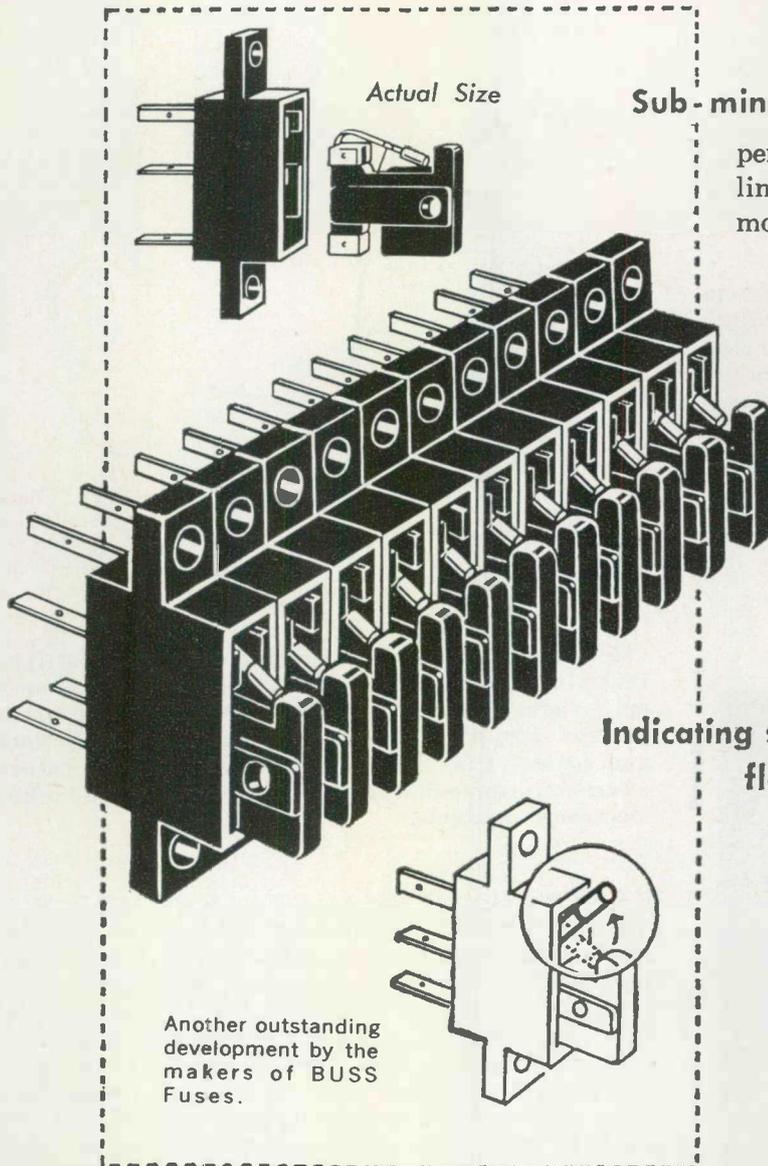
SARKES TARZIAN INC

east hillside drive • bloomington, indiana
edison 2-7251

MANUFACTURERS OF TUNERS . . . SEMICONDUCTORS . . . AIR TRIMMERS . . . FM RADIOS . . . AM-FM RADIOS . . . AUDIO TAPE . . . BROADCAST EQUIPMENT and SHISH-KABOB GRILLES

NEW! BUSS

Signal Indicating • Alarm Activating
GMT Fuse & HLT Fuseholder



Sub-miniature design

permits multiple mounting of fuses in limited space. Fuseholders can be mounted on $\frac{1}{4}$ inch horizontal centers.

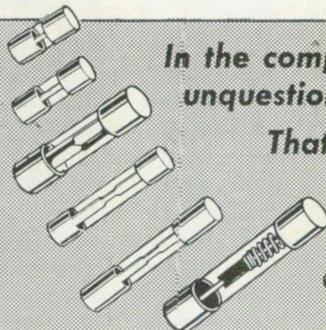
Fuse and holder combination readily adaptable for use in equipment operating at 300 volts or less, such as: communication equipment, business machines, computers, control equipment or other multiple circuit apparatus where space is at a premium.

Indicating spring flashes color-coded flag when fuse opens

to give quick, positive identification of faulty circuit.

Indicator spring also makes contact with an alarm circuit so, it can be used to flash a light—or sound audible signal on fuse panel or at a remote location.

Ask for bulletin GMCS on BUSS GMT fuses and HLT holders.



In the complete BUSS line, there are fuses and fuse mountings of unquestioned high quality to fit every protection need.

That's why it's more profitable to handle only BUSS fuses.



BUSSMANN MFG. DIVISION, McGraw-Edison Co., UNIVERSITY AT JEFFERSON, ST. LOUIS 7, MO.

Tuning In the

TV "BAIT" ADVERTISER "catches" Federal Trade Commissions' Bureau of Litigation. Mars Electronics, Inc., a Washington, D.C., TV servicer agreed to discontinue \$1 "service charge" and other misleading information appearing in their ads.

EDUCATIONAL TV stratovision broadcasts from a plane flying 23,000 feet over Montpelier, Indiana, indicate good reception is possible up to 200 miles on UHF channels 72 and 76. Blonder-Tongue Laboratories, and Jerrold Electronics Corporation say this is made possible through installation of master antenna systems and crystal controlled UHF converters. More than 13,000 schools will be served by the giant educational project which is being financed primarily by the Ford Foundation.



AUTOMATIC DIAL TELEPHONES



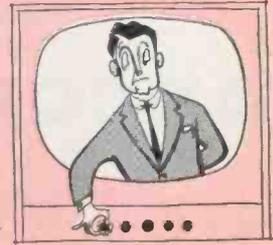
Push-button telephones dial numbers automatically with punched cards or magnetic tape. (Top) Bell Telephone Systems' card dialer. (Bottom) "Rapidial" has numbers pre-recorded on magnetic tape. Up to 290 names and numbers can be handled. Knob is set to name, receiver lifted and dialing bar pressed. Phones are expected to benefit sales and reservation personnel, brokers, buyers, or any others who make frequent same-number calls.

CBS DROPS TUBES from its line; entertainment-type receiving tubes, that is. Raytheon will purchase a major part of its receiving tube inventory and plans to offer parts and service to present CBS distributors and dealers. CBS Electronics will concentrate future efforts on semiconductors, microelectronics, and other electronic products.

ELECTRONIC ENTERTAINMENT UNIT SALES showed substantial upturns in March. But year-to-date totals remained well below those for the same 3-month period in 1960, with the exception of radio sales which were slightly above last year. Some electronic component sales increased over last year. For example, for the first three months of this year, 40,583,632 transistors were sold at the factory, compared with 31,155,798 units in 1960. Year-to-date totals for picture tubes rose above last year's 3-month totals, according to recent figures released by EIA.

GLOBAL TV RECEPTION is possible within two years if uniform TV transmission standards are established. So states Dr. Erik Esping, a Swedish delegate to the International Festival of Television Arts & Sciences, in Montreux, Switzerland. Delegates from 32 countries are participating in the meet. A Soviet scientist predicted that he will be able to observe Venus and Mars via color TV soon. Brig. Gen. David Sarnoff, RCA Board Chairman, sent a message to the world's first International Festival predicting a worldwide color TV audience of one billion within ten years.

Picture



ELECTRONIC STOCK QUOTATIONS give subscribing brokers the last price, bid-asked quotations and other data on 800 selected New York Stock Exchange issues. The subscriber dials a code number for the desired issue and within a few seconds the information is displayed on a special panel. Prices originating at the exchange are processed and stored on magnetic memory drums at an electronic data processing center in New York City. The system, called "Telequote," is operated by the Teleregister Corp., Stamford, Conn.

TV CUSTOMERS' TROUBLES "BAGGED" by General Electric in a good will promotion for service technicians. Each No. 4 size paper bag says: "We have 'bagged' your troubles. Your set has been completely serviced by a qualified technician, and all parts and tubes found to be defective have been replaced with first quality material. We appreciate your confidence, and intend to earn and keep your TV-Radio service business by providing prompt, reliable service at fair prices." Space on the defective-parts bag is provided for name and address of both customer and dealer.

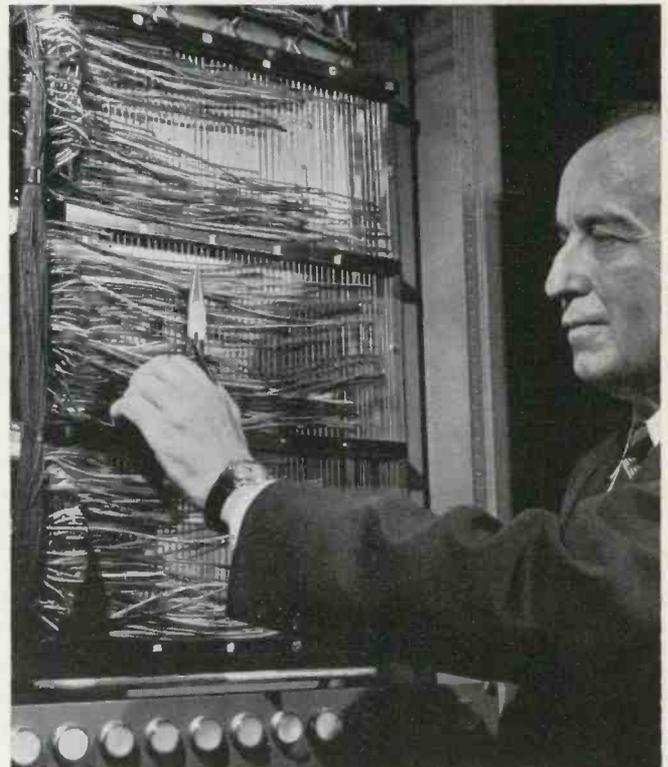
UNBORN BABIES SEND "SOS" signals with new electronic medical device developed by a group of Indian doctors and manufactured by Hermathematrol Corp. The instrument indicates fetal distress at its onset early enough to alert hospital delivery teams and the obstetrician to use indicated medical means, such as oxygen, therapy, forceps, or a Caesarian delivery. Engineering difficulties during development were solved by Robert J. Braunlin, MD, a resident at the Indiana University Medical Center who is also a graduate electronics engineer.

FCC ORDERS TWO TV OWNERS to show cause why they could not cease and desist from interfering with a shut-in's radio reception in Maysville, W. Va. This is the first time FCC has actually instituted formal proceedings against private owners of TV sets. A third neighbor's TV set was also causing radio interference, but he had it corrected when Uncle Sam requested it. The two others did not reply, and were consequently brought up on charges for their spurious radiation. (See editorial, "TV Non-Interference Seal," on page 29 of this issue.)

CALENDAR OF COMING EVENTS

- Aug. 18-20: National Alliance of Television & Electronic Service Associations (NATESA) Convention, Pick-Congress Hotel, Chicago, Ill.
- Aug. 22-25: Western Electronics Show & Conference (WESCON), Cow Palace, San Francisco, Calif.
- Aug. 22-Sept. 2: British National Radio & Television Show, Earls Court, London, England.
- Aug. 25-27: Tenth Annual Chicago High Fidelity-Home Entertainment Show, International Sight & Sound Exposition, Inc., Hotel Sherman, Chicago, Ill.
- Sept. 13-17: 1961 New York High Fidelity Music Show, New York Trade Show Building, New York, N. Y.
- Oct. 2-4: IRE Canadian Electronics Conference, Automotive Bldg., Exhibition Park, Toronto, Canada.
- Oct. 9-11: National Electronics Conference, (IRE, AIEE), International Amphitheatre, Chicago, Ill.
- Nov. 14-16: Northeast Research & Engineering Meeting (NEREM), Somerset Hotel, Boston, Mass.

ROBOT MUSIC COMPOSER



A special-purpose computer designed by RCA scientists helps composers create new music by suggesting tone combinations and variations based on their original ideas. The experimental unit, known as a "random probability" system, has circuit arrangements capable of selecting musical notes in random fashion from among many choices. Composed of tubes, relay switches, etc., the device can also be used in designing and style.

Stancor. n.

Synonym for quality and dependability in coils and transformers

It makes good sense for you to choose replacement parts from the manufacturer who is the world's largest supplier of electronic transformers to the original equipment market. The complete Stancor line includes the unit you need, at the fine performance level you expect. For quality and dependability in transformers and coils, always specify Stancor.

The Stancor TV Guide

gives you always up-to-date replacement information—through regular mailings of loose-leaf pages direct to you from Stancor. Register with your distributor to get the Stancor TV Guide.

STANCOR

ELECTRONICS, INC.

formerly Chicago Standard Transformer Corporation

3501 WEST ADDISON STREET • CHICAGO 18, ILLINOIS

(Continued from page 12)

Burn-Up...Maybe Fire Hazard...Never

Editor, ELECTRONIC TECHNICIAN:

In the "TV Manufacturers Technical Digest" column in the May issue of Electronic Technician, I note an item concerning the General Electric M6 Chassis.

I am quite concerned over the statement that the contrast control may "burn-up" under certain conditions. The inference of a fire hazard, which results from use of this wording creates a false impression of its seriousness. Actually, no fire hazard from this condition exists at any time.

I assume your information was taken from our "Service Talk." I should like to point out that we do not say the control may "burn up," but that it may be overloaded to the point of failure, if the unbalance condition is permitted to continue. Only in the final paragraph is a reference made to "burned spots," as a means of identifying damage to the control element.

I am sure that you are as interested as we are in presenting the greatest possible amount of helpful and factual information to service men. Therefore, I would greatly appreciate any steps you can take to correct the false impression which may have been created.

R. C. HANNUM
Supervisor-Technical Service

General Electric Co.
Syracuse, N. Y.

• We used "burn-up" in the vernacular of technicians. The meaning is failure due to excessive heat or load. We certainly did not mean to imply an actual fire hazard.—Ed.

Hearing Aid Corrections

Editor, ELECTRONIC TECHNICIAN:

In reading your Feb. 1961 article on Servicing Transistorized Hearing Aids, I was intrigued by your statement in the first column, "there is nothing mysterious about a hearing aid." This may all be very true, except that either the author or the proofreader got a few of his wires crossed.

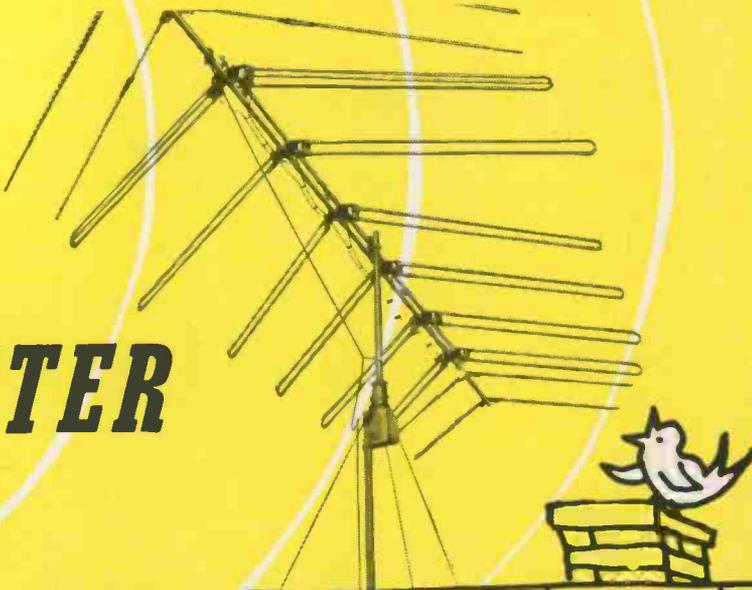
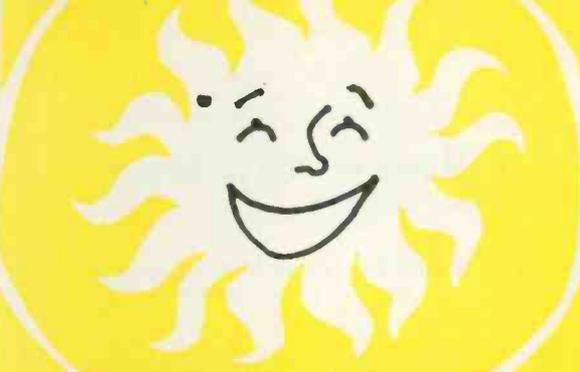
(1) There is no ground at the switch for the battery circuit, so only Q1 is operative. (2) In the middle of the 2nd column, page 30, you say "bias—is AUGMENTED by the voltage fed to the base from the junction of the voltage divider R1-R2." The purpose of the junction of R1-R2 is exactly the opposite. (3) On page 31, 1st column, you say "Signal voltage . . . is applied to the base of Q3 through C4." You evidently mean C3 as C4 is in the collector or output circuit of Q3. (4) Page 31. Top of 2nd column. ". . . and by the loop consisting of R16 and C8." No loop is shown.

M. G. GOLDBERG

Beacon Radio & TV Service,
St. Paul, Minn.



"I called a man to repair the TV, Harold."



CHANNEL MASTER
has everything
under the
sun...

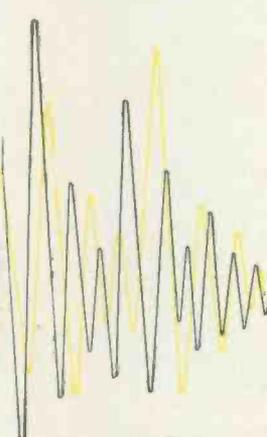


to keep your Summer Sales Simmering!

Summertime is "easy living" time. People have more leisure hours in which to enjoy radio and television. That's why they'll want radios and TV sets that are in top operating condition... and Channel Master has everything you need to do the job better.

Replace winter-worn antennas with one of the powerful Super T-W's. Convert old-fashioned manual rotators to fully automatic operation with the new Channel Master Automatic Rotator Control Consoles. Perk up TV set performance by replacing weak or worn out tubes. Show your customers how their leisure hours can be more enjoyable when they own Channel Master portable radios.

There aren't any summer sales doldrums when you sell the Channel Master line because Channel Master has everything you need to keep summer sales simmering.



CHANNEL MASTER works wonders in sight and sound

ELLENVILLE, NEW YORK

For more data, circle 7-17-1 on coupon, p. 50

NOW...
Master System
Performance at a
Home
Booster
Price!



Blonder-Tongue signal master, AB-4

(new transistor, mast-mounted TV/FM 4-set booster)... \$29.95 list

- ✓ Transistor circuit provides lowest noise, maintenance free operation—no tubes to burn out or replace—no heat dissipation problems.
- ✓ Mast mounting takes advantage of best signal-to-noise ratio—minimizes snow. (Can also be mounted at any convenient point along the download.)
- ✓ World's smallest and lightest booster—no additional weight or wind resistance for mast to bear.
- ✓ Remote power supply at set uses 4 low-cost flashlight batteries for pure d.c.—eliminates AC power line, and components which may fail.
- ✓ Converts existing antenna into a powerful amplifier-distribution system—no need to invest in a new antenna.
- ✓ Eliminates costly installation of giant antenna arrays in most fringe areas.
- ✓ Provides improved FM reception (gain 12-15 db).¹
- ✓ Stripless 300-ohm terminals on booster and remote power supply for fast installation, positive contact.
- ✓ No separate balun needed—matches impedance of antennas and TV sets.

ALL THIS PLUS... 4 set coupler incorporated in remote control power supply distributes fully isolated amplified signals for brilliant reception on up to 4 TV or FM sets.

Improve TV and FM reception today. Add the new Blonder-Tongue AB-4. Sold thru distributors. For details write. ET-7



<p>1 set gain: up to 19 db, channel 2 Up to 10.5 db, channel 13</p>	<p>2 sets gain: up to 14 db, channel 2 Up to 6 db, channel 13</p>	<p>3 sets gain: up to 13 db, channel 2 Up to 4 db, channel 13</p>	<p>4 sets gain: up to 10.5 db, channel 2 Up to 2 db, channel 13</p>
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Patent applied for

engineered and manufactured by

BLONDER-TONGUE

9 Alling St., Newark, N. J.

Canadian Div.: Benco Television Assoc., Toronto, Ont. Export: Morhan Export Corp., N. Y. 13, N. Y.
home TV accessories • UHF converters • master TV systems • closed circuit TV systems

News of the Industry

REGENCY ELECTRONICS, INC. is the new name for I.D.E.A., INC.

ELECTRONIC PUBLISHING CO. has moved to larger quarters at 133 W. Jefferson St., Chicago 6, Ill.

UTAH ELECTRONICS CORP. is the new corporate name of UTAH RADIO AND ELECTRONIC CORP.

UNITED CATALOG PUBLISHERS reports the appointment of ED WEISL, as national distributor sales manager.

RAYTHEON CO. has promoted ROBERT B. FISK, from division accountant, to controller for the Distributor Products Division.

SYLVANIA's 1962 line of TV receivers, currently introduced, includes new chassis, GT-555, powered by SYLVANIA-developed Flexi-core.

PACOTRONICS, INC. announces the appointment of SIDNEY FLEISCHMAN, as sales manager of its subsidiary, PRECISION APPARATUS CO.

TEXTRON ELECTRONICS INC. reports that production of the GLOBE ELECTRONICS DIV. is being consolidated with that of GC ELECTRONICS, another TE division.

BELDEN MFG. CO. reports they have issued a license to CHANNEL MASTER CORP. for the manufacture of BELDEN twin-lead foamed polyethylene transmission line cable.

JERROLD ELECTRONICS CORP. has elected SIDNEY HARMAN, as executive vice president. JERROLD ELECTRONICS CORP. and HARMAN-KARDON merged on February 28th., 1961.

JERSEY SPECIALTY CO.'s exhibit at the Parts Show included portions of the following antenna lines: JFD, ANTENNA DESIGNS, CLEAR BEAM, ALL CHANNEL, TACO, SNYDER, BRACH, WINEGARD, TARGET, RADION, JERROLD, HI-LO and RMS, thus highlighting JSC's reported position as supplier of 300 ohm twin lead to leading antenna manufacturers.

(Continued on page 20)

Never before so much performance, versatility and styling in a speaker as small in size as it is in price!

NEW ELECTRO-VOICE

PA 15



Model PA15 (8-ohms) \$37.00 List
Model PA15-45 (45-ohms) \$32.25 List
Model PA15T (70.7-volt transformer) \$32.00 List

Small enough to be hidden . . . with a voice that can't be missed!

Now, from Electro-Voice—home of major PA speaker improvements since World War II—comes the most effective solution to many sound problems. It's the exciting new PA15! Features a driver located right up front—in the horn mouth itself—to eliminate one of the “bends” of ordinary reentrant horns . . . and to

insure wider range and smoother high frequency response!

And the PA15 is uniquely easy to install and service. Special swivel mount permits installation anywhere . . . while the driver's front location makes field replacement unusually quick and simple. Installations are neater, too, when you use the PA15T with its optional 70.7-volt transformer built right in!

Better check these other PA15 features:

- Modest size (8" x 9" x 9½") to fit anywhere.
- Highest power-handling capacity in its class.
- Smoothly rising response for better penetration, less feedback.
- Rectangular shape for best dispersion, minimum wasted power.
- 8-ohm or 45-ohm Impedances available.

ELECTRO-VOICE, INC.

Commercial Products Division, Dept. 716T
Buchanan, Michigan

FURTHER PROOF THE SMART MOVE IS TO ELECTRO-VOICE!

For more data, circle 7-19-1 on coupon, p. 50



Write for full specs
on the PA15 today!

Electro-Voice®

Get ALL Basic Color-TV Test Patterns From This ONE Low-Cost Generator



RCA WR-64A

COLOR-BAR / DOT / CROSSHATCH GENERATOR

Here is the low-cost, lightweight, high-quality instrument that gives you all essential Color-TV test patterns: Color-bar signals for checking, adjusting and troubleshooting Color-TV circuits; dot and crosshatch pattern signals for adjusting convergence in color receivers and for adjusting linearity and overscan in either color or black-and-white receivers. Designed for in-the-home or shop servicing.

ONLY **\$189.50***

*User Price (Optional)

SIMPLICITY: Only three operating controls! Provides RF output... connects directly to antenna terminal of receiver. No external sync leads needed.

STABILITY: Crystal controlled signals assure accuracy and dependability. Patterns are rock-steady, free from "jitter" and "crawl".

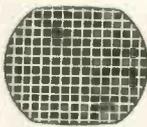
PORTABILITY: Weighs only 13 pounds. The ideal test instrument for proper in-the-home color-TV adjustment and servicing.

FLEXIBILITY: Extra wide range on chroma control... "standby" position on function switch... fixed number of dots and bars... "on-off" control on sound-carrier.

GENERATES:



Color-Bar Pattern... Ten bars of color including R-Y, B-Y, G-Y, I and Q signals spaced at 30° phase intervals for checking phase and matrixing, and for automatic-frequency and phase alignment.



Crosshatch Pattern... A crosshatch of thin sharp lines for adjusting vertical and horizontal linearity, raster size, and overscan. **Dot Pattern** (not illustrated) permits accurate color convergence.

GET ALL THE FACTS ON THE NEW RCA WR-64A

RCA Electron Tube Division, Dept. ET
Commercial Engineering
Harrison, N. J.

Please send me your folder (1Q1017) on the new RCA WR-64A Color-Bar/Dot/Crosshatch Generator.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

-----Or see it at your Authorized RCA Test Equipment Distributor-----



The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

(Continued from page 18)

DAYSTROM, INC. announces the election of ALLAN W. GREENE, as a corporate vice president. MR. GREENE will continue as president of HEATH CO., a subsidiary of DAYSTROM.

GENERAL ELECTRIC's Television Receiver Department names: ROBERT F. DAVIS, as manager-sales; and JOHN S. CHAMBERLIN, as manager-product planning and market research.

CHANNEL MASTER CORP. announces the following appointments: HUGH OVERBEY, to the new post of Southern regional sales manager; and MARVIN GROSS as Export and Canadian sales manager.

SYLVANIA's Electronic Tube Division has appointed JOHN T. MALLEEN to the newly-created position of equipment sales manager—entertainment products. Formerly equipment sales manager for the Midwestern Region, MR. MALLEEN will continue his headquarters in Chicago.

Reps & Distributors

SCHROEDER SALES CO., Cleveland audio rep firm, has moved to 2554 Euclid Ave.

J. MALCOLM FLORA, INC., Michigan rep firm, has added PAUL V. WALLACE to the sales staff.

JAMES LEE, INC., new rep firm, at 4241 S. Toledo Ave., Minneapolis, Minn., is headed by W. S. MEYERS and DONALD E. GIES.

ELECTRONIC PUBLISHING CO. reports they have prepared a new 204-page catalog for STAR ELECTRONIC DISTRIBUTORS, 7736 S. Halsted St., Chicago 20, Ill.

ASTRON SALES CORP. reports the appointment of rep firm JACK BROWN ASSOCIATES for Metropolitan N. Y., Westchester County, and Northern N. J.

COMPONENT SPECIALTIES announces the following rep appointments: JACK BROWN ASSOCIATES, for Metropolitan N. Y., N. Y. state, and N. J.; RICHARD LEGG CO., for Oregon and Wash.; JOHN O. OLSEN CO., for Ohio, Western Pa., Ky., and W. Va.; HENNY FELDMAN CO., for Southern Calif., Ariz., and West Coast; JOHN MUSTICO CO., for Middle Atlantic States; and ROBERT S. REISS ASSOCIATES, for New England States.

(Continued on page 22)

TRAIN

THEN SHARE THE PROFITS



IN THE BOOMING COMMERCIAL TWO-WAY AND CITIZENS BAND RADIO SERVICE BUSINESS

HERE'S HOW RAYTHEON WILL HELP YOU —
 Now Raytheon can train you and franchise you as a Certified Raytheon Service Station operator, qualified to service Raytheon's expanding line of commercial two-way and citizens band radio equipment, as well as other brands. There are 2.5 million units in use today, and the number is growing every day!

TRAIN TO SERVICE — Raytheon's Communication Technician's Correspondence course will give you a thorough groundwork in the operation, installation and maintenance of this equipment. On completion of the course, you will be qualified to take the exam for the FCC Class II license which is required for servicing CB and commercial two-way radio. The cost is \$96.00 and it is available either direct or through your local Raytheon distributor.

PROFIT AS A RAYTHEON CERTIFIED SERVICE STATION — Then, with Class II license and adequate test equipment you can become one of a national network of independent service facility operators franchised to service Raytheon Ray-Tel CB equipment. Operating a Certified Service Station, you'll be reimbursed by Raytheon for all authorized parts and labor required in repair of in-warranty Ray-Tel units.

MAIL THIS COUPON NOW
 Mail this coupon now for full details. Join others cashing in on this growing new field.

RAYTHEON COMPANY
 Distributor Products Division
 411 Providence Turnpike
 Westwood, Massachusetts
 Box No. xxx

- Please send me your brochure describing the Raytheon Communication Technician's Course.
- Please send me details on the Raytheon Certified Service Station Service Program.

Name _____
 Company Name _____
 Address _____
 City _____ State _____
 Name and Address of Raytheon Distributor _____



RAYTHEON COMPANY

DISTRIBUTOR PRODUCTS DIVISION

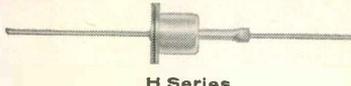
For more data, circle 7-21-1 on coupon, p. 50

TARZIAN

Silicon rectifiers that mean fewer call-backs for you

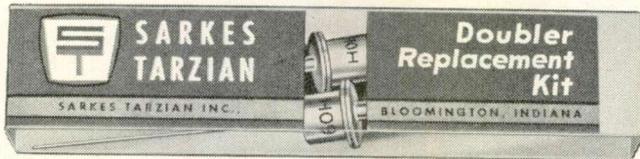


F Series



H Series

Now 600 piv F Series and H Series units for stereo...hi fi...television



Tarzian 600-volt F and H series units are now available to meet the popular demand for them for servicing stereo, hi fi, television. The 600-volt units reduce failures due to line voltage transients. 400 and 600 volt F and H series rectifiers are available in Doubler Replacement Kits—also in Ten Packs and in bulk. And remember—M 150 and M 500 conversion Kits are available for those who prefer snap-in mounting.



M 150



M 500

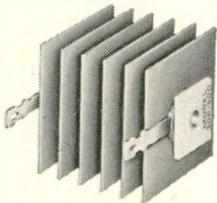
Plus



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 Full Wave Silicon Rectifier (S5347), replacing 6BW4 or 12BW4 in Citizen's Band radios for maximum performance in reception quality and range.

Plus



Model 300-500 now 1/3 smaller than before; only 1 1/4" wide. Other models are 50-75, 100-150, 200-250

Tarzian "Condensed-Stack" Selenium Rectifiers

Tarzian's four "condensed-stack" selenium rectifiers replace the 20 types that formerly made up the 50 to 500-milliamper line. Their small size eases both your application and inventory problems. Improved production processes have substantially reduced watt losses by as much as 50%.

Send for Tarzian "Distributor Line" Rectifier Catalog



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

(Continued from page 20)

KIERULFF ELECTRONICS, INC., Los Angeles, reports their merger with DUCOMMUN METALS & SUPPLY CO., a long established metal supplier with \$55 million in annual sales.

SLATER ELECTRIC, INC. announces the appointment of the following reps: ANTLE-SMITH-DELLZELL SALES, for Texas, Okla., Ark., and La.; SAMUAL K. MACDONALD, for Dela., Md., Va., D.C., and parts of N.J. and Pa.; and PAUL R. STURGEON, INC., for Me., N. H., Vt., Mass., Conn., and R. I.

SEMITRONICS CORP. announces the appointment of the following reps: ART CERF & CO., for Northern N. J., New York and Va.; LAWRENCE B. COLE, for New England States; WALLACE & WALLACE, for southern Calif., Ariz. and southern Nev.; DAVID S. LINZ, for eastern Pa., Md., and Wash. D.C.; and BERTHOLD SALES CO., for Ark., La., Miss., Okla., western Tenn., and Texas.

Catalogs & Bulletins

CARTRIDGES: Revised specifications for phone cartridge ADC-1 are provided in a colorful brochure. Audio Dynamics Corp., 1677 Cody Ave., Ridgewood 27, N. Y.

For more data, circle 7-22-2 on coupon, p. 50

LAMPS: Model 6101 fluorescent illuminated magnifier, covered in current literature, features 5" double convex lens for undistorted magnification. Flexo International Corp., 3720 N. Milwaukee Ave., Chicago 41, Ill.

For more data, circle 7-22-3 on coupon, p. 50

CONVERTERS: Catalog sheet covers the new "Dynamo," model 50-196. This little device makes it possible to use a home table model radio in a car, by changing d-c car current to 110v a-c current. Terado Co., 1068 Raymond Ave., St. Paul 8, Minn.

For more data, circle 7-22-4 on coupon, p. 50

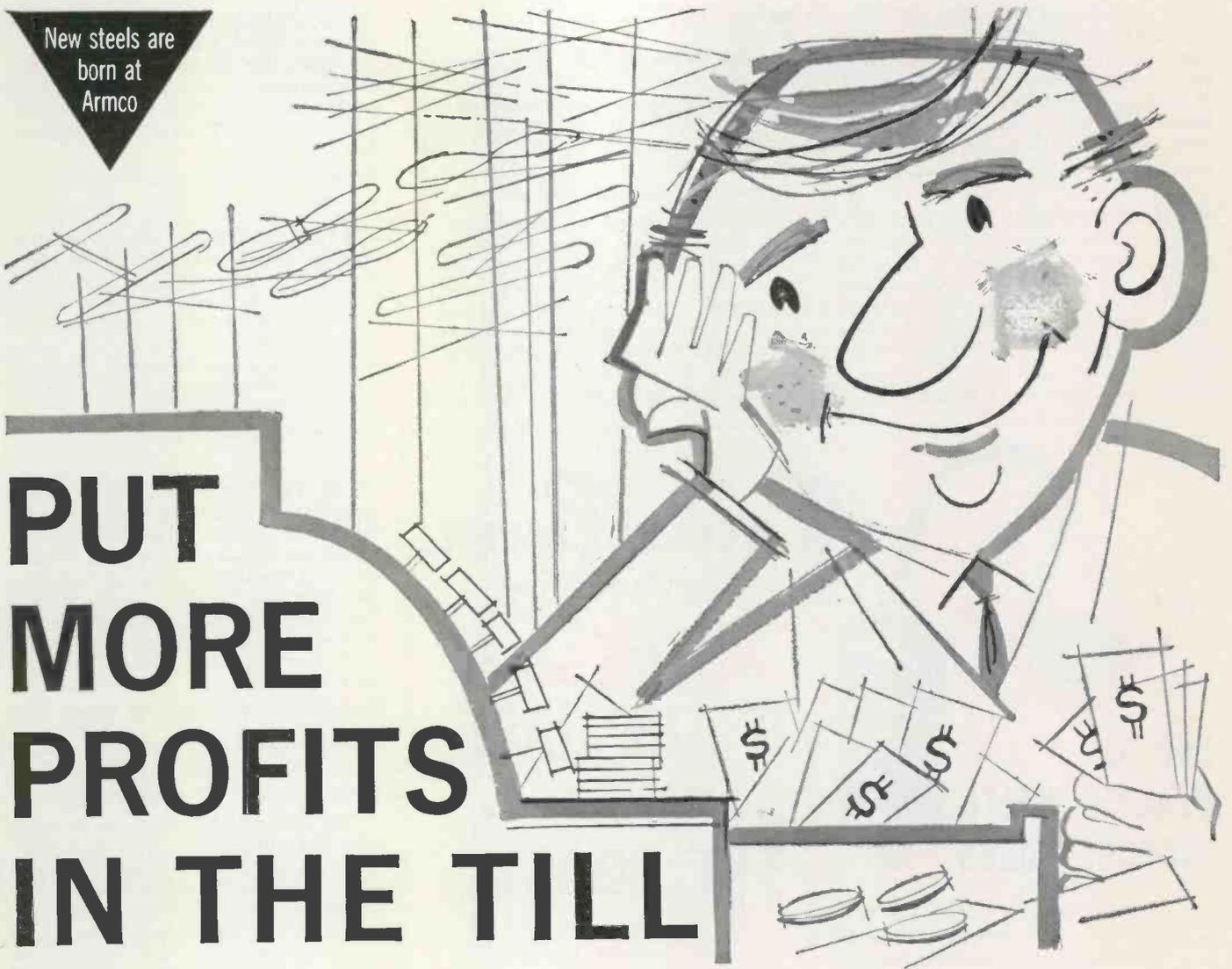
VIDEO-RF DISTRIBUTION SYSTEM: New Lock-Jax Outlet for schools is covered in literature. Its many uses include: supplying signal from classroom to as many TV receivers as desired; also from classroom to direct or projection type monitors and to originate closed-circuit TV programs. Blonder-Tongue Labs., 9 Alling St., Newark, N. J.

For more data, circle 7-22-5 on coupon, p. 50

(Continued on page 24)

New steels are
born at
Armco

PUT MORE PROFITS IN THE TILL



With TV MASTS and TOWERS made of ARMCO ZINCGRIP TUBING

You'll hear the happy ring of the register more often, make more money when you sell TV masts and towers made of Armco ZINCGRIP® Tubing. They're easier to sell because they combine outstanding strength with rust-resistance and good looks. See how they boost your profits. Mail the coupon for names of manufacturers of TV masts and towers of special ZINCGRIP Steel Tubing.



This mark stands for durability, economy, dependability.

ARMCO DIVISION, Armco Steel Corporation
2281 Curtis Street, Middletown, Ohio

Send me names of manufacturers who make masts and towers of Armco ZINCGRIP Tubing.

Name _____

Firm _____

Street _____

City _____ Zone _____ State _____



Armco Division

(Continued from page 22)

CHIMNEY MOUNTS: Literature covers new line of strap-less chimney mounts, designated as catalog #52. Mounts feature skin packaging. R-Columbia Products Co., 2008 St. Johns Ave., Highland Park, Ill.

For more data, circle 7-24-2 on coupon, p. 50

REMOTE CONTROL UNITS: A new TV and radio remote control unit, covered in current literature, is designed to turn the power on or off and/or regulate volume. Economically priced, easily installed. CBC Electronics Co., 2601 N. Howard St., Philadelphia 33, Pa.

For more data, circle 7-24-3 on coupon, p. 50

SPRAY CLEANERS: Offered in current literature are well chosen servicing aid premiums with orders covering TUN-O-LUB and TROL-AID cleaning compounds. Premiums include 12" spray aid and choice of small size screw driver. Chemtronics, 870 E. 2nd St., Brooklyn 3, N. Y.

For more data, circle 7-24-4 on coupon, p. 50

SOLDERING IRONS: Form #025, a new catalog sheet, covers the Magnastat soldering iron line. Sheet covers many changes, especially in the availability of tips, their new style numbers, additional temperature ranges, etc. Weller Electric Corp., 601 Stone's Crossing, Easton, Pa.

For more data, circle 7-24-5 on coupon, p. 50

TV KNOBS: Literature covers Deal #49-510 which includes 103 knobs, in 36 types, for Hoffman TV sets. Balanced assortment complete with wall or counter display rack. GC Electronics Co., 400 S. Wyman St., Rockford, Ill.

For more data, circle 7-24-6 on coupon, p. 50

FILTER CHOKES: Six new filter chokes, covered in Bulletin 589, consist of two high current filter chokes, rated at 1v RMS, 60 cycles, with dual windings for parallel operation; and four smoothing chokes for d-c power supplies, rated at 10v RMS, 60 cycles. Stancor Electronics, Inc., 3501 W. Addison St., Chicago 18, Ill.

For more data, circle 7-24-7 on coupon, p. 50

TUBE TESTER/VOM: Model TC101 combination tube tester and VOM, described in current literature, is designed for home and shop use. Checks Hi-Fi, TV and radio tubes including five star and foreign import. With a flip of the function switch, it becomes a handy VOM for testing the circuits. Gold Products Inc., 500 S. Westgate Drive, Addison, Ill.

For more data, circle 7-24-8 on coupon, p. 50



**FOR ALL
BLACK & WHITE
PICTURE TUBES**

2 volt/4 volt/6 volt/8 volt
series or parallel
electrostatic or electromagnetic

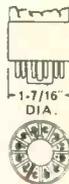
Perma-Power
INTRODUCES THE

2-Brite
**IF THE BASE
IS RIGHT
THE BOOST
IS RIGHT**

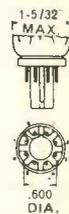
7 POWER RATINGS

VOLTS	AMPS
2.34	.600
2.68	.450
4.70	.300
6.30	.300
6.30	.450
6.30	.600
8.40	.450

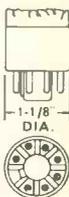
MODEL C202
for duodecal
base sets



MODEL C212
for 110°
button base
sets
(RCA type)



MODEL C222
for 110° shell
base sets
(Sylvania-
Dumont type)



List Price \$3.75

A Britener with a slide switch for series or parallel wiring is nothing new—but those previously available could only be used on picture tubes with heater ratings of 6.3 volts, .600 amps. For all other heater ratings, a single-purpose auto-former has been necessary.

Now Perma-Power has developed a truly universal series/parallel Britener—one that can be used on ANY set without endangering the delicate filaments through too much boost. Only Perma-Power—the leader—offers you this convenience.

You can brighten any TV picture with Perma-Power's 2-Brite. If the base is right, the boost is right! You don't even have to take the time to consult a Britener Selector Guide. Just choose the right base style—and install with confidence.

Perma-Power COMPANY
3104 N. ELSTON AVE. • CHICAGO 18, ILL.

Westinghouse TV RECEIVERS

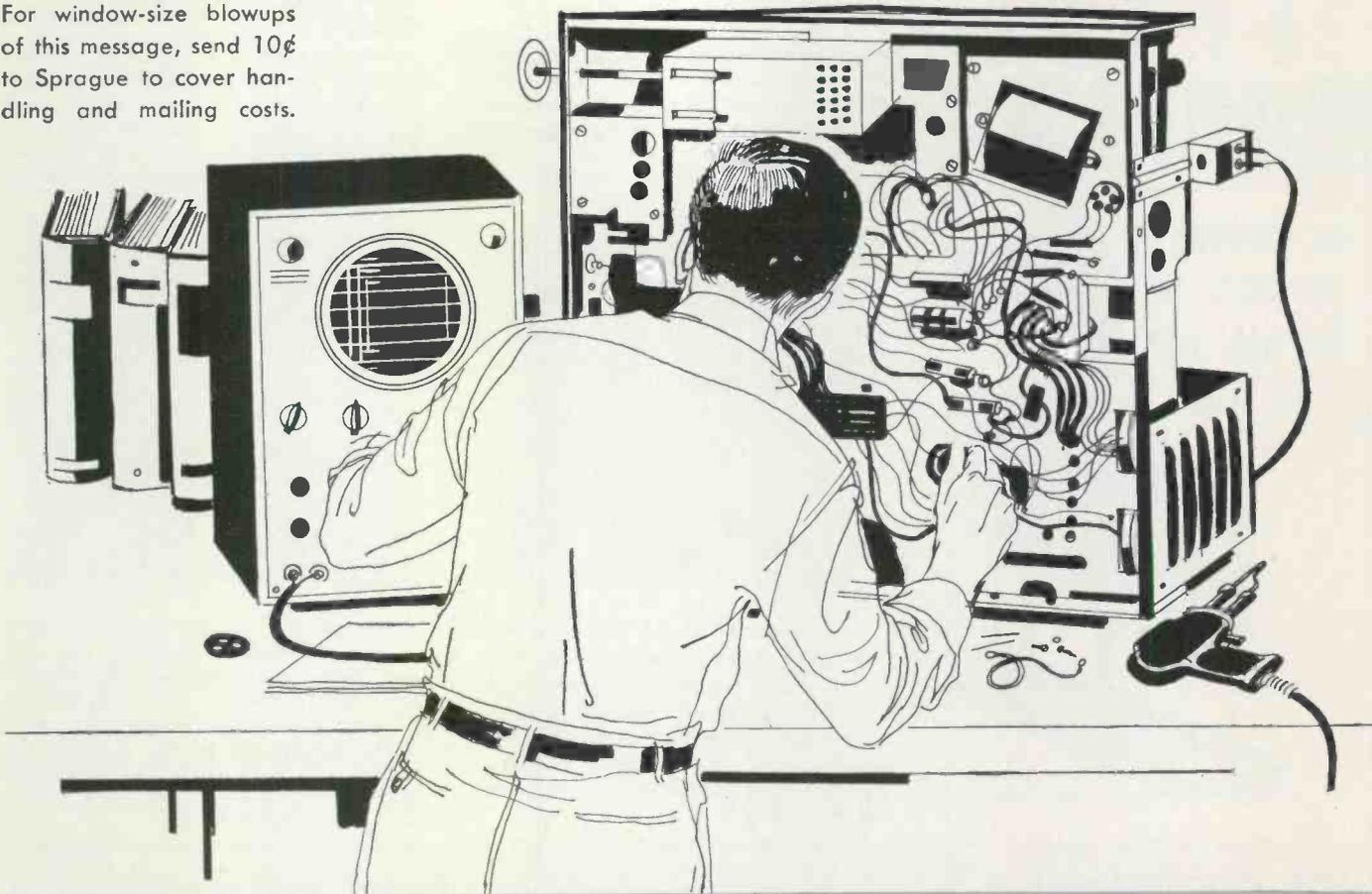
Two series of 19" portable TV sets, with Attaché styling, are announced. The leader series, models P3170, P3171 and P3173, which has an open list price, come in burnished charcoal, turquoise and golden pewter textured metal finishes. The step up Attaché series, models P3320, P3321 and P3322, is available in blue rajah silk, charcoal and nutmeg brown vinyl cabinets. \$189.95. Improvements incorporated in both series include: three-stage amplifier; turret-type tuner which can be stripped for UHF reception; and new automatic gain control circuitry. Westinghouse Electric Corp., Metuchen, N. J.

For more data, circle 7-24-9 on coupon, p. 50



"There's your trouble, an overheating tube . . ."

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



**More than 5600 ft. of circuitry ... 590 parts ...
and he has to know how to fix 'em all!**

YOUR TV SET is the most complicated piece of equipment you've ever owned. It represents a considerable investment of money. It provides your family with a wealth of entertainment pleasure. You value it highly.

Nobody is more aware of these facts than your neighborhood TV-Radio technician. And because he stakes his reputation on your satisfaction, *he strives to be worthy of your trust in him.* He achieves this by years of training and practice in electronic theory and application. He equips himself with expensive but essential test equipment, tools, and service

manuals. He spends countless hours keeping up-to-date on new developments, new circuits, new trouble-shooting techniques.

His training and experience qualify him as a modern, professional expert. As such, he asks a fair, professional price for his services. Since he will not use cut-rate methods or cut-rate parts in your TV set, he cannot offer cut-rate prices. *Remember, you get only your money's worth in TV-Radio service. When you are taken in by a "bargain-type" offer, you can expect to get "bargain-type" service. BEWARE THE SERVICE BARGAIN!*

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

YOUR NEIGHBORHOOD TV-RADIO TECHNICIAN

COLOR CODED NUTDRIVER SETS

no fumbling...
you reach for
the right one
every time!



No. 17
HANDY
BENCH STAND

- 7 Most-used sizes — $\frac{3}{16}$ " thru $\frac{3}{8}$ "
- High carbon steel, polished and plated
- Precision fit case-hardened sockets
- Shockproof plastic handles (UL)
- Large, readable size indexes



No. 127
SPACE-SAVING
WALL RACK (Lockable)

OTHER SETS, TOO: hollow-shaft or mixed
PLUS A FULL RANGE OF SEPARATE NUTDRIVERS:
 $\frac{3}{32}$ " thru $\frac{3}{4}$ " — Regular, Stubby, Extra-long,
Midget (Pocket clip)
available through leading electronic distributors

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

XCELITE[®]

HAND TOOLS

Quality screwdrivers, nutdrivers, pliers,
wrenches, service kits, and special purpose tools.

For more data, circle 7-26-1 on coupon, p. 50

26

ATR INVERTERS

Budget-priced inverters, to change 6 or 12v automobile or marine battery current into 110v a-c current, are: Mighty Midget model DME and model RME, designed for use with dictating machines, record players, and similar low wattage devices; and ATR Uni-

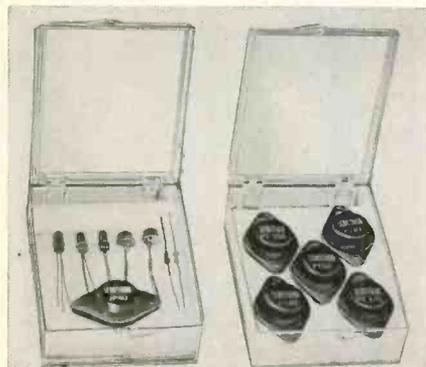


versal inverter, model RHG, for tape recorders, small TV sets, PA systems, and a wide variety of electrical devices. The units also provide a power source for emergency lighting applications, civil defense, etc. American Television & Radio Co., 300 E. 4th St., St. Paul 1, Minn.

For more data, circle 7-26-3 on coupon, p. 50

Semiconductors TRANSISTORS & DIODES

Kit No. 8JP contains 8 American-made transistors and diodes, designed to replace more than 95% of the semiconductors used in Japanese and other foreign radios. Supplied with each kit is a complete replacement and inter-

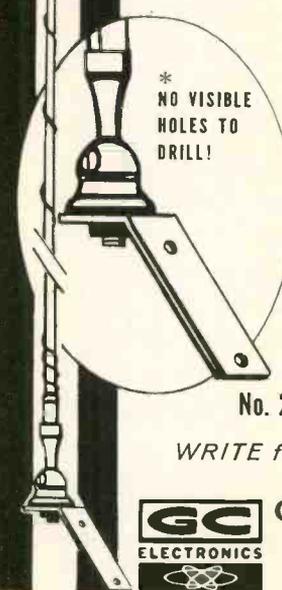


changeability chart. Semiconductors in the kit replace Japanese and foreign-made audio output, detector diode, oscillator mixer converter, i-f amplifier, audio driver detector, AVC diode and audio power components. Comes in sturdy, reusable plastic container. Semiconductors Corp., 370 Broadway, New York, N. Y.

For more data, circle 7-26-4 on coupon, p. 50

easy to install WHIP ANTENNA

WITH TRUNK LID MOUNT



* 48" TEL-COIL WHIP

* 15 FT. LEAD

Get plenty of easy-to-install replacement business with this new 48" Whip Antenna. For either side or center of the trunk groove; gives better signal due to location. Continuously loaded, and complete with cable and connector.

No. 29-753

Dealer Net Only \$11.16

WRITE for free catalog.



GC ELECTRONICS CO.

Division of Textron Electronics, Inc.
West Plant: Los Angeles 18, Calif.
Main Plant: Rockford, Ill., U.S.A.

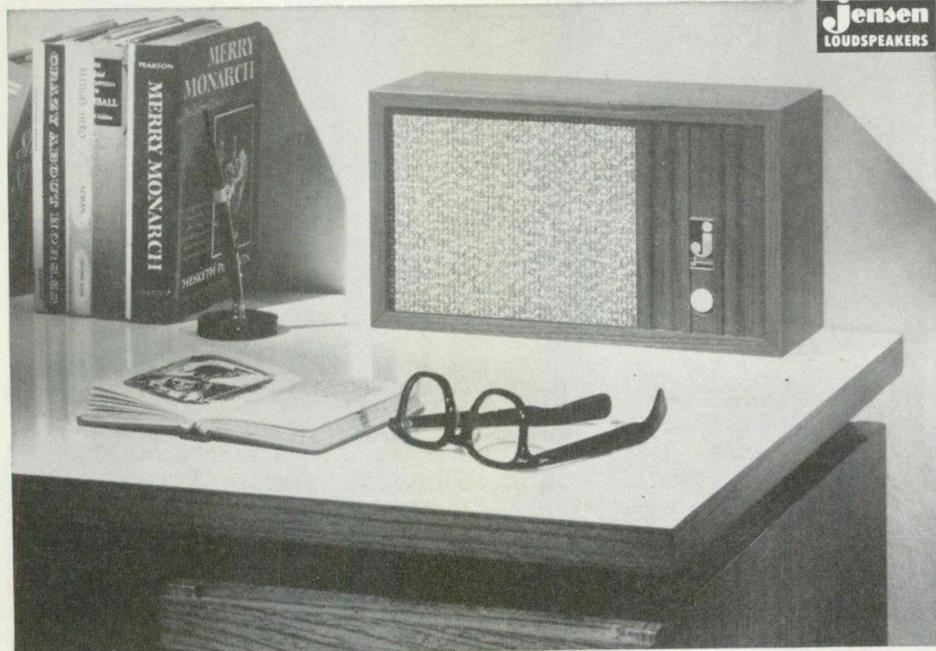
For more data, circle 7-26-2 on coupon, p. 50

ELECTRONIC TECHNICIAN • July, 1961

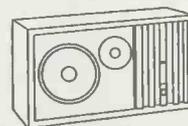
So Compact...



X-10



A startling achievement—an ultra-compact (7 $\frac{1}{4}$ " H, 13" W, 4 $\frac{5}{8}$ " D) 2-speaker system capable of sound you'd expect from a much larger unit. Volume control on front. Perfect for FM Multiplex, very low cost stereo, other-room extensions.



X-10 2-speaker 2-way system for use with amplifier having 4, 8, or 16 ohm output. Power rating 6 watts. Adequate room sound with 1 watt to speaker. In Oiled Walnut.....\$29.75

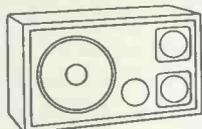
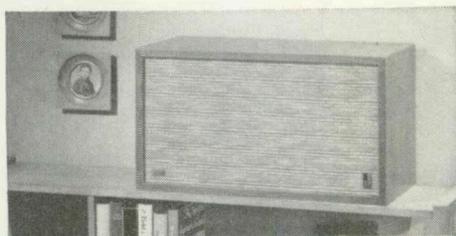
So Big in Sound...

Strikingly beautiful compact bookshelf systems—perfect for every stereo or mono hi-fi need. Recent "blindfold" tests by audio experts proved a preference for the TF-3 and TF-2 over "rated" systems costing much more. Make your own careful comparison. You will be delighted with such big sound in small space.

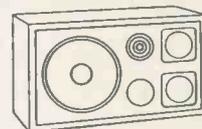
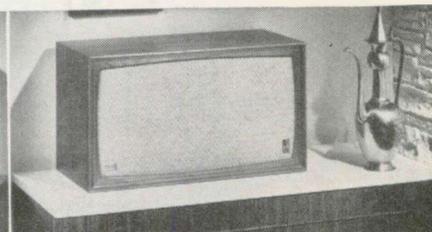


TF-2

TF-3



TF-2 3-speaker 2-way system. Full size Flexair* woofer for distortion-free bass response, plus two special direct radiator tweeters giving extended smooth highs. 13 $\frac{1}{2}$ " H, 23 $\frac{3}{4}$ " W, 11 $\frac{3}{8}$ " D. In Oiled Walnut.....\$79.50 Unfinished Hardwood.....\$64.50



TF-3 4-speaker 3-way system. Covers full frequency range with Flexair* woofer in Bass-Superflex* enclosure, two coloration-free midrange units, and the sensational Sono-Dome* Ultra-Tweeter. 13 $\frac{1}{2}$ " H, 23 $\frac{3}{4}$ " W, 11 $\frac{3}{8}$ " D. In Oiled Walnut.....\$99.50 Decorator Styling.....\$109.50

Unfinished Hardwood.....\$79.50



jensen MANUFACTURING COMPANY
DIVISION OF THE MUTER CO.

6601 S. Laramie Avenue, Chicago 38, Illinois

In Canada: Renfrew Electric Co., Ltd., Toronto

In Mexico: Universal De Mexico, S.A., Mexico, D.F.

*T.M. Reg.



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Two Tube Makers Quit

We are distressed to learn that two major manufacturers are getting out of the receiving tube business. CBS has already stopped production, and Philco will discontinue this year. Both companies will concentrate on semiconductor manufacturing, and CBS will also stick with special electron tubes.

Why? Obviously both companies found receiving tubes to be presently or potentially unprofitable. But there are more fundamental underlying reasons.

There's overcapacity. Bitter competition between tube makers grows out of this ability to overproduce. Thin profit margins result.

There's the long term trend toward transistors. Fortunately for tube companies, there are many circuit functions in which tubes can presently outperform transistors.

There's the disappointing sales picture in TV sets this past year. Were it not for the important and continuing replacement tube market, the tube industry would be in a fine fix.

There's import competition. However, imported tubes account for only a tiny fraction of all sales.

There's the squeeze some major distributors put on the manufacturers. Special concessions and extended payment periods are not unknown.

We hope that the drastic measures taken by Philco and CBS will at least have the byproduct effect of taking some of the pressure off the other tube makers. TV service dealers must have competing, yet reliable, sources of tubes. To be reliable a supplier must be making a profit. We hope remaining tube producers will now be in a stronger position to serve the electronic service industry.

TV Non-Interference Seal

The Federal Communications Commission has issued the following public notice:

"Purchasers of new TV and FM receivers should look for the seal or label on the set which indicates that it complies with the radiation requirements of the Federal Communications Commission."

Since receivers radiate signals which could in-

terfere with other radio services, FCC has set standards to limit such radiation. The rules prohibit the use of a set made after Dec. 31, 1957 if it does not have a seal showing compliance. Sets made prior to this date do not need a seal, but they must still conform with radiation requirements.

If a customer's set is "on the air" when it should not be, TV service dealers can use the usual suppression methods of shielding and r-f bypass to help the owner comply with the law.

Dealers Kick at Extended Warranty

A few months ago Magnavox abruptly extended its free labor-and-parts warranty on certain TV sets and phonos from 90 days to one year. It was done without any substantial consultation with the dealers.

Previously the company had allowed \$10 for TV and \$15 for TV-phono combinations for the 90-day warranty. For one year the ante is raised to a total of \$20 and \$25. When some dealers complained that this was not enough to cover costs, Magnavox Pres. Frank Freimann is reported to have stated: "Most dealers don't know enough about their own service costs to argue with the allowances we're giving." Papa knows best.

To make matters worse, consumers will no doubt be confused. The Gold Seal extended warranty program covers only part of the line. It doesn't help the dealer to have to tell a customer that the warranty advertised does not apply to the particular model desired.

As sets become more reliable, it is not unreasonable to expect longer warranties. However, we doubt that there has been a recent design breakthrough which justifies quadrupling the warranty period all at once.

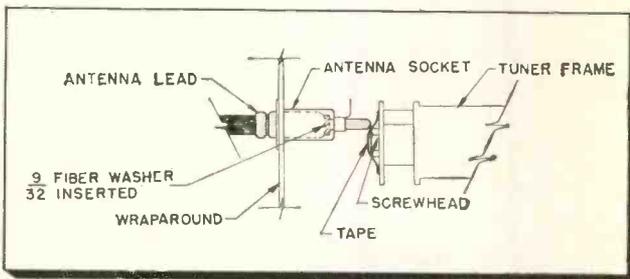
And certainly dealers should be consulted first to learn about practical field experience with warranties.

TV MANUFACTURERS

DELCO

1961 Cadillac Auto Radio— Antenna Plug Causes Dead or Noisy Radio

In early production Cadillac auto radios the antenna socket's pin may short to the tuner, especially if the production tuner coil strip is replaced. Heads of the self-tapping screws used to mount a replace-



A fiber washer inserted at the antenna socket, or friction tape placed over screw heads, can prevent a dead or noisy Cadillac auto radio.

ment coil strip extend further out than the rivet heads securing the original coil strip.

To prevent the antenna from shorting out, place a $\frac{1}{32}$ fiber washer on the antenna pin before inserting it into the antenna socket. If radio is removed for service, place 2 or 3 layers of friction tape over the screw head nearest the antenna socket. This will prevent the antenna from shorting out even if the fiber washers are not used.

MAGNAVOX

62 Series—Radio Interference

Interference which appears on the AM band may be caused by the set's neon type pilot bulb. Careful selection of neon bulbs should prevent this condition. However, addition of a $0.1 \mu\text{f}$ capacitor across the neon bulb will eliminate this interference and allow any bulb to be used. Mount this capacitor to the leads on the terminal board that are connected to the pilot light. This capacitor is being added to production.

MOTOROLA

Chassis TS-432—Production Changes

(See ET Circuit Digest #558, 9/60)

... code C-04. For better sound at low levels: Change R312 (resistor feeding push-pull transistor

audio output circuit) from 56 ohms to 68 ohms. This change will protect the audio output transistors too.

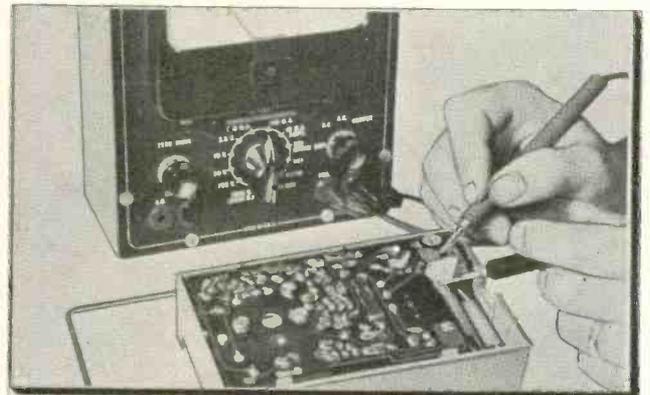
To protect the first video amplifier's transistor incorporate the following circuit change: Between the collector and L112 (resonant choke) install a $.01 \mu\text{f}$ capacitor and a 680 ohms resistor designated as C134 and R140. For chassis coded C-00 to C-03 use the open lug on the terminal strip directly opposite TR-11 as the tiepoint for L112, C134 & R140. Sync stability is improved by changing R402 from 56K to 33K and C114 in the base circuit of the agc amplifier is removed.

PHILCO

Measuring Current Drain of Transistor Radios

Transistor radio troubleshooting can be speeded up by measuring current drain on its battery.

To facilitate this operation, use a pen-knife to cut through a portion of the battery's cardboard jacket, exposing a small part of the battery case.



Transistor radio current drain can be measured by inserting a piece of paper between ground contacts of a radio's battery. Place test leads across paper, as shown.

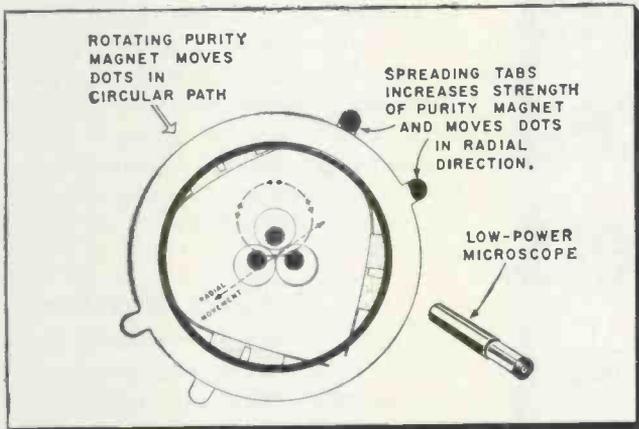
With the set first turned off, test can be made as follows: (1) Insert a piece of paper between battery's ground contacts. (2) Place a VOM's probes (with VOM set on milliammeter scale) from battery to ground, across paper. This test often reveals defective battery holders, shorts, and leaky switches. Set is now turned on and regular current drain checks are made under no-signal or normal signal levels as specified by manufacturer. Abnormal current drain will indicate defective transistor, shorted capacitor, etc.

TECHNICAL DIGEST

RCA

Color TV—Purity and Performance

Whenever color shading is detected on the CRT during reproduction of a black-and-white picture, precautions should be taken to insure that the metal parts located around the tube are not magnetized. Magnetization may occur when the color TV has been



Purity adjustments at center of CRT are made by adjusting purity magnet tabs. A low power microscope is used to check beam's centering on its proper color phosphor dot.

transported from one location to another or when the receiver is subjected to a magnetic field. A receiver should be degaussed whenever it has been moved from one location to another or even when it has been faced to serve in a different direction in the room.

When degaussing a color CRT, subject the tube's entire face plate area to an alternating field developed by a degaussing coil. Move the coil about the CRT's face plate and forward sides in a uniform circular motion for about 30 seconds. Gradually withdraw it from the tube until it has no further effect.

Purity adjustments required in the CRT's center area are accomplished by manipulating the purity magnet on the tube's neck. Purity around the outer edges of the screen is obtained by careful repositioning of the deflection yoke.

A small microscope can be employed to observe beam-dot matching on the CRT screen. It is recommended that the video signal be removed to prevent beam intensity variations while centering beams in

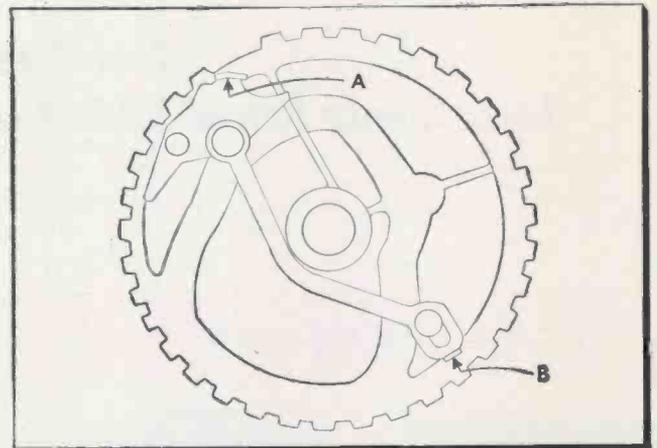
their appropriate dots. Make purity adjustments for center of screen first before adjusting for edge areas.

WEBCOR

Model 140, 141, 151, & 152 Record Changers— Cam Gear Renewal Kit

Because of a parts shortage, it is recommended that you repair, rather than attempt to obtain, a cam gear assembly (#11X1297) on these models. This gear is also used on models 157, 158, 159, 1631, 1632, 1831, 1841, 1842.

To renew a cam gear assembly, order part number SD-11X1953. This rebuilding kit consists of one 11X1953 slide plate assembly, and two 27P320 shoulder pins which secure the slide plate to the cam casting. The old shoulder pins are easily removed by grasping the heads with a pair of pliers and pulling the pins from the cam casting.



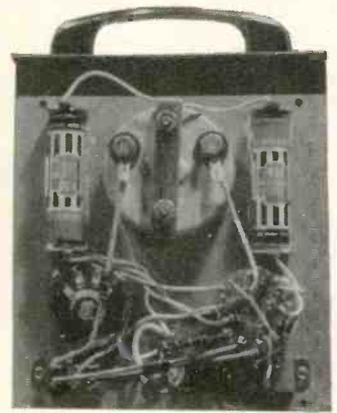
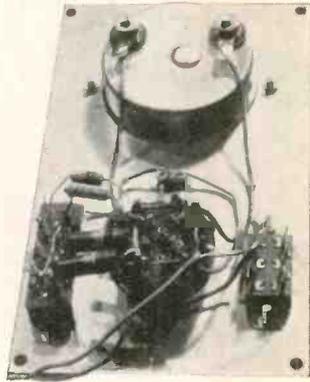
Proper record cycling is obtained by adjusting tabs A & B after repairing cam gear in a Webcor diskchanger.

The replacement slide should be secured to the cam with the new pins. Old pins may become burred during removal and prevent free travel of the slide assembly. After the new slide assembly has been secured to the cam, the linkage should fall freely through the entire length of its stroke when the cam gear is tipped 35 degrees from horizontal.

The renewed cam gear assembly should be adjusted when it is installed in a Diskchanger and when properly adjusted the changer will trip and begin cycle at the end of 45 RPM record.

EMC Model 210—\$30.00

G-C Model 36-560—\$19.95



ET Staff Examines Low-Priced Transistor Testers

*Test Capabilities of
Instruments Below \$30 Are Evaluated*

ELECTRONIC TECHNICIAN
EDITORIAL STAFF

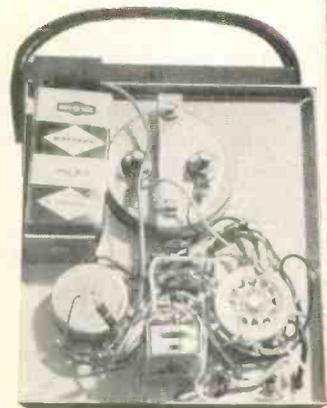
• Any technician worth his salt will purchase a transistor tester (if he already hasn't). The increasing number of sets using transistorized circuits demand it! As a result, it's important to know what is checked by transistor test instruments. Also, the basic accuracy of these tests. Otherwise, how can a technician buy a test instrument to fit his needs?

Transistor Evaluations

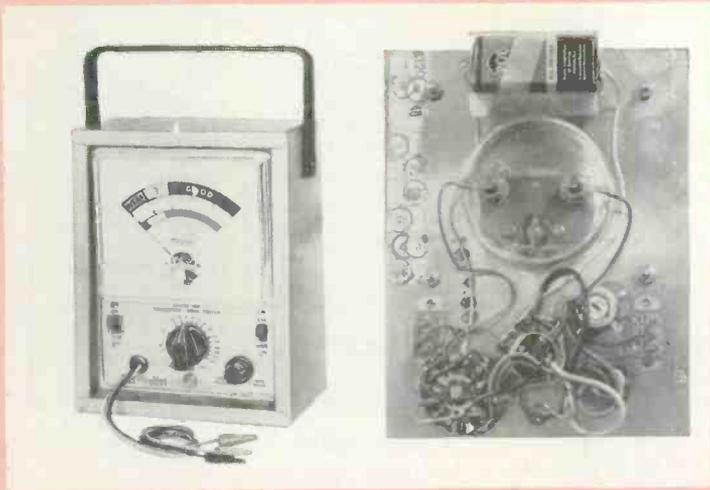
Most technicians were raised on vacuum tube theory and practice. Consequently, they are, comparatively speaking, unfamiliar with transistors. Transistors *do* fail. Vacuum tube testing and transistor testing are dissimilar. Therefore, technicians should acquaint them-

SECO Model 100—\$19.95

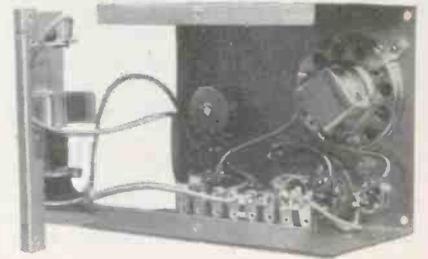
SENCORE Model TRC-4—\$19.95



MERCURY Model 700—\$24.25



MOTOROLA Model 67B65—\$17.95



selves with transistor evaluation methods.

Two *basic* tests can give a fairly good indication of a transistor's quality. They are: (1) Gain and (2) Leakage current.

A transistor's *gain* is generally expressed as "Beta." This is broadly analogous to a vacuum tube's amplification factor. Like a vacuum tube emission test, though, it is not infallible. However, it is fairly reliable in most instances when appraised together with a separate leakage test. A-c, d-c, or both Beta test methods may be used.

Beta is expressed as a ratio of collector current change to base current change, with collector voltage held constant. Other gain tests can be employed, but the Beta test is

the most popular one for service-type instruments.

An Alpha gain factor test, for instance, could also be employed. This refers to the ratio of collector current change to emitter current change. The base would be grounded in this case, just as a vacuum tube's grid may be grounded. All of the electrons leaving the emitter do not reach the collector; some go to the base. Thus, there is a current *loss* in the collector. Alpha readings for junction transistors are therefore, always less than one. Perhaps a reading will be 0.9 as contrasted to typical Beta readings like 30 or 40.

Alpha tests are not employed by service-type instruments because it is difficult to determine a transis-

tor's gain quality when faced with a 0.95 reading when it should be about 0.98. A Beta reading, on the other hand, offers easier analysis. For example, a 50 Beta reading when the component should be 90 Beta gives a technician some breathing space.

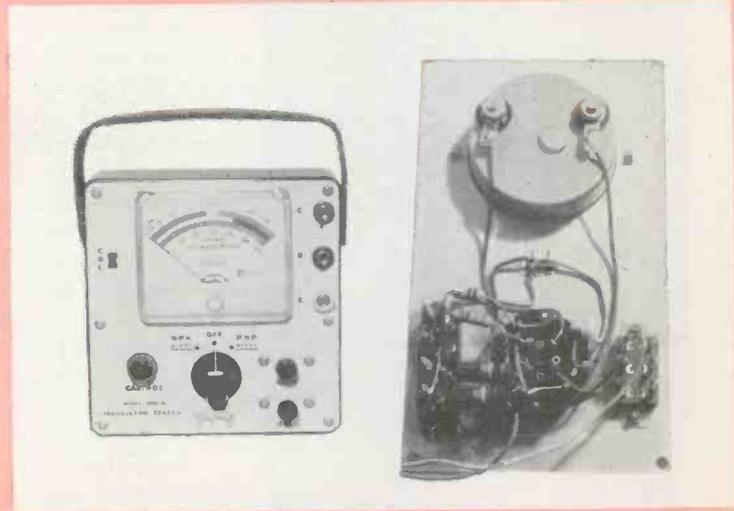
Leakage cut-off current is a measurement of current flowing between two elements. For example, between the collector and the base. This is often referred to as I_{cbo} (sometimes called I_{co}). That is, the current (I) flowing between the collector (c) and base (b). The "o" at the end of the nomenclature indicates an omitted element or elements. In this instance, the element out of the measuring circuit is the emitter. If the leakage symbol is I_{ceo} , it indicates the base has been

SIMPSON Model 650—\$26.95



Used with Model 260 or 270 VOM

TRIPLETT Model 690—\$29.50



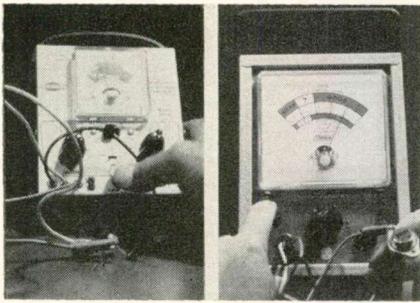


Fig. 1—Pressing a push-switch (left) tests a signal transistor's gain. Pulling down a slide-switch button of another tester (right) checks a power transistor's gain.

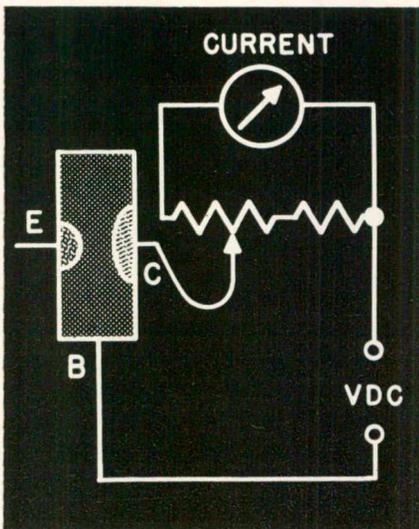
omitted.

Notwithstanding the fairly reliable quality indications of these two tests, other tests are sometimes employed. These other tests can, all things being equal, permit an even better appraisal of a transistor's quality. Such additional tests may include a leakage test between another pair of elements, shorting an element to the base, and other tests. The letter "s" substituted for "o" at the end of the symbol indicates that the omitted element is shorted instead of open-circuited.

Some instruments have separate short tests which protect their particular meter movement. Other meter circuits may not be damaged by testing shorted transistors, however, and a shorted one would be detected in leakage and gain tests.

Aside from price, physical appearance, and size, what should a technician look for when purchasing a transistor tester? A cursory glance at the instruments chart accompanying this article will indi-

Fig. 2—Basic test circuit employed to measure a transistor's I_{cbo} leakage.



cate that there are many different features available. Each technician will have to decide for himself which ones are especially appealing. Next month, ET will examine six transistor testers with additional features. Perhaps a technician will find one of these more desirable because he wants a signal generator in addition to a transistor meter tester. Or, maybe he prefers a more elaborate tester because he does a lot of transistor work and wants maximum test flexibility. Then again, a technician might prefer an inexpensive tester covered here to test popular type transistors with fair reliability. A low-cost unit is all that is needed by many technicians.

Whatever the preference, certain guide posts will help him make a choice based on knowledge instead of speculation.

Instrument Buying Factors

Every tester should indicate current gain and cut-off leakage. A good transistor has a high Beta current gain and a very low leakage current. These measurements must be equated with the ratings of the particular transistor being tested, of course. Sometimes a questionable transistor can be satisfactory in one circuit application and unsatisfactory in another application. However, if gain is decidedly low or leakage decidedly high it should be rejected. Some defective transistor conditions and their gain and leakage indications are shown in Chart I.

Two different gain measurements are utilized: d-c Beta and a-c Beta. Ideally, a transistor tester should be able to measure both quantities. Most units, however, measure one or the other. Which is the best is debatable. For example, if a transistor is being used in a low-level preamp stage, an a-c test will be more realistic. If a transistor is used in a high-signal stage, such as an audio output, a d-c test is more realistic. Normally, the difference between the results is small.

A-c Beta tests generally utilize a small signal 1000 cps a-c current for the input stage of a transistor. D-c Beta tests employ a large d-c input current. Fig. 1 shows two instruments testing transistor gain.

Some units utilize insertion of a transistor into an oscillator circuit,

CHART I

TRANSISTOR	
CONDITION	INDICATION
Emitter to Base SHORT	Zero Leakage Zero Gain
Base to Collector SHORT	Maximum Leakage Maximum Gain
Emitter to Collector SHORT	Maximum Leakage Maximum Gain
Emitter OPEN	Zero Leakage Zero Gain
Base OPEN	Normal Leakage Zero Gain
Collector OPEN	Zero Leakage Zero Gain

using a meter, neon, or speaker to indicate its quality.

An important feature should be mentioned here: Transistors should, ideally, be tested at specified voltages and currents. Thus, the more accurate (and more expensive) transistor testers have numerous potentiometers to change operating conditions as specified by the manufacturer.

Testing all transistors at the same operating conditions cannot give absolutely accurate readings, though most "good" or "bad" indications can be fairly reliable.

Some transistors tested under these conditions may read "good" when they are really "bad." An excellent example of this is indicated by gain tests made on power transistors. Many testers purport to check power transistors. However, most units cannot always determine the status of a power transistor's condition because of their power supply limitations. For example, many power transistors operate with one to three amps I_c . Flashlight batteries simply cannot supply enough base current to cause this much collector circuit current. Thus, high power transistors are not being tested under actual operating conditions. This may be compared to testing a vacuum tube with 75 volts applied to the plate when it normally operates with 500 volts. True, many such defective tubes will check out "bad" with the 75 volt application, but some will only break down under a 500 volt load.

A few transistor testers do apply higher base current for power transistors. For instance, this may result in testing small-medium power transistors with collector circuit currents of 5 milliamperes, while high power output transistor gain may be tested with 50 milliamperes

TRANSISTOR TEST INSTRUMENTS

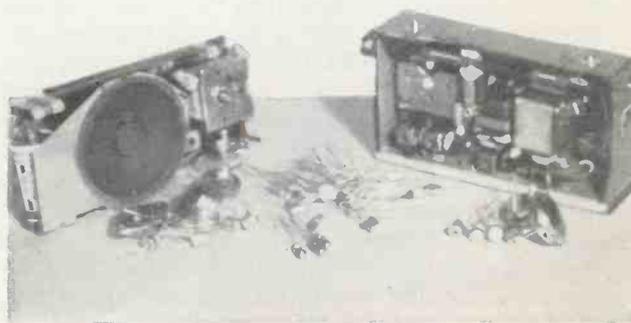
Models & Prices	Test Functions		Test Indications		Semiconductor Tests			Notes
	Leakage	Gain	Indicator	Readings	Low-Med Signal	High Power	Diodes	
EMC Model 210 \$10.95	I _{cer}	d-c	ma meter	"gd-bad" Lkge relative Gain	✓		✓	1. no test leads 2. use math to calculate gain
G-C Model 36-560 \$19.95	I _{ceo}	d-c	ma meter	"gd-bad" Lkge direct value, Gain	✓	✓	✓	1. has separate short test
MERCURY Model 700 \$24.25	I _{cer}	d-c	ma meter, cal. dial	"gd-bad" both direct value, Gain	✓	✓	✓	
MOTOROLA Model 67B65 \$17.95	oscillator circuit		speaker cal. dial	relative vol. & tone	✓	✓		1. no direct readings
SECO Model 100 \$19.95	oscillator circuit		neon, cal. dial	relative Go- No Go Lamp	✓	✓		1. has separate open-short test 2. has in-circuit tests 3. no direct readings
SENCORE Model TRC-4 \$19.95	I _{ceo}	d-c	ma meter	"gd-bad" both	✓	✓	✓	1. up-to-date set-up charts available
SIMPSON Model 650 \$26.95	I _{cbo}	d-c	μa meter (260/270 VOM)	direct value, both	✓	✓		1. has batt. adj. 2. unit plugs into models 260 & 270
TRIPLETT Model 690-A \$29.50	I _{cbo}	d-c	μa meter	"gd-bad" both direct value, both	✓		✓	

The TESTERS The CHALLENGE

Fig. 3—Here's a "family" group picture of the transistor testers studied by ET. Each one is described at the end of this article.



Fig. 4—The ET Editorial Staff used 52 low-medium-high power transistors and two transistor radios to evaluate testers' operation.



Ic. This is certainly a step in the right directions, but its limitations should be clearly understood.

Gain measurement setups vary. Transistor manufacturers normally recommend that the base input current be adjusted to obtain a standard collector current. Some of the eight testers use this method. Others, however, obtain satisfactory results with fixed base input current.

■ Leakage tests are, in a sense, a measure of a transistor's cleanliness during manufacture. If it is not sealed properly or otherwise contaminated, leakage value will be high.

Various current cut-off leakage tests are employed by transistor test instruments. The most popular manufacturers' leakage test is the Icbo test shown in Fig. 2. Here, the semiconductor is reverse-biased with an open emitter. You may think that current should not flow, but a small amount always does due to semiconductor thermal action. Leakage values in this configuration are very low. Values are measured in microamps for low power germanium transistors. (High power audio output transistors often exhibit milliamp leakage.) Consequently, a microammeter is needed to measure this leakage.

Another popular leakage test is that of Iceo. Here, current leakage is measured between collector and emitter, with the base open. Leakage is much higher when utilizing this configuration. Essentially, the Icbo leakage current is multiplied by the transistor's gain. Thus, if the Icbo is 10 microamps and the Beta is 100, Iceo is 1 milliamp. A milliammeter indicator easily suffices here. And it's cheaper, too, than a microammeter. However, manufacturers maintain that the Icbo test is more indicative of a transistor's quality than an Iceo test. Many units with milliammeters test power transistors in the Icbo configuration due to their high leakage. Others change meter sensitivity.

Another leakage test, roughly comparable to an Iceo test, is an Icer test. Here, the base is connected to the emitter through a resistor instead of being open.

■ All testers have PNP switches to simplify polarity switching. All units have transistor sockets, too. However, some units do not have socket accommodations for four-

lead transistors (tetrodes). Though not popularly used when compared to three lead transistors, four-lead types may become more popular in the future. At least one tester does not provide clip lead jacks or extensions. This makes it physically difficult to test transistors. It has been our experience that most transistors are more easily tested with clip leads as opposed to twisting and

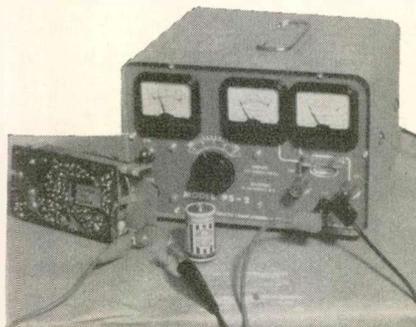


Fig. 5—An Electro Products Labs. Model PS-2 power supply was used to substitute for a transistor radio's battery. The supply provided us with low-current (0-75 ma) and variable voltage. It can also provide high current for 6 or 12 volt auto radios.

turning a transistor to maneuver its wire leads into a miniature socket, and removing solder from leads. Also, the heat of a hand may adversely affect transistors, and the leads are more susceptible to breakage when twisted. Heat, by the way, influences test results, too. Leakage current doubles in value for every 10°C rise in junction temperature. Beta increases roughly 10% for each 8°C rise.

■ Another decidedly important factor to consider when buying a transistor tester is the provisions for testing newly introduced transistors. Some testers do not need new test data info because they can be operated by using specifications listed in transistor manuals. (This can be inconvenient at times.) Many testers, however, require continual updating of transistor spec charts because their control settings have nothing to do with actual manufacturers' ratings. In these cases, new test information should be obtainable from the instrument manufacturers. Some manufacturers offer new test charts at nominal charges. Thus, a buyer is assured of an instrument that will not be obsolete in a short period of time.

■ Ease of operation is another consideration to note. Naturally, when an instrument makes additional tests, operational complexity is increased. However, even this factor can be weighed against unnecessary (from the human use viewpoint) test operator movements. Other operation points are: Is it necessary to mathematically calculate results? Is there any difficulty reading the indicator? Are results dependent upon learning the indications of known-to-be-good transistors? Can the power supply (if battery-powered) be checked without taking the unit apart?

Special features, as mentioned previously, are offered by some testers. These include tests like battery current checks, in-circuit tests (most portable transistor radios, you know, are soldered-in types), additional test facilities of component parameters, testing of silicon transistors (most units test germanium types), and others.

Perhaps our greatest disappointment with the eight transistor instruments employed by the ET Editorial Staff was the obvious lack of quality control. Fully 50% of the instruments we obtained and tested did not operate properly at first. This was due to broken internal connections, weak batteries, etc. This sad commentary, though it may not be typical, is mentioned to forewarn the buyer.

Conclusions

Gain is not absolute for standard stock transistors. A manufacturer's transistor characteristics manual may indicate a particular transistor's Beta gain as: 50 minimum, 100 maximum. Thus a transistor with a gain of 50 is considered good. Another manual may indicate an average gain of 70. Most service-type transistor testers emphasize that if a transistor's gain is within 50% of a typical gain factor it should be considered "good." Of course, a technician may wish to be more selective when replacing transistors in some portables. Perhaps he wants to enable a touchy customer to achieve louder volume by selecting a stocked transistor with higher than "typical" gain.

Since gain varies considerably between good transistors, a reason-

(Continued on page 56)

Remedy For Noisy 1960 Mercury Auto Radios

*"Clicking" Sound
Can Be Caused
By Defective Printed
Circuit Regulator*

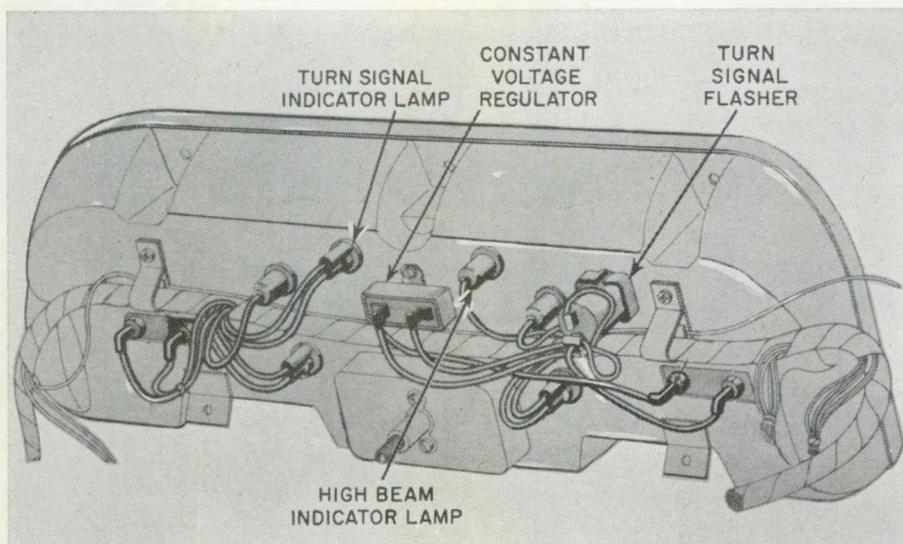


Fig. 1—Constant voltage regulator, mounted on 1960 Mercury cars, can interfere with radio reception due to poor electrical contact or lack of a filter choke.

HERB CARRIER

• A periodic "clicking" sound, much like the noise made by the turn signal indicator lamp flashing "on" and "off," is sometimes experienced from radios installed in 1960 Mercury cars. It can be caused by the operation of the constant voltage regulator, which is mounted on the instrument panel printed circuit board (see Fig. 1).

The regulator is used to limit input voltage to the fuel and temperature indicator units to a constant *average* value of five (5) volts to insure accurate readings. Operation of the regulator sets up radio interference if it is defective. The defect is due to not making good electrical contact with its socket, or if a filter choke is not installed

on the board in series with the regulator power supply.

The printed circuit board, with the integral filter choke, entered production on 1960 Mercury cars built after Feb. 8, 1960. See Fig. 2.

To pinpoint the cause of this type interference, disconnect the plug-in wire connectors at the regulator, remove the mounting screw that holds the regulator to the printed circuit board and unplug the regulator from the circuit board (which is much like a radio tube socket). Operate the radio without the regulator installed to see if the interference has been eliminated.

A word of *caution* though. Avoid short circuiting the regulator. Even a flash short can cause complete regulator damage. It's a good idea to disconnect the battery negative

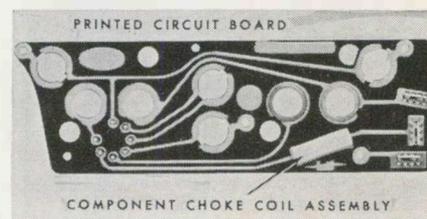
cable while removing the regulator to avoid the possibility of a short circuit. It can be reconnected once the regulator is unplugged.

If the radio noise disappears when the regulator is unplugged, check the circuit board visually to see if a filter choke coil is used in series with the regulator. The choke coil is a plastic block 1 inch long by $\frac{3}{8}$ inch square.

If the choke coil is used, make sure the constant voltage regulator and the electrical contact points on the printed circuit board are making satisfactory contact. This can be determined by looking carefully at the regulator contact points. They should show signs of metal-to-metal contact with the socket. If they are dull and tarnished, dress them carefully with an ordinary ink eraser. Once cleaned, test the fit of the regulator to the socket. It should be firm and snug. If not, bend the points slightly and carefully until a good fit is obtained.

If the radio interference is traced to the lack of a filter choke coil or if the coil is defective, the entire printed circuit board must be replaced. If the regulator is defective, it can be replaced with a new one. •

Fig. 2—PC board with filter choke entered auto production after February 8, 1960. Plug-in wire connectors are employed.



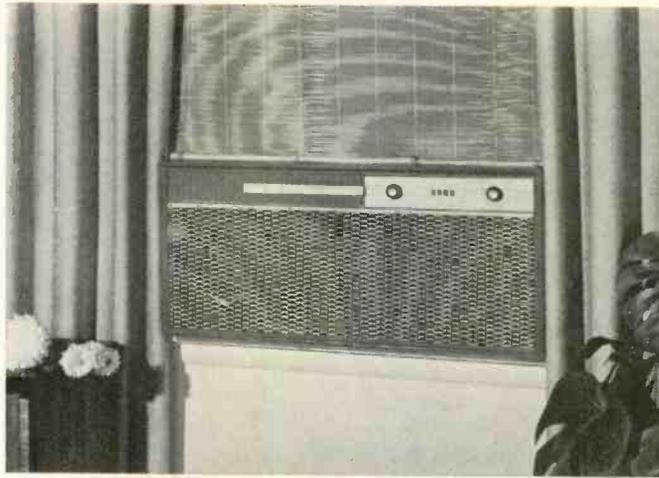


Fig. 1—Typical completed double-window home air conditioner installation showing inside flush-mounted Remington conditioner unit.

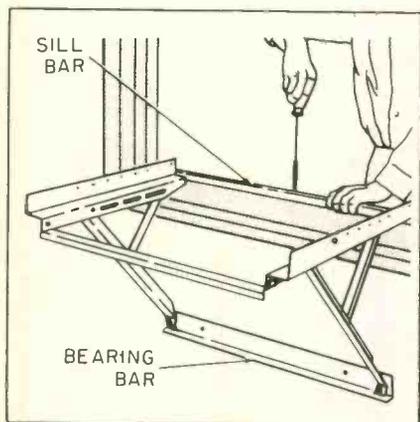
Installing & Servicing Home Air-Conditioners

Added Income Can Take The "Heat" Out Of Summer TV Service Slump

ARNOLD MANDON

• TV shops generally ignore the rewarding air conditioning service-installation field. I'm not referring to major repairs. Rather, my comment refers to minor repairs and installations. Compressor overhauls

Fig. 2—If a cradle is used, center it on window sill with bearing-bar against outside wall. Hold firmly and drive three or four one-inch long screws through sill-bar into the window sill.



and the like can be farmed out to specialists in your area.

It may surprise you to learn that standard TV hand tools are adequate for most minor repairs and installations. Add a little muscle and common sense and you're set for a high paying service field offering a summer profit "lift."

Since the manufacturer usually includes all needed hardware and other accessories in the conditioner package, all you contribute besides time and muscle is a carpenter's level and some caulking compound. New business arises from a variety of sources. For example, regular TV customers may inquire if you do this work, or local appliance stores can be approached for installation jobs.

If a prospective customer approaches you for a unit, the normal procedure in my area is to refer the customer to photos and specifications in brochures, and suggest a unit be selected. Cost and list price sheets are available from the local

air-conditioner distributor. This information is sufficient to allow you to quote competitive prices.

After the deal has been consummated, contact the distributor, order the instrument, and then install the unit. But do not forget to inquire if electrical power provisions in the customer's home is adequate for the machine selected. If you are not in a highly competitive price-slashing discount area, you can make a reasonable profit on the sale and also receive about \$25 for an efficient window installation job. A typical completed installation is shown in Fig. 1.

The procedure here does not trespass upon the distributor. And you are not cutting-in on the local appliance dealer since the customer approaches you for the merchandise—frequently desiring only *your* advice regarding the equipment and installation. The customer will usually purchase one of the many popular name units, for example, Fedders, Carrier, G-E, RCA, etc.

Some installations require a cradle (see Fig. 2) to support the unit (all parts are generally included in the installation kit).

Other units are split and the casing is installed first with the conditioner being slipped into the mounted casing. Note that manufacturers include a handy list of step-by-step instructions with each unit. After a few units are installed the procedure becomes automatic. Units are generally installed in double hung windows ranging in width from 28¾ to 39 inches. Information on narrow and wide-window installations are usually included in the package.

Typical Installation

It may be helpful to go through the actual steps necessary to install a typical conditioner. Let's install one in the upstairs bedroom of a home. A two-man team is normally required. Average time for the installation is about one hour.

If you did not sell and deliver the unit, it is usually found in the owner's garage or the delivery agent may have left it on the bedroom floor.

First, ask the owner exactly how he wishes the conditioner mounted. Is it to be flush with the inside or extending into the room six or eight inches? The owner's choice naturally determines mounting procedure to a certain extent.

After the unit is unpacked, the shell or casing is removed from the chassis as outlined in the four easy-to-follow steps shown in Fig. 3. The chassis contains the compressor, fan, cooling coils, and other components. If a mounting cradle is required, of course, the unit is not separated from the shell.

Now inspect the compressor to determine if external spring mountings are used. If the compressor has external springs, loosen the hold-down nuts until the compressor floats freely on its springs. Do not loosen hold-down nuts completely. If the compressor is rubber mounted it is not necessary to loosen the hold-down nuts.

Measure the window's width, determine the center point and mark this point on the window sill. Install the rubber cabinet side seals, as shown in Fig. 4. Ends of the steel prongs inside the seals are placed in

slots provided in the clips on the cabinet's top and bottom. These seals are left and right handed and the correct one must be selected for the proper side. The square cut end must be on top and the rubber extension of the bottom should be towards the unit's rear. The beaded lip of the rubber seal is toward the cabinet front.

Now place the cabinet assembly into the window, aligning the center hole in the bottom tie angle with the center line previously marked on the sill. Pull the window's bottom sash down tightly behind the top bar spacers. Secure this arrange-

ment temporarily so the sash will not be accidentally raised. Now drive three one-inch long flat-head self-starting wood screws through holes in the bottom tie angle into the window sill.

After the casing has been mounted the back supporting brackets should be attached as shown in Fig. 5. Use the level here and tilt the cabinet slightly to the rear (outward) so that condensation can drain off to the rear.

The next step is to measure, cut, and mount the filler panels. The

(Continued on page 68)

Fig. 3—Four easy steps for removing shell from air-conditioner chassis.

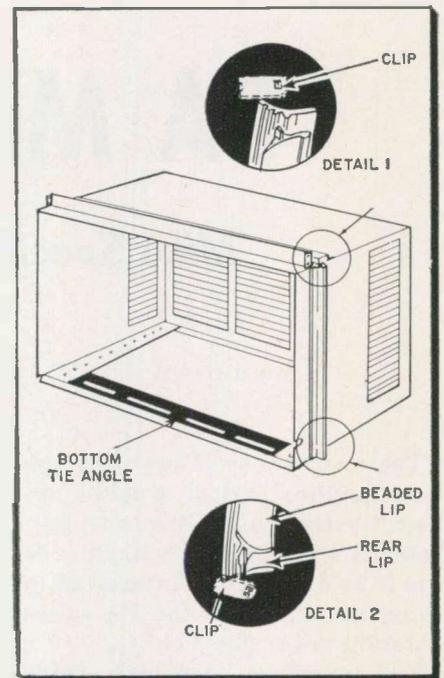
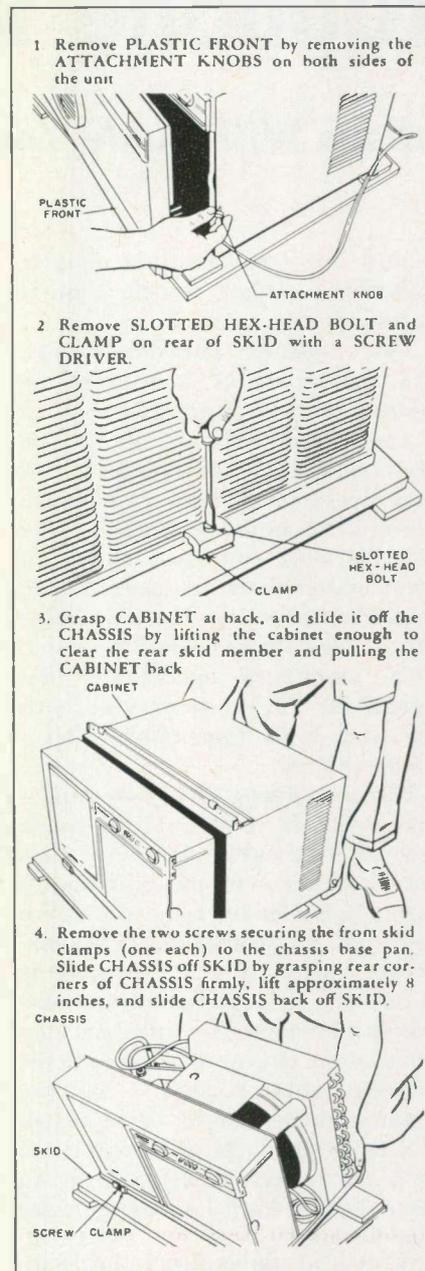
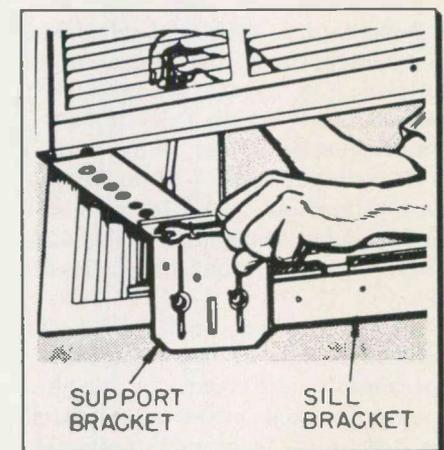
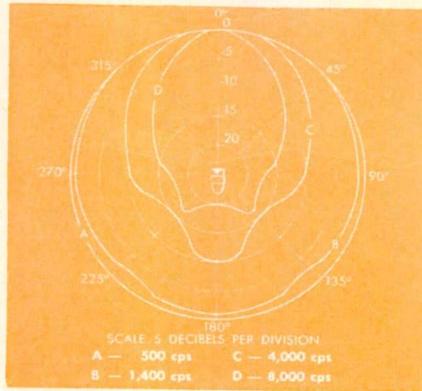


Fig. 4—Details of rubber side seal installation. Beaded lip of seal must be toward the cabinet front.

Fig. 5—Attach support brackets to the cabinet tracks and tighten the carriage bolts. Make sure the cabinet is tilted slightly downward to the outside.





An omnidirectional mike's sound pattern.

PA Microphone Ratings

Mike Specifications Will Guide Your Selections

ARNOLD HABER

• The microphone is probably the least familiar part of a public address system to a service technician. This unfamiliarity handicaps him if he's active (or interested in becoming active) in the PA sales-installation-service field.

For example, consider three specifications that invariably appear in a microphone spec sheet: impedance, output level, and polar pattern. A technician should understand the meaning and significance of these ratings. This knowledge will enable him to select the correct microphone type for his customer's use.

Some typical specifications listed in manufacturers' catalogs are as follows: (1) Astatic model—High Impedance, -54 db Output Level, Omnidirectional. (2) Shure model—High Impedance, -53 db Output Level, Cardioid. (3) Electro-Voice model—Low Impedance (50, 150, 250), -55 db Output Level, Cardioid.

As you can see, each model selected here has at least one major specification difference (we've purposely ignored other specs such as type and frequency response,

though they are certainly equally important). What is the significance of each rating?

Let's consider **impedance** first. The impedance of a microphone should match the input impedance of the PA amplifier to obtain the best transfer of power. If a PA amplifier has a high impedance microphone input, a high Z mike must be used (unless a matching input transformer is used). If the amplifier has a low impedance input, a low Z mike should be used. Most amplifiers specifically designed for PA work provide both low and high impedance microphone inputs.

The advantage of a low impedance mike is in its ability to be used at long cable distances from the amplifier without picking up hum. High Z mikes tend to pick up hum past 15 feet of cable length. Consequently, if a PA system is to be used in a nightclub or banquet hall where the speaker may move to the center of a dance floor, or from table to table, a low impedance mike should be selected. If a microphone is to be employed at a stationary position, say an office desk, a high impedance mike may be used.

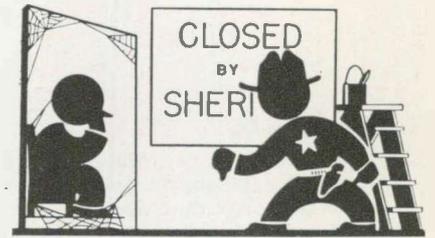
It should be pointed out here

that many microphones have multi-impedance taps that permit switching from low to high impedance and vice versa. Also, some mikes are strictly low impedance units but provide different low Z choices (for example, 50, 150, or 250). Different amplifier matching choices are thus available. The lowest impedance permits the longest hum-free cable lengths. Low Z mikes are generally priced higher than high Z mikes (crystal and ceramic mikes are natural high impedance devices). They often incorporate miniature step-up transformers to raise their otherwise low output levels, whereas crystal or ceramic mikes have high outputs.

This second rating, **output level**, is the open-circuit voltage generated by the mike for a stated sound pressure at its diaphragm. The sound pressure is in dynes per square centimeter (sometimes called, microbar). The result is usually correlated to decibels. High impedance mikes, like two of the examples mentioned, are usually rated for output level by referring the negative db figure to: 0 db equals 1 volt per microbar. Another method is usually used for low impedance mikes. The

(Continued on page 55)

Don't Murder Your Business



A Study Of Why Small Businesses Fail

IRVING ELBAUM
CPA, Los Angeles Area

• Most businesses do not die natural deaths. Their managements kill them! Whether they are a sole proprietorship, partnership or corporation doesn't seem to matter. The blunt, inescapable fact is that homicide, accidental though it may be, is committed. And there are various murder techniques.

Today, there seems to be a popular misconception regarding the ease with which the life of a TV service company can be sustained. Sustaining life in any business, be it large or small, is a tough job. Superimposed on this general business difficulty is the hardship faced by the small operator. After all, consider his position. His business is usually not too well capitalized, is not as well controlled as a larger operation, generally faces shortages of working capital, and receives a tighter credit line than its larger competitors. What it really comes down to in the final analysis is this: the advantage of having everything under the thumb of the owner is more than offset by the disadvantages which are concomitant with smallness—inadequate financial reserves and difficulty in decentralizing responsibilities among subordinates.

Failure Survey

Let's delve into some figures concerning business failures. A survey made by Dun & Bradstreet indicated that only 78 out of every 10,000 businesses fail. This is truly amazing since many new businessmen have had little or no prior business experience. Naturally, there have been wide variations de-

pending on the particular stage through which the economy was passing. Still, this very low mortality rate should encourage every small TV service organization. Another Dun & Bradstreet survey showed that two out of every three concerns that failed had been in business for five years or less.

Just what are the basic, and broad reasons that businesses die? A study of 9,162 failures came up with the following reasons:

Incompetence	42%
Lack of business experience..	31%
Lack of rounded experience..	14%
Neglect	6%
Fraud of the owners.....	4%
Miscellaneous	3%
	<u>100%</u>

Let us examine each group and explore some of the controllable factors.

Incompetence: Generally speaking, this group can be broken down into three categories: physical, emotional and economic.

Physical incompetence is self explanatory. Either you cannot adjust to the hours or you are not suited for the type of work. Antidotes would be: (1) sell the business before it dies, (2) transfer labor duties to someone else, (3) rent or buy labor-saving devices (if available).

Emotional incompetence is a very common reason for the failure of many businesses. Many men are excellent workers, but cannot assume responsibility. Therefore ask yourself the following questions before going into business. You alone know the answers.

• Do I realize that I may lose mon-

ey and that I'll be in a rough spot pretty often?

• Can I take the responsibility of paying my creditors and my workers on time?

• Will I mind working long hours?

• Do I care for this type of business?

• Am I ingenious enough to get myself out of a tight financial spot quickly?

With *economic incompetence* the largest factor is inadequate initial capital. The wise man thinking of going into a small operation should take time to accurately calculate his financial needs to keep the business going for at least a year. Unfortunately, far too many people start on the proverbial shoestring. They feel that once the initial outlay for machinery, furniture, fixtures, deposits, licenses, merchandise, supplies, etc. is made, things will take care of themselves. Such could not be further from the truth.

Lack of business experience: Can be termed as a lack of general business experience as well as specializing in the particular line. Here is a list of typical symptoms originated by this: (1) No, or inadequate, records. (2) Overextension of credit. (3) Poor receivable collections. (4) Taking on too large a fixed overhead. (5) Not reducing the variable overhead when the going gets rough. (6) Overbuying or underbuying. (7) Poor location. (8) Not knowing how to combat competition. (9) Not "knowing" this business.

Lack of rounded experience: This defect stems from favoring one department to almost complete exclusion of all others. Former salesmen generally are the great-

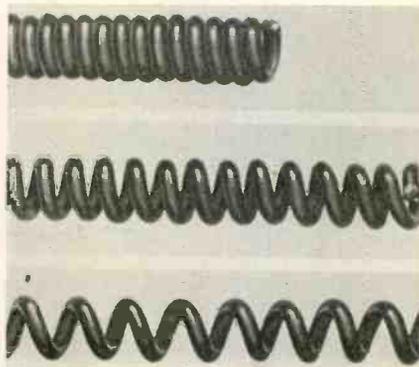
(Continued on page 63)

New Products For

Alpha CORDS

Announced is a complete line of neoprene jacketed, retractile coil cords—electric cords that are permanently coiled into a spring shape. Reported to offer an extra degree of safety in many electrical applications. Available are: Power cords, in 48" retracted length with maximum extension to appx. 25'. Communication coil cords, 4' long, retracted, with extended length of 25'. Retractable test lead wire, extended length of 6', retracts to 12" Alpha Wire Corp., 200 Varick St., New York, N. Y.

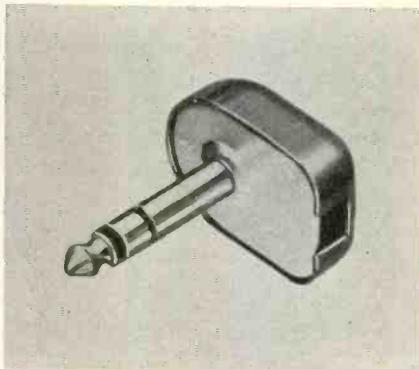
For more data, circle 7-42-1 on coupon, p. 50



Switchcraft FLAT PLUGS

Introduced are two new flat plugs, with .206" diameter finger, to mate with small hole phone jacks. They are commercially interchangeable with MIL type plug PJ-068 (Switchcraft No. 480). They are designed to solve connection problems where the MIL spec is not applicable. Construction features nylon insulation between tip, ring and sleeve circuits of the finger assembly. Part No. S-230, \$1.75, with black plastic handle. Part No. S-235, \$1.75, with red plastic handle. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.

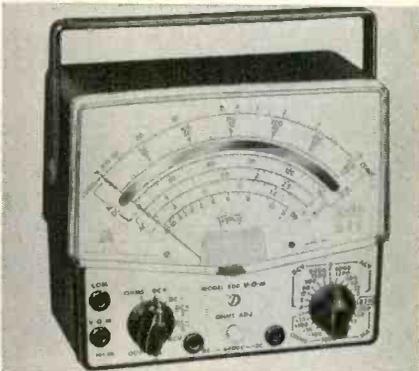
For more data, circle 7-42-2 on coupon, p. 50



Triplet VOM

Model 800 has 70 ranges and also maximum reading accuracy as a result of longer mirrored scales (6.95" top arc). Other features include: frequency compensation from 40 cps to 20 kc for more accurate reading at audio frequencies; overload protection for greater meter safety; 20,000 ohms per volt d-c sensitivity and 10,000 ohms per volt a-c sensitivity. The large meter has a crystal-clear, shatter-proof plastic front; and incorporates a self-shielded high flux Bar-Ring magnet for increased ruggedness. Modern design black molded case, completely insulated, 7½" x 6¼" x 3⅞". Movable handle serves as a stand. Triplett Electrical Instrument Co., Bluffton, Ohio.

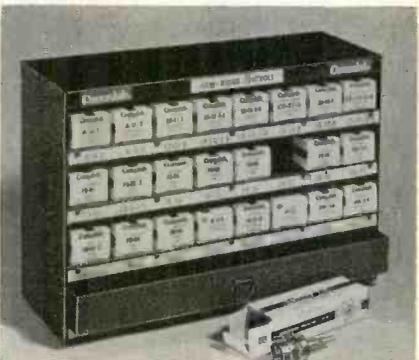
For more data, circle 7-42-3 on coupon, p. 50



Centralab AUTO RADIO CONTROLS

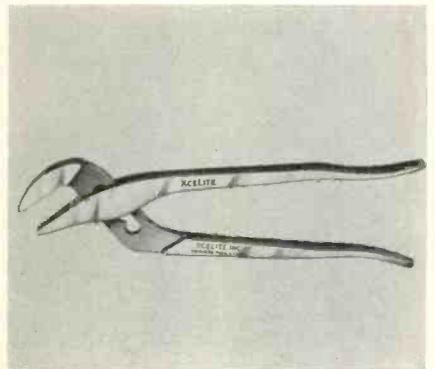
ACK-100 kit contains 24 most frequently used replacement auto radio controls. They are exact replacements and are contained in a sturdy steel shelved cabinet that is supplied without charge. The cost of the kit is the same as the cost of the individual controls. Included are controls for Chevrolet, Ford, and Plymouth radios. Also replacements for Automatic Universal radios, used in many American and Foreign cars. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 7-42-4 on coupon, p. 50



Xcelite HAND TOOLS

A new forged alloy steel utility plier, in 7" and 10" lengths, featuring double-strong box joint construction and flush-ground rivet pin, is reported to be 30% thinner than conventional models. For use on flat, square, hex, or round-shaped objects. Produces pow-

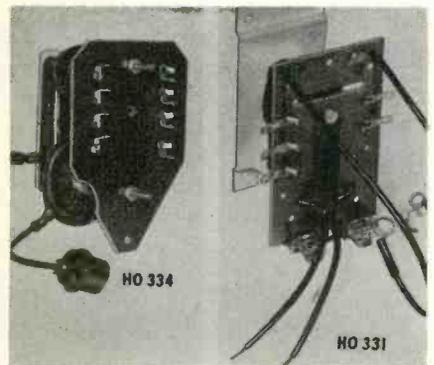


erful leverage in each of 4 gripping positions. Simple, lever-action movement of the handle adjusts serrated jaws. Mirror finish plate is rust resisting. Measuring only ⅝" at its thickest point, 7" model adjusts to 1⅛" opening. Large 10" model, ½" thick, max. jaw opening, 1½". Xcelite, Inc., Thorne Ave. & Bank St., Orchard Park, N. Y.

For more data, circle 7-42-5 on coupon, p. 50

Stancor TRANSFORMERS

Three new exact replacement transformers are: Stancor flyback HO-331, for Magnavox parts 320055-1, 320061-1 and 320061-3, used in 384 chassis. HO-334 replaces part 320811-1 used in



20 models and chassis of both Sentinel and Magnavox chassis. HO-335 replaces Magnavox part 360779-1 in 51 chassis. Stancor Electronics, Inc. 3501 W. Addison St., Chicago 18, Ill.

Electronic Technicians

Jensen SPEAKER SYSTEMS

Shelf model TF-2, 3-speaker 2-way system, uses a new special 10" Flexair high-compliance, low distortion woofer for full bass and two direct radiator tweeters for precise, clear highs. Frequency range, 25—14,000 cps. Cross-over, 2,000 cps. Power rating, 20 watts. Input impedance, 8 ohms. Control, H-F balance, mounted on rear panel. 13½" H x 23-¾" W x 11-⅞" D. Oiled walnut cabinet shown, \$79.50. Also in unfinished, \$64.50. Jensen Mfg. Co., 6601 S. Laramie, Chicago 38, Ill.

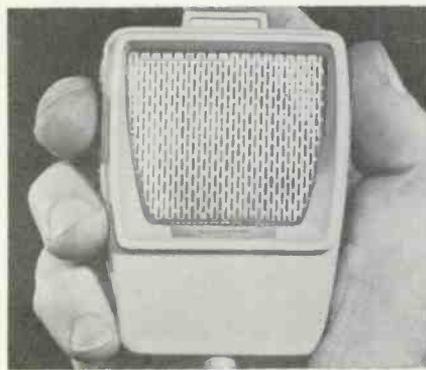
For more data, circle 7-43-1 on coupon, p. 50



Sonotone MICROPHONES

Model CM-30 ceramic citizens band microphone is reported capable of absorbing the punishment and continuous service anywhere a rugged communication mike is desired. Frequency range, 100—6,000 cps. Sensitivity, -49 db. Made of lightweight shatter-proof plastic. Equipped with 6 feet of four-conductor shielded coil cable, a push-to-talk switch and dashboard mounting brackets. \$14.00. Sonotone Corp., Elmsford, N. Y.

For more data, circle 7-43-2 on coupon, p. 50



Fisher

STEREO CONTROL-AMPLIFIER

Model X-1000 stereo control-amplifier, a combination of master audio control and dual-channel power amplifier with a combined music power output of 110 watts, employs: 22 controls and switches; 18 inputs; 11 outputs; 14 tubes; and 7 diodes. Features include: stereo dimension control; center channel facilities for speaker; tape deck; remote monophonic system; new-design tape monitoring system; and built-in exclusive Spaceexpander control. 16¹⁵/₁₆" wide x 5¼" high x 13¾" deep. Weight, 50 lbs. Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.

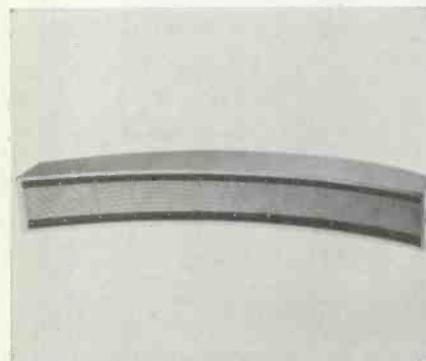
For more data, circle 7-43-3 on coupon, p. 50



E-V PA SPEAKERS

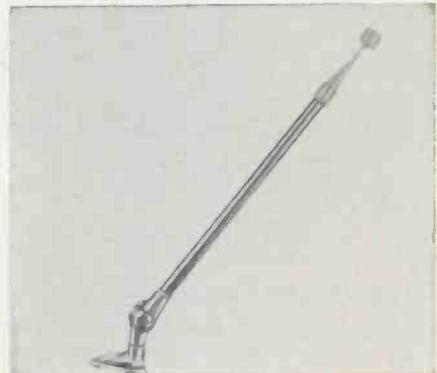
Model LR-4 line radiator public address speaker, an entirely new concept in commercial sound, is said to have a well-defined polar pattern with maximum radiated energy in a horizontal plane with vertical dispersion. Its small size permits mounting in almost any location. Special mounting fixtures or complicated installation accessories are not needed since the unit is unusually light in weight. Power-handling capacity, 30 watts. Electro-Voice, Inc., Buchanan, Mich.

For more data, circle 7-43-4 on coupon, p. 50



Atlas MIKE MOUNT

Announced is a new language lab mike mount, a multi-purpose microphone support with "floating action" capable of a wide variety of applications. The boom arm and all moving parts of the new model US-2 are spring friction loaded to float in any desired position without locking ad-



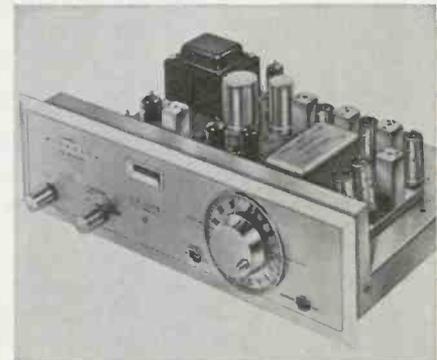
justment. Base swivel rotates 350°. A stop prevents twisting of mike cable. The cable, concealed in the boom, feeds through the swivel assembly and mounting flange. These features make it ideal for language lab installations, switchboards, dispatcher desks, etc. Atlas Sound Corp., 1449 39th St., Brooklyn 18, N. Y.

For more data, circle 7-43-5 on coupon, p. 50

Scott

FM MULTIPLEX TUNERS

Model 350 wide-band FM multiplex stereo tuner is reported to have wide-band circuitry throughout its design. The 2 mc wide-band detector provides superior rejection of interference and complete freedom from drift. The wideband design of the i-f's and de-



detector give the new model a remarkable usable sensitivity of 2.5 μ v, measured by stringent IHFM standards. It has 10 tubes and 11 diodes. Can receive either monophonic FM or stereo FM multiplex programs. Special circuitry for stereo tape recording is included. \$199.95, east of the Rockies. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.

For more data, circle 7-43-6 on coupon, p. 50

TV Low Voltage Power Supply Problems

Minimizing Call-backs With Careful Troubleshooting & Repair Techniques

JOHN HASKELL

• Did you ever think of trying to investigate a few hundred complete records of TV failures extending over a period of years? It may be found that low voltage TV power supplies cause more call-backs per repair job than any other TV sec-

tion. This may appear especially true if break-downs occur under conditions specified within three broad categories, as follows:

- (1) Sets that owners have operated over long periods of time while low voltage rectifiers are weak.
- (2) Sets that owners have not used over a period of time—usually

while on extended vacations during hot and humid summer months. (3) Sets that received *minimum* shop repairs on their low voltage power supplies.

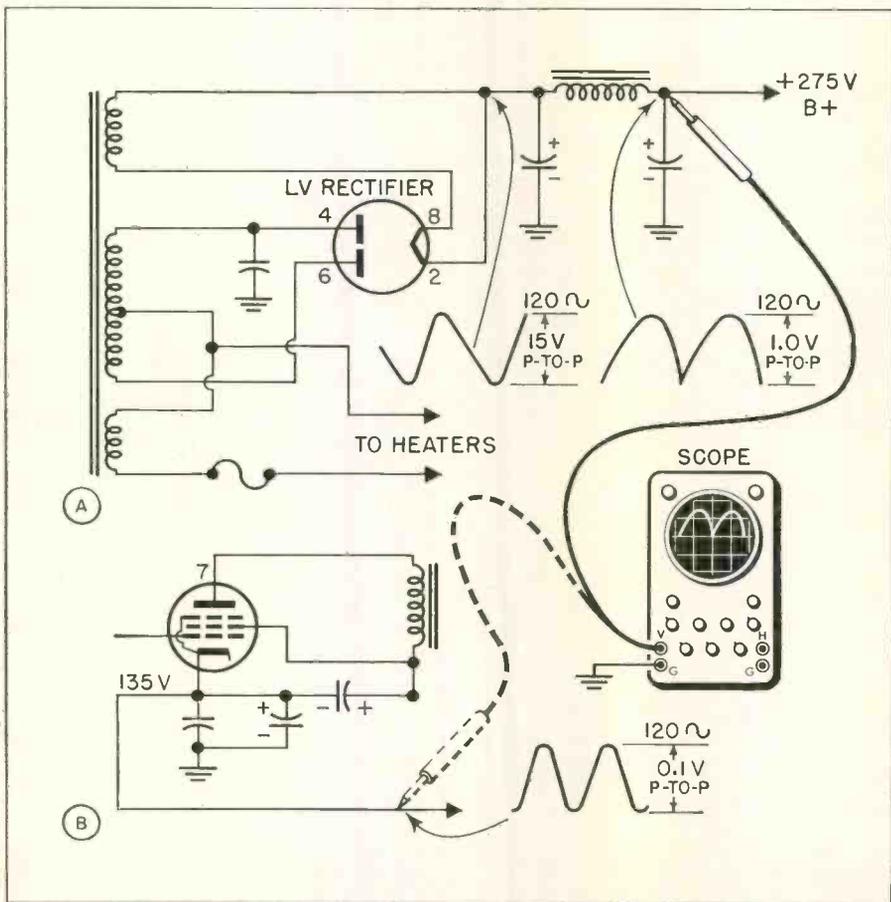
Many technicians have replaced 5U4's or solid-state type rectifiers while on regular house calls—only to find it necessary to pull the set a few days later because of a similar symptom-complaint. Or, worse still, the technician arrives and finds an excited customer nursing a smoking TV. In many cases the customer has reason to be excited. A little foresight by the technician can minimize, and often completely eliminate, many of these trying customer problems.

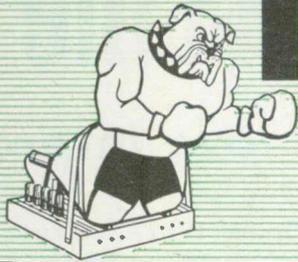
The primary reason for failures in this category is obvious. When a TV is allowed to run for months with low B+, a filter capacitor's oxide dielectric on its positive plate may "reform" to a lower voltage break-down thickness, allowing little or no overload tolerance. Naturally, when a new rectifier restores normal higher-than-usual voltage, an electrolytic capacitor frequently "pops".

When a weak or dead rectifier is replaced in a customer's TV while making a regular house call, the technician would do well to explain tactfully that the set may *not* stand up. Nothing to worry about, of course, but the set *may* require further repairs—and such repairs *may* require shop work. It should be explained that nothing can be done *now* to prevent a break-down—should it occur. Thus, the customer would not become unusually

(Continued on page 60)

Fig. 1 (A)—By checking the a-c ripple content of a TV's low voltage supply with a calibrated scope, condition of filter capacitors can be determined. (B)—A similar check should be made at the audio output tube's cathode on sets having this voltage supply.





"Tough Dog"



Corner

Difficult Service Jobs Described by Readers

"Error" Feedback Upsets Horizontal Range

A Magnavox Model CT 297 TV chassis was brought into the shop for troubleshooting, and repair of an unstable horizontal condition. The customer complained it was necessary to reset the rear oscillator adjustment several times while using the set. Tube substitution did not correct the condition.

With the chassis on the bench, I proceeded to check for a drifting component. A hot soldering iron was held close to each resistor and capacitor in the afc circuit, but nothing conclusive showed up.

Suspecting the horizontal oscil-

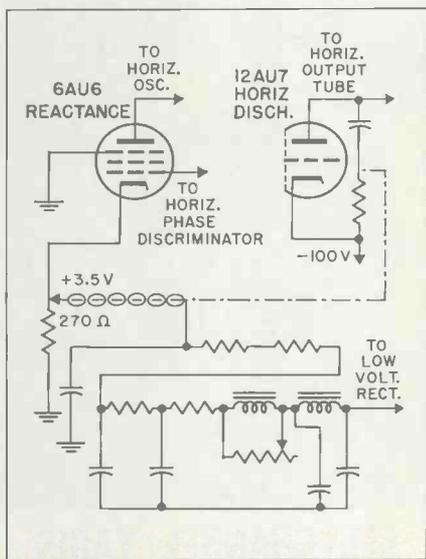


Fig. 1—Wiring error caused feedback of sine wave voltage to control tube's cathode. A-c voltage resulted in poor horizontal hold range.

lator pull-in range was not up to par, I decided to check this with the scope. Waveforms seemed proper until I touched the scope's probe to the reactance tube cathode. I obtained a small sine wave at 15,750

cycles! Temporarily bridging the cathode with a $40\mu\text{f}$ capacitor, the sine-wave disappeared. Horizontal oscillator stability immediately improved with considerable increase in range. The next step was to find out how this horizontal sweep voltage was getting to the reactance tube cathode.

I started tracing back from the cathode to the tap in the power supply and there I found it! One of the voltage divider resistors in the B+ had been replaced some time before, and someone made an error. As shown in Fig. 1, the resistor had been soldered to the wrong terminal lug. Although it was a very low voltage point and caused no obvious effect in other areas of the receiver, it completely upset the afc circuit.

Soldering this lead to its proper place restored normal operation, after the horizontal frequency coil was properly set.—Frank A. Salerno, Long Island City, N.Y.

Open Filter Kills Vertical Sweep

A Crosley 404 TV chassis was brought to the shop with no vertical sweep. At the customer's home the 12BH7 vertical oscillator/output tube was replaced to no avail. After placing the chassis on the bench a VTVM check at the 12BH7's socket revealed a most unusual set of readings:

- Pin 1: 400 volts
- Pin 2 & 6: -150 volts
- Pin 3: 14 volts
- Pin 7: -1 volt

Comparing these voltages with those on the schematic, I immediately noted the negative voltage at pins 2 & 6 was very high. I then proceeded to check voltages at the height control and found that lugs 1 & 2 were at 400 volts. But lug 3 indicated -150 volts. Using an

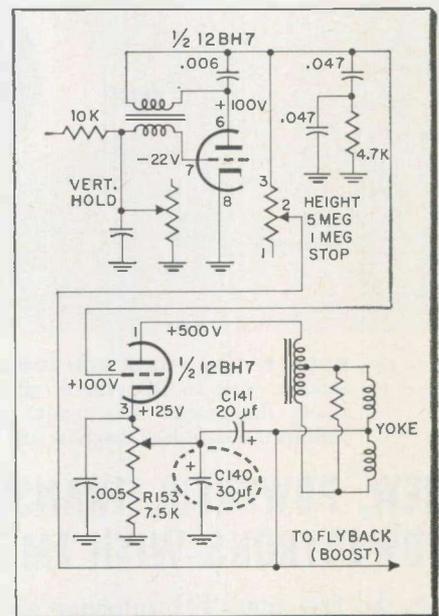


Fig. 2—Open $30\mu\text{f}$ vertical decoupling capacitor "killed" vertical sweep in a Crosley 404 TV chassis.

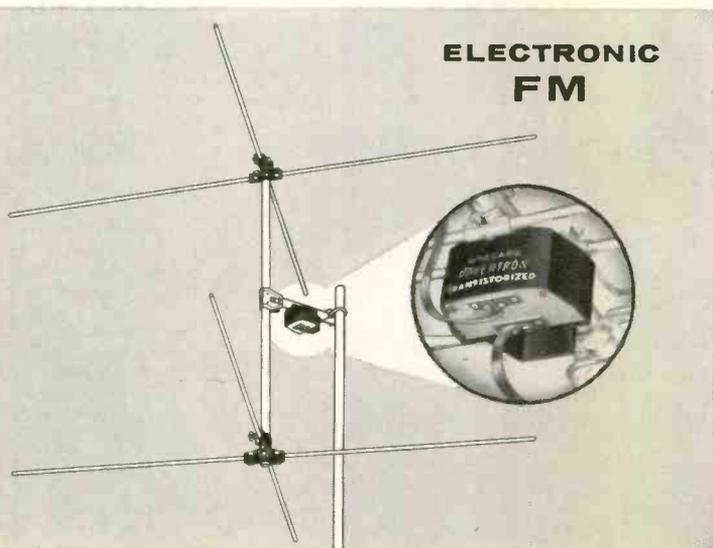
ohmmeter, I varied the control and it checked out as good, including its 1 megohms tap.

My attention was then directed to the tube's output triode section. The normal cathode voltage is +125, as indicated in Fig. 2. The reading at this point was 14 volts. At this time I noticed the resistor in series with the linearity control was "cooking." Switching my meter to the a-c test scale, revealed 110 volts a-c on the 7.5 K ohms cathode resistor.

Rechecking the schematic, I noted the $30\mu\text{f}$ filter capacitor from the linearity control center arm to ground. A check showed this component was open. A scope check at the cathode showed a husky horizontal saw-tooth which the open decoupling filter allowed to pass. Replacing the capacitor restored normal operation and eliminated a real headache.—Lambert C. Huneault, Windsor, Ontario, Canada.

NOW...A Complete Line of

Built-in Amplifier clears up snow, improves



MODEL PF-T FM POWERTRON TURNSTILE Non-directional FM antenna with 16 DB gain in all directions over a folded dipole. Has unique offset mount and comes complete with built-in transistorized amplifier and TV-FM coupler.

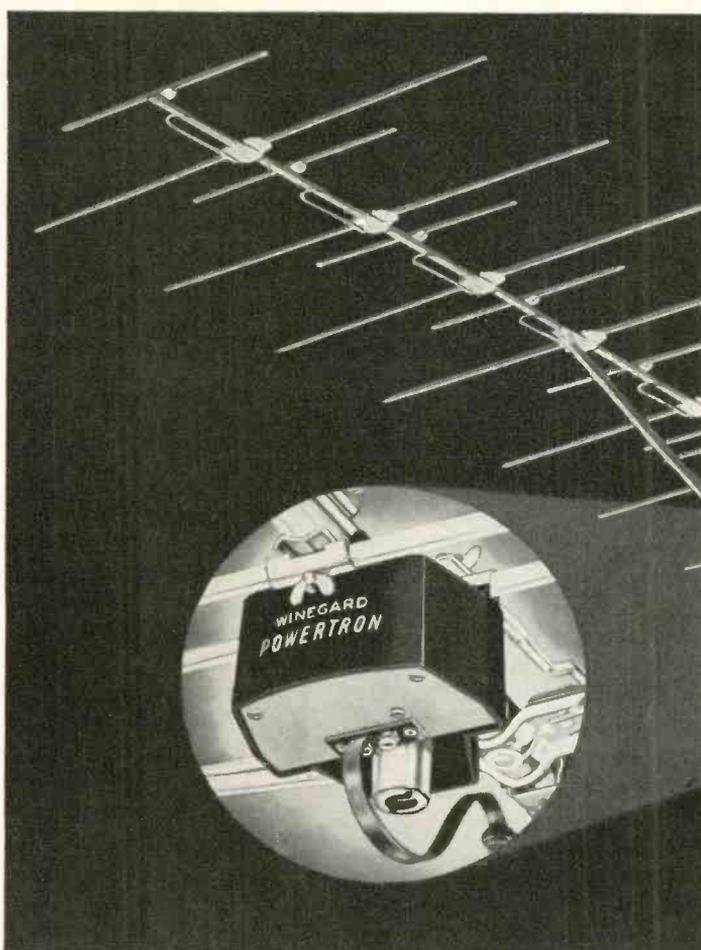
NEW, POWERFUL TRANSISTORIZED FM POWERTRONS WITH FM-TV COUPLERS

For the first time, FM antennas with built-in transistorized amplifiers are available for long range FM reception. Winegard offers two models — FM Powertron Turnstile (omni-directional) and the FM Powertron Yagi (directional). Both models have two 300 ohm terminals on the amplifier: one for down-lead connection to the set and one for connection to a TV Powertron antenna.

MODEL PF-8 FM POWERTRON YAGI This is the world's most powerful FM antenna. Makes weak signals come in like "locals". Has 25 DB gain over folded dipole. Eight elements with exclusive Winegard "tapered T" driven element. Built-in TV-FM coupler allows you to couple into TV Powertron with only one power supply. Complete with built-in transistorized amplifier.

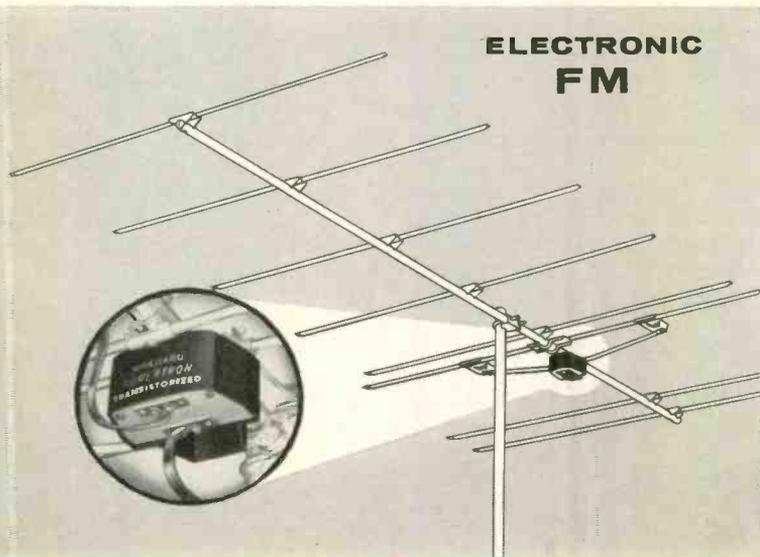
In addition to three all-channel (VHF) Powertron antennas, Winegard now offers you 14 cut-channel and broad band Powertron yagis and two FM Powertrons. Each of these high gain antennas has the following important features:

1. Electronic amplifier for unprecedented antenna gain.
2. Amplifier connected *directly* to the yagi "Tapered-T" driven elements for best possible signal-to-noise ratio.
3. Linear frequency response for crisp, clear black and white and brilliant, true color reception.



ELECTRONIC ALL-CHANNEL YAGIS

... will greatly improve every channel. Weak, faded pictures become crisp and clear. "Good" channels will be even better. In many areas you'll watch channels you couldn't possibly see before. Because Powertrons are powerful enough to drive up to 10 TV sets, you can have plug-in outlets in every room . . . and in many locations you can install a Powertron lower than other antennas.



POWERTRON MODEL P-44
14-Elements

POWERTRON MODEL P-44X
21-Elements

POWERTRON MODEL SP-44X
30-Elements

Winegard Electronic Antennas

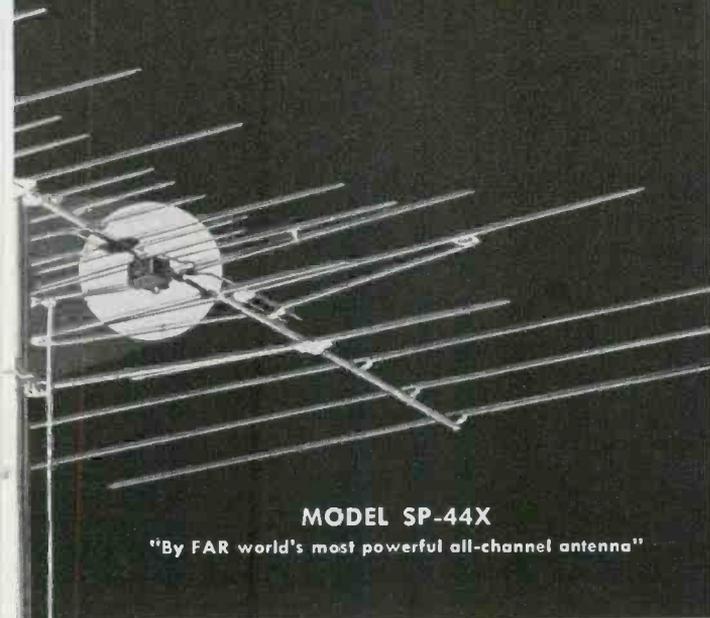
contrast... gives you greater reception distance!

4. Gold Anodized finish for permanent corrosion protection and fine appearance.

5. Deluxe quality materials and workmanship.

Try a Powertron and see for yourself. Take a field strength meter reading with your present antenna and then take a Powertron reading. When you see the meter jump 5 to 10 times . . . and see the sharp, contrasty reception you get, you'll be convinced . . . and so will your customers.

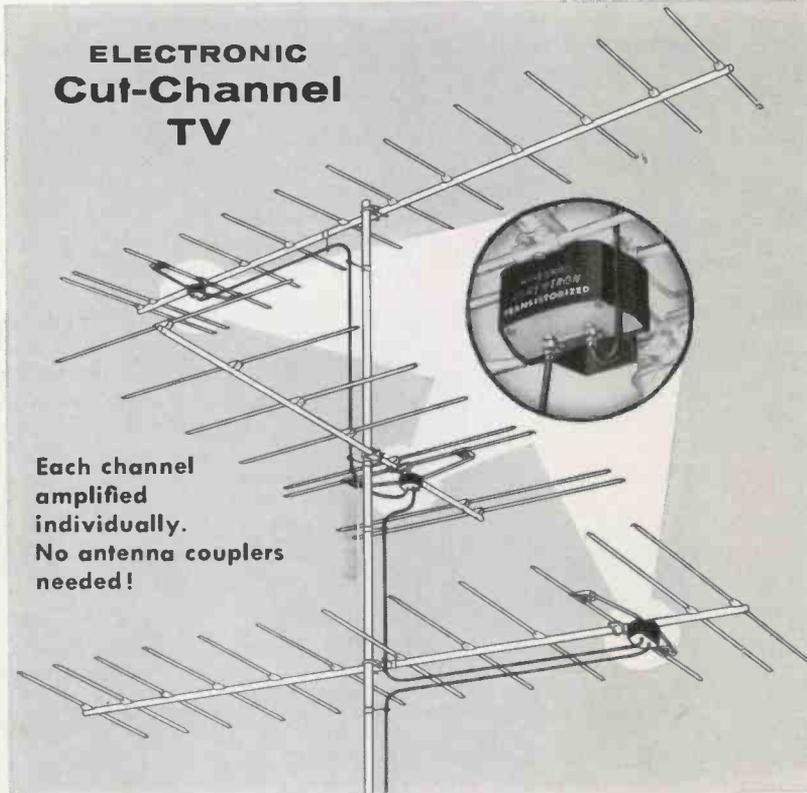
**"Amplifies the Signal
at the point
of Interception"**



MODEL SP-44X

"By FAR world's most powerful all-channel antenna"

ELECTRONIC Cut-Channel TV



**Each channel
amplified
individually.
No antenna couplers
needed!**

NEW, TRANSISTORIZED CUT-CHANNEL YAGI POWERTRONS FOR THE FINEST INSTALLATIONS

Here are the highest gain (28 db) TV antennas ever made! Each is powered by a *built-in transistorized* amplifier. Because TV signals are amplified right at the point of interception, you get the best possible signal-to-noise ratio . . . resulting in the ultimate in reception!

Each Powertron yagi amplifier has two 75 ohm coaxial connectors: one for the down-lead to the power supply and one from the built-in coupler for connection to another Powertron yagi.

Because of the built-in mixing coupler, they can be connected directly to each other without interaction. The negligible power consumption of these transistorized antennas (.05 watt each) means you can tie as many as 8 Powertron yagis together and run them all from one power supply on one down-lead.

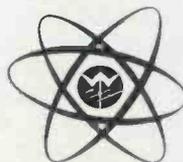
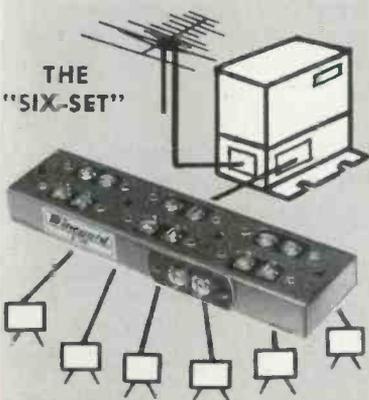
There are six (8-element) cut-channel and broad low band models — eight (12-element) cut-channel and broad high band models. Ideal for hotels, motels, apartment buildings or wherever the finest installation is needed.

WINEGARD "SIX-SET" TV COUPLER

With the Powertron, hook up 3, 4, 5, or 6 sets by adding a Winegard "Six-Set". Here's the only 6 tap coupler on the market. Six no-strip terminals give you instantaneous taps with complete electronic isolation. Model LS-63.

©1961

THE "SIX-SET"



Winegard

ANTENNA SYSTEMS

Winegard Co., 3019-7 Kirkwood Ave., Burlington, Iowa

Write today for technical bulletin on Winegard's complete line of Powertron antennas. Ask your distributor for details.

SHOP HINTS



Wire Reel Tool Holder

A discarded wire spool or reel may be converted into a useful shop aid. This is accomplished in an easy and simple manner.

One end of the reel is removed leaving the other end and the center section in place. When the reel is placed as shown in Fig. 1, the cen-



Fig. 1—Handy tool holder is made from discarded wire spool by removing one end.

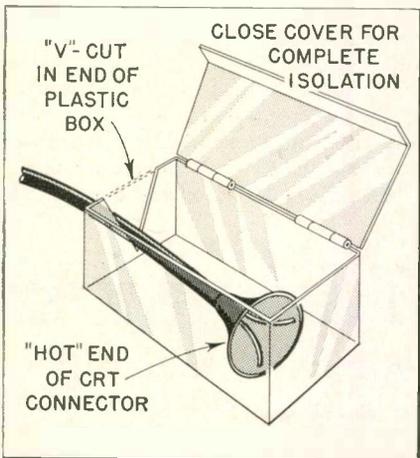
ter area can be used to hold tools. The base provides a resting place for a hot soldering iron and roll of solder.

Reel end-flanges and tool-holding center sections vary in size depending upon the type wire reel employed.—*H. Leeper, Canton, Ohio.*

Plastic Box Isolates HV Lead

TV receivers are frequently serv-

Fig. 2—High voltage lead is safely isolated when snapped into a "V" notched discarded capacitor box.



iced without a CRT attached. This creates a psychological hazard—keeping an eye on the HV lead. The high voltage anode lead can be easily isolated with a modified plastic box.

A "V" notch is filed or cut in the box at one side. The HV lead's end is placed in the box, as shown in Fig. 2, and the lid is closed. A handy "isolator" can be made from an empty capacitor box. The box not only offers protection to the technician, but prevents arcing to exposed grounds or electronic equipment on the bench.—*Bill Varn, Lynnwood, Washington.*

Soldering Aid Tames Tuner Spring

Ever have a turret tuner's drum retaining spring sail across the room when releasing it with

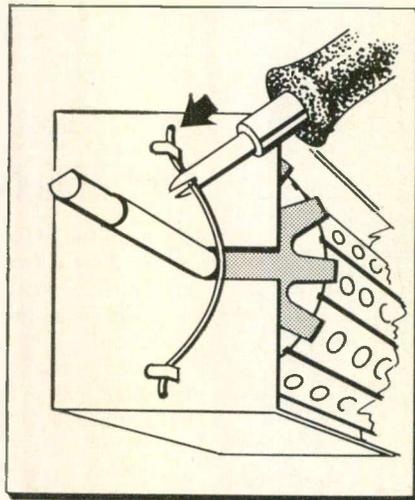


Fig. 3—Slightly spread forked soldering aid holds on to "jumpy" turret tuner retaining springs.

screwdriver? I experienced this on many occasions, until I began using a soldering aid, instead of a screwdriver (see Fig. 3).

The tuner's retaining spring can be easily removed by using the forked end of a soldering aid. Depressing the spring until it's out of the tuner chassis prong, I find that the solder aid enables me to keep

the spring under control at all times. The forked end of some soldering aids may require slight spreading.—*Louis Lasch, Jr., Delray Beach, Florida.*

Hand Cleaner Helps Service Image

We've mounted a waterless-type hand cleaner on each service truck, as shown in Fig. 4, to permit technicians to wash their hands before greeting customers in their homes. This creates a better company image by keeping smudge marks



Fig. 4—Vehicle-mounted waterless hand cleaner helps techs maintain clean appearance without using customer's washroom.

away from a customer's furniture and, of course, improving the personal appearance of our technicians. Also we save unproductive service time since technicians don't have to ask the customer to use their washroom facilities, or stop and chat somewhere while cleaning up.—*Harry J. Miller, Sarasota, Fla.*

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.



For stronger... clearer TV reception

Belden
PERMOHM*
TV Lead-in Cable

There's a Belden Lead-in Cable for every requirement



STANDARD 300-OHM LINE—Offers low losses at high frequencies. For use with TV and FM receiving antennas.



CELLULINE † 300-OHM LINE—Resists abrasion, sun, and wind. Provides strong UHF and VHF TV pictures.



STANDARD 72-OHM LINE—Can be used with all types of receiving antennas at high frequencies.



WELDOHM † 300-OHM LINE—Provides 2½ times the breaking strength of ordinary lead-in cable.



DECORATOR LEAD-IN 300-OHM LINE—For interiors only. Replaces unsightly cables. Neutral color blends into room's decor.



STANDARD 150-OHM LINE—For receiving antennas, matching transformers, and experimental applications.

Permohm conductors are encapsulated in cellular polyethylene. This exclusive 300-ohm line design provides clearer TV reception in all areas, including areas where conditions of extreme salt spray, industrial contamination, ice, rain, or snow are experienced. It further improves fringe area pictures on all channels, as well as strengthening UHF and color TV transmission. Ask your Belden Distributor about this improved 300-ohm cable. Permohm is available in packaged lengths of 50, 75, and 100 feet, and in 500- and 1000-foot spools.

*Belden Trademark and Patent . . . U.S. Patent No. 2782251



Power Supply Cords • Cord Sets • Portable Cordage • Electrical Household Cords • Magnet Wire • Lead Wire • Automotive Wire and Cable • Aircraft Wires • Welding Cable



Belden Cable is Packaged in Standard Lengths for Display and Handling.

† Belden Trademark—Reg. U.S. Pat. Off.

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 TV Controls: Literature covers the new Uni-Tite line. Allows assembly of over 200 different replacement controls for TV, radio and car radio from an assortment of 35 rear units, 30 front units, 3 switches and a selection of shafts. Clarostat Mfg. Co.

For more data, circle 7-50-1 on coupon

2 Tuner-Shafts: Literature describes a new kit assortment of popular tuner-shafts to service hundreds of tuners used in major TV lines. Kit includes cross-reference guide for tuner shafts and antenna coils. Colman Electronic Products.

For more data, circle 7-50-2 on coupon

3 Loudspeakers: Colorful 18-page brochure covers a full line of hi-fi loudspeakers, including new ultra-thin design. Illustrations, specifications, and prices are included. Jensen Mfg. Co.

For more data, circle 7-50-3 on coupon

4 Audio Distribution: Audio-Trol Model AT, described in catalog sheet, utilizes an unused TV channel to transmit music, voice, radio etc., to every TV receiver on the distribution system. Jerrold Electronics Corp.

For more data, circle 7-50-4 on coupon

5 2-Way Radio: Poly-Comm 62, featuring conversion superheterodyne receiver, VFO or crystal controlled transmitter, and built-in mobile and fixed power supply, is covered in literature. Polytronics Lab. Inc.

For more data, circle 7-50-5 on coupon

6 VOMS: Models 267 and 268, featuring easy-to-read 7" meter, is covered in literature. Other features include: low microamp ranges, less circuit loading, popular DBM ranges and improved frequency response in a-c measurements. Simpson Electric Co.

For more data, circle 7-50-6 on coupon

7 Chassis Sliders: Literature covers model PS ball bearing record player and hi-fi chassis slides. May be mounted on side or underneath phone shelf; requires only 3/4" space for either mounting. South River Metal Products Co.

For more data, circle 7-50-7 on coupon

8 TV KNOBS: 36-page, 2-color, catalog provides a cross reference guide with knob list, color, description and manufacturer's part number. Includes exact replacement knob illustrations. TV Development Corp.

For more data, circle 7-50-8 on coupon

9 Terminals: Literature covers current promotion of a solderless terminal electrical repair kit, at a reduced price. Contains complete assortment of 10 popular terminals, #1900 all-purpose crimping tool, and pop-up display card in an 11-compartment plastic box. Vaco Products Co.

For more data, circle 7-50-9 on coupon

10 Saws: Illustrated circular covers model 909 heavy duty power saw. Offered complete with 7 blades, rip guide, circle cutter, and 45° tilting base plate. Saw table model 9-T-2 also covered. Wen Products, Inc.

For more data, circle 7-50-10 on coupon

11 TV-FM Signal Amplifier: Literature covers the new "Booster-Pack," reported as the first home TV-FM amplifier with a gain control switch that permits the TV set owner to vary the power of the signal received. Winegard Co.

For more data, circle 7-50-11 on coupon

12 Tools: Literature covers new Twirl-Con twirl connection tool, for use in condenser and resistor replacement. Makes quick, neat, secure connections in difficult places on printed and conventional wired chassis. Twirl-Con Tools.

For more data, circle 7-68-1 on coupon

CUT HERE

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

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

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7-7-1	7-22-3	7-25-1	7-43-2	7-50-8	7-61-2	7-67-1	7-C2-1
7-8-1	7-22-4	7-26-1	7-43-3	7-50-9	7-62-1	7-67-2	7-C3-1
7-9-1	7-22-5	7-26-2	7-43-4	7-50-10	7-62-2	7-67-3	
7-11-1	7-23-1	7-26-3	7-43-5	7-50-11	7-62-3	7-68-1	
7-12-1	7-24-1	7-26-4	7-43-6	7-51-1	7-62-4	7-68-2	
7-13-1	7-24-2	7-27-1	7-47-1	7-53-1	7-62-5	7-69-1	
7-16-1	7-24-3	7-28-1	7-50-1	7-54-1	7-63-1	7-69-2	
7-17-1	7-24-4	7-42-1	7-50-2	7-56-1	7-64-1	7-69-3	
7-18-1	7-24-5	7-42-2	7-50-3	7-57-1	7-64-2	7-70-1	
7-19-1	7-24-6	7-42-3	7-50-4	7-58-1	7-65-1	7-70-2	

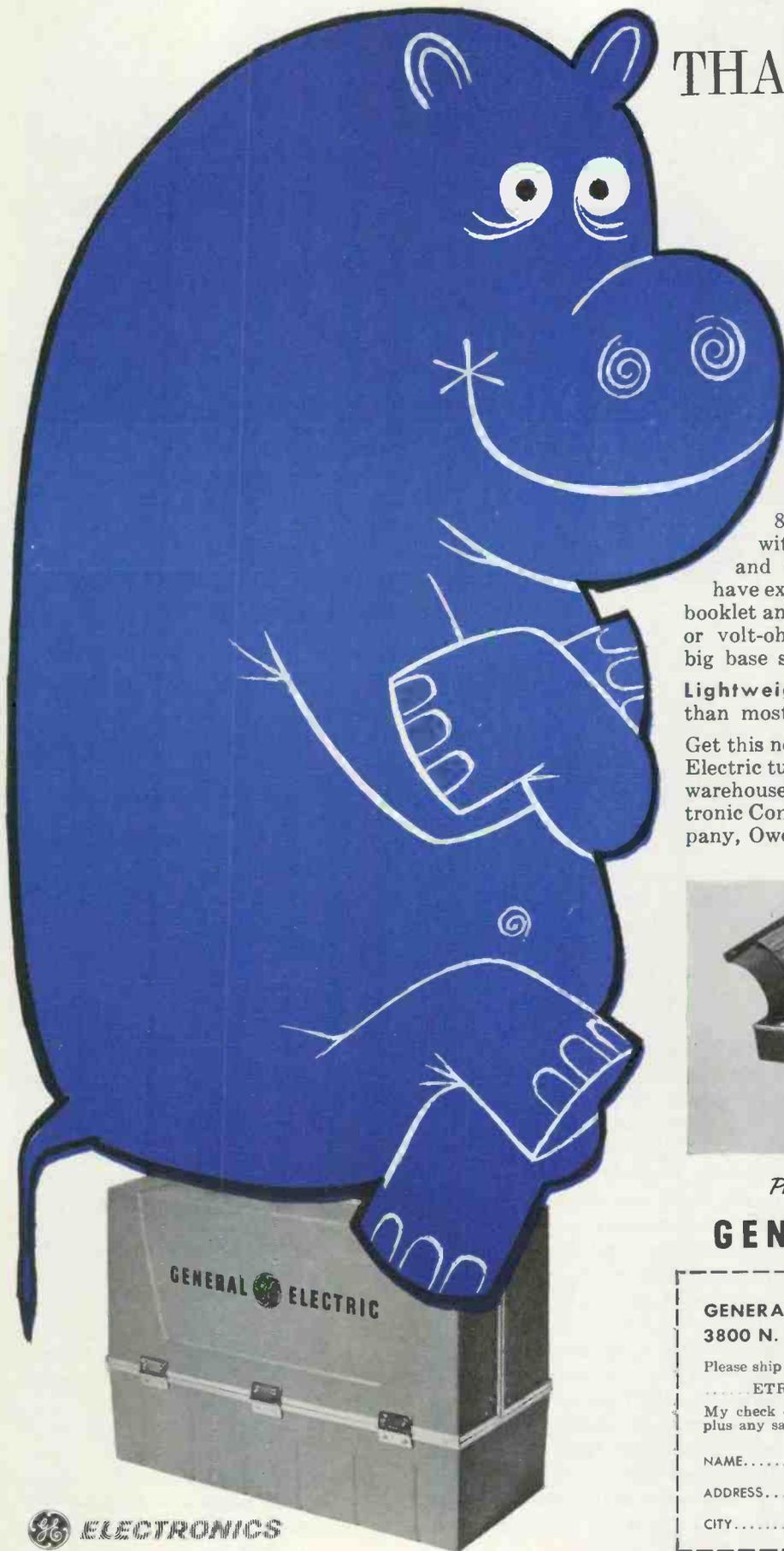
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NEW FROM G.E. ... A TOUGH PLASTIC SERVICE CASE THAT CAN REALLY TAKE IT!



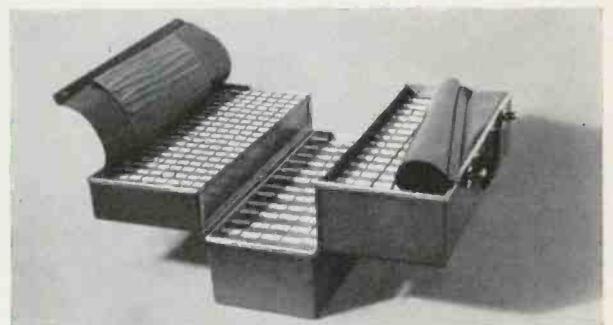
The first real innovation in service cases makes this the most durable case you can own. *It's built like fine luggage* — from tough Royalite* plastic, with aluminum binding, and luggage-type fasteners. Rugged! Bump it, bang it, drop it—this case can take it. Resists scarring or splintering. It's waterproof, won't stain, even resists acids, wipes clean.

Large Capacity — Here's plenty of space to carry a practical tube replacement inventory and tools (22 $\frac{1}{4}$ " long, 8 $\frac{3}{4}$ " wide, 15" high). Two top sections with egg-crate separators hold 152 miniature and 90 GT-type tubes. Snap-down curtains have extra pockets for job tickets, characteristics booklet and service tools. Carry 65 large glass tubes or volt-ohm-milliammeter and other tools in the big base section.

Lightweight — It weighs just 8 lbs. — 4 lbs. less than most cases of comparable capacity.

Get this newest G-E Service Aid from your General Electric tube distributor, or mail coupon to Chicago warehouse address given. Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.

*T.M., U.S. Rubber Co.



Progress Is Our Most Important Product

GENERAL  ELECTRIC

**GENERAL ELECTRIC COMPANY, Room 7189A
3800 N. Milwaukee Ave., Chicago 41, Illinois**

Please ship prepaid:

..... ETR-2700 Service Case, \$24.95 each.

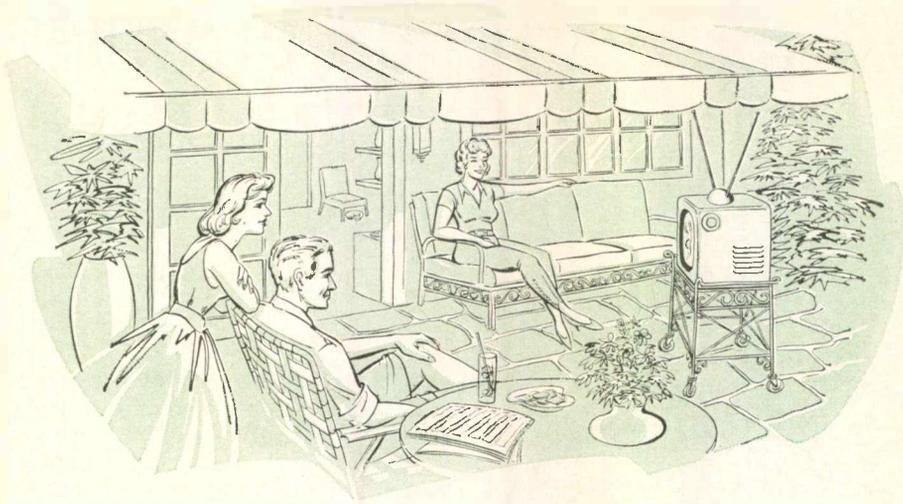
My check or money order is enclosed for the required amount plus any sales or use tax applicable in my area.

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 **ELECTRONICS**



*More Viewers Move
Their Sets Around
In Warm Weather.*

*Here's How To Sell
Them Indoor And
Replacement
Antennas.*

Cash In On Summer Portable TV Antennas

SCOTT TURNER

• Summer weather is luring people out to patios and yards. In many cases, an outdoor electrical outlet or long extension cord is providing power for lights, rotisserie or electric garden tools. Why not TV too?

Though those popular "portable" TV sets are too heavy to carry great distances, they certainly can be toted out to the back of the house. In strong signal areas, an indoor antenna will provide a picture that's very satisfactory. In medium strength areas, a somewhat degraded picture may be a small enough price to pay for the pleasure of outdoor viewing.

Some TV sets have decent built-in indoor antennas; others are hardly worth the bits and pieces that went into making the antennas. In either case, there's an antenna market for service dealers.

In the case of good built-ins, there is a solid replacement market. Trucking the set in and out of the house, sliding antenna rods up and down, and locating a set outdoors where there is more physical activity means more antenna wear and breakage. Replacing built-in or

hide-away antennas is not much of a problem since distributors carry such replacements for virtually every set in use.

In the case of inadequate built-in antennas, there is real opportunity to sell high quality indoor antennas. Except in weak signal areas, such an antenna should produce an outdoor picture that is anywhere from very good to passable.

Certain locations may be better suited for an extension from the main antenna line than a separate indoor type antenna. That's not a lost sale. Serve your customer by installing a multi-set coupler and transmission line extension.

For viewer convenience, it may be desirable to eliminate the need to screw and unscrew terminals every time the TV set is taken outdoors. This may be done simply by terminating the antenna lines and a short line from the set terminals with polarized twin lead connectors.

The technical aspects are not generally a problem. The real task is promotional. How to inform people that they can enjoy their TV receivers outdoors at modest cost?

Flyers, newspaper ads, and window displays can promote such themes as:

"RELAX OUTDOORS WITH YOUR TV"

"THIS ANTENNA FREES YOUR TV FOR OPEN AIR VIEWING"

"YOU CAN HAVE TV ON YOUR PATIO—ONLY \$13.95"

"HEADQUARTERS FOR OUTDOOR TV"

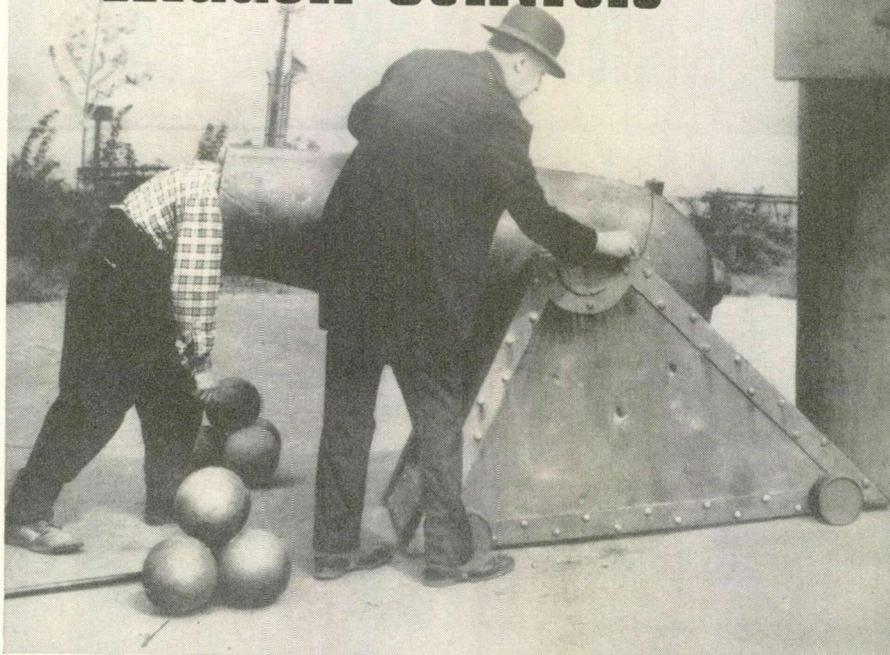
"SUMMERTIME IS OUTDOOR-TV TIME"

You will want to provide more details and your own variations. Your window can be fixed up to simulate outdoor summer living.

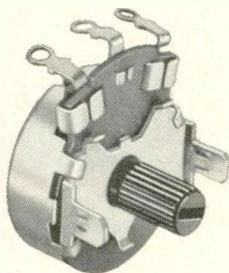
In addition to antenna sales, folks moving their portable TV sets outside may want to buy a sturdy, mobile TV table. They are also good prospects for batteries, transistor radios, patio speakers, and even portable TV sets.

To paraphrase an old chestnut, strike while the weather is warm. Offer your customers another variation on TV pleasure—outdoor TV with indoor antennas. •

Easy Adjustment of Hidden Controls



With **Centralab** Twist-Tab Radiohms



You'll get a big bang out of CENTRALAB tab-mounted Radiohm Controls—because they're easy to install and easy to adjust. These Twist-Tabs are tailored to the *minimum* shaft length needed for TV hidden controls. When a *longer* shaft is needed, it's simple to use the 2" polyethylene extension packed with each unit. Nothing to saw—a snip of the scissors gives the needed length, and the adjustment slot is still there, and still easy to get at.

CENTRALAB Twist-Tabs are available in 25 values from 200 ohms to 7.5 megohms... rated at $\frac{1}{2}$ watt, $\frac{15}{16}$ " diameter, $\frac{7}{16}$ " deep. Shoot over to your CENTRALAB distributor for full details.

Centralab[®]

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

B-6115 S

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



1961 NEW YORK HIGH FIDELITY SHOW dates: Sept. 13-17, N.Y. Trade Show Bldg.

DUOTONE issues 1961 supplement to its needle replacement guide.

AMERICAN MICROPHONE announces 2 dynamic mikes: P-55 @ \$195 & D-55 @ \$89.50.

ELECTRO-VOICE has instituted a new needle kit plan made up to each distributor's specific requirements. New sales aids are being made available.

HEATH introduces the AA-151 stereo amplifier, 14 watts/channel, \$59.95 kit; AA-31 20-watt pa amplifier @ \$59.95, AN-11 input matching transformer @ \$11.95.

FANON acquires MARK SIMPSON. Masco founder Miryam Simpson Shannon has disposed of her holdings. Fanon Pres. Salo Nachtigall was once employed by Masco as chief engineer.

BOGEN-PRESTO is expanding with line of recorders, background music, and commercial tape programmed electronics. Decentralized promotion program gives local reps complete responsibility for co-op ad funds.

JENSEN MANUFACTURING announces the TF-2 3-speaker system with 10" woofer @ \$64.50 unfinished, \$79.50 oiled walnut. Model X-10 2-way system @ \$29.75 measures $7\frac{1}{4}$ x 13 x $4\frac{5}{8}$ ". Ratings are 20 and 6 watts, respectively.

AUDIO DYNAMICS reports revised specifications for their ADC 1 cartridge as: frequency response, 10-20,000 cps ± 2 db; channel separation 30 db from 50-7,000 cps; sensitivity, 7 millivolts; tracking force, 0.75-1.5 grams; compliance, 20×10^{-6} cms/dyne.

ASTATIC announces new Cantata model 45D stereo cartridge. Designed for use with amplifiers having magnetic inputs or high impedance ceramic inputs. Frequency response, 20-20,000 cycles. Channel separation, 30-35 db. Channel balance within 2 db at 1000 cycles. Tracking force, 1 gram. Needle, single 0.7 mil replaceable diamond. \$44.50.

PAMicrophone Ratings

(Continued from page 40)

—db rating is referenced to: 0 db equals 1 milliwatt per 10 microbars. Therefore, output levels of competitive microphones should be compared within their impedance types.

With today's high gain amplifiers, output level is not nearly as important as it once was. However, it should be remembered that a mike's volume range is limited to the difference between self-generated noise and its signal. In effect, this is a signal to self-noise ratio.

The higher output level, incidently, is indicated by a lower negative db rating. For instance, a -50 db rating indicates higher output than a -60 db rating.

A particular polar pattern is shown in the illustration accompanying this article. This indicates the directivity of a microphone. In other words, the mike's pickup pattern. The pattern shown here is an omnidirectional one that becomes directional with increased frequency. At all but high frequencies, it picks up sound well from all directions. This type pickup is undesirable if the speaker is in a noisy area.

Another type pickup pattern is the bi-directional pattern. Contrasted to an omnidirectional pickup, a bi-directional pickup is basically dead at the sides. It picks up front and back, like a figure eight.

One of the most popular type PA pickup patterns is the unidirectional or cardioid pattern. This type sound pickup pattern indicates that most of the sound arriving at the mike's back is rejected. Thus, undesirable extraneous noise is minimized. Also, acoustic feedback problems are lessened.

Other microphone rating factors must be considered, of course. Frequency response is an important consideration. So is the effect of humidity, fragility, anticipated useful life, price, etc. Realizing this, a technician will understand why the term "consultant" is frequently applied to techs in PA work. •

NEW RCA ALKALINE BATTERIES

increase your profit opportunities



Now, you can increase your profit while reducing the number of battery types you have to stock. What makes this possible? The new RCA Alkaline Battery! This new type of cell outlasts comparable zinc-carbon batteries yet sells at a lower price than premium mercury types.

here's how you benefit...

- **MORE PROFIT PER SALE:** Provides perfect opportunity to "sell up".
- **SIMPLIFIED INVENTORY NEEDS:** The RCA Alkaline multi-purpose type is designed for use in radios, flashlights, photoflash, toys and electronic instruments. A few types cover a wide range of applications.
- **LONGER SHELF AND OPERATING LIFE:** A useful life of 2-to-8 times that of zinc-carbon types, depending on application.
- **NO REST PERIOD NEEDED:** A big advantage in portable radios.

Four of these money-making new Alkaline types are now available from your Authorized RCA Distributor. These include: VS1334, a 1.5-volt penlite cell; VS1335, a 1.5-volt "C" cell; and VS1073, a 1.5-volt "N" cell. Each of these is a multi-purpose type. The VS1149, a 4.5-volt battery, is specifically designed for transistor radios.

RCA Batteries... Zinc-Carbon, Mercury, and the new Alkaline types... mean more opportunities for dealer profit right down the line. See your RCA Distributor now for full details.

RCA Electron Tube Division, Harrison, N. J.



The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

Transistor Testers

(Continued from page 36)

able approximation of its worth is all that many service technicians need. Thus, the "good-bad" type gain scales are fine for everyday service work in many instances.

An especially accurate tester with actual gain values may be desirable, of course. Here, the technician is not given a speedy "good" or "bad" in-

dications. He must evaluate a transistor's worth from a manual's ratings. This gives him an opportunity to personally pinpoint the transistor's actual rating and judge whether it's good or not for a particular application.

Consequently, it's really a choice of whether the technician wishes a speedy, broad indication of transistor gain or a slower (because he must judge good or bad for himself), potentially more accurate tester.

More elaborate testers, with vari-

ous voltage and amperage settings, come closer to simulating actual transistor operation. Test results are more definitive here. Testing may be a bit slower and instrument cost higher, but the percentage of questionable transistors is smaller than with simpler testers.

The same foregoing comments apply to leakage test indicators. It should be mentioned that some oscillator type testers, which employ neon lamps or speakers as indicators, permit fast observations also. In fact, the fastest observations. However, unless a transistor has a bad short or open, evaluation depends on technician experience with the particular instrument's past indications of other transistors.

The eight transistor testers examined here all have one limitation in common: they cannot test high power transistors' gain under typical high current operating conditions. Some can give fairly reliable indications at lower amperages. None of the eight units tested can check many of the other transistor types under *actual* operating condition voltages and amperages either. However, they do ordinarily indicate transistor quality with reasonable certainty.

All of the instruments, with the possible exception of one, are out-of-circuit testers. In other words, transistors must be disconnected for testing component quality. One of the eight units provides a signal injection test and, under some circumstances, checks transistors directly in the set. In many instances, however, the emitter must be unsoldered to check the component. Impedances vary from circuit to circuit, of course, and direct check of a component completely *in* the circuit may be hampered here by impedance loading. A relatively expensive unit (which we will examine next month) does accurately test transistors without disconnecting them from the circuit. It uses a variable null bridge to counteract impedance loading.

The ET staff employed 52 transistors, both known good and known bad, in their tests. The transistor types included: audio output (including high-power auto radio types), i-f, converter, and oscillator. Two transistor portables were also used: An American seven-transistor set and a Japanese six-transis-

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36-560



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tor set. See Figs. 3 and 4. We also utilized a variable power supply to substitute for a radio battery when checking transistor operation in a portable set. See Fig. 5.

Though all units accurately identified good and bad low-medium power transistors, the eight instruments' gain readings did not coincide. For example, testing a 2N94 i-f transistor, readings varied from 23 to 47. All were in the "good" area, however. This transistor's d-c current gain is rated as 10 minimum and 80 maximum by one manufacturer. We double-checked readings with a very expensive and proved-accurate tester which indicated the actual Beta of this transistor as 38.

All instruments indicated if leakage was good, too. Once again, indications varied, though they were broadly correct.

The final test of a component test instrument is: can it increase a service technician's knowledge of a component's quality? And to what extent?

In answer to the first question, all instruments examined definitely increased our knowledge of a transistor's quality (excluding, in some instances, high power transistors).

Concerning the second question, some instruments were more accurate than others. Also, some instruments gave more meaningful results due to the type of tests offered. Bearing in mind that these instruments are not infallible, most transistors will yield good service-type information to techs. Familiarization with the idiosyncrasies of a particular tester will, of course, further usefulness of test results.

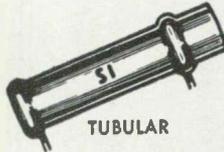
The following descriptions and comments should enable technicians to balance individual tester attributes against their shop requirements and "pocket books." Next month we will conclude our examination of transistor test instruments by focusing our attention on six other testers.

EMC, Model 210 @ \$10.95 wired—Battery-powered (6-volts) unit tests leakage and gain quality of low-medium power transistors and diodes. Has 2 ma meter. Leakage is read on "good-bad" type scale. Gain is indirectly measured by employing tester's calibrated meter scale and using simple math based on typical gain factors. Gain switch has three ranges. Includes transistor chart with typical gain readings. Can use transistor manual.

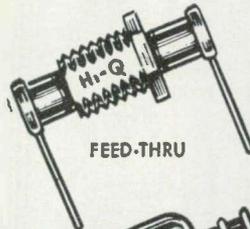
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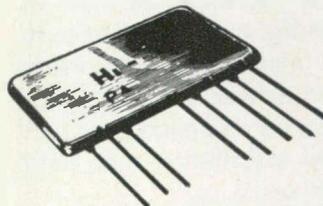
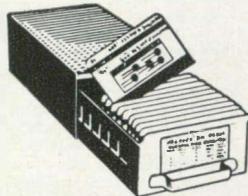


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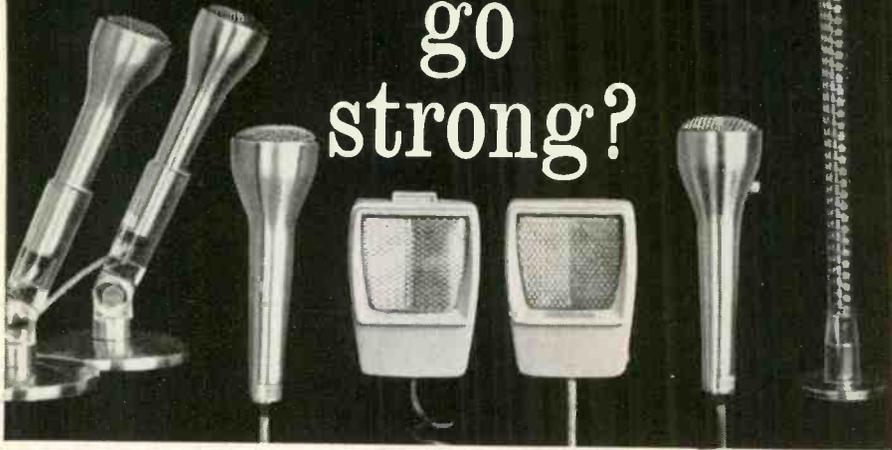
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CM-11A—Where greater sensitivity is desired	Frequency response80 to 9,000 cps	Sensitivity—53 decibels ±2db	CM-17A—"Flex-Mike". For audio-visual labs, etc.	Frequency response50 to 11,000 cps
CM-T10A—For stereo taping	Frequency response50 to 11,000 cps	Sensitivity—56 decibels ±2db	CM-30—Coiled Cord, Switch. For citizen's band use—	Sensitivity—56 decibels ±2db
CM-T11A—For stereo taping, also greater sensitivity	Frequency response80 to 9,000 cps	Sensitivity—53 decibels ±2db	Frequency response100 to 6,000 cps	Sensitivity—49 decibels ±2db
CM-12A—For long lead installations—PA systems, etc. with push-to-talk switch			CM-31—Coiled Cord. For communication use—	Sensitivity—49 decibels ±2db
			Frequency response100 to 6,000 cps	Sensitivity—49 decibels ±2db
			CM-32—Standard Cord & Plug. For tape recordings—	Frequency response80 to 9,500 cps
			Frequency response80 to 9,500 cps	Sensitivity—49 decibels ±2db

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Comments: Doesn't provide test leads or jacks in the event tester's transistor socket is inconvenient to use (and it usually is). No provisions for high power transistor tests. Fair accuracy. Easy to operate except for inserting transistors into socket, which often requires removing solder from leads. Available in kit-form for \$7.95.

G-C, Model 36-560 @ \$19.95—Battery-powered (6-volts) unit tests leakage and gain quality of low-medium-high power transistors and diodes. Leakage is read on "good-bad" type scales. Gain is read directly on scale. Has separate short test; low and high power switch position. Includes transistor chart with average gain readings and leakage. Can use manual for gain comparison, but need chart for leakage readings.

Comments: Fair accuracy. Maximum gain reading is 100. Some transistors exceed this. Has stationary carrying handle.

MERCURY, Model 700 @ \$24.25—Battery-powered (6-volts) unit tests leakage and gain quality of low-medium-high power transistors and diodes. Has 5 ma meter. Leakage is read on "good-bad" type scale. Gain is read directly on gain control dial setting after adjusting meter pointer to calibration point. If gain is known, control, which adjusts base current, can be set and gain read on "good-bad" type scale. High power transistor leakage is read with gain control fully clockwise to open emitter. Power transistor gain is measured as before after calibration at another point. Can use manual for gain ratings. Otherwise, relative gain can be used.

Comments: "Test" switch is the spring-return type, returning to "off" when not depressed. Weak meter batteries can be detected with test switch. Internal calibration pot permits compensation for run down batteries. Easy to operate. Fair accuracy when checking gain in manual. Has carrying handle which can be used as a convenient tilt rest.

MOTOROLA, Model 67B65 @ \$17.95—Battery-powered (12-volts) unit tests low-medium-high power transistors. Uses transistor under test in an audio oscillator circuit with a speaker. A variable 0 to 10 control adjusts feedback amount. If audio tone is not detected, transistor is defective. The higher the control setting before a tone ceases, the higher the transistor gain. No direct gain or leakage readings are made.

Comments: Though it supplies only a rough check of a transistor's quality, it is the fastest-checking test unit examined. Obviously, it has no "measuring" accuracy. However, it will quickly indicate a transistor that is completely shorted, open, or has very high leakage. In addition, it permits the

user to determine relative gain, based on his own judgement, and to match gains of transistors. Has no on-off switch.

SECO, Model 100 @ \$19.95—Battery-powered (1½-volts) unit tests low-medium-high power transistors. Uses transistor under test in an oscillator circuit. An operating transistor develops enough signal to fire a neon indicating lamp. A variable 0 to 100 control adjusts both feedback and base current. With control at "0" a fast check of short or open can be made (if the lamp doesn't light, the transistor isn't operating). Relative gain is checked by adjusting the control toward 100 until the lamp goes out. No direct gain or leakage readings are made. In-circuit tests can be made. The tester also acts as a signal generator.

Comments: Same as Motorola tester, plus: Seco's speed-checking ability is only an eyelash away from Motorola's, which means it's especially fast. High power transistors are tested with collector currents up to 50 ma (instead of 5 ma) by adjusting the base-feedback control past zero. Impedance loading of certain circuits sometimes disallows use for in-circuit tests. The tester has two output jacks for VTVM connection so that some low-current i-f and converter transistors that don't fire the neon can be tested.

NEXT MONTH!

ET Staff concludes examination of transistor testers, including:

- B&K model 160
- Eico model 680
- Hickok model 870
- Hickok model 890
- Precision model 960
- Sencore model TR-110
- Superior model 88

SENCORE, Model TRC-4 @ \$19.95—Battery-powered (6-volts) unit tests leakage and gain quality of low-medium-high power transistors and diodes. Has 3 ma meter. Gain and Leakage are read on "good-bad" type scales. Has a low and high power switch position. Gain set control sets each transistor's base current to obtain a standard collector current. Includes a transistor booklet with gain set readings. Up-to-date booklets (25¢) available from factory.

Comments: Low power transistors tested with 1.5 ma collector current; high power with 50 ma. Latest transistor info plan offers six mailings annually for \$1.00 per year. Easy to operate. Fair accuracy. Has carrying handle.

SIMPSON, Model 650 @ \$26.95—Battery-powered "Add-A-Tester" adaptor, for use with Simpson's 260 or 270

VOM's, tests low-medium-high power transistors. Uses two flashlight batteries plus VOM batteries. Actual Beta and leakage (Icbo) values are read directly on VOM. Meter is 50µa. Has battery adjust control, zero control to maintain 1 ma collector current for Beta tests, and a switch to permit use of VOM without detaching transistor tester. Can use transistor manual for ratings.

Comments: High power transistors' Beta and Icbo must be checked indirectly because of their high leakage currents. Consequently, high power transistor checks are awkward. Oper-

ation is easy for low-medium power transistor tests. Also measures silicon transistors (primarily used in industrial products) by multiplying Beta readings by 1.16. Unit is highly accurate. Instrument is high quality throughout; majority of resistors, for example, have 1% tolerance. Adapter fits into VOM in a manner that makes it one solid unit, rather than a wobbly addition.

TRIPLETT, Model 690-A @ \$29.50—Battery-powered (6 volts and 30 volts) unit tests low-medium power transistors and power transistors with Icbo leakage under 600 µamps. Also

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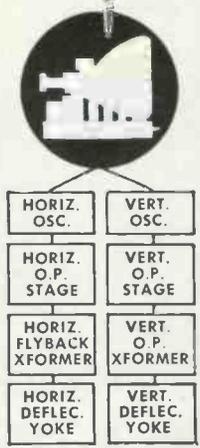
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tests diodes. Beta and leakage (Icbo) values are read directly on 600 μ a meter scale or "good-bad" type scale. A calibration adjust control is employed to adjust base current. Can use transistor manual for ratings.

Comments: Easy to operate. Good accuracy on Beta and leakage "good-bad" type scales. Two bonus features, direct value scales for both, are fine guides. However, large gaps in numerical scale divisions limit accuracy. •

Illustration credits: Chart 1, Sen-core, Inc., Addison, Ill.; Fig. 2, Precision Apparatus Co., Inc., Glendale, N.Y.

Transistor credits: Delco Radio Div., GM Corp., Kokomo, Ill.; Raytheon Co., Westwood, Mass.; Semitronics Corp., New York, N.Y.; Sylvania Electronic Products, Inc., Woburn, Mass.; Workman TV Products, Inc., Sarasota, Fla.

Power Supply Problems

(Continued from page 44)

upset if the set should fail later.

The second category includes component break-downs occurring shortly after the owner returns from vacation. When the set is first switched on, a component shorts because of abnormal moisture absorption, dust accumulation, or because of dormant-state chemical reactions, and a heavy load is placed on the power supply. Damage usually occurs to the power transformer, high wattage voltage-divider resistor, or to some other component directly or indirectly associated with the power supply. In any event, before an estimate is given for repairs in such cases, it is advisable to check *all* power supply components thoroughly.

Even if electrolytic filter capacitors appear good, a scope check to determine the power supply's a-c ripple content is advisable. Since ripple content may vary widely at different voltage divider points, in different models, and in different manufacturers' sets, individual specifications should be followed carefully.

Scope Tests

Ripple content of a power supply's output or outputs can be checked with a calibrated oscilloscope, as shown in Fig. 1A. This test will provide a reasonably good indication of a capacitor's condition. If ripple content exceeds that specified at various B+ points, filter capacitors should be replaced or cost of replacement included in customer's repair estimate.

Many problems arise in the third category. When a filter breaks down because of dielectric reforming, for example, *all* power supply filters, especially in sets more than a year old, should be replaced. Piece-meal replacements cost the customer more in the long run, and cuts into the technician's over-all profit because of wasted calls. It frequently results in a lost customer.

When a power transformer has become overheated and smokes because of an overload created by a shorted tube, capacitor, or other component, but appears to work



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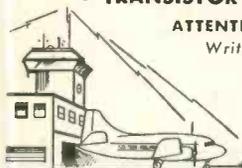
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normal after repairs have eliminated abnormal load, this fact should be noted *in writing* on the customer's estimate or bill. The transformer may stand up for years, and it may fail quickly. The customer can have it replaced now or take a chance with it. If the transformer *does* break down, of course, another shop job is necessary—and this fact should be explained to the customer.

If a power transformer is bad and requires a replacement, customer estimate should include cost of installing a fuse barrel or other type holder for a 3, 4, or 5 amp fuse in one of the set's a-c input lines. This will not only protect the customer's new transformer from future overload, but will insure the technician's repair job during the warranty period.

When one rectifier in a two-rectifier power supply fails, whether tube or solid state, replace *both* rectifiers. And it may be advisable to "age in" new solid state rectifier replacements. This is done by alternately turning the set on for five minutes and off for five minutes—over a period of at least two hours before the set is allowed to run continuously.

In the event germanium or silicon rectifiers are substituted for regular selenium types, a voltage increase of 8 to 10% may be expected, and filter capacitors should be in top condition to withstand this additional voltage.

If a series string set employs one or more center tapped parallel connected tubes, carefully inspect the solder joints on the heaters' parallel jumper wire before returning the set to its owner. A poor joint here can result in an intermittent open, with periodic burn-out of this tube's heater.

Globber type resistors occasionally go "hay-wire" and cause considerable confusion. Tubes will appear to be operating normal, but with a slightly higher-than-normal globar resistance, average over-all operation of the set will be subnormal because of slightly lower heater voltages. Globars should be measured carefully with a VTVM when the resistor is cold.

Finally, we must not forget a particularly troublesome B+ point frequently overlooked by many technicians—the 135 volt supply de-

veloped at the audio output tube cathode, as shown in Fig. 1B. A shorted audio tube or defective electrolytic can upset this source. The capacitors here should be treated in the same manner as those across the regular power supply. •

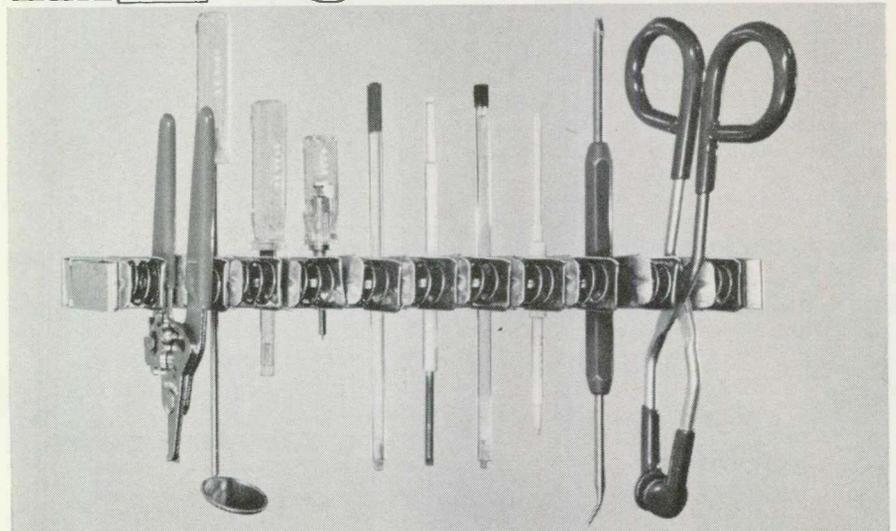
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For more data, circle 7-61-2 on coupon, p. 50

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Announced is a new line of low-priced, portable self-powered megaphones, designed for many uses such as school functions, sports events, construction and plant use, on boats, etc. Model MV-8, the Megavox, shown, is an all transistorized instrument with a range of over 600 yards. Aluminum construction, baked enamel finish. Operates on flashlight batteries. Magnetic microphone is waterproof. Equipped with variable volume control and carrying case. \$99.95. MV-1, smaller version, range 300 yards, \$39.95. Fanon Electronic Industries, 439 Frelinghuysen Ave., Newark 12, N. J.

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For more data, circle 7-62-4 on coupon, p. 50

GC TUBE CHECKER

Dynamic Super Tester, Catalog No. 36-512, is reported as a highly compact portable instrument that will test over 99% of all radio-TV receiving tubes dynamically with just 6 sockets. It also tests picture tubes, transistors (for leakage and power gain) and radio batteries under full load. New tubes are accommodated without adding or changing sockets, requiring only a simple chart addition. New charts are issued as needed. \$109.00, complete with free picture tube adapter. GC Electronics Co., 400 S. Wyman St., Rockford, Ill.

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Seven new space-saving TV receiving tubes are: 6EA7, heater-cathode, doubletriode with dissimilar units, one unit is a high-mu triode, the other, a low mu. Four miniature tubes, 8GN8, 6EB8, 8EB8 and 6GH8, heater-cathode, triode-pentode. 3AW3, cathode-type diode, electrically similar to 3A3 but 1/2" shorter. 3DG4, directly-heated cathode, full-wave high-vacuum rectifier. Industrial Components Div., Raytheon Co., 55 Chapel St., Newton 58, Mass.

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1A7GT	3CB6	5V6GT	6AV5GT	6BR8	6DE6	6SH7	7B4	7Z4	12BY7	19AU4GT	50L6
1B3GT	3Q4	5X8	6AV6	6BS8	6D6GGT	6SJ7	7B5	12A8	12CA5	19BG6G	56
1H5GT	3S4	5Y3	6AW8	6SY3G	6DF6	6SK7	7B6	12A5	12CN5	19J6	80
1L4	3V4	6A6	6AX4GT	6BZ6	6E5	6SL7	7B7	12A05	12F5	19T8	84/624
1L8	4BQ7A	6AB4	6AX5GT	6RZ7	6F5	6SQ7	7B8	12A76	12F8	2A	11723
1N5GT	4BS8	6AF4	6B8	6C4	6F6	6SR7	7C4	12A77	12K5	2326GT	
IS5	4BZ7	6AH4GT	6RA6	6CA8	6H6	6T4	7C5	12A06	12K7	27	
IT4	4CB6	6AH6	6BC5	6CD6G	6J4	6T8	7C6	12A06	12L6	35A5	
IU4	5AM8	6AK5	6BC8	6CF6	6J7	6U5	7C7	12A07	12Q7	35B5	
IU5	5AN8	6AL5	6BD6	6CG8	6K6GT	6U8	7C5	12AX4GT	12R8	35C5	
IV2	5AT8	6AM8	6BE6	6CH8	6K7	6V8GT	7E6	12AX7	12S47	35W4	
IX2	5AV8	6AN8	6BF5	6CL6	6N7	6W8GT	7E7	12A27	12S17	35Z5	
1A4	5A24	6AO5	6B66G	6CM6	6Q7	6X4	7F7	12B5	12SK7	36	
2B4	5B8	6AO8	6BH6	6CM7	6S4	6X5GT	7F8	12BA5	12SN7GT	38	
2CY5	5C8	6A07	6BJ6	6CN7	6S7	6X8	7G7	12BA7	12S9/44		
3A5	5J6	6AR5	6BK5	6CR6	6S8GT	6Y6G	7H7	12BD6	12V6GT	41	
3AL5	5R4	6AS5	6BK7	6CS6	6SA7	7A4/XXL	7J7	12BE6	12W6GT	42	
3AU5	5T8	6AT8	6BL7GT	6CS7	6SD7GT	7A5	7J7	12B76	12X4	43	
3BC5	5U4	6AU4GT	6BN6	6CU5	6SF5	7A6	7X6	12BH7	14A7/12B7	50A5	

*For every tube you buy at 35¢ each, YOU GET A SECOND TUBE FOR JUST ONE PENNY!
*Buy 100 tubes for 33¢ each and GET AN EXTRA 100 TUBES FOR JUST \$1! Take your pick . . . tube types may be mixed!

IR5	6CQ8	12AF6
6AC7	6J5	12AU7
6AG5	6J6	12BL6
6AU6	6SC7	12D4
6CB6	7N7	17A4
6CG7	12AD6	17X4

Sensational Offer!
"Self Service"
TUBE CHECKERS
\$37.95

Let your customers test their own tubes! These reliable, reconditioned 22-socket tube checkers will return your investment in one week or less with little or no effort on your part! Handsome, field-tested console models COMPLETE WITH KEY FOR BOTTOM DOOR AND NEON-LIGHTED HEAD!

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Costly, famous make console models with little or no tube replacement! Require only minor adjustment. Perfect for resale, or as your own second set! 16", 17" and 19" screens none smaller! Sets shipped FOB, Harrison, N.J.

\$16.95 As Is

ANY Tube Not Listed Also Available at 35¢ Each!
BRAND NEW 1-YEAR GUARANTEED TV PICTURE TUBES
Below Listed prices do not include dot add. Additional \$2.00 deposit on tube sizes to 20" on 21" and 26" tubes—\$7.50. Deposit refunded immediately when dot is returned prepaid. *Unlimited tubes—\$4.00 extra.
Picture tubes shipped only to continental USA and Canada—All tubes P.O.B., Harrison, N.J.

3BP4	7.90	18KP4	11.00	17HP4	16.00	20EP4	17.80	91AP4	17.40	21X14	17.40
12L8	8.40	18LP4	11.10	17LP4	16.10	20FP4	17.90	91CP4	17.50	21Y14	18.30
14B/CP4	11.00	18UP4	11.20	17UP4	16.20	20GP4	18.00	91UP4	18.30	21Z14	17.90
16BD6	16.00	17AP4	15.40	17FP4	16.30	20AP4	18.70	91FP4	18.30	24AP4	20.40
18DP4	17.10	17BP4	16.40	17GP4	16.50	20BP4	19.30	91GP4	18.30	24CP4	20.40
18GP4	16.00	17CP4	16.30	20CP4	16.30	21AP4	14.70	91CP4	18.30	24DP4	20.70
20BT4	12.10	17DP4	16.40	20DP4	16.30	21BP4	15.70	91BP4	18.30	24FP4	20.70

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TRU-VAC

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

Don't Murder Your Business

(Continued from page 41)

est violators. They have become so accustomed to seeing business through sales lenses that they find it very hard to place purchasing, credits, collections, etc., in their proper position on the business scale.

Where a partnership exists the problem of rounded experience is usually not as acute as it is in the case of many sole proprietorships. It is also a wise idea to make use of the firm's accountant. His varied experience can prove invaluable in showing the owner(s) the forest rather than the individual trees.

Neglect: This is generally due to: (1) Poor personal habits. (2) Poor health. (3) Domestic difficulties. Some of these foibles are difficult, others are impossible to eradicate. A logical view commands the owner to decide whether the difficulty is surmountable or not.

Fraud of the owners: Included are false financial statements, illegal disposition of assets, deliberate overbuying. Luckily for the business community this group represents only a small percentage of the total failures.

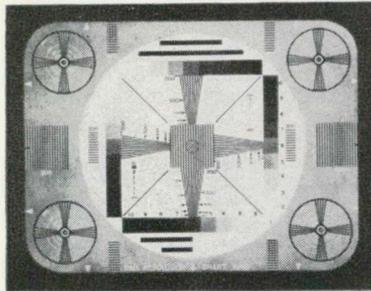
Miscellaneous: Covers such items as employee frauds, disasters and unknown reasons for failure. Employee frauds and such disasters as fire, burglary, boiler explosion, etc., can be protected against at reasonable cost. The advice of an insurance broker should be sought not only at the inception of a business but on a continuing basis. Obviously, business is dynamic and it therefore follows that an insurance program covering its risks should change from time to time.

Conclusions

Awareness of the causes of failure can go a long way toward preventing it. Action goes a longer way. The following list, by no means exhaustive, should give you action ideas sufficient to prevent you from killing the source of your income.

- (1) Join a trade association.
- (2) Read as many trade journals

- as you can.
- (3) Question suppliers and their salesmen about new developments.
- (4) Talk to your attorney, accountant, banker and insurance man about those phases of your business which come within their jurisdiction.
- (5) If you have a partner, discuss all phases of the business with him regularly. Remember, you're married to him commercially.
- (6) See your doctor if you're chronically tired. If you're not, have an annual checkup anyway.
- (7) Keep accurate, up-to-the-minute records.
- (8) Review your list of receivables regularly and often. Keep after the slow ones. Be polite but firm.
- (9) Digest your financial statements. Remember, they are not novel to skim through. •



TV TIPS FROM TRIAD

NO. 13 IN A SERIES,
PART 1

"This 'orphan' came in the basket of a 'borrowed' supermarket cart," began Joe, "and when I had laid out the chassis, yoke, flyback, picture tube, miscellaneous parts and leads, I knew it had finally happened to me.

"The character said his 'fixit' book called for replacing the flyback when he had no light on the picture tube so he carefully unsoldered everything in the cage, took the flyback down to Public Wholesale where he was told he would have to give them the model or chassis number, plus the part number before they could look it up. Since this job had no numbers that made any sense he was stuck.

"At this point he lost interest and dumped the mess on me."

"Sucker," said Bill. "No disconnect chart either, I suppose?"

"Right. I think I found the original trouble which was an open 5 mfd electrolytic on the cathode of the horizontal output, so I reinstalled the flyback as far as I could go. I can get a raster at normal plate and screen current, but the video overloads. I have no horizontal or vertical hold and it looks like this job used horizontal blanking. The flyback has a separate winding which is tapped, so my problem is to recover AFC, AGC, and blanking, without having to try the eight wrong combinations first. Is there anyway I can connect them correctly, the first time?"

"If you take care of the obvious first," said Bill, "and then clear the circuits based on what 'you know for sure' you should be able to cut down on the experimental part.

"The first step is to gain control of your video system because you cannot check your AFC or AGC unless you have incoming sync available.

"Therefore," continued Bill as he rapidly traced the circuit layout, "since you have a single -CB6 video stage driving the cathode of the CRT you adjust your bias box to show about four volts peak to peak of video with negative going sync at your video detector output."

"I knew the scope would get into the act some place," said Joe with a grin.

"Well, the video detector measurement is probably the most valuable scope measurement in servicing," answered Bill. "It's one of the 'for sure' factors and it's much more accurate than attempting to gauge video levels on a CRT where hold and blanking are out. As a final touch see that video represents at least 25% of the total signal at all levels of picture information. You are then ready to solve the AGC, AFC, and blanking in the proper sequence."

* * *

MORAL: More next month; but in the meantime PTM #4, to be published soon, will show an inexpensive circuit and parts list for a bias box. In addition, other devices and service procedures to make possible more accurate correction of "Multiple Trouble" problems will be discussed. You will receive PTM #4 if you have ever registered for the Triad PTM mailing list. If not, a request to *Renewal Division, Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.*, will bring you a copy.

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more than



Now—from the leader in packaged semiconductor replacements—5 pocket-sized new kits that fill 95% of your service needs. Semitron Popular-Quick kits end costly and inconvenient duplications. Only 37 transistors, diodes and rectifiers do the job of more than 1000. You slash non-profitable, slow moving inventory that ties up your purchasing dollar. You can always carry in stock all the replacements you need for better than 9 out of 10 semiconductor service calls. Comprehensive replacement and interchangeability guide included.

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ASSOCIATION NEWS

California

\$3 Hr. Pay Endorsed

CSEA, Fresno, Santa Clara Valley & Santa Cruz Chapter, has endorsed the three dollar an hour minimum pay for radio and TV journeyman technicians. The three dollar wage is to become effective July 1, 1961. The state organization also reported it has received pledges of \$5,000 toward its campaign to collect \$12,000 for support of the state licensing bill. The bill has come out of the Government Economy and Efficiency Committee with a "Do Pass" request. The Committee decided not to certify technicians at this time. Provisions are made for licensing of all technicians. The measure now goes to the Ways and Means Committee.

Illinois

All-Industry Advisory Group

NATESA, Chicago, announced that a call has been sent out for an all-industry conference to be attended by top-level representatives of all segments of electronics: production, distribution, and servicing. Invitations were extended to twenty-five industry leaders, without reference to any industry organization affiliation, by Frank J. Moch, Executive Director of NATESA, and Mauro E. Schifino, President of the National Electronic Distributors Association. This first national conference of various segments of the electronics industry is aimed at establishing a permanent all-industry advisory group to consider common problems.

Indiana

ITTA, Indianapolis, has elected the following officers: Pres., Harold Joergens; V.P., Robert Shuck; Corr.-Sec., Bernie Lynch; Rec.-Sec., Dick Glass; Treas., Delbert Williams; Sgt.-at-Arms, Ralph Perry.

IESA, Indianapolis, announced the following officers were elected: Chairman, LaMar Zimmerman, Jr.; Vice Chairman, Robert Luecke; Sec'y, Clyde Smeltzer; Treas., Jay Schupbach.



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

Write today for complete information.

PLANET SALES CORPORATION
225 Belleville Avenue Bloomfield, New Jersey

Kansas

TESA, Leavenworth, elected the following officers: Pres., Jim Connelly; V. P., Dean Maxwell; Sec'y, Ralph Moore.

Michigan

TSA, Detroit, reports that over 100 dealers and their service technicians attended a recent color TV clinic held at Radio Specialties Co. The clinic was arranged for members in Oakland and Macomb Counties. Set-up procedures in color TV receivers was presented by Jim Kelly, RCA sales engineer.

Missouri

Technicians' Booth Attracts Public

TEAM, St. Louis, said that the Bildors Home Show booth, sponsored jointly by TEAM, TESA, the BBB, and the Electronics Club, attracted wide interest during the two day show. Included in the booth's many attractions was a tube-test demonstration. The tube tested good on a tube checker but would not function properly in a receiver. Literature explaining the many costs involved in operating a service business was distributed by the Better Business Bureau. The Electronics Club is an organization of distributors and manufacturers representatives. TEAM also announced new officers elected were (St. Louis): Pres., Robert C. Lucas; V.P., Stanley L. Siegel; Sec.-Treas., Herman J. Wolf; Rec.-Sec., Thomas L. Dooly; Sgt.-at-Arms, Frank Pericic. (Kansas City): Pres., Ralph McClellan; V.P., Jay Johnson, Sec.-Treas., P. C. Brink; Rec.-Sec., Richard Lagle; Sgt.-at-Arms, Fred Loeb.

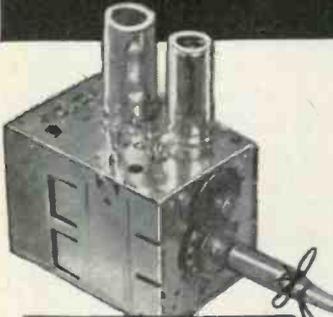
New Jersey

TSC, Pennsauken, Tri-State Council reports a bill has been introduced in the State Assembly, Trenton, to regulate the Radio & TV Serviceman. Sponsored by Assemblyman Maurice V. Brady, the measure requires service technician's to register with the State Labor Department and pay an annual fee of \$10. The bill, as presently designed, attempts to "correct" common abuses prevalent in the industry and does not contain licensing provisions or penalties. It was said the measure, if approved, may lead to state licensing at some future time.

ALL MAKES ONE PRICE

Professional Technicians Use CASTLE'S Complete TV TUNER OVERHAUL

\$9⁹⁵



VHF TUNERS • UHF TUNERS • UV Combinations*
 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.

NOW ALSO IN THE EAST
 Castle pioneered TV Tuner Service almost a decade ago. Overhauling TV Tuners is our only business.

*One piece construction. Separate UHF and VHF tuners must be dismantled.

SAME DAY SERVICE!
 on Popular Types
 48 Hours most Others

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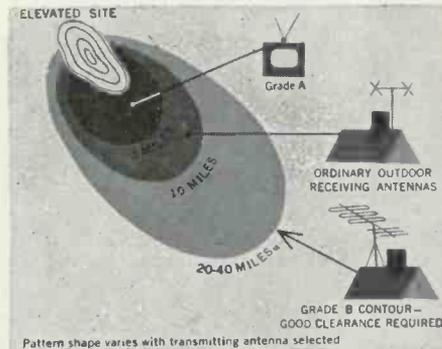
NEW! 653 PALISADE AVE., CLIFFSIDE PARK, NEW JERSEY
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The EMCEE VHF TRANSLATOR

for simplest installation and maximum performance! FCC TYPE ACCEPTED!



Here's the new VHF Translator with outstanding advantages for all installations. EMCEE Translators are the result of long experience in quality design and trouble-free construction by some of America's leading experts. Now fill in troublesome areas with the advanced EMCEE VHF Translator.

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 Gentlemen:

—Please rush free planning package including data sheet, complete installation check list, coverage calculation form.

—Please send free reprint of FCC rules covering translators.

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TRANSLATORS MAY BE RUN IN TANDEM TOO!



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- 8 oz. can Net \$1.98
3 oz. caddy size Net .98

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Cleans as well as lubricates. Will not alter electrical properties nor harm insulation.

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3 oz. caddy size Net .98

NO-ARC HI-VOLTAGE INSULATOR

20,000 V Dielectric with the NEW "JET-STREAM" action. For HV transformers, Yokes, HV leads, etc. Waterproofs and protects. MIL-C 12599

8 oz. can Net \$2.79

FROST-AID

For locating THERMAL INTERMITTENT Components by instantly cooling suspected resistors, condensers, coils, etc.

6 oz. Net \$1.98

MASK-N-GLAS GLASS & PLASTIC CLEANER & POLISHER

- Anti-static • Non-staining
 - Non-abrasive • Removes dirt & grime • Ideal for TV masks; safety glass, plastic cabinets, picture tube, etc.
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WIPE-A-WAY A NEW WATERLESS HAND CLEANER

Exclusive formulation of activated lanolin and germ-killing trichlorophenolate and mild ingredients. Ideal for every type of hand cleaning problem.

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A revolutionary new concept of combining penetrating and lubricating oils into one exclusive formula. Ideal for changers, recorders and instruments. Excellent FROZEN YOKE REMOVER.

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Montana

ESA, Butte, showed two twenty-minute films entitled "Intermittent Operation In Home Radios," and "Elimination of Microphonics in Home Radios," at a recent association meeting.

North Carolina

NCFEA, Durham, announced it has collected more than \$1,000 to support the Certification Bill now in the state legislature. Association officials are requesting local organizations to honor the financial pledges they made in support of the Certification measure at a meeting held in Greensboro some time ago.

Pennsylvania

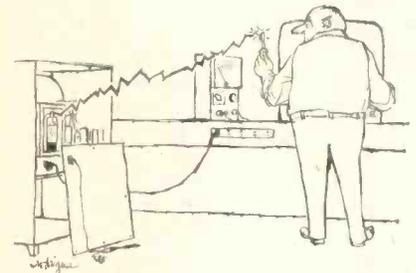
Refuses Records To FTC

TSADV, Philadelphia, said that the association has refused to produce its record before a special "investigative procedure" instituted by the Federal Trade Commission. Counsel for the TV-radio technician's organization, Sidney H. Black, said he felt the subpoena demanding the records was "invalid" and that it should be directed to in-

dividuals of the association. The Federal Trade Commission's investigation is understood to be concerned with an alleged "boycotting" of certain radio-television parts jobbers by independent service technicians. The FTC had subpoenaed the charter, membership list, copies of the association's monthly publication, and all other memoranda and correspondence relating to disputes with certain distributors.

Washington

TSA, Seattle, has elected the following officers: Pres. George Brown; V.P., Doyle Gudgel; Sec.-Treas., James Humphrey.



Introducing an alligator clip with a "microscopic tip"!

the Mueller **MICRO-GATOR**

Here is the alligator clip you can now use where no other clip will do! On printed circuits, in tight spots and on tiny terminals too crowded for anything but its "microscopic" tip. Fully insulated right down to the nose. It offers all the speed, free-handed ease and convenience associated with other Mueller alligator clips.

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Tough, Vinyl, skin-tight insulator. Lip-action tip-slot. A ringer for the popular "Mini-gator" insulator.

INSULATORS SOLD SEPARATELY. (Standard Red and Black colors. White, Blue, Yellow and Green also available.)

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Background Music Franchise for TV Service Dealers

A former management consultant to a service association has embarked on a program to offer service dealers a profitable sideline. Lawrence Kanover, president of Musi-Pak, Inc., is franchising local dealers to sell and install background music cartridge tape players. In addition to the sales commission on the original equipment, the dealer earns a continuing monthly fee for the rental of the tapes and maintenance of the equipment.

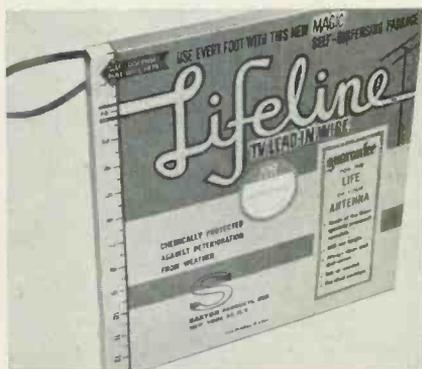
Among the advantages reported for this on-location music system for offices, stores, plants and public places is lower cost compared to central systems which transmit music to the location. Further, the music selection is completely controlled by the user and the equipment may be used as a public address system.

After purchasing the demonstration unit, franchised dealers need not tie up any capital in an inventory of machines. Quality dealers who qualify for franchise receive an exclusive territory and support of the company's promotional campaign.

Additional information on this factory-to-dealer program is available from Musi-Pak, Inc., subsidiary of Electronic Transmission Corp., 103 E. Hawthorne Ave., Valley Stream, N.Y.

Saxton TV ANTENNA WIRE

A new self-dispensing, self-measuring package of TV antenna wire, called Lifeline, is reported to end the problems of waste, dirt, tangling, and



breakage. The wire is specially treated to protect against weather damage and built to withstand the push-pull stress of outdoor installations. Saxton Products, Inc., 4320 Park Ave., New York, N. Y.

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5 Channel,
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Dual voltage



12 Volts DC/115 Volts AC... 3.2 Amps full standby current
... Transistor power supply... Highly sensitive, selective, superheterodyne receiver with RF stage... 2 IF stages... Automatic noise limiter... Adjustable quieting squelch... Full 5 watt transmitter... Dual tuned pi-network output circuit... Universal mounting bracket included.

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ALSO AVAILABLE
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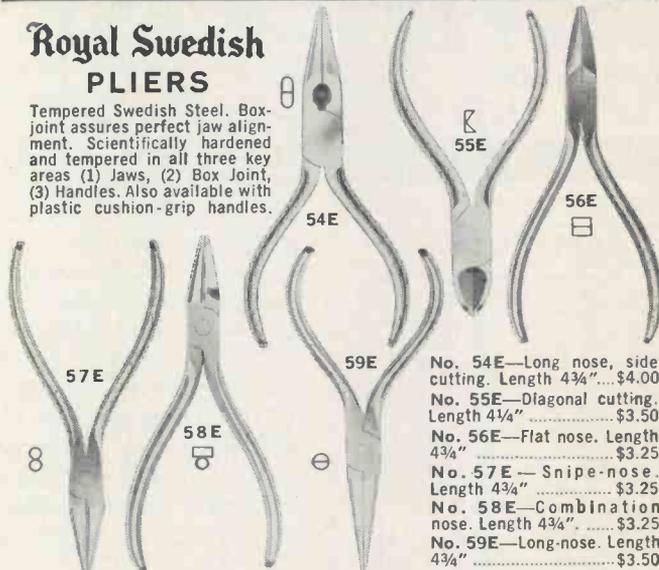
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Turn a dreaded replacement into a pleasure.

Make chassis removal unnecessary in many cases.

Help eliminate bad solder connections, broken-off socket lugs, short circuits, and burned and peeled Printed Circuit boards.

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1U4	.94	6AL2	.74	6CG8A	1.26	12AX4GTB	1.08
1U5	.82	6AM5A	1.36	6CL6	1.50	12XK7	1.02
1X2A/B	1.22	6AN8A	1.40	6CM7	1.10	12B4A	1.08
2BN4	1.02	6AQ6A	.86	6C08	1.32	12BA6	.80
2CY5	1.12	6AU4GT	1.34	6CU8	1.74	12BE6	.88
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Home Air Conditioners

(Continued from page 39)

panel material can be cut with a sharp pointed instrument (an awl or ice pick will do), scoring the material back and forth with the sharp point using a heavy straight edge. It should be scored deeply on both sides, and then broken by holding it against a flat surface as shown in Fig. 6A. The filler panels are now installed as shown in Fig. 6B.

Now loosen the top bar setscrews on both sides of the cabinet and push the slider ears to the window stop mouldings. Tighten the top bar setscrews and then drive 1 1/4" screws through the slider ear holes into the moulding, as shown in Fig. 7.

Raise the window, remove the plastic top bar spacers, and check the outward tilt of the cabinet with the level. Mount the top rubber gasket and pull the window sash down tightly behind the seal. Install a screw through the top bar center hole into the window sash, as shown in Fig. 8. Lift the chassis from the floor and slide it into the cabinet. Wedge a sponge plastic seal between the upper and lower window sections. Do not forget to insert the power cord in the cabinet/chassis notches.

Some units are provided with a three-position speed control to adjust for power line variations of 5 to 10%. This should be checked and set, under load conditions, using the a-c scale of a VOM to determine the proper adjustment point.

If the unit's a-c cord is not long enough to reach the outlet, the extension cord used should have the same size wire as the cord attached to the unit. And cables are not normally extended beyond 25 feet unless heavier wire is used. Likewise, on 117 volt machines, if a regular polarized outlet is not present, an adapter should be used and the green wire on the adapter should be grounded to the outlet plate screw.

Troubleshooting Tips

Occasionally a customer will complain that the room does not cool properly. This condition can be caused by a defective compressor, insufficient freon in the unit, or the

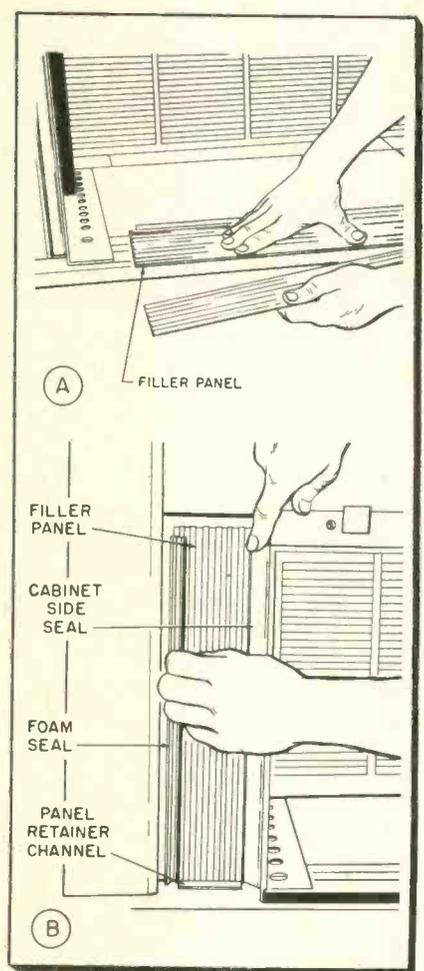


Fig. 6 (A)—Filler panel is broken on scored edge against a flat surface. (B)—Cut panel edge is inserted into the rubber side seal groove by flexing the beaded lip of the rubber seal.

thermostatic control may be defective. If the thermostat is suspected, the best test is to jump it with a length of wire and turn the unit on. If the unit begins to cool, then you know the thermostat is defective and should be replaced. This part is guaranteed by the distributor and can be removed and replaced on some machines without removing the unit from the window.

If the trouble is not in the thermostat, and the dealer is not set up to make comprehensive repairs, it is better to pull the unit and return it to the distributor or take it to a specialist for needed repair.

When the fuse blows frequently with the air-conditioner running, a compressor is generally suspected. Although a defective fan motor can cause the fuse to blow, this is highly unlikely. A VOM can be used to check for shorted or open windings on the motor.

If a fan should become loosened from the motor shaft, or is loosened

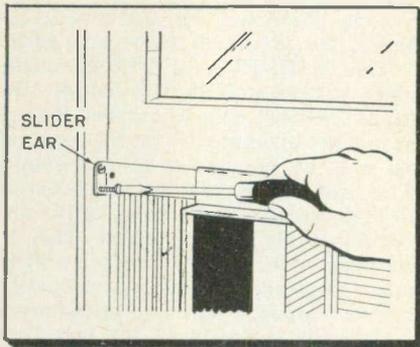


Fig. 7—Two screws attach slider ears to window stop moulding on right and left sides of the conditioner.

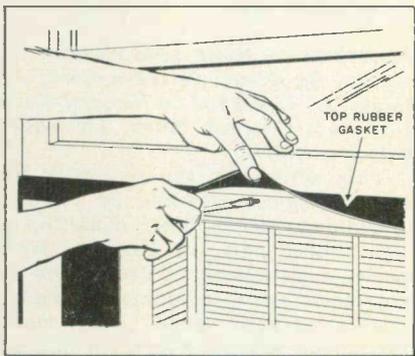


Fig. 8—A permanent installation requires a screw to be driven through the top-bar center hole into the window sash.

for any reason, the manufacturer's service manual should be consulted for proper repositioning on the motor shaft. Maximum cooling cannot be obtained in some machines unless the fan is correctly located on the motor shaft.

Compressors are generally guaranteed for five years by the manufacturer. However, if a freon recharge becomes necessary for any reason, this is usually charged for. The technician would normally charge a customer for his time, transportation of the conditioner to

and from the shop or distributor, etc., for replacement of a defective compressor within the 5-year guarantee period. Fan motors and other components are generally guaranteed for only one year.

Once the technician has entered the air-conditioner installation field he has the opportunity of continuously servicing a growing number of units from year to year. The customer usually calls, or the technician reminds the customer, to have the unit checked, cleaned, oiled and filter changed before starting the machine in the spring or early summer. In certain localities filters are changed more frequently.

If the technician is interested in doing full service work on air conditioners he should equip the shop with all manufacturers' service manuals, schematics, spare parts lists, and a minimum of spare parts, including motor and compressor capacitors. •

Illustration Credit: Fedders, Maspath, Long Island & Remington, Mineola, Long Island.

Seco TUBE INDEX

Complete setup data for model 107 tube tester is provided in a new 70-page tube index. Thumb-indexed for quick reference, it covers all domestic, industrial and foreign tube types. Designated as FC-4 (flip chart #4), it replaces the FC-3 which was made to fit into a metal list finder. Having outgrown this type of mechanical index, the firm has published its new 70-page tube index on quality card stock and bound the pages with a 13-ring flexible plastic binding to allow the pages to lie flat at any opening. \$2.00. Seco Electronics, Inc., 5015 Penn Ave. South, Minneapolis 19, Minn.

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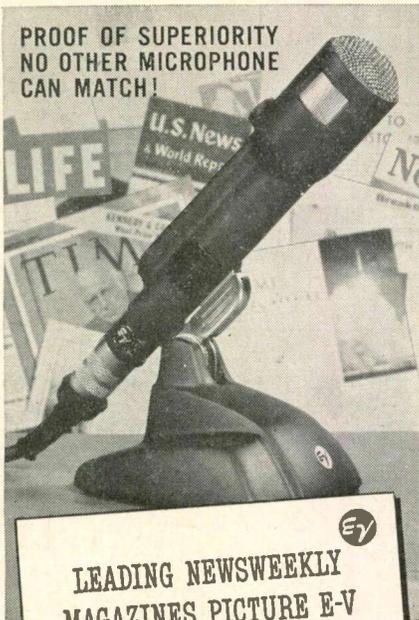
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New Books

SEMICONDUCTORS AND TRANSISTORS. By Alexander Schure. Published by John F. Rider Publisher, Inc. 138 pages, soft cover. \$2.90.

Semiconductor theory and operation is covered thoroughly in the first two chapters of this latest book in the Electronic Technology Series. Atomic structure, the quantum theory, conductor and insulator properties are discussed in an easy-to-understand language. Theory of the P-N junction and tunnel diode is included. Transistor theory and operating characteristics is fully explored in two chapters. A final chapter covers small signal analysis and circuit parameters. The text is adequately illustrated with schematics, drawings and charts. Review questions appear at the end of each chapter. This is a must information source for every technician desiring a thorough knowledge of semiconductor theory and operation.

CITIZENS BAND RADIO By Allan Lytel. Published by John F. Rider Publisher, Inc. 160 pages, soft cover. \$3.90.

This book explains all phases of Citizens Band radio service for the user and prospective buyer of this equipment. Usual questions about CB radio's origin, service classes, FCC rules and regulations, circuit designs, antennas, power supplies and other areas of interest are thoroughly explored and adequately answered. Each subject is outlined with easily understood "layman's" language. Both "kit" and ready-to-go equipment is covered. Equipment installation and repair problems are reviewed. Photographs, schematics, drawings, and tables are included. This is an integrated-information book for the operator-owner, and the electronic technician desiring a thorough basic knowledge of Citizen Band equipment.

INTRODUCTION TO HI-FI. By Clement Brown. Published by Gernsback Library, Inc. 188 pages, soft cover. \$3.20.

This is HI-FI as a British music-lover understands it. It's factual, detailed; written by a prominent British authority, and oriented to the amateur as well as the seasoned audiophile. The book opens with an introduction to high fidelity where basic terms and fundamentals are explained. The remaining nine chapters describe pickups, amplifiers, speakers, acoustics, stereo, tapes; selecting components and finally, procedures for installing the equipment. Almost every conceivable question that may arise in the average audiophile's mind is answered. Photographs, drawings, and schematics aid the reader in comprehending the text.

HANDBOOK OF NOISE MEASUREMENT, 4th edition. By Arnold Peterson and Ervin Gross, Jr. Published by General Radio Co. West Concord, Mass. 132 pages, soft cover, \$1.00.

This edition of the handbook has been brought up-to-date by revision. Beginning with a brief definition of the decibel unit, 13 chapters cover noise measurements, description of equipment used, including a complete general-purpose noise and sound measuring system. Vibration measuring instruments and their applications are also discussed. DB power-pressure ratio conversion tables, and definitions are included in appendices. This is an excellent book for the technician or engineer involved in broadcast studio work, PA sound level surveys—or general measurements of acoustical properties.

VIDEO SPEED SERVICING, Vols. 4 & 5. By Samuel L. Marshall. Published by Howard W. Sams & Co., Inc. 160 pages each, soft cover. \$2.95 ea.

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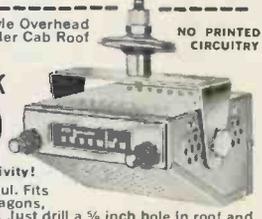
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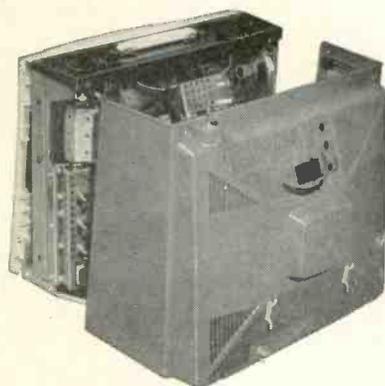
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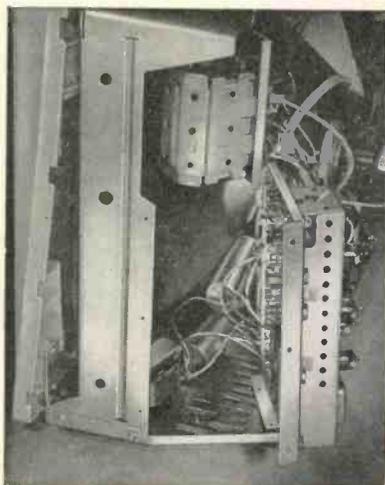
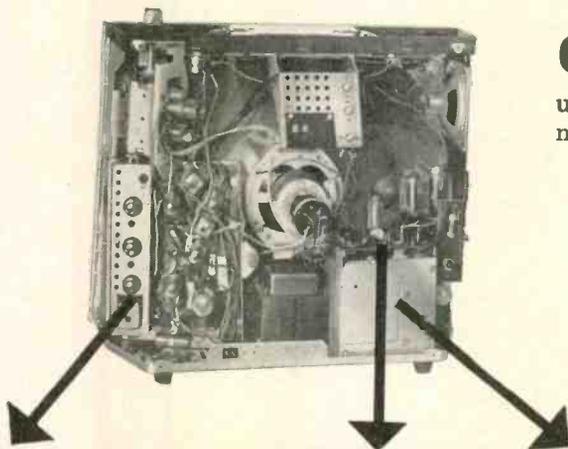
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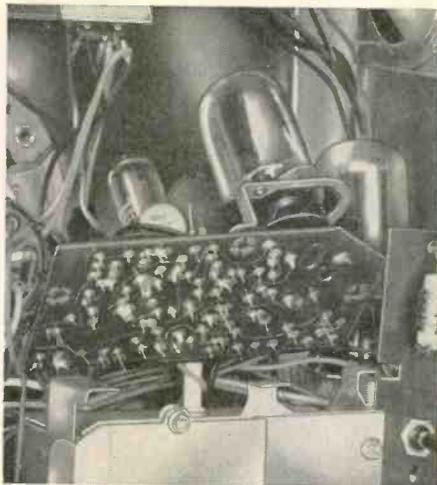
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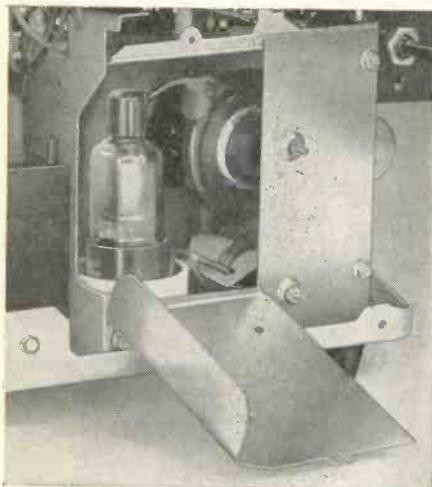
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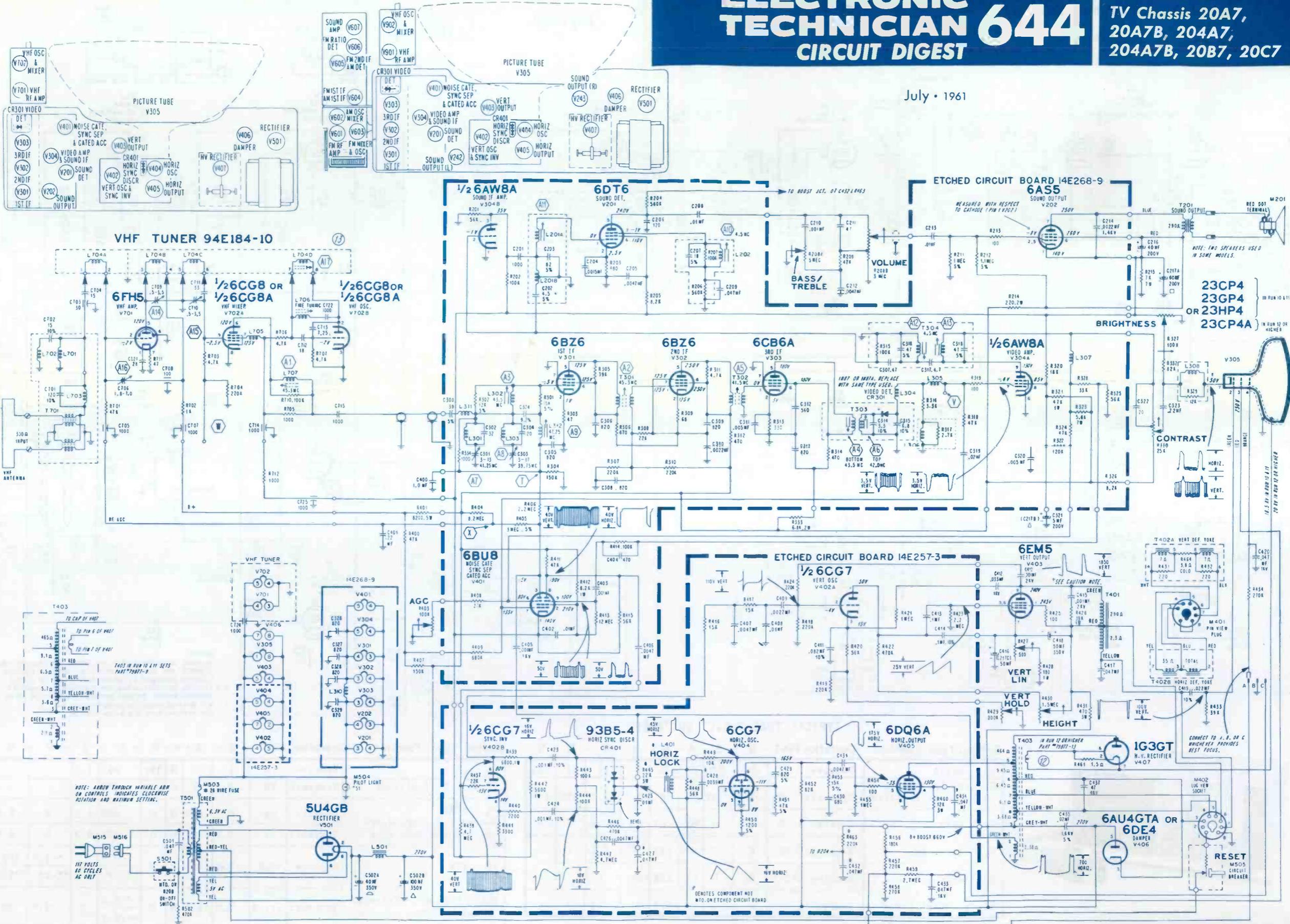
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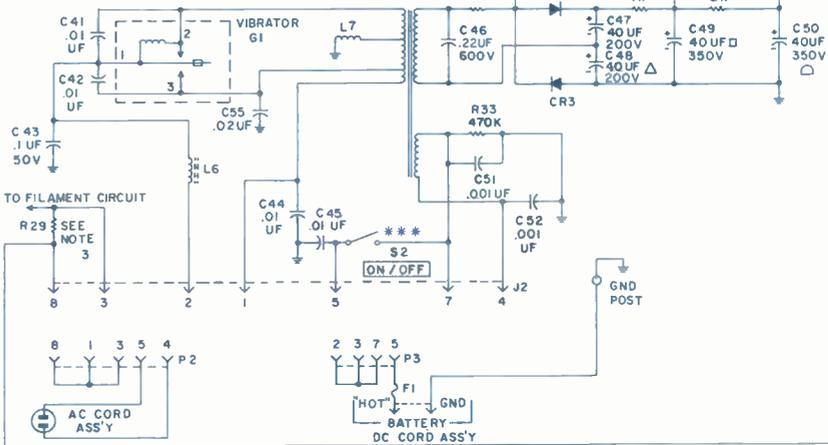
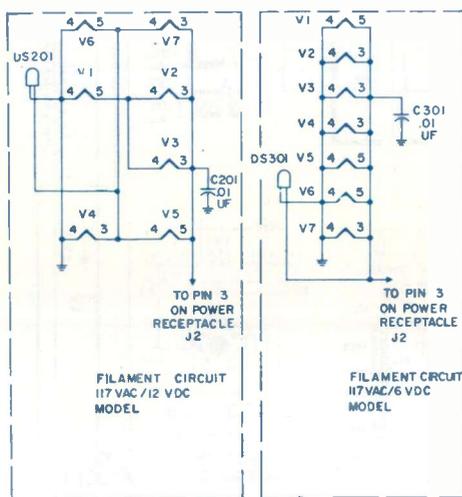
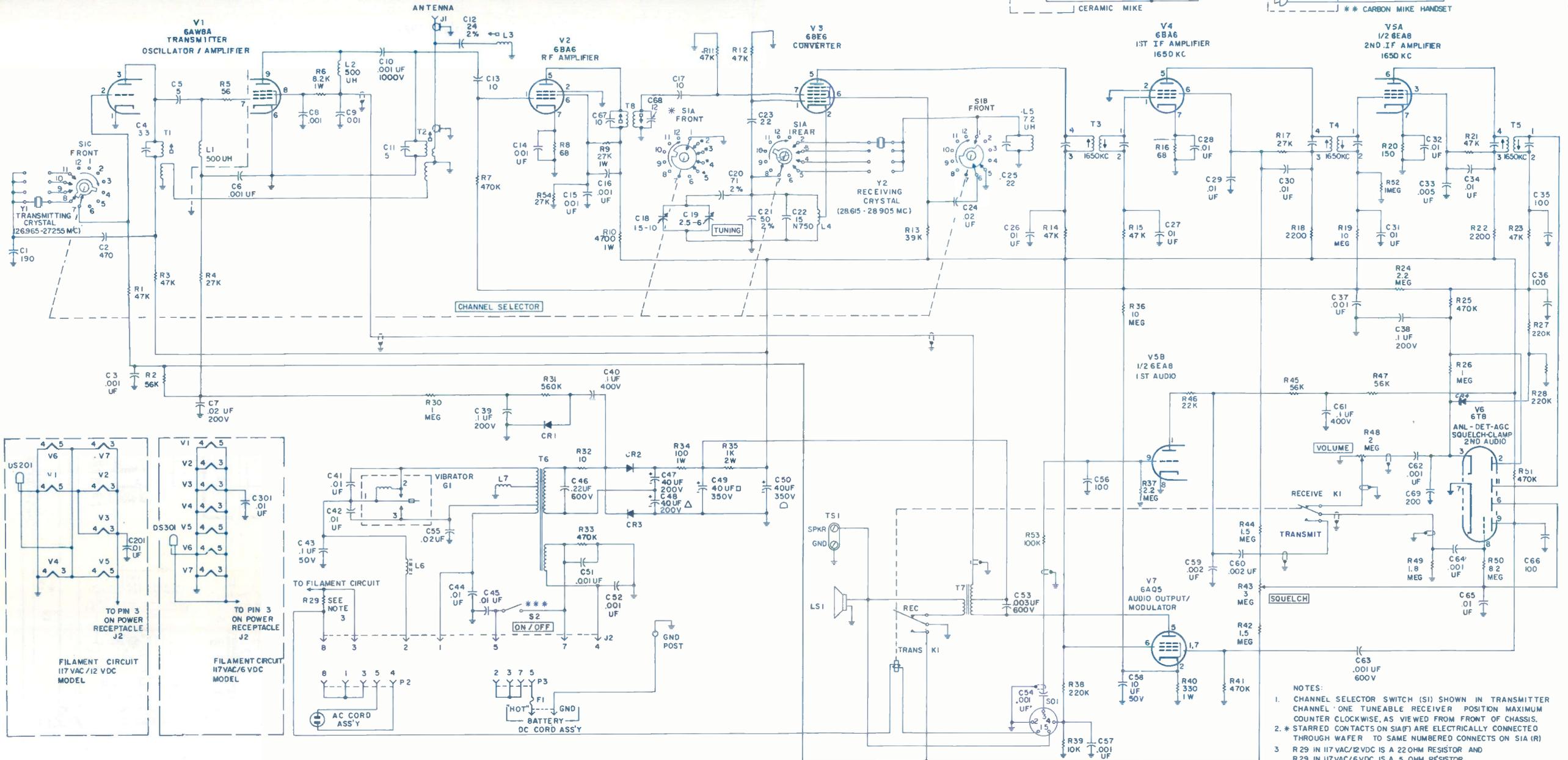
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1. CHANNEL SELECTOR SWITCH (S1) SHOWN IN TRANSMITTER CHANNEL ONE TUNEABLE RECEIVER POSITION MAXIMUM COUNTER CLOCKWISE, AS VIEWED FROM FRONT OF CHASSIS.
 2. * STARRIED CONTACTS ON S1A† ARE ELECTRICALLY CONNECTED THROUGH WAFER TO SAME NUMBERED CONNECTS ON S1A (R)
 3. R 29 IN 117 VAC/1/2 VDC IS A 22 OHM RESISTOR AND R 29 IN 117 VAC/6 VDC IS A 5 OHM RESISTOR.

TYPICAL TUBE SOCKET VOLTAGES

Symbol, Type, Function	Operation	Pin 1	2	3	4	5	6	7	8	9
V1 - 6AW8A	Receive	0	-77	220	H	H	0	-80	265	265
Crystal Oscillator/ R.F. Power Amplifier	Transmit	0	-6.6	105	H	H	0	-7.2	190	245
V2 - 6BA6	Receive	0	0	H	H	163	82	0.8	-	-
R.F. Amplifier	Transmit	-82	0	H	H	211	166	0.4	-	-
V3 - 6BE6	Receive	-3.2	0	H	H	158	66	0	-	-
Mixer - Oscillator	Transmit	-3.7	0	H	H	202	74	-6.1	-	-

Symbol, Type, Function	Operation	Pin 1	2	3	4	5	6	7	8	9
V4 - 6BA6	Receive	0	0	H	H	187	90	1.0	-	-
First I.F. Amplifier	Transmit	-70	0	H	H	232	225	0	-	-
V5 - 6EA8	Receive	14	0	105	H	H	200	1.3	0	-0.9
Second I.F. Amplifier/ Microphone Amplifier	Transmit	14	-6.3	210	H	H	230	0.3	0	-0.9
V6 - 6T8	Receive	-1.0	-0.6	0.2	H	H	*-0.3 **-28	0	*-1.0 **-26	*60 **215
Noise Limiter - Detector - Squelch Clamp	Transmit	-11.0	-8.0	-5.2	H	H	*-0.2 **-0.3	0	-1.0	60
V7 - 6AQ5	Receive	0	11	H	H	250	218	0	-	-
Audio Output-Modulator	Transmit	0	11	H	H	250	235	0	-	-

* Squelch control maximum clockwise.
 ** Squelch control maximum counterclockwise.
 Voltages measured to chassis with VTVM (RCA VoltOhmyst or equivalent) and are positive except where noted.
 Transmitter tuned and loaded, with no signal input to receiver.



ELECTRONIC TECHNICIAN 648

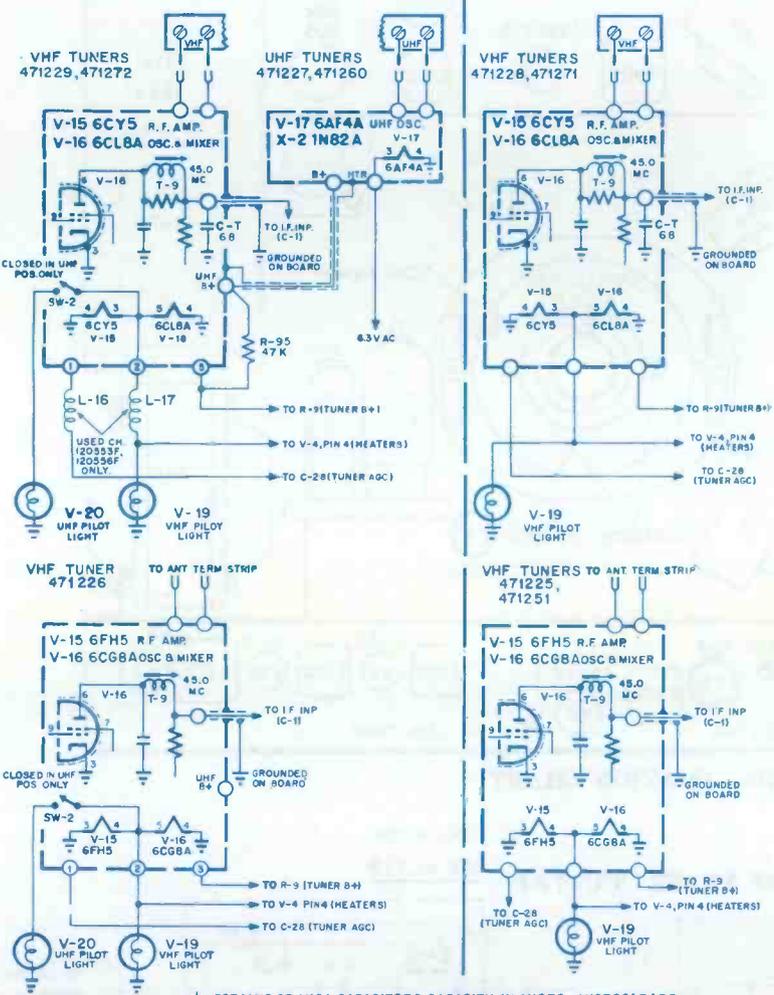
CIRCUIT DIGEST

EMERSON
 TV Chassis 120530C,
 120549C, 550D, 551C,
 120552E, 553F, 554E,
 120555E, 556F, 557E

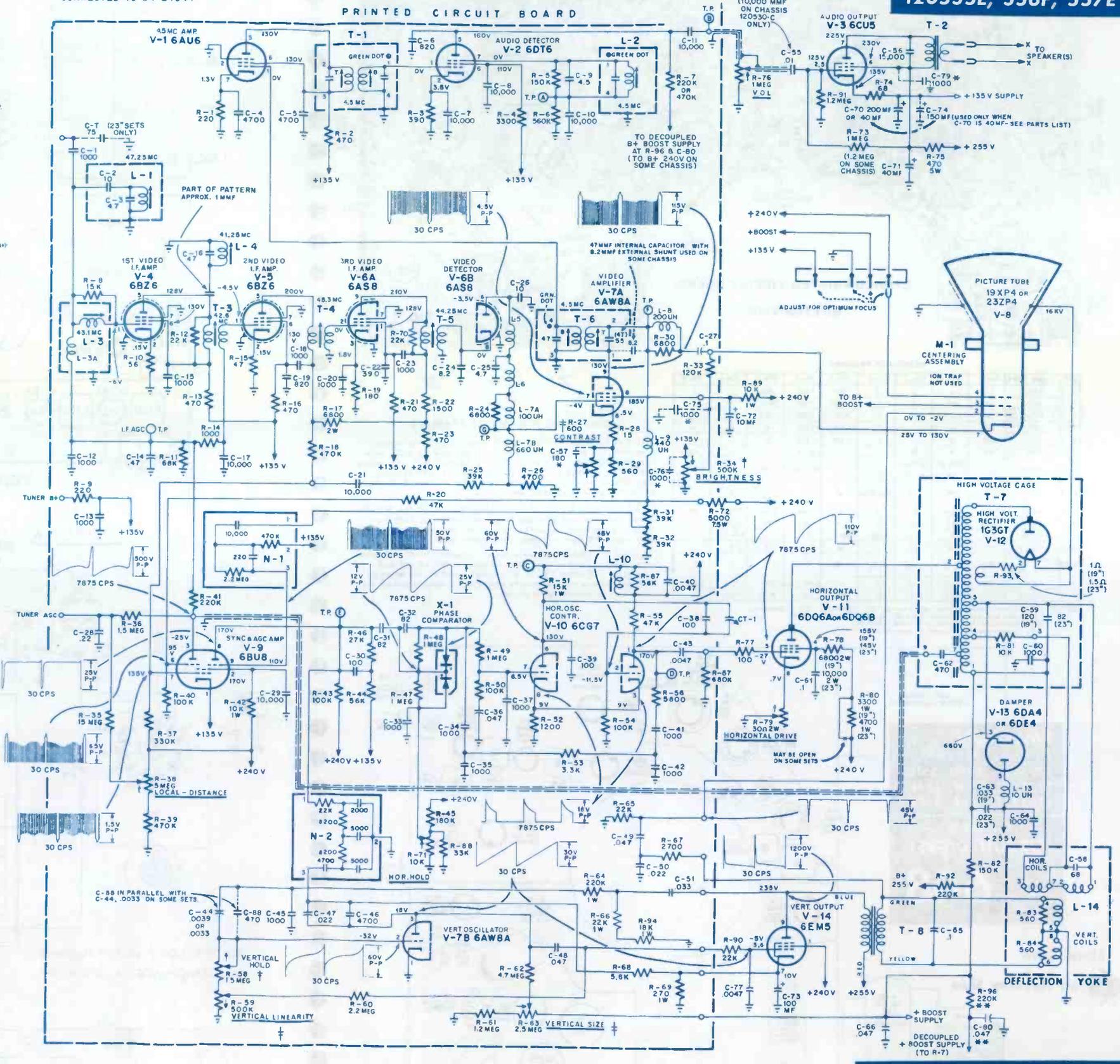
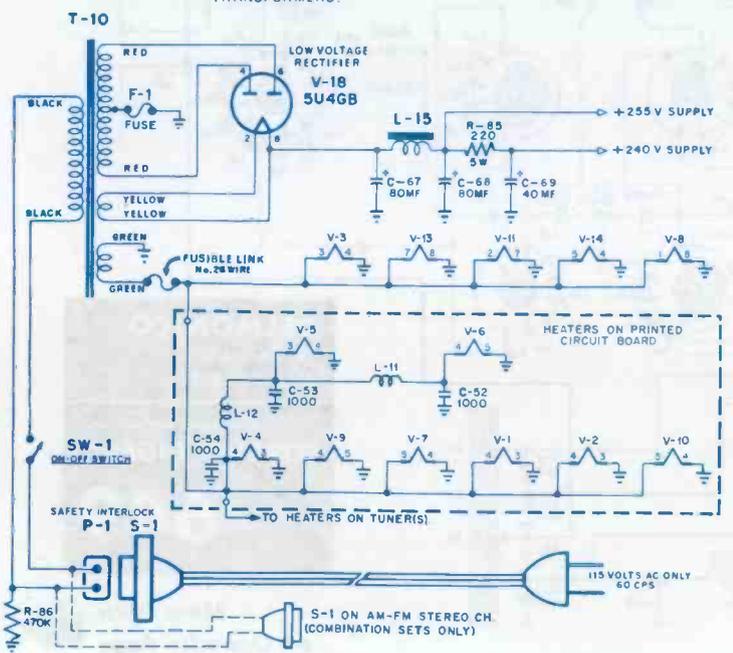
UHF-VHF TUNER ASSEMBLIES

VHF TUNERS

NOTES: † CONTROLS R-27, R-58, R-59, R-63 AND R-34 NOT MOUNTED ON ETCHED CIRCUIT BOARD ON ALL CHASSIS.
 * C-57, C-75, C-76 AND C-79 NOT USED ON CHASSIS 120555E, 556F AND 557E.
 ** R-96 AND C-80 NOT USED WHEN R-7 IS CONNECTED TO B+ 240V.

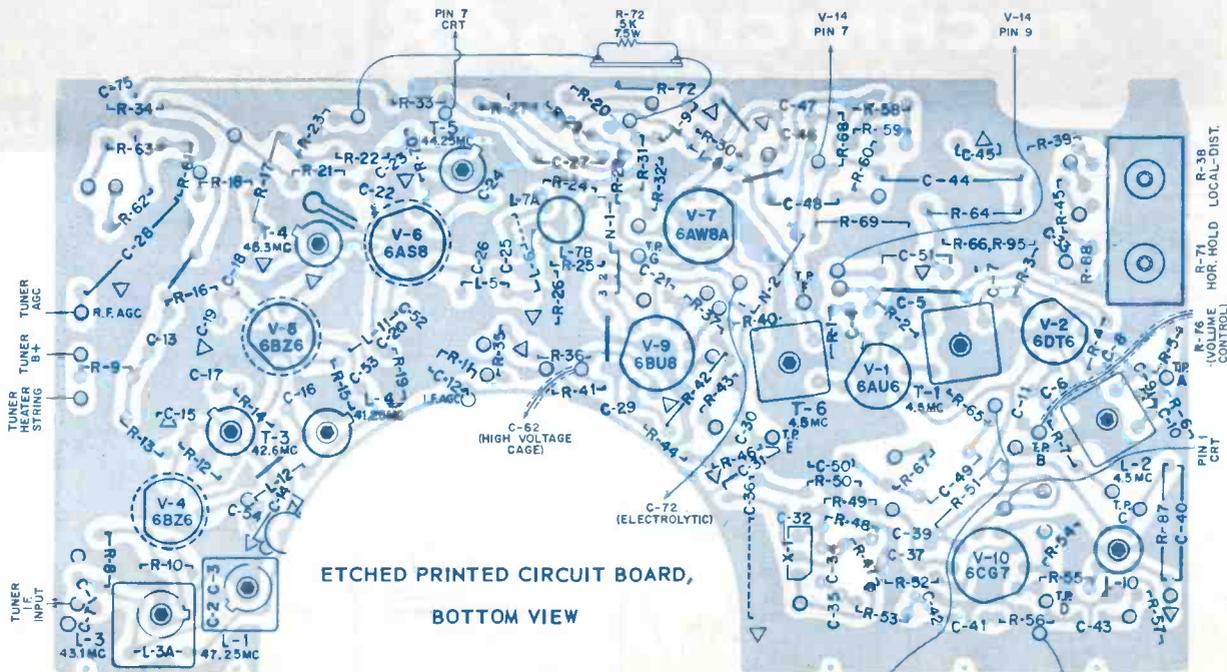


† CERAMIC OR MICA CAPACITORS, CAPACITY IN MICRO-MICROFARADS.
 * TUBULAR CAPACITORS, CAPACITY IN MICROFARADS.
 RESISTORS IN OHMS (K=1000 OHMS) AND 1/2 WATT, UNLESS NOTED.
 ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION.
 T INDICATES TOP CORE, B INDICATES BOTTOM CORE IN DOUBLE TUNED TRANSFORMERS.



More Data on Reverse Side

July • 1961



ETCHED PRINTED CIRCUIT BOARD,
BOTTOM VIEW

RESISTANCE READINGS

SYM	TUBE TYPE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-1	6AU6	1.5	0	0	.1	*50K	*50K	220	-	-
V-2	6DT6	5	390	0	.1	*300K	*50K	560K	-	-
V-3	6CU5	*50K	1.2M	.1	0	N.C.	*50K	*50K	-	-
V-4	6BZ6	68K	56	0	.1	*55K	*55K	0	-	-
V-5	6BZ6	69K	47	.1	0	*50K	*52K	0	-	-
V-6	6AS8	*48K	0	100	.1	0	4.5K	0	0	*48K
V-7	6AW8	0	500K to 2M	5.9M to 8.4M	0	.1	20 to 300	4.5K	*48K	*34K
V-8	CRT	.1	22K	*3.5M	0 to 3.5M	-	-	100K to 240K	0	-
V-9	6BU8	*50K	*50K	270K	.1	0	*46K	250K	*70K	3M
V-10	6CG7	*82K	100K	1.2K	0	.1	*50K	3M	1.2K	0
V-11	6DQ6	T.P.	0	N.C.	*44K	680K	T.P.	.1	0 to 30	-
V-12	1G3-GT	I	N	F	I	N	I	T	E	-
V-13	6DA4	N.C.	N.C.	3.5M	N.C.	*42K	N.C.	.1	0	-
V-14	6EM5	*40K	T.P.	N.C.	.1	0	2.3M-2.8M	270	N.C.	*48K
V-18	5U4-GB	N.C.	*40K	N.C.	20	N.C.	20	N.C.	*40K	-

CONDITIONS FOR CHASSIS READINGS

VOLTAGES AND WAVESHAPES were taken under actual operating conditions (normal picture and sound). AGC voltage developed at junction of C-12, C-14 and R-11 was minus six volts. Voltage and waveshape readings obtained may vary 20% in value due to component tolerances and strength of input signal to chassis under test.

RESISTANCE READINGS were taken with no power applied. Where readings are affected by control settings, both maximum and minimum values are given. All resistance readings may vary 10% due to normal component tolerances.

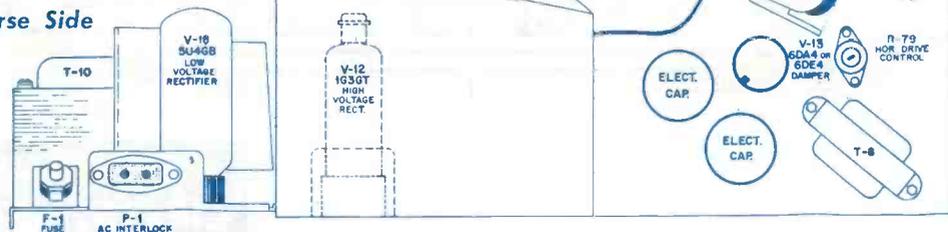
ALL MEASUREMENTS were taken between points indicated and chassis (unless otherwise noted), with line voltage maintained at 115 volts AC. A VTVM was used for all voltage and resistance measurements and a low capacity probe was used for all waveshapes shown.

NOTES: All resistance readings given are in ohms, "K" is Kilohms, "M" is Megohms.
* Indicates varying resistance; allow 30 seconds for meter to settle.
N.C. Denotes no connection at terminal indicated.
T.P. Denotes connection to terminal post.

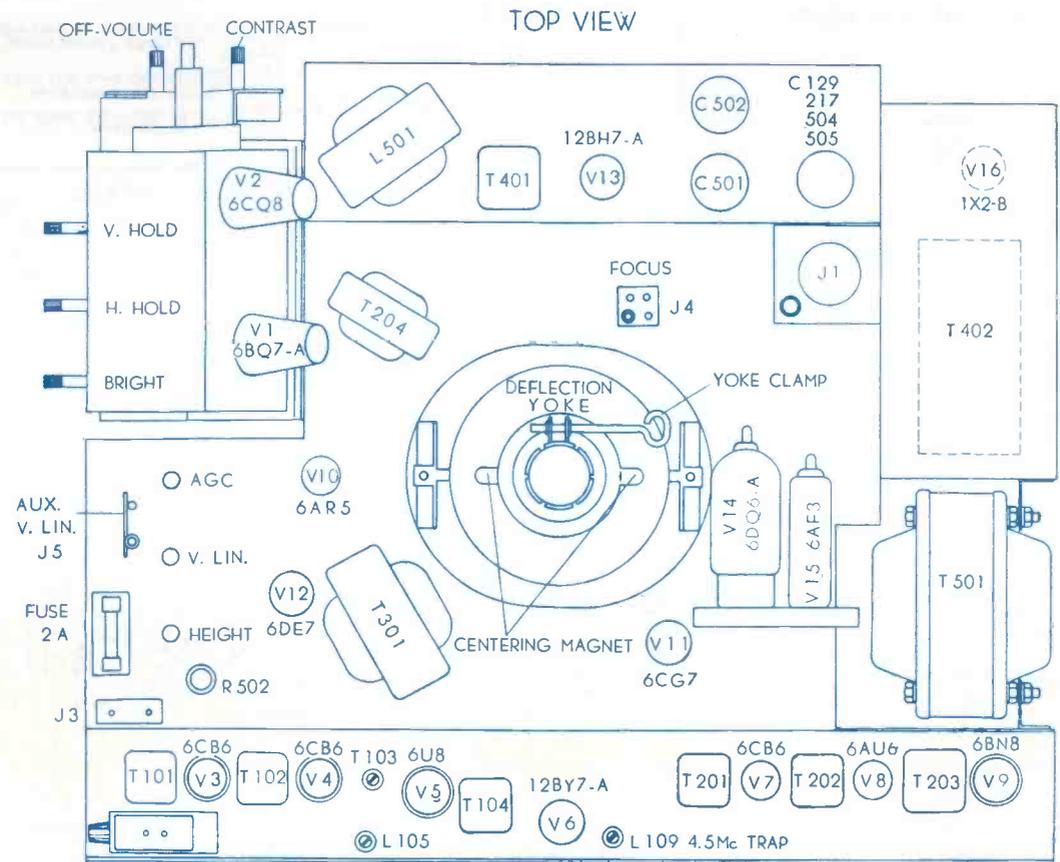
EMERSON
TV Chassis 120530C,
120549C, 550D, 551C,
120552E, 553F, 554E,
120555E, 556F, 557E

Electronic Technician
CIRCUIT DIGEST
648

More Data
on Reverse Side



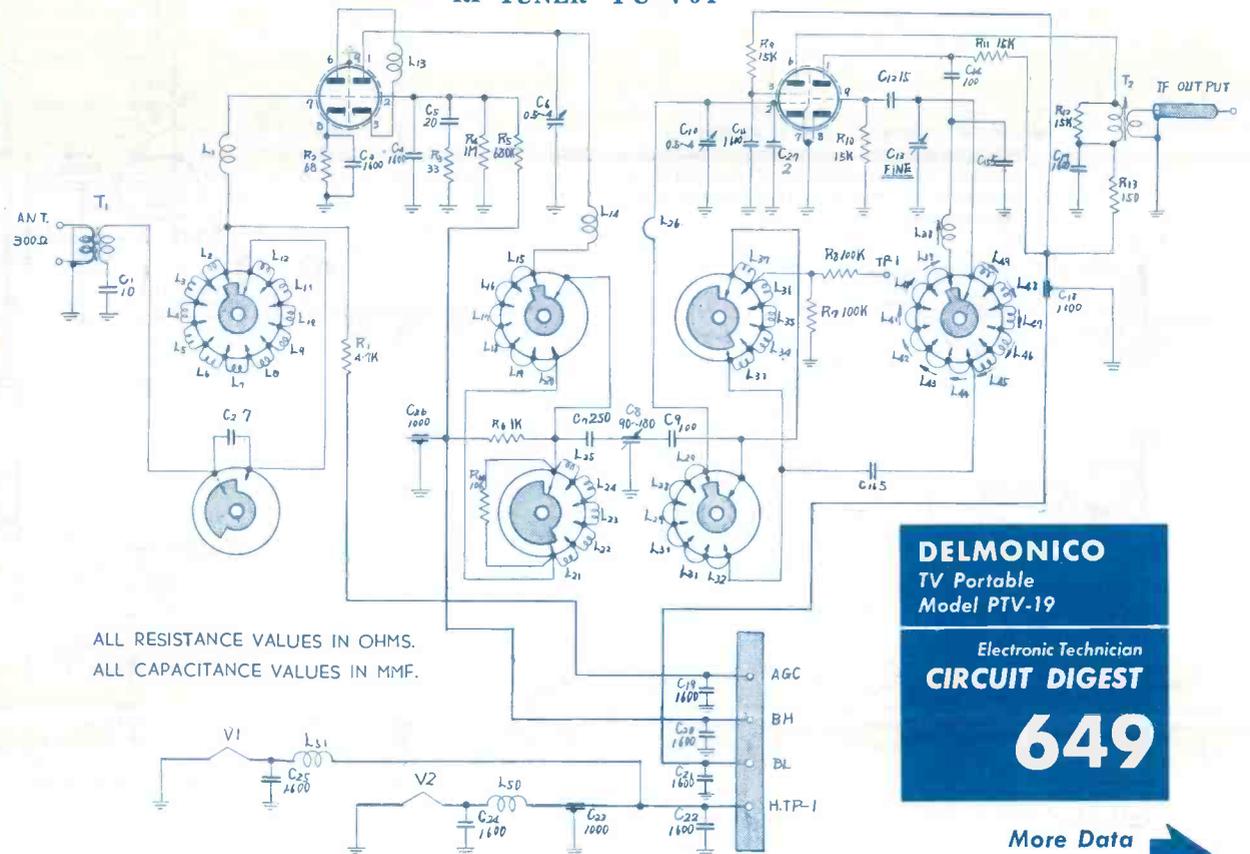
TUBE LOCATION AND ALIGNMENT POINTS



TUBE LOCATION CHART

RF AMP.
V1 6BQ7-A

OSC. & MIX.
V2 6CQ8



ALL RESISTANCE VALUES IN OHMS.
ALL CAPACITANCE VALUES IN MMF.

DELMONICO
TV Portable
Model PTV-19

Electronic Technician
CIRCUIT DIGEST
649

More Data
on Opposite Page

ELECTRONIC TECHNICIAN 649

CIRCUIT DIGEST

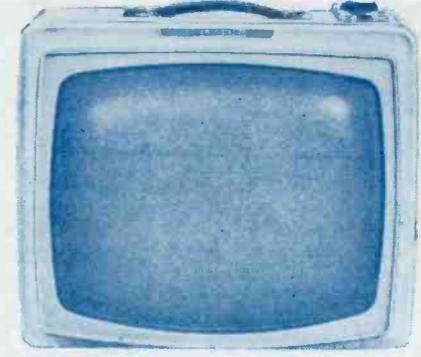
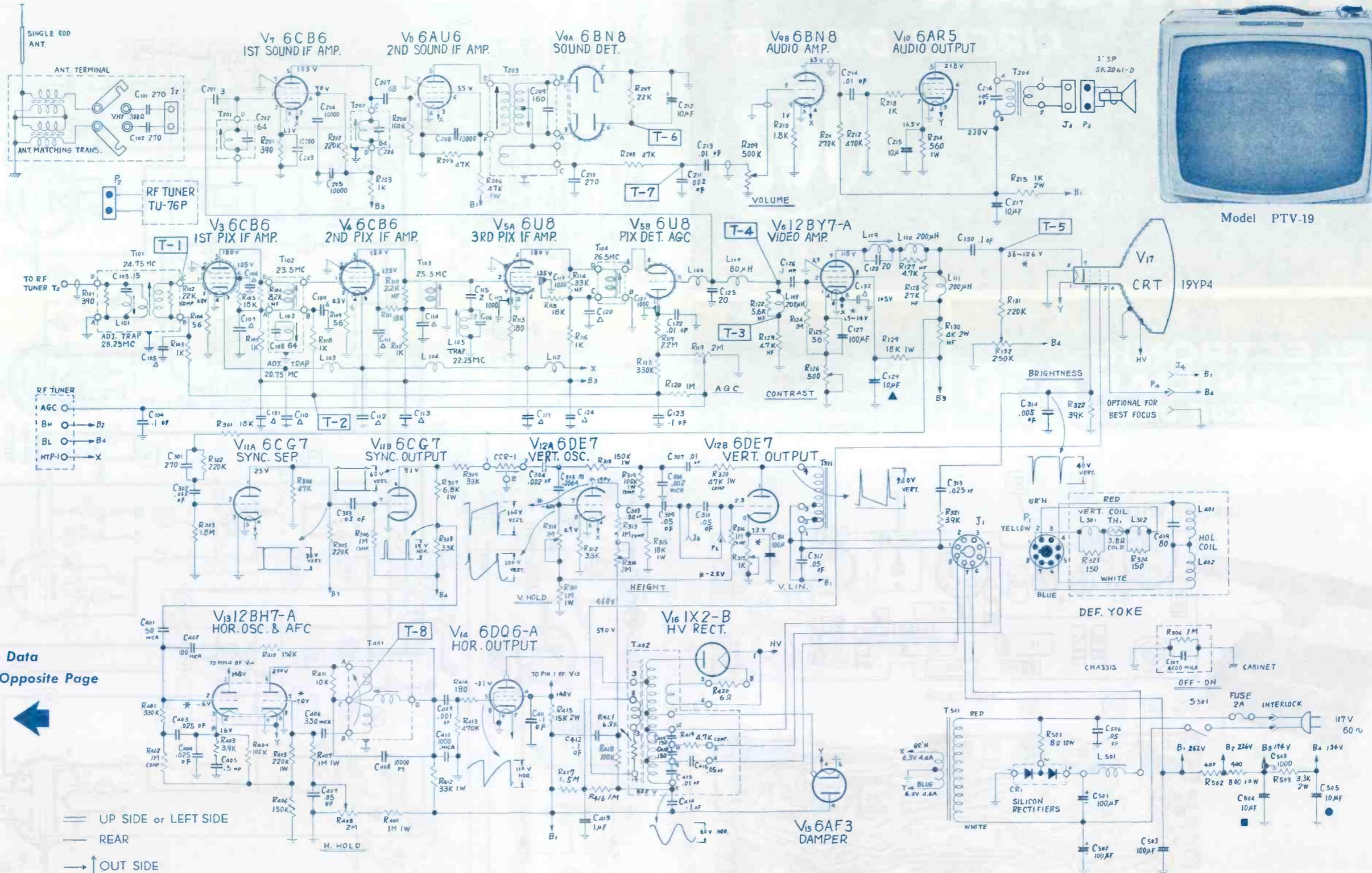
DELMONICO
TV Portable
Model PTV-19

July • 1961

NOTES:

COMP: composition resistor
PR: porcelain resistor
Unspecified capacitors are ceramic capacitor
Δ: 1600 MMF ceramic capacitor

MP: metallized capacitor
OF: oilfilled capacitor
PA: paper capacitor
PS: polystyrol capacitor



Model PTV-19

More Data
on Opposite Page



- UP SIDE or LEFT SIDE
- REAR
- OUT SIDE
- ← IN SIDE

※ Voltage readings will vary with setting of controls.

ELECTRONIC TECHNICIAN

CIRCUIT DIGESTS

In This Issue (No. 107)

Circuit Digest Schematic No.

ADMIRAL TV Chassis 20A7, 20A7B, 20A7C, 20A7D, 20B7, 20C7	644	MOTOROLA Auto Radio 1961 Ford & Falcon Model 14MF	647
DELCO Auto Radio 1961 Chevrolet Model 988414	650	RCA Citizens Band Radio Model MARK VII "Radio Phone"	645
DELMONICO TV Portable Model PTV-19	649	SYLVANIA TV Chassis 552-1, -2, -9	646
EMERSON TV Chassis 120530C, 120549C, 550D, 551C, 120552E, 553F, 554E, 120555E, 556F, 557E	648		

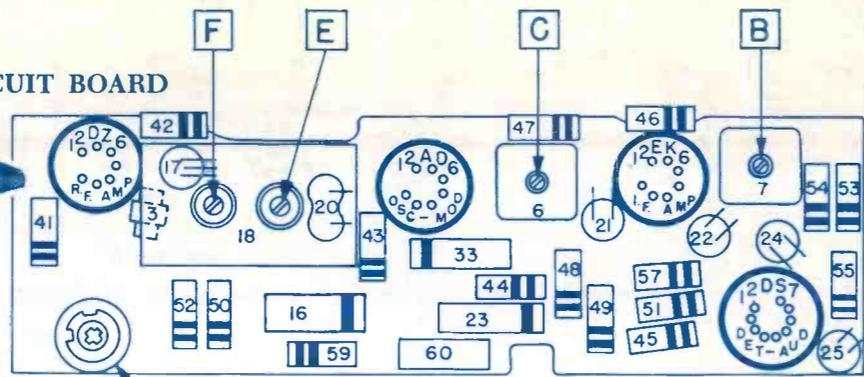
GROUP
107

ELECTRONIC TECHNICIAN 650

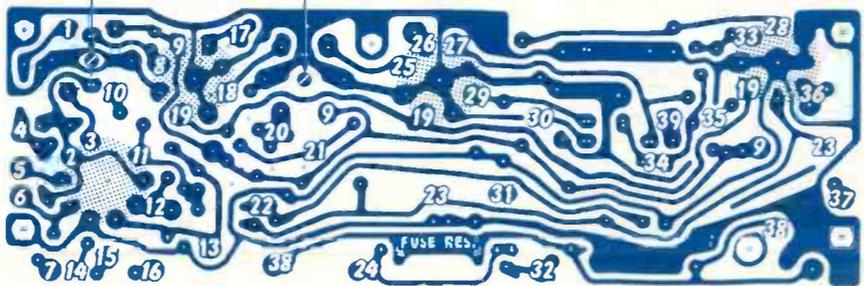
CIRCUIT DIGEST

DELCO
Auto Radio 1961
Chevrolet Model 988414

CIRCUIT BOARD



TOP VIEW



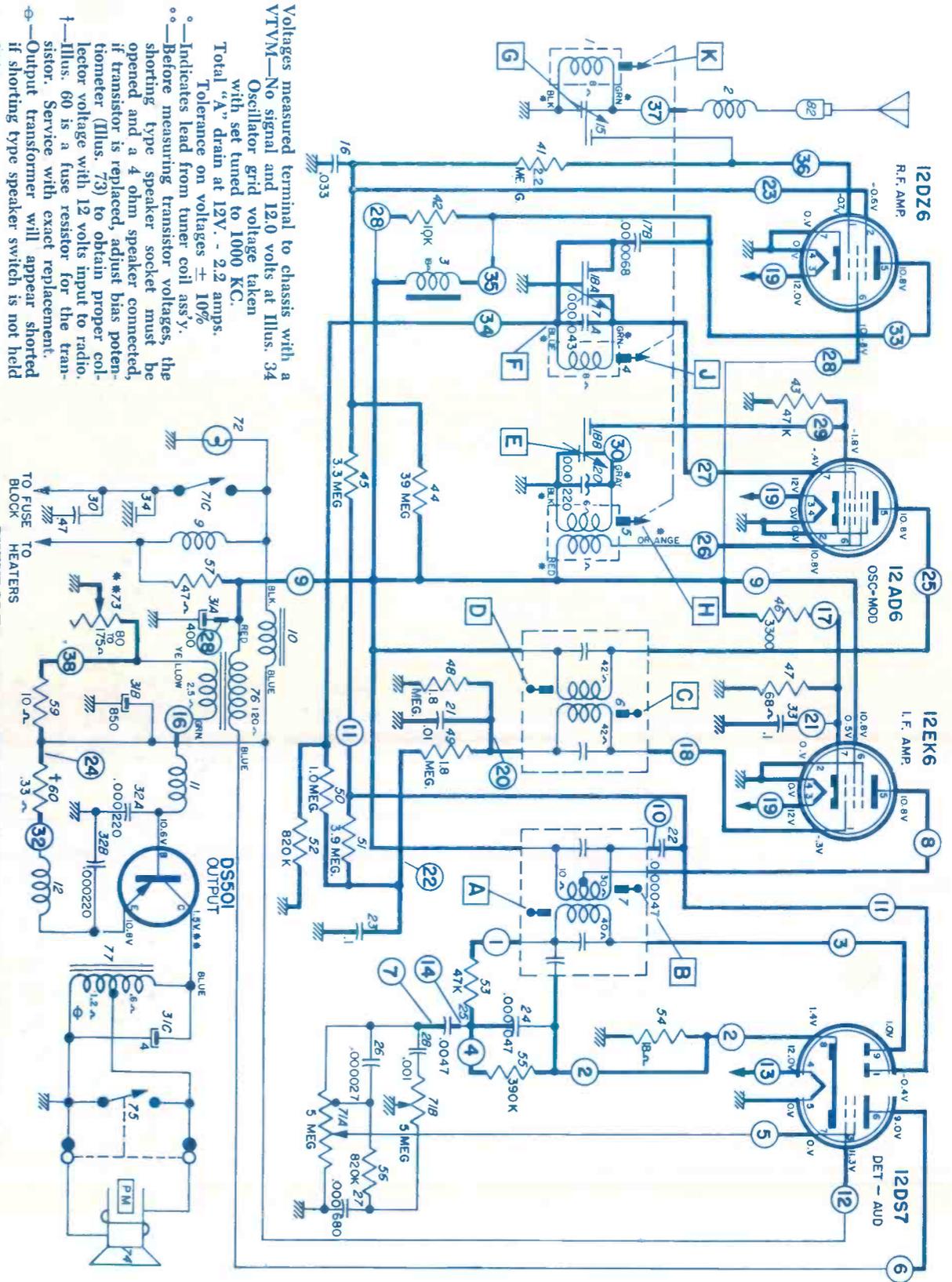
BOTTOM VIEW

Electronic Technician
CIRCUIT DIGEST 650

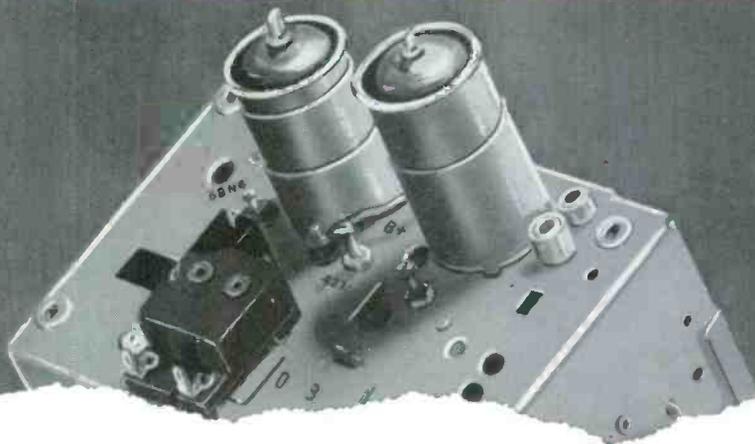
NUMBERS ON PRINTED CIRCUIT BOARD CORRESPOND WITH NUMBERS IN CIRCLES ON SCHEMATIC DIAGRAM.

Voltages measured from terminal to chassis with a VTVM—No signal and 12.0 volts at Illus. 34
Oscillator grid voltage taken with set tuned to 1000 KC.
Total "A" drain at 12V. - 2.2 amps.
Tolerance on voltages ± 10%
—Indicates lead from tuner coil as'y.
—Before measuring transistor voltages, the shorting type speaker socket must be opened and a 4 ohm speaker connected, if transistor is replaced, adjust bias potentiometer (Illus. 73) to obtain proper collector voltage with 12 volts input to radio.
†—Illus. 60 is a fuse resistor for the transistor. Service with exact replacement.
⊖—Output transformer will appear shorted if shorting type speaker switch is not held open.

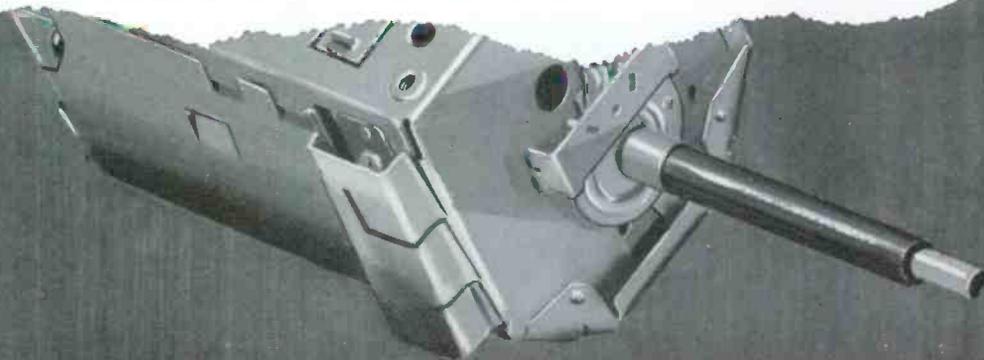
CHEVROLET 988414—PRINTED CIRCUIT SHOWN IN HEAVY LINES.



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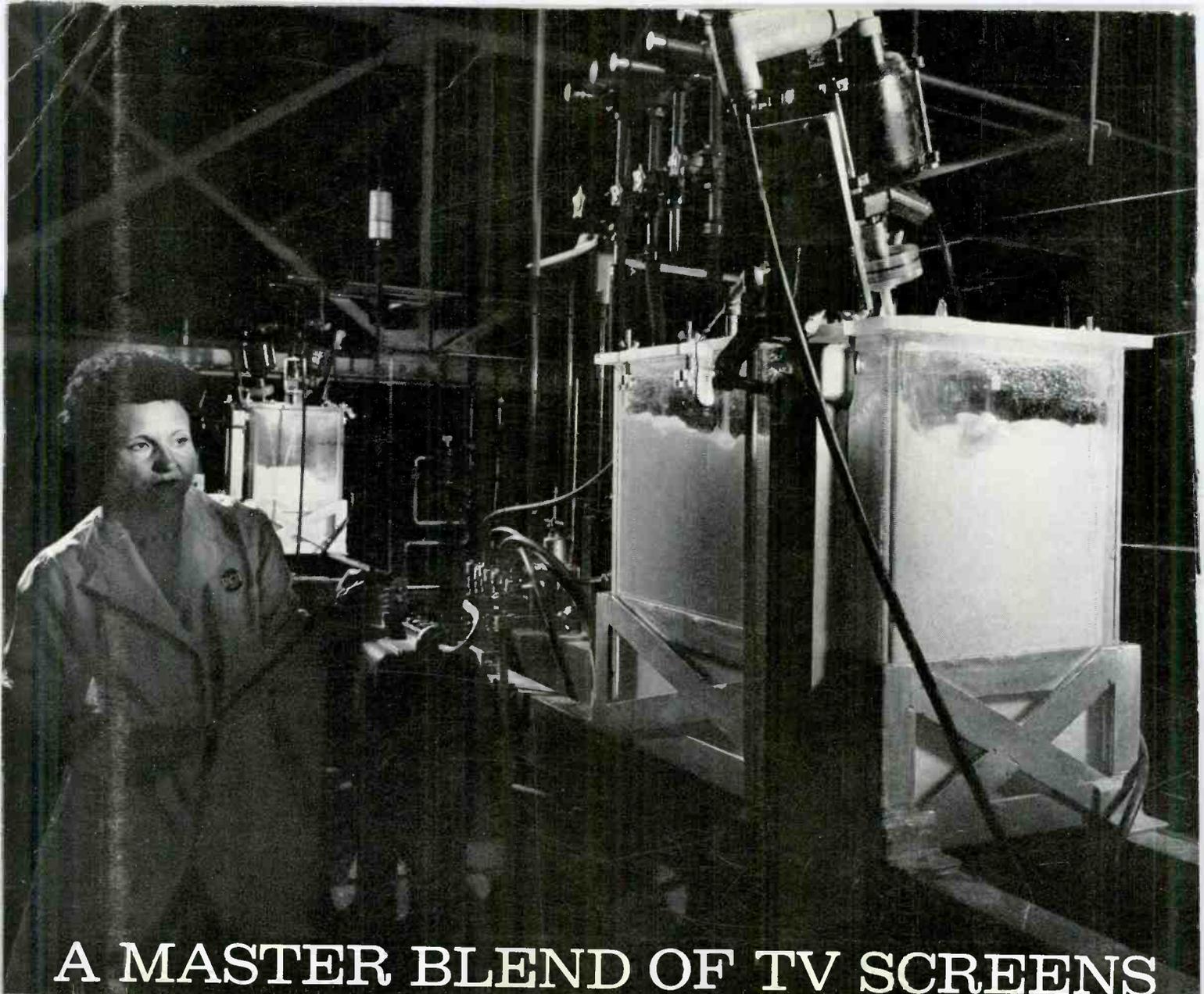
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For more data, circle 7-C3-1 on coupon, p. 50



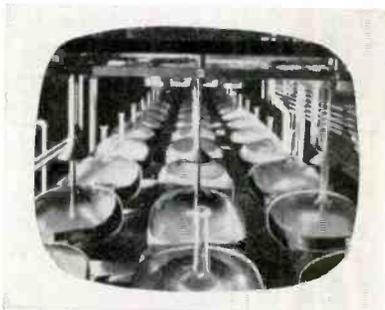
A MASTER BLEND OF TV SCREENS

RCA's Precise Control of Phosphors Assures Finest Picture Quality

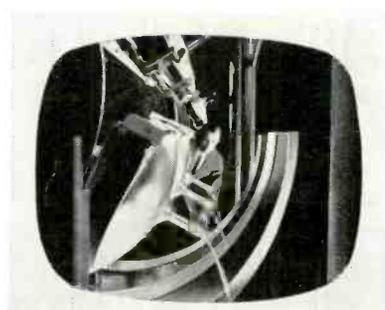
Here RCA Silverama Picture Tube screens have their beginning.

Phosphor in a solution of demineralized water (impurity level: less than 1 part per million!) is continuously agitated by electric blenders to maintain uniform suspension. When mixing is complete, solution is sprayed into Silverama's glass envelope which has been scrubbed and rinsed until it is chemically clean. Then with tube on slow-moving, vibration free settling belts (below), phosphor settles evenly over the entire faceplate to provide the smooth, grain-free screen for which Silverama is famous.

This same painstaking care goes into every part of RCA Silverama picture tubes. It is your assurance that every Silverama is the finest replacement picture tube modern science and technology can produce. It contains a precision electron gun—the finest parts and materials, plus a thoroughly clean and inspected reused envelope. Such built-in quality means a better picture in your customers' sets—and therefore, more business, fewer call-backs and valuable word-of-mouth advertising for you. See your Authorized RCA Distributor this week.



Settling belt moves at less than 10 inches per minute to give ample time for gradual settling and smooth adherence of phosphor to faceplate.



When settling is complete, excess liquid is poured slowly and gently from neck of envelope to avoid disturbing smooth phosphor coating.

RCA ELECTRON TUBE DIVISION, HARRISON, N. J



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