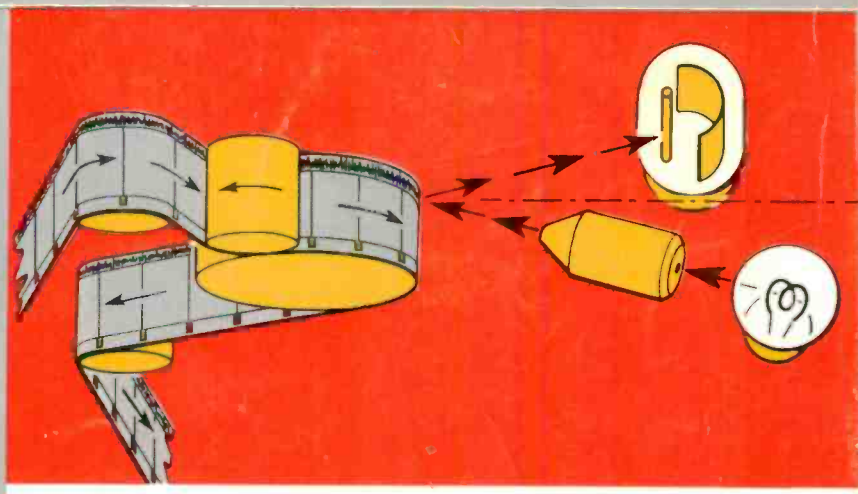
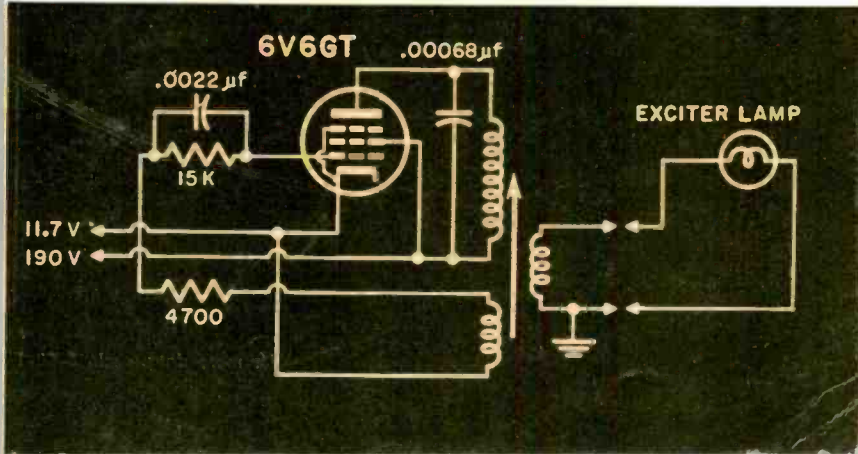
ELECTRONIC TECHNICIAN

Including SERVICE Magazine



SERVICING OPTICAL SOUND



50¢

August • 1960

Here is the new Standard Coil Tuner Replacement and Repair Program that enables you to offer better service to your customers at greater profit. Now Standard Coil Products provides the tools that will enable you to cash in on the profitable tuner repair and replacement market.

TUNER REPLACEMENT LISTING IN SAMS PHOTOFACT

Starting in January, Standard Coil tuner replacement listings will appear in all Sams TV Photofact. Tuner replacement information will be right at your finger tips. Standard Coil is the *only* manufacturer ever to provide this service.

NEW TV TUNER REPLACEMENT GUIDE

Lists original equipment TV tuners with the Standard Coil equivalent replacement for each. Also includes major mechanical replacement parts for all Standard Coil Tuners —those used in original equipment as well as the universal replacement. Eliminates all guesswork—minimizes your tuner repair and replacement problems.

48 HOUR FACTORY GUARANTEED REPAIR SERVICE

Standard Coil's special service department set-up assures factory guaranteed repairs—*on a 48 hour in-plant cycle!* All repaired tuners carry a *six month warranty* on defective workmanship and parts failure (excluding tubes). Gives you more time for additional service calls—promptly returns your customer's set to like new operating condition.

DEFECTIVE TUNER TRADE-IN ALLOWANCE

Tuners which can *not* be repaired can be traded in against a new replacement tuner which carries a full *twelve month factory guarantee*. See your Standard Coil Distributor for complete details on how trade-ins can increase your tuner sales and profits—create greater customer satisfaction.

JUMP ON THE STANDARD COIL PROFIT WAGON TODAY!

For additional details, see your authorized Standard Coil Distributor or write to:

Standard

Coil Products Co., Inc.

2085 North Hawthorne Avenue, Melrose Park, Illinois

For more data, circle 8-C2-1 on coupon, p. 46

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Including SERVICE Magazine

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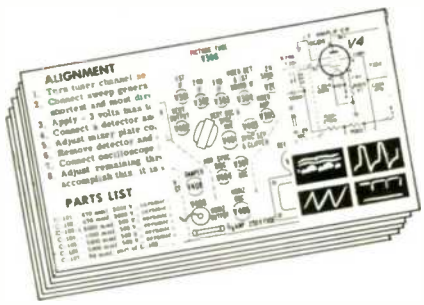
August, 1960

FRONT COVER If you can repair an audio amplifier, our cover story may uncover a new and profitable service field for you: optical-sound movie projectors. The principles and repair practices concerning sound-on-film equipment are described in the article starting on page 26.

FEATURES and ARTICLES

DEPARTMENTS

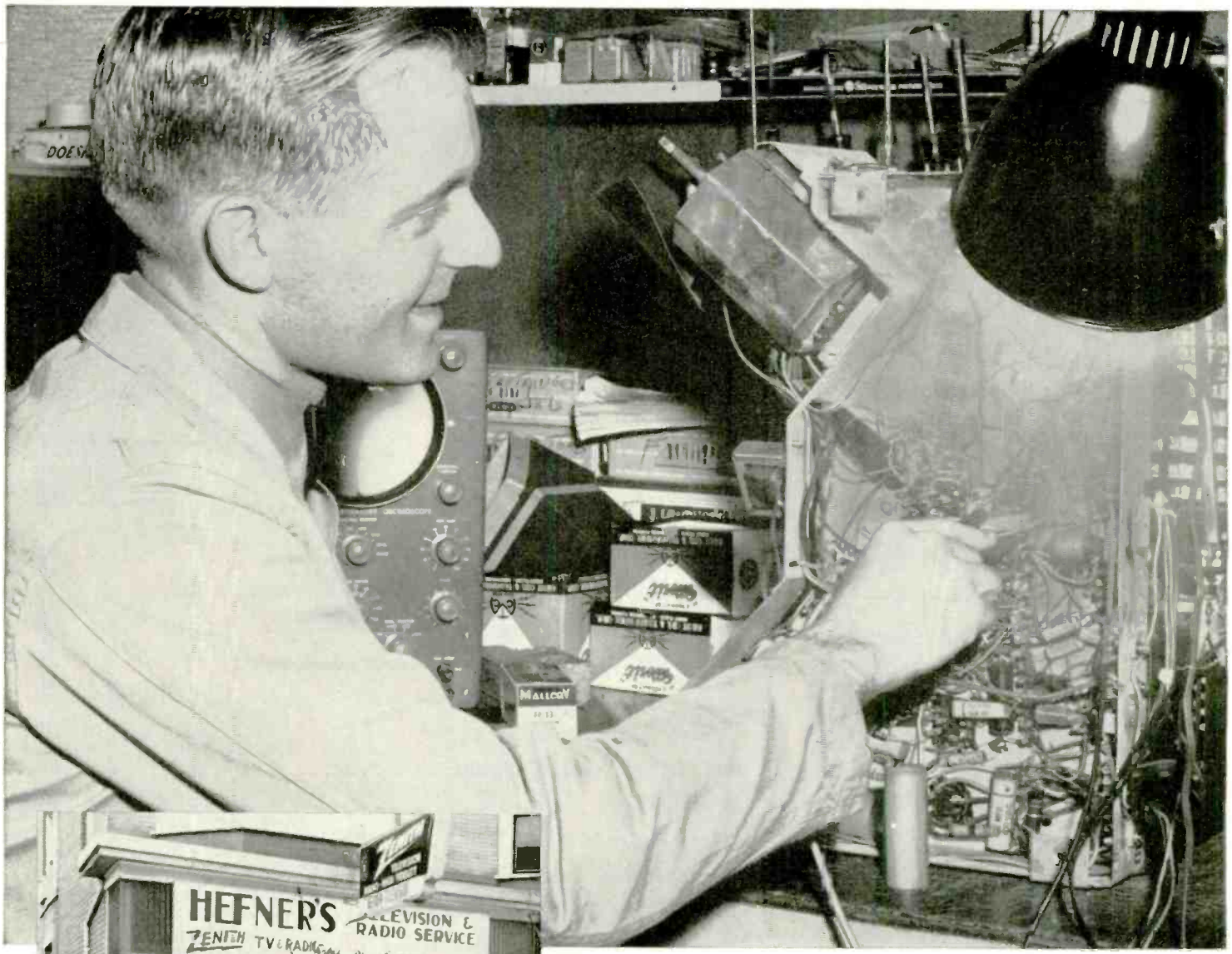
CIRCUIT DIGESTS ..... Preceding Back Cover



IN THIS ISSUE

(16 pp. latest schematics & data)

GENERAL ELECTRIC: TV Chassis M-6
GLASER-STEERS: Record Changer GS-77
MOTOROLA: Transistor Radio Chassis HS-797
PACKARD-BELL: TV Chassis 98D6
PHILCO: TV Chassis 11N51
VOCALINE: Intercom "Vocatron" Model CC-60



Roger Hefner owns and operates Hefner Television & Radio Service in Lima, Ohio. He attended DeVry School in Chicago, then furthered his electronics training by working with a major radio-TV manufacturer. He returned to Lima five years ago to go into business for himself. Roger now has two technicians helping him with sales and service on home and auto radio, TV and hi-fi. He credits his business success to prompt, courteous attention to service calls, careful, thorough workmanship and the use of only quality products.

Radio-TV Serviceman Roger Hefner explains why:

"Mallory Quality Components

protect my reputation for quality service"

"I use only first quality components for replacement. My reputation for quality service has been built on a firm foundation of quality products combined with quality workmanship . . . and I'll never jeopardize it by using cheap 'specials' that are sold as 'just as good'. I always choose Mallory. No substitutes for me!"

For replacing ceramic capacitors in TV tuners and other precision circuitry, Roger Hefner, like thousands of other technicians, has discovered that Mallory RMC Discaps* are the surest step to customer satisfaction. The quality built into every Discap ends call-backs . . . provides the margin between just *service* and genuine *quality service*. Discaps—for years the standard of quality in original equipment—come packaged for replacement in handy 3 x 5" file card five-packs.

Whatever your component needs, look to Mallory for the highest quality parts . . . sensibly priced . . . and the widest selection in the industry. See your Mallory distributor soon.

*Registered Trademark of Radio Materials Company
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P.R. MALLORY & CO. Inc.
MALLORY
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TC TUBULAR ELECTROLYTICS
Economically priced filter capacitors with a reputation for doing an excellent job. Performance proved and backed by years of Mallory experience. Also special TCX type available for 55°C.

MERCURY BATTERIES
Unequalled for long, fade-free life in transistor radios . . . and virtually unlimited shelf-life. Chosen as the "power package" in U.S. satellites. Made by the world's largest manufacturer of mercury batteries.

FP ELECTROLYTICS
The original 85°C capacitor. New shock-resistant construction with leakproof seal. Etched cathode—standard at no extra cost only in FP's—gives hum-free performance. High ripple current ratings fit the toughest filter circuits.

For more data, circle 8-3-1 on coupon, p. 46

Editor's Memo

An increasing number of service dealers are being asked to join The Club. I'm referring to centralized service clubs which direct calls from consumer members to affiliated repair outlets such as TV technicians, plumbers, masons, painters, etc.

A typical club gets $5 or $10 annually from consumer members, and collects 10% of the bill from the service contractor.

There are a number of advantages for the contractor. Where the club acts as factor or collection agency, the immediate payment (less 10%) is most attractive. Satisfied contractors cite the increase in new customers and the prestige of being club approved as benefits.

On the other hand, some contractors complain that the 10% charge cuts much of the profit. Frequently the club makes too much of a thing of "the customer's always right." In addition, fly-by-night clubs have sprung up and disappeared, leaving unpaid bills.

It's up to each service dealer to decide the value of a club contract. However, be sure that the reputability and financial responsibility are in order. United Home Service in Los Angeles was founded in 1954, and claims to be the oldest such club. It is said to have 35,000 members and 800 contractors. Allied Homeowners Assn., Long Island, N.Y., has some 5000 members and 285 contractors. National Home Owners Club of Detroit has about 6000 members and contractors.

Clubs in cities such as Chicago and Phoenix have either folded or are struggling to stay alive. The trouble is that a club can start on a shoestring, but substantial capital ($25,000 to $50,000) is usually needed to make it a success.

The important thing for service contractors to consider is the integrity and wisdom of the management.

And that, as the man says, reminds me of the story of the immensely successful TV service shop owner who was introducing his son into the operation.

"Our business is built on integrity and wisdom, son. Integrity means when we promise a customer something, we keep that promise even if we lose money.

"And what is the wisdom we need?" asked the lad.

"Wisdom," replied the father, "means that we don't make such foolish promises!"

Al Forman

For more data, circle 8-5-1 on coupon, p. 46 ➤

PHILCO

89'er

You can get this luxurious Harvester

watch FREE!

with the purchase of only

89 PHILCO TUBES

It's a watch you'll be proud to own or give—beautifully styled, and mastercrafted in the finest traditions of the Swiss watchmaker's art. Each watch gift-packed in luxurious presentation case. Fully guaranteed. When you see it, you'll agree it's the most sensational FREE offer of all time!

- **Electronically timed. Antimagnetic. Shock resistant.**
- **Newest high fashion styling!**
- **The perfect gift for back-to-school or any special occasion.**
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Famous for Quality the World Over®

LETTERS

To the Editor

Sears Retorts

Editor, ELECTRONIC TECHNICIAN:

In your May issue you published a letter signed, Ray Cramer, that we, the undersigned, feel privileged to answer. While we at the Tampa Sears Store are more concerned with the quality of our work, we never let our abilities rest on our sitter end. Frankly, most of our work is done with our heads (in spite of the fact that the company does provide stools, some plain and some upholstered). Regarding parts substitution, we sincerely feel that whenever possible exact replacements should be used (since the engineers who designed the set knows best what should be used). However, we do make substitutions when we feel it is practical and will not impair the over-all operation or life expectancy of the set. The last black snake whip (to our knowledge) was buried somewhere out West when large horse-drawn vehicles went out of style. Our "bosses" have developed the idea (some several decades ago) that we are human beings and have treated us that way from the day we hired in. While we confine ourselves exclusively to servicing Sears products, we make no attempt to inhibit anyone from servicing Silvertone sets. Schematics, parts, and all the information we can give are available over our counter. Portions of our trading area are serviced by independent contractors, but these are areas remote to us and Sears feels that rendering proper service is our prime requisite. So to expedite this service, it is "let out" to private firms.

SAM TAGLIARINI
OWEN PARLIN
FRANK PANDOLFE
LLOYD BARTLETT
TONY STEVENS
ALBERT GAUDI
HERMAN ALVERSON
WILLIAM WEGNER
BENNY DIAZ
R. SHIKENJANSKI
Sears, Roebuck & Co.
Tampa, Fla.

● *There are plenty of good men working for Sears, but that doesn't alter the short-sightedness of Sears' policy of refusing to make schematic and service data available nationally to independent service dealers.—Ed.*

Transistor Testing

Editor, ELECTRONIC TECHNICIAN:

To comment on your June article, "Repairing Transistor Portables," we do not argue against a harmonic generator for troubleshooting. However, a pencil type does not work, because it

(Continued on page 8)

For more data, circle 8-7-1 on coupon, p. 46 ➤

"BEST OF ALL CONTACT SPRAYS"

AS REPORTED BY INDEPENDENT PRODUCT-TESTING LABORATORY

	Shield	A	B	C	D	E	F	G	H	I
Lubrication After Rubbing For 90 Sec.	GOOD	Fair	Very Poor	Poor	Good	Poor	Very Poor	Good	Poor	Fair
Cleaning After Rubbing For 90 Sec.	GOOD	Good	Good	Good	Good	Fair	Poor	Good	Fair	Poor
Protection After 30 Sec. Exposure to H_2S Gas	GOOD	Fair	Fair	Good	Good	Fair	Very Poor	Good	Very Poor	Good
Protection After 2 Hours Exposure to H_2S Gas	BEST	—*	—*	2nd Best	5th Best	—*	—*	3rd Best	—*	4th Best
Flash Characteristics	None at 200°F.	—*	—*	Greatest tendency	Boils at 70°F. Tendency to ignite	—*	—*	Tendency to ignite	—*	Slight tendency to ignite
Attack On Plastic Material	NO	—*	—*	Yes**	Yes**	—*	—*	Yes**	—*	Yes**

*Not tested further following sub-standard performance in 30-second exposure test.

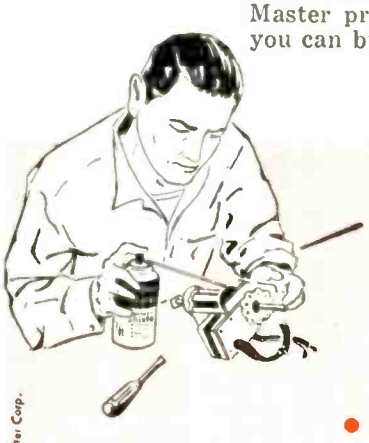
**Presence of solvents and chlorinated hydrocarbons.

Channel Master introduces the first triple-action spray!

Channel Master set out to provide a superior cleaner, lubricant, and protector for electrical contacts. Contact Shield was the result.

To verify our own estimates of the product's effectiveness, Contact Shield was submitted to a nationally known independent testing laboratory.

This famous testing organization made a thorough study of Contact Shield, as well as of nine similar products on the market. The above findings demonstrate conclusively that this new Channel Master product is the most reliable contact spray you can buy!



Here's why Contact Shield is best:

- provides the most long-lasting protection
- eliminates background and resistance noises
- is safer. Will not ignite, flash, or cause short circuits . . . propellant is actually a fire extinguisher
- contains no solvents to attack plastics
- performs at temperatures from −95°F. to +320°F.

CHANNEL MASTER works wonders in sight and sound

Ellenville, New York

(Continued from page 6)

has no ground lead, no output control, and not enough output to drive a speaker directly. Nor does it have a second lead to connect to the speaker. Our HG 104 does. Also, the battery eliminator shown will not operate Philco, Sylvania, or Motorola radios with tapped power supplies. Our PS 103 will. Mention is made of checking current drawn as a valuable service aid. I agree. The PS 103 does this by flipping a switch.

R. H. BOWDEN
President

Sencore
Addison, Ill.

Dealers Set Up Distributorship

Editor, ELECTRONIC TECHNICIAN:

Mutual Distributors, Inc., 709 Warrington Ave., Pittsburgh 10, Pa. was instituted by several other dealers and myself. It is definitely not a co-op, but instead a full scale wholesale electronic parts distributor chartered under the Pennsylvania state laws. It is, pure and simple, an investment enterprise, and stockholders are various business men. Only the legitimate tax paying service dealer can purchase from Mutual. This separates the do-it-yourself people or tinkerers from undermining the bread and butter of a dealer trying to earn his living and pay his taxes. The technique involved in setting up Mutual Distributors was simply an attorney, a bank, and some other dealers or businessmen in the field who felt they should form a legitimate parts distributor. In spite of all attempts to block its growth, it is progressing fairly well in the short space of a year. It was branded as the work of an association; it was a buying syndicate; it was a group of men undercutting other distributor prices. Manufacturers were blinded by their reps who actually were being led around by the nose by their established distributors in the area. Manufacturers who investigated over the heads of their reps found the exact opposite. Several reps contacted informed their companies as to the legitimate acceptability of Mutual and actual orders were written. The material never arrived, evidently stopgapped at the last minute by some unfriendly persons' say-so. There was no legal reason for this. The representative was obviously told, stop it or else. Two major tube reps were contacted and all necessary information was given up to and including financial statement. In spite of Mutual's Grade A credit reputation and the potential to compete effectively with a line second to none, the requests were completely ignored. Within a year, we have moved to a main street location with unlimited potential. Mutual will sell only to those people in the business carrying a proper sales tax license number. We are trying to achieve for the service dealer a fair level from which a dealer may have a fighting chance to remain in business.

THOMAS E. SCHOLLER
Mutual Distributors, Inc.
Pittsburgh, Pa.

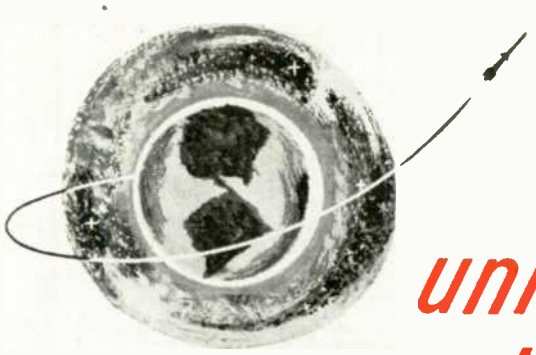
Proof of Know-How

Editor, ELECTRONIC TECHNICIAN:

Next month ends my 41st year in this business. We service TV "dogs" for eight stores—and we service their test instruments too. Concerning your June editorial, "Death of a License Bill," here we have several men who are very good salesmen, with negligible TV know-how—which is okay, because there are dopes who service all TV's for $5, flat rate—all parts and tubes supplied by outside men. No, we don't work for these outside men. Too bad others do. A licensing bill is very important, to keep out this type, who live on the know-how to men who are technicians, not businessmen. In the old days any idiot could obtain a driver's license, merely by paying a fee. Today, the prospective (hit-and-run) driver has got to prove he knows enough about traffic laws, has a reasonably safe car, before he can buy a license. Same should be the case in TV. Otherwise, the Unions will step in, and no more independent TV techs.

NATE SILVERMAN
Los Angeles, Calif.

(Continued on page 10)

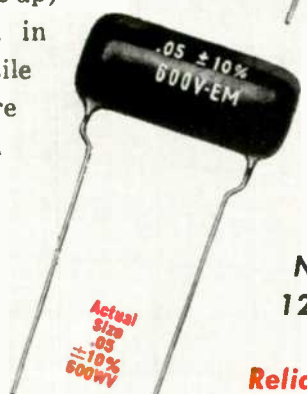


universal acceptance!

miniaturized

ELMENCO

Dipped Mylar*–Paper Capacitors



The exclusive Elmenco dip-coated Mylar-Paper capacitors (Arco type dp) represent a double breakthrough in capacitor design. They combine missile and computer quality and compare favorably in price with commercial general purpose units. The "dp" series is designed for **universal use**, from TV by-pass to critical industrial applications requiring stringent electrical and environmental characteristics. New high levels of ruggedness, stability and reliability have been achieved in a miniaturized body.

54,745,000 SOLD IN LESS THAN 2 YEARS

NOW . . . OPERATING AT 125° C WITHOUT DERATING

Reliability Elmenco dp Mylar-Paper Capacitors have achieved a reliability that meet missile and computer requirements. They are thoroughly and continually tested during production to insure outstanding performance. For example a 0.1 mfd. dp capacitors operated at full rated voltage and at 105° C will have a life expectancy of more than 7,168,000 unit hours.

Moisture-Proof Elmenco dp Capacitors are specially processed and vacuum dipped to obtain solid impregnation and a rugged moisture-proof coat designed to withstand 4 times more humidity than the best molded capacitors used in the past.

Miniaturized These capacitors are up to 50% smaller than other types and can be used in printed circuit and transistor applications.

±10% Standard Tolerance

* DuPont Reg. Trademark

Write for catalog dp 110.

ARCO electronics inc.

64 White Street, New York 13, N. Y. • *Branches: Dallas 19, Los Angeles 35*

Visit us at the Wescon Show . . . Booth No. 901

For more data, circle 8-9-1 on coupon, p. 46

Formerly for Licensing

Editor, ELECTRONIC TECHNICIAN:

I believe I have changed my mind regarding licensing of TV shops. I was all for it when the idea was first brought up, but after having read so much pro and con, I have started leaning toward the other side. A license, whether state or city, will bring us closer to being under politicians, either directly or indirectly. It will mean money for a license, adding to our already heavy load for taxes and etc. A city inspector will be hired, and technicians will carry his cost in salary and expenses. I believe licensing will promote some wrangling between shops, accusing each other of malpractice whether justified or not. But it will be in the public eye. Associations could upgrade technicians by providing talks on new products, methods, and business practices and by giving tests and issuing cards for helpers, journeymen, and masters. The important thing is the technician would be keeping his own house, spending his money where it would benefit most.

EDWIN REID
Reid's Television Service
Palatka, Fla.

Death of a License Bill

Editor, ELECTRONIC TECHNICIAN:

Your June issue editorial, "Death of a License Bill," is an excellent analysis of the situation in New York state. It may be the shot in the arm we all need to knuckle down and do what is necessary to obtain a long sought for goal.

PETER M. FERRARI,
President
TESA
Rochester, N.Y.

Hinterland Deliveries

Editor, ELECTRONIC TECHNICIAN:

This community is located in the mountains about 85 miles NE of Atlanta, so direct contact with distributors and reps is quite difficult. Our most certain delivery of specialty service items has been from mail order firms. We get quicker delivery from the established parts concerns in Atlanta, but their stock of supplies is not so broad. Incidentally, the writer had just completed servicing a TV with increased resistance of the ballast resistor in the filament circuit as described by L. C. Kisor in the Tough Dog corner on page 37 of the March issue. This service procedure had been as deceptive to find and it was surprising to read about it soon after encountering the same. As a new subscriber to ELECTRONIC TECHNICIAN, we have nothing but the best of comments on the makeup, and regret not subscribing sooner.

E. L. GEDNEY
Gedney's
Helen, Ga.

(Continued on page 12)

This service man is installing insurance against costly call-backs... capacitors made with MYLAR®

You can save money by using capacitors insulated with "Mylar"* polyester film . . . eliminate wasted call-backs for failure of newly installed capacitors. "Mylar" means superior performance for four important reasons.

1. High dielectric strength . . . "Mylar" averages 4,000 volts per mil breakdown strength.

2. Long life . . . neither time, temperature nor highest humidities affect the stability of "Mylar".

3. Size reduction . . . the high dielectric strength of "Mylar", coupled with its great physical strength, permits its use in thinnest gauges. Smaller capacitors are ideal for hard-to-get-at jobs . . . save precious space.

4. Proven value . . . leading manufacturers make capacitors insulated with "Mylar" for critical military applications, missiles and sensitive electronic computers.

Next time you order, ask your distributor for the extra reliability, long life and economy of trouble-free capacitors made with "Mylar". And for test data that details the basic properties of "Mylar", write for Du Pont's free booklet. E. I. du Pont de Nemours & Co. (Inc.), Film Dept., Room #16, Wilmington 98, Delaware.

DU PONT
REG. U.S. PAT. OFF.

*"Mylar" is Du Pont's registered trademark for its polyester film.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

DU PONT MYLAR® POLYESTER FILM

For more data, circle 8-11-1 on coupon, p. 46

Troubles Coming to Roost

Editor, ELECTRONIC TECHNICIAN:

Have been meaning to drop you a note commenting on your very fine May editorial, "Showdown at Distributor Gulch." Our group has always deplored the condition of jobbers selling to the public, and in 1955 we adopted a resolution to that effect. However, at the time things were still too good for the average serviceman and the inroads he feels today were not very painful then. Most servicemen were too busy agitating and being attracted to the mirage of wonderful non-competitive conditions which licensing would create for them to be concerned about the insidious activity of the jobber. The serviceman is now beginning to hurt bad; to try and lock the door after the horse is stolen seems to me a waste of effort. The next best thing is for servicemen to join together and set up their own jobbing enterprises.

HOWARD WOLFSON
Editor of "Common Sense"
Assoc. Radio & TV Servicemen
Chicago, Ill.

Color TV Converter

Editor, ELECTRONIC TECHNICIAN:

For some time I have been looking for replacement parts for the Color Converter (Circuit Digests No. 264 Col-R-Tel color TV converter) designed to convert black and white TV to color. I have found the source, and you may wish to pass it on to anyone else who may need parts. Whitley Electronics, Inc., P.O. Box 349, Huntington, Ind. has taken over the distribution of the converter, and has a lucrative package deal going on these units. They furnished the belt that I needed at no cost, thereby placing themselves on my preferred list of companies for their speedy and interested manner of handling my problem. My own unit has performed admirably and I can vouch for the beautiful color rendition when properly adjusted.

ROBERT J. CISZAK, Pres.
Bob Ciszak's TV-Radio Service
Buffalo, N.Y.

Retain Freedom

Editor, ELECTRONIC TECHNICIAN:

I agree with your subscribers regarding suggestive advertising; however, I cannot agree with the statement made in the June Letters to the Editor by Mr. J. J. Szomolyai that "It should be against the law for some of the pictures taken and used in advertising." In this day there are too many laws passed restricting our freedoms. It is suggested that one give this phrase "There otta be a law," more thought before advocating legislation that will ultimately cause a further loss of personal freedom.

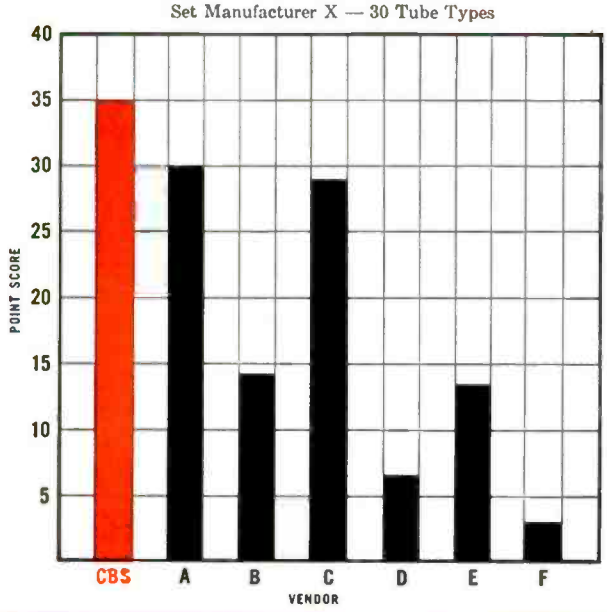
EUGENE ORRICO
Gene's TV Service
Whittier, Calif.

(Continued on page 14)

Leading set manufacturers RATE CBS RECEIVING TUBES TOPS

. . . IN VENDOR RATINGS

Set Manufacturer X — 30 Tube Types



. . . IN LOTS ACCEPTED

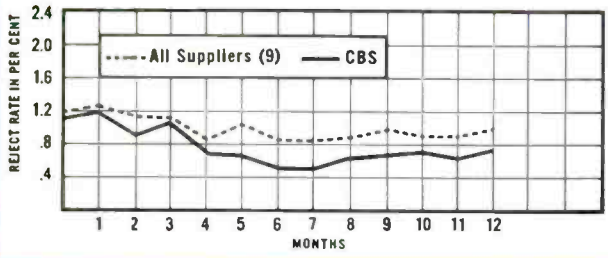
Set Manufacturer Z

Tube Type	Lots Received	Lots Accepted	Lots Rejected	Rating*
A	5	5	0	*Preferred*
B	2	2	0	*Preferred*
C	1	1	0	*Preferred*
D	10	10	0	*Preferred*
E	3	3	0	*Preferred*
F	4	4	0	*Preferred*
G	1	1	0	*Preferred*
H	6	5	1	*Fair*
I	5	5	0	*Preferred*
J	2	2	0	*Preferred*
K	1	1	0	*Preferred*
L	7	7	0	*Preferred*
M	1	1	0	*Preferred*
N	4	4	0	*Preferred*
O	1	1	0	*Preferred*
P	12	12	0	*Preferred*
Total	65	64	1	

**Ratings: Preferred, Excellent, Good, Fair, Poor, Unsatisfactory*

. . . IN LOWEST LINE REJECTS

Set Manufacturer Y



. . . IN LOWEST FIELD REJECTS

Set Manufacturer Z

Tube Type	Per Cent Rejects	
	All Vendors	CBS
1	.7	.3
2	.8	0
3	.9	1.0
4	.5	.5
5	.8	.3
6	1.6	1.1
7	.4	.1
8	.8	.8
9	.5	.5
10	1.7	.8

TOTAL RELIABILITY . . . proved in performance

Yes, CBS receiving tubes are rated tops by leading TV and radio set manufacturers. Any way you want to look at it — vendor ratings . . . lots accepted . . . lowest line rejects . . . lowest field rejects — during 1959 these facts as reported by leading set manufacturers proved CBS tubes superior. This same total reliability . . . continually proved *in performance* by set manufacturers can be yours for the asking. Just ask for CBS tubes . . . always.

CBS ELECTRONICS

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

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

For more data, circle 8-13-1 on coupon, p. 46

Japanese Parts

Editor, ELECTRONIC TECHNICIAN:

Some members of our profession are purchasing Japanese tubes for use in consumer radio and TV units. The reason is obvious—they are receiving a slightly higher discount than they would for a comparable American brand. This, in my opinion, is unethical in that, in many cases, the consumer is not advised that a Japanese tube has been placed in their units. This is a method of actually forcing the consumer to buy something that he may not want. Technicians buying these important tubes may not realize they are nurturing "a viper in their bosom." By continual purchase of these cheaper and, in many cases inferior goods, they are putting highly skilled American workers out of work. For the extra 10¢ on each tube, we can keep an American worker on the job. All this foolishness is made possible by a stupid agreement our State Dept. has made with the Japanese government that permits them to send almost anything here tariff free, while we may only ship them tariff free four-engine airplanes.

L. CYBULSKA

Lincoln Radio
Brooklyn, N.Y.

Tough Dog Misses the Boat

Editor, ELECTRONIC TECHNICIAN:

In your June issue there appeared a Tough Dog by W. A. Pisciotto, Jr., referring to a Philco 8L41 chassis. Your Editors' note chided Mr. Pisciotto for indiscriminate replacement of ½ watt resistors with those of a 1 watt rating. It now behooves me to take both of you to task for the same reason. Doesn't anyone read production bulletins? The change that your writer sweated so laboriously to effect, could have been accomplished if he had read them. Quite possibly I am being a little rough on both of you in this particular case because I have many, many of this chassis under motel contracts and made it my business to know every quirk involved.

DAN PROWLER

Prowler TV Service
Miami, Fla.

To the Trade Only

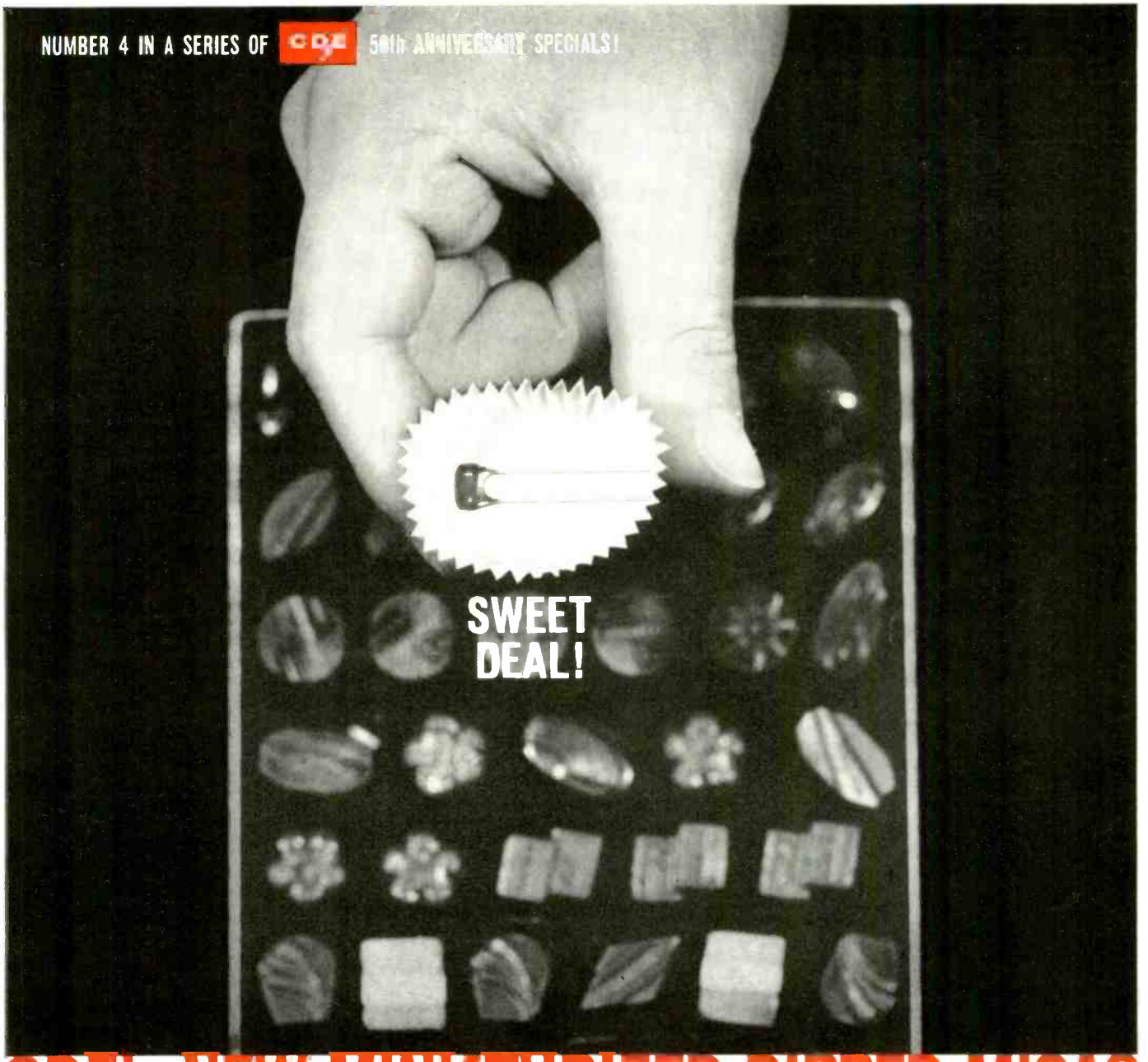
Editor, ELECTRONIC TECHNICIAN:

There are many things I like about your magazine. The articles are to the point, down to earth, where the average technician lives and works. I receive two others which are good, but not up with ET. Also, one thing I would like to point out is that your magazine is not sold on newsstands and therefore, does not get into the hands of every Tom, Dick, and Harry. Keep up the good work you are doing and please keep this magazine for people in the trade.

ADAM W. MILLER

Meadville, Pa.

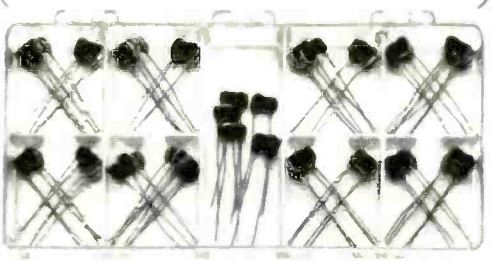
● *We will.*—Ed.



CDE's NEW MINIATURIZED DIPPED MICAS

YOU GET . . .

. . . ALL 500V. 5%	
Five CD15-5Q56 56 mmfd.	Five CD15-5T22 220 mmfd.
Five CD15-5Q82 82 mmfd.	Five CD15-5T33 330 mmfd.
Five CD15-5T1 100 mmfd.	Five CD15-5T39 390 mmfd.
Five CD15-5T18 180 mmfd.	Five CD19-5T47 470 mmfd.
	Five CD19-5T68 680 mmfd.



Here's a SWEET DEAL from CDE to add dollars to your bank account and time to your crowded day. CDE dipped silver micas save you dollars because they cost less. They perform as well as the best molded silver micas at a fraction of the price; and they STAY dependable too, because their rock-hard phenolic coating effectively seals out humidity.

CDE dipped micas save you time because they're TINY. They'll slip into a tight chassis or crowded printed board with ease. They replace ANY mica or ceramic capacitor—and you get all 45 of these 500V., 5%, dipped micas, in a convenient clear plastic box, for only $10.20. Call or write your distributor. CDE *Distributor Division, South Plainfield, N. J.*

CDE CORNELL-DUBILIER ELECTRONICS DIVISION
Federal Pacific Electric Company

For more data, circle 8-15-1 on coupon, p. 46

News of the Industry

CBS ELECTRONICS has named HOWARD P. MUNDAY as Training and Communications Coordinator.

INT'L. RESISTANCE Control Components Div. reports the appointment of HOWARD MORRISON as Marketing Mgr.

DU MONT LABS. and FAIRCHILD CAMERA INSTRUMENT CORP. have set stockholder meetings to vote on a merger agreement.

RCA Electron Tube Div. reports the appointment of REYNOLD J. GOUVERNEUR as Mgr., Advertising & Sales Prom., Entertainment Market.

SANGAMO ELECTRIC has announced the appointment of ROGER D. MILLER to the new position of Sales Mgr., Electronic Components.

CHANNEL MASTER has produced a new 4½ min. film on antenna replacement, for distribution to TV broadcasters throughout the nation. Prints are available through the company's Advertising Dept.

VOCALINE reports that DONALD GORHAM is now serving with the Electronics Products Div.

WELLER ELECTRIC has announced a price reduction of their Model #800 Sabre Saw to $14.95.

CAPITOL RADIO ENGINEERING INST. announces the appointment of H. E. MC CALLICK as executive Vice Pres.

RAULAND-BORG announces the appointment of CARL DORWALDT as head of a newly established Sales Engineering activity.

UTAH RADIO has announced a lifetime guarantee on all popular replacement speaker sizes and shapes, providing replacement if there is any performance failure at any time during the life of the owner.

PHILCO has announced the following appointments: LARRY F. HARDY, Vice Pres.-Public Relations, a newly-created position; ROBERT M. JONES, Dir. of Personnel, a newly-created position; HENRY E. BOWES, Vice Pres. and Gen. Mgr. of Consumer Products Div.; ROBERT G. URBAN, Vice Pres.-Marketing; RAYFORD E. NUGENT, Vice Pres.-Asst. to Vice Pres. of Marketing; and FREDERICK D. OGILBY, Dir. of Sales.

AEROVOX New Bedford Div. has appointed EDWARD E. BAUER as Vice Pres. and Gen. Mgr.

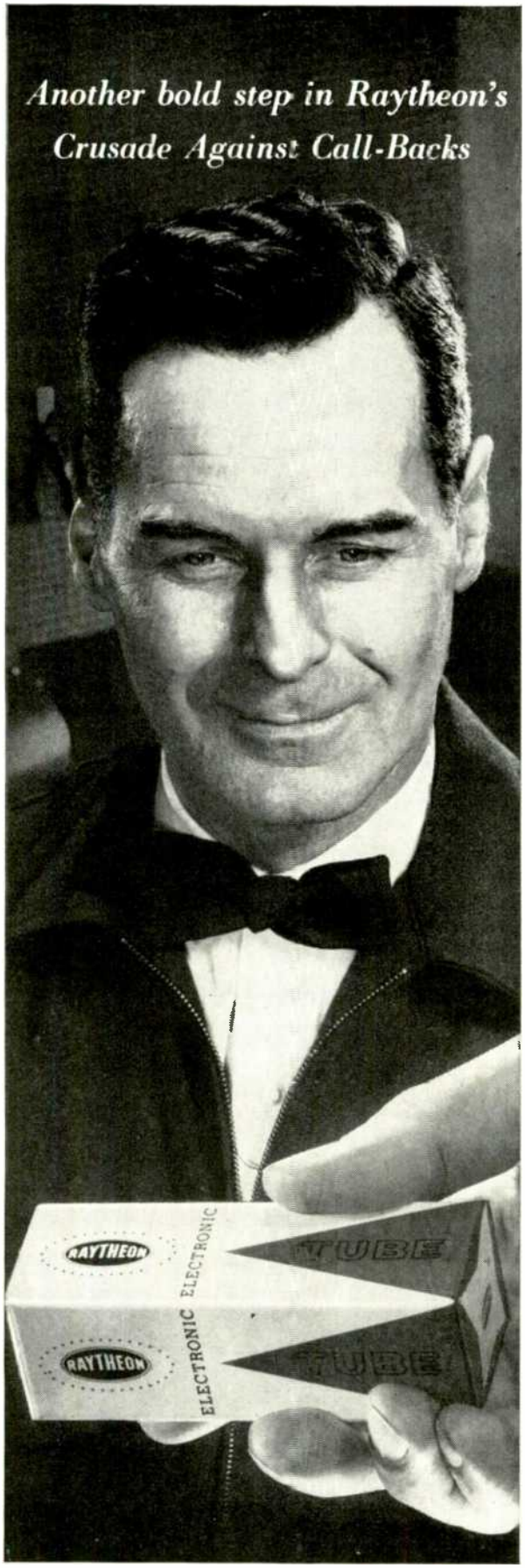
CENTRALAB has named WALTER E. PEEK to the new position of Vice Pres., Marketing, and BRUCE E. VINKEMULDER, Marketing Mgr.

BLONDER-TONGUE Foundation, non-prifit organization, has awarded grants to 18 colleges and educational institutions for the purpose of improving teaching techniques through the use of educational TV.

RAYTHEON has announced election of three new Vice Presidents as follows: GLENN R. LORD, Gen. Mgr. of Equipment Div.; FRITZ A. GROSS, Asst. Gen. Mgr. of Equipment Div.; and THOMAS L. PHILLIPS, Asst. Gen. Mgr. of the Missile Systems Div.

SPRAGUE ELECTRIC and the TELEGRAPH CONDENSER CO., LTD. of Great Britain have signed an agreement to exchange research, development, and manufacturing know-how for the next 21 years. Also reported is the appointment of ALBERT COUMONT as Sales Mgr. of SPRAGUE PRODUCTS CO., the distributors' supply subsidiary of SPRAGUE ELECTRIC.

(Continued on page 18)



RAYTHEON

Raytheon Announces

UNILINE

The new standard of receiving tube quality . . . backed by an extraordinary guarantee against call-back loss.

Now, for the first time, a tube manufacturer offers you a new "tough-type-tested" tube line to protect you against call-backs . . . UNILINE . . . built to an entirely new standard of quality and covering the ten types you voted the most troublesome in Raytheon's recent nation-wide poll.

We believe the quality of Raytheon's Uniline tubes is so superior that they will become the most trusted and talked about receiving tubes in the industry.

NOW...

"TAKE TEN AND SEE!"

Your Raytheon Distributor now has in stock specially prepared get-acquainted "Ten-Packs" consisting of one each of the ten Uniline types (1B3GT, 6AU4GTA, 6AX4GT, 6BQ6GTA/B, 6SN7GTB, 1X2A/B, 6CB6A, 6CG7, 6X8, 12AT7). We invite you to "Take Ten and See" if these are not the most trouble-free tubes you have ever used.

To back our complete confidence in Uniline, Raytheon is prepared to make a guarantee never before offered. Your Raytheon Distributor has full details. Prove it to yourself. Start your own Crusade Against Call-Backs today by ordering your Raytheon Uniline "Ten-Pack" in the distinctive new cartons.

RAYTHEON COMPANY

DISTRIBUTOR PRODUCTS DIVISION • WESTWOOD, MASS.

For more data, circle 8-17-1 on coupon, p. 46

(Continued from page 16)

ZORON, INC., 612 W. Monroe St., Chicago 6, Ill., is a new supplier of electronic components. Complete catalog is available from the company on request.

JACKSON ELECTRICAL INSTR. announces completion of a plant expansion program involving the transfer of office and production facilities of its Commercial Div. into 15,000 sq. ft. of space at 124 McDonough St., Dayton, O.

GENERAL ELECTRIC has completed transfer of the Radio Receiver Dept. headquarters from Bridgeport, Conn. to Utica, N.Y. The Semiconductor Products Dept., Rectifier Component Products Section, has announced the appointment of ARTHUR S. BAKER as Mgr. of Marketing Administration.

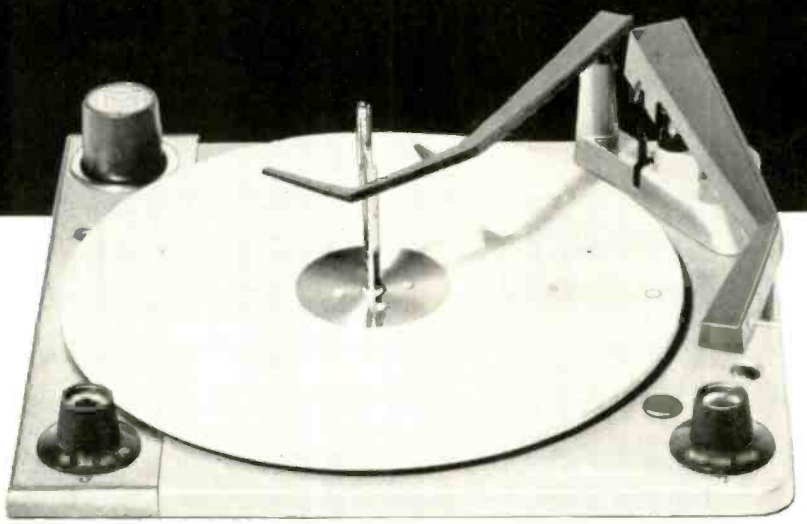
MOTOROLA service dealers can now obtain a "starter" kit of "Golden M" premium rated tubes being used for the first time in the 1961 TV, stereo, and radio sets, from the Motorola distributors. The Semiconductor Div. has named JOHN R. WELTY Product Mgr for diodes & rectifiers.

TUNG-SOL announces the following appointments and expansions of duties: L. EDWARD COTSEN, Asst. to Vice Pres.-Sales; RICHARD L. JANDL, Distributor Sales Mgr.; JOHN L. MALONE, Mgr. of Headquarters Account Sales; JOHN D. VANDERVEER, Mgr. of Govt. Relations, will supervise sales contacting various government agencies; HAROLD F. COOK, Mgr. of Marketing Services, directing advertising, sales promotion, market research, and sales planning departments; ARTHUR J. KECKEISSEN, expanded activities in areas of customer services, products, and factory warehousing; RALPH B. KENNETT, Coordinator of pricing activities for Sales Div., will represent the Sales Dept. in all pricing procedures.

"You sure that all it needs is a new 6CB6?"

infinite versatility!

deluxe 'stere-o-matic'® 4-speed automatic record changer with stereo cartridge and diamond needle



MODEL 1571 SHOWN WITH ACCESSORY "45" RPM SPINDLE IN BASE PLATE SPINDLE WELL

by

V-M

satisfy all customers for all custom hi-fi and stereo installations!

NEW and functionally-perfect are the features of this professional turntable-type record changer: *New* "Automatic Manual-Play" Feature returns tone arm to the rest post *automatically* after single record play! *New* Massive Turntable is a full eleven inches in diameter and has *new* micro-precision bearing system with TEFLON thrust bearings. *New* extra-long, dynamically balanced, non-resonant tone arm reduces the possibility of uneven needle pressure on wall of record groove! *New* accessory "45" rpm spindle adaptor stores in handy well right in changer baseplate. *New* V-M styling plus all the other famous V-M record changer features!

V-M Deluxe 'Stere-O-Matic'® 4-Speed Automatic Record Changer *with* Cartridge *and* DIAMOND NEEDLE—*Model 1571*. $50.00* list. Available with 4-pole motor and plug-in tone arm head for magnetic cartridges as *Model 1572*. $50.00* list. *Model 1586* is Model 1571 mounted on High Impact Plastic base. $56.00* list. *Model 1587* is Model 1572 mounted on High Impact Plastic base. **$56.00*** list.

V-M RECORD CHANGERS COMBINE TRUE TRANSCRIPTION TURNTABLE FIDELITY WITH AUTOMATIC RECORD CHANGER CONVENIENCE.

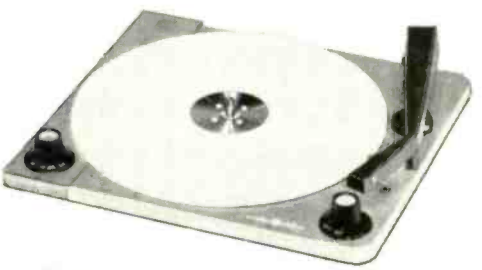
the Voice of Music®

V-M High-Fidelity Transcription-Type Turntable—Model 1580

Ideal for Custom Systems

• Massive 11" Turntable! • Micro-Precision Turntable Bearing with Teflon Thrust Bearing! • Stereo Cartridge with Diamond Needle! • Feather-light, Extra-long, Dynamically-balanced Tone Arm! • Finger-lift for easier Tone Arm Set Down! • Exclusive V-M Deluxe Styling! **$35.00*** list.

*Slightly Higher West



See your V-M Representative today!

V-M CORPORATION • BENTON HARBOR, MICHIGAN • WORLD FAMOUS FOR THE FINEST IN RECORD CHANGERS, PHONOGRAPHS AND TAPE RECORDERS

For more data, circle 8-19-1 on coupon, p. 46

Reps & Distributors

VOCALINE has named W. H. CONNORS CO. as sales rep for Wyo., Idaho, N.M., Utah, Colo. and Mont.

SHELL ELECTRONICS has announced plans for a free week in Florida to each distributor who purchases a specified quota up to Oct. 31st.

BETTAN SALES, manufacturers' rep firm, announces they are moving to new and larger quarters at 77-15 164th St., Flushing 66, N.Y.

JERROLD ELECTRONICS presented RAY R. HUTMACHER ASSOCIATES with the annual "Rep of the Year" Award at the recent annual sales meeting of its Distributor Sales Div.

LOWELL MFG. announces the winner of its "April in Paris" contest as FRED HARRIS of the ATLAS RADIO CORP., Toronto, Canada. Second and third place went to W. B. PRAY SALES and H. W. KNAGGS CO., respectively.

TACO reports winners in the T-Bird Bolo Drawing as follows: first drawing BUD EHRLICH, BUD ELECTRONIC SUPPLY; and second drawing, LEE HARRINGTON, WORLD RADIO LABS.

Catalogs & Bulletins

PARTS: A new 48-page general catalog features replacement parts. Detailed specifications and other data on resistors, diodes, fuse resistors and controls are included. International Resistance Co., Distr. Div., 401 N. Broad St., Philadelphia 8, Pa.
For more data, circle 8-20-2 on coupon, p. 46

CB ANTENNAS: Bulletin 601 covers model HW Heliwhip antennas and beacon fixed station antennas for the 27 mc-11 meter citizens band. Specifications, illustrations, diagrams and prices included. Mark Mobile, Inc., 5441 W. Fargo Ave., Skokie, Ill.
For more data, circle 8-20-3 on coupon, p. 46

ELECTRICAL TAPES: A new 12-page booklet, "Useful Tips For Top Savings & Service," covers 24 specific tape jobs from protecting tools to use of color-coded tapes. Dutch Brand Div., Johns-Manville, 7800 S. Woodlawn Ave., Chicago 19, Ill.
For more data, circle 8-20-4 on coupon, p. 46

ANTENNAS: T-Bird antenna, a new improved broad-band yagi design, for channels 2 through 13, has numerous design innovations. Details and illustrations are provided in current literature. Technical Appliance Corp., Sherburne, N. Y.
For more data, circle 8-20-5 on coupon, p. 46

SOLDERING TOOLS: Catalog #S-60, covering the firm's standard line of soldering tools, features the new improved soldering iron handle, #776. The colorful, 8-page, catalog provides descriptions, illustrations, and prices. Ungar Electric Tools, 4101 Redwood Ave., Los Angeles 66, Calif.
For more data, circle 8-20-6 on coupon, p. 46

CAPACITORS: Four-page bulletin, EL-5, covers type ML subminiature electrolytic capacitors, designed for high quality transistor equipment. Specs, dimensions and typical performance characteristics are included. Pyramid Electric Co., Darlington, S. C.
For more data, circle 8-20-7 on coupon, p. 46

MASTER TV SYSTEMS: A new 24-page manual, "Designing and Installing Master TV Systems," covers types of building construction, design of systems and the installation of cables and components. Block diagrams illustrate typical combinations of antennas, amplifiers, cable and distribution components. Blonder-Tongue Labs., 9 Alling St., Newark 2, N. J.
For more data, circle 8-20-8 on coupon, p. 46

TUBES: A handbook of industrial tube interchangeabilities lists some 900 tube types. Included are miniatures, subminiatures, voltage regulator-voltage references, radiation counter, pencil, transmitting, magnetron, klystron and many others. From distributors of Raytheon Co., Distr. Products Div., Westwood, Mass.

READY TO SERVE YOU!

OVER 1500 CLAROSTAT DISTRIBUTORS

with

CLAROSTAT

"Right Replacements"

RTV CONTROLS

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

GREENOHM RESISTORS

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

PICK-A-SHAFT CONTROLS

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

WRITE FOR COMPLETE CATALOG, OR ASK YOUR DISTRIBUTOR

CLAROSTAT MFG. CO., INC.

DOVER, NEW HAMPSHIRE

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

See us at WESCON BOOTH 2630

For more data, circle 8-21-1 on coupon, p. 46

ELECTRONIC TECHNICIAN
Including SERVICE Magazine

The Meaning of the Census

By this time, the census takers have counted all of us, and the preliminary tabulations are being reported.

The nation's population in 1960 is approximately 179,500,000, a healthy 18.6% rise from the 1950 total of 151,325,798. Also heartening is the impressive 60.3% jump in monthly per capita income from $118.17 a decade ago, to $189.43 currently.

The growth has not been evenly spread across every town and state. Some cities and states gained, while others lost. An important trend has been the move from the cities to outlying suburbs. As shown below, eight of the top 10 cities in the country lost population, while most of the medium-large cities gained.

1960 Rank	City	1960	Change In Percent
1	New York	7,660,000	— 2.9
2	Chicago	3,516,258	— 2.9
3	Los Angeles	2,448,018	24.2
4	Philadelphia	1,959,966	— 5.4
5	Detroit	1,672,574	— 9.6
6	Houston	932,680	56.4
7	Baltimore	921,363	— 3.0
8	Cleveland	869,867	— 4.9
9	Wash., D.C.	746,958	— 6.9
10	St. Louis	740,424	—13.6
11	Milwaukee	734,788	15.3
12	San Francisco	715,609	— 7.7
13	Boston	677,626	—15.4
14	Dallas	672,117	54.7
15	New Orleans	620,979	8.9
16	Pittsburgh	600,684	—11.2
17	San Antonio	584,471	43.1
18	Seattle	550,525	17.7
19	San Diego	547,294	63.7
20	Buffalo	528,387	— 8.9
21	Memphis	491,691	24.2
22	Denver	489,217	17.7
23	Cincinnati	487,462	— 3.3
24	Atlanta	485,425	46.5
25	Minneapolis	481,026	— 7.8
26	Indianapolis	470,464	10.1
27	Kansas City	468,325	2.6
28	Columbus, O.	465,151	23.7
29	Phoenix	430,459	303.0
30	Newark	396,252	— 9.7

In terms of metropolitan areas, there was fair growth. For example, typical metropolitan areas grew, despite losses in the core cities:

Metropolitan Areas	1960	Gain
New York City	14,586,519	+13.0%
Philadelphia	4,279,961	+16.6%
Detroit	3,761,221	+24.7%
Pittsburgh	2,339,176	+ 5.7%
St. Louis	2,056,623	+19.6%
Washington	1,969,536	+34.5%
Cleveland	1,790,435	+22.2%
Baltimore	1,706,961	+21.5%
Minneapolis	1,477,080	+28.3%
Buffalo	1,304,581	+19.8%

The state-wide trend, for the most part, followed Horace Greeley's advice to go west. The 10 states showing the greatest growth are as follows:

Growth Rank	State	1960	Percent Change
1	Florida	4,893,098	+76.6%
2	Nevada	281,348	+75.8%
3	Alaska	224,383	+74.4%
4	Arizona	1,282,405	+71.1%
5	California	15,537,413	+46.8%
6	Delaware	443,158	+39.3%
7	New Mexico	943,348	+38.5%
8	Maryland	3,072,999	+31.2%
9	Colorado	1,735,807	+31.0%
10	Utah	886,485	+28.7%

These preliminary figures by the Bureau of the Census can serve as a guide to service dealers whose areas have changed or who are thinking of relocating. Traditionally, business prospers in growth areas, particularly for those businesses established early in the growth period. After the peak of the boom, a shakeout period is not uncommon.

Thinking of moving to a warmer climate? Would you like to settle down in hunting and shooting country? Planning to open a branch out in the suburbs? Keep in mind the population shifts, for they vitally affect the potential success or failure of business operations.

Tuning In the

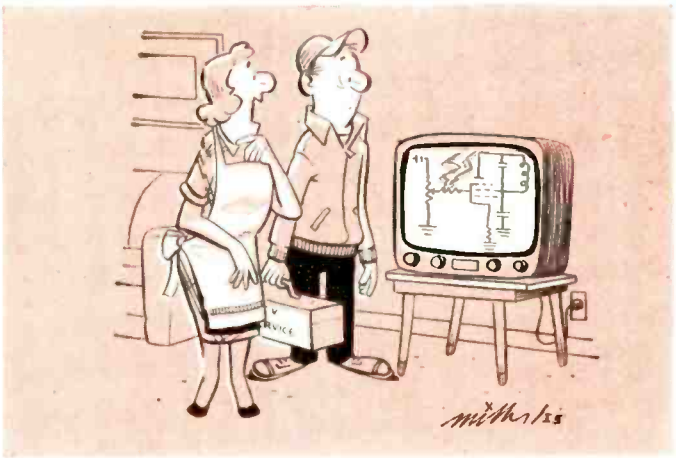
SOFAR (Sound Fixing and Ranging) system for locating aircraft or ships in distress by depth charge generated water sound waves, has set a new record. Depth charges set off south of Australia were recorded in Bermuda. It took the sound 223 minutes to traverse the 12,000 mile distance. The previous record distance recorded was about 3000 miles. There is evidence that the sound waves traveling through water "feel" their way around islands and shallow areas.

TECHNICIAN EARNINGS according to the U.S. Bureau of Labor Statistics cover a relatively wide range. Although beginning radio and TV servicemen were among the lowest paid technical workers, earnings of journeymen varied from $80 to $130 a week in 1958. Generally, servicemen in the larger cities had the highest earnings. Technician employed in companies manufacturing military and commercial electronic equipment generally earned from $1.75 to over $3 an hour in 1958. Electronic technicians employed in manufacturing usually work the normal 5-day, 40-hour week, and receive time-and-a-half pay for overtime hours. Radio and TV repair shops, most of which are small establishments, usually have longer working hours. Although some of the largest shops have a 40-hour week, the 6-day, 48-hour week is the more common work schedule.

NEW FLAT SPEAKER invented at Israel's Weizmann Institute under a research program sponsored by Emerson and a French Company has been announced by Emerson. A 16" model shown was only 3/8" thick. This electrodynamic pancake design can be made in almost any shape, size, or form.

COMPUTER AIR NAVIGATION

New air navigation system uses a computer to automatically position a map of half the earth in a glass hemisphere. The projection of a 400-mile diameter area (125,000 sq. mi.) on a 7½" screen pinpoints the pilot's location. For space navigation, a stellar map would be used. IBM engineers R. W. Kern (l) and J. F. Creedon check out the system.



"I think it's trying to tell us something."

ALL-AMERICAN AWARD program to honor public-spirited TV service technicians has been announced by General Electric's Receiving Tube Dept. The new plan, a revision of the 1957 and 1958 award programs, permits franchised G-E distributors to nominate candidates. The previous program called for the naming of 10 outstanding service technicians, a limitation that left many worthwhile deeds unsung. There is no limit on the number of awards under the new program and no deadline. Nominations by the G-E distributor should be endorsed by a civic leader and two members of the TV service profession, and sent to the Secretary, All-American Awards Comm., General Electric Co., Receiving Tube Dept., Owensboro, Ky.

COMPUTERS are finding interesting—and sometimes humorous—applications in business and industry. In St. Louis, the Lucas Avenue Garage is using a Universal Match device which computes charges for parked cars. The ticket is placed in the slot, and the device automatically determines the length of time and the correct charge, at the proper rate for that particular day or time period. In Kokomo, Ind., for exhibition purposes, Delco Radio fixed up a computer which tells a man's correct age when 10 questions are answered—but will not reveal the true age of a woman over 21.

TV VIEWER TALKS BACK with a small device called "Key TV" developed by TelePrompTer Corp. The control contains two buttons, which a user pushes and which register at a central control point, enabling viewers to take educational television course examinations and participate in opinion polls. The device will be tried out this summer in community TV systems at Liberal, Kan. and Farmington, N.M.

Picture .....

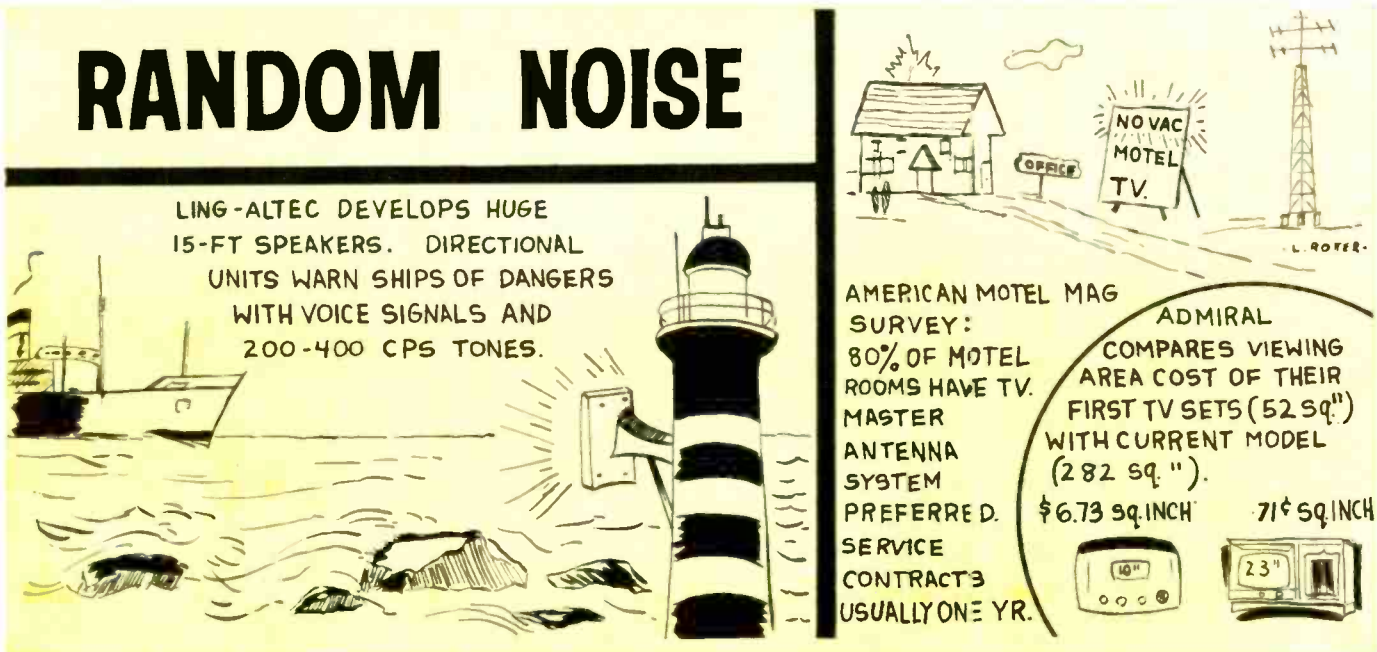
CREDIT APPRAISAL of electronic parts distributors conducted by National Credit Office shows a 55% gain in dollar volume over the past 5 years, with parts sales in excess of $815 million. Tubes represent 30% of sales. Classification according to risk showed 7% excellent, 57% satisfactory, 20% fair, and 16% not recommended or no line assigned. A study of 10,000 payments by 1700 firms in the last 6 months revealed 77% were paid on a discount or prompt basis, 10% were 1 to 30 days delinquent, 3% over 90 days late, and 2% were handled on a COD basis.

NEW TV DEVELOPMENTS are coming to the fore. Philco is said to be experimenting with an 18", 122° rectangular picture tube that is less than 9" deep. More commercially speaking, Philco introduced its new 23" line with Mark II Cool Chassis using 20 kv 2nd anode. Air flow chassis design is reported to reduce failures by increased dissipation and elimination of heat traps. From Zenith, we learn of the development of a high voltage transformer used in the company's 22 kv TV chassis. The flame, heat, and moisture resistant alkyd cup is said to be practically impervious to corona discharge.

THE SIGNAL CORPS celebrated its 100th anniversary by demonstrating two 24½ lb. transistorized transceivers powered entirely by sunlight. The Hallicrafters, Inc. developed unit, the FPM 200, contains 41 transistors, 30 diodes, 20 quartz crystals and three vacuum tubes, replacing almost 200 lbs. of conventional equipment.

CALENDAR OF COMING EVENTS

Aug. 19-21:	NATESA Annual Convention, Sheraton Towers Hotel, Chicago, Ill.
Aug. 23-26:	Western Electronics Show & Convention (WESCON), Ambassador Hotel, Memorial Sports Arena, Los Angeles, Calif.
Sept. 6-8:	Joint Automatic Control Conference, Mass. Institute of Technology, Cambridge, Mass.
Sept. 6-11:	1960 New York High Fidelity Music Show, New York Trade Show Bldg., New York, N.Y.
Sept. 14-15:	Fourth Annual Joint Military-Industrial Electronic Test Equipment Symposium, Museum of Science & Industry, Chicago, Ill.
Sept. 15-16:	Eighth Annual Eng'g Management Conference, Morrison Hotel, Chicago, Ill.
Sept. 15-17:	Upper Midwest Electronics Conference and Exhibit, Minneapolis Auditorium, Minneapolis, Minn.
Sept. 21-22:	Industrial Electronics Symposium, Manger Hotel, Cleveland, Ohio
Sept. 26-29:	American Welding Society Fall Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.
Sept. 26-30:	Instrument Society of America Conference, Exhibit and Fifteenth Annual Meeting, The Coliseum, New York, N.Y.
Oct. 3-5:	Sixth National Communications Symposium, Hotel Utica, Utica, N.Y.
Oct. 10-12:	IRE National Electronic Conference, Hotel Sherman, Chicago, Ill.
Oct. 24-26:	East Coast Aeronautical and Navigational Electronics Conference, Lord Baltimore Hotel, Baltimore, Md.



Optical Sound Servicing

Movie Projectors Utilize Exciter Lamp & Photoelectric Cell To Obtain Synchronized Audio

LUTHER B. HOFFMAN

• The obvious inadequacies of playing a phonograph record while showing motion pictures prompted the development of sound tracks directly on film, permitting accurate synchronization of voice and lip movement.

Two types of optical sound systems are used: variable area and variable density. (A different system, the magnetic sound system, is becoming increasingly popular in current sound projectors.)

Both systems use the effect of light passing through film with varying intensity to a photoelectric cell, which converts it into an electrical signal. The amount of light and its variations determine the gain and frequency of the signal. The variable area film operates on the principle of constant density with varying area; variable density has constant area with varying density. See Fig. 1.

Sound-On-Film

Systems
- Variable Area
- Variable Density

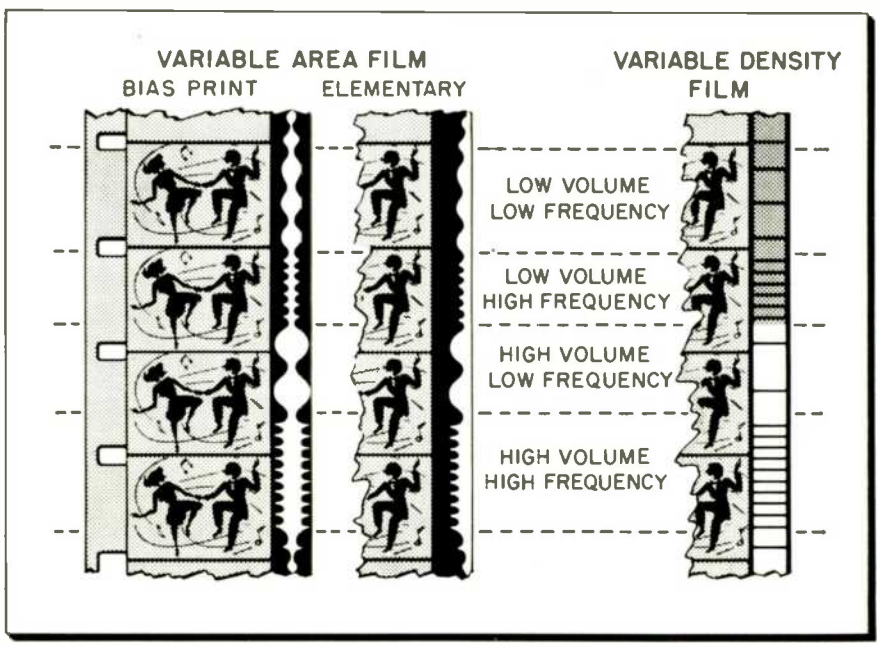
Major Components
- Exciter Lamp
- Focusing Lens
- Reflector
- Photo Electric Cell
- Audio Amplifier
- Speaker

Service Equipment
- Audio Signal Generator
- VTVM
- Camel Hair Brush
- Lens Tissue
- Cleaning Fluid

Probably the most popular sound projector in use today, that is, non-professional, is the 16mm film with optical sound track. Schools are using it in audio-visual education. Some state conservation agencies, as well as some of the larger manufacturers, are constantly providing program material gratis, or at a nominal fee, to schools, clubs and institutions. The result is a widespread ownership of movie projectors, and the technicians who can service them properly will find increasing popularity and profit. (In almost every major city, for example, audio-visual service companies have been formed which employ sound projector servicing as the nucleus of their service business.)

The average technician shouldn't be afraid of this service work. With the exception of two circuits, which the technician can easily understand, the electronic portion of the sound system is essentially the same as found in any well-designed audio amplifier. The two generally unfamiliar circuits are: the ultrasonic oscillator and the photoelectric circuit.

Fig. 1—Either a variable area or variable density recording system is used for a movie projector's optical sound track. Variable area film employs constant film density (either "black" or "white"), whose area varies according to sound modulations. The elementary system shown is rarely used due to edge distortion and impaired sound when the film is only slightly misaligned. Variable density film, in contrast to variable area, has constant area with varying film density. The transparency of the film varies with the sound volume.



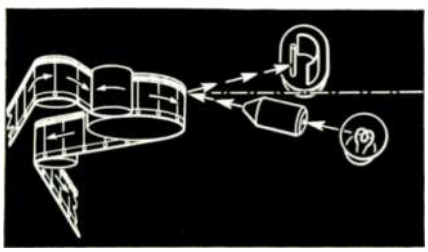


Fig. 2—Basic optical sound operation: light is focused on film's sound track; modulated light passing through film is reflected to a photoelectric cell.

Operation

The basic physical concept of optical sound systems can be seen in

Figs. 2 & 3. A light source, called exciter lamp, is focused through a tiny slot so that it falls on the sound portion of the film. The degree and variations of light passing through the sound track of the film is reflected to a PE (photoelectric) cell. Electronic amplifier circuitry completes the fundamental system.

With this background, let's go back to the exciter lamp. The light source for sound track scanning is usually a coiled filament lamp. The beamed light must not have an appreciable amount of variation, eliminating the possibility of using 60 cycle a-c for the lamp's filament supply. (The PE cell's sensitivity to light variations would pose a serious hum problem if 60 cps was used.)

Although a pure d-c supply would be electronically ideal, a bulky transformer-rectifier addition would hamper portability. A common compromise is an ultrasonic oscillator arrangement, shown in Fig. 4. The separate tube involved is usually an ordinary audio output type, such as a 6V6. This is generally supported by an oscillator-transformer circuit that is practically trouble-free and adds no appreciable weight to the equipment. See Fig. 5. The oscillator frequency operates above human hearing range, usually around 20 kc.

The light is focused through a small, oblong aperture (approximately 3/32" x 1/64") on the film's sound track, which modulates the intensity. See Fig. 6. The modulated light strikes a mirror (Fig. 7) and is reflected to the cathode of the PE cell (Fig. 8).

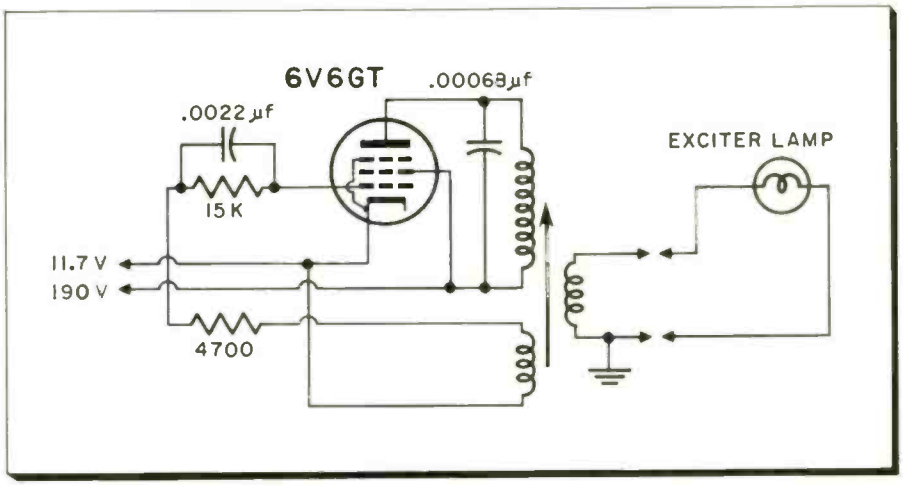


Fig. 4—Oscillator/transformer circuit used to supply exciter lamp filament voltage. Frequency is high enough to avoid hum.

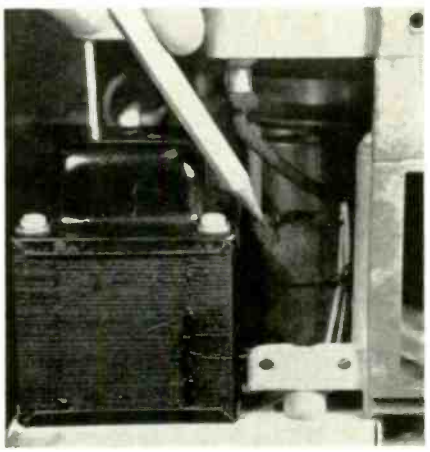
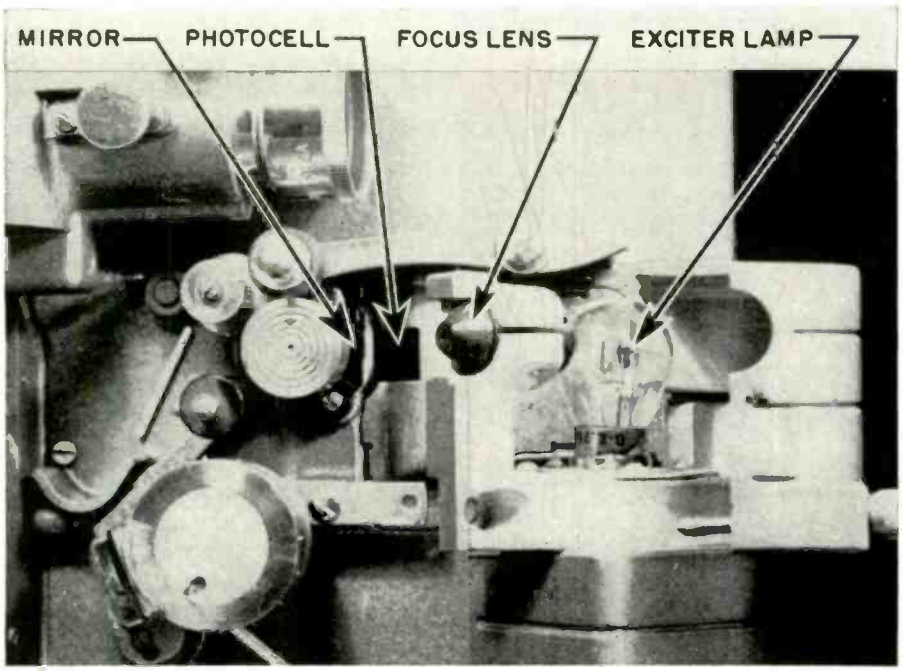


Fig. 5—Compact oscillator/transformer unit.

The PE cell is usually a two-element tube with a light-sensitive cathode. The cathode emits electrons in proportion to the volume of light falling on it. The electrons are attracted to the positive anode, converting light to electronic information. The positive potential is supplied to the anode through a load resistor, which is coupled to the grid of the first audio tube through a capacitor.

Aside from its higher impedance, the PE cell behaves very much like a zero-bias voltage amplifier. But, because of its high impedance, the decoupling must be thorough. Therefore, most circuits employ two bypassed resistors preceding the load resistor, as shown in Fig. 9.

Fig. 3—A movie projector's optical sound components are illustrated here.

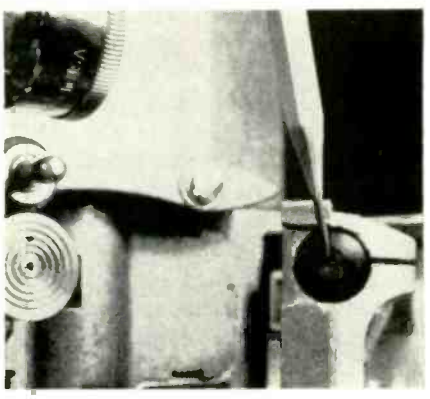


Troubleshooting

Before troubleshooting an optical sound system to locate a defect, it is imperative that the technician know how to operate the unit. Perhaps a friend, relative or the technician

(*Continued on page 56*)

Fig. 6—Light source from focusing device, as it appears to film's sound track.



Benchman's View Of Damper Circuits

Commonly Encountered TV Damper Service Problems Are Explored

HAROLD WEST

• Damping circuits have undergone numerous changes, as evidenced by the different damper tubes that are now used. The early post war TV sets used 5V4, 6W4 and 6AS7 tubes in their circuits. It was common to find a 5V4 and 6AS7 in the same high-voltage chassis. The need for new rugged tubes that could withstand the high positive voltages between filament and cathode of the damper soon became obvious. The old 6W4 would break down under this terrific strain.

Damper History

Within the last few years the 6AX4, 6AU4, 6DA4 and 6DE4 have taken over as popular damper tubes. Present design has eliminated the separate filament transformer or separate power transformer winding for the damper tube. With the turn to series circuit design and pressure of competitive economy-designed sets, tubes in the damper circuit were wired either in series or parallel in the overall filament string.

Series filament string design brought forth the 12 volt damper tube. In some TV sets a 17AX4 or 19AU4 may be found, but usually the 12 volt duplicate of the parallel string six volt tube is found.

Applying theory to pinpoint circuit trouble is naturally a desirable troubleshooting method, rather than using "cut and chop" servicing. This applies to the damper circuit, too. The damper tube, a medium voltage rectifier, has the job of (a) suppressing unwanted damped oscillations, (b) conducting during the last negative portion of the shock-excited flyback pulse until the output tube recovers and (c) providing boost voltage for the plate of the Horizontal Output tube, as well as other circuit sections.

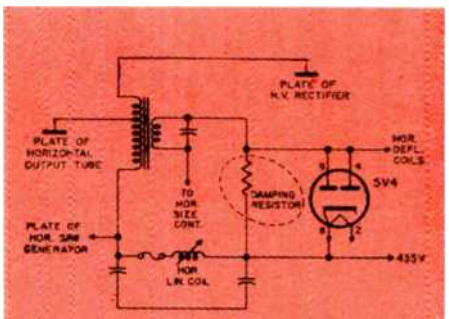
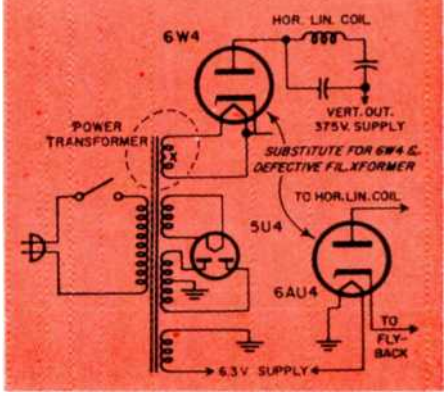


Fig. 1—Damper lines & poor horizontal linearity in the DuMont RA-103, 4, 5, 10 chassis traced to an open damper resistor.

Fig. 2—When the damper heater winding of an RCA KCS 47, 49 series chassis opens, a heater supply can be obtained from another 6.3 v source which is capable of handling the additional current drain. A 6AU4 is substituted for the original 6W4.



Troubleshooting Tips

Troubleshooting a damper circuit under normal design conditions is very similar to tracing the B+ loss of any low-voltage rectifier.

Damper circuit defects are seen on the picture tube screen in many ways; one symptom is the loss of high voltage, with consequent loss of raster. The "no raster" symptom may be caused by no output of the damper tube or a shorted capacitor in the horizontal linearity or width coil circuit. (Naturally a defective yoke, flyback, oscillator stage, etc., could cause the same effect.) Often the boost supply is fused and technicians are tempted to jump out an open fuse. In circuits with a low voltage transformer, a short in the damper circuit with a jumped fuse has overheated many low voltage transformers. Obviously, its a bad practice to jump a fuse. Locating the cause of the excessive current and correcting it is a much wiser practice.

Equally poor is the allied practice of replacing shorted capacitors with under-rated components. Many of the sets on the market use 600 volt capacitors in the linearity and width circuits. Replacing these parts with 1000 vdc capacitors at repair time reduces damper circuit breakdowns. Do not use 400 vdc capacitors; they will not stand up.

Frequently the damper tube will momentarily arc, causing the horizontal output to collapse into a narrow band; a bright white line with sparking branches. When this happens with older sets, which used a

standard type ¼ or ⅜ amp fuse, the fuse would generally "pop." Consequently, the service technician may locate only a blown fuse in the customer's home. Replacing this fuse—and nothing else—will only result in a rehash. Let's face it, fuses usually blow due to some defect. An intermittently sparking damper tube is a major cause of blown fuses.

Therefore, the best way to check if the damper tube is apt to arc again is by tapping the side of the tube's glass envelope; perhaps using the plastic handle of a screwdriver or spintite. If the damper tube is defective, it will usually exhibit arcing, giving the picture a Christmas tree effect. If this occurs, the damper tube should be replaced. Additionally, it would be good practice to substitute the later type "slow blow" fuse, eliminating the possibility of a blown fuse at the slightest surge.

Of late, the barber pole or barkhausen effect (black and white rope-like line on the left side of the screen) has been overcome with the inclusion of filter chokes in series with the plate and cathode of the damper tube. In this case, another potential defect is apparent. An open choke could cause no raster due to eliminating the Boost or B+ from the tube. (Older sets got around barkhausen oscillations by placing a magnet, similar to an ion trap, around the horizontal output tube envelope.)

Sometimes the technician has to service a set with distortion at the right side of the picture. This is sometimes caused by the wrong capacitor being used in the linearity circuit. A leaky capacitor replacement with a value *almost* the same as the original is often found as the "defect." Unbalancing this critical filter network will result in picture disfigurement. Consequently, replace that shorted capacitor with the exact value. Don't try to improvise.

Case Histories

In the older *Du Mont* chassis a 7500 ohm 20 watt resistor was used as the damping resistor in the circuit shown in Fig. 1. When this part opens the picture on the screen is overrun with drive lines and the horizontal drive adjustment would not correct this situation. Also, the right side of the picture would appear much wider than the left. Replacing the defective part returned the set to normal operation.

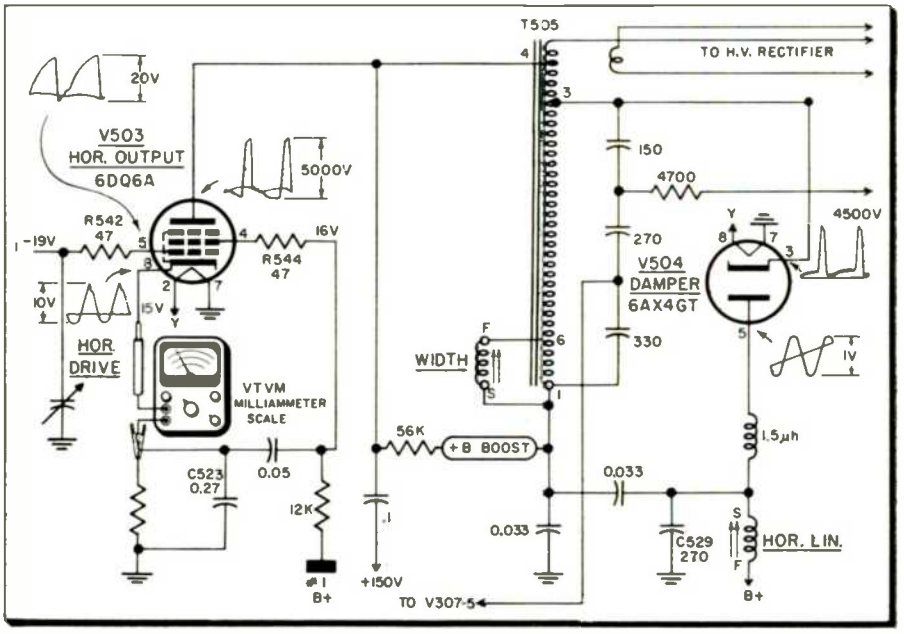
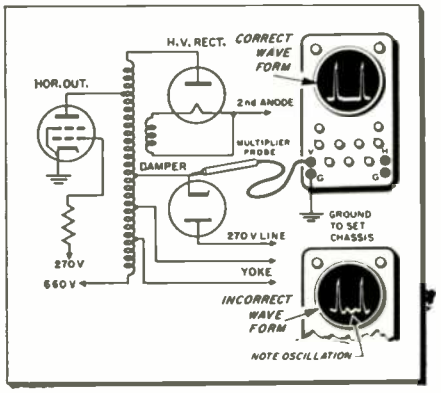


Fig. 3—Minimum milliammeter reading is desirable when a horizontal linearity coil is adjusted. Improper adjustment may overheat the flyback transformer due to excessive current.

It was common to find the old *RCA* (KCS 47, 49 chassis, having a separate 6W4 winding on the power transformer, with an open damper winding. The technician has three separate choices to make regarding this set repair: change the low voltage transformer at considerable cost to the customer, install a separate filament transformer for the one tube (sometimes space limited use of this method), or change the damper tube to the newer type, namely the 6AU4. This is accomplished by wiring the 6AU4 filament to a suitable 6.3 source, as shown in Fig. 2.

[*Space can generally be found on these chassis to mount a separate 3 amp, 6.3 volt heater transformer to replace the defective unit in the power transformer.—Ed.*]

Fig. 4—Wave-form illustrates the proper shape found at the damper cathode. The irregular scope trace shown indicates trouble in the damper filter circuit.



TV sets as recent as five years ago added a horizontal linearity coil in the plate circuit of the damper tube. This pi type filter, with its capacitor, coil and capacitor, filtered the voltage at the plate of the damper tube. By adjusting the horizontal linearity coil the picture changed from a normal deflected picture to one of disfigurement to the left side. It is important to note at this time that defective linearity coils and improperly adjusted coils may cause flyback transformers to burn up due to excess current. A milliammeter inserted in the cathode of the horizontal output tube (Fig. 3) while adjusting the linearity coil for minimum reading will prevent breakdowns of this nature.

Sets that channel the boost voltage to feed the vertical output circuit often cause the "no high-voltage" symptom through a bypass capacitor shorting, thereby creating a B+ short. Replacing the charred resistor and shorted capacitor should restore normal operation.

In the final analysis, the damper circuit should be treated as a medium voltage rectifier. Following normal service procedure by employing a VTVM to check voltages will readily indicate circuit operation. Problems of horizontal line-

(*Continued on page 49*)

Becoming Acquainted With Your VOM

Tips For Getting The Most From This Versatile Instrument

JOHN HASKELL

• While the volt-ohm-milliameter is perhaps the most frequently used instrument employed by the electronic technician, field, or plant engineer, few take full advantage of its versatility.

VOM's designed with basic meter movements ranging from 10 to 50 microamperes, with sensitivities from 20 to 100 thousand ohms-per-volt. are inherently capable of wide use. For example, it is often forgotten that these instruments can serve admirably as the basic meter in field strength measurements, null indicators in many bridge applications, grid dip meters, modulation meters, and countless others. In addition, its everyday usefulness as a troubleshooting and measuring device can be greatly expanded by providing the meter with a few necessary probes and other accessories. To get the most out of these instruments, however, it is first necessary to recall a few fundamental facts about the VOM.

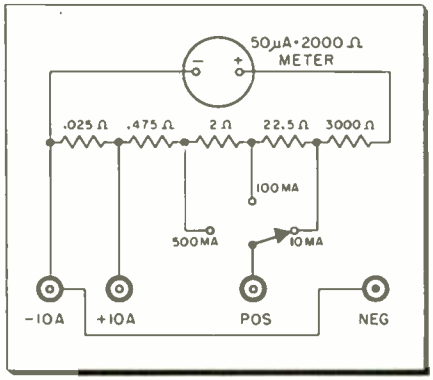
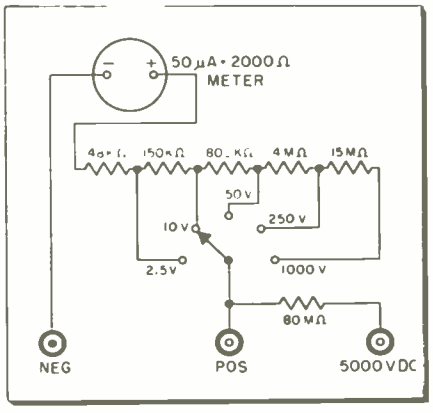


Fig. 1—Basic arrangement of shunt resistors in a VOM for d-c current measurements ranging from 10 ma to 10 amperes.

Fig. 2—Simplified series resistor circuit in a 20,000 ohms-per-volt meter providing d-c voltage ranges covering 2.5 to 5000 v.



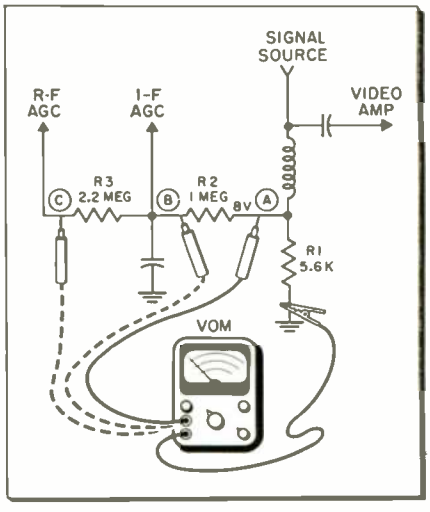
How It Works

Some users of VOM's can recall with pleasant surprise that it is like a transistor, basically a current-operated device. A 50 μa movement, for example, requires 50 μa of current to deflect it full scale, regardless of the markings and indications on the meter scale. The meter's voltage sensitivity is directly related to this basic full-scale current deflection. This sensitivity is normally specified in ohms-per-volt. For example, 20,000 ohms-per-volt. By using switchable, tapped shunt resistors. as shown in Figs. 1 and 2, and by marking the meter's face in volts, ohms, amperes, milliamperes and microamperes, we have in our hands an essential device adapted to innumerable test and troubleshooting applications.

Another fact which may surprise some is that a 20K ohms/v VOM is just as accurate on its 500 volt scale as a 10 megohm input VTVM. On its 1000 volt d-c scale the VOM has an input resistance of 20 megs while the VTVM remains at 10 megs. A 100K ohms/v meter has an input resistance of 15 megs on its 150 volt d-c scale. As we all know, the VTVM is essential for accurate low voltage readings in extremely high impedance circuits and also for very high resistance indications.

The input resistance for a VOM on a given d-c voltage scale is. of course, determined by multiplying the full scale indication by the meter's sensitivity. For example, on a 10 volt scale, this would be 10 x 20,000 (with a 20,000 ohms/v meter) or 200,000 ohms. On a 250 volt scale, the meter's input resistance would be 250 x 20,000, or 5 megs, and so on. Remembering this fact can be very important, as we shall now see.

Fig. 3—A significant voltage reading at points B and C in this agc circuit can be obtained only by using the highest readable scale of a VOM. Low input resistance of lower scales will adversely affect VOM/circuit voltage relationships.



How Not To Use It

On occasion a technician will proclaim that a 20,000 ohms/v. VOM is useless on avc and agc measurements and will reach for a VTVM. This is not necessarily true, and can easily be demonstrated by referring to the simplified schematic in Fig. 3, representing a TV agc distribution system or radio avc circuit.

A bias of 8 volts is arbitrarily assumed across R-1, the 5.6 k resistor. The imaginary technician sets the VOM on the 10 volt scale and measures the voltage at point A. The 200,000K meter resistance across the 5.6K ohms will not adversely upset voltage relationships in the circuit. The meter will indicate close to 8 volts. But wait . . .

When the technician moves the meter probe to point B, there will be 200,000 ohms across 1 megohm circuit resistance, giving an average resistance of about 170,000 ohms, which completely upsets meter/circuit voltage distribution relationships. Only about 15% of the voltage, or 1.2 volts, appears across the meter. When the meter probe is moved to point C, the situation grows even worse. The meter needle registers a perceptible flicker at this point, and the technician begins looking for the shop's VTVM.

No one should try to obtain a significant voltage indication in this circuit with the VOM set on its 10 volt scale. Let's try the 250 volt scale.

Input impedance of the meter is 5 megohms on the 250 volt scale. 5 megohms across 1 megohm gives about 630,000 ohms average, and the voltage relationship is now reversed. The meter appears to move only slightly but when we take a closer look we can easily see the needle pointing near 7 volts. Even at point C we can determine close to 4 volts meter deflection. True, it's more difficult to read than a VTVM's scale, in this instance, but a VOM *can* be employed. Of course, as was pointed out before, in very high resistance circuits with very low voltage, only a VTVM can give the needed information. But what the VOM can do far overshadows the few instances where it fails to adequately perform a task for which it was never intended.

Current Applications

The d-c current scales of the VOM, generally in amperes, milliamperes and microamperes, are highly valuable to the technician or plant engineer. With the increased use of transistor radios, for example, the low current scales of the VOM provide a convenient, rapid trouble-shooting tool for these sets.

A customer walks into the shop with a transistor portable, complaining that "the batteries run down too fast." Maybe he bought the batteries from you, or somewhere else. In any case the first thing you want to know is: How much total current is the radio drawing? Now the average transistor radio draws about 14 milliamperes at normal volume level. Some more, others less. Currents range from about 8 to 25 ma, depending upon type.

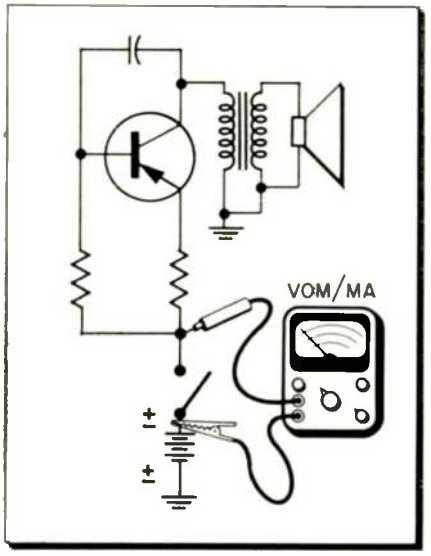
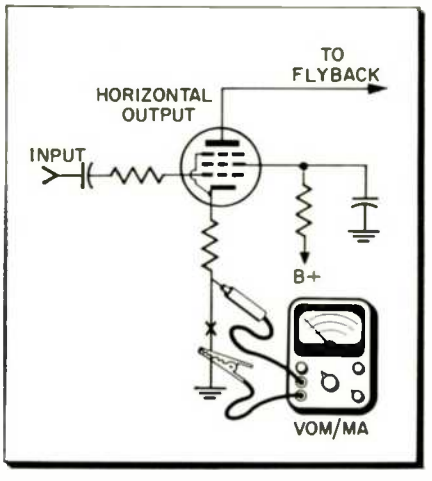


Fig. 4—Current overload in a transistor radio can be detected by inserting a VOM's milliamp scale in series with its load.

Fig. 5—Insert VOM (150 ma or higher scale) in cathode circuit of TV horizontal output tube and adjust linearity coil to give minimum reading. This frequently prevents damaged flybacks and output tubes.



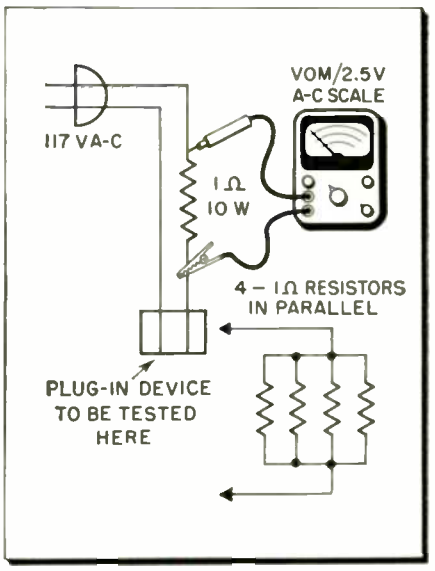


Fig. 6—Extension cord used for measuring power loads by employing a VOM's 2.5 a-c scale. By substituting four 1 ohm resistors, in parallel, currents up to 10 amperes can be measured on this scale.

By opening one connection in the radio, or by inserting the VOM/MA probes across the open on/off switch, as shown in Fig. 4, and operating the radio at normal volume, you learn quickly if a bad transistor or a low resistance short in the radio is running the batteries down prematurely.

Many horizontal output and high-voltage problems develop in some critically designed TV's because of a misadjusted linearity coil. The most practical way to check and adjust this coil properly is by inserting your VOM/MA in series with the horizontal output tube cathode and adjusting the linearity coil for *minimum* dip reading on the meter, as shown in Fig. 5. You can now be sure that the fly-back transformer insulation won't melt off or an output tube burn up because of a misadjusted linearity coil.

Power Load Problems

Power load checks on radios, TV's, and any kind of equipment can quickly be made with the milliampere and ampere scales of a VOM. First measure the voltage across the circuit load, then the current in series with the load, and use Ohms' law, remember?

$$P = E \times I$$

If you know what the normal power

(*Continued on page 44*)

ADVANCE NOTICE TO SUBSCRIBERS

PRICE TO BE INCREASED

During the past couple of years, every electronic magazine serving the maintenance industry has raised its subscription price—with one exception—Electronic Technician. Since its inception in 1953, ET has benefited its subscribers by holding the subscription rate down to its original introductory price.

Quite candidly, the economic realities of increasing postage, labor and material costs during the past seven years, coupled with the need for expanded reader services (more editors, more editorial pages, larger inquiry processing staff, etc.), make a price increase necessary.

Effective later this year, at a date to be announced, prices will go up about 8¢ per copy (or less for 2 & 3 year subscribers), which is a modest increase.

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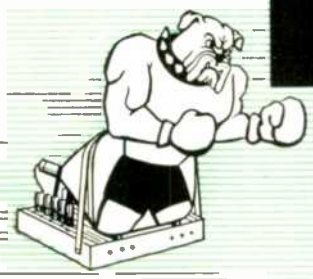

"Tough Dog" Corner

Difficult Service Jobs Described by Readers

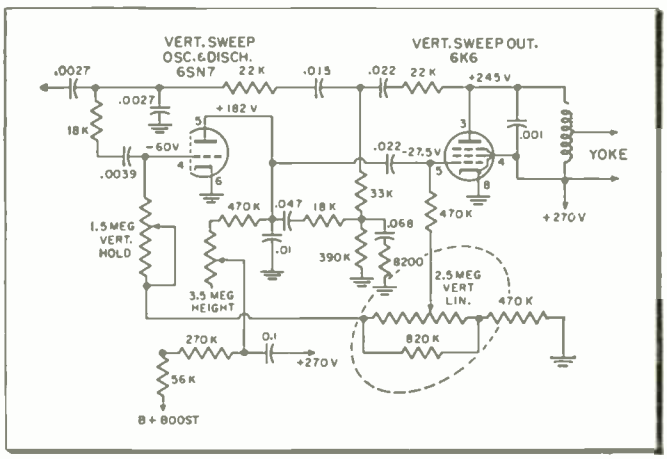

Fig. 1—"Peaked heads" was the complaint in this RCA KCS83 TV chassis. Problem was traced to a defective 2½ meg vertical linearity control, whose resistance (with all connections unsoldered) varied from 1½ to 10 megs as the shaft was rotated.

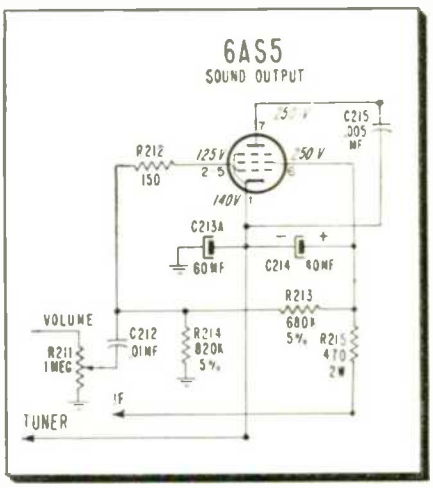

Fig. 2—Leaky coupling condenser to audio output grid caused channels 7 and 10 to fade out when volume control was varied.

Stretched Heads & Poor Vertical Sync

The TV was an RCA KCS 83C; a printed circuit chassis. My customer complained "the peoples' heads are too long" and the vertical hold is critical. Substitution of vertical output, oscillator, and sync tubes didn't improve the condition, so the set was taken to the shop.

Horizontal stability was rock-steady. Other than top-stretch and critical vertical hold (syncing at the end of the range), the set functioned normally. Adjusting the vertical linearity and height controls in this circuit changes the vertical hold position due to circuit inter-action, making it difficult to service by voltage checks.

I was able to check all resistances without unsoldering because of the way the circuits are laid out. Also, I checked and substituted all capacitors from the sync circuit to the output circuit, trying to obtain a linear picture. To no avail. After substituting one of the capacitors, a brief improvement was observed, but abnormal operation quickly returned.

Unsoldering the leads at the high end of the linearity control, disconnecting the 820K resistor, as shown in Fig. 1, I connected a VTVM ohmmeter between the center arm of the control and the high end. As I rotated the shaft, erratic resistance readings were observed. Investigation showed an intermittent condition in the control fitting that varied the control's resistance from 1½ to 10 megs, depending upon the position of the shaft.

Replacing the defective 2½ megohm vertical linearity control returned the set to normal operation.—*Robert E. Cox, Seattle, Wash.*

Volume Control Varies Video

The complaint on this Admiral 18XP4 was a loss of channels 7 and 10. Channel 4 was good. A new 6J6 oscillator was placed in the tuner, the set turned back on, and the volume adjusted. Channels 4, 7 and 10 all worked fine.

The following day the customer called to say that the set was having the exact same trouble. This time, because the customer's baby was asleep, we turned the volume down low—and sure enough, no channel 7 or 10. Channel 4 was good, though. The volume control was advanced just far enough to check for audio, and all channels were re-checked. Now 7 and 10 came in! Then, by mere chance, we turned the volume back down and the picture disappeared on both channels. Channel 4 was still OK.

The set was pulled to the shop and the chassis removed. A check with a VTVM showed the .01 μf capacitor from the volume control arm to the 6AS5 audio output grid, was leaking. (See Fig. 2.) Variation of the 1 meg volume control changed the voltage on the grid of the 6AS5. This, in turn, raised or lowered the 140 volt supply at the tube's cathode, which furnished B+ to the i-f's. It also varied the voltage going to the tuner. The weaker, original 6J6 was even more critical to these variations.—*Clyde M. Fuqua, Amarillo, Texas.*

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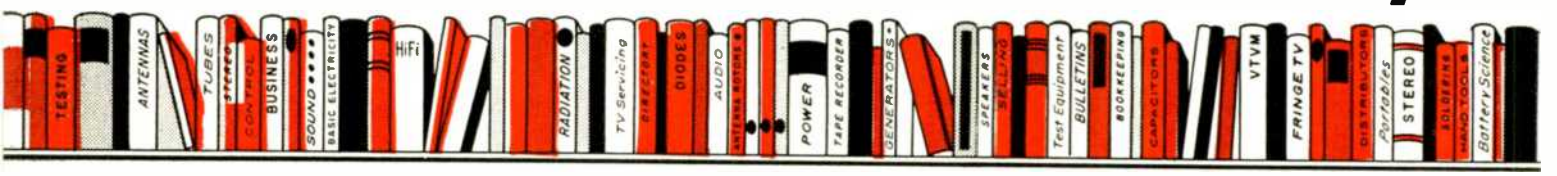

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Also See New Books on Page 58

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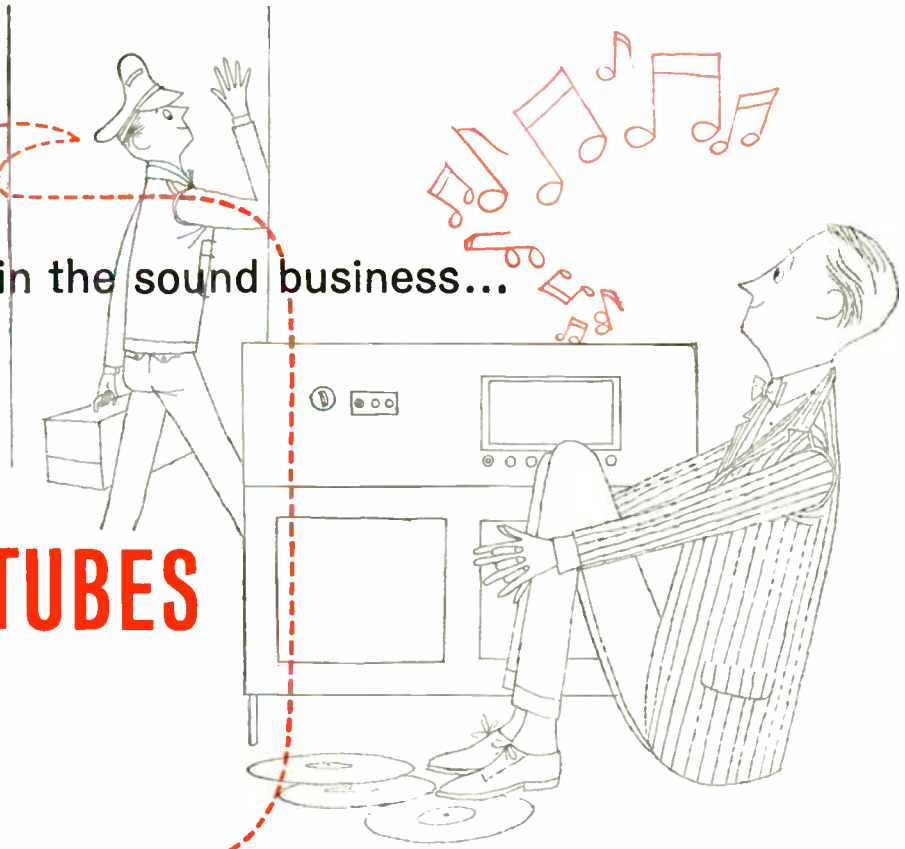

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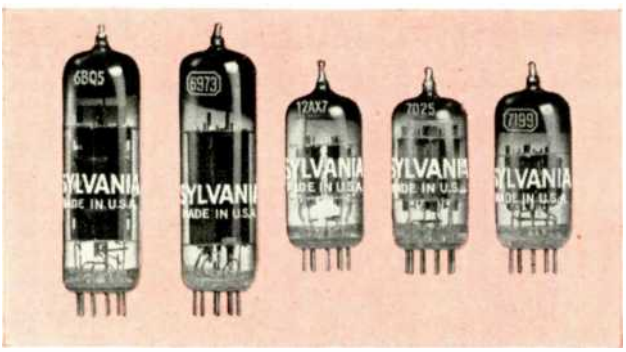

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SHOP HINTS

Tips for Home and Bench Service

Eliminating Vertical Jitter

This hint may save some technicians a few premature gray hairs. I learned the hard way.

There are untold numbers of RCA KCS 47's, 47T's, 47A's, and 47AT's, with 16GP4 CRT's, still in use; some as 2nd sets. And customers still get them repaired. I have had a number of these in the shop recently.

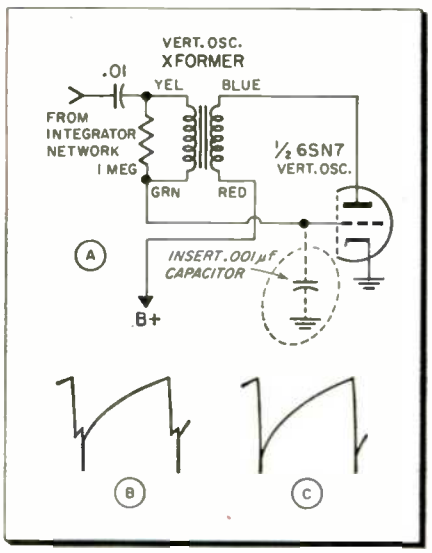


Fig. 1 (A)—Vertical jitter was eliminated by installing a .001 μf capacitor. (B)—distorted sync in waveform taken at the vertical oscillator plate of Ambassador TV. (C)—Normal waveform after installing capacitor.

After years of use many of these sets develop a critical vertical hold control range. With certain settings of the vertical height and linearity controls, vertical jitter takes place. The swing of the jitter is equal to several scanning lines, usually worse at the picture's top. Although most of the sets in for repair did not originally include this fault in the customer's complaint, most will call attention to it after the set is returned. They become accustomed to the fault over a period of years, simply forgetting about it—until the set is returned. Consequently, it is a good policy to include the cost of this fault in the original estimate and remind the customer about it before repair.

This fault has shown up even when the vertical oscillator transformer was replaced. All parts may check perfectly and dressing leads to eliminate stray coupling between horizontal and vertical, doesn't help. The only positive solution found was to shunt the vertical oscillator grid circuit to ground through a .001 μf, 600 v capacitor, as shown in Fig. 1A, slightly readjusting the vertical height and linearity controls.

After discovering this solution, another set, an Ambassador 17" chassis came into the shop for replacement of a vertical oscillator transformer. When replaced, the vertical jitter was very bad. When a .001 μf capacitor was shunted from the vertical oscillator grid to ground the jitter promptly disappeared. On the RCA receivers no appreciable change appeared on a scope trace of the signal from the oscillator output. On the Ambassador set, however, the trace changed from that shown in Fig. 1B to that illustrated in Fig. 1C.—*M. G. Goldberg, St. Paul, Minnesota.*

Sync Instability

Poor horizontal sync stability and a soft vertical hold condition in a GE "U4" chassis, can frequently be traced

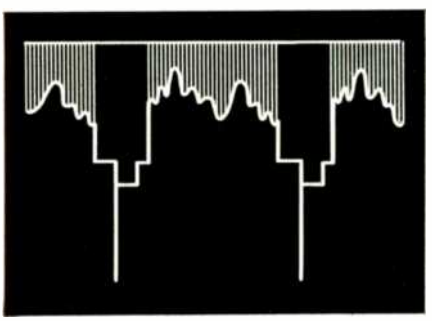


Fig. 2—Composite video waveform taken from the video detector at vertical frequency shows narrow, excessively peaked sync pulse spike, indicating open agc filter capacitor.

to an open agc filter capacitor, C-252.

When measured with a VTVM, the average voltage may be normal, but a scope examination of the waveform at test point VII (agc bus), shows the keyer pulse present. With the scope set to obtain two waveforms of vertical information (30 cycles), further checking at test point IV, at the video detector, shows an excessively peaked and narrow vertical sync pulse as shown in Fig. 2. This spike results from cancellation of agc at pulse time by the keying pulse, producing a greatly exaggerated sync spike which causes the instability.

The cure for this condition is to replace the capacitor. The red durez-dipped type capacitor should be used for replacement instead of the black molded case type.—*General Electric Co., Radio & TV Div., Syracuse, N.Y.*

Solder Dispenser

A very convenient, easy to use, solder dispenser can be made from a 5" or 6" length of hollow tubing ⅜" or ½" in diameter. I use a hollow

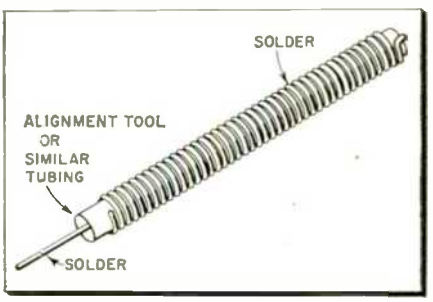
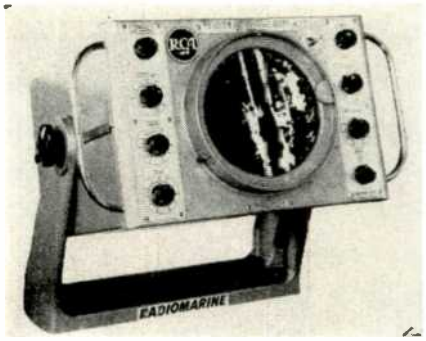


Fig. 3—Made from a length of hollow tubing, this handy solder dispenser is used like a pencil—eliminating a spool or loose coil.

composition type alignment tool.

A length of solder is first fed straight through the tube until it protrudes a few inches from one end. Winding is started at the opposite end and solder is wound around the tube until covered with one layer. It is then cut off. (See Fig. 3).

The holder is used like a pencil, and when more solder is needed at the "feed-end" it is simply pulled out from the tube, easily unwinding from the other end.—*G. R. Lince, Stratford, Ontario, Canada.*



RCA PPI radar-scope, Model CR-103.

Radar— How It Works

Understanding Typical Radar-Scope Display Systems

ALLAN LYTEL

Fig. 1—84-foot diameter "dish" on its 90 foot tower used to bounce radio signal from the planet Venus back to earth. Signal took about 5 minutes for round trip.

Fig. 2—Field assembly of AN/MPS-16 height finder radar antenna.

• Radar has developed from the early equipment that helped win the battle of Britain during world war II, into an indispensable tool of the hour. It is used to guide aircraft through storms, detect and track missiles, satellites, and provides man with long-seeing eyes through rain, fog, and darkness.

Radar signals, sent into space from M.I.T.'s huge research radar at Westford, Mass., in 1957 (Fig. 1), were bounced off Venus and returned to earth. This was man's first known contact with another planet and extended radar test ranging to 28 million miles.

Signal Corps tests, using a modified SCR-271 radar, sent signals to the moon and back as early as 14 years ago, but M.I.T.'s 84-foot dish is in a real sense man's first radar space-probe. The new MASER (Microwave Amplification by Simulated Emission of Radiation) sensitive low-temperature amplifier was used by M.I.T. in making the Venus contact.

A 265 kw UHF signal from the M.I.T. radar's 84 foot diameter parabolic antenna made a round-trip of 56 million miles to Venus and return. This was a long journey, consequently only a very small signal returned. Even though amplified by the low-noise maser, the signal was still so weak that special digital computer techniques were necessary to process the pulse data and confirm the Venus contact.

There are many types of radars including the height-finder (Fig. 2), the long-distance search radar (Fig. 3), and the ship-borne set shown in Fig. 4. Basic principle of operation of all types are about the same.

Operating Fundamentals

Arising from the words Radio Detection And Ranging, RADAR was originally developed primarily for detecting and ranging military aircraft targets. The ability of radar to spot unseen objects has proven important for peace-time uses, such as air traffic control and tracking of tropical storms for storm warning purposes.

Radar functions by bouncing back or reflecting a portion of its transmitted r-f energy from the object to be detected, displaying the reflected signals from the object on a CRT screen, as shown in Fig. 5. This is somewhat similar to the sound wave echo. The bat uses this system to avoid collision with objects in his flight path by transmitting an ultrasonic wave with its "voice" and picking up the echo with his ears.

Radar employs electromagnetic waves beamed in a straight line. The frequencies used are in the UHF band or higher. Since the speed of the radio waves is known, it is possible to determine the distance from the point of transmission to the reflecting object. This is done by measuring the time between the transmission of the wave and the return of its echo back to the starting point.

As we already know, radio waves travel at the speed of light, or approximately 186,000 miles per second. Thus, the round-trip for one mile takes about 10.75 μseconds. By transmitting pulses of r-f energy and timing their return, the distance to a target can be measured. When a pulse or burst of r-f energy is sent out, the receiver starts an "electronic

clock" which is stopped by the return signal. This elapsed time, when converted into distance readings, gives the target range. Direction of the antenna determines the bearing of the received target.

Radar Systems

Fundamentally, a radar system consists of approximately 14 essential units, as shown in the functional diagram in Fig. 6. While the design of some of the individual components may vary widely depending upon the radar's use, the function of each unit in different sets are primarily identical. Briefly, the system consists of a transmitter which sends out radio signals, a receiver which picks up reflected signals, and an indicator which shows the signals returned by a target. This indicator is a visual display on a cathode ray tube. Transmission systems used may be frequency modulation, frequency shift, and pulse modulation.

Unit Functions

A more thorough understanding of the role played by the various units indicated in Fig. 6 can be obtained by a brief functional description of each unit.

(1) The power supply, of course, provides the energy to the radar, including the modulator for feeding the transmitter. Both a-c and d-c is supplied to the set.

(2) Synchronizer components may be located in one integrated unit but in many sets they are distributed throughout other units. This is the "electric clock" system which provides the sync pulse timing requirements for the entire system. It is the radar's master oscillator. Both trigger pulses for timing the r-f oscillator firing with the rest of the system, and in some sets, a gating pulse to instantly turn the receiver on after transmitter firing are provided by this unit.

(3) The modulator is part of the transmitter and essentially acts as a switch. It stores d-c energy from the power supply and provides the energy for the transmitter in pulses. Pulses generated should be as near rectangular as possible.

(4) The transmitter generally employs a magnetron tube for providing r-f output if the system is operated in the microwave spectrum. A conventional type oscillator may be used on lower frequencies. Extremely high power units usually employ klystrons.

(5) This section of the wave-guide carries the transmitter r-f power to the T-R box (transmit-receive switch).

(6) Acting as an r-f switch or duplexer, the T-R box prevents the transmitter power from reaching and overloading the receiver. It also permits the returning r-f energy to go to the receiver.

(7) This section of the waveguide carries the transmitter's r-f energy to the antenna.

(8) The antenna radiates the r-f energy against the reflector which is facing in the proper direction.

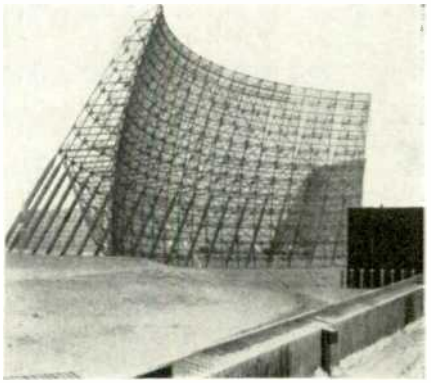


Fig. 3—One of the four giant long-range radar antennas, each 165 feet high and 400 feet long, used in BMEWS missile detection system located at Thule, Greenland.

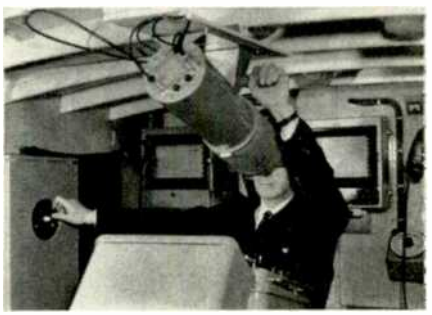


Fig. 4—Small-craft type radar unit shown mounted to bulkhead in the wheel-house.

(9) The reflector beams the r-f waves outward toward the target. generally in a 2 degree beam. The rotation of the radiator sweeps the

Fig. 5—A portion of the signal from the radar transmitter is reflected from the object, picked up by the receiver, and then displayed on the radar's CRT screen.

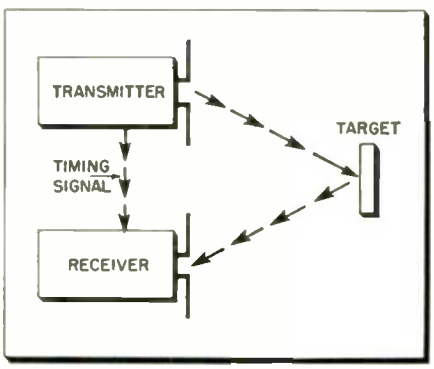
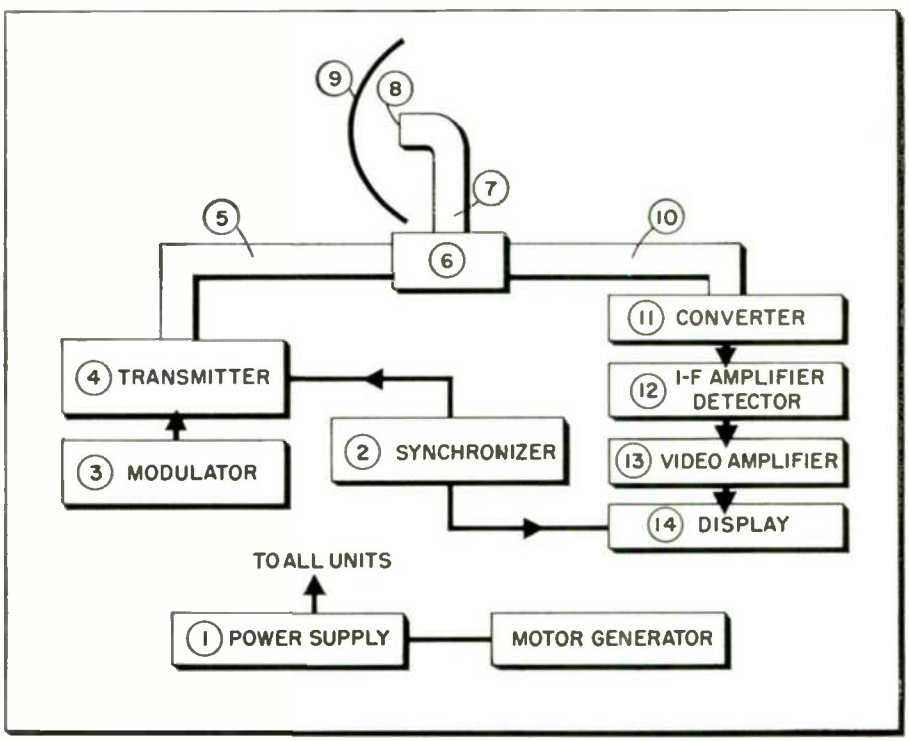


Fig. 6—Functional diagram showing individual units in a complete radar installation.



area under observation in a 360 degree pattern. The waves are reflected in all directions by any object they strike.

(10) Since the same reflector is used for both transmitting and receiving, this section of waveguide is employed for transferring the reflected return waves from the T-R box to the converter.

(11) The converter mixes the r-f return pulses with a local oscillator signal to produce the i-f frequency. These signals then pass to the receiver amplifier.

(12) The i-f signals are amplified here, the video pulses detected and passed on to the video amplifier.

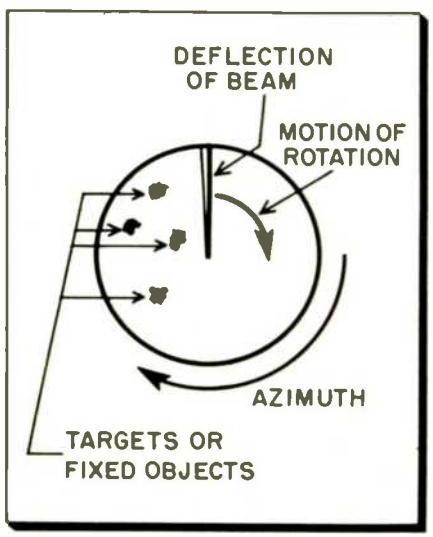
(13) The video signals are properly amplified and fed to the control grid of the indicator CRT.

(14) Visual display takes place at this point. Part of the indicator circuit includes the time-base generator which is controlled by sync pulses.

One system, a form of frequency-shift, employs the Doppler effect. If the source of radio energy or an object from which radio waves are reflected is moving rapidly toward or away from a stationary point, the frequency of the transmitted wave changes. Radar speed meters, employed in highway control, use this principle to determine roughly the speed of automobiles. Briefly, the system performs as follows:

The radar transmitter beams a signal at the object which must be moving directly away from or toward the transmitter/receiver point. The radar receiver picks up the reflected signal from the moving object, the frequency of which is decreased or increased through the Doppler effect. The frequency of the signal transmitted by the radar is also being picked up by the receiver. The f-m detector in the receiver responds to the change in frequency. The greater the speed of the object the larger the signal detected. The amount of frequency change is proportional to the speed of the object. Of course, if the object is moving crosswise to a radius drawn through it, the returning frequency is the same as the transmitter frequency, in which case the detector output is zero.

Fig. 7—The deflection yoke of the CRT rotates with the antenna on a PPI type radar. A complete map of the area swept by the antenna appears on the CRT screen.



CRT Indicators

As we have seen, visual information from targets is presented on the face of a radar's CRT. Fixed surface objects return many echoes to the radar receiver (ground clutter) and these appear on the indicator. In some cases it is difficult to track an aircraft, for example, close in to the radar installation when the radar is near buildings or hilly terrain. The technique of discriminating against fixed targets, and the display of only moving targets, is called moving target indication (MTI). The technique employs the Doppler effect in conjunction with proper pulse timing.

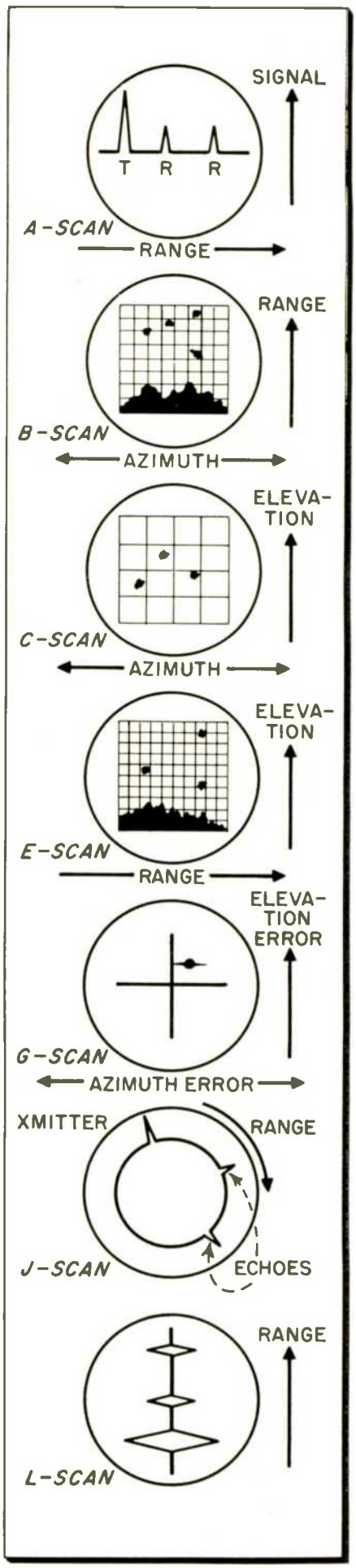
Another display system, known as a plan position indicator, (PPI) is shown in Fig. 7. The electron beam sweeps out from the center of the CRT to its outer edge. The deflection yoke rotates together with the antenna. Thus, the tube sweep which is the time base, indicates the direction of the antenna at any instant. Direction of a target's movement may be determined from the PPI sweep.

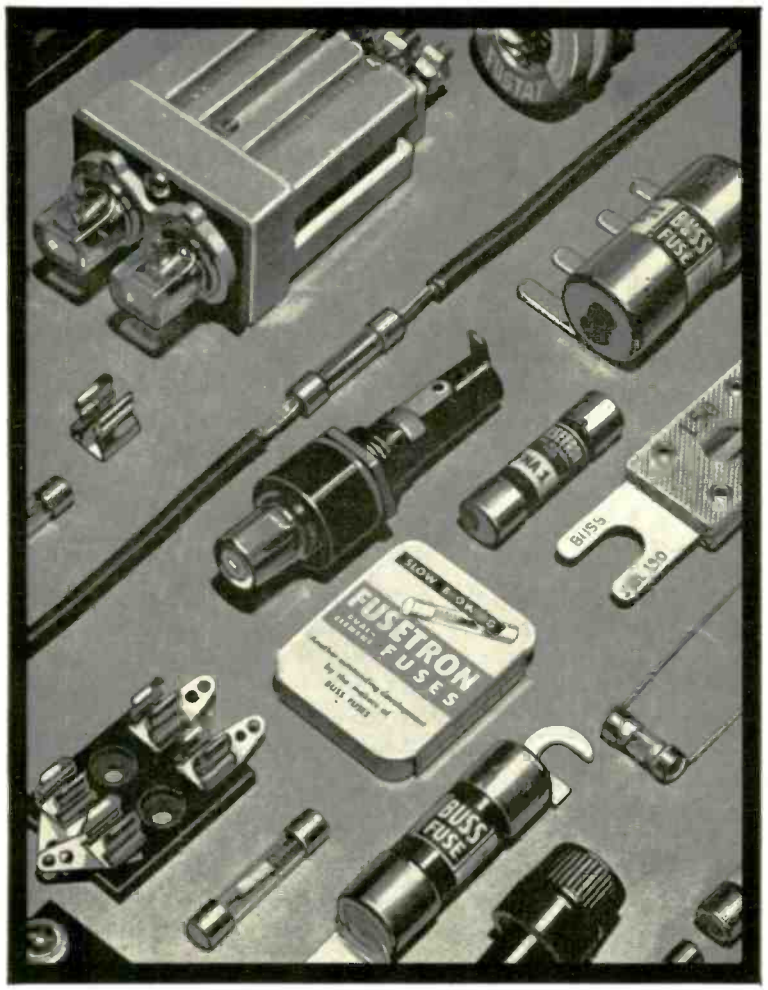
When the transmitted r-f energy strikes a target and produces an echo, the intensity of the electron beam and the spot is increased. A bright spot is placed and remains at that point on the screen, even after the scanning spot has passed. With this scan, the CRT can indicate a map of the area near the radar. This system is useful when the radar set is used as an aid to navigation.

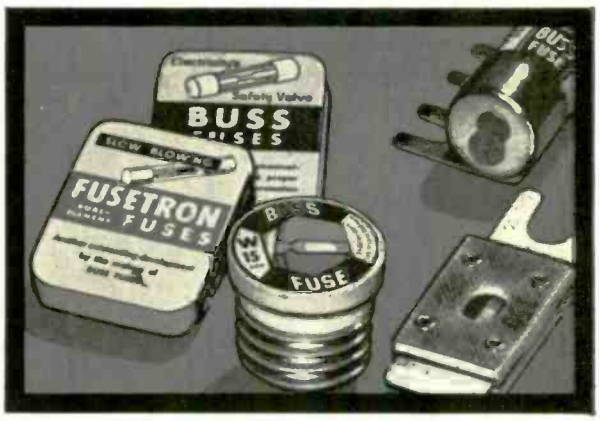
Other visual CRT displays can take several forms, as illustrated in Fig. 8. In the scan at 8A the spot has a constant intensity, starting the instant a

Fig. 8—Different types of scope displays employed in typical radar systems. ►

(Continued on page 42)







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Radar

(Continued from page 40)

pulse of energy is radiated by the transmitter. The spot moves across the CRT face and received echoes cause a vertical deflection of the spot. The horizontal distance between transmitted pulse (T) and the returned echo (R) represents the distance to the target.

The bearing (azimuth) at 8B as well as the range of reflecting objects are both shown. A directional antenna system is rotated which causes the radiated beam, in this case, to cover a horizontal plane. This motion causes the spot on the CRT screen to have a horizontal motion. The vertical motion from bottom to top of the screen is also given to the scanning spot and every vertical line is synchronized with the transmitter pulse. This vertical sweep is more rapid than the horizontal sweep and a raster is produced. When an echo or a returned signal is received, the signal is applied to the CRT grid, creating a bright spot. The position of this spot to the right or left of the center line of the screen indicates the azimuth of the target which is its angle to the right or left of the radar. The height of the spot above the base line, as shown, indicates the range or distance of a target.

The returned signal appears as a bright spot at 8C with the azimuth indicated as the horizontal, and the elevation angle as the vertical. This system has been used by night fighter aircraft.

The scan at 8E is somewhat similar to that shown in 8B. The echo appears as a bright spot with the range as the horizontal and the elevation vertical. This is frequently used by planes for blind landing.

Only the echo is presented on the CRT face in the scan illustrated at 8G. It appears as a bright spot on which wings grow as the distance to the target decreases. The azimuth appears as the horizontal and elevation as the vertical. This type of scan has been used for gun-fire direction.

The scan at 8J is a circular version of that at 8A. Here the spot rotates in a circle near the edge of the CRT face. An echo appears as a deflection from the circle. As the distance changes, the deflection moves around the circle. It is used in radar altimeters.

Another version of the scan at 8A is shown at 8L which indicates azimuth by comparing two signals from the left and right antennas. It is used in special radar homing applications.

Present radar systems are being developed and installed which have extreme long-range detecting ability. With these systems it is possible to "see" objects far beyond the horizon, thus providing warning signals for national defense. • *Information credit: D. S. Kennedy & Co., Cohasset, Mass.; Marconi International Marine Communication Co., Ltd., London.*

Latest New Products

CDE CAPACITOR KIT

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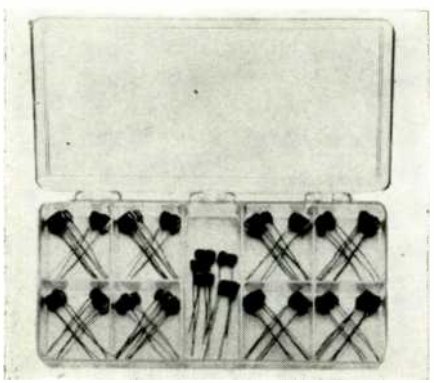


the dealer for the cost of the capacitors alone, at $10.20. The free case, provides an orderly dispenser for bench or home service, and, thereafter, can be utilized for small item storage. Cornell-Dubilier Electronics, 1006 Hamilton Blvd., S. Plainfield, N. J.

For more data, circle 8-42-1 on coupon, p. 46

Jackson AUDIO OSCILLATOR

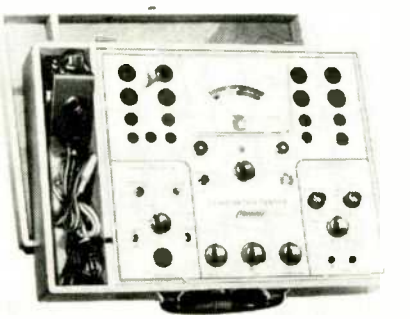
Model 605, a wide range oscillator that provides both sine and square wave output for checking hi-fi and audio-amplifier circuits, features push-button range selection and continuously variable output power. Range is 20 to

200,000 cps in four ranges. Accuracy is 3% or 1 cycle, whichever is greater. Output voltage: sine wave, 0 to 5.0 rms volts; square wave, 20 mv to 7.0 p-p volts $129.95. Jackson Electrical Instrument Co., 124 McDonough St., Dayton, Ohio.

For more data, circle 8-42-2 on coupon, p. 46

Mercury COMBINATION TESTER

Model 300 combination tester incorporates a versatile multiple-socket tube tester, an advanced design CRT tester-reactivator and a volt ohmmeter (20,000 ohms per volt). The tester checks emission of over 700 types, including



OZ4's, gas regulators, and foreign tubes. The reactivator tests quality of every black and white or color tube, including 110° tubes. VOM tester specifications include: d-c, 20,000 ohms per v; a-c, 5,000 ohms per v. $99.75. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y.

For more data, circle 8-42-3 on coupon, p. 46

VOM

(Continued from page 31)

load is for the equipment being checked you now know if trouble exists in the equipment and, if so, the basic reason why. If the meter is designed with a-c current facilities you can make accurate load checks in the a-c supply line to the particular piece of equipment. (The TV nameplate usually lists the power drawn, as 150 watts, 200 watts . . .)

Even if the meter has no a-c current range, it can still be used to measure the power drawn by any device by using the set-up in Fig. 6.

With an accurate 1 ohm, 10 watt resistor in the cord, and using a 2.5 v a-c scale on the meter, current ranges from about 100 milliamperes to 2.5 amperes can be recorded. By using 4 of these 1 ohm resistors in parallel, in place of one, the 2.5 v a-c scale can be extended × 4 to 10 amperes. The current multiplied by the line voltage measured under load, will give relatively accurate wattage. For example, if the line records 118 v, up to 1180 watts can be calculated. If the power factor of the device under test is known, a closer approximation of the wattage can be derived. This is an excellent method for checking a-c motor loads against their normal full-lead ratings.

Transmitter Checks

CB, mobile and other type radio transmitters can be tuned to resonance from their oscillator outputs to the final amplifier with a VOM/MA. Check of the transmitter's final amplifier input in watts, a requirement of the FCC, can also be easily made.

To tune the transmitter, insert the meter in series with the plate tank circuit, by-passing the meter with a suitable capacitor ranging from .01 to .005, depending upon frequency of the r-f, as shown in Fig. 7A. Tune C-1 or the slug L-1, depending upon tuning facilities provided in the transmitter's tank coil, to give *minimum* dip on the meter. If the transmitter's oscillator output is untuned, then begin in the next tuned circuit whether plate or grid. Next, as shown in Fig. 7B, insert the VOM/MA in the grid of the frequency multiplier. Readjust C-1 or L-1, for *maximum* reading on the meter. Then move the meter to the plate circuit as likewise shown in Fig. 7B, and tune C-2 or L-2 for *minimum* dip.

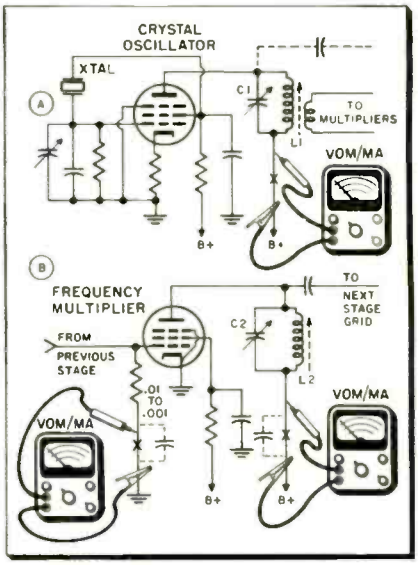


Fig. 7—All r-f stages of a radio transmitter can be accurately tuned to resonance with the oscillator's frequency by adjusting for *maximum* current reading in grid and *minimum* current reading in plate circuits.

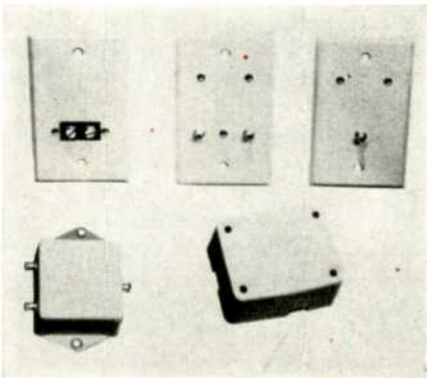
For more data, circle 8-44-1 on coupon, p. 46 ▼

Proceed in a similar manner from stage-to-stage through the transmitter's final amplifier tuned circuits. Each stage is now adjusted to operate efficiently at the crystal oscillator's frequency. Remember: *maximum* current reading in the grids, *minimum* current in the parallel tuned plate circuits. If you want to know the power input to the transmitter's final amplifier, measure its plate voltage, multiply by current.

In addition to a number of commercially available high voltage, multiplier and demodulator probes available for extending the usefulness of the VOM, there are also adapters available for converting the meter into a transistor tester, VTVM, thermometer, audio wattmeter, etc. Furthermore, virtually scores of additional pieces of external equipment can be easily designed and constructed by the technician for further increasing application ranges. The number of possible uses for this no-warm-up, completely portable instrument is limited only by the ingenuity of the technician or plant engineer. •

B-T TAPOFFS AND SPLITTERS

An advanced series of splitters, baluns and tapoffs, said to satisfy all installation requirements of antenna systems, is available for 75 ohm, 300 ohm, or mixed impedance systems. Flush or wall mounted. Coax may be plugged into a solderless fitting and used with a quick disconnect. Flat 300 ohm line is inserted directly into "no-



strip" connectors. Included are: Model TF-771 75 ohm tapoff, $2.70 list; TF-771B, $3.95; TS-771B, $4.30. Three 75 ohm solderless line splitters are: TF-772B, $5.85; TS-772, $5.20; TS-774, $7.50. Four 300 ohm "No-Strip" tapoffs are TF-331, $1.75; A-331A, $2.65; TF-731B, $3.00; TS-731B, $4.30. Two 75 ohm to 300 ohm baluns are TF-731, $4.30; TS-731, $3.40. Blonder-Tonque Labs., 9-25 Alling St., Newark, N. J.

For more data, circle 8-45-2 on coupon, p. 46

Clear Beam INDOOR ANTENNA

A new slim line indoor antenna designed to blend with new TV set styling offers four section telescoping dipoles which extend to a full 36". Models H6M

and H6B, in both blonde and mahogany finishes feature heavily weighted bases. For added merchandising appeal, Slim Line indoor antennas will be packaged in a new display type, "see-through" pliofilm package. Clear Beam Antenna Corp., Canoga Park, Calif.

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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.

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3 Contact Spray: Current literature covers "Contact Shield," a new spray that cleans, lubricates, and protects electrical contacts of all types. Channel Master.

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5 Pricing Digest: Literature is available covering Vol. 4, No. 1, all new edition of Dave Rice's Official Pricing Digest. Electronic Publishing Co.

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8 Tubes: Literature is available covering the new S-5347 silicon rectifier tube. It replaces 12BW4 and 6BW4 vacuum tube rectifiers. Sarkes Tarzian, Inc.

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10 Rectifiers: A new 42-page silicon rectifier handbook and catalog includes technical data, illustrations, specifications, and dimensional drawings. Standard Rectifier Corp.

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11 Tap-Off: "Tap-A-Line," which provides multiple taps from a single power source, is described in current literature. Tap-A-Line Mfg. Co.

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12 Stereo Tape Recorders: Model 722 all-new stereo record tape recorder, a portable unit that records stereophonically on 4 tracks, is covered in current literature. Voice of Music (V-M).

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8-10-1	8-20-6	8-46-4	8-48-6	8-55-2	8-62-5
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8-12-1	8-20-8	8-46-6	8-49-2	8-57-1	8-62-7
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For more data, circle 8-47-1 on coupon, p. 46

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Seco PORTABLE CB TEST SET

Model 500 combination crystal checker, r-f signal and field strength meter checks citizens band transmitters and receivers, and is ideal for servicing crystal controlled aircraft communications, marine gear, remote controls and fleet radio equipment. It

is self-contained, portable, and is powered by a 1.5v "C" battery. 15' remote cable included. The unit supplies low power, minimum interference test signal of unmodulated or modulated r-f signal. $29.95. Seco Electronics, Inc., 5015 Penn Ave. S., Minneapolis, Minn.

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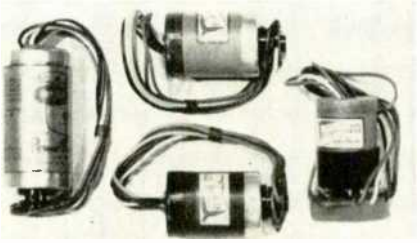
Perma-Power TUBE BRITENERS

Four new TV tube briteners are: model C 412, for all series wired sets with 110° button base regardless of filament voltage rating, which requires no switching or adjustments on any

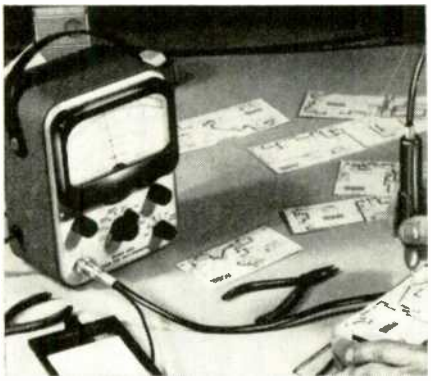


110° series set; companion unit, model C 403, for all duodecal base series wired sets; model C 411 for use in parallel wired sets with 110° button base, all heater ratings; and model C 311, a new Universal type britener for 110° button base sets. Perma-Power, 3100 N. Elston Ave., Chicago 18, Ill.

For more data, circle 8-48-4 on coupon, p. 46

Philco "TRACE"

A new testing device, for pinpointing faulty circuits and components in transistor radios, is a facsimile of the actual radio circuitry. It aligns with the radio printed circuit chassis panel and diagrams a complete test procedure. Panels contain color-coded cir-



cuit paths and printed locations of major components that match various chassis in the firm's transistor radio line. Visual identification is made of the r-f, i-f, and audio signal paths antenna to speaker. Voltages, and component data are included. Philco Corp., Tioga & "C" Sts., Philadelphia 34, Pa.

For more data, circle 8-48-5 on coupon, p. 46

Scott STEREO AMPLIFIER

A new, improved version of the 299 complete stereo amplifier is announced. Model 299B features such improvements as: tape monitoring provisions for easier tape recording; an extra high level input for connection of an electronic organ and an increase in power to 50 watts measured by stringent IHFM standards. This additional power enables the unit to drive a pair of low efficiency speakers plus extension speakers throughout the house. $209.95, east of the Rockies. H. H. Scott, Inc., 111 Powdermill Rd., Maynard, Mass.

For more data, circle 8-48-6 on coupon, p. 46

For more data, circle 8-48-2 on coupon, p. 46

Damper Circuits

(Continued from page 29)

arity are often solved by examining the damper pulse on an oscilloscope. Using the manufacturer's schematic as a reference for proper waveforms, it is simple to cross-check your findings.

Fig. 4 is an example of a proper wave-form coupled from a set to the oscilloscope. Fig. 4 also shows improper wave shape, which indicates poor horizontal linearity. Don't neglect your scope for a visual check as a supplement to meter readings in the damper section. Damper distortion is visually indicated as clipped or irregular waveforms.

Although damper tube circuitry is essentially simple, that is, comparable to any other rectifier circuit, don't let your guard down. Extensive use of B+ boost to other sections can be deceiving. Therefore, don't neglect checking this allied circuitry. •

Sylvania TUBES

"Ten Pin" miniature electron tube utilizes the regular 9-base pin arrangement of the conventional T-6½ miniature envelope with an additional pin centered in the pin circle. This new design in miniature receiving tubes, which combines multiple circuit functions in a single bulb or envelope, should reduce chassis designing costs by simplifying circuitry and wiring. The first tubes to incorporate the new design are a double tetrode for use as an r-f amplifier and oscillator-mixer in FM tuners and receivers; and a triple triode for use as an r-f amplifier, oscillator-mixer and afc control. Sylvania Electric Products, Inc., 730 Third Ave., New York 17, N. Y.

For more data, circle 8-49-3 on coupon, p. 46

ADDENDUM, JULY 1960

Service Citizens Band Radios

Illustration & information credits: Figs. 6 & 7, Poly-Com Model PC-IID, Polytronics Labs., Clifton, N.J.

ERRATUM, JULY 1960

New Products, page 75

Raytheon Co.'s "Ray-Tel" Citizens Band Radio described. Photograph of Pearce-Simpson Model CBD-1 appeared in error.

Starting A Sound And Intercom Business

How To Get The Business
How To Make The Sale
How To Estimate Costs

M. S. Sumberg, BOGEN-PRESTO

• The commercial sound and intercom field offers a fertile area for the qualified radio-TV or industrial electronic technician to diversify, expand, and substantially boost his average income. By completely ignoring this potential, many technicians are missing a stable growth opportunity.

Very conservative figures have been accumulated which indicate that the average town with a population of 100,000, for example, has approximately 2,000 prospects who have a need for commercial or packaged sound equipment. This represents important "plus" business, over and above home hi-fi, TV, or radio.

Basic Requirements

What does it take to be successful in the sound field?

First, you must have or obtain the know-how to sell, install, and service this equipment.

Second, if you do not have a flair for salesmanship, you must learn the techniques. We do not mean the flashy, obnoxious sales attitude portrayed in novels; nor the high-pressure type sometimes seen in the movies. This type salesmanship never proved successful. The real salesman is a sincere, friendly, dignified businessman who meets people with a quiet ease, inspiring respect and confidence because he knows precisely what he is talking about in every detail. Knowledge is a prerequisite for the type of self-confidence that produces notable sales results.

Getting Started

It does not require any great stretch of a technician's imagination to visualize business prospects in the field. Industrial paging and intercommunication systems are being installed in practically every modern business office, factory, and store today. Many installations include background music facilities. Other installations are made in day nurseries, doctors' offices, clinics, and group-practice set-ups. Most schools have one or more systems, with additional facilities being planned. Many new homes are having various systems installed, including sound monitors from children's room to various parts of the house: basement, laundry, garage, etc. Nightclubs, restaurants, motels, and retail stores, are using some form of sound system, including back-ground music. Both manufacturer and sound equipment distributor can usually provide new ideas on additional applications.

The average TV-service dealer or industrial electronic technician is technically equipped to handle this business. All that is required is a little planning—some additional effort. The first move should be in the direction of contacting a manufacturer or distributor who can provide a complete line of equipment.

Although most normal sales leads come from telephone inquiries, direct-mail or other types of advertising, including knocking on doors, a well-planned effective "business getting" campaign in the sound and intercom field goes much deeper. Every local organization that offers an "in" to business should be contacted. Some of these are as follows:

1. Rotary, Lions, Kiwanis, The Chamber of Commerce service clubs, and country clubs.
2. Trade organizations.
3. State registrar of contractors or contractor's licensing bureau.
4. State or county board of education for school information.
5. State or county board of technical or professional registration for professional architect and engineer contacts.

Sales-lead services can be obtained from a number of professional organizations. Two of these are: Dodge Construction Reports, and the Business Extension Service. Once you have a list of prospects, contact can be direct, by phone or mail.

Answering Inquiries

When your phone rings and you find yourself voice-to-voice with your first inquiring prospect, you should already be thoroughly prepared to follow through to the ultimate sale and installation. To operate successfully, your prospect must have a genuine need for the product, and, if he does not immediately recognize this need, your job is to show him. Most of your inquiring prospects will fall into two main categories:

1. A potential customer who needs

equipment but must be convinced of his need. He must also be convinced that it is to his advantage to spend money to meet the need. You have to sell him 100%.

2. This prospect has a genuine, immediate interest. He acknowledges that he has a sound problem which he wants solved. He is already half sold. The other half calls for efficient, courteous and thorough follow-up.

Your telephone should be handled at all times by a well trained intelligent person. "This is Miss James, Interstate Sound Service, may I help you please?" can be an important step in the proper direction.

Survey And Quotations

Keep your appointments and arrive on time. Your personal appearance is important at this point. No one wants to do business with flashy clothes or with baggy trousers. And you are "beat" at first contact with a 24 hour beard.

A careful survey of a prospective installation is the key to a realistic cost estimate. Consider all variable factors involved. This will convince the customer that your quotation is near the mark and not inflated to cover guessed-at contingencies. Sketch the floor plan of the areas to be served by the system. This should include walls, floor, ceiling, and attic space. Physical problems and length of cable runs should be noted. Agreement on physical appearances, exposed cable runs, etc., should be reached with the customer. Availability of electrical outlets for master stations or amplifiers should be noted.

Prepare an exact equipment list for the job. Enter itemized cost prices, extend them and show total cost of the complete job. Make a step-by-step summary of the installation. Each step is translated into man-hours, in turn, into dollars. Do not forget to add social security, taxes, insurance, transportation, supervision, etc., or any other expense involved in giving the customer one hour of labor. When this is totaled you will come up with a true labor cost. This might mean $1.50 more per hour than the originally assumed hourly labor charge.

You now must multiply the *true* labor cost by the estimated number of man-hours required for the job and you will have a realistic estimate

of labor costs. When this is added to the cost of material, the complete job cost is fixed. But not quite. It should be multiplied by your previously determined fixed overhead constant. For a profit on your investment, it must be multiplied by your profit constant. You are now ready to present a realistic estimate to your prospective customer. Always add a few cents to your quotation ($347.75, $296.50, etc.).

Close The Sale

You have spent a lot of time and effort analyzing the customer's problem, surveying the job and preparing an honest quotation. If you don't close the sale you have wasted your time.

There are no mechanical rules for successful application to closing a sale. But there are fundamental procedures that raise the odds in your favor.

Do not waste your time explaining your quotation to a "flunkey," who has to get an ok from higher up. Determine in advance if the person you are dealing with has authority to sign an order for the job.

Don't be afraid of asking for the order. There are a number of approaches.

"We can begin work tomorrow morning. Just sign here, Mr. Smith."

Or, "We can arrange financing if you like, Mr. Smith. Sign the order here, please."

Or, "Do you prefer natural or mahogany speaker enclosures?"

If you can't think of any of these things, just say: "If you will please sign the order we will start the installation right away."

If you fail to click and the prospect is undecided and says he will "call you later," don't hesitate, answer: "I am out most of the time handling business, let me call you." You are still in control of the situation. If the customer does not sign the order at this point, try to discover why.

Ask the customer: "Is the price in line with your ideas?" Or, "Can we help with our financing plan?" Or, "Do you have a better figure?"

When the installation is made, the customer should be taught how to use and get the most from his equipment. Do not rush off and forget this vital part of an installation. •

Information Credit: "Getting Started In the Sound and Intercom Field." By Bogen-Presto, Paramus, New Jersey.

Tarzian RECTIFIER

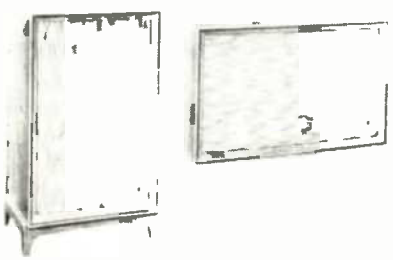
Type S-5347 silicon rectifier tube is announced to replace 12BW4 and 6BW4 vacuum tube rectifiers. Also may be utilized in rectifier applications which require 1,600 PIV at 500 ma d-c. It has a 9-pin miniature base and will replace 12BW4 and 6BW4 in citizens

band transceivers. Provides increased d-c output from the rectifier, and better regulation and high reliability. No filament power is required. $13.00. Sarkes Tarzian, Inc., Semiconductor Div., 415 N. College Ave., Bloomington, Ind.

For more data, circle 8-53-3 on coupon, p. 46

Jensen SPEAKER SYSTEMS

The new "Decorator Group" speaker systems include the TR-30 TRI-ette (shown) a 3-way system utilizing a 12" Flexair woofer for bass response to 25 cycles. Power rating is 30 watts (60 peak) $159.50 net or unfinished at $134.50. Also the new GALAXY III consists of three units: a Bass-Center Unit and two satellites. Each satellite contains an elliptical speaker for the 350-



4000 cps range and a compression tweeter for 4000 cps to beyond audibility. $229.50 net or unfinished at $195.50. Model F-3 is a 4-speaker 3-way system using a specially designed 10" long travel Flexair woofer. 2 specially designed midrange units take over from 2000 to 10,000 cps. $79.50 unfinished only. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.

For more data, circle 8-53-4 on coupon, p. 46

ASSOCIATION NEWS

California

CSEA, Fresno, has formed a Western Council of Electronic Service Associations to sponsor and direct a major electronic consumer products parts show covering 11 Western states. The show has been proposed for the summer of 1961, to be held either in Los Angeles or San Francisco. Format will be geared to the interests of the electronic service industry. The state organization elected the following officers: Pres., Robert Whitmore; V.P., Jerry Strauss; Sec., Howard Bogue; Treas., Earl Robbins.

The San Fernando Valley chapter of CSEA, elected the following officers: Pres., Ernest C. Larsen; V.P., Conrad Breil; Sec.-Treas., Ed Stevens.

TSA, San Francisco, members started an initial 20 week advertising campaign in the top-circulation daily, News Call Bulletin. Theme of the ad, Double Warranty on TV Repairs, points out: (1) "Your repair work is guaranteed by the dealer doing the job. (2) The dealer's work is guaranteed by the San Francisco TSA—a non-profit trade association dedicated to serving the public with honesty, fairness and dependability."

TV Business School

RTA, San Jose, Santa Clara Valley's business school for shop owners and technicians is showing considerable progress. The 10-weeks, one-night a week series, being held in San Jose City College, emphasizes the shop owner's need for maintaining accurate business records as a prime pre-requisite for avoiding business failure. Numerous recordings of interviews with successful shop owners around the country are used as the course take-off. G.E.'s profitable Service Management course is used for the course text. This is supplemented by lectures on accounting, book-keeping, and tax record practices.

Indiana

IESA, Fort Wayne, has elected the following officers: Pres., Jay Schupbach; V.P., Tom Hardy; Treas., Clyde Smeltzer; Rec.-Sec'y., Paul Evans; Corr.-Sec'y., John Crocker.

Massachusetts

ETG, Boston, announced election of the following officers: Pres., Alfred Nickerson; V.P., Patrick LaFauci; Sec'y., Ted de Bryun; Treas., Albert Giddis.

Michigan

NARDA, Kalamazoo, president Carrol McMullin, advised appliance and radio-TV dealers to "hang on to your service privilege." McMullin said NARDA has taken the stand that dealers should have the right to service the merchandise they sell if they can do it satisfactorily.

Missouri

TEAM, St. Louis, reports that the Honorable Tom J. Stubbs, Kansas City, in division 5 of the Circuit Court of Jackson County, Missouri, has recently declared void the Kansas City License Ordinance regulating the service of TV receiving equipment. Judge Stubbs declared that the Council of Kansas City does have charter authority to adopt an ordinance regulating the service of TV equipment, but the definition of TV service in the present ordinance was altogether too broad and unreasonable. The city is said to be planning

to introduce a completely new ordinance which it hopes will not include objections found in the one voided.

Pennsylvania

LVEA, Allentown, has elected the following officers: Pres., Clarence Eck; V.P., John Griffith; Sec'y., George Beisel; Fin.-Sec'y., Peter Patterson; Treas., Louis Rosati.

Anti Pay-TV Stand

TSA, Delaware Valley, has ratified a petition, sponsored by FRTSA state association of Pennsylvania to the FCC, objecting to licensing pay-TV systems. The state association has taken the stand that pay-TV is a form of captive service. The organization has asked promoters and manufacturers of the systems a number of questions which they have not yet answered. Some of the questions include: Will independent service dealers be allowed to install the coin-operated units? Will the set owner be limited to calling a pay-TV authorized service company for repairs? The following officers were elected: Pres., Louis J. Smith; V.P., Herman Shore; Corr.-Sec'y., Charles Sonnenberg; Rec.-Sec'y., John Hadfield; Treas., John McCloy, Jr.

Washington

TSA, Yakima, announced that representatives from fourteen areas of the state have set up the Washington State Electronic Council and adopted by-laws governing its operation and incorporation. The council will meet periodically to discuss all problems facing the electronic industry, including public relations problems.

TSA, Seattle, declares that the recently appointed Citizens Evaluation Committee for Local Industrial Training has found that the Radio and Television Service section of the Edison Technical school is not fulfilling its intended purpose of supplying adequately trained and acceptable technicians to the service industry. Important factors contributing to this failure included: Haphazard selection of applicants, mixing of various level students into the same class, obsolete test equipment, shop work not related to class-room instruction, and failure of instructors to keep pace with developments in a rapidly changing industry. Graduates, it was said, are unsuitable for employment, either as advanced apprentices or as technicians. The committee recommended that if the entire program is not immediately revised, it should be terminated entirely. The report stated that present conditions result only in a waste of students' time and tax funds allocated for the purpose.

ONE OF A SERIES

THE PRACTICAL APPROACH

Robert Cornell

Coaxial Cable or Flat Transmission Line?

Unfortunately, there is no single answer to this question. But, there are certain rule-of-thumb situations that help the technician arrive at a proper conclusion. Arguments between those who hold out for coax cable and those who champion flat line, have persisted since the early days of TV. As a matter of fact, many early TV receivers called for 75 ohm coaxial cable. This, of course, did not preclude the use of 300 ohm flat line with appropriate matching transformer. The fact that most, if not all, new sets are equipped with 300 ohm antenna terminals does not necessarily mean that the 75 ohm advocates were wrong.

It could have been price, low loss, ease of installation, industry practices, or a host of other practical reasons that caused the adoption of the 300 ohm balanced flat line as standard . . . At least, we can readily obtain from distributors' stock, 300 ohm antennas, 300 ohm wire, and other 300 ohm accessories to match the 300 ohm input of TV receivers (even if, in many cases, the so-called 300 ohm antenna wire, or set, is actually anything *but* 300 ohms.)

Conditions that determine characteristic impedance are extremely complex and almost impossible to control for all-channel reception. Fortunately, however, a considerable amount of mismatch can be tolerated, and may often go unnoticed. Of course, mismatch could be responsible for loss of signal, distortion, ghosts, sync problems, and many others.

Impedance match is only one consideration . . . and the chances are that the inconsistencies in rated impedance would show up in either 75 or 300 ohm systems. What about susceptibility to stray noise pick-up and other interference? Here, coaxial cable is desirable; but even 300 ohm line can be given a gentle twist to minimize, if not eliminate stray pick-up.

What about ease of handling? This is a toss up. It depends upon a technician's experience. Much of the problem of preparing lead ends, in both types of lines, has been simplified. Stripless terminals, quick disconnects, and other fittings put both types of transmission on par with each other in this respect.

What then are the factors involved in making a choice? Cost? Perhaps. If the line is going to run inside a metal conduit, or rest against fairly large parts of a building, especially metal parts, then coax is a must. If the run is external and exposed to lots of moisture, losses could run up to 6 db per 100 feet at 100 mc for flat lines, whereas coaxial cable losses for RG-11/U is 2 db, and for RG-59/U is 3.5 db, under most atmospheric conditions. For dry conditions, flat line has the edge; losses are minimal and are approximately 1 db for each hundred feet. However, losses on flat line cannot be predicted as well as on coaxial cable. Each contact, even with stand-offs, or variations in dress of flat line will cause variable and often unpredictable amounts of loss.

One advantage of coaxial cable is that even with its greater losses, attenuation can be more accurately predicted because of its relative immunity to external environment. In larger systems where amplifiers, line splitters, and other accessories may be used, and where signal conditions must be predicted at various receiver sites, coaxial cable is usually installed.

Since all types of equipment and accessories are now available for either type of transmission line, experience and cost will usually dictate the type of line to be used. On small installations, generally you will be safe with flat line.

WHETHER you use 300 ohm line or 75 ohm cable, Blonder-Tongue makes it easy for you to come up with a matched, positive installation in the fastest possible time. Blonder-Tongue TV amplifiers, splitters, tapoffs and other accessories are equipped with stripless terminals for 300 ohm connection. A new solderless coax connector was recently developed for speedy, positive 75 ohm connection. For further information, contact the Sales Engineering Dept., Blonder-Tongue Laboratories Inc., 9 Alling Street, Newark 2, N. J.

For more data, circle 8-56-1 on coupon, p. 46

Optical Sound

(*Continued from page 27*)

himself owns one. Operating the unit a few times will familiarize the technician with threading of film, controls and switches that are used. It's as simple as operating a tape recorder.

As far as the mechanical side of projectors are concerned, any technician who can trace and service the mechanical linkage of a record changer shouldn't experience any

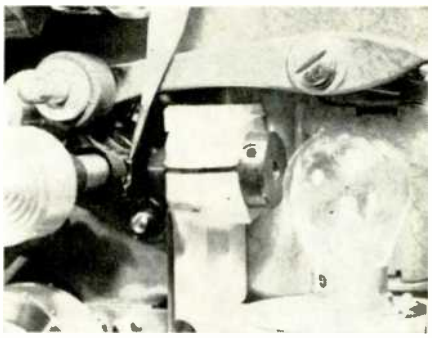
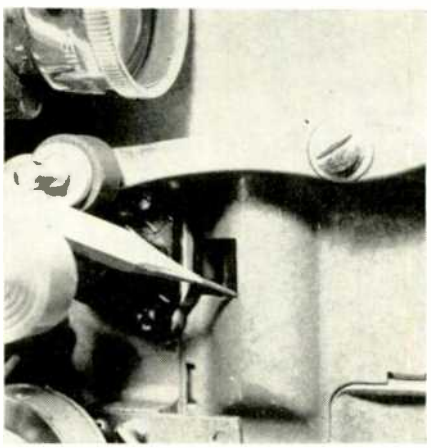


Fig. 7—Optical sound system's mirror.

difficulty with a portable movie projector.

The most common mechanical defects are due to worn belts: motor drive, rewind and take-up. Electrical defects are pretty much standard: line cord, switches, fuses; nothing that the experienced technician can't quickly detect. In addition, the projection or exciter lamps may need replacement, as may the small fan motor. The replacement lamps or fuses should have the exact electrical rating of the original. For example, if the original projection lamp has a rating of 750 watts, the cooling system may not be able to adequately ventilate the heat emitted by a 1,000-watt lamp. Film damage may result if heat is excessive.

Fig. 8—The photoelectric cell is always well hidden to avoid any stray light.



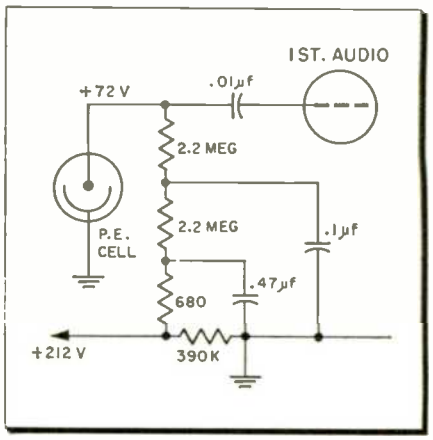


Fig. 9—This photoelectric cell loading circuit shows thorough decoupling of the voltage supply. Slight variations, such as coupling impedance combinations and adjustable resistors to vary the PE potential, are also encountered.

Servicing the sound system of a movie projector for complete absence of sound should begin with checking the exciter lamp. No light is usually the result of an open lamp filament (although a dead oscillator tube or transformer failure is also a possibility).

If the lamp is operating, be certain that the focused light is being reflected into the PE cell. Directing the light of a flashlight at the PE cell and moving it back and forth would result in a "thud" sound in the speaker if the cell and amplifier were normal.

Assuming that the exciter lamp is operating and its light is being focused and reflected correctly, a routine check of the amplifier is the next service stop to take. Check the amplifier tubes, after determining that power is being supplied to the unit, of course. The projector lamp and motor switch may be left in the "off" position when checking the sound circuit. If the tubes are good, a signal generator can be used to isolate the defective section while a VOM or VTVM is utilized for resis-

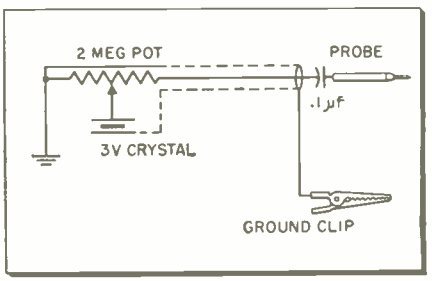


Fig. 10—Audio source for signal injection troubleshooting when audio generator is not available. The 2 meg pot adjusts gain.

ance voltage checks in the suspected area.

If an audio signal generator is not available, any good audio source may be used for signal injection. In fact, I use a record player with the probe connected directly to the cartridge through a 0.1 μf capacitor, and across a 2 meg potentiometer, as shown in Fig. 10. The pot in the record player is important as an attenuator to check approximate gain. Injecting the signal from grid-to-grid, as shown in Fig. 11, and working from the speaker toward the input, the volume should increase progressively up to the anode connection of the PE cell.

When the defective component is located and replaced, a final check can be made by interrupting the light beam between the aperture and the film. This can be accomplished with any appropriate object. If operating properly, the audible result is a pronounced click or thud in the speaker.

Weak or otherwise impaired sound could indicate a defect in the amplifier. Normal audio troubleshooting

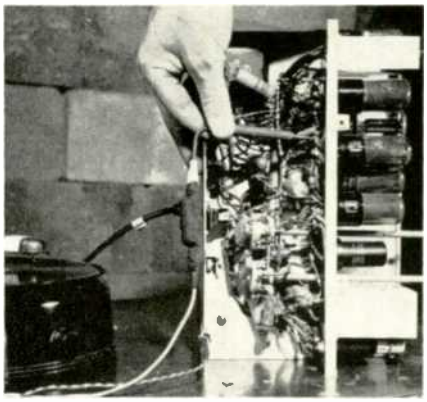


Fig. 11—Audio signal probe used with record player assists author's troubleshooting.

techniques will locate the defect. However, impaired sound can also be due to a weak exciter lamp (it should emit a clear, white light), or, a dirty focusing lens, reflection mirror or PE cell aperture. These parts may be cleaned with a soft #5 camel hair brush, lens tissue and a mixture of pure grain alcohol and water. Some toothpicks will also be handy for cleaning purposes. Wrap lens tissue around the toothpick to get into those tight corners. Avoid scratching any surfaces, though.

Don't forget to clean the exciter lamp, too. (Do not clean a *heated lamp!*) Don't leave any fingerprints or smudges on any surfaces, since this can adversely affect sound. Another important precaution: do not disrupt the lens setting. The light beam must line up precisely in order to obtain proper activation of the PE cell.

Although optical sound projectors differ from make-to-make, a little mechanical talent and experience, coupled with average electronic know-how, makes sound projector servicing fair game for any electronics man. •

COMING
in September
ELECTRONIC TECHNICIAN:

STEREO 1961

New Books

Books marked with an asterisk (*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

***FUNDAMENTALS OF TRANSISTOR PHYSICS.** *By Irving Gottlieb. Published by John F. Rider Publisher, Inc. 152 pages, soft cover. $3.90.*

A thorough theoretical analysis of the action of semiconductors, written in an easy-to-understand language is presented here. Beginning with a clear description of atomic structure of matter, the author moves logically through an adequate review of the nature of electricity and current flow through materials. Reaching the fundamental transistor, the author compares basic functions and circuitry with comparable aspects of the vacuum tube. Related semiconductor devices such as the double base or tetrode transistor, four-layer diode, bilateral transistor, Zener, etc., are covered. The more recent tunnel diode is likewise considered. For those desiring to know more about the fundamental physical aspects of transistor functions, this book offers a condensed, easy-to-absorb source of essential information.

***CLASSIFICATION OF ELECTRON TUBES.** *By J. Haantjes and H. Carter. Published by The Macmillan Company. 96 pages, soft cover. $3.50.*

An unusually colorful pictorial-text presentation describes the basic operating principles and applications of a multitude of different type electron tubes in this Netherlands-printed book. Beginning with a brief description of the atom, free electrons, and the theory of thermionic, photo, ionic, field and secondary emission, the authors describe methods of classifying various electron tubes. Rectifiers, high frequency triodes, tetrodes, and secondary-emission type pentodes are covered. Magnetrons, klystrons, travelling wave and X-ray tubes are likewise detailed. Cathode ray, timing indicator, counter, photo-electric, photomultiplier, image orthicon, vidicon, thyratrons, and other special types are described in detail with cut-away color illustrations. The section on applications is well illustrated with black-and-white photographs. Information contained in the book can prove helpful to the student, as well as the advanced technician and engineer.

***TUBE CADDY TUBE SUBSTITUTION GUIDE BOOK.** *By H. A. Middleton. Published by John F. Rider Publisher, Inc. 56 pages, soft cover. $0.90.*

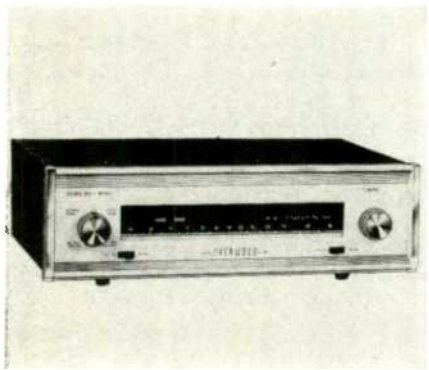
This tube substitution guide, including a list of foreign tube substitutions, is designed for caddy use. The pocket size booklet includes direct substitutions only, and is divided into four sections. Substitutions with a "good" or "excellent" coding is found in Section 1. Section 2 lists some ruggedized tube type substitutions, and Sections 3 & 4 includes European-American and American-European substitutions. It can be a handy addition to the technician's tube caddy or work bench.

***PRACTICAL TRANSISTOR SERVICING.** *By William C. Caldwell. Published by Howard W. Sams & Co., Inc. 192 pages, soft cover. $2.95.*

Here's a genuinely practical servicing book, unlike many that incorporate the word "service" in their titles. Beginning with a basic discussion of transistor theory, and circuitry, the remainder of the text commendably illustrates how to isolate troubles in transistor portable radios and auto radios. One chapter each is devoted to Normal Transistor Voltages and Defective Voltages And Their Meanings. Other chapters include: Testing Transistors and Case Histories of Actual Troubles. Test meter connections for ohmmeters and voltmeters are illustrated throughout the book, adding to its practical flavor. This is a decidedly value-packed basic transistor servicing volume and will, no doubt, be enthusiastically received by radio-TV technicians.

Sherwood STEREO TUNER

Models S-3000 III, FM/multiplex stereo tuner incorporates a unique FM "corrective" inverse feedback circuit. 3 db of inverse feedback is applied through a special network from discriminator to afc tube, and the effect is to increase the discriminator equivalent to 1,100 kc and the i-f equivalent



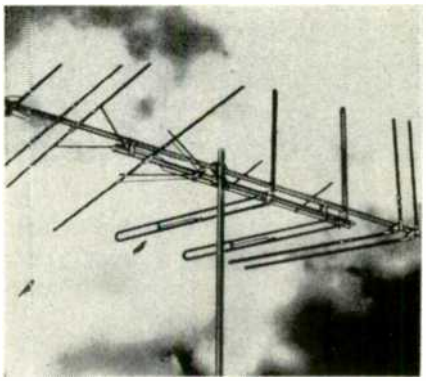
bandwidth to 290 kc, without sacrificing selectivity. Sensitivity, 0.95 μv for 20 db quieting and 1.8 μv for the IHFM standard of 30 db. Hum and noise, —60 db. Response, 20-20,000 cps ±½ db. Chassis, less case, $110.50. Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill.

For more data, circle 8-59-2 on coupon, p. 46

TACO ANTENNA

T-Bird improved broad-band yagi antenna for channels 2-13, virtually eliminates side lobes. Features include: t-match coupling for high and low band; new signal injector; new cradle-lok bracket; and power-grip saddle with built-in clips. Three models, available in plain or in gold-anodized aluminum: 707-5 for suburban service, 5 parasitic and 2 driven elements; 707-6 for fringe areas, 6 parasitic and 3 driven elements; and 707-8, which has 6 parasitic elements, 4 driven elements. Technical Appliance Corp., Sherburne, N. Y.

For more data, circle 8-59-3 on coupon, p. 46



Schober ORGAN TUNER

Autotuner, a new pocket-size stroboscopic device, is designed to fine-tune electronic organs in minutes. Its operation requires no technical or musical skill. Simply place the microphone near the speaker, or connect the test cable to the organ's output or speaker coil, and play 13 notes. Each note is tuned until the appropriate pattern in the unit's window stops moving. Accuracy, 1/100 semitone. Complete with microphone and test cable. Assembled $69.50. Kit, $49.50. Schober Organ Corp., 43 W. 61 St., New York 23, N. Y.

For more data, circle 8-59-4 on coupon, p. 46

Audio NEWS LETTER

SHURE has re-issued its reactance slide rule priced @ $1.

ROBINS announces 3 rigid record changer covers listing @ $6.95 each.

STROMBERG-CARLSON names Bernard S. (Tommy) Tucker Los Angeles hi-fi dist. mgr., William C. Potter for Minn.

JENSEN INDUSTRIES introduces a line of phono drive wheels, idlers, pulleys, tires and belts in a "Wheel Deal" display rack.

GENERAL INDUSTRIES announces the K-4 "Dial-A-Speed" phonomotor, a knob controlled 4-speed refinement of its earlier lever controlled motors.

BOGEN-PRESTO Pres. Joseph N. Benjamin resigns his position for personal reasons, effective June 30. The new president is Harold A. Goldsmith, former top executive of Magnetic Amplifiers.

V-M introduces 5 portable phonos which range from $29.95 to $99.95. A variety of consoles list up to $1025. The new line of changers incorporate a diamond needle at no price increase.

SHERWOOD adds four authorized service stations to handle local repairs, bringing current total to 23. Included are: Baker's Hi Fi Service, Baton Rouge; Pittman TV Service, Knoxville; Scherrer Instruments, St. Louis; and Audio Service Labs., Irvington, N.J.

ASTATIC publishes a 40-page needle catalog, N-61, covering the company's complete needle line. First part is a replacement guide, and the second a master cross-reference. Director of Sales G. Leonard Werner resigns from the position he has held for the past six years.

1960 N.Y. HIGH FIDELITY SHOW is cooperating with dealers to distribute discount tickets at stores. Upon $10 worth of purchases at a participating dealer, admission price will be refunded. N.Y. Chapter of ERA will distribute posters and pre-register dealers.

BIRMINGHAM SOUND REPRODUCERS' U.S. outlet changes name from Discus (USA), Inc. to BSR (USA) Limited.

ARMOUR RESEARCH has demonstrated a 3-3/4" diameter tape cartridge using 1/4" tape. Adapters are said to make operation on today's recorders possible.

"Compactron" Multi-Function Tubes

• Transistors have another competitor for the "replace-the-vacuum tube" market, G-E's "Compactron." This development consists of a line of tubes—each one containing the working functions of several vacuum tubes within its glass envelope. Two compactrons, for example, can replace the functions of five tubes (12BE6, 12BA6, 12AV6, 35W4, and 60C5) in a radio, as shown in Fig. 1. Another compactron replaces a TV set's horizontal oscillator and afc tubes (6CG7 and 6AL5).

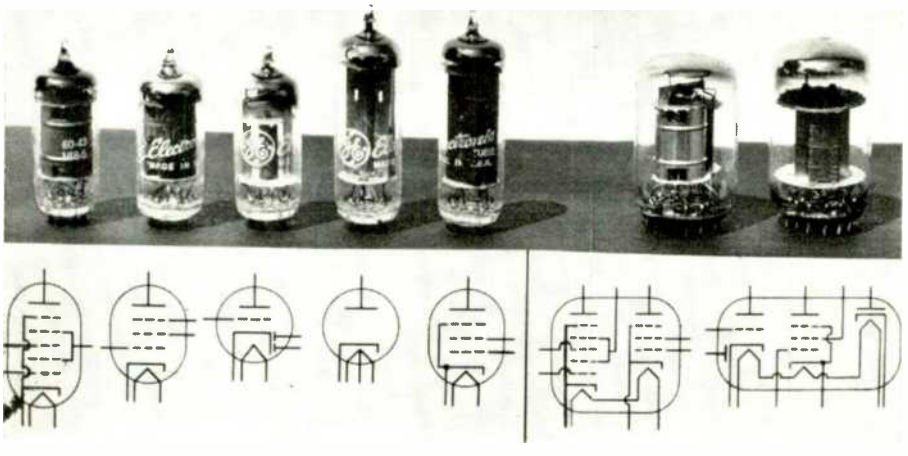
Physically, compactrons are about 1⅛" in diameter and vary in seated height from 1 to 2¾", resembling short, squat, standard miniature vacuum tubes. The compactrons now scheduled for production use 12-pin connections, with the envelope exhausted from the bottom, unlike standard tube exhausts from the top. A cross-section view of a compactron is illustrated in Fig. 2.

The new tube innovation is said to permit adequate isolation of the plate from other electrodes in high-voltage operation, using two "blank" pins on either side of the plate connection. An arc rating in the order of 10,000 d-c volts is claimed. New metallurgical developments assisted the designers. For example, a new anode material is said to reduce heater power requirements of the cathode by as much as 40%.

Some compactrons replace conventional tubes on only a one-to-one ratio because of maximum power requirements or high voltages. These single-function compactrons are also said to be significantly smaller than the vacuum tubes they replace.

The compactrons' space-saving attribute is emphasized by the working functions they can offer: Two compactrons equal five tubes or seven transistors in a home radio. Seven compactrons and 1 diode equal 15 tubes and three diodes, or 23 transistors and 11 diodes, in black and white TV. Compactrons offer color TV 15 compactrons as against 22 tubes and 2 rectifiers, or 36 transistors, 5 tubes, 1 diode and 1 rectifier.

Fig. 1—Two "compactron" tubes, pictured at right, replace the 5 radio tubes at left.



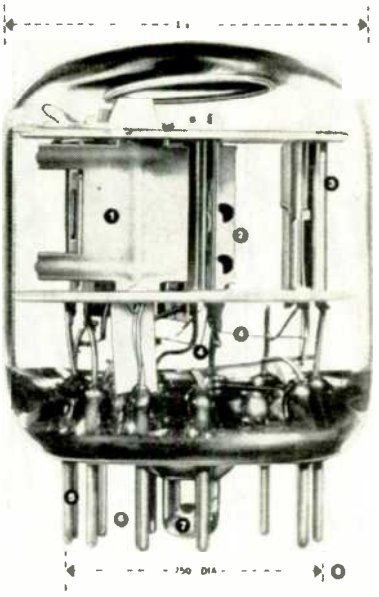


Fig. 2—A single compactron containing the working functions of a pentode, triode, and duo-diode tubes.

A G-E spokesman pointed out that tubes offer greater distortionless power output than transistors; in effect, sounding better at higher volume. In addition, transistors cost 50% more than tubes. Contrasting compactrons with tubes, G-E expects compactrons to reach a cost of up to 20% less per function than tubes. The compactron size is, of course, a desirable feature when compared to the larger space needed for equivalent standard tubes.

The multi-function compactrons could lower manufacturing costs through fewer sockets, smaller cabinets, and lower assembly costs. The radio-TV service dealer may sell more "tubes" in a compactron set, since one defective "tube" means replacement of the several "tubes" contained in a compactron, but service time may be reduced.

G-E plans to introduce approximately nine more compactrons in the next 12 months, in addition to the six units they presently have in development. Long range plans indicate a line having from 75 to 100 types. •

Shure CARTRIDGE

M8D stereo standard dynetic cartridge, designed for use with record changers, is completely compatible. Frequency response. 30–15,000 cps. Channel separation, more than 20 db at 1,000 cps; Tracking force. 5 to 8 grams. Vertical and lateral compliance,

3.0×10^{-6} cm per dyne. Output voltage, 5 mv per channel at 1,000 cps. The cartridge has four terminals, but is adaptable to three-terminal arms. It has standard mounting centers of ½" and 5/16". Including a 0.7 mil diamond stylus. $16.50. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

For more data, circle 8-62-3 on coupon, p. 46

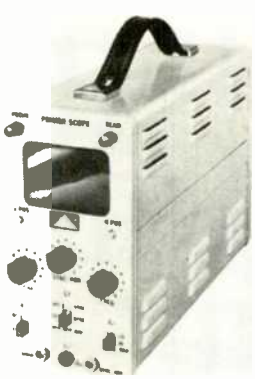
Raytheon RECEIVING TUBES

Six new receiving tubes are: 12FR8 and 12FX8, for automobile radios; 6EZ8, 9-pin, miniature triple triode designed as a one-tube tuner for frequencies as high as the FM band; 6AN8A, class A amplifier, direct replacement for 6AN8; 6EV5, high frequency sharp cutoff for use as the r-f amplifier in VHF tuners; and 12FQ8. 9-pin miniature twin-triode with 4 plates, two for each triode section. Raytheon Co., Distr. Products Div., Westwood, Mass.

For more data, circle 8-62-4 on coupon, p. 46

Waterman OSCILLOSCOPE

Primer Scope Mark I, a new versatile factory wired and tested instrument, measures 3½" x 7" x 10". Unit ratings: vertical, 1v peak to peak per



inch d-c to 75 kc, 25 millivolts RMS per inch 20 to 75 kc; sweep, 20 cps to 20 kc continuously variable in 3 steps; sync, amplified, internal and external; horizontal, 1.5v peak to peak per inch, d-c to 75 kc; and modulation, convertible to modulation monitoring. $69.95. Waterman Products Co., 2445 Emerald St., Philadelphia, Pa.

For more data, circle 8-62-5 on coupon, p. 46

V-M STEREO RECORD TAPE RECORDER

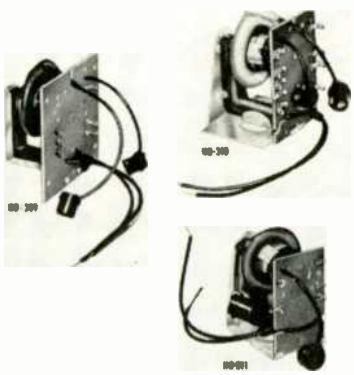
Model 722, an all-new, portable, tape recorder records stereophonically on 4 tracks. It offers mono and 2 track or 4 track stereo playback. Dual microphones, dual mike input jacks and a dual tuning eye make it possible to

record stereo. It also incorporates the firm's "Add-A-Track" feature which permits recording on one track; rewinding the tape, and recording again on a second track while listening to the first. $259.95. Matching model 168 auxiliary amplifier speaker, $75.00 completes system. V-M Corp., 226 Pipestone St., Benton Harbor, Mich.

For more data, circle 8-62-6 on coupon, p. 46

Stancor FLYBACKS

Three new exact replacement flyback transformers are used in Emerson TV sets. Stancor HO-309 replaces Emerson parts 738138 and 738138A; Stancor HO-



310 replaces Emerson 738142 and HO-311 replaces Emerson 738155. These exact replacements are used in 141 Emerson models and chassis without any circuit or chassis alteration. Chicago Standard Transformer Corp., 3501 Addison St., Chicago 18, Ill.

For more data, circle 8-62-7 on coupon, p. 46

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August, 1960

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