

ELECTRONIC TECHNICIAN

Including 16 pages of
Circuit Digests

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TV ANTENNA HORIZONS
for SALES & SERVICING

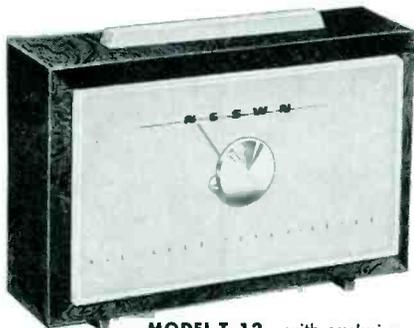
50¢

September • 1957

FULL **C** **O** **L** **O** **R** TV



MODEL U-98—first and finest fully automatic rotator. Eye-appealing decorator colors—Ivory, Forest Green and Standard Mahogany Grain. Retail **\$44.25**



MODEL T-12—with exclusive Tenna-Teller Pointer—highly accurate. Striking, modern design. Forest Green and Ivory or Standard Mahogany. Retail . . . **\$34.25**
Decorator Colors priced \$2.00 extra.

demands reliable



DON'T ASK VIEWERS TO PUT UP WITH A 'STAY-PUT' ANTENNA!

- TV authorities admit the higher sensitivity of color.*
- Viewers won't tolerate weak, washed out color!
- Maximum directivity with ALLIANCE TENNA-ROTOR is the best insurance for top antenna performance—for FULL COLOR!

Wherever you find Color TV, it will pay you to recommend Alliance!

- Every color TV buyer is a potential Tenna-Rotor sale . . . even in metropolitan areas. Because the "**fringe**" area for color is closer to the transmitter! Viewers who might tolerate black and white TV that's "so-so", will **not** put up with irritating, "ghosty" color. And independent interviews **at point of sale** show that color TV customers find it **easy** to say Yes to Alliance Tenna-Rotor!

*Practically all TV authorities agree "color is critical"—more sensitive than black and white. "Chromatic gradation" with color that's ghosty, is harder on the eyes than black and white. Many recommend properly installed outdoor antennas with rotators, to improve directivity of the antenna, to help overcome interference and reduce annoying effects caused by the higher sensitivity of color, and the normal characteristic of **color** to "drop out" quicker.

Ride the Trend to Color . . .

and soak up those extra profits with Alliance! Tie in with the longest and strongest TV campaign in TV accessory history! Remember . . . Poor color is worse than no color . . . and Alliance Tenna-Rotor is the sensible answer!

**THE ALLIANCE
MANUFACTURING COMPANY, INC.**

(Division of Consolidated Electronics Industries Corp.)

ALLIANCE, OHIO

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Including
Circuit Digests

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September, 1957

FRONT COVER

TV antenna sales and servicing continue to be a primary source of technician income, both in metropolitan and suburban areas. Old antennas worn out by the weather, or outmoded by newly improved designs, are excellent replacement prospects . . . and real merchandising opportunities for the enterprising service technician. To boost your antenna servicing know-how, don't miss the article starting on page 38.

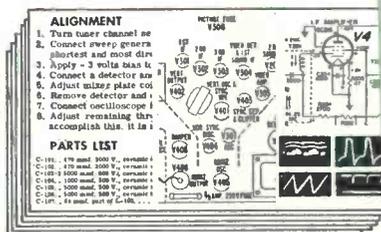
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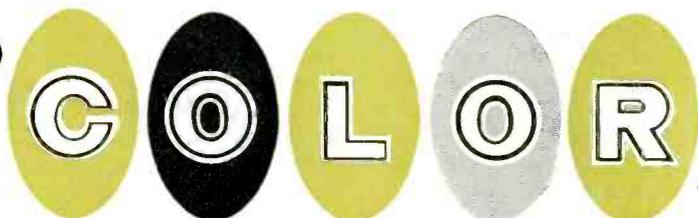
CIRCUIT DIGESTS



how to pick up the chips in the



Non Color-Blind **HELIX**



Yes Mr. Service Dealer

Your thousands of Colortenna orders and reorders prove it . . .

You like the idea of an integrated antenna line that assures you the right antenna answer for every reception problem . . .

You like the idea of the red helix which identifies the Colortenna to prospects as an outstanding performer in black and white and color . . .

You like the big prizes and trips you win in the fabulous Colortenna Sell-A-Bration . . .

You like the hard-hitting local advertising and promotion that pays off in Colortenna sales in your store . . .

You like the ready-made customer acceptance and confidence that Colortenna performance builds for you . . .

NOW WITH BRILLIANT ALCOA SPEC.

And in 1958

You'll love the spectacular new JFD Colortenna line that will send your antenna profits rocketing to new highs. Put its dynamic selling power to work for you by seeing your JFD distributor now.

CASH IN ON THE SELL-A-BRATION SWEEPSTAKES!

Over \$100,000.00 worth of prizes given so far to TV dealers and servicemen!

3 GRAND PRIZES TO SERVICE-DEALERS

with highest totals for season, September 1, 1957—March 31, 1958.

Winners to be announced May 19, 1958.

First Prize ALL-Expenses Paid Trip for Two to Paris

Second Prize

Third Prize

Fourth Prize

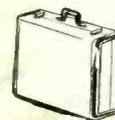
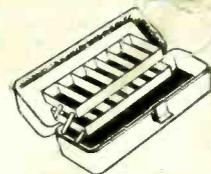
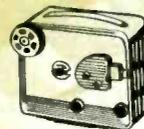
500 FREE PRIZES!

500 Ladies Case
by 38 Wonder-Helix—WX811

500 Men's "Quick-Tripper"
by 40 Wonder-Helix—WX811

500 Aluminum Fishing Tackle Box
by 11 Star Helix—SX711S

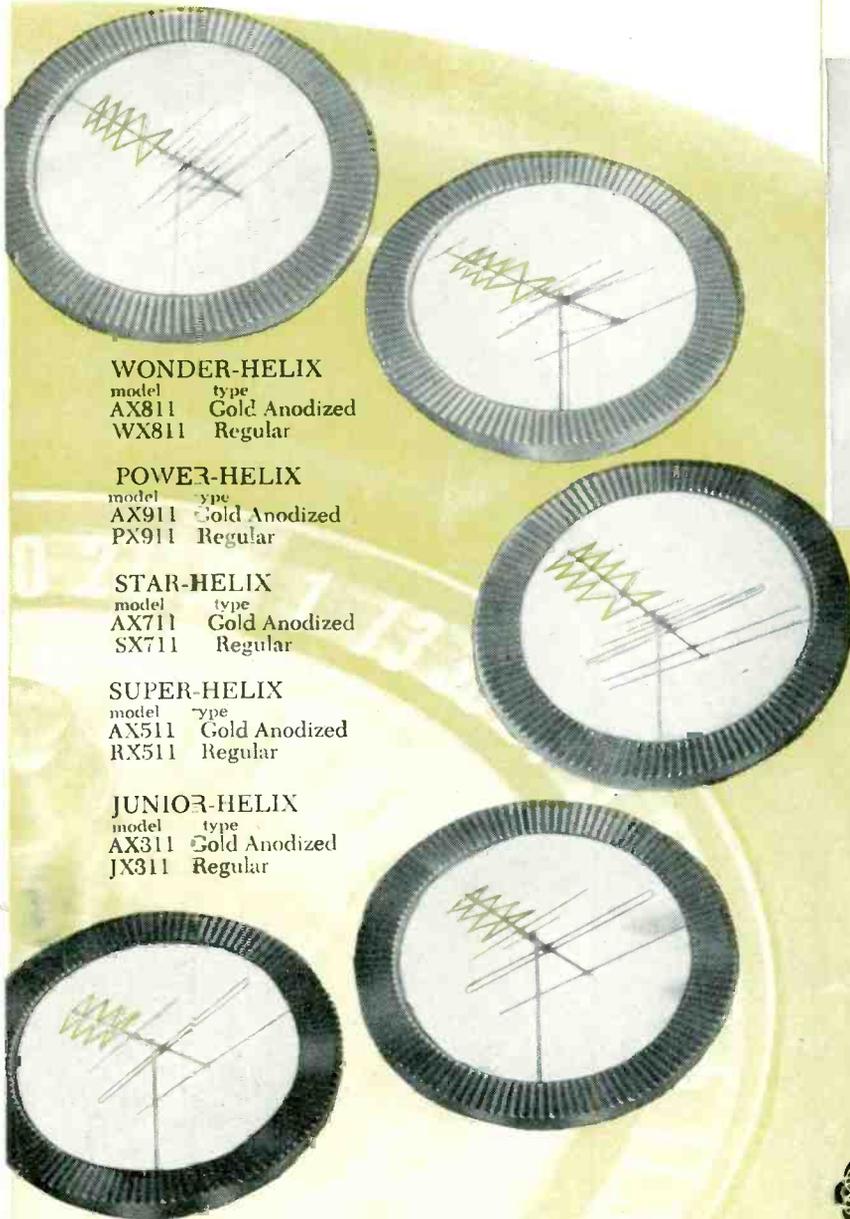
500 AND-NAME PRODUCTS



TV Antenna Market

TENNAS[®]

SUN-FAST GOLD ANODIZING!



WONDER-HELIX
 model type
 AX811 Gold Anodized
 WX811 Regular

POWER-HELIX
 model type
 AX911 Gold Anodized
 PX911 Regular

STAR-HELIX
 model type
 AX711 Gold Anodized
 SX711 Regular

SUPER-HELIX
 model type
 AX511 Gold Anodized
 RX511 Regular

JUNIOR-HELIX
 model type
 AX311 Gold Anodized
 JX311 Regular

GLEAMING GOLD ANODIZING GIVES YOU MORE TO SHOW!... MORE TO SELL!

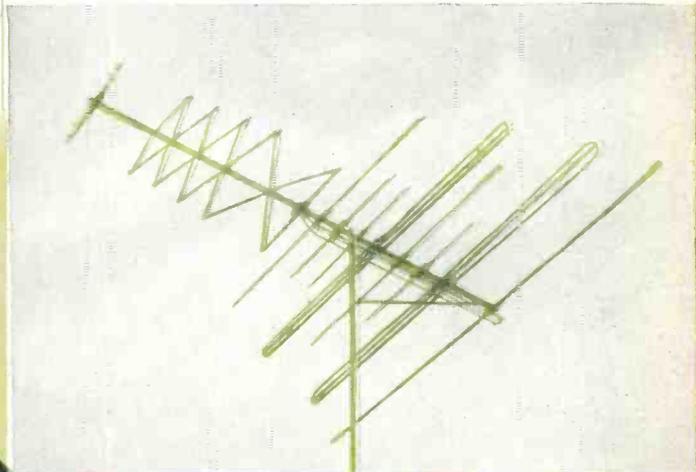
New... new... new! *Gold Colortennas* with ALCOA Spec. fade-proof gold anodized finish that catches the eye and makes them buy.

NEW UNBREAKABLE "KRALASTIC" INSULATORS

You get the toughest, hardest, strongest insulators money can buy. Matchless electrical, physical and weathering properties for better performance all year, every year.

NEW RIGIDIZED REFLECTORS

Twice the strength—twice the rigidity. Every element over 30 inches long is now reinforced with 16 inch aluminum dowels in center. Never before so many dynamic selling features packed in one antenna.



THE FUSE IS LIT! *Get Set FOR*
 THE COLORTENNA BOOM *in 1958*

IN PROFITS!
 PERFORMANCE!
 PREMIUMS!
 PROMOTION!



See your JFD distributor.

ELECTRONICS CORP.

Brooklyn 4, N. Y.

Pioneers in electronics since 1927

Sylvania TV Damper Tubes

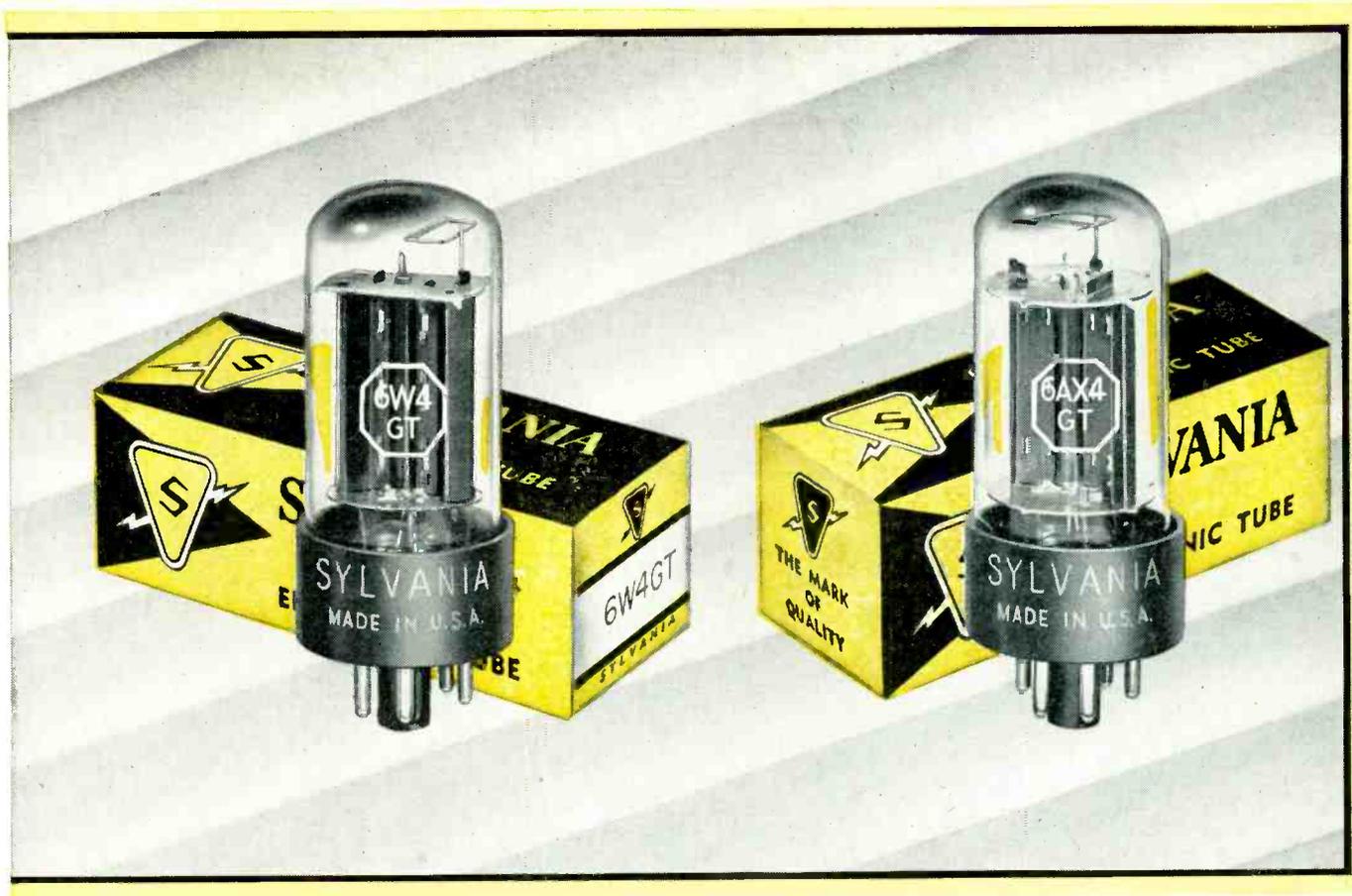


...New design plus



New heater-cathode design helps Sylvania damper types pass this dynamic arc test with flying colors. Dynamic tests such as this have now been instituted by Sylvania on all important types in every

critical TV function. It's Sylvania's way of helping you overcome problems which often make the difference between profit and loss and a happy or unhappy customer.



new dynamic tests produce high E.L.A.*

Sylvania damper tubes scored an **Earned Life Average* of 99.54% in a recent test of types in the 6AX4GT family. This means greater service reliability for you with an absolute minimum of trouble resulting from arcing, heater-cathode shorts and heater burnouts. It's the result of a new heater-cathode design introduced by Sylvania to meet your service needs.

Earned Life Average is an established method for evaluating tube life performance; for the service industry it serves as an index of protection against call-backs. These tests

were performed in TV sets which simulated field service conditions where high line voltages are encountered.

109 Sylvania damper tubes performed for a total of 132,890 hours out of a possible 133,500 hours for an *Earned Life Average* of 99.54%.

To Sylvania this is satisfying evidence that the service industry has been provided with extra protection against the most common damper tube troubles. We think you'll agree too, that in the long run you'll profit more with Sylvania.



SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., Montreal

LIGHTING • RADIO • ELECTRONICS • TELEVISION • METALS & CHEMICALS

ONE OUT OF FOUR
OUTDOOR
INSTALLATIONS
ARE MADE WITH

AMPHENOL

TWIN LEAD



More than 25% of all outdoor tv installations—more than 5,000,000 installations in the United States alone—have been made with AMPHENOL Twin Lead! These tremendous sales figures reflect the popularity of AMPHENOL Twin Lead with Dealers, popularity founded on these important advantages:

PERFORMANCE: Good TV pictures depend upon the *reliability* of the entire set installation—AMPHENOL Twin Lead is the *strongest link* in any system, a guarantee of better picture quality!

CUSTOMER SATISFACTION: Complete customer satisfaction is your key to *repeat sales*—AMPHENOL Twin Lead provides you with this key to better business, better profits!

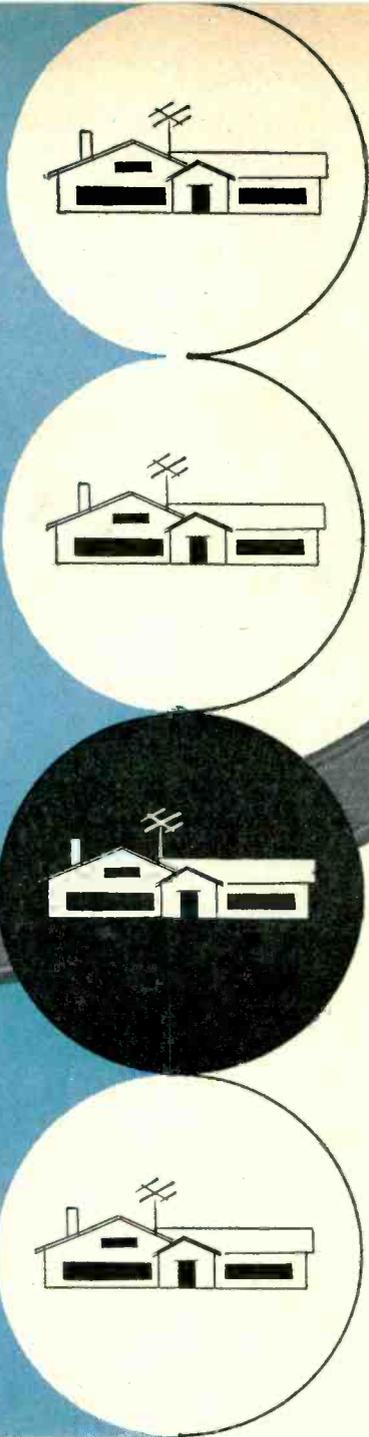
GREATER PROFITS: As every Dealer and Serviceman knows, AMPHENOL Twin Lead provides *plus profits* on every sale—fair mark-ups to fair list prices!

EASY-TO-USE-HANKS: Complete customer satisfaction is your key to *repeat sales*—AMPHENOL Twin Lead Hanks make selling and installing easier. Popular lengths of 25, 50, 75 and 100 feet; also reels of 500 and 1000 feet.

Over 5,000,000 AMPHENOL outdoor Twin Lead Installations Have Shown The Way to Quality!



AMPHENOL ELECTRONICS CORPORATION
chicago 50, illinois



Editor's Memo



I've had the feeling for a long time that our subscribers have more ideas buzzing around their heads (currently over 54,000 heads) than any other similarly situated group. A good many of these ideas relate to changes or additions to the magazine's contents, and every one of them is welcome. Of course, not all ideas can be put into practice promptly, but each gets careful consideration. Reader suggestions are credited with several editorial improvements made over the years.

Here's one suggestion we're adopting, and chances are the magazine will be none the better for it. One reader proposes: "Your Memo column is fine. I like the personal touch. But why don't you make it really personal and print your picture? Let's see what you look like."

OK. You asked for it!

Another reader says it's important for him to keep up with the various activities and meetings going on. Well, we list all the important national meetings in our calendar of coming events on the Tuning In page. But maybe this isn't enough. So let's see some of the promotional weeks coming up this month and next.

First, there's National Television Week, Sept. 8-14. But there are plenty of other "weeks" in September (which happens to be Child Foot Health Month and National Better Breakfast Month). Here are some, with dates:

Lessons in Truth Week (9-15)
National Soft Water Week (15-23)
Rock 'n' Roll Week (16-21)
National Sweater Week (16-22)
National Dog Week (22-28)
National Tie Week (22-29)
Anti-Freeze Week, North (24-29)
For October (Cheese Festival Month and Let's Go Hunting Month) we have:
National Letter Writing Week (6-12)
Anti-Freeze Week, Middle States (8-13)

Save the Horse Week (13-19)
National Macaroni Week (17-26)
National Donut Week (19-26)
Cleaner Air Week (20-26)
National Thrift Week (20-26)
Pass the Laugh Week (20-27)
National Popcorn Week (27-2)
National Pretzel Week (27-2)
Anti-Freeze Week, Deep South (29-3)
So much for weeks, except that someone may want to come up with a National Weeks Week to honor the many many weeks in the year.

As I said, we at least try to follow up reader suggestions. Next?

Al Forman



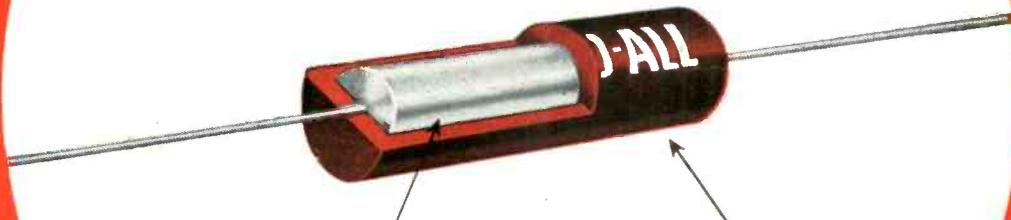
GOOD-ALL

"Capacitor of Tomorrow"... here TODAY!

**GOOD-ALL
TYPE 600-UE**

*** MYLAR Dielectric • Molded in EPON-EPOXY ****

The 600-UE is a rugged, trouble-free capacitor you will find ideal for replacement of conventional tubulars. It features extremely reliable service in humid climates, low leakage, high stability. Designed especially for today's modern circuitry, an ever increasing number of original equipment manufacturers are specifying the 600-UE.



***MYLAR® DuPONT'S**
tradename for its amazing,
space-saving polyester film.

****EPON® SHELL'S**
EPOXY RESIN wonder plastic
molding compound base.

... the "materials of tomorrow," skillfully combined by **GOOD-ALL'S** exclusive production technique to create the 600-UE, a capacitor designed to give you trouble-free service.

SUPERIOR QUALITY • COMPETITIVELY PRICED



GOOD-ALL ELECTRIC MFG. CO. Distributors' Division

26 RITTENHOUSE PLACE • ARDMORE PENNSYLVANIA

PROFESSIONAL RECOGNITION, GENERAL ELECTRIC ALL-AMERICAN

LIFE

Announcing

THE GENERAL ELECTRIC ALL-AMERICAN AWARDS FOR TV SERVICE TECHNICIANS WHO HAVE DISTINGUISHED THEMSELVES IN PUBLIC SERVICE

General Electric proudly establishes the All-American Awards to honor the TV Service Technicians of America for their good citizenship in many fields of public service.

Individually and as members of some three hundred trade groups, TV Service Technicians make many unheralded contributions to the welfare and happiness of their communities. You will find them repairing TV sets without charge in children's hospitals—teaching disabled veterans how to service TV sets—instructing Boy Scouts and other youth groups in elementary electronics—applying their specialized technical knowledge to many important fields of public service.

G-E All-American Award trophies will be presented to the eleven TV servicemen who, in the opinion of the judges, have achieved the most distinguished records of participation in community service during the two-year period ending September 30, 1957. In addition, General Electric will present \$500 to each winner for use in community improvement activities.

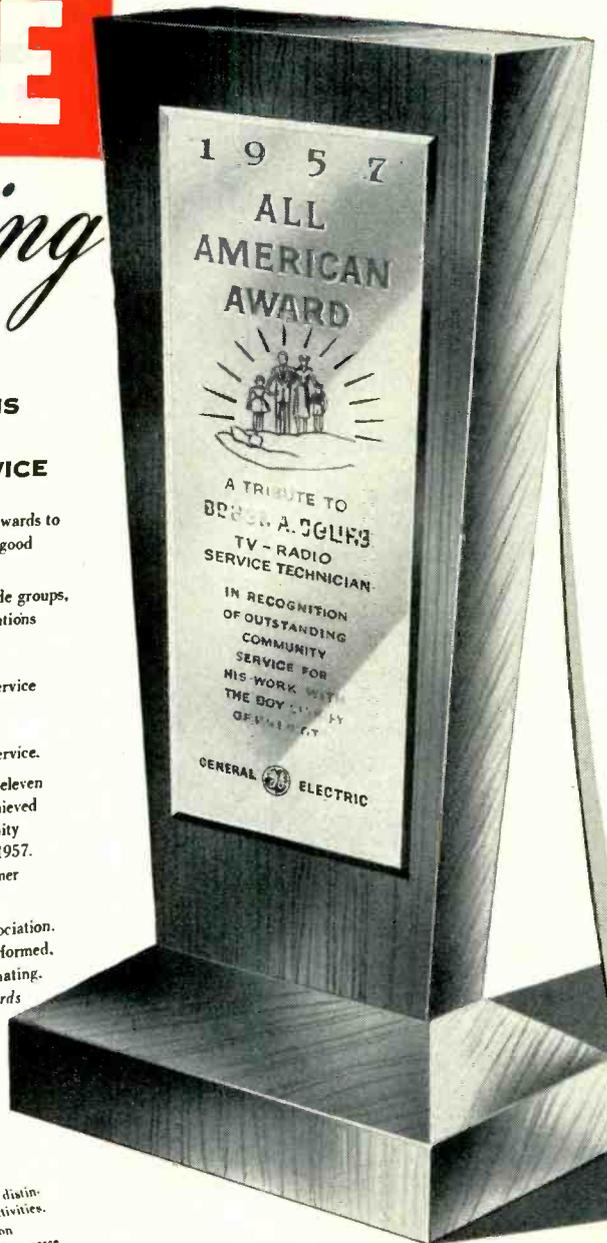
Nominations may be made by any individual, club or association. Simply write a letter describing the community service performed, give the name and address of the serviceman you are nominating, and mail it before October 19th to the All-American Awards Committee, General Electric Company, Owensboro, Ky.



All-American Award winners will be selected by a panel of distinguished citizens renowned for their own public service activities.

WENDELL BARNES, Administrator, Small Business Administration
WENDELL FORD, 1956-1957, Pres., National Junior Chamber of Commerce
HERMAN HICKMAN, Sports Authority and Commentator
ED SULLIVAN, Columnist and TV Personality

Decision of the judges will be final. Establishment of the All-American Awards is another step in General Electric's program to give recognition to independent businessmen everywhere for their important contributions to America's progress. General Electric Co., Receiving Tube Department, Owensboro, Ky.



WINNERS TO BE ANNOUNCED IN DECEMBER



GENERAL  ELECTRIC

Full-page General Electric national advertising spotlights community service of independent TV-radio technicians such as yourself.

Your customers and prospects are being asked to help select an All-American award-winning team of 11 outstanding service dealers.

A complete package of promotion aids and display tie-ins is waiting for you. Your G-E tube distributor has this timely, colorful material. Ask him to help make your shop All-American service headquarters!

These advertising tie-ins can open your door wide to new fall business—

Easel-back display, "Football Time Is TV Tune-up Time"... Large football-theme window banner... Eye-catching window streamers... Special direct-mail folder and postcard... Newspaper mats... "Set-owners' TV Service Guide", a business-building booklet to give to service prospects.



INCREASED SERVICE VOLUME— CAMPAIGN OFFERS YOU BOTH!

FOOTBALL IS HERE. The star-studded entertainment programs are back. Millions of TV owners need to have their sets checked for top performance. Timed for this fall market, General Electric has kicked off its All-American campaign in support of the TV-service profession—the biggest ever—to 25,000,000 readers of LIFE. Full-page ads feature the all-around job service dealers like yourself are doing in and for the community...point to shops like yours as neighborhood TV-radio service headquarters.

To assist you further as an independent TV technician...to help identify your shop as first choice for tune-up work...General Electric has ready for you, through your G-E

tube distributor, a new, timely kit of displays and advertising aids that will catch the eye of football fans and other set-owners who want tune-ups and repairs.

You also can make good use of the special football schedule shown below, carrying your name and address. It's a reminder item that prospects for TV-service work will value and keep with them for many months.

Phone your G-E tube distributor! Ask him how you can tie in *now* with this big General Electric fall campaign to strengthen your community standing, and underscore your reputation for service! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Ky.*

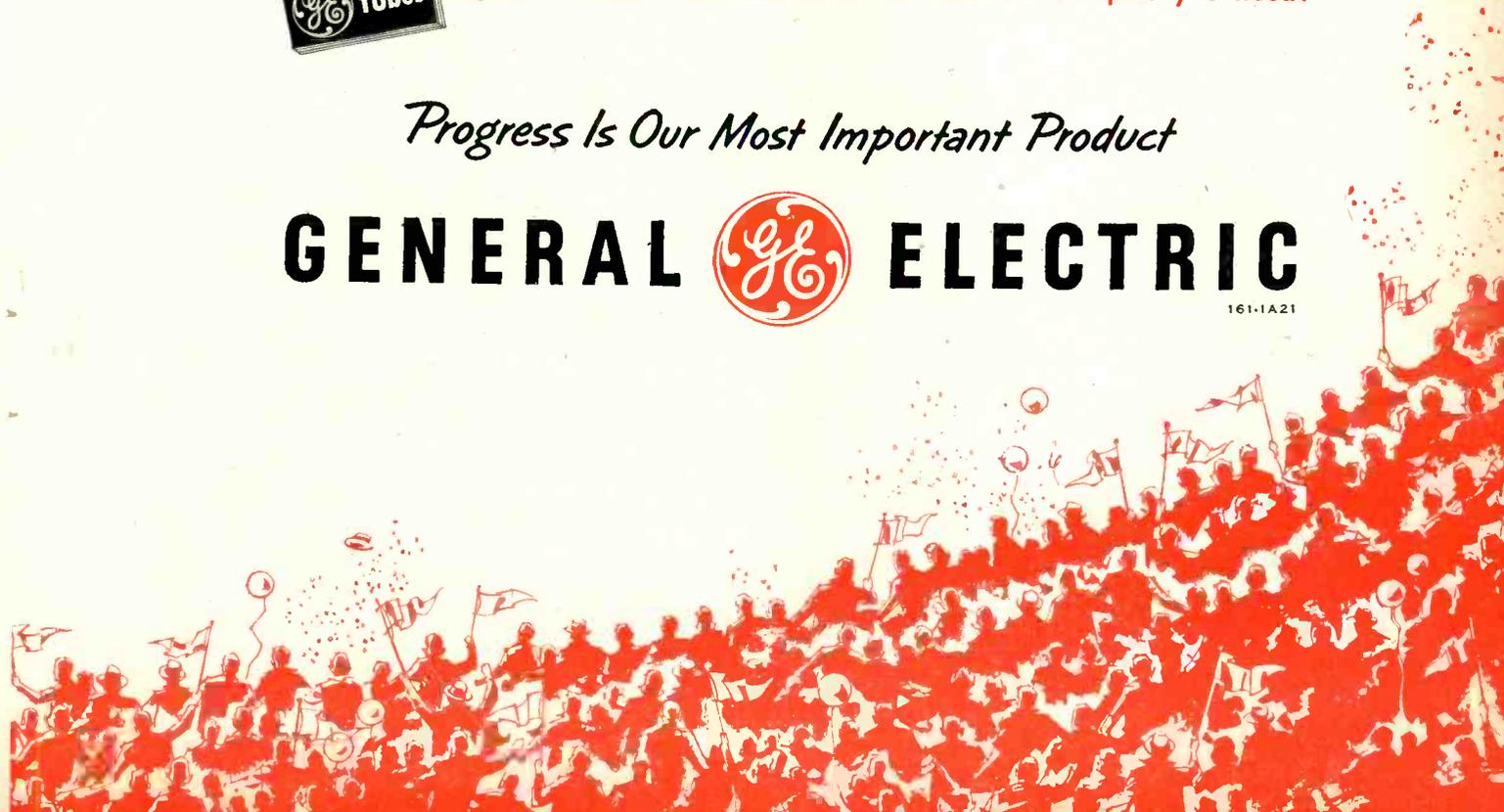


AVAILABLE IN QUANTITIES: 1957 college and professional football schedule, with space for your name and address. Everybody wants one. You can use this handy pocket guide to make friends for your shop and as All-American reminder advertising. Ask your G-E tube distributor how to obtain the copies you need!

Progress Is Our Most Important Product

GENERAL  ELECTRIC

161-1A21



look what **\$24⁵⁰** buys
in test equipment!



**HEATHKITS
GIVE YOU
TWICE AS MUCH
equipment for
every dollar
invested**

The famous model V-7A Vacuum-Tube-Voltmeter is a perfect example of the high-quality instruments available from Heath at 1/2 the price you would expect to pay! Complete, only **\$24⁵⁰**



Get the most out of your test equipment budget by utilizing HEATHKIT instruments in your laboratory or on your production line. Get high quality equipment, without paying the usual premium price, by dealing directly with the manufacturer, and by letting engineers or technicians assemble Heathkits between rush periods. Comprehensive instructions insure minimum construction time. You'll get more equipment for the same investment, and be able to fill your needs by choosing from the more than 100 different electronic kits by Heath. These are the most popular "do-it-yourself" kits in the world, so why not investigate their possibilities in your particular area of activity! Write for the free Heathkit catalog now!



Contains detailed descriptions of Heathkit models available, including VTVM's, scopes, generators, testers, bridges, power supplies, etc.



Also describes Heathkit ham gear and hi-fi equipment in kit form. 100 interesting and profitable "do-it-yourself" projects!

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A SUBSIDIARY OF DAYSTROM, INC.
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Address _____

City & Zone _____

State _____

LETTERS

To the Editor

Out of Business

Editor, ELECTRONIC TECHNICIAN:

Recently, a CBS-Columbia Air King TV set was brought to my shop for repair. Could you let me have the address of this manufacturer?

F. O. Regin

Ethel, La.

• *Sorry, but this company was among the 32 set makers who went out of business between 1954 and 1956.—Ed.*

TV Set "Improvements"

Editor, ELECTRONIC TECHNICIAN:

I've seen many marvelous changes and improvements during my past 15 years in the radio-TV business. But now it seems most manufacturers are sacrificing quality for price, and going wild with their odd ball tubes. If these changes improved performance there would be some justification, but so many changes in filament voltage and current are made just to accommodate a manufacturer's own series string set. With all these changes, my one-year old tube checker with a new roll chart is practically out of date. Another drawback in many sets, especially portables, is the lack of a power transformer, which means the chassis is common to one side of the line. The consumer can get quite a jolt from a hot chassis. I can't help admiring the old sets of 1953-54.

Marvin E. Pooley

Pooley's Radio Service
Mitchell, S.D.

• *Readers interested in Mr. Pooley's comments are invited to read the editorial in this issue, "Shock Hazard—A Grim Responsibility," and "Why Special Tubes for Series String Operation?" in the July 1957 issue.—Ed.*

Please Send Me . . .

Editor, ELECTRONIC TECHNICIAN:

I noted with sympathy and interest the letter on page 10 of your July issue from a reader asking you to "Please send me any information you have on electronics." Such general requests made to us and to other companies can throw us into neutral faster than anything else, much as we would like to lend a helping hand. In fact, even to specify "electronic tubes" is pretty vague, inasmuch as there are more than 2000 different tube types. People who write to manufacturers and publications would do well to be as specific as possible with their questions in order to get the best service.

S. E. McCallum

General Electric Co.
Schenectady, N.Y.

Mr. Service Dealer:

A PHILCO ANTENNA ON YOUR CUSTOMER'S ROOF



**...is like a boost
in station power!**

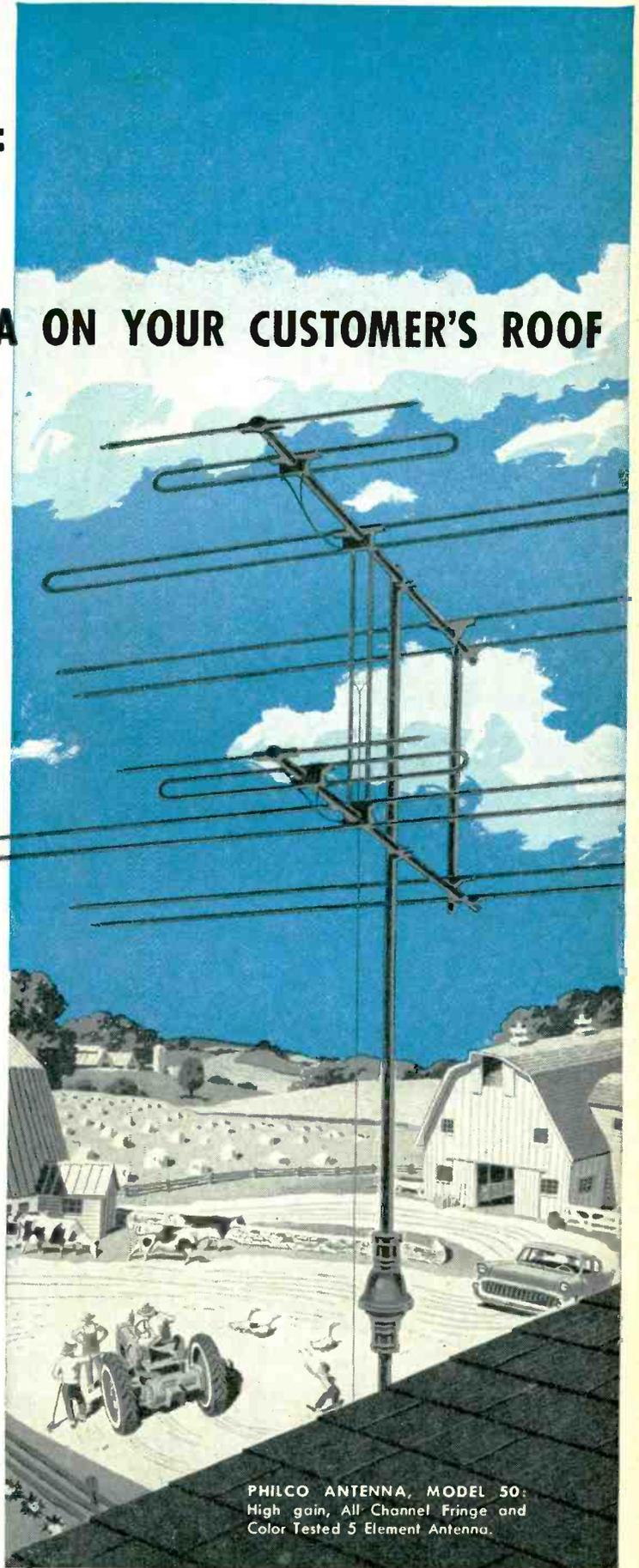
Now, Philco brings you a complete line of quality antennas. These antennas were designed and engineered to reproduce the best picture far out into the fringe whether receiving a picture in black-and-white or color. Field and Laboratory tests conducted under the most exacting conditions with actual on-the-air programs give you the complete assurance that you can sell Philco antennas and rotors with confidence in any TV area. See your local PHILCO DISTRIBUTOR for the full story on Philco quality antennas and rotors.



AP22 Rotor Control: Heavy duty, long life automatic rotor with automatic finger-tip control unit providing dependable and fool-proof operation. Attractive, stream-lined cabinet with modern styling.



AP22 Rotor: Weather-tested and proven for long service-free life. Designed by service-experienced engineers to highest quality standards.

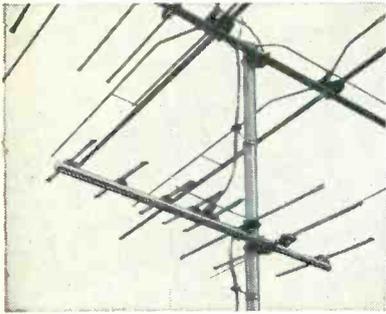


PHILCO ANTENNA, MODEL 50: High gain, All-Channel Fringe and Color Tested 5 Element Antenna.

PHILCO CORPORATION • ACCESSORY DIVISION • PHILA. 34, PA.

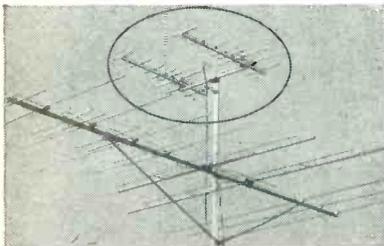
WHAT'S **NEW** FROM

Now...2 Ways to Add UHF to Your Fringe Area Color'ceptor



Here's something really new!

A UHF antenna (Winegard Mod. GG-1) that connects in series with the same lead used for the VHF Color'ceptor. No couplers... no loss... no interaction. Perfect results every time! Can be oriented independently from CL-4 or CL-4X. Same general features as on GG-2 shown below. Completely gold anodized. Only \$7.95.



New UHF Colinear Yagis Model GG-2 mounted with CL-4X Color'ceptor

High gain UHF antenna has 4 col. driven elements, 10 directors, 6 reflectors. Pin point directivity. No minor lobes. Flat frequency response. Can be stacked up to 16 bays for up to 21 db gain. Completely gold anodized. Can be ordered factory peaked to favor your channels. Only \$14.95.

NEWS NOTE: Color'ceptor, the favorite fringe area antenna of professional installers everywhere, is now even better! —NEW TDM insulators. Low loss, unbreakable—NEW special alloy plus extra reinforcing used in reflectors. Four times more durable—NEW sunfast gold finish. Permanently anodized.

... NEW ... SUPER *twilight** FOR THE TWILIGHT* TV AREA

Biggest Advance Yet In Antenna Design!

Something new and wonderful has happened to antennas! Now you get the "whole ball of wax"... mast, lead-in, Antenna, mount... everything factory-assembled—factory-engineered into one simple, integral unit!

- NO loose parts to assemble
- NO wires to strip

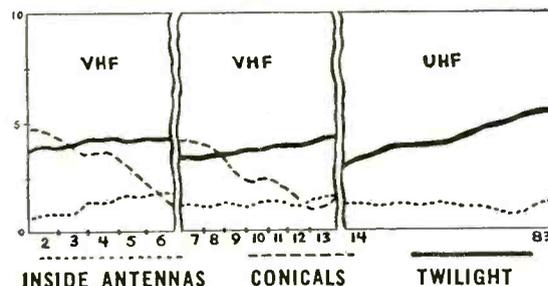
Just take your Twilight out of the box... pop it open... put it up as easy as driving 3 nails... it's as simple as that!

Now you can make a complete installation (in most cases without even getting on the roof) in no more time than it takes to pull a TV chassis for repair! Twilight is so easy... it's a breeze to install.

Engineered for results... styled to sell... as new and modern as today!

SENSITIVITY COMPARISON CHART

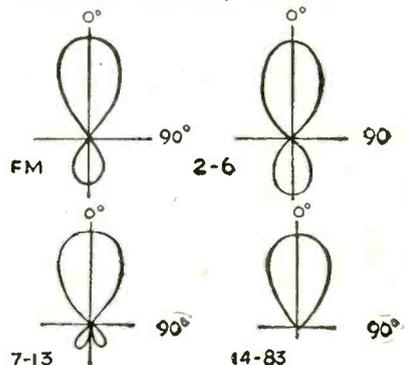
Note extremely linear frequency response of Twilight



LOOK AT THESE ALL NEW EXCLUSIVE ENGINEERING INNOVATIONS

- 1 **UNIVERSAL MOUNT*** goes up in minutes... super-sturdy... eliminates ugly guy wires, chimney brackets... fits all surfaces, flat, sloping and vertical.
- 2 **SPECIAL DRIVE FASTENERS** go in like nails, hold like screws... special gaskets seal roof automatically.
- 3 **SNAP-OUT MAST CLAMP**... automatic, self-aligning. No tools.
- 4 **SERIES-FED UHF** new intermixed design. No loss, no interaction, one lead-in. Can't become obsolete. And at no extra cost!
- 5 **ELECTRO-LENS HIGH GAIN DIRECTOR SYSTEM** for ultra linear frequency response and no ghost-catching minor lobes on any channel.
- 6 **DUAL "T" MATCHED DRIVEN ELEMENTS**... end-fire phased. Accurate 300 ohm impedance match.
- 7 **PERMANENT NON-CORROSIVE ANODIZED FINISH** in Sunfast Gold, Twilight Blue or Starbrite Silver... looks better, sells faster... makes all other antennas look as old-fashioned and out-of-date as they really are.

Horizontal Directivity Patterns



*Patent Pending

NEW PEEK-A-BOO PACKAGE

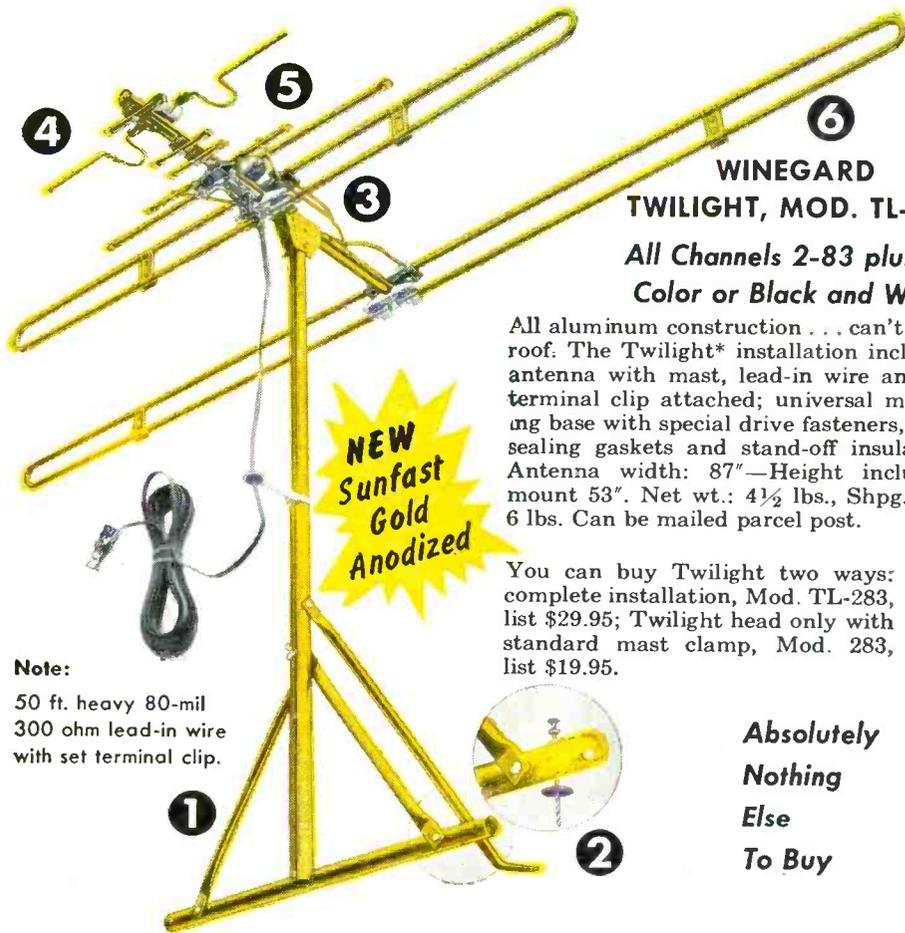
Makes beautiful display... lets customer see merchandise without opening carton... has complete sales story pitched to your customers on back of carton.



Winegard Co.

Winegard

COMPACT... POWERFUL!



**WINEGARD
TWILIGHT, MOD. TL-283**
All Channels 2-83 plus FM
Color or Black and White

All aluminum construction... can't stain roof. The Twilight* installation includes: antenna with mast, lead-in wire and set terminal clip attached; universal mounting base with special drive fasteners, roof-sealing gaskets and stand-off insulators. Antenna width: 87"—Height including mount 53". Net wt.: 4½ lbs., Shpg. wt.: 6 lbs. Can be mailed parcel post.

You can buy Twilight two ways: complete installation, Mod. TL-283, list \$29.95; Twilight head only with standard mast clamp, Mod. 283, list \$19.95.

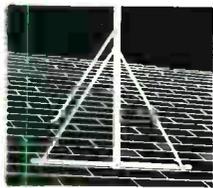
Note:

50 ft. heavy 80-mil
300 ohm lead-in wire
with set terminal clip.

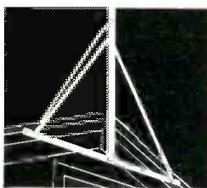
**NEW
Sunfast
Gold
Anodized**

**Absolutely
Nothing
Else
To Buy**

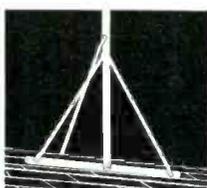
Twilight Mounts on ANY Surface—Sloping, Flat, Vertical



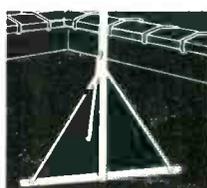
Side of roof



End of roof

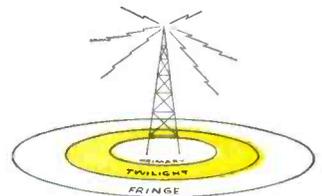


Peak of roof



Flat or trailer

**THIS IS THE
TWILIGHT AREA**



The "in-between" Twilight area (5 to 35 miles) presents reception problems all its own. Most set owners living within its boundaries have been enjoying neither the finest TV reception nor the poorest.

Because the Twilight area has many of the reception difficulties of both the fringe and primary areas, almost every type of antenna from rabbit ears to large arrays is used here. None of which were actually designed with the Twilight area's actual requirements in mind.

An extensive survey made by the Winegard Company in the Twilight areas of some of our larger cities brought to light these amazing facts:

- 42% of the TV owners were not really satisfied with their reception
- 72% of these dissatisfied TV viewers were using set-top antennas
- 53% didn't like antennas on top of their set
- 34% said set-top antennas were too difficult to adjust
- 49% thought outside antennas were too big and unsightly
- 34% thought outside antennas were too susceptible to corrosion-stained roofs... and were ruined by weather
- 49% of all set owners questioned were willing to spend up to \$30.00 for a TV antenna that would overcome all these objections. 7% would spend up to \$60.00

With the above information, Winegard engineers went to work to produce the first antenna designed specifically for the needs and wants of TV set owners in the Twilight area.

We call this new electronic masterpiece... appropriately enough... the Twilight!

SELL THE LINE THAT HELPS YOU SELL!

As
Advised
in **LIFE**
The Saturday Evening
POST
Better Homes
& Gardens

List price established nationally in Life magazine at \$29.95. Extra long discount structure so you can allow trade-ins or free installation if you wish... and still make your normal profit.

Mr. Dealer:
See Your
Winegard
Distributor
and

Mail Coupon
Today!

WINEGARD CO., Dept. ET-9
3000 Scotten Blvd., Burlington, Iowa

- Complete information on Twilight plus sales aids.
- Other Winegard Do-It-Yourself antennas and kits as low as \$14.95.
- Complete information on high powered Color'ceptor.

Dealer Firm Name.....
Address.....
City..... State.....

**It's a sure thing
...the odds are 4 to 1
in your favor!**



**Put your
money on
Wirewounds . . .
out of
Centralab**

Stable mates in Centralab's long line of champions—Model WW and WN Wirewounds pack a 5-watt control into a 2-watt size, in short- or long-shaft styles. Now, one size takes care of 2-, 3-, 4-, and 5-watt replacements in TV, hi-fi, home and auto radio sets.

Every Centralab Wirewound is a real thoroughbred — and gives you a winning ticket that cuts inventory, helps save time, helps you make more money.

Here's another sure thing — Centralab Wirewounds are favorites in the rich industrial handicap.

Ask your Centralab distributor about these versatile controls. Complete information on these and other top-quality Centralab components can be found in Centralab's new catalog 30.



Centralab
#-1558

A DIVISION OF GLOBE-UNION INC.
902 I EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN

(Continued from page 10)

Index Backing

Editor, ELECTRONIC TECHNICIAN:

When you publish your master index of Circuit Digests (see May 1957), I suggest you don't put a schematic on the back of it. It would be better to have the index by itself for handy reference, and have the schematic filed with all the others.

Glenn Powers

Locke, N.Y.

• Reader Powers' suggestion is appreciated. The schematic backing up the index was intended as an extra, which might not have been published if we did not squeeze the index into a smaller space.—Ed.

Tester Data for NEDA

Editor, ELECTRONIC TECHNICIAN:

We would appreciate receiving a copy of the article on the self-service tube tester market, published in your Nov. 1955 issue.

Herbert V. Hedeem
Executive Officer

National Electronic Distributors
Association
Chicago, Ill.

Circuit Seeker

Editor, ELECTRONIC TECHNICIAN:

Recently I purchased a second-hand "Sparx" signal tracer, Model 905. It needed a few repairs, so I wrote to the manufacturer, McMurdo Silver Co., for a schematic. Lo and behold, the letter returned, marked "unclaimed . . . out of business." I am now at wits end trying to get the schematic and related information.

Joseph Lombardi

817 Allen St.
Elizabeth, N.J.

• We're sure Reader Lombardi would appreciate receiving this data from any fellow technician. Can you help?—Ed.

Product Info

Editor, ELECTRONIC TECHNICIAN:

On page 22 of your July issue you described a new material, Pyrocera, made by Corning. I would like an explanation of manufacturing process, applications and prices. What is the manufacturer's address?

Edward J. Chapman

Clawson, Mich.

• Corning Glass Works, Corning, N.Y.—Ed.



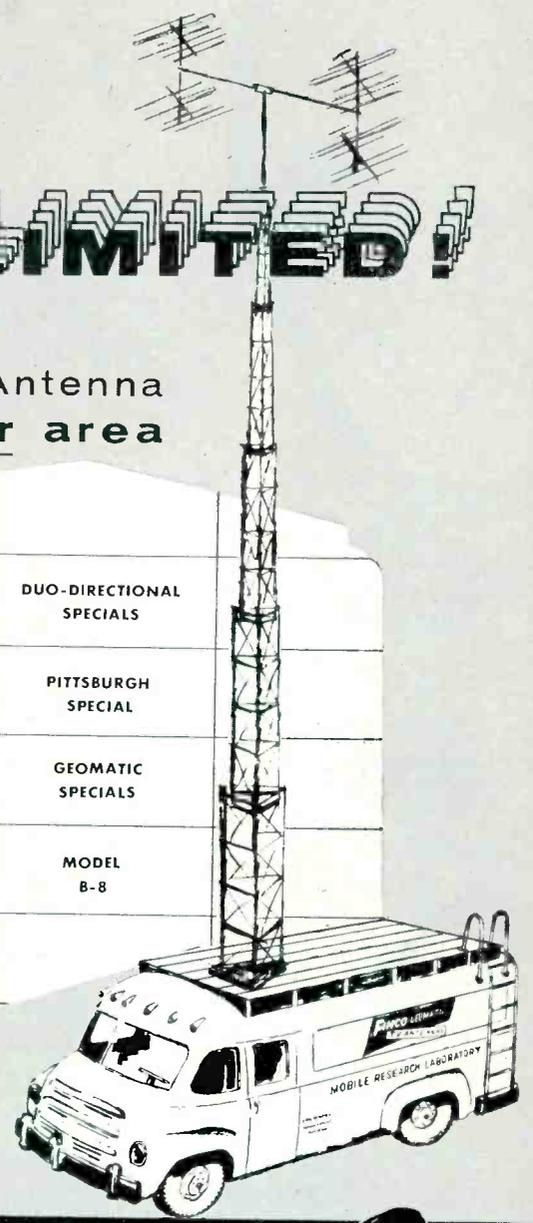
"Says here they've developed a 19 pin tube . . ."

FINCO® announces

MODELS UNLIMITED!

NOW ... you can sell a TV Antenna designed for your area

	BUFFALO SPECIAL	SYRACUSE-ROCHESTER SPECIAL	DUO-DIRECTIONAL SPECIALS
	SAN DIEGO B-6	CHICAGO SPECIALS	PITTSBURGH SPECIAL
LONGVIEW, TEXAS SPECIAL	VICKSBURG SPECIAL	FLORIDA, WEST COAST SPECIAL	GEOMATIC SPECIALS
	PATENTED FIDELITY PHASING	DETROIT-TOLEDO SPECIAL	MODEL B-8
UHF-VHF SPECIALS	MODEL B-66		
MODEL B-7	FRONT-TO-BACK SPECIALS		



• IN SOLVING UNUSUAL, LOCALIZED RECEPTION PROBLEMS, FINCO has proved that the only positive way to develop the most efficient and economical TV Antenna is by actual MOBILE RESEARCH LABORATORY TESTS combined with Expert Topology and Channel Power Platting.

If a distributor qualifies, Finco's research department assumes the task of studying the specific, local reception problems. If the problems can possibly be salvaged the result is an exclusive Red-Hot, High-Profit Hi-Performance Antenna For Your Area —

Hundreds of FINCO research projects are now in process or already completed, giving dealers and servicemen a big jump on their competition. The total cost to your Jobber IS HIS COOPERATION ... urge Your Jobber to write, wire or call FINCO TODAY!

FINCO®

is often imitated...
the leader always is!



FINCO®

THE FINNEY COMPANY • 34 West Interstate Street • BEDFORD, OHIO • Telephone: BEDford 2-6161

Copyright 1957, The Finney Co.

Form No. 20-199



millions of people will read powerful, large-space ads in

★ NATIONAL MAGAZINES

★ SUNDAY SUPPLEMENTS IN 164 KEY CITIES

★ LOCAL NEWSPAPERS

CHANNEL MASTER

Launches Another Dynamic

NATIONAL ADVERTISING CAMPAIGN

featured
in NEW
NATIONAL ADS

Once again Channel Master uncorks a massive national advertising drive to help you sell more outdoor antenna installations. These ads provide powerful sales support — right in your own local area . . . sparking new and replacement outdoor antenna installations . . . creating store traffic . . . promoting regular antenna check-ups.

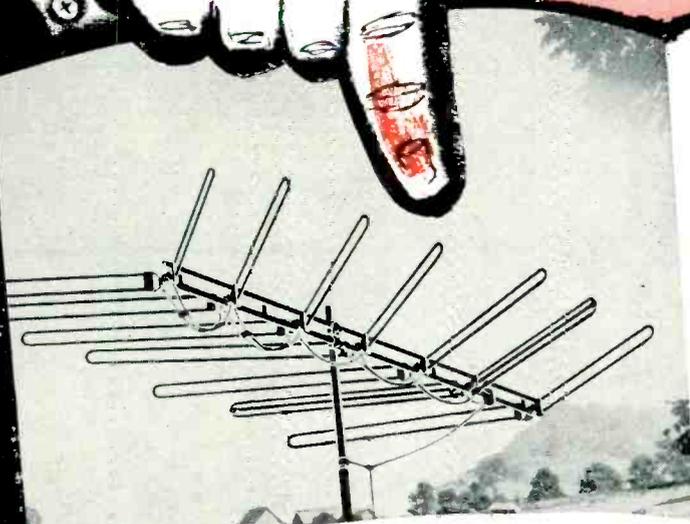
HOW YOU CAN WIN PRESTIGE and PROFITS WITH THIS CAMPAIGN

Sell a "Complete Channel Master Installation"

Consistent, big-space national advertising has created strong consumer preference for all Channel Master products. That's why it's now more profitable than ever for you to sell a "complete Channel Master installation"—featuring Channel Master masting, guy wire, transmission line, standout insulators, etc.

Identify Yourself as a Channel Master Dealer

Customers have confidence in you when you sell the brand they know best — and Channel Master is the only nationally advertised brand of TV antennas and accessories. Identify yourself with the leader. Display the prestige-building Channel Master banners, streamers, antenna check-up charts, and other materials. Available thru your local Channel Master Distributor. Call him Now!



CHANNEL MASTER® T-W ANTENNA

The revolutionary new T-W is America's largest selling outdoor antenna. In gain, front-to-back ratio and mechanical strength, the T-W is unequalled by any other Broad Band antenna. Available in 7, 5, and 3-element models.

® Reg. U.S. Pat. Office and Canada



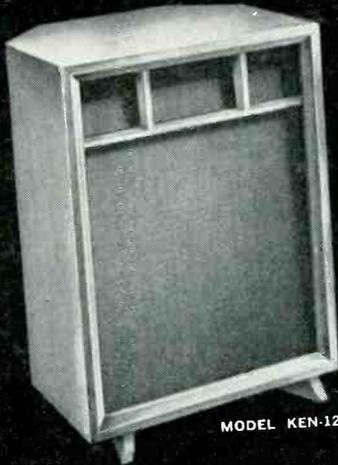
CHANNEL MASTER CORP. ELLENVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES

copyright 1957 Channel Master Corp.

Why you need every feature of these

NEW UNIVERSITY FOLDED-HORN ENCLOSURE KwiKits



MODEL KEN-12

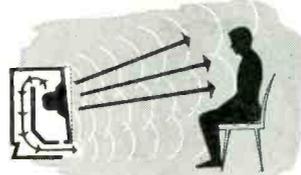
Because... in performance, mechanical design, construction and ease of assembly, these new-KwiKits are unquestionably the very finest enclosure kits—at any price!

KEN-12 For 12" speakers & systems \$44.75
 15½" D x 21½" W x 29½" H USER NET

KEN-15 For 12"/15" speakers & systems \$59.50
 18½" D x 29" W x 35¼" H USER NET

Adapter for mounting 12" speakers in KEN-15 \$1.50 User Net

ROOM-BALANCED PERFORMANCE



KwiKit acoustic design and tilted baffle combine direct speaker radiation and compensated rear horn loading in a way that blends bass, middle and treble ranges perfectly... for uniform response throughout the listening areas of a room.

HEAVIER CONSTRUCTION



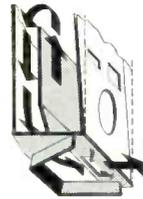
Heavy ¾" first grade, fully cured lumber for top, bottom, sides and back... not flimsy ½" wood commonly used in "kits." Bigger, sturdier—as much as 30% heavier than others in the same price class. Eliminates spurious resonances so detrimental to achieving richer, cleaner bass reproduction.

PRECISION MECHANICAL DESIGN



Exterior and interior elements, even the cleats, fit snugly within close tolerance "rabbeted" grooves. Gluing and screwing of each piece results in reliably air-tight, permanent joints. No nails used. No pencil markings necessary. Mitering and plenty of glue blocks and bracing for truly rigid construction.

PLACE ANYWHERE IN ROOM



Underside view shows how advanced design, self-contained folded horn extends to the front of the cabinet, projecting low frequencies into the room... not back into a corner, splashed against the walls. Small slot in base is resistively controlled vent which equalizes woofer diaphragm excursions in compression chamber. KwiKits are therefore independent of room furnishings, shape or placement and can be used against a flat wall, in a corner... even up in the air!

FOOLPROOF ASSEMBLY



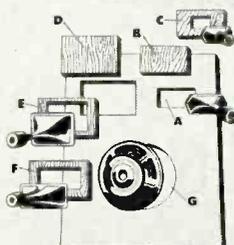
All pieces are pre-cut and pre-drilled... engineered to go together quickly. All you need is a screwdriver! Baffle board is pre-cut... blank plugs and adapters supplied for easy installation of additional components as your system expands. Your KwiKit includes all required hardware, plastic wood, glue, sandpaper, Tufflex insulation, easy-to-follow instructions and... special attention is given to packaging of KwiKits to insure safe, intact delivery to your door.

PROFESSIONAL RESULTS



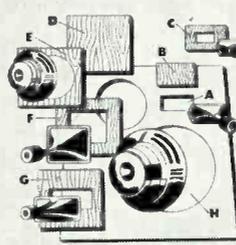
There's no end of decorative treatment you can give your KwiKit enclosure. Genuine Korina veneer is same as used in fine furniture, and provides a beautiful finish. Decorative front mouldings have been designed to complement and enhance your present decor. Exquisite, textured grille fabric is equally at home in settings of any period and is acoustically correct to prevent high frequency attenuation.

KWIKITS...THE PERFECT COMPLEMENT FOR P.S.E.*



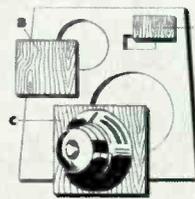
A—Hole cut out for HF-206.
 B—Blank plug supplied when tweeter isn't used.
 C—Adapter supplied cut out for UXT-5.
 D—Blank plug supplied.
 E—Adapter supplied cut out for 4409.
 F—Adapter supplied cut out for H-600 horn.
 G—Takes 312, UXC-123, Diffusicone-12, UXC-122, Diffaxials, 6200, 6201 wide-range speakers and C-12W woofer.

MODEL KEN-12
 takes any 12" wide-range or woofer cone speaker and any tweeter or mid-range speakers.



A—Hole cut out for HF-206.
 B—Blank plug supplied when tweeter isn't used.
 C—Adapter supplied cut out for UXT-5.
 D—Blank plug supplied.
 E—Adapter supplied cut out for C-8W or Diffusicone-8.
 F—Adapter supplied cut out for 4409.
 G—Adapter supplied cut out for H-600 horn.
 H—Takes 315-C, 6303, Diffusicone-15 Diffaxials, and C-15W, C-63W woofers.

MODEL KEN-15
 takes any 15" wide-range or woofer cone speaker and any tweeter or mid-range speakers.



MODEL KEN-15
 takes any 12" wide-range or woofer cone speaker when 12" adapter board (optional) is used.

A and B—Blank plugs supplied.
 C—Takes 312, UXC-123, Diffusicone-12, UXC-122 Diffaxials, 6200, 6201 wide-range speakers and C-12W woofer.

* University's Progressive Speaker Expansion Plan

REMEMBER... if you like to build your own and save money too, the KwiKit is made to order for you... SEE YOUR DEALER TODAY!

UNIVERSITY LOUDSPEAKERS, INC. 80 SOUTH KENSICO AVENUE, WHITE PLAINS, N. Y.



University sounds better



ASTRON "Staminized" CAPACITORS HAVE . . .

long life

**NO CALL-BACK CONSTRUCTION
ASSURED BY 10 INDIVIDUAL
PRODUCTION TESTS**
plus **100% FINAL INSPECTION**

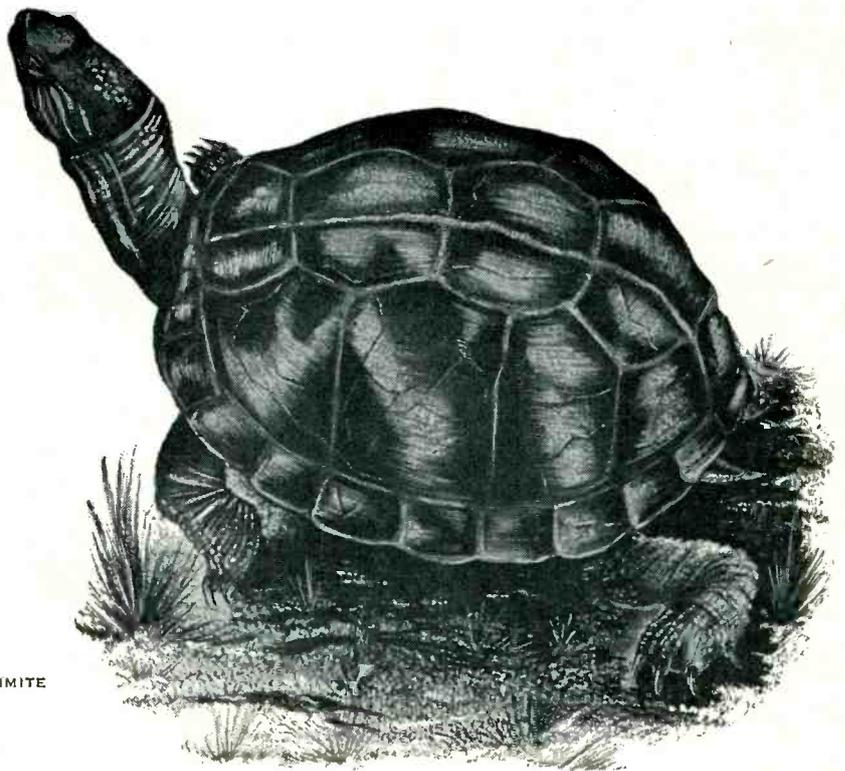
Long life in capacitors is important to you as a serviceman. Complete confidence in the components you use is a necessity, because your business is built on reputation.

Astron considers the serviceman's reputation to be prime importance. That is why each capacitor is manufactured under Astron's "Staminized" system. Astron's "Selected Purchasing" guarantees that only the very finest of raw materials are chosen. Astron's special production techniques are supplemented by continuous inspection under strict quality controls. Production tests are made right on the production line . . . 10 separate tests in all. A 100% final inspection is made before any capacitor can be shipped.

You can put your trust in Astron . . . your assurance of top performance . . . every time.

There is an Astron "Staminized" Capacitor built especially to fill the specific, exacting replacement requirements of any job you tackle.

Remember, your reputation is our business, too. Build it, guard it, protect it . . . Buy Astron!



*Trade-Mark



BLUE POINT ® MOLDED PLASTIC PAPER TUBULAR



Free Servicing Aid . . .

Save time, use handy Astron pocket-sized Replacement Catalog and Pricing Guide (AC-4D) . . . Write today!



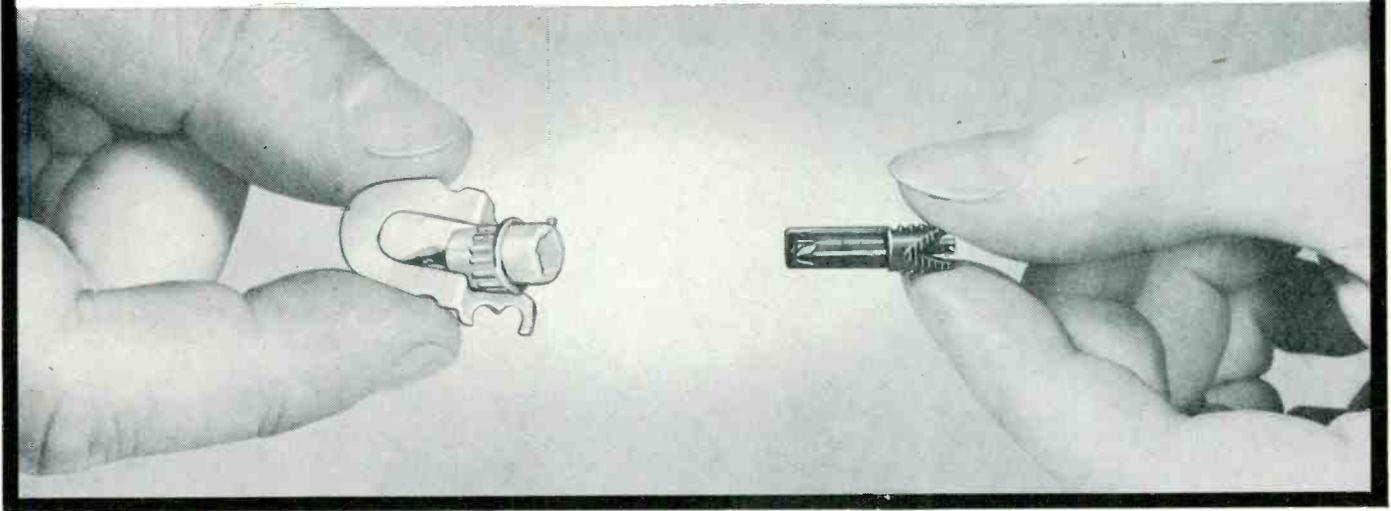
ASTRON

C O R P O R A T I O N
255 GRANT AVENUE EAST NEWARK, N. J.

Export Division: Rocke International Corp., 13 East 40th St., N. Y., N. Y. . . In Canada: Charles W. Pointon, 6 Alcina Ave., Toronto 10, Ontario

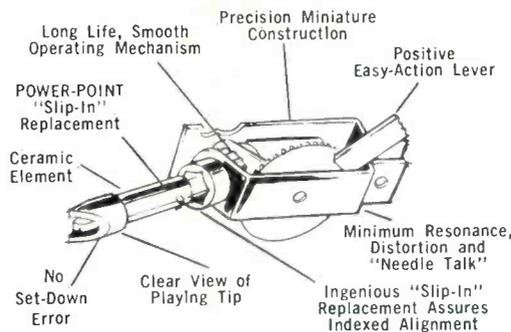
Electro-Voice® POWER-POINT

For Profit and Customer Service Without Problems!



POWER-POINT is the unique, easily installed, miniaturized unit containing BOTH a fresh ceramic cartridge and jeweled playing tips. You sell **POWER-POINTS** for LESS than the cost of a separate cartridge or two comparable phono needles alone! Most models \$3.75 list. Only $\frac{3}{4}$ " long and less than $\frac{1}{2}$ " in diameter, they're in color-coded nylon cases, blister-packed in plastic to keep them clean, factory-fresh, easy to handle.

YOU install the mount. Once that's done, the **CUSTOMER** can remove and replace units in a matter of seconds. You get the replacement business but none of the grief. You stock just three types of mounts and seven types of **POWER-POINT** units to service virtually all modern phonos. You save on inventory costs, conserve shelf space, take no risk of obsolescence.



Typical **POWER-POINT** and Turnover Mount
POWER-POINT
Case—Nylon
Element—Ceramic
Tip Material—Superior Synthetic Sapphire or Natural Diamond
Tracking Force—5 to 8 grams
Net Weight—300 milligrams
Terminals—Beryllium Copper, Self-cleaning Type
Load—1 meg. 100 mmf
Compliance— 1×10^{-6} cm/dyne
Average Output Voltage at 1000 cps
Test Record RCA 12-5-49V.85 Volt Col. 1000AM 1.75 Volt
PT1 Mount
Material—Steel and Nylon
Finish—Cadmium Plate
Connector Size—.050"

THE MARKET IS BIG: OVER TWO MILLION NEW PHONOGRAPHS USE **POWER-POINTS** AS ORIGINAL EQUIPMENT! THE PROFITS ARE BIG—AND E-V HELPS YOU SELL WITH THESE MERCHANDISING AIDS.

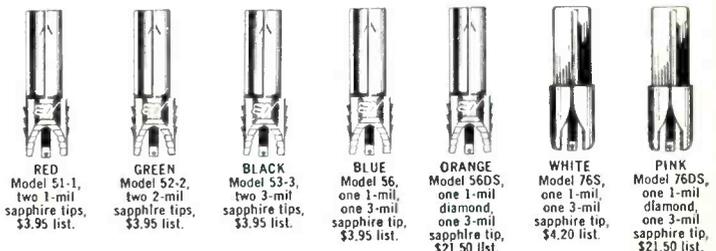


Fact-cramped folder tells the full **POWER-POINT** story. Ask for Bulletin No. -223. Colorful, compelling envelope stuffer for mailing. Bulletin No. -225. Write Dept. ET79.



Plastic-sealed blister-packed **Power-Points** are always in perfect condition. Package gives model identification, color-coding and instructions.

These are the color-coded **POWER-POINT** units, actual size

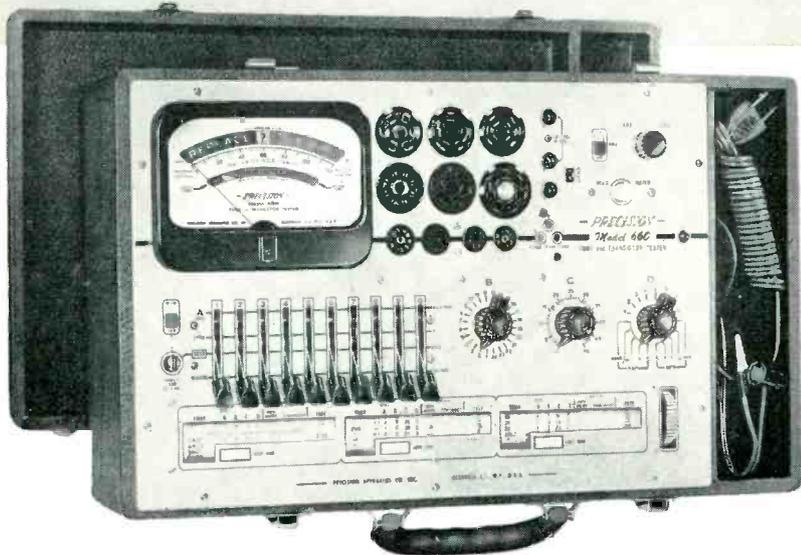


CALL YOUR
E-V DISTRIBUTOR
TODAY!

Electro-Voice

ELECTRO-VOICE, INC. • Buchanan, Michigan.
Export: 13 East 40th Street, New York 16,
U.S.A. Cables: ARLAB

PRECISION has it! ...all in the model 660



COMPREHENSIVE TRANSISTOR TESTING

plus a complete cathode conductance tube checker
and picture tube beam-current tester—
for only **\$99.50**

THE PRECISION MODEL 660 is the only moderately priced instrument with truly comprehensive transistor and crystal diode testing features—designed on the basis of engineering recommendations by leading transistor manufacturers.

- Provides thoroughly reliable tests for I_{cbo} , gain, shorts, leakage, etc. on all RF, audio, power and tetrode transistors of both the N-P-N and P-N-P types.
- Tests crystal diodes in special circuit for both forward and reverse current

THE PRECISION MODEL 660 represents the ultimate degree of value in a tube-checking instrument designed according to the time-proven emission-testing principles which have been recommended by tube manufacturers as well as RETMA.

- Tests all modern TV, FM and AM tube types, including series-string types, tuning eyes, gas rectifiers, etc.
- Free-point, 10-lever element selection for merit, leakage and short tests.
- Dual short-check sensitivity. Built-in pin straighteners.

THE PRECISION MODEL 660 tests TV picture tubes in a specially engineered circuit for actual picture-producing beam current. (Requires PTA cable adapter. *)

THE PRECISION MODEL 660 gives you the highest degree of insurance against obsolescence PLUS the utmost simplicity and speed of operation.

- Filament voltages from $\frac{3}{4}$ to 117 volts on 24-position selector switch.
- Extra-large, $5\frac{1}{4}$ " , rugged PACE meter, $\pm 2\%$ accuracy.
- High-speed, 3-window roll chart with PRECISION "Tube Finder Feature"

MODEL 660: etched, satin-brushed aluminum panel. Leatherette-covered, carrying case with tool compartment and removable cover. Dimensions: $18 \times 10\frac{1}{2} \times 6\frac{1}{4}$ ". **Net Price \$99.50**

*ALSO AVAILABLE—Model PTA Picture Tube Adapter Cable . . . Net Price \$7.75

PRECISION
model **640**

CATHODE CONDUCTANCE TUBE TESTER

Same tube testing facilities as Model 660, but without transistor, crystal diode or CR tube test facilities.

Net Price \$79.50



PACE
THE METER OF PRECISION

PRECISION Apparatus Company, Inc.

70-31 84th Street, Glendale 27, L. I., N. Y.

Export: 458 Broadway, New York 13, N.Y., U.S.A. • Cables: MORHANEX

Canada: Atlas Radio Corp. Ltd. • 50 Wingold Ave. • Toronto 10, Ont.

Available and on display at leading electronic parts distributors.

Reps & Distributors

ALLEN B. DU MONT LABS., INC. announces the appointment of LEROY & MCGUIRE, of Phelps, N.Y., as sales Rep. for TV picture tubes, receiving tubes, and replacement parts. Territory: New York state, exclusive of New York city metropolitan area.

ERIE RESISTOR CORP. reports that JACK M. THORPE, 640 Hidden Lane, Detroit 36, Mich., has been appointed to handle distributor sales in the state of Michigan.

RADIO MERCHANDISE SALES INC. adds following Reps. to handle antennas, antenna hardware and accessories: HENRY FELDMAN CO., Los Angeles, for southern Calif. and Ariz.; Packard Associates, Dallas, for Texas (excluding El Paso), and Okla.

RADIO RECEPTOR CO. announces appointment of two special Reps.: Howard J. Benner, 800 Washington Lane, Jenkintown, Pa., and Philip Lepofsky, 1345 Kimberly Drive, Philadelphia, Pa.

WESTINGHOUSE ELECTRONIC TUBE DIVISION has appointed Ackerman Radio Sales, 3861 N. 35th St., Milwaukee, Wis., as distributor of Reliatron tubes.

HUGH L. OVERBY ASSOCIATES, new firm of electronic manufacturers representatives, announces complete office facilities at 117 E. 3rd St. Charlotte, N. Car., and at 3105 Roswell Rd. N.E., Atlanta 5, Ga.

NATIONAL ELECTRONICS DISTRIBUTORS ASSOCIATION reports: The Missouri Valley, St. Louis, Iowa-Nebraska, and North Texas NEDA Chapters will hold a combined meeting on Sept. 14 and 15, at the Pickwick Hotel, Kansas City, Mo. Meeting chairman is Charles Goebel, Manhattan Radio Corp., Kansas City. Also, scheduled for Oct. 20, 21, and 22, the Ninth Regional Seminar to be held at Grossinger's Hotel, Grossinger, N.Y., featuring business sessions as well as relaxation.

(News continued on page 24)



for the Right
'LYTIC replacement
... use an exact
SPRAGUE replacement



YOU GET EVERYTHING IN A SPRAGUE TVL! *Every* TVL for *every* voltage rating is made with the more expensive high-purity etched-foil anode construction using ultra-stable film formation techniques. Cathodes are etched to meet high ripple requirements. Sprague TVL's give maximum trouble-free service—NO HUM—as well as long shelf life. And they perform just as well in the cold North as they do in the sub-Tropics. Yet this premium quality costs you no more!

That's why Sprague Twist-Lok® electrolytic capacitors are the first choice of leading radio-TV set makers and independent service technicians alike. Insist on TVL's for more exact ratings . . . quality that meets original equipment specifications . . . and all the latest results of capacitor research.

Write for catalog C-612.

don't be vague . . . insist on

SPRAGUE®

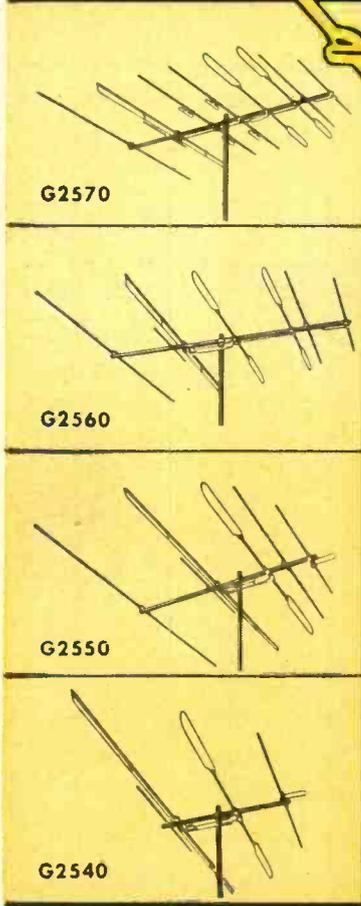
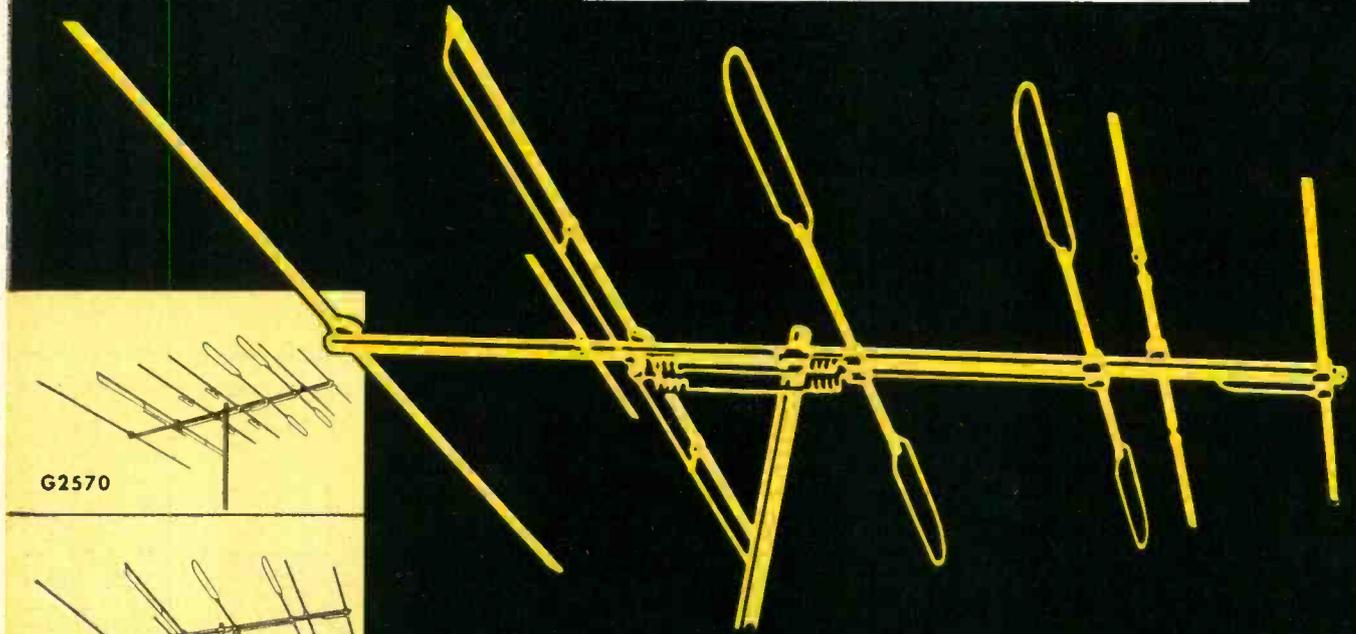
world's largest independent capacitor manufacturer

SPRAGUE RESEARCH IS CONSTANTLY PRODUCING NEW AND BETTER CAPACITORS FOR YOU

Sprague Products Company • Distributors' Division of the Sprague Electric Company • North Adams, Massachusetts

ANODIZED

...it lasts forever



The new magnificent

GOLDEN

Topliner

Trade-mark

Completely anodized to lock out corrosive fumes and weather elements . . .

Designed to outperform any antenna, dollar-for-dollar, or size-for-size . . .

Designed to make your installation look better . . .

This is the new Taco Golden Topliner, the antenna you've been waiting for . . .

Install a Golden Topliner. You'll marvel at its performance.



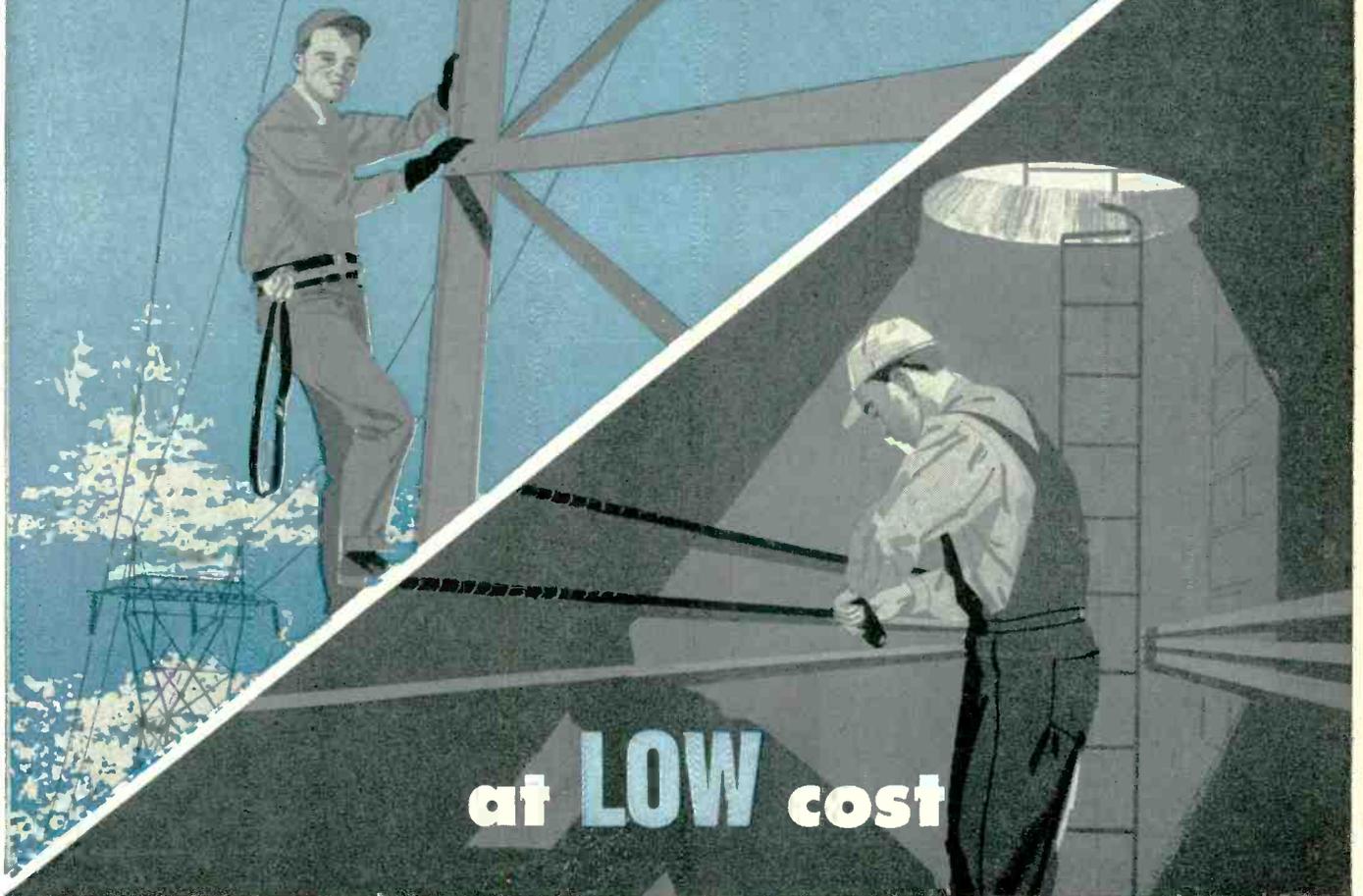
TECHNICAL APPLIANCE CORPORATION

SHERBURNE, N. Y.

In Canada: Hackbusch Electronics, Ltd., Toronto 4, Ont.

U.S. PAT. 2799018

for **HIGH** dependability...



at **LOW** cost

DUTCH BRAND PLASTIC TAPE

for every electrical need!

From high line to cable vault Dutch Brand Plastic Electrical Tape meets the requirements of the job. It has high dielectric strength, over 1000 volts per mil of thickness, with stretch to conform neatly and smoothly to irregular shapes. It protects against corrosion, is weather-proof, waterproof, rot, mildew and fungus proof. Linemen and electricians know the value of dependable tape . . . and tape economy.

That's why they insist on safe, easy-to-use Dutch Brand Plastic Tape for every electrical maintenance, production

and construction job. Available in the sizes and widths to meet every requirement.

Write for booklet—In the market for new ideas on tape as a time-and-money-saver? Send for "Big Four in Electrical Tapes," our new booklet. Write today!

*Johns-Manville Dutch Brand Products
7800 South Woodlawn Avenue
Chicago 19, Illinois*



JOHNS-MANVILLE
JM
PRODUCTS

JOHNS-MANVILLE

... another
MALLORY
 service-engineered
 product



Introducing...

The Mallory *Gold Label* Vibrator

Here is a line of vibrators especially designed and constructed to provide the very best in dependability and performance . . . Mallory Gold Label Vibrators.

The Gold Label line is the result of over 27 years of pioneering and leadership in vibrator design and manufacturing. The exclusive Mallory buttonless contacts, used in this design, eliminate sticking and arcing—insure fast starting—provide up to 100% longer life. Driving power requirements are lower. It's the *quietest* vibrator on the market.

For the very best in dependable performance, rely on Mallory Gold Label Vibrators. See your Mallory Distributor.

P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

- Capacitors
- Vibrators
- Resistors
- Power Supplies
- Mercury and Zinc-Carbon Batteries
- Controls
- Switches
- Rectifiers
- Filters

News of the Industry

ALPHA WIRE CORP. announces appointment of HAROLD MASON as Plant Manager. Duties comprise operation of present wire plant plus layout and organization of Alpha's new assembly production division.

AMPEREX ELECTRONIC CORP. goes into domestic production early 1958 of special-purpose, premium type, miniature electron tubes at Hicksville, L.I., N.Y. plant. Such tubes are presently manufactured by Philips of the Netherlands, and imported under the Amperex name.

ASTRON CORP. reports a new division to handle government negotiations, ROBERT BLACK has been named as Government Contracts Manager.

CBS-HYTRON reports the appointment of ARTHUR F. BALDENSPERGER, JR. to the newly created position of Management Development Co-ordinator, Sales, to co-ordinate sales training and management development activities.

CHANNEL MASTER CORP. has appointed RICHARD DEUTSCH as Chief Sales Engineer. Mr. Deutsch will be in charge of the sales and field engineering department, which conducts dealer and distributor meetings throughout the country.

TOBE DEUTSCHMANN CORP. offers handsome ball point pen free with dealers' first order of a TOBE Capacitor from local jobber.

GENERAL ELECTRIC, Schenectady, N.Y. announces appointment of GEORGE O. CROSSLAND to newly-established position of manager of electronics parts distributor development and trade relations.

INTERNATIONAL RESISTANCE CO. recently appointed: RALPH DINSMORE as Manager, and EVON WELLS as Ass't Manager of the Company's Philadelphia sales office.

INTERNATIONAL TELEPHONE & TELEGRAPH CORP., Components Div., Clifton, N.J. announces the launching of a new manufacturing operation in Palo Alto, Calif. New plant will initially produce hermetic seals, and selenium and other semiconductor type rectifiers for use in radio, TV, industrial and aircraft applications.

MERIT COIL & TRANSFORMER CORP. states they have retained top professional counsel to help assemble a new catalog, product guide and handbook. An informal advisory board, consisting of distributors, representatives, and MERIT management are working on a catalog to give the jobber quickly full information on the firm's transformers, coils and other electronic components.

MOTOROLA INC. has appointed PAT CALOBRISI as National Director of Consumer Products Service.

PHILCO CORP. announces a "Guess Who Will Be Miss America" public contest with more than 1500 dealers

throughout the country participating. The contest is being held from August 19th to midnight Sept. 6, in conjunction with PHILCO's sponsorship of the Miss America Pageant, Saturday, Sept. 7.

SPRAGUE ELECTRIC CO. has promoted ALBERT COUMONT and KENNETH PRICE to Regional Sales Supervisors.

WARD PRODUCTS CORP. Electronics Division of the Gabriel Co. is now located in a new plant in Amsterdam, N.Y. Plant was formerly located at Ashabula, Ohio.



TELECTROSONIC has announced the new model 1960 2-speed tape recorder priced at \$79.95. Weight is under 15 lbs., size 7-3/4" x 11-5/8" in carrying case. Single control is used for record and play.

PILOT RADIO has named Joseph E. M. Conklin Eastern Regional Sales Manager, and Frank C. Porter Western Regional Sales Manager. Firm has published a 16-page booklet entitled, "High Fidelity in the Home—A New Approach by Pilot."

AEROVOX has come out with a heavy duty tape degausser, model 710. It removes residual magnetism on 10" and smaller reels without re-winding. Weight is 15 lbs. Price at jobbers is \$49.95.

BOGEN hi-fi amplifier DB130 and PA amplifier LX60 have been chosen for the 1957 Triennale in Milan as outstanding examples of U. S. industrial design.

MICROTRAN has introduced a hi-fi multiple speaker matching and level adjusting transformer rated at 50 watts. It's designed for audiophiles who are enlarging their sound systems; they can make changes without unbalancing present setup. Net is \$8.97.

MOTOROLA has introduced an audio line comprising 10 hi-fi sets in the \$110-\$775 price range. JENSEN and ELECTRO-VOICE 15" woofers are in the more expensive models, as well as mid-range, tweeter, AM/FM, etc. 3 phonos range from \$34.95 to \$94.95.

(Continued on page 30)

... another
MALLORY
service-engineered
product



Stop
tourin'
the town
for
dual control
replacements...

get the *NEW*
MALLORY
Dual Controls

the newest and surest solution
to an old service problem

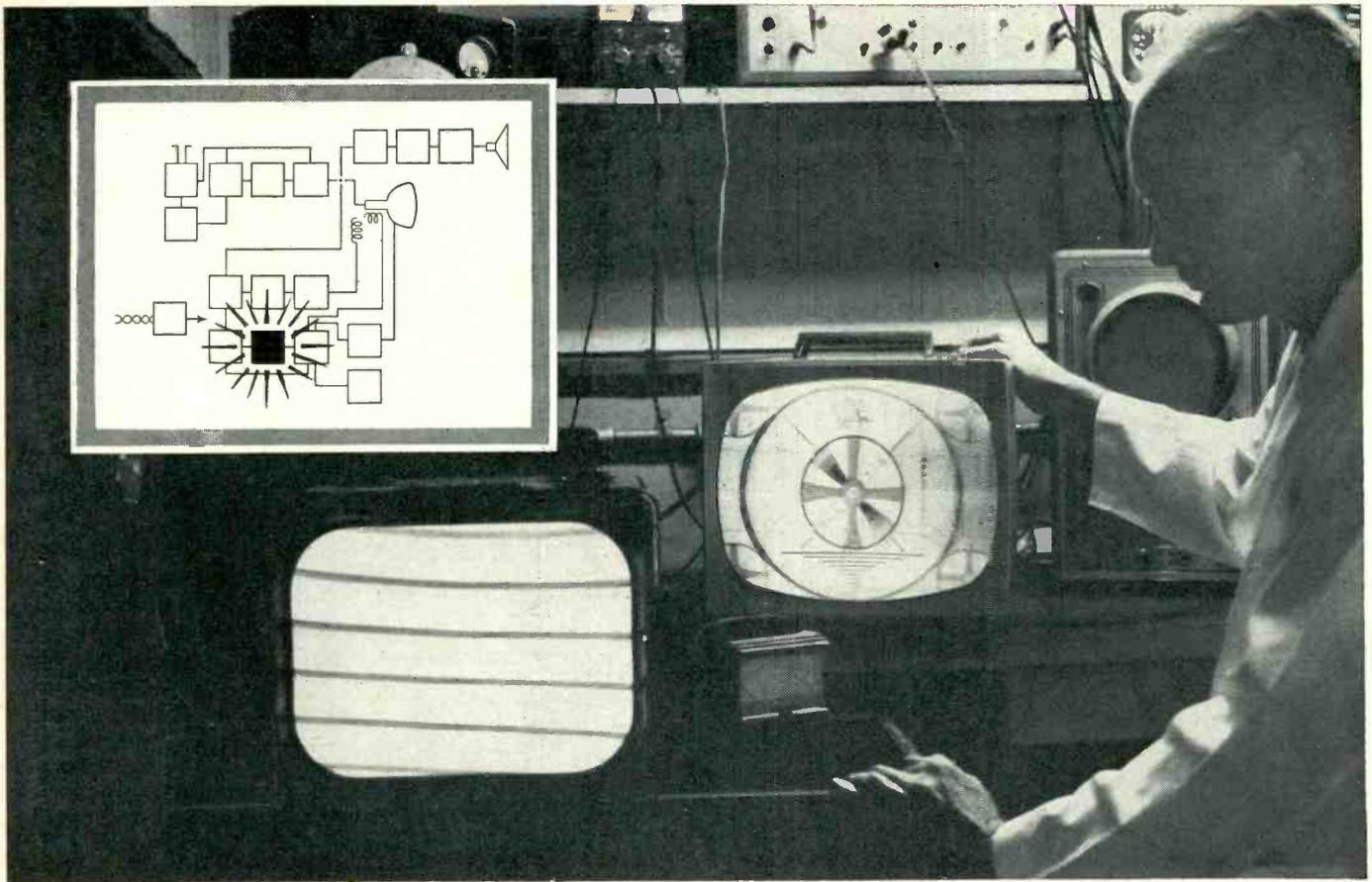
Here's how you can put a stop to those time-consuming shopping tours and special orders... eliminate those "awaiting-parts" delays. Get Mallyory dual control replacements... the newest and surest solution to the age-old servicing problem of where to find *exact* dual control replacements.

Your Mallyory Distributor can assemble a custom-made dual concentric control, with or without a switch, in just 30 seconds... with the new Mallyory components and technique. You'll get a control to meet original specifications... to service just about any make or model TV set, or home or auto radio. The finished part will be as rigid as a one-piece control... won't come apart in service.

P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

- Capacitors • Vibrators • Resistors • Controls • Switches • Filters
- Rectifiers • Power Supplies • Mercury and Zinc-Carbon Batteries



Here General Electric Application Engineer C. L. Taylor shows what can happen when an old-style horizontal-oscillator tube is used in two different TV sets. Image at left is completely

out of sync. To avoid this hazard, the cut-off and other electrical characteristics of General Electric tubes are held within limits that bring satisfactory operation in all television circuits.

Built-in high quality of G-E horizontal-oscillator tubes means fewer TV-servicing call-backs!

Call-back demands from television owners are cut when you install General Electric horizontal-oscillator tubes.

For example: tube microphonics in multivibrator circuits can cause eccentric sync, especially when a set such as a portable is moved or shaken. With G.E.'s 7AU7 and 12AU7, extra-heavy micas, the tight fit of grid side rods, plate, and cathode, and sturdy over-all construction result in minimum microphonics and a steady television picture.

Also, uniform tube-to-tube cut-off characteristics—achieved by care in grid manufacture and rigid testing—enable you to install General Electric types in any receiver knowing that minimum adjustment will be needed for superior picture performance.

Blocking-oscillator circuits require that a tube

throughout its life be able to produce peak plate currents 10 to 15 times higher than average. In the 6CG7 and 6SN7-GTB, General Electric scores with a specially processed high-emission, long-life cathode. Peak current capabilities remain high; sync drift is avoided.

For every set, for every socket, G-E receiving tubes mean greater assurance of owner satisfaction . . . and your G-E tube distributor makes prompt delivery. Phone him today! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

161-1A9

**BRAND
NEW**

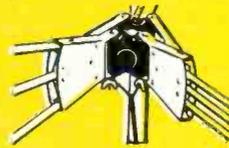
FEATURES

THAT MAKE **TRIO** THE LEADER IN '55



HEAVIEST BOOMS!

Thick - wall, extra - sturdy $1\frac{1}{4}$ " diameter Booms. Nothing approaching them for strength! Now used on **ALL** low-band yagis.



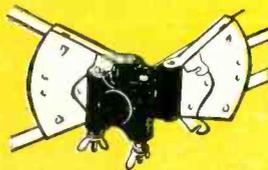
New "VARI-CON" HEAD

Four Hi-strength aluminum adjusting arms. Interlocking Butterfly sections. Heavier snap-action spring assembly. The "Vari-Con" is the only antenna with spring dampeners to lessen vibration and breakage. The "Vari-Con" head also used on the popular TRIO 88 Series.



Sensational
INSTA-LOK CLAMP
(Good-Bye Nuts)

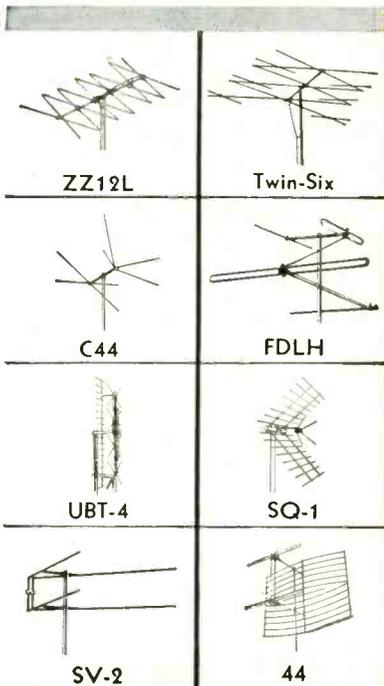
This revolutionary clamp permits instant flip-out assembly, permanent alignment with ultra strength. Nothing stronger — nothing faster! Insta-Lok employed on **ALL** TRIO Antennas that have parasitic elements.



New MINIT-UP CONICAL HEAD

Swing out element mounting plates, fan out elements into snap-fastenings and it's set! Used throughout conical line.

New MYCASTYRENE INSULATORS USED THROUGHOUT TRIO LINE



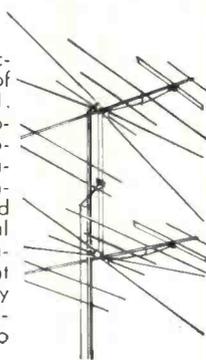
New TRIO ARISTOCRAT ROTATOR

NOW AVAILABLE IN **FOUR** GLORIOUS COLORS!



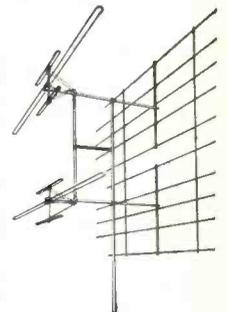
TRIO 88

For superior construction. Rugged, foolproof — easily installed. Parasitic elements supported by TRIO's revolutionary new "Insta-Lok" clamps. Low channel dipoles supported by the strongest conical head made. No vibration — No element shedding. Completely pre-assembled. Available in single or two bay models.



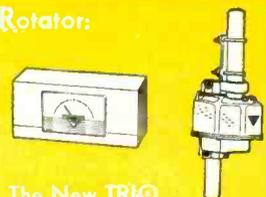
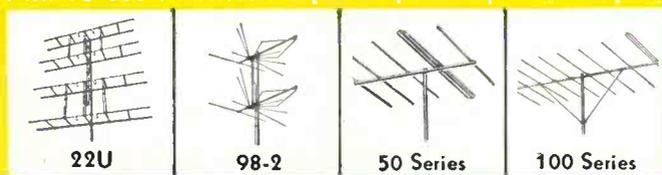
TRIO 66

Three dipoles provide exceptionally high gain on all VHF channels. Exclusive TRIO grid reflector gives improved performance. Extremely rugged yet lightweight. Pre-assembled — simply unfold and tighten reflector and dipole assemblies. Three vertical braces on reflector screen for increased strength. Available in single or two bay models.



Copyright 1954 by Trio Manufacturing Co.

Ask To See America's Most Dependable And Beautiful Rotator:



The New TRIO "ARISTOCRAT"

TRIO Leader in Antenna Development

for Servicing in "Quick Time"...



ALWAYS USE **RCA** SERVICE PARTS

Fact is, it's not only *quicker*, but *more profitable* when you use RCA Service Parts for servicing RCA Victor TV, Radios and Phonographs!

Makes sense, too, when you realize that every one of the thousands of RCA Service Parts have been designed and produced for one purpose . . . to replace original parts used in RCA Victor instruments. Each is an identical mechanical and electrical duplicate, factory-tailored to fit without time-consuming filing, drilling, or sawing. Out with the old, in with the new . . . it's as simple as that!

On your next trip to your local distributor, stock up on fit-right, install-fast RCA Service Parts—and keep your servicing *on the go*—profitably!



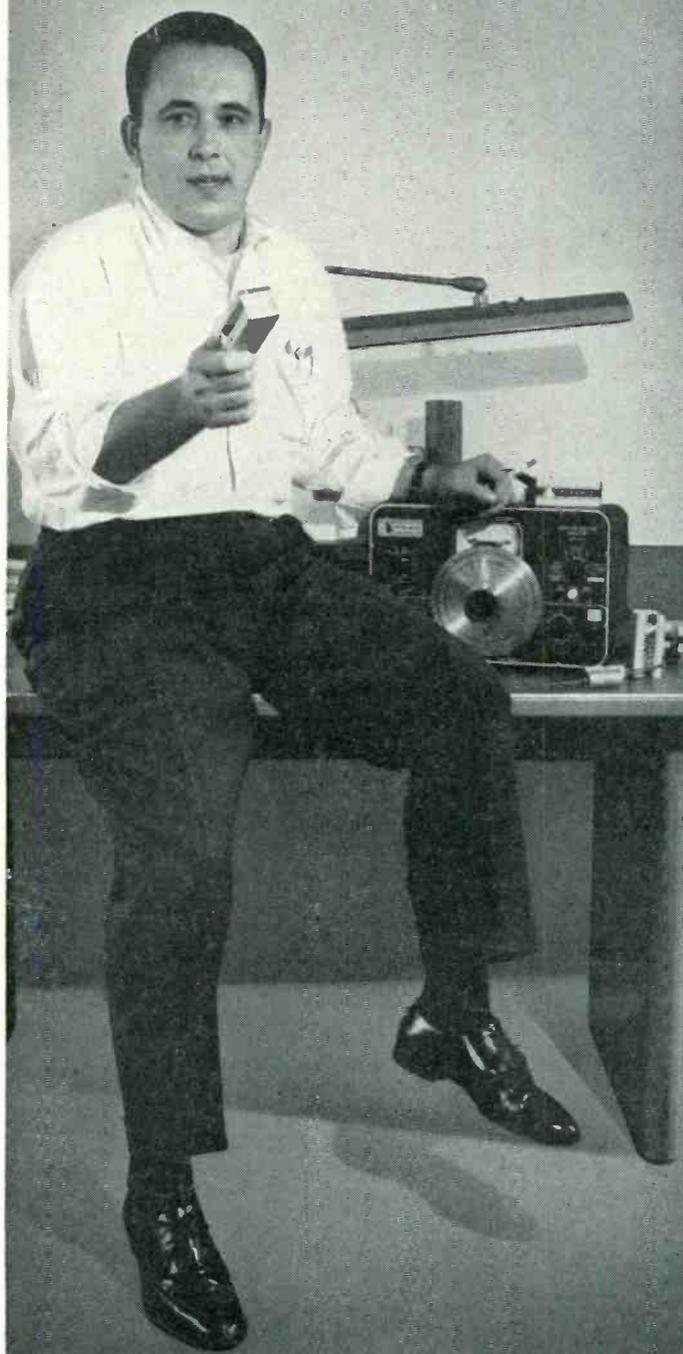
RADIO CORPORATION of AMERICA

COMPONENTS DIVISION

CAMDEN, N. J.

RCA PRODUCTS AND RCA SERVICE PARTS — made for each other!

BRYSON BROWN/Mar Tech



**FOR
DEPENDABILITY...
WHICH
CAPACITOR
DO YOU
PREFER?
PYRAMID...
SAID
4.9
OUT OF
EVERY 6
SERVICEMEN**

CAPACITORS—RECTIFIERS
FOR ORIGINAL EQUIPMENT—FOR REPLACEMENT



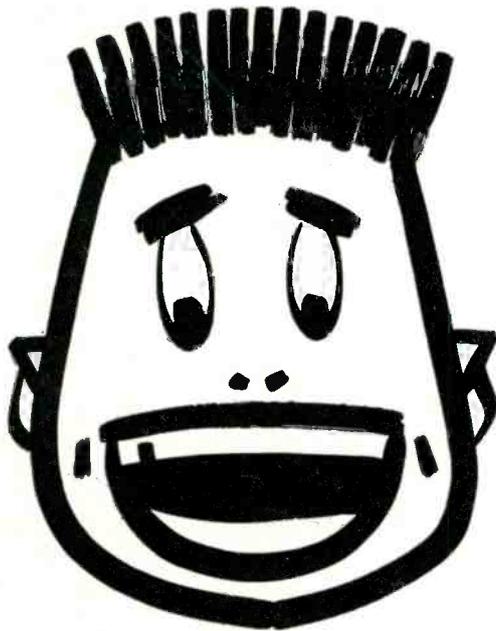
PYRAMID
ELECTRIC COMPANY

1445 HUDSON BLVD., NORTH BERGEN, NEW JERSEY

Page from the



RECOGNITION MANUAL



PANIC PAUL

This frantic space salesman may be recognized by his feverish display of terrorized urgency. His slogan is: If you can keep calm while others lose their heads, maybe you don't understand the situation.

He comes in two varieties: Spontaneous and Calculated. The former is demoralized when an ad space buyer cancels a 3-time 1/6 page campaign. The latter presses his own panic button at the dramatic moment ("It's suicide for your ad to be out of this issue!").

ELECTRONIC TECHNICIAN space salesmen are never Panic Paul's. They master any situation calmly. At least that's what they report to the sales manager.

Oh, yes . . . one day they did panic in the office. It was the day no subscriptions came in the mail. Fear arose of losing ELECTRONIC TECHNICIAN'S lead in audited paid circulation, largest in the field (53,959, ABC Publisher's Statement, 6/30/57), including highest waste-free percent of paid servicemen (92.92%). The panic was for naught, as usual. Who delivers mail on legal holidays?

ELECTRONIC TECHNICIAN

CALDWELL-CLEMENTS CO., 48Q Lexington Ave., New York 17, N. Y. Plaza 9-7880

(Continued from page 25)

REGIONAL HI-FI SHOWS scheduled by Rigo Enterprises for 1958 are Minneapolis, Jan. 10-12; Milwaukee, Jan. 24-26; Miami, Feb. 7-15; Cleveland, Feb. 21-23; Pittsburgh, March 7-9; Buffalo, March 21-23; Newark, April 11-13; Indianapolis, April 25-27; Cincinnati, Sept. 19-21; St. Louis, Oct. 3-5; Kansas City, Oct. 17-19; Denver, Nov. 1-3; and Seattle, Nov. 14-16.

MINNESOTA MINING has come up with a shadow box dealer display card which shows how recorder head life is extended by the use of Scotch magnetic tape with its silicone dry lubrication.

REK-0-KUT appoints Clifford Shearer Director of Marketing. Shearer was formerly ad manager. Bert Berkowitz was named asst. sales manager.

CAPITOL RECORDS has entered the hi-fi field with a line of phonos ranging up to \$250. In addition to 5 low-priced portables, there are a half dozen phonos, top items offering 4 speakers, 40-watt peak amplifier, provision for tuner. The company also introduced a line of 13 stereo tapes recorded at 7-1/2 ips. These tapes are in the \$10 to \$17 retail price range.

HARRISON Catalog of Recorded Tapes for summer 1957 runs 68 pages covering over 50 different tape labels. Prices range from \$6.75 for the lowest monaural 7" reel to \$18.95 for the highest. Stereo tape range is \$6.95 to \$23.90. All major composers are covered, and a large selection of variety material is included.

SYMPHONIC's latest audio entry is the Model 340 combination hi-fi phono and stereo tape playback. Provision is made for addition of an optional tuner. Retail price is \$419.95.

J. J. POWERS CO., 1317 S. 5 Ave., Box 211, Maywood, Ill., has issued an 8-page catalog describing a line of wall and ceiling speaker baffles and housings.

(Continued on page 32)

**THE
INDEPENDENT
SERVICE
BUSINESS
AND
YOUR
FUTURE**



**SOMETHING IS BEING DONE
FOR INDEPENDENT SERVICE**

This free booklet gives you all the details of your big Independent Service-Dealer national advertising campaign and the promotional tie-in material to help you increase your business.

The program is important to *your own* future. A nationwide survey conducted among independent service-

dealers revealed that 88 out of every 100 of you are concerned for the future of independent service and want this campaign continued. Because of your remarkable interest, it is being continued. And it will be expanded as your interest and support grow.

Learn all about your Independent Service campaign, its supporting material, and how you can get the most from them. Ask your CBS Tube distributor for your free copy of booklet PA-163, or write to us.

Remember — each time you buy CBS tubes, you support your own Independent Service-Dealer program. Keep it going . . . keep it growing . . . always specify CBS tubes.



CBS-HYTRON, Danvers, Massachusetts
A Division of Columbia Broadcasting System, Inc.

For the best entertainment, tune to your local CBS station

Weller soldering guns make safe repairs to Heat-Sensitive Components

A WELLER Soldering Gun gives you precise control of heat. This feature is especially important when replacing heat-sensitive components. Here are some typical applications:



1 REPAIRING PLASTIC-MOUNTED TRANSFORMERS. Your Weller Gun gives you precise heat control for this delicate operation. Prevents melting of plastic sockets; enables you to repair loose contacts and hair-thin coil-winding wire without damage.

2 SOLDERING VOICE COIL CONNECTIONS. Heat-control characteristic of Weller Guns enables you to repair loose or broken voice coil connections on the reflecting surface of paper resonating cone. The slightest mishandling of a soldering iron would burn cone.



4 REPAIRING REMOTE-CONTROL TUNING UNITS. Your Weller Soldering Gun fits neatly into the small spaces between the terminal tabs on telephone-type relay stacks. Also, heat shut-off feature of gun prevents damage to insulation.



3 REPLACING CRYSTAL OSCILLATOR. Controlled heat is imperative for replacing crystal oscillator in color demodulator circuits. With a Weller Soldering Gun you get perfect heat control, thus avoid damage to delicate crystal element.



There are professional model *Weller* guns
for every type of service work



Your choice of models... ranging from 100 to 250 watts single heat and 100 to 275 dual heat types. Suitable for every kind of service operation. All models heat in 5 seconds; provide instant, triggermatic control of temperature.

ORDER FROM YOUR ELECTRONIC PARTS DISTRIBUTOR

Weller

ELECTRIC CORP.

601 Stone's Crossing Road, Easton, Pa.

(Continued from page 30)

WESTINGHOUSE wares include 4 new hi-fi consoles retailing from \$159.50 to \$298.50. The 3-speaker model with 6-8 watt amplifier is at the low end, the 4-speaker unit with 16-18 watts at the top.

TRAV-LER has announced 4 new radio-phonos and 8 phonos ranging up to \$199.95. 2 electrostatic tweeters are included in the better models.

HARMAN-KARDON's Recital II amplifier-tuner and REK-O-KUT's Rondine turntable have been selected by the American Society of Industrial Designers to appear at the Triennale in Milan, Italy, July 28-Nov. 2, 1957.

GENERAL ELECTRIC SUPPLY, Boston, will distribute TELEFUNKEN and AUDIO ELITE hi-fi equipment in New England.

AUDIO-MASTER has made available a home version of the Tefifon long-play tape-groove reproducer manufactured in Germany. Model KCC chassis mechanism only, at \$79.50, and KCA with amplifier and speaker at \$129.50, can play up to 4 hours on a single soundbook or cartridge of vinyl tape. The tape is 1/2" wide and contains 92 grooves. 15 soundbooks in the \$12 to \$24 range are now available, 40 more are in the works. Other reproducers in the line are Tefi-Autofon for car and boat at \$109.50, and Model KCR with AM radio at \$149.50.

AUDIO-VISUAL manufacturers and services will exhibit at the first annual Industrial Audio-Visual Exhibition, Nov. 11-13, at the New York City Trade Show Building. Prime sponsor is the National Visual Presentation Association. Show is being organized by Industrial Exhibitions, Inc., 17 E. 45 St., New York, N. Y.

CAPEHART hi-fi line made by British affiliate features Victoria Model 418 with AM/FM/SW tuner, 5 speakers, GARRARD changer. List is \$599-\$619.

MIDWESTERN INSTRUMENTS has moved its MAGNECORD DIV. to Tulsa.

**Make hay
while the
Moon shines...**



... stock and sell

**RCA
BATTERIES!**



Modern Americans play outdoors, day and night, twelve months a year. And, wherever they go, hayrides, football games, weenie roasts, ski lodges — they take their portable radios along!

Make sure your supply of RCA Batteries is adequate to meet public demand this fall!



RADIO CORPORATION of AMERICA

COMPONENTS DIVISION

CAMDEN, N.J.



RCA BATTERIES...THE BRAND THAT COMMANDS PUBLIC DEMAND!

Another **RAYTHEON** First...

AN INDEPENDENT SERVICE DEALERS' SPECIAL PROGRAM OF GOOD-WILL BUILDERS

 <p>E-Z NEEDLE THREADERS End needle threading headaches</p>	 <p>METAL BOTTLE-CAPPERS Keep beverages fresh</p>		
 <p>KWIK-KLEEN LINT BRUSH Whisks away lint, dust, dandruff</p>	 <p>RAIN-MATE Water resistant bonnet</p>	 <p>ALL-PURPOSE SEWING KIT Complete with black and white thread, needle, thimble, and safety pin.</p>	 <p>KEYCHAIN "FIRST AID KIT" Contains band aids, antiseptic cream, first aid instructions</p>
 <p>COMB AND EMERY STIK Pocket comb and stik in case</p>	 <p>FLY SWATTER Lightweight, plastic</p>	 <p>TV SCREEN POLISHING CLOTH Chemically treated</p>	 <p>WOODEN LEAD PENCILS</p>

In addition to the skill and knowledge you offer your customers, there are many other ways to make a good impression and to help assure repeat calls.

A neat appearance, a friendly smile, a courteous manner, and remembering to clean things up after the work is done — all do a great deal toward having you remembered in the right way! This is good business.

When a job is done and you present your bill, you have a golden opportunity to encourage a feeling of good-will in the home you have visited.

One effective way of doing this is to give your customers something useful that will be appreciated. The fact that your name and telephone number appear on it makes this good business, too!

Good-Will Builders afford an effective, inexpensive way to keep ahead of national service company competition. You may select any of those shown and buy them in minimum quantities of 50 or 100 (depending on the item) at far below normal prices. They are available only through the Raytheon

Good-Will Builder Supply Station. For the complete story, send the coupon to Raytheon Good-Will Builders Supply Station, Box 30, Milford, Connecticut.

THEY'RE RIGHT...



RAYTHEON GOOD-WILL BUILDERS SUPPLY STATION
Box 30 . . . C
Milford, Connecticut

Gentlemen: I certainly would like the whole story on the Raytheon Good-Will Builders that will help my business. Please send a FREE copy of the booklet by return mail.

Company.....

Name.....

Address.....

City and State.....

FOR SOUND AND SIGHT

ELECTRONIC TECHNICIAN

Including
Circuit Digests

Shock Hazard—A Grim Responsibility

Some weeks ago, a six-year-old boy in a Chicago suburb brushed against the metal table supporting the family's new TV set. He reached for a knife in the drawer of a metal kitchen cabinet . . . and was immediately electrocuted.

What appears to have happened was that the hot chassis had come in contact with the metal cabinet of this 17" portable, which was resting on the metal table. The kitchen cabinet was evidently grounded, and the boy's body completed the circuit between table and kitchen cabinet.

Other stories started to crop up concerning recent electrocutions, one by an electric guitar, another by an electric buffing machine, still another by a toaster.

Who's Responsible?

First, let's recognize that from a statistical viewpoint, series string or transformerless TV sets with the chassis connected to one side of the ac line are not a major menace. TV deaths may receive sensational attention, but these sets are far safer than many other consumer products. Not only are there on the order of 3,000,000 hot TV chassis in use, but there are over 75,000,000 hot radio chassis around that are just as potent!

We should recognize that most technological advances—cars, planes, motorboats, etc.—entail some degree of risk. Nevertheless, we can not help but think that set manufacturers may have failed to take as many design precautions as prudence might dictate. A fragile chassis insulator is very little life insurance. No doubt sales price pressure by the public has encouraged corner cutting. The customer does not think of this when he receives a shock . . . his life being spared time and again only by the good fortune that he was not in contact with a grounded surface. Manufacturers should consider the use of an isolation transformer, grounding provisions and improved protection of metal cabinets in their sets.

TV service technicians are in a particularly vulnerable position. An oversight in remounting the chassis in the cabinet could make the cabinet hot, with dire consequences. The technician could be held responsible for negligence and sued for everything he owns! (Do YOU have liability insurance,

and does it cover such circumstances? Better find out.)

How to Meet the Problem

TV technicians can perform a valuable service by offering the following services to the public:

CABINET TEST: Offer to check hot chassis TV and radio sets to see if the metal cabinet or exposed metal parts are hot. First make a cold ohmmeter continuity test with the line plug disconnected. Then make a voltmeter test with the set operating. Find out if there is any potential between any external part of the set and a good ground. Reverse the line plug and do it again. Shake the set during the test and examine the chassis mountings.

PLUG REPLACEMENT: One side of the ac outlet is grounded, the other is a hot 115 volts or so. The set will of course work with the line plug in either of the two positions, but one of these positions will connect the chassis to the ground side so it remains cold during operation. If you examine any wall outlet made in the past 15 or 20 years, you will notice that one receptacle slot is a bit wider than the other. If the house has been properly wired, the wide slot is grounded. You can buy two-prong polarized plugs (one prong wider to match the outlet) to replace the present reversible plug. If you connect the chassis side of the line cord to the wide prong, and IF the outlets are similarly wired (check this for each outlet in the home which might be used), the polarized plug will keep the chassis cold.

ISOLATION: Series string sets can be isolated from the line by installing a transformer between the line cord and outlet. For this purpose, be sure the transformer has two separate windings not connected at any common point. There are transformers available which are also variable, which improves set performance when line voltage fluctuates.

GROUNDING: A simple expedient is to run a wire from the metal cabinet to a good ground. Then, if the cabinet becomes hot, the wire will short it to ground, a fuse will be blown, and no one will be injured. This grounding idea is also recommended for irons, toasters, mixers, etc.

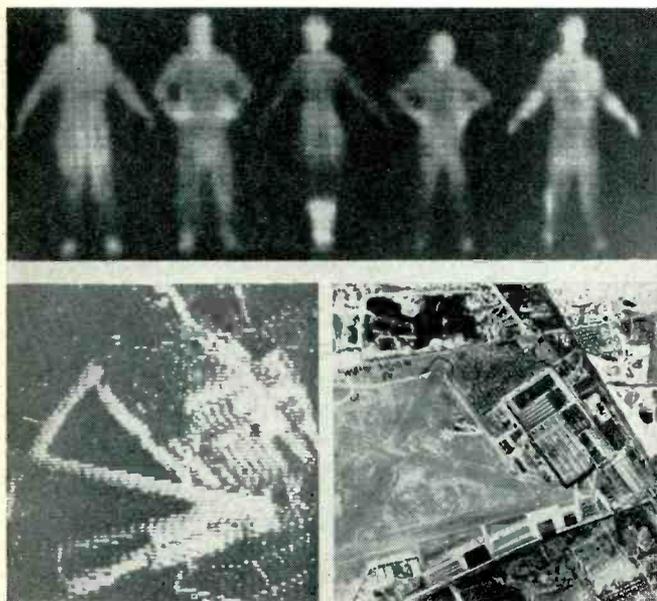
Shock hazard is serious. TV technicians can do a big job to reduce the risk.

Tuning In the

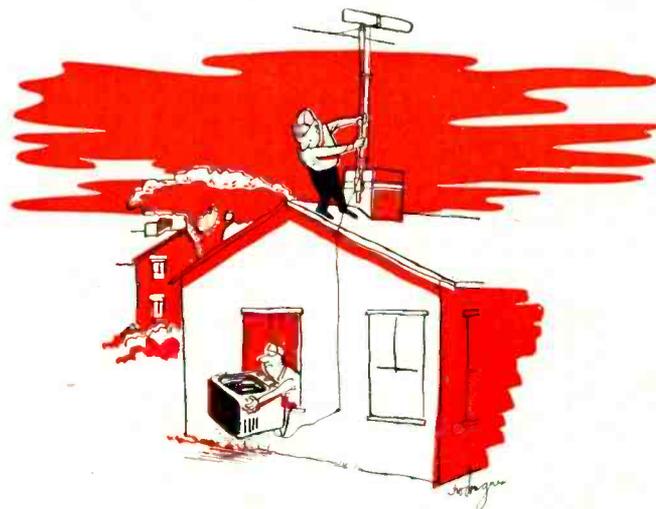
LATE NEWS FLASH! The color TV receivers being introduced this month by RCA as a supplement, not replacement, of its present line will feature all-glass picture tubes. A darker safety glass tint will be used to heighten picture appeal, and brighter pictures will be achieved, at least in part by the use of 22 kv second anode voltage, 2 kv over older sets. Its major feature is the claim that there is no need to adjust convergence or purity when installing the set; simple degaussing is all that is required. Prices are \$50 to \$100 over present models. There are 22 tubes and 7 rectifiers. These new additions bring the total number of RCA color models to 18.

WORLD TV statistics compiled by *Television Digest* shows 900 TV stations and some 63,000,000 sets in use in 43 countries. Deducting 500 stations and 44,500,000 sets in the U. S., plus 23 Armed Forces stations, foreign countries had 377 stations and close to 18,500,000 sets at midyear. This is an increase of 50 foreign stations and 4,000,000 sets since Jan. 1, 1957.

INFRA-RED FOR INDUSTRY & MILITARY

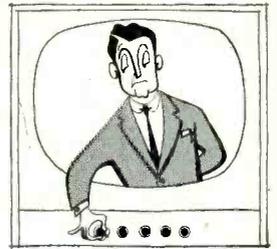


The ability to photograph objects on the basis of radiated heat has applications in industrial operations, plant security and military reconnaissance. Top photo shows group of people. Note woman in center, showing bright area where legs extend beyond hemline. Thermal map, lower left, of same airport area in aerial photo shows runways and plants, where trucks and planes give off heat. Infra-red system developed by Servo Corp. cannot be fooled by camouflage or jammed by electronic countermeasures.



QUOTABLE QUOTES and interesting statistics flew thick and fast at the Texas Electronic Association meeting last month. RCA's Hal Bersche stated that: "The independent technician will continue to dominate the electronics maintenance industry as far into the future as can be foreseen at this time. The fabulous growth of TV-electronic servicing during the past 20 years—from \$80,000,000 to \$1,800,000,000 annually—is expected to continue during the next two decades, reaching a record \$8 billion by 1975. At the present time, there are approximately 180,000 electronic technicians serving the industry. Of this number 120,000 are full time operatives and less than 3,000 are employed by all companies engaged in factory service. Expansion of the Industrial and Commercial fields is proceeding at a rapid rate. Although many companies, particularly the larger ones, employ their own electronic technicians much of the work goes to outside service operators either on contract or on a demand service basis. Surveys show an estimated 1.9 billion tube sockets in active use today of which approximately 400 million contain power and special purpose tubes. The latter are found in all kinds of electronic devices except home equipment. It is estimated that tube manufacturers in the U. S. will sell 185,000,000 tubes for replacement use in 1957." GE's John Thompson stated that: "The nation's 100,000 radio and TV technicians are each doing a gross business of \$20,000 a year, based on the fact that electronics service business has reached \$2 billion gross. However, the \$20,000 annual revenue estimate fluctuates violently between individual technicians and businesses. I was recently told that one mid-western independent service dealer does a total volume of over \$250,000 per year."

Picture



UNITED HOME SERVICES is the name of a Los Angeles company described by the Wall Street Journal as an outfit that finds the right man to make home repairs at the right price, right away. Here's how it operates: The consumer pays United \$5 a year to supervise anything from the repair of an ac-dc radio to remodeling a complete house. When something breaks down, the subscriber calls United, which calls the service company or contractor. The servicer sends the bill to United, which pays the bill, less 10% commission, and re-bills the subscriber. United has 700 firms in different repair lines on its roster, and any which pad bills or do unsatisfactory work are eliminated, thereby losing this prompt-paying, mass-buying customer. Some 15,000 households in the area subscribe to United's service, though half have not used it. 92% renew, and next year President Louis Lek expects to have 50,000 subscribers.

TECHNICIANS and dealers accounted for 68.2% of the business volume done by electronic parts distributors in 1956, reports the Market Planning Service division of National Credit Office. This represents an increase of 30% in dollar volume since 1953, but a decrease of 3.9% in percent of total market. Industrial customers accounted for 20.7% of the market in 1956, hams 5.6%, government 3%, consumers 1.8%, others 0.7%.

CALENDAR OF COMING EVENTS

- Sept. 9-13: Instrument Society of America 12th Annual Automation Conference, Cleveland Public Auditorium, Cleveland, Ohio.
- Sept. 13-15: High Fidelity Show, Palmer House, Chicago, Ill.
- Sept. 24-25: Sixth Annual Industrial Electronics Symposium, Morrison Hotel, Chicago, Ill.
- Oct. 7-9: 1957 National Electronics Conference, Hotel Sherman, Chicago, Ill.
- Oct. 7-12: Institute of High Fidelity Mfrs. Show, New York Trade Show Building, New York City.
- Oct. 9-11: Fall Assembly Meeting, Radio Technical Commission for Marine Services, Ambassador Hotel, Los Angeles, Calif.
- Oct. 16-18: Institute of Radio Engineers' Canadian Convention, Automotive Bldg., Exhibition Park, Toronto, Ontario.
- Nov. 11-13: Radio Fall Meeting, King Edward Hotel, Toronto, Canada.

TRANSISTORIZED RADIO-PHONO combination portable is reported in production by Rockland Precision Mfg. Co., Orangeburg, N.Y. The all-transistor unit, selling for \$79.95 retail list, will play 6,000 records or 750 hours of radio programs on one set of four flashlight batteries. A phono-only model retails for \$49.95. The entire unit weighs only 6 lbs., and measures 11" high by 8½" wide. A most important feature is an electric governor which keeps the turntable rotating at constant speed even though the batteries lose power; when the batteries die, all operation ceases.

RANDOM NOISE

3-D COLOR TV SYSTEM DEVELOPED BY GE FOR CLOSED-CIRCUIT USE MONITORING ATOMIC REACTORS IS VIEWED THROUGH POLARIZED GLASSES—CAMERA IN RADIOACTIVE AREA HAS ROTATING SHUTTER PROVIDING 45 FRAMES/SEC ALTERNATELY FOR EACH EYE

LARGEST PARTY LINE

IS THE SHIP-TO-SHORE RADIOTELEPHONE WHICH CONNECTS OVER 55,000 BOATS IN THE CIRCUIT—LARGE YACHTS OFTEN INCLUDE RADAR-DEPTH SOUNDERS AND DIRECTION FINDERS

OVER-THE-HORIZON TV AND PHONE LINK BETWEEN FLORIDA AND CUBA GOES INTO SERVICE SEPT. 12 - SYSTEM COST TO COVER 185-MILE SPAN--- \$3 MILLION

TV Antenna System Know-How

Horizontal and Vertical Antenna Orientation, Transmission Line

JAMES A. McROBERTS

• In spite of improvements in noise immunization circuitry, ignition interference remains one of the sources of customer dissatisfaction with TV programs. Care in installation can minimize ignition interference and provide more satisfactory reception. The ideas that follow may be utilized singly or in combination to alleviate this type of complaint. Attention should be paid to the antenna, lead in, and the set itself.

Antenna

The antenna should be located as far away as possible from the street or road carrying traffic. Do this even at the expense of more antenna height and longer transmission line. An extra 30 feet of lead-in will not reduce signal strength greatly but an added 30 feet of distance from the front of the building may greatly reduce the amount of noise picked up by the antenna.

When routing the transmission line, have the vertical drop at the rear of the house and the horizontal run towards the front of the house, as shown in Fig. 1. The rear drop keeps the line away from the front of the house where the noise source is. Keeping the horizontal run higher

—near the ceiling of the story instead of at window sill level will also help maintain a greater distance from the street.

Antenna pickup patterns show pronounced directivity in the vertical as well as the horizontal plane. Less noise is picked up from the street if the antenna is oriented vertically. Even a 30° to 40° upward tilt will not affect the station signal as much as it will reduce the noise pickup. In most cases an angle of about 10° to 20° is sufficient. See Fig. 1. A compromise between best signal and minimum noise may also be obtained by horizontal orientation. Quite often noise reflections from nearby buildings causes interference. Moving the antenna about 10° in a horizontal plane may cut the noise figure as much as 50%.

A reflector sharpens the pickup pattern so that a more favorable signal-to-noise ratio is obtained, and the front-to-back ratio is also improved. A director may also be used. It may be desirable in some instances to select an antenna having both a director and a reflector.

Transmission Line

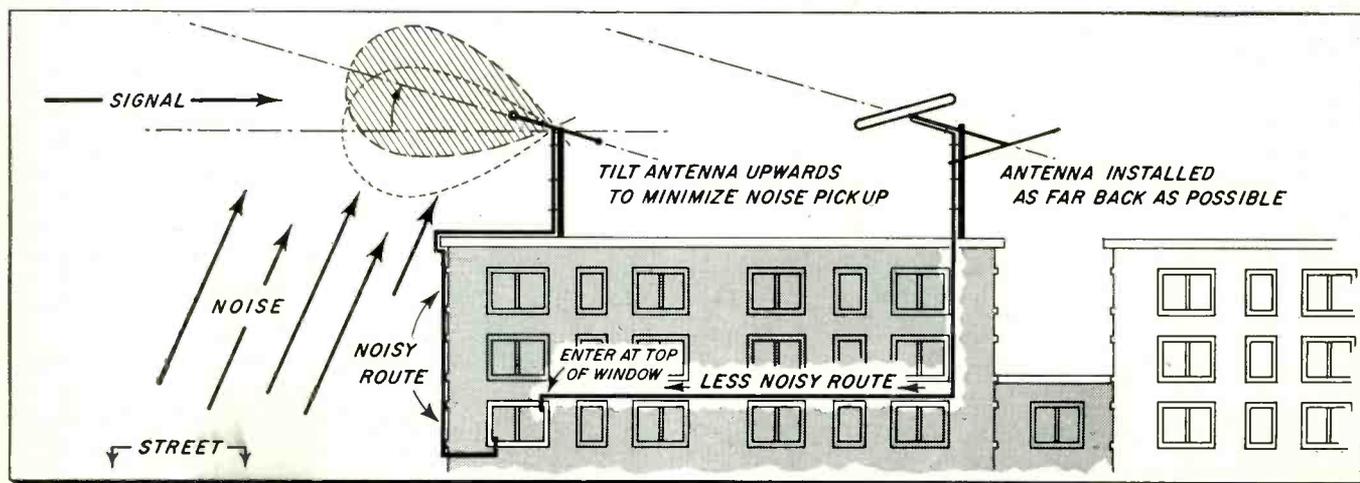
The antenna delivers the signal to the transmission line in such a manner that while the signal current is traveling down one lead, it is coming up the other. Noise pulses cutting

the transmission line may or may not induce noise currents to flow. Should the noise strike both conductors at the same time, any tendency for noise current to flow would cancel itself out, as shown in Fig. 2. On the other hand if one lead of the transmission line were closer to the noise source, a stronger current would be induced in that lead, and a weaker current in the lead further away. The difference would cause some noise currents to flow. This phenomena is similar to that which takes place in a loop antenna, and exhibits almost the same directional characteristics. Only when signal or noise or both currents are flowing, can transformer action take place and deliver the information from the transmission line to the set.

By twisting the transmission line, both conductors alternately face the noise front, and are equally excited. Since both leads now have equal noise pulses going in the same direction, these pulses cancel each other. Fig. 2 depicts a condition which may exist at any given instant. The solid arrows indicate signal current. The dotted arrows show noise currents which want to travel in the same direction but can't.

If one side of the line runs adjacent to the building all the way from the antenna to the set, this will cause stray capacity to be more on one side of the line than the other, and will

Fig. 1—Vertical drop of transmission line is most susceptible to stray pickup and should be kept as far from the noise source as possible. Vertical and horizontal orientation of antenna may reduce interference considerably, without too much loss of station signal.



Beats Ignition Interference

Considerations and Filters Can Result In Clean TV Reception

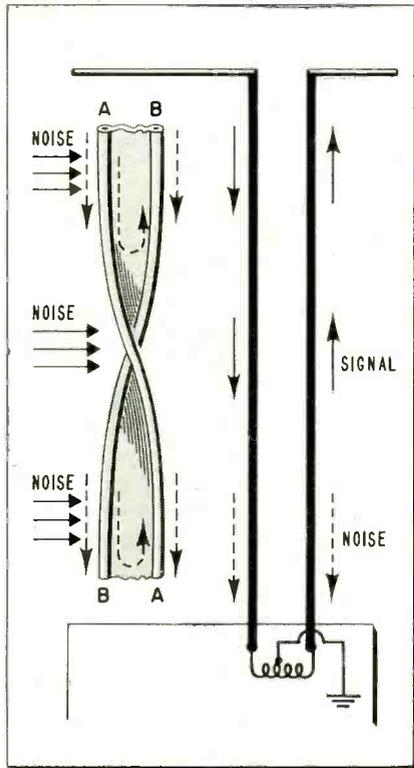


Fig. 2—Twisting antenna lead-in minimizes noise pickup and capacitive line unbalance.

upset line balance with respect to ground. This is another good reason for twisting the transmission line. About one twist every two feet is satisfactory.

In addition to twisting the transmission line and in the interest of maintaining a maximum signal-to-noise ratio, it is important to maintain other good practices of antenna installation techniques. A good antenna and quality accessories can be compromised by not having the lead-in properly dressed around gutters and other abutments. Proper standoff insulators should be used where needed. When it becomes impossible to place an insulator at a particular sharp edge, then it is best to form a loop around the edge with an insulator on either side to act as a strain relief. Failure to follow this procedure will also cause difficulties in the form of broken leads and abraided insulation. The use of ordi-

nary tape at the edge is a poor practice, because it acts as a trap for dirt and moisture and its dielectric characteristics are not as good as the transmission-line's insulation. In time, the tape will also rub away.

Proper Impedance Match

Since the signal-to-noise ratio is an important factor care must be exercised to maintain proper impedance match both from the antenna to the transmission line, and from the line to the TV set. In strong signal areas constant impedance, variable attenuators may reduce enough of the noise signal, improve impedance match and allow enough signal to get through to warrant its use. In extreme situations and where the transmission line run is not too long, shielded or coaxial transmission line may be used.

TV Receiver

A good ground for the TV set will help bypass some of the unwanted noise signals. In a transformerless set where one side of the chassis is connected to the power line insert about a 0.01 μf capacitor in series with the ground lead.

Power lines can intercept TV station signals, but they pick up much more noise. House wiring, including the TV lamp on top of the set, may act as a radiator. The line may even yield some increase in signal, which may help the indoor antenna system. But, the wiring is more likely to induce a heavy noise signal. Keep the transmission line as short as possible and away from house wiring, including the power cord.

Power-line noise signals may also enter the set via the line cord. Part of this signal is usually shunted to chassis immediately by the capacitor from the interlock to the chassis and, thence to ground, if the chassis is grounded. Sometimes reversing the plug will result in a reduction of the noise signal. A filter at the outlet, as shown in Fig. 3, with or without the ground on the set, will further reduce the noise and the signal fed into the set via the power lines. Not all grounds work equally well. It

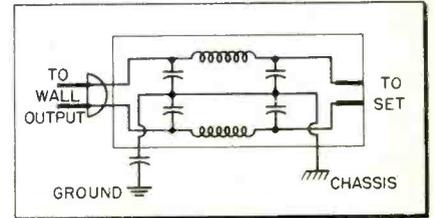


Fig. 3—Low-pass line filter tends to reduce noise frequencies above 60 cycles.

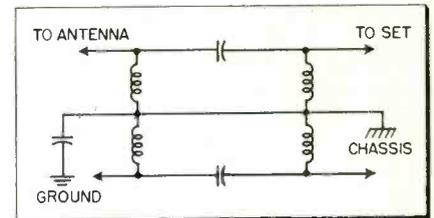


Fig. 4—High-pass filter in the set's antenna line cuts off frequencies below 54 mc.

may be worthwhile to run a heavy braided conductor to the nearest cold-water pipe. Cases are known in which a ground actually added noise instead of taking it away from the TV set.

Traps & Filters

Since the frequency spectrum of ignition interference is so wide, it is difficult to design any one trap which can eliminate this type of noise. Ignition noise may extend from the radio broadcast band clear past Channel 13. A high-pass filter as shown in Fig. 4, capable of cutting off all frequencies below Channel 2 installed in the antenna lead-in, at the TV set, in addition to the low-pass filter in the line cord will do much to alleviate the noise problem. Shielding may help in those cases where the chassis is subject to direct pickup. As a last resort the technician and other agencies might be able to encourage the use of anti-radiating devices right at the source. Resistor type spark plugs, properly shielded, bonded and bypassed motors, generators, appliances and electrical systems in automotive and other stationary equipment would eliminate this problem. •

The Independent Technician

What Role Will You Play In The Years Ahead?

ELECTRONIC TECHNICIAN asked some manufacturing executives an important question which bears heavily on the future careers of all electronic-TV service technicians: "What do you think will be the future role of the independent electronic technician and service business in the repair and maintenance of industrial electronic and communications equipment?"

Their answers, drawn from the insight of their many years of electronic experience, should receive serious examination from every reader.—Ed.



Arthur L. Reese

**Vice President & General Manager
Motorola Communications &
Industrial Electronics Div.**

We recognize the independent electronic technician as a key factor in industrial electronic and communications equipment.

Statistics published by the Federal Communications Commission show that the need for technicians in the electronic industry is great. To this we add the many industrial electronic devices not now and probably never requiring licenses, particularly in the field of automation and control. This need, of course, extends from the manufacturing stage through to the maintenance and operations stage.

It must be recognized that the rate of growth of the communications industry continues to rise. In the industrial electronics field, new products are appearing on the scene at an unprecedented pace.

As a manufacturer of two-way radio and allied industrial communications products, we have fostered the philosophy of independent, fac-

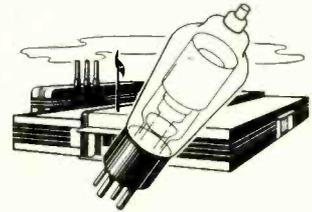
tory authorized service stations working with the manufacturer to provide the necessary maintenance facilities to the user. With the growth in use and number of our products, we expect a continuing growth in both the size and number of such service organizations.

In general, the communications serviceman differs from the TV service technician for several reasons. First, the communications product is quite complex, is more of a precision instrument, and more generally follows a custom design approach, at least in the systems aspect of the user's operations. Secondly, outage of a radio or TV receiver may be of inconvenience to the user, but the outage of a radio communications system removes an operational necessity which can be extremely costly in dollars, property, and lives. Thirdly, the communications serviceman must be screened and qualified through federal examination and licensing. We therefore conclude that the communications technician should have the special training and experience necessary to cope with the unique problems of the equipment, and be imbued with the philosophy that he is serving an urgent need and could be called on to serve his clients at any time, much as a physician.

It has been our policy to distinguish clearly between sales and service activities. As a result, equipment or maintenance contract negotiations with the user are conducted by our factory sales representatives. Execution of maintenance functions, a sub-contractual arrangement between the serviceman and Motorola, is defined as the serviceman's responsibility. With this viewpoint, the service technician maximizes his efficiency and income potential by devoting his attention exclusively to his service program. The prime responsibility to the user resides with the manufacturer who will insure both full customer satisfaction and full protection to the serviceman against unforeseen problems. The serviceman, as an independent business man operating under the free

enterprise system retains his right to accept or reject contracts and set equitable rates on his services. A part of the manufacturer's responsibility is to maintain a continuing flow of product and service information plus management guidance.

Under a program of this type, the qualified technician and his organization can grow rapidly to new stature, limited only by his own technical and managerial abilities. More qualified technicians are required due to growth of the industry. Their participation and the expansion of activities of men already in the industry has no readily discernible upper limit today.



Harold F. Bersche

**Merchandising Manager
RCA Electron Tube Div.**

The critical shortage of trained technical talent now plaguing American industry is not confined to the level of college graduate personnel. The need for expert technical maintenance on servicing levels is equally pressing, and the situation will worsen rapidly as electronization continues to spread into all segments of industry.

At one time, only a few years ago, the number of major industries in which electronics played an essential role was not great. But today there is scarcely an industry—scarcely a commercial plant of any kind—that does not depend on tubes, transistors and other components for dependable, economical production. Included are Steel, Motors, Petroleum, Chemicals, and Machinery, to name only a few. Add to these the manufacturing and maintenance processes involved in paper and textile mills, lumber operations, railroads, and electronic computing and

in Industrial Electronics

Read What The Experts Say.

the possibilities grow in immensity.

During the past decade, I have talked to many thousands of service technicians throughout the country. The majority of these men have been specializing in radio and television servicing. Through their skills, particularly as they apply to the TV field, they have made it possible for television, starting from scratch in 1946, to become one of the nation's most amazing and successful industries.

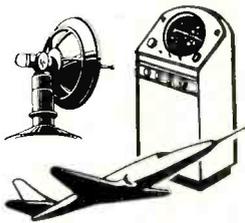
These same technicians are now looking ahead. They are reading and hearing about new applications of electronic controls, automation and miniaturization, and the prospects offered by these advances appeal to them. In these new fields, they see increased opportunities for advancement and profit. It is a challenge they are willing to accept. But are their hopes justified? I believe they are.

Of course, it should be realized that the majority of commercial firms will have their own maintenance crews; but the smaller concerns, and there are tens of thousands of them, will not find it economical to do the same thing. Here is where the independent servicemen will find their golden opportunities. Service technicians who have proved themselves good business men in the radio-television fields should be able to move into the broader areas of commercial industrial servicing with relative ease. Thousands, I am sure, will do so. And, if they approach their new responsibilities with a determination to succeed, they will not fail.

Industrial electronic equipment can be far more complex than television receivers. But the electronic fundamentals are much the same. This means simply that existing radio-TV technicians must broaden the base of their knowledge by study or experimentation in order to be equally successful in the more demanding field of industrial servicing. For one thing, they can count on aid from the 5000 firms now producing electronic devices. It is to the interest and commercial well-being of these manufacturing firms that they

make available desirable information to independent servicemen in order that customers may derive full value from the product once it has been installed.

In other words, there will never be a better chance for the radio-TV service technician to add to his stature and his income by preparing for the broad field of industrial electronics maintenance. Today is the time to start. Tomorrow may be too late!



John Bennett
Manager

Philco Factory-Supervised Service

We can see nothing but busy times and prosperity ahead for the independent electronic technician and service business as a whole. Daily, our lives are becoming more involved and more dependent on products and systems that are electronically activated and controlled.

Automation in factories, computing equipment with electronic memories, even domestic appliances that "think"—hundreds of thousands of new industrial and consumer products of miraculous design and utility, but no matter how amazing the inventions and dramatic their performance, there is yet to be built a device that will maintain itself! Only the informed troubleshooter—the trained and experienced electronic service technician can do the job. And his role becomes increasingly important as the products become increasingly complex.

We believe that just as a shortage of trained engineers exists for industry, we are rapidly approaching a critical situation in the field of electronic product maintenance. Industry's answer seems to be one of

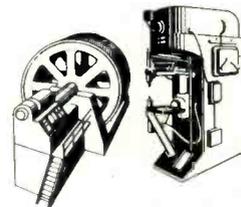
greater interest in the prospective technician, and a greater emphasis on educational programs.

We have taken special steps over the years to meet the ever-growing need for informed and qualified product service technicians. Before, during and since the war, thousands of independent servicemen have been constantly trained through Philco Factory-Supervised Service. In the course of this training, many of the men have moved into the field of industrial electronic and communications equipment maintenance.

There can be little question as to the significant part the independent electronic technician will play in the industrial and consumer goods business of tomorrow, when one considers the increasing reliance placed on him today.

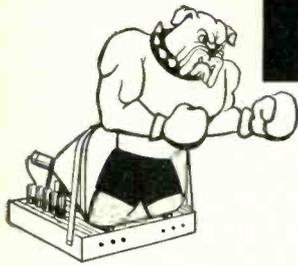
It is our opinion that all of the segments of our great industry—whether interested in industrial, commercial or consumer business—will find it highly advisable to join forces in developing, through education, a greater pool of technical service personnel.

For the independent electronic technician it's horizons unlimited!



Gordon T. Roberts
Field Service Manager
Raytheon Manufacturing Co.

The independent electronic technician and service businessman can have an important position in the future of industrial electronic and communications equipment. It is our policy to enlist the aid of independent businessmen in the marketing of our products. We believe that technical service is a most important function of marketing, and we delegate the
(Continued on page 78)



"Tough Dog"



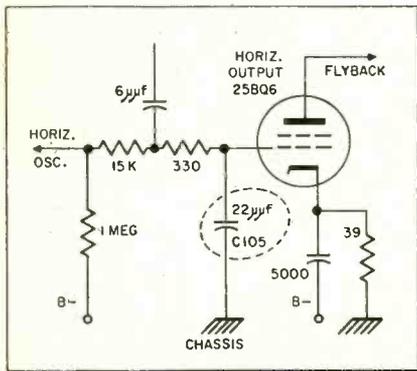
Corner

Difficult Service Jobs Described by Readers

Hour-Glass Raster

The set: a GE Model 17T1. The complaint: intermittent "hourglass" shaped raster. The raster would remain at full width at the top and bottom but the center would pull in from each side in a smooth curve forming an hour-glass shape.

Since the pattern remained even under no-signal conditions, it was obvious that the horizontal sweep was being modulated by some spurious 60-cycle signal. The scope sweep was set at 60 cycles and the probe applied to the boost B+ line. An excessive 60-cycle ripple was detected. To eliminate the possibility of interaction from the vertical circuit, the vertical oscillator was disabled. The 60 cycle remained.



Defective capacitor passed strong hum signal from chassis to horizontal-output tube.

The scope probe was then shifted back to the grid of the horizontal-output tube. Here the 60-cycle signal was present with an amplitude of about 100 volts peak-to-peak. As the probe moved back across the resistor R110 the 60-cycle ripple decreased. This definitely established that the trouble was being introduced directly on the grid of the horizontal-output tube. So large a signal could not be picked up out of the air, nor could it be passed by the small capacitor C105; the only possible an-

swer was that there had to be a heater-to-cathode short in the horizontal-output tube. I also suspected that the series-heater string had something to do with this trouble.

To demonstrate this I disabled the heater string and removed the tube. In spite of my devastating logic the 60-cycle ripple was still there. I was chagrined and as a final gesture of resignation I turned off the a-c switch. Alas! the 60-cycle signal still remained on the grid of that tube.

Grabbing a pair of dykes I clipped off C105 and the 60 cycles disappeared. I then checked the chassis with respect to B- and found a 200-volt ripple on it. This was traced to a conductive path on the a-c interlock receptacle which had been arcing for a considerable time, and which was going to be replaced later.

Turning back to the small capacitor C105 which could not have possibly passed so much ac, I checked and found it to be quite leaky. It had a d-c resistance of less than 1 megohm. —Ivan White, Albuquerque, N.M.

No Sound, No Picture

I have been in the TV servicing field for the past 7 years. In all that time, I have never run into a set which was so confusing. I received a service call from a customer, who purchased this set from me not more than 8 months ago. It was a Zenith Model Z222C (Circuit Digest #303). The complaint was, raster, but no sound and no picture. In the home, I noticed the following: picture was down from the top and in from the sides about a 1/16 of an inch; it was just noticeable. On Channel 10, after setting the fine tuner at mid point and turning it one turn counter clockwise I could get a picture, but it had a buzz in the sound. If from that point I turned it 1 1/2 turns clockwise I got a good picture and good sound. If from that point I turned

it another 1/4 turn clockwise I lost both sound and picture; to regain it I had to turn it back approximately 3 turns.

In this locality we also get channels 3 and 6, but 10 is the strongest. I couldn't get anything on 3 and 6. It appeared to me to be low voltage, causing the oscillator to stop. Actually, I didn't fully believe this at the time because Channel 10 is the highest frequency and it would tend to stop first.

I started by replacing the 5U4GB; no help. I replaced front-end, i-f, agc, video-amp, and sync tubes. I tried a new 1N64 detector; no help. At this point I decided to bring the set into the shop. In the shop, the same conditions were present. I scoped the grid of the first i-f tube and there was no video present. A voltage check of the tuner led me to the agc tube. The voltages indicated trouble in this part of the set.

After many hours of checking and checking, the thought occurred to me that I was getting nowhere. So I started to pull out components and replace them. I replaced almost all the parts of the agc circuit, but this didn't help. I now had approximately 12 hours on the set and was still enmeshed in the agc circuit. The set was in the shop approximately 1 week.

I came in one night to try and get some work out. I was in a very disgusted mood, since this set was keeping me awake at night. I turned on the set and leaned back in my chair, waiting for it to warm up; it appeared the same as usual. I just started to get the test leads in my hands when I noticed some flashes in the picture. I looked at the 6AX4 damper and saw it was arcing. I replaced the tube and turned the set on. The set worked beautifully. The agc voltages were right, picture and sound on all channels worked normal.

(Continued on page 82)

40%

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QUALITY**

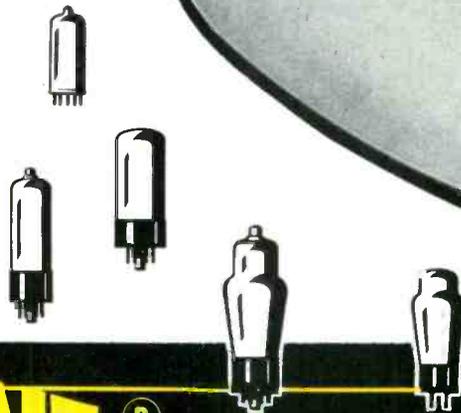
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Guide to Electronic

Effects Of Derating, Quality Control

LARRY D. SMITH, 2ND LT., USAF
WRIGHT AIR DEVELOPMENT CENTER

• During the life of electronic equipment, shutdowns caused by the failure of electronic component parts consist of three types, often intermixed in such a way that it is impossible to determine to which type a given failure belongs. These three types are: (1) early failure, (2) random failure, and (3) wear-out failure. The relative contribution of each of these types to the overall failure picture is influenced by such factors as age, environment and maintenance.

Early Failures

Early failures are defined as those causing the failure rate during the early life of the equipment to be higher than that experienced during later periods. These failures are the result of poor control of component-part manufacturing techniques, materials, and assembly. They are affected by the experience of the manufacturer, quality - assurance

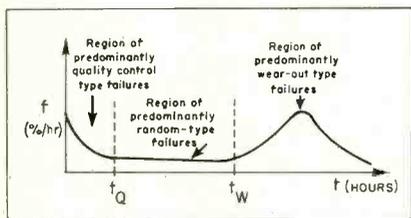
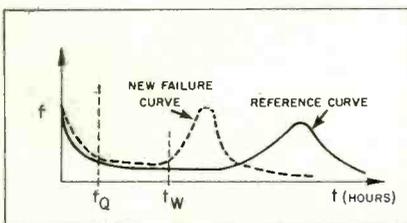


Fig. 1—Reference failure curve. "F" is failure rate in %/hour of original parts.

Fig. 2—Effect of overrating is to reduce expected life. Area under both curves is same.



methods, and other factors, so that this type of failure is often unaffected by technological advances in the state of the art. One of the best ways for an equipment manufacturer to avoid trouble from this source is to use tried and proved components purchased to rigid specifications.

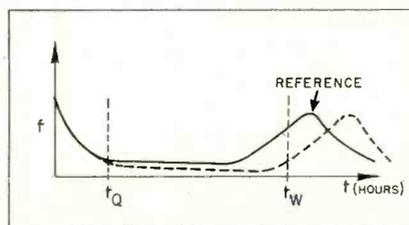
These early failures might be typified by hermetically sealed capacitors and vacuum tubes with defective seals, wirewound resistors with resistance wire that has been partially severed during manufacture, or cold-soldered joints in transformers and relays.

As the equipment ages, this type of failure contributes less and less to the overall failure picture. Suppose, for example, that 10 per cent of the parts in the equipment are initially defective and show a high failure rate such that most of them have been replaced after twenty hours of operation. The chances are, of course, that 10 per cent of the replacement parts will also show an unusually high failure rate, but these defectives are now only 10 per cent of 10 per cent or 1 per cent of the whole. This is a gross simplification of a complex problem, but it does point out the basis of argument for the advocates of "burn-in."

Random Failures

Random failures are just as likely to occur at one time during the life of the equipment as another; in fact, reliability prediction depends on the assumption that the equipment is being operated in a region of constant average-failure rate and that the time interval between any two

Fig. 3—Technological advance increases life and decreases random failures (dashed curve).



How long will it operate?

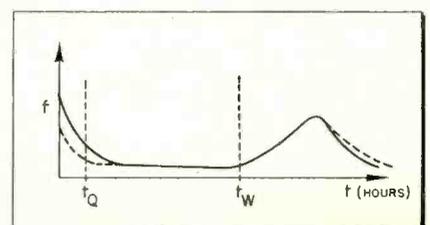
Author Smith comes up with an interesting formula estimate, based on experience with high-performance military equipment, on the anticipated failure time of electronic products. The mean failure time in hours is $10^4 / (4 \times \text{number of tubes})$. For an audio or TV system with 20 tubes this comes to 10,000/80, or 125 hours. This is based on military type tubes, and may be lower for regular receiving types. Of course, any individual set could operate for shorter or longer periods without failure. The 125 hours is calculated on the basis of operation at rated voltage, current and temperature. By derating or reducing voltage and related factors by 1/3, mean failure time may be increased by as much as a factor of 10 to 1250 hours.

given failures is completely random. This type of failure is the major contributor to unreliability during the time after most of the early failures have been removed and before wear-out failures begin to contribute heavily to the equipment-failure rate.

The random-failure rate is a function of the technological state of the art, manufacturing methods, environmental factors, circuit function, and others. Taken for any given component part, the random-failure rate may seem negligibly low, but when compounded by the immense number of parts in modern-day equipment, it reduces the mean time between failures for the equipment to an alarmingly low value.

Random failures consist of changes in parameter values more often than total failure, although they often go

Fig. 4—Effect of improving quality control.



Equipment Failure

and Burn-In Period Analyzed.

undetected until they result in a total failure and in the meantime cause degraded performance of the equipment. For this reason, the use of generous amounts of feedback in circuitry can be just as important as conservative ratings, environment control, redundancy, and component selection.

Wear-Out Failures

Wear-out failures are defined as those that cause the failure rate in old age to increase appreciably over that experienced during the random-failure-rate period. The life of equipment is such that most conservatively rated component parts never show wear-out failures; however, components with moving parts and unconservatively rated parts may contribute significantly to the failure rate of the equipment by showing wear-out failure patterns.

Wear-out failures rise to a peak at a time that can be predicted from the history of the equipment. This time is represented by t_w in Fig. 1. If, for instance, electron tube VI on chassis C5 regularly burns out after 50 to 75 hours of operation, t_w for that tube might be estimated as 50 hours. This tube can then be replaced by scheduled preventive maintenance after each 50 hours of operation and can thus be prevented from contributing drastically to the equipment-failure rate.

Failure Curves

The failure curves for a hypothetical component are shown in Figs. 1 through 8. These curves show what

happens as various measures are taken to improve the failure rate. The scale is exaggerated in order to show the principles involved. If it is assumed that 10,000 components are put on test at time $t=0$, then the integral of the area under the curve must equal 100 per cent of the original group of 10,000 parts.

Fig. 1 shows a representative failure curve. The regions in which the three different types of failure are predominant are identified.

Fig. 2 gives the result of increasing environmental parameters such as temperature, moisture, or vibration, or of increasing critical stresses such as voltage or dissipation. The area under the dashed curve must remain the same as the area under the reference curve. Note that the time scale is compressed while the failure rate is increased. The region of constant average-failure rate is reached sooner, but the value of the failure rate is greater.

Fig. 3 represents the effect achieved by using improved materials, design, and processing in the manufacture of component parts. The early failures are largely unaffected unless the manufacturer improves construction methods and personnel skills at the same time. The random-failure rate is less, so that the equipment shows a longer life between failures after time t_q .

Fig. 4 shows the result of better quality control in the manufacture of component parts or subassemblies. The random-failure region is reached earlier.

Fig. 5, dashed curve, shows the effect of "burn-in" under severe environment combined with use at

conservative environmental stresses. "Burn-in" compresses the period of early failure. As soon as the failure rates begin to assume a constant value the components are returned to normal operating stress, and since conservative rating has been employed, the random-failure rate will be low. If derating were not employed, the dotted life curve would be followed.

"Burn-in" has no useful value with components as shown in Figs. 6 through 8; it merely uses up a portion of the useful life of the component. Fig. 6 represents the majority of electronic component parts that are being produced to modern military specifications. "Burn-in" imposed on such components will result in great expense, and loss of useful life with no significant increase in reliability. It can be said that "burn-in" is only a poor substitute for quality control.

The above information is presented through the courtesy of the Advisory Group on Electron Tubes. •

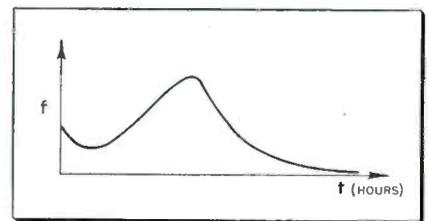


Fig. 7—Short life, poor quality control.

Fig. 5—Effect of combining extensive derating with burn-in at high voltage or temperature.

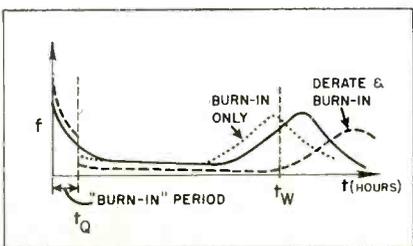


Fig. 6—Good quality control. Burn-in is no good with parts having characteristics of Figs. 6-8, merely using up useful life.

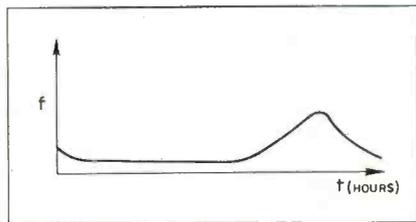
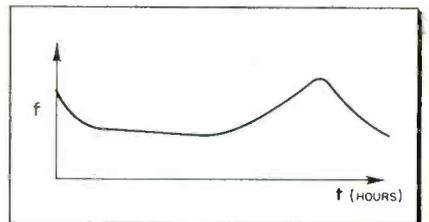


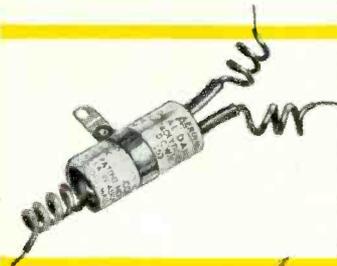
Fig. 8—Random failure too high to be used.



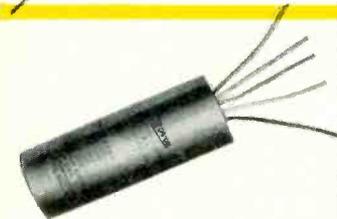
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Pyramid AMPROBE

A new model snap-around volt-ammeter, the RS-2 has a 300-volt scale, a 150-volt range and four current ranges (5 amps, 15 amps, 40 amps, and 100 amps) each on a separate and distinct scale. A built-in, recessed range selector permits selection of any one range. Since only one current scale or voltage scale is visible at any time, speed of reading is increased and chance of error is minimized. Other features include a magnifying-glass covered dial; a longer needle sweep; a pointed-lock to lock the needle in place when taking a reading in a difficult location. It can be used for current measurement without cutting conductors. Pyramid Instrument Corp., Lynbrook, N. Y. (ELECTRONIC TECHNICIAN 9-68)

Electrix TOOLS

Two new low priced hand tools will effectively crimp solderless terminals and connectors, strip insulation, and cut wires from 22 through 10 gauge. The stripper may also be used as a wire gauge. Both tools are made of high grade steel and hardened for strength and durability and have insulated handles. Electrix Terminals & Connectors, Inc., 990 E. 67 St., Cleveland 3, Ohio (ELECTRONIC TECHNICIAN 9-61)

Grayhill SWITCH

A new precision-built DPST push button switch is a silent-action, momentary contact, type and is rated at 0.5 amps, 115 volts ac for a resistive load. Grayhill, Inc., 561 Hillgrove Ave., La-Grange, Ill. (ELECTRONIC TECHNICIAN 9-62)

Dyna KITS

The Mark III 60-watt amplifier kit utilizes the new heavy-duty KT-88 tubes in the output stage. All audio portions of the circuit are pre-mounted at the factory on a printed circuit assembly. Total assembly time is less than 3 hours. The preamplifier kit is 2 $\frac{5}{8}$ " high. Included is a printed circuit board on which all components are pre-mounted at the factory and dip soldered, a built-in voltage-doubler rectifier to supply dc for the filament circuits, and 6 inputs. A feature of value to tape recordists is the tape AB monitor switch which permits comparing the input with the recording. Dyna Co., 617 N. 41st St., Philadelphia 4, Pa. (ELECTRONIC TECHNICIAN 9-65)

Telectro TAPE RECORDER

New 2-speed tape recorder (3 $\frac{3}{4}$ & 7 $\frac{1}{2}$ ips) with push-button speed change control, is easy to operate, and weighs less than 15 pounds. It measures 7 $\frac{3}{4}$ " x 11" x 11 $\frac{1}{2}$ " and is housed in a 2-tone luggage-type carrying case. The Model 1960 features dual-track recording, fast forward and rewind speeds, delayed action interlock control to prevent accidental erase, record-level indicator and a 6-inch speaker. \$79.95. Telectro-sonic Corp., 35-16 37th St., Long Island City, N. Y. (ELECTRONIC TECHNICIAN 9-59)

ELECTRONIC AUTOMATIC FINE TUNING

• Correct fine tuning of today's TV set can be accomplished only when the sound carrier is about 30 db below the picture carrier signal at the video detector, and the picture carrier is about 1/2 the peak i-f response. The first requirement insures good sound quality without false picture distortion; the second assures good picture detail and eliminates high-lights in dark areas. Electronic circuitry developed by Westinghouse Electric Corporation TV engineers

provides automatic fine tuning (AFT) by maintaining these two essential requirements simultaneously under such adverse receiving conditions as drift, tilt, and fringe tuning.

Before the advent of electronic AFT, an automatic gain control circuit maintained the picture carrier level at a constant value selected by the viewer. The new electronic fine tuning circuitry measures the picture carrier level and the sound carrier level, and operates to maintain the

picture-sound carrier ratio at the proper value by controlling local oscillator frequency. The operation of AFT can be demonstrated for drift, tilt, and fringe tuning on the i-f passband curve.

The conventional TV receiver i-f passband curve is shown in Fig. 1. For a strong signal, the picture carrier will be located at P and the sound carrier at S (always 4.5 mc apart). The i-f passband for the new
(Continued on page 72)

Fig. 1—Conventional i-f response curve.

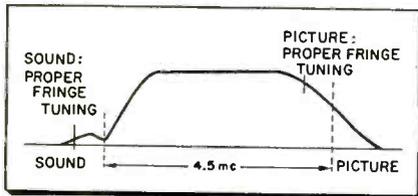


Fig. 2—Sharpened response curve improves AFT sensitivity to position of sound carrier.

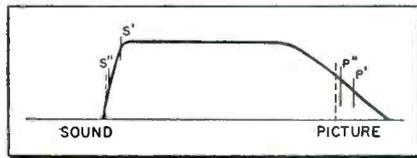
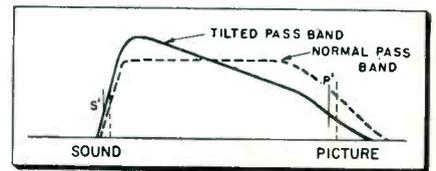


Fig. 3—AFT shifts carriers when passband is tilted, which improves picture/sound ratio.



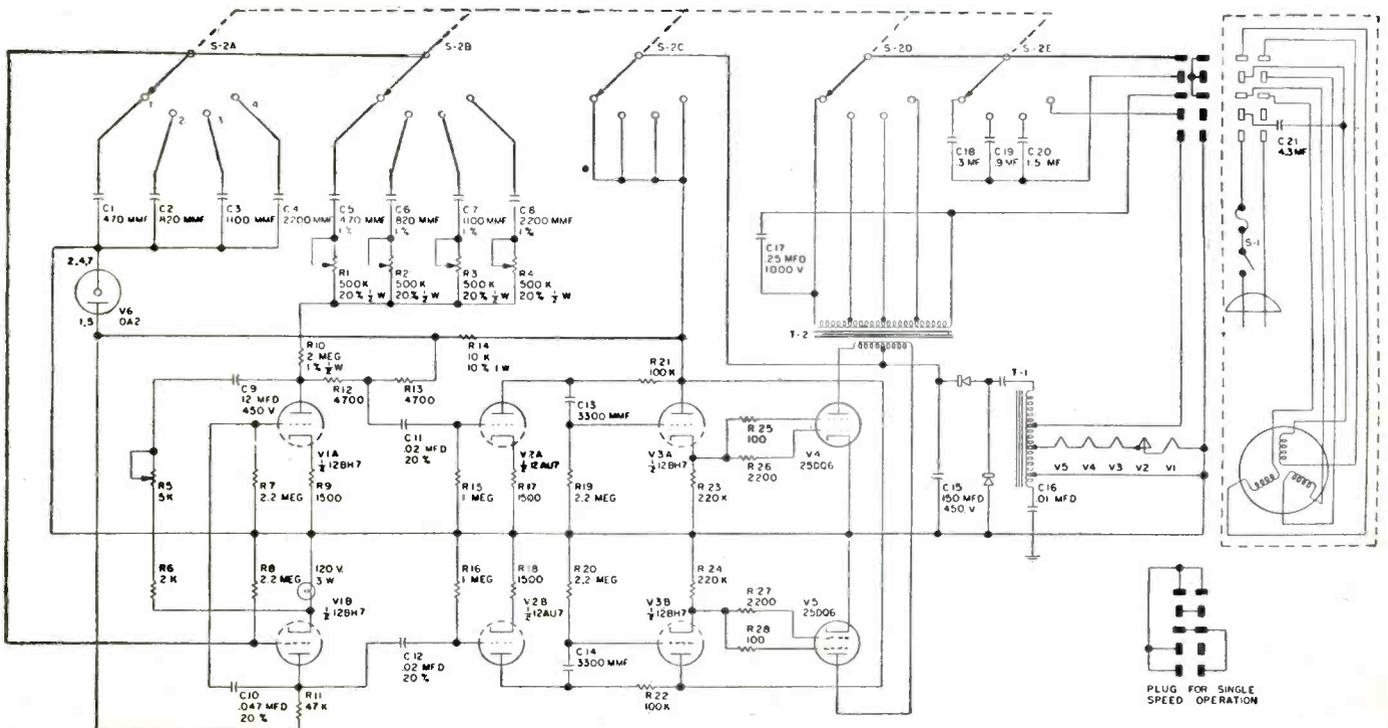
Electronic Phono Drive

• Most unique of the many features incorporated in the 4-speed Model 412-4 turntable manufactured by the Fairchild Recording Equipment Co., is the use of a hysteresis synchronous motor to provide variable speed. These motors are generally consid-

ered fixed-speed motors, which they are as long as the frequency of the power supply is held constant. Voltage fluctuations, a fairly common occurrence, have little effect on their speed. Therefore, hysteresis motors are preferred for high quality equip-

ment where constant speed is of primary importance.

The new electronic drive unit is an accurate variable frequency power source which drives the hysteresis motor at either 16 2/3, 33 1/3, 45 or 78
(Continued on page 83)



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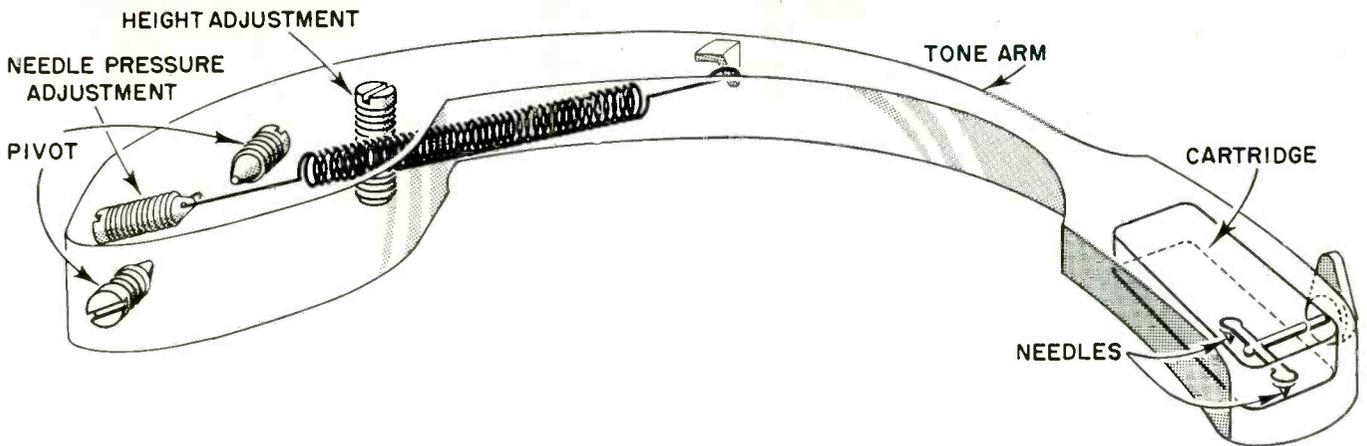
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Let's Look At

Phono Pickup Cartridges

Performance Characteristics, Types, Construction & Mounting Techniques, Troubleshooting, Improvements & Modernization

• There are currently some 35 million phonographs in American homes, each containing a pickup cartridge. Most of these pickups are inexpensive (\$4 or \$5) crystal or ceramic types with osmium or sapphire needles. They represent a giant replacement market.

A growing number of phonos, including both single record players and record changers, are incorporating high quality cartridges selling in the \$10 range with sapphire needles, \$20 and up with diamond. In addition to direct replacement, these better cartridges may be used to replace the most inexpensive types to gain better performance, and longer record life, as long as output level is sufficient and compensating circuits are properly rearranged.

There are also expensive cartridges in the \$40 to \$60 range. These are generally used in commercial transcription equipment and costly hi-fi systems. In terms of quantity, they represent a very small replacement and servicing market.

Briefly, the pickup cartridge is an electro-mechanical transducer which converts the needle's vibrations into equivalent electrical signals. The needle (stylus) vibrations are actuated by the snake-like record grooves which are impressed in the record disc in accordance with the

recorded sound. The cartridge-generated audio signals are amplified, and subsequently played through a speaker.

The cartridge with its removable or permanent needle is mounted in the head of the tone arm. The two cartridge terminals are connected to the amplifier or preamplifier input.

Performance Characteristics

Let's look at some of the most important cartridge characteristics.

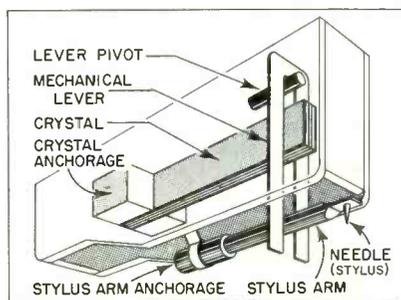
COMPLIANCE: This relates to the amount of force required to move the needle laterally. The stiffer the needle movement, the lower the

compliance and the greater the record wear. An easy-moving needle assembly with high compliance is desirable, especially for good low-frequency response. Typical compliance for good cartridges is on the order of 1×10^{-6} cm/dyne, or 2×10^{-6} , commonly referred to as a compliance of 1 or 2, respectively.

DISTORTION: This generally refers to intermodulation distortion. Distortion may also be caused by resonances, harmonics and nonlinear needle movement. In good cartridges undesirable IM distortion is on the order of a few percent.

EQUALIZATION: Compensation required to produce flat output, generally accomplished in the preamplifier or equalizer. In velocity type cartridges such as magnetic and dynamic types, output voltage is more or less proportional to speed of needle movement; that is, high frequency grooves with many lateral movements per second produce a high velocity with consequent high output. (Internal action is similar to rapid coil movement in magnetic field.) Conversely, low frequency grooves produce too low an output. To correct this, the equalizer boosts the lows and reduces the highs. On the other hand, the outputs of crystal and ceramic types depend on the

Fig. 1—Crystal and ceramic type operates on piezoelectric principles. Impedance and output are high. They are non-inductive.



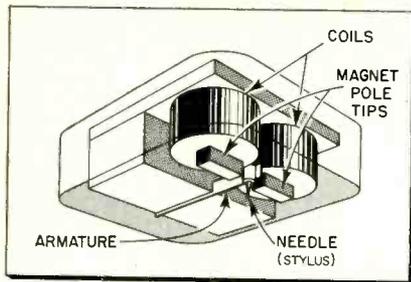


Fig. 2—Variable reluctance pickup is a magnetic type having an iron core armature. Has low impedance and low output characteristics.

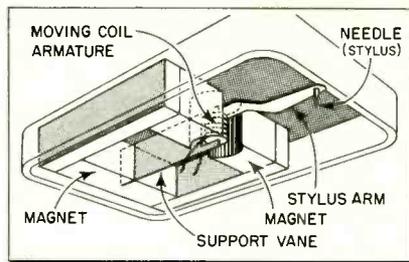


Fig. 3—Dynamic cartridge has a coil for an armature which is placed in a magnetic field. Characteristics are similar to reluctance type.

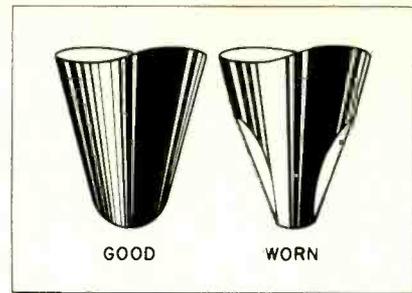


Fig. 4—Comparison of good and bad needles.

amplitude of needle movement instead of velocity; to the extent that groove amplitudes are more or less constant, these cartridges are not dependent on equalization.

FREQUENCY RESPONSE: Good cartridges commonly respond within a few db from 30 cps to 15 kc. Special hi-fi types may range from 15 cps to 25 kc. Popular inexpensive crystals often range only up to 6 or 8 kc.

HUM: Undesirable pickup of stray magnetic fields from the turntable or motor. Magnetic and other inductive type cartridges, if not properly encased in high-permeability metal housings, are particularly susceptible. Turntable rumble and vibrations also cause noise.

IMPEDANCE: Magnetic and dynamic pickups have low impedance characteristics as compared to the ceramic, crystal and capacitor types.

NEEDLE TALK: Also called needle chatter. Audible sounds coming directly from the phono pickup during operation. This undesirable effect may indicate a faulty cartridge.

OUTPUT: Voltage level at the cartridge terminals resulting from needle vibrations. Output of magnetic cartridges are commonly in the 3 to 50 millivolt range; ceramic types 0.5 to 1.0 volt; crystal types 1 to 4 or more volts.

NEEDLE PRESSURE: More correctly, this is a tracking force, which is measured in grams, rather than pressure, which is measured in grams per unit of area. It is equal to the effective weight or force exerted on the record by the needle. The smaller the force, the less the record wear. While some specialty cartridges are rated as low as 1 gram, most good cartridges recommend a force of 4 to 10 grams. Some crystal types require from 10 to 30 grams.

TRACKING: Ability to follow record grooves faithfully. It is affected by quality and adjustments of pickup arm, cartridge and turntable mounting. Tracking improves with higher tracking force, but record wear increases. A cartridge with high compliance makes tracking easier.

Cartridge Types

With the exception of two cartridges which act as variable-capacitance or variable-resistance modulators, all cartridges act as generators in the circuit, converting the recorded sound to electrical signals. There are two piezoelectric types and two magnetic types.

CRYSTAL: In this type, the needle is coupled to an element in the cartridge made of Rochelle salts. Needle vibrations cause stresses in the crystal, which converts these stresses into electrical energy. This cartridge type has been popular in low-priced phonos because it is inexpensive and offers high output. Its limited frequency response has often been no worse than the rest of the low-priced phono system. A sizable replacement market exists for these non-inductive units.

CERAMIC: This type operates on the same piezoelectric principles as the crystal cartridge. See Fig. 1. The ceramic element used in place of Rochelle salts is, unlike the latter, not subject to deterioration caused by heat and humidity. However, soldering leads directly to the cartridge should be avoided to prevent damage to heat sensitive insulating materials and other rubber or plastic parts. Output is lower, but frequency response is superior. Since piezoelectric cartridges are amplitude devices, they often do not require equalization. However, certain ceramic types designed for direct replacement of magnetic pickups do have internal equalization. Because ceramic types

are available in a wide range of prices (and equivalent performance), some are useful in hi-fi, and those with high outputs may be used as direct replacements for crystal types. They are noninductive, and not generally susceptible to stray magnetic fields.

MAGNETIC: This nomenclature generally refers to the variable reluctance type, as shown in Fig. 2. An iron armature fixed to the needle assembly vibrates in a magnetic field between two coils, changing the magnetic gap. This varying reluctance induces current in the coils in relation to needle vibrations. Performance characteristics are very good. A preamplifier-equalizer is needed to raise the output up to the order of 1 volt, and to compensate for the record's recording characteristic and velocity effect noted in the section on equalization.

DYNAMIC: Also known as moving coil cartridge. This type also operates on magnetic principles. A coil fixed to the needle assembly vibrates between the poles of a magnet in the cartridge, inducing current in the coil. See Fig. 3. Characteristics are similar to the magnetic type. In some cases a step-up transformer is connected between the cartridge and preamp to raise output voltage and accomplish impedance match.

Construction

A number of different construction designs are used to fit the cartridge in the head of the tone arm (or pickup arm). Mounting screws are commonly used to hold the cartridge to the arm. Both solder lug terminals and plug-in pins are used to make connections. One type of cartridge uses a holder fitted to the arm; the small cartridge is plugged into this holder. Another type is fixed to the pickup arm head, which is detachable from the rest of the arm by

plug-in means. Still another is friction fitted without brackets. Whichever means is employed for holding the cartridge to the arm, visual inspection will generally reveal in short order how the cartridge may be removed for replacement.

Those cartridges designed for carrying only one needle, such as the 1 mil (0.001" diameter tip) for microgroove, 3 mil for 78 rpm, or 2 mil compromise, have no needle changeover problem. Consequently both cartridge and needle are mounted in one fixed position.

However, many cartridges bear both 1-mil and 3-mil needles, so means have been devised to enable the user to change from one to the other. The basic techniques for accomplishing this change is in the turnover design and variations thereof.

TURNOVER: There are two types of turnover cartridges. One uses a stationary cartridge with the two needles mounted back-to-back on a rotatable shaft. A convenient lever turns the shaft 180°, flipping the desired needle into playing position. The second turnover type has the two needles fixed on opposite sides of the cartridge, and the entire cartridge is flipped over by the lever. In some cases the cartridge-turnover type consists of a single cartridge generating element coupled to the two needles by a common needle arm; in other cases two independent elements are mounted back-to-back, each with its own needle. Turnover types are widely used by several manufacturers.

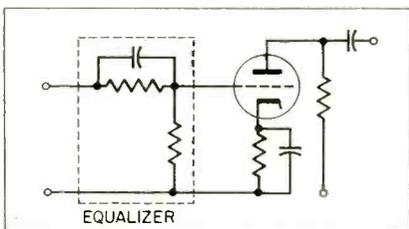
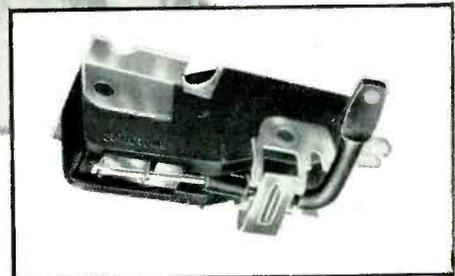


Fig. 5—Equalizer used with some crystals.

PUSH & TURN: This type keeps the cartridge in a fixed position, and changes the needle position without turnover action. The two needles are mounted at the ends of an arm support running from front to back of the cartridge, both needles pointing down in the same direction. A spring-loaded shaft fixed to the middle of the support (forming an inverted T) runs up vertically through the cartridge. To move the rear needle to the forward playing position,



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*The Audio League Report, April 1956—the hi-fi authority.



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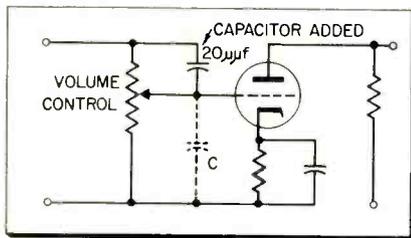


Fig. 6—Capacitor added to improve high-frequency response especially at lower volume level. Compensates for stray capacity.

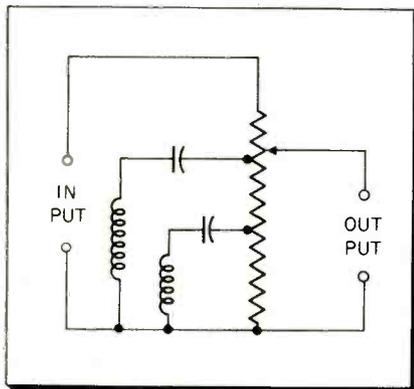


Fig. 7—Compensated volume control. Series tuned circuits absorb low frequencies. Losses can be calibrated to maintain an equal level of highs and lows, or to permit more highs to compensate for the loudness contour.

the vertical shaft is pushed down and rotated 180°.

TILTING: Here the two needles fixed to the cartridge are separated from one another, both pointing in an essentially downward direction. By means of a lever or slide button, the cartridge is tilted to the position which brings the desired needle into the playing position. The other needle remains clear of the record.

Needle Replacement

Consider the fact that a needle covers around 4/5 of a mile in the playing of both sides of a 12" microgroove or long-play record. Consider further that the pressure of the needle on the actual record contact area, despite low tracking force, is on the order of many thousands of pounds per square inch (the contact area is extremely small), and you will understand why needles wear out. A worn needle means poor audio quality and excessive record wear. Expert findings vary, but as a general guide osmium metal needles are reportedly worn out after 10 to 25 hours of play, sapphire needles after 50 to 100 hours, and diamond needles from 1000 to 5000

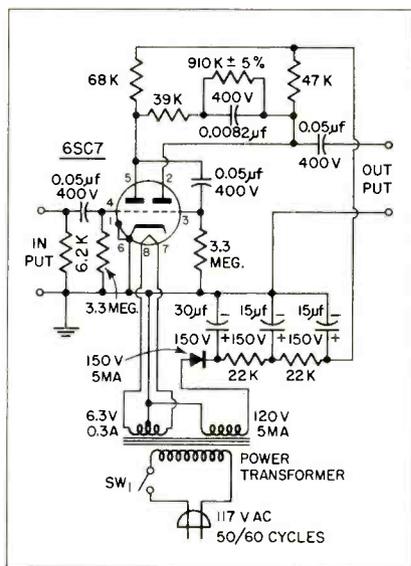


Fig. 8—Preamplifier and equalizer used with some variable reluctance cartridges. Transformer, rectifier and filters may be eliminated by tapping into the 6.3-volt and approximately 100-volt supply of the amplifier.

hours. Periodic needle examination under a microscope is most desirable.

Certain cartridges have permanently fixed needles which can not be removed, so a worn needle demands replacement of the cartridge. Other needles, and there are a very large variety of shapes and sizes, are held in place by one of four methods, each with several of its own variations.

SCREW: The conventional shank needle fits into a chuck, equipped with a thumbscrew or set screw, in the cartridge. One side of the shank is usually flat, and the screw bears against this surface to hold it in place. Other needles use a round shank or are key slotted. Those cartridges with screws readily accessible from the front of the pickup head, or screw or knurled nut easily reached from under the cartridge, may generally have their needles replaced without removing the cartridge from the pickup arm. Other cartridges must be removed first.

FRICITION: Here the needle shank is held in place by the pressure of the sides of the cartridge receptacle slot, akin to the friction effect of a socket on tube pins. Most of these needles may be removed by prying out, vertically or horizontally, with a knife, tweezers or fingernail. On certain friction-held units care must be taken to lift needle from guide fork and turn needle aside before attempting to remove from friction grip.

SPRING: Some cartridges rely on spring action to hold the needle in place. Spring pressure is relieved by either lifting the spring with the fingertip or pressing a spring release button, while lifting the needle out of place. One variation of the release button type requires the removal of a spring-retaining washer to release the needle and its support arm.

CLIP: This method of needle mounting, which permits removal with the use of a fingernail, has the needle mounted in a specially shaped clip. One edge of the clip fits first into a cartridge slot, and then the assembly is pushed against the cartridge to click into place.

Troubleshooting

Low, distorted or no output could be due to a defect in any of the components including the record, needle, pickup, tone arm, leads, or amplifier and its associated accessories. The amplifier can usually be eliminated as the source of trouble simply by finger-touching the hot lead to the amplifier at the cartridge end. If a loud hum or buzz is heard, then the amplifier is probably in working order. It may be necessary to disconnect the leads from the pickup to make this test. A shorted cartridge may bypass the hum signal injected by the finger. An audio-signal generator instead of the finger provides a more comprehensive test of the amplifier. Also where the pickup is suspected, another unit, known to be good may be substituted. The output of some cartridges may vary with needle pressure. Manufacturers specifications should be adhered to. In the field the technician may observe this condition by altering the weight of the tone arm at the needle end.

Where there is a range of different pressures over which no difference in playback is noted, then in the interest of reducing needle wear, the lighter pressure should be accepted. Most tone arms are spring loaded and provisions are usually provided for adjusting the tension of the spring. Either screw adjustments or brackets which can be bent, may be provided for this purpose. Some tone arms are equipped with counterbalancing weights which can be moved backwards or forwards and then locked in place. A needle-pressure scale should be used at record playing level. Needle pressures may vary at different tone arm heights, especially with the spring-loaded types. The condition and quality of the tone arm is an important factor in determining proper needle pressure. Any tendency to

bind either in the vertical or horizontal direction will require a heavier needle touch.

Tone arm difficulties may be due to worn, improperly adjusted, dirty or dry pivots. Congealed oil or gum deposits may also be responsible. Watch makers techniques and the type of lubricant he uses are recommended when servicing the tone arm. Binding or other obstructions, caused by trip mechanisms, indexing devices, switches, etc., may cause trouble at one or more points, as the arm traverses the record. The obvious remedies are to replace worn out parts, and to clean, adjust and lubricate where necessary.

Tracking

Other mechanical considerations include proper alignment of the cartridge with the tone arm. In most cases the technician will have no choice as to the way the pickup aligns itself in the arm. However, to assure proper pickup action and tracking, the needle should rest "squarely" in the record groove without any tilt. Excessive needle talk, usually accompanied by lower output and distortion, may be caused by the needle not being properly centered in the pickup itself. This causes the needle to come in contact with pole pieces, or other parts of the head. Broken and worn out needle mounts may not properly transmit the information picked up by the needle to the sensing element in some types of cartridges. Damage can often be avoided by not using force when changing a needle.

Needle size is another important consideration. Too small a needle will ride low in the grooves where it is likely to strike bottom, cause too much drag, additional wear and excessive noise pickup. Too large a needle will not track properly and much signal information may be lost. It should also be ascertained that the turntable is level. Tracking becomes more of a problem if the tone arm is required to travel either up or down an incline. Turntable speeds should be checked for accuracy and freedom from intermittent speed variations. Improper frequency response due to improper speeds may be wrongfully attributed to other parts in the pickup and amplifier system.

Where there are moving parts, it is inevitable that normal wear and tear will take place. The needle does wear out, and if not replaced in time, it will damage records which cost many times that of the needle.

(Continued on page 84)

Sonotone "5 Series" Ceramic Cartridges

NEW!



At last—a popular-priced cartridge that brings out new fidelity in any set!

Here's the climax of ten solid years of research and development. A remarkable new cartridge with the high output, the self-equalization, the problem-free performance of the Sonotone 2T line—plus even greater response, greater compliance. Just slip it in—out comes new fidelity,

new "presence" in any set.

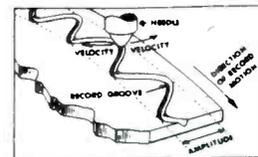
"5 series" ceramic cartridges are a dream to work with. Slip right into any standard arm.

Stock, promote, replace with Sonotone "5 series" cartridges...the easiest way yet to make new friends—and constant customers.

Here's how the "5 Series" actually improves old sets:

"5 series" cartridges respond to the amount (not the velocity) of side-to-side needle movement. Unlike velocity cartridges, their voltage output does not depend on frequency. So the "5 series" will play back any record so close to "flat" that special equalization is not necessary. The tone con-

trols on any set amply cover any delicate adjustments! No magnetic hum, either!



Sonotone 5T Ceramic Cartridge—turnover model for 78 and 45/33 1/3

\$8.50 LIST

Sonotone 5P Ceramic Cartridge single-needle model for 78 (3 mil.) for 45/33 1/3 (1 mil.)

\$7.50 LIST

Electronic Applications Division

SONOTONE® CORPORATION

ELMSFORD, N. Y.

Write Dept. CT-97 for free specification sheet on the "5 series."

Causes and Cures of

A Practical Insight Of The Reaction Scanning

A. R. CLAWSON

The frequently occurring symptom of horizontal foldover and resulting loss of width may be either very easy to service, or it can develop into an exceedingly tough dog. A clear understanding of how and why this symptom is produced is essential for rapid troubleshooting these difficult jobs.

The normal function of the horizontal sweep is to move the focussed electron beam in the CRT from left to right, as in Fig. 1A, and then retrace rapidly to the left so as to start another line. During retrace time the beam is extinguished by a blanking pulse.

Suppose the spot is not returned all the way to the left in time; the blanking signal ends, and video begins; the viewer would see the spot still moving to the left. The result is left hand foldover. Objects in the foldover area are reversed and face the opposite direction. Since the spot retraces over approximately the same region during this time, the foldover area will be about twice as bright as it would normally appear, as shown in Fig. 1B.

Right Hand Foldover

Fig. 2 shows how one type of right hand foldover is produced. The normally straight current waveform bends, levels off, and finally starts going negative. A weak horizontal-output tube and its inability to supply sufficient yoke current may cause this type of trouble. Even a good tube will not deliver peak current, at the end of the sweep, if its associated circuitry is not functioning properly. Insufficient screen, B+ and boost voltage, and improper bias may be responsible.

The drive signal to the grid of the output tube may be of improper shape and amplitude. If it does not drive the tube into sufficient conduction, loss of width and foldover may be the result. A leaky drive control capacitor or lowered grid

resistor are frequent troublemakers.

Should station blanking time be decreased or omitted, part of the retrace would appear during the visible part of the scan. Such disturbances do occur now and then, but are of short duration, usually on one station only. Since station engineers monitor their programs, it isn't likely that this condition could exist for any length of time. Some sets have built in horizontal retrace blanking circuits which would tend overcome this type of defect.

If retrace is unduly prolonged, the retrace part of the yoke wave will run into visible scan time as in Fig.

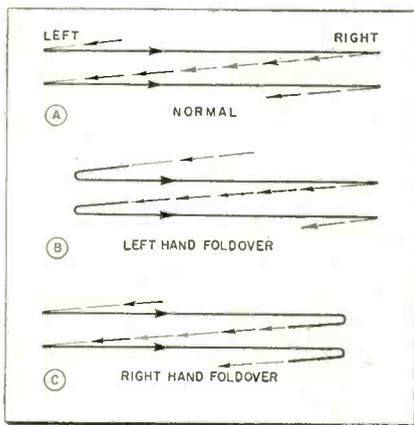


Fig. 1—Normal and abnormal beam motion.

Fig. 2—Non-linear sweep causes foldover.

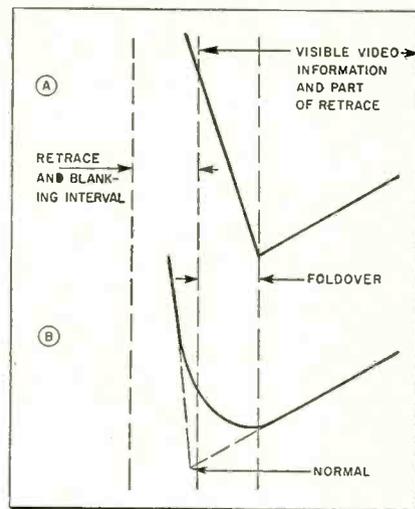
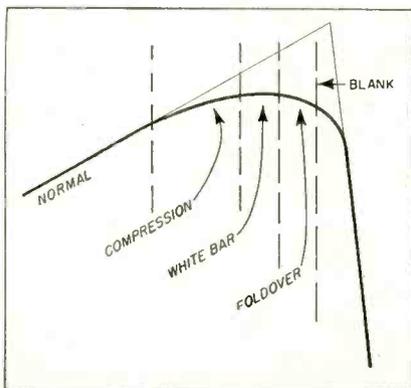


Fig. 3—Prolonged, improperly synced, or non-linear retrace may run into the visible video area and cause left-hand foldover.

3A. Or, improper starting of retrace might shift a normal retrace into a similar condition. Failure of the wave to reverse itself immediately after retrace and start its positive rise may resemble the shape shown in Fig. 3B. The downward visible portion will be evident as a left hand foldover. Compare this with the normal quick reversal shown by the dashed line.

Reaction Scanning

Normal action of the almost universally employed horizontal reaction scanning system causes a steady rise of yoke current and is really produced by two separate waveforms as can be seen in Fig. 4.

Retrace and the starting half of sweep is provided by a mechanism allied to waveform A. Wave B is produced by current flow through the horizontal output tube and the primary of the flyback transformer. This current in turn is controlled by the drive signal on the grid of the output tube; it is either a trapezoid or some form of sawtooth. This drive signal is presumed to be in sync with the incoming video information. Sudden cutoff of the output tube by

Horizontal Foldover

System and What To Look For In Case Of Trouble.

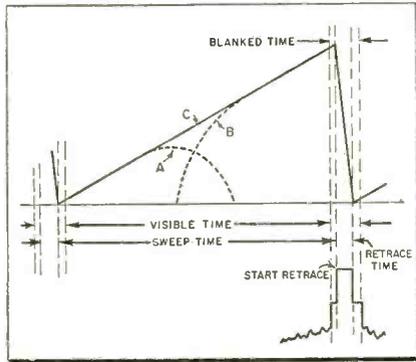


Fig. 4—Typical waveforms produced by the reaction scanning system in most TV sets.

the grid signal causes the heavy magnetic field in both the flyback transformer and the yoke, which has been building up, to collapse rapidly. This is the condition during retrace.

Fig. 5 shows an equivalent drawing of the yoke, flyback, and damper circuit. The flyback and yoke windings and stray capacitance which is lumped together in the diagram form a tuned circuit. It is resonant at about 70 kc on older sets and about 55 kc on some of the more modern versions. The stored energy in the collapsing magnetic field energizes this resonant circuit and sets up an oscillation as shown by curve A in Fig. 6. The first half cycle is negative going and the damper does not conduct at this time. Retrace is rapidly completed in 7-9 usec, which is one-half cycle of the natural frequency of the circuit. The damper tube starts to conduct on the positive going point of the cycle. Without resistance R it would charge capacitor C_D along curve B. But R causes it to follow curve C, an almost linear path for a longer time; this is the first half of the sweep. About the midpoint of the sweep, conduction of the output tube starts and takes over, as the energy in the first half is spent, and completes the scan.

R is the lumped resistance of the yoke and transformer windings, including the damper-tube resistance,

and the reflected resistance of the flyback primary. It also contains the resistance of the horizontal-linearity coil. The linearity coil plus two capacitors filter the voltage developed across the damper tube and combined, in series aiding, with the B+ provide additional boost voltage which may be utilized elsewhere in the set. Direct drive flyback systems operate similarly, but with circuit rearrangements. If R increases, the oscillatory wave train following the first half cycle may still occur resulting in a wavy type of foldover.

Left Hand Foldover

Left hand foldover may be tricky and can be far more difficult to cure. Start with the simple things first. Try a new damper tube. If it develops a high resistance it will not damp out the oscillation. A similar condition arises when the capacitor in the damper cathode circuit loses value, and to a lesser extent when the capacitor on the other side of the linearity coil acts up the same way.

A gassy output tube may not deionize rapidly enough and retrace starts late. Retrace does not finish within the allotted 10 usec. A prolonged drive signal will have similar results.

If the usual routine trouble shooting procedure does not clear up the trouble it is advisable to examine yoke current waveforms. Insert a 1 to 5-ohm resistor in series with the hot horizontal yoke lead. Place the

Fig. 5—Equivalent circuit of yoke, flyback and damper showing stray capacitance and resistance lumped as C and R respectively.

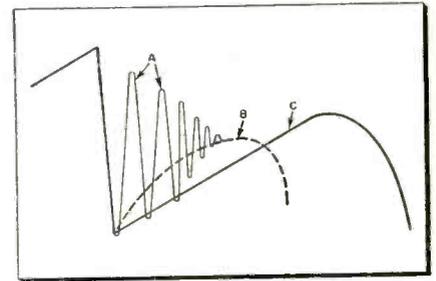
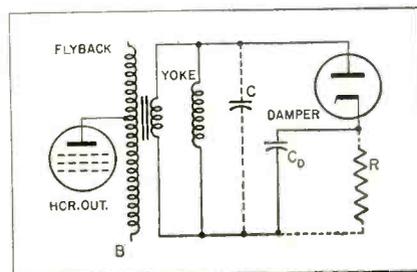


Fig. 6—Damper tube rectifies positive going oscillations and would normally charge the capacitor along curve B. Circuit resistance modifies the curve to look like C.

scope across this resistor. If retrace is narrow enough, you should search for improper sync action. If the retrace portion takes too much time look for added inductance or capacity affecting the natural resonant frequency of the yoke and flyback. (Note 10 usec on a scope, operating at 7875 kc, half the horizontal line frequency with a 3 inch horizontal sweep is slightly less than 1/4 of an inch.)

If inspection reveals normal retrace time check waveforms in the feedback loop from the flyback to the afc circuit.

Long retrace time may be due to excessive capacity across the yoke or some portions of the flyback. It can also be due to too much inductance. Either of these two conditions will have a tendency to lower the natural resonant frequency. The air gap on the flyback in some cases; undue loads such as a shorted width coil, shorted afc and agc windings also cause an upset in inductance values.

Improper sync will cause retrace problems and foldover, as well as out-of-phase horizontal conditions.

The same thing is true for waveform observations. Where wave shape, amplitude and timing are factors, merely taking voltage readings and resistance checks only ascertain that another toughy is tying up the bench. The use of an oscilloscope and an understanding of what it displays will leave more time for other tough dogs yet to come. •

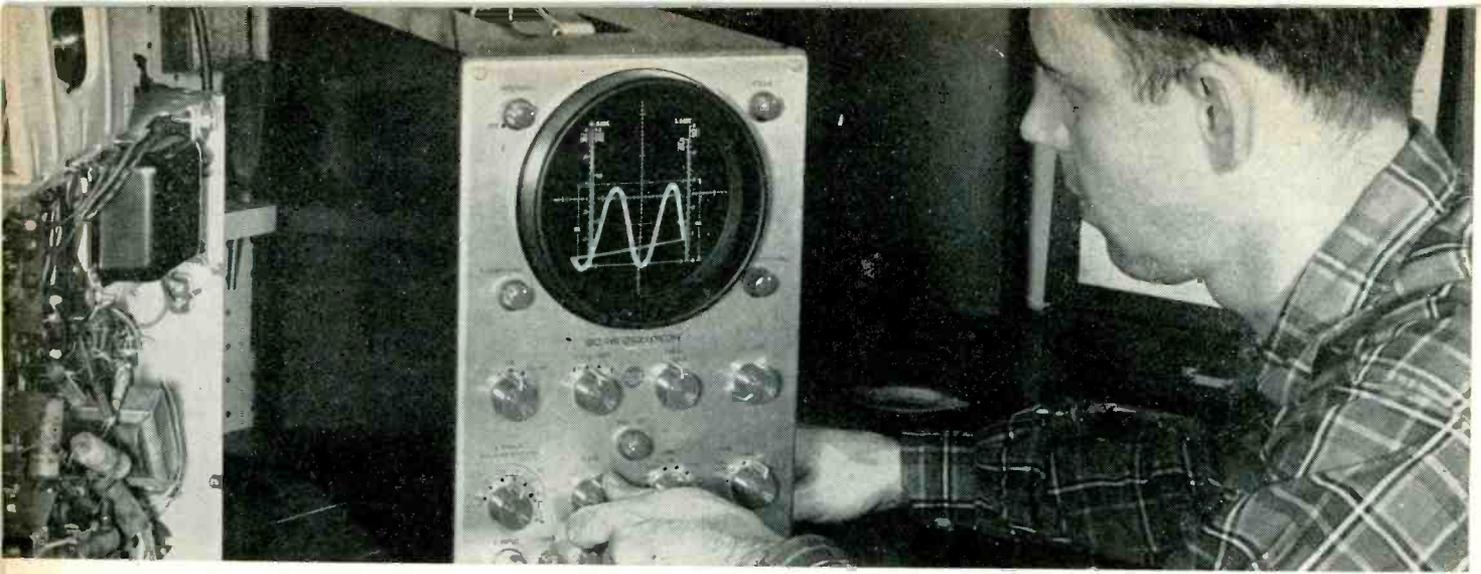


Fig. 1—Scope is calibrated for peak-to-peak voltage measurements when the calibration waveform just fits between the top and bottom lines. Set bandwidth control on "Cal" position and adjust the vertical and centering controls until the desired trace is obtained.

Voltage Measurements

Scope Used To Determine Peak-To-Peak Voltage Of Complex

RHYS SAMUEL
RCA COMPONENTS DIV.

• Nearly all modern oscilloscopes have facilities for voltage calibration and measurement. These provisions are valuable because they permit the operator to make simultaneous peak-to-peak voltage measurements while observing the shape of a displayed waveform. This feature is especially useful in TV servicing. In many instances it is just as important to

know the amplitude as well as the shape of the signal.

Voltage calibration consists of the application of a known peak-to-peak voltage to the vertical amplifier of the scope and the adjustment of the vertical-gain controls to obtain a prescribed amount of deflection. Because the amplification and deflection characteristics of the scope are linear, the vertical deflection of the waveshape is directly proportional to the input voltage. For example, if the controls are adjusted so that a

1-volt calibrating input voltage produces a 1-inch waveshape on the scope screen, an input of 3 volts will produce 3 inches of vertical deflection. After the scope screen is calibrated, the vertical deflection of any waveshape is a direct indication of its peak-to-peak voltage.

Another method of measuring peak-to-peak voltage compares the

Fig. 2—Calibrating voltage at front panel.

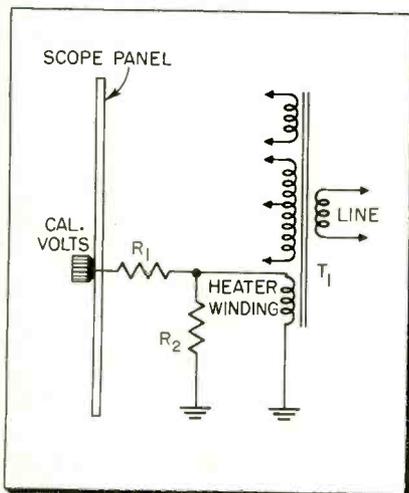


Fig. 3—Multi-range voltmeter type scales.

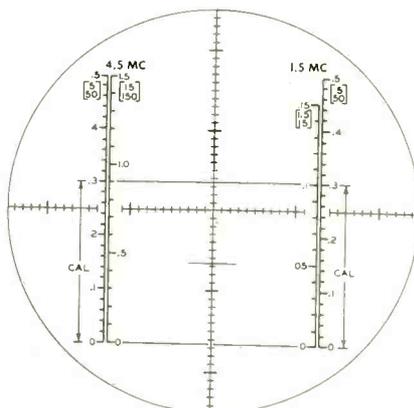


Fig. 4—Internally applied calibrating voltage. Switch selects signal to be fed into amplifier and enables the probes to remain in the test circuit even while calibrating.

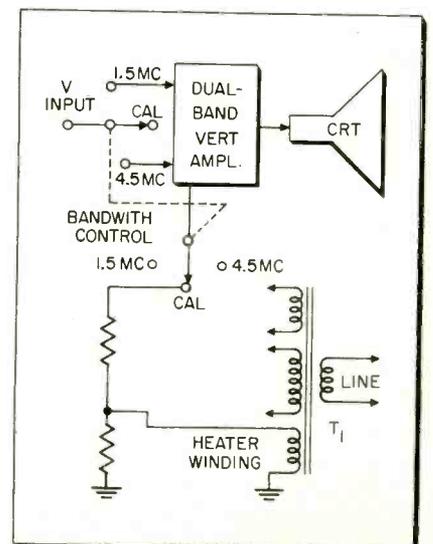




Fig. 5—Scale reading multiplied by the probe attenuating factor, indicates peak-to-peak voltage when signal is set on the bottom line. Set range switch for convenient deflection, zero bottom of trace on lower graph line and read voltage on proper scale opposite peak.

with An Oscilloscope

Waveforms. Signal Comparison & Scope Calibration Techniques.

amplitude of the waveform under observation with the known amplitude of another waveform. One type of calibrator varies the calibrated signal until it equals the signal under test, and a direct peak-to-peak reading may be taken from a meter which is part of the calibrator. Some calibrators are more or less permanently attached to the scope and have a switching arrangement which enables the technician to rapidly switch from signal to calibrator. The meter is compensated to enable accurate readings of the calibrator signal. A conventional meter cannot be relied upon to render accurate peak-to-peak readings for the many different waveshapes and frequencies encountered in everyday servicing.

Scopes not equipped with calibrating facilities may benefit from the use of an external calibrator. In an emergency any known a-c voltage may be used. The 6.3 a-c filament voltage, available in most sets, will display approximately an 18-volt peak-to-peak waveform. ($P-P = 2.83 \times \text{RMS}$; $2.83 \times 6.3 = 17.82$).

External Calibrators

Many different types of calibrators are available and may be equipped with one or more of the following features: a direct reading meter;

calibrated dials; continuously variable output level, or a compensated step control, or a combination of both; sine or square waves or both; 60 cycles, 1,000 cycles or other frequency; a feedthrough position for the signal under test; a signal selector switch; etc.

A square-wave calibrating signal, not appreciably affected by normal line voltage variations is very desirable. To calibrate, the direct probe and ground lead from the scope are connected to the output terminals of the calibrator and the scope controls are set to give the desired amount of vertical deflection. Should a different probe be substituted, then the readings would have to be multiplied by the probes attenuation factor.

Probe Attenuating Factors

Consideration must also be given to the type of probe used and its attenuation factor. All low-capacitance probes used with scopes attenuate the signal applied to the vertical amplifier. Many of these probes are designed to have an attenuation factor of 10. When these probes are used, therefore, it is necessary to multiply the voltage amplitude of the displayed pulse by 10 to obtain the true voltage measurement. If the probe has an equal response to both the cali-

brating and tested signal, then the probe can be used to calibrate the scope, and the attenuation factor disregarded.

Front-Panel Calibrating Voltage

A calibrating voltage at a front-panel terminal is available on many scopes. To calibrate, it is necessary to connect the direct probe to this terminal and adjust the vertical-gain controls for a prescribed amount of deflection. A circuit for this type of calibration is shown in Fig. 2.

This voltage is usually factory-set to provide 1-volt peak-to-peak output at 60 cps. To calibrate, the vertical range switch is set to the X 1 position and the vertical vernier control is adjusted for 1-inch deflection. The vernier must be left in this position to maintain calibration. If it should be necessary to amplify or attenuate the signal under measurement, only the range switch is changed. Only if the instrument has a calibrated and frequency-compensated vertical range switch will the initial calibration hold for any setting. Some scopes have 4 settings, X 0.1, X 1.0, X 10, and X 100. The peak-to-peak voltage is determined by multiplying the vertical deflection in inches by the number on the range-switch setting. For example,

(Continued on page 79)

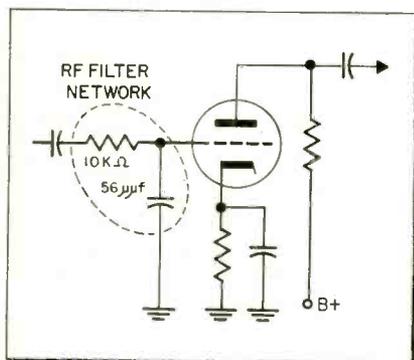
SHOP HINTS



Tips for Home and Bench Service

RF In Audio

In many high gain audio amplifiers, in P-A systems, tape recorders, radios, phonos, etc., particularly those with a very high impedance first audio grid circuit, there is a possibility that very strong local R-F signals, regardless of frequency, may appear at the grid of the first audio stage. Under certain conditions, this R-F signal may drive the tube to the extent that it is caused to operate on a non-linear portion of its characteristic curve, and rectification (detection) could occur. If the R-F signal is amplitude modulated, the audio modulation could be detected, fed to succeeding audio stages, and



RF filter inserted in the grid of the first audio amplifier will bypass interference.

be heard from the speaker. This could result in interference to the desired audio signal. If the volume control is located ahead of the first audio grid, it is possible that the control would have no effect on the volume of the interfering signal.

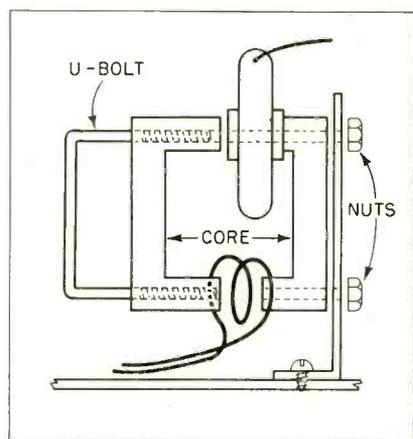
The interfering signal could cause all sorts of harmonic and other types of distortion in the audio amplifier, even though the R-F signal itself contained no audio or other amplitude modulation which could be heard, even after slope detection had taken place. The distortion would be due to the fact that the audio amplifier tube is no longer operating over the linear part of its characteristic curve.

The usual correction for this type of R-F interference is to install a simple R-F filter at the grid of the

first audio amplifier tube. The diagram illustrates how a 56 μf ceramic capacitor and a 10,000-ohm ½-watt resistor may be hooked up. Keep all leads as short as possible and get as close to the tube socket as possible. A filter at the grid of the first audio stage is usually most effective because the R-F interference is eliminated regardless of its frequency or the means by which it entered the instrument.—Ralph Burns, St. Louis, Mo.

Transformer Replacement

Considerable labor can be saved when replacing the horizontal output transformer by eliminating the need for disassembling the high voltage cup under the high-voltage rectifier tube and replacing the filament leads on the GE chassis Models S, ST, U, and other TV receivers. This can be accomplished by leaving the



Removal of 2 nuts and U-bolt releases filament winding and speeds flyback replacement.

transformer mounting bracket attached to the chassis and the filament leads attached to the tube socket. Remove the 2 nuts and U bolt holding the core to the bracket. Slip one side of the core out to free the filament winding, then remove the rest of the transformer. Install the new transformer in reverse manner, using original filament winding and transformer bracket.—Al Diamond, Queens, N.Y.

Glass Polishing

Glass rubbed against glass will result in a ground-glass appearance on either or usually both pieces. A spot such as this may occur as a result of contact between the safety glass and the CRT.

With reasonable care, these spots can be removed. The basic idea is to polish the glass with a soft cloth and a very mild abrasive. Bon Ami in cake or powdered form, or other similar product, slightly moistened so that it has a paste-like consistency, is applied to the spot and the immediate adjacent area. The glass is then polished by rubbing it with a soft cloth or a pencil eraser. A chamois cloth is also good for this purpose.

Inasmuch as quite a lot of patient elbow grease is required, an electric drill equipped with a cloth buffing wheel will save much labor. When using a power-driven tool on the face of the CRT, extreme caution should be used so that the picture tube will not be struck a sharp blow due to slippage of the drill, etc. Safety precautions in the form of gloves, goggles and a heavy apron are advisable. Also avoid excessive pressure. It is also advisable to experiment on another piece of glass before attempting the actual polishing. It is possible to make matters worse the first time.—James A. McRoberts, Brooklyn, N. Y.

Burned Phosphors

Whenever a fixed test pattern such as is produced by a color-bar generator is used for testing a color TV receiver, care should be taken to prevent damage to the phosphor coating on the kinescope. When the receiver is on test for a considerable period of time, with color bars, the brightness and color controls should be set for a low level of brightness to prevent "burned in" bars on the face of the CRT.

Normal usage of the tube has the effect of aging the phosphors so that they are less susceptible to burns from a stationary pattern. It is recommended, therefore, that new tubes

(Continued on page 82)

MODEL 280SW (shown right)

- Double stacked array PLUS high frequency elements.
- All Aluminum Construction.
- Mounts on any mast up to 1 3/4".
- QUICK-RIG design for speedy one man installation.
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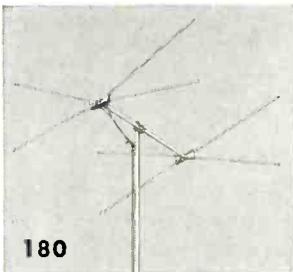
MODEL 180SW same as 280SW only not double stacked.

MODEL 180 QUICK-RIG 8 element "Lazy-X" Conical.

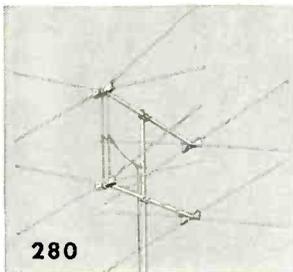
MODEL 280 QUICK-RIG double stacked "Lazy-X" Conical.



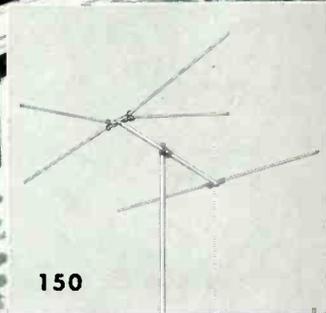
12 NEW RADIART TV ANTENNAS



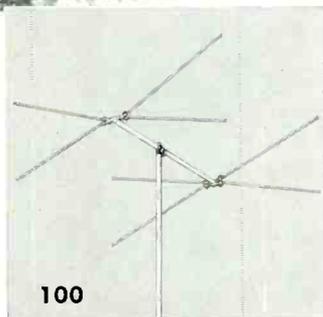
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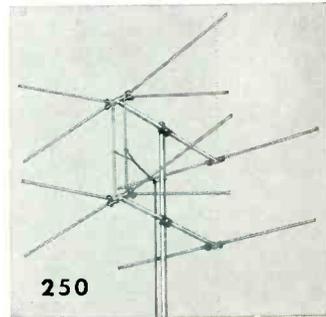
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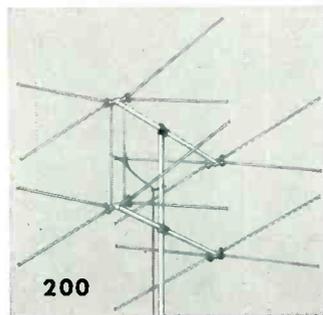
150



100



250



200

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- LZX 101 single array, unassembled
- LZX 200 8 element conical completely assembled, stacked array
- LZX 201 8 element conical unassembled, stacked array
- LZX 150 single array
- LZX 151 single array, unassembled
- LZX 250 6 element conical assembled, stacked array
- LZX 251 6 element conical unassembled, stacked array



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For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the B&K Model 1050 Dyna-Scan portable video and audio generator. (9-1)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the Jerrold oscilloscope preamplifier Model SPR-100. (9-2)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the Electro Products Model GFA Universal Power Supply. (9-3)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the Sencore Vibra-Dapter Model VB-2. (9-4)

Name

Address

City State



← B & K DYNA SCAN

Model 1050 Dyna-Scan portable video and audio generator facilitates servicing, installation or demonstration of b&w and color TV receivers. Maximum resolution is in excess of 450 lines. A built-in color scan provides crystal-controlled, full color rainbow display for testing color sync circuits. Also provides FM sound 4.5 mc above video carrier, with external modulation or built-in tone generator. B&K Mfg. Co., 3731 N. Southport Ave., Chicago 13, Ill. (ELECTRONIC TECHNICIAN 9-1)



← Jerrold PREAMP

A high-performance oscilloscope preamplifier, which increases the sensitivity of oscilloscopes by 40 db without adding substantially to the hum or noise content. It is particularly useful when measuring or adjusting r-f circuitry where signal levels are relatively small. Some of the features of the Model SPR-100 are the inclusion of marker insertion circuitry; and a high-pass filter section. Jerrold Electronics Corp., 23rd & Chestnut Sts., Philadelphia 3, Pa. (ELECTRONIC TECHNICIAN 9-2)



← Electro POWER SUPPLY

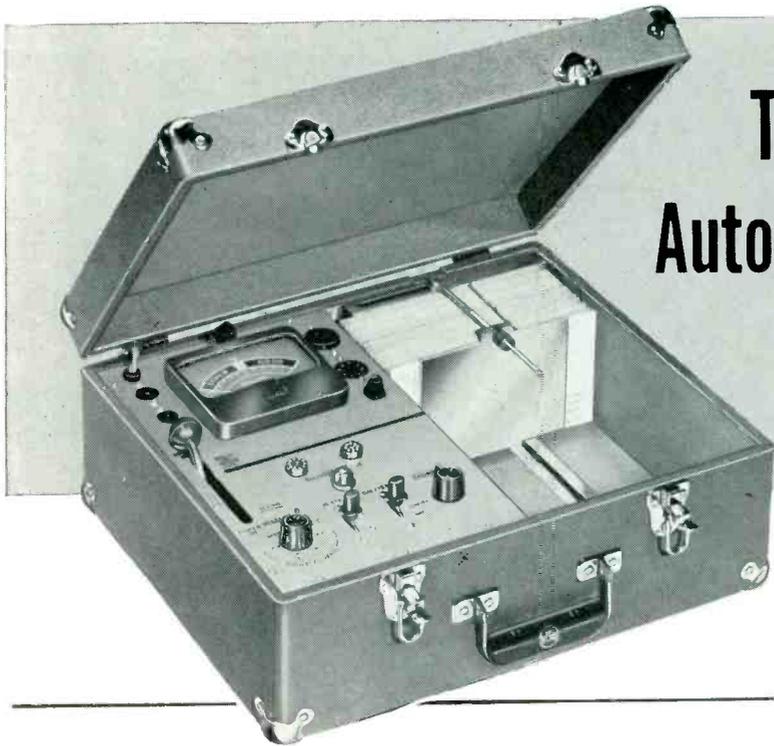
A new, 125-volt d-c power supply, provides higher efficiency by the use of germanium rectifiers. The Model GFA Universal converts ac to dc for testing and servicing industrial d-c equipment. From 0 to 125 volts up to 10 amperes, with less than 1% ripple at top load, is available. 115 volt 50/60 cycles input. Uses a single control for different load conditions over a specific range, as well as choke and Pi type filters. Electro Products Laboratories, 4500 N. Ravenswood Ave., Chicago 40, Ill. (ELECTRONIC TECHNICIAN 9-3)



← Sencore VIBRA-DAPTER

New tube tester adapter checks both 3 and 4-prong vibrators. The tube tester is set to accommodate a 6AX4 or 6SN7 when checking 6-volt vibrators and 12AX4 or 12SN7 for 12-volt vibrators. Two indicating lamps, at the top of the unit, glow if the vibrator is good. If neither or only one lamp lights, the vibrator is defective. It can also be used in leakage type testers. Model VB-2 is \$2.75. Service Instruments Corp., 171 Official Rd., Addison, Ill. (ELECTRONIC TECHNICIAN 9-4)

an announcement of utmost importance to the service industry...



The RCA WT-110A Automatic Electron Tube Tester

smashing the price barrier
at . . . **\$199⁵⁰***!

. . . automated to provide simplicity,
accuracy and speed never before achieved in a comparable service type tester!

Here—from RCA—is a modern tube tester geared for modern servicing requirements . . . and at a price you can afford. In fact—you can't afford to be without it!

Here is tube testing with no wasted motion—no time-consuming searching and setup of old-fashioned roll charts or socket panels, no dial twisting, no fumbling. It's truly *automatic testing* with speed and simplicity that will amaze you!

Here is virtually an obsolescent-proof design—no roll charts to constantly maintain or replace. All data and setup are supplied on the 241 pre-punched cards provided with the instrument. These cards cover 95% of the currently active TV tube types. In addition, accessory cards and punch are available for punching your own cards, enabling you to keep your instrument current as new tube types are released.

See it . . . test it for yourself . . . at your local RCA Distributor's!

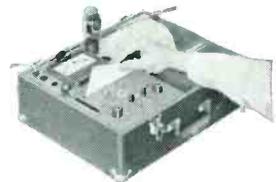
ACCURATE AUTOMATIC ANALYSIS!

- automatically sets up, not only socket connections, but all operating voltages such as filament, signal, plate and screen voltages, and bias (both fixed and cathode).
- checks tubes for transconductance, gas, and shorts between elements.
- provides 220 combinations of heater voltage, 10 bias voltages, 11 values of cathode resistors, and 50 quality sensitivity ranges.
- tubes tested under heavy load currents, such as rectifiers, at 140 ma per plate.
- leakage test with high and low sensitivity ranges.
- 12-volt plate and screen supply for testing new automobile tubes.
- meter protected against burnout.
- calibration card provided for checking instrument.
- active card magazine capacity—350; storage capacity—350 . . . a total capacity of 700 cards.

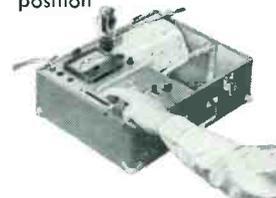
*User Price (Optional)

SIMPLE AS A-B-C!

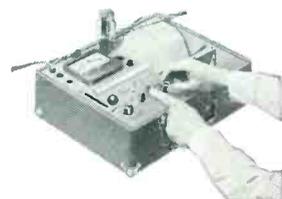
- a.** merely insert card in matrix



- b.** flip power lever to "power-on" position



- c.** press calibrate lever and adjust calibration control



TUBE IS NOW UNDER TEST!



RADIO CORPORATION of AMERICA

COMPONENTS DIVISION

CAMDEN, N. J.

New Products for Technicians

For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the Taco UHF "Golden-Grid" Bowtie Antenna Model 3011. (9-5)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the ATR Electronic Tube Protector Models 250 & 300. (9-6)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the Channel Master Color King series of outdoor TV Antennas. (9-7)

Name

Address

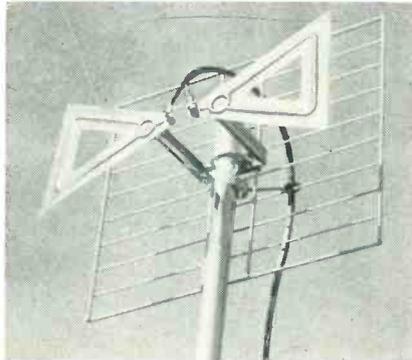
City State

As described in ELECTRONIC TECHNICIAN send me more data on the STANDARD COIL Fireball Neutrode Tuner. (9-8)

Name

Address

City State



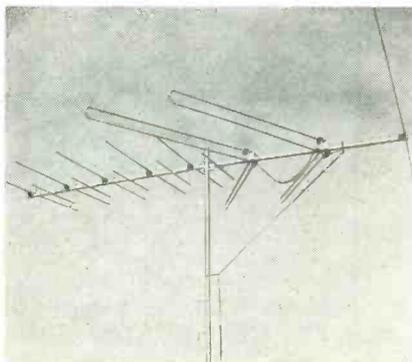
← TACO ANTENNA

UHF bowtie antenna features air-dielectric (there is no insulating material used in the antenna) is designed for use in prime UHF service areas. The Model 3011, bowtie provides a gain up to 7 db over the entire UHF spectrum. The "Golden-Grid" reflector is extra large, to achieve optimum directivity and added gain. Stacking lines are available for tandem assemblies where additional gain is required. Technical Appliance Corp., Sherburne, N. Y. (ELECTRONIC TECHNICIAN 9-5)



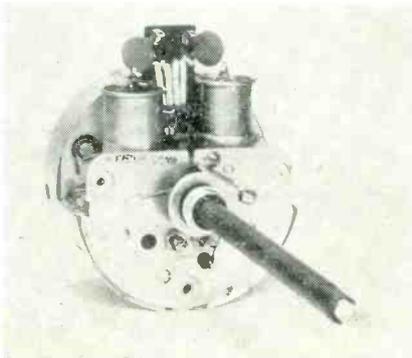
← ATR TUBE PROTECTOR

Electronic Tube Protectors are especially designed to protect electronic tubes in amplifiers, and similar electronic equipment rated up to 300 watts. Model 250 plugs directly into the wall socket. Model 300 is equipped with a line cord and provides flexibility in positioning. These units utilize a thermal cushion-action principle which also protects all other components by eliminating initial damaging surge currents. American Television & Radio Co., 300 E. 4th St., St. Paul, Minn. (ELECTRONIC TECHNICIAN 9-6)



← Channel Master ANTENNA

The Color King series consist of two antennas, a 13-element Super Color King shown and a 9-element Color King. Stacked models of each are included in the line. The new outdoor antennas have 2 advanced electrical design features. They are an improved Controlled Impedance Dipole System for flat gain on all channels in the VHF range, and a special Impedance-Compensating Coil which does not resonate at high band frequencies. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 9-7)



← Standard Coil TUNER

The Fireball Neutrode tuner differs in appearance but uses a circuit similar to the Neutrode turret tuner. All components are visible when the cover is removed. It will operate on B+ supply as low as 125 volts. Total current requirements is about 25 ma. The tuner may be used in series or parallel filament string sets. Features high gain and low noise using a single triode tube as an r-f amplifier. Standard Coil Products Co. Inc., Melrose Park, Ill. (ELECTRONIC TECHNICIAN 9-8)

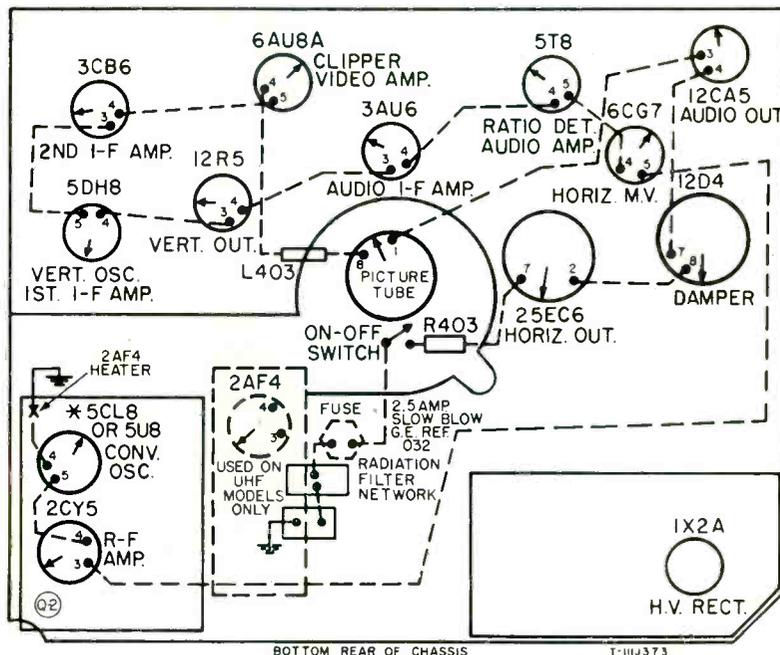
How filament wiring charts can save you time and work servicing **HOTPOINT PORTABLE TV**

Fast Tube Test Without Testing Each Tube!

This year, all Hotpoint Portable TV receivers have Filament Wiring Charts printed right on the inside of the cabinet back.

Since these Hotpoint models have tube filaments connected in series, an open filament in any tube would make all the tubes appear inoperative. But now you can quickly spot the ailing tube. The dashed lines on the Filament Wiring Charts (at right) indicate wiring connections to the tube filament pin numbers. And each tube is keyed to give the exact location of the filament pin numbers just as you see the tubes when the back is removed.

By using these charts and an ohmmeter, you can check resistance before and after each tube in the series and quickly uncover the tube with an open filament.



1958 Hotpoint Portable TV—Q2 Chassis only
(for M3 Chassis, see chart inside of cabinet back)

EXAMPLE: Assume the filament of the 2nd IF tube in the Q2 chassis is open. To test:

1. Remove the power plug from wall power outlet and turn "ON-OFF" knob to "ON" position.
2. Connect one lead of an ohmmeter to chassis ground.
3. With the other probe of the meter, check the resistance to ground at each of the tube filaments by following the dashed lines starting from the A. C. interlock socket. At all points measured prior to pin 4 of the 2nd IF tube, infinite resistance would be indicated on the meter. At pin 3 and each succeeding tube, the reading would be zero. **SINCE THERE IS CONTINUITY FROM PIN 3 OF THE 2nd IF TUBE TO CHASSIS GROUND, IT IS EVIDENT THAT THE FILAMENT OF THIS TUBE IS OPEN.**

Use this easy procedure to save time and work servicing HOTPOINT Portable TV.

Another service to Servicemen from

Hotpoint Hi-Vi TV

Hotpoint Co., A Division of General Electric Company, 5600 West Taylor Street, Chicago 44, Illinois

New Audio Products



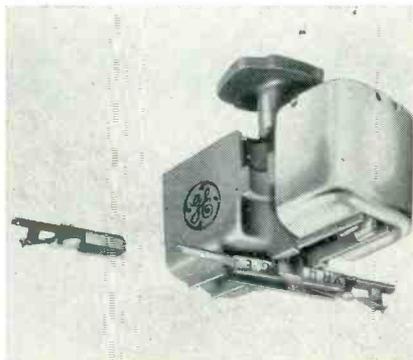
For more free information, fill in coupons and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y.

As described in ELECTRONIC TECHNICIAN send me more data on the new line of GE Variable Reluctance Cartridges, VR-11 series. (9-9)

Name

Address

City State



← GE CARTRIDGES

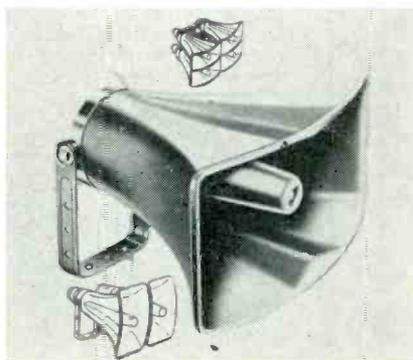
New magnetic variable reluctance cartridges features a frequency response from 20 to 20,000 cps at 4-gram tracking pressure. They also have a narrower body with a 27% weight reduction and a 10% lighter stylus, and incorporate a new electrostatic shield. Closer manufacturing tolerances and greater rigidity in the cartridge reduce record wear, "needle talk", mechanical vibration, and microphonic feedback. General Electric Co., W. Genesee St., Auburn, N. Y. (ELECTRONIC TECHNICIAN 9-9)

As described in ELECTRONIC TECHNICIAN send me more data on the University Wide-Angle Reflex Trumpet Model CLH. (9-10)

Name

Address

City State



← University PROJECTOR

A new wide-angle public address reflex trumpet incorporates an omnidirectional swivel mounting arrangement that enables the projector bell to be rotated 360° on its axis. The positive-lock serrated, swivel "U" mounting bracket is also specially designed to link two or more projectors into any configuration. It has an air column length of 4½ feet, horn cutoff of 120 cps and a dispersion of 120° x 60°. University Loudspeakers, Inc., 80 S. Kenosco Ave., White Plains, N. Y. (ELECTRONIC TECHNICIAN 9-10)

As described in ELECTRONIC TECHNICIAN send me more data on the Astatic Soundflo Cartridge-Needle Combination, Models 81TB & 89TB. (9-11)

Name

Address

City State



← Astatic CARTRIDGE

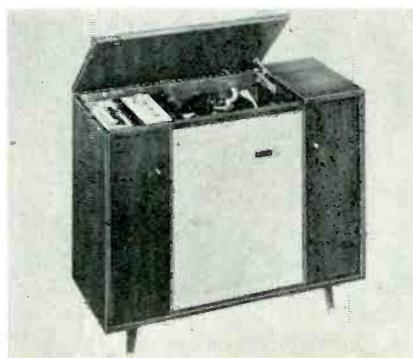
A new wide range ceramic "plug-in" cartridge-needle combination—the Soundflo is designed as an original and direct replacement for ceramic cartridge applications. The cartridge-needle combination plugs in or out of the holder. Model 89TB offers an output of 1.3 volts and a compliance of better than 2. Frequency response is 30-15,000 cps. Model 81TB has the same frequency response and output is 1 Volt. Compliance is better than 1. The Astatic Corporation, Conneaut, Ohio. (ELECTRONIC TECHNICIAN 9-11)

As described in ELECTRONIC TECHNICIAN send me more data on the V-M Radio-Phono Combination, 4-Speaker Hi-Fi Console Model 568. (9-12)

Name

Address

City State



← V-M's RADIO-PHONO

The Summit, Model 568, is a high fidelity unit and features a custom FM/AM radio tuner and a 4-speed record changer. It is equipped with a 4-way speaker system housed in an acoustically balanced reflex chamber, consisting of a 12-inch woofer, an 8-inch mid-range speaker and a pair of 4-inch tweeters. Also has a stereo input jack and an external speaker output jack. V-M Corporation, 280 Park St., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 9-12)

20,000 HOURS!

...and still going strong



103 Locked TV "Torture Tests" Prove Westinghouse Tubes Last Longer, Cut Call-Backs!

More than words, this picture proves the superior quality of Westinghouse RELIATRON® Tubes. "Torture tested" coast-to-coast in full view in distributor showrooms, 103 standard make TV sets with RELIATRON Tubes are making history! All sets are chained and padlocked. One of these sets has already run an incredible 20,000 hours . . . more than 13 years' average viewing time . . . and still going strong!

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your customers—with one important difference. They're equipped with Westinghouse RELIATRON Tubes—the most reliable, most profitable tubes you can sell—bar none!

But see it to believe it! Stop by your Westinghouse Tube Distributor's today and watch famous "Locked TV" roll up even more hours—in the most strenuous TV performance test ever! Your best proof that you profit much more when you sell Westinghouse RELIATRON Tubes.



YOU CAN BE SURE...IF IT'S **Westinghouse**
Electronic Tube Division Elmira, New York

New Components

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As described in ELECTRONIC TECHNICIAN send me more data on the Good-All Capacitors type 600-UE. (9-13)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the International Rectifier tube base mounted S6X4. (9-14)

Name

Address

City State

As described in ELECTRONIC TECHNICIAN send me more data on the Erie "Hi-Stab" line of Resistors. (9-15)

Name

Address

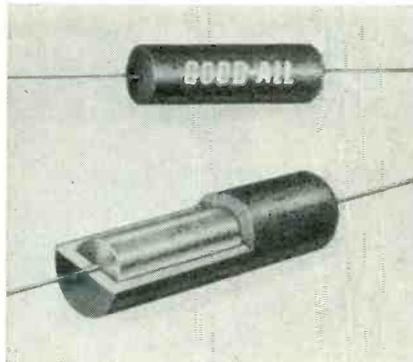
City State

As described in ELECTRONIC TECHNICIAN send me more data on the Centralab Tube-R-Cap, Resistor-Capacitor Unit. (9-16)

Name

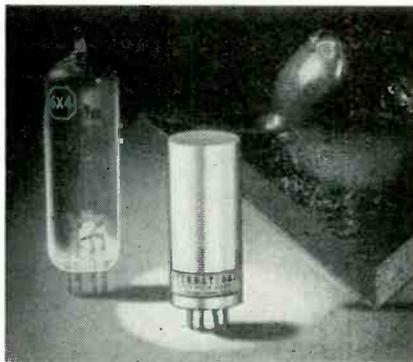
Address

City State



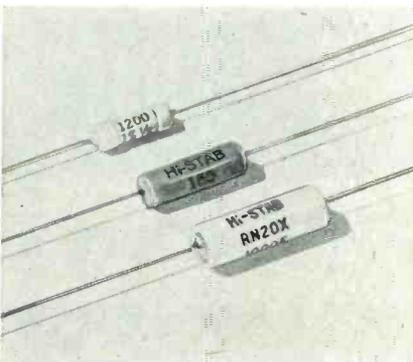
← Good-All CAPACITORS

The 600-UE, Mylar dielectric—Molded in Epoxy, has low leakage and high stability. Mylar is DuPont's trade name for polyester film, and Epon is Shell's trade name for its Epoxy Resin plastic molding compound base. A new production technique combines these into a rugged space-saving capacitor, molded in one piece, which assures excellent humidity resistance, low leakage, and long trouble-free life. Good-All Electric Mfg. Co., 26 Rittenhouse Place, Ardmore, Penna. (ELECTRONIC TECHNICIAN 9-13)



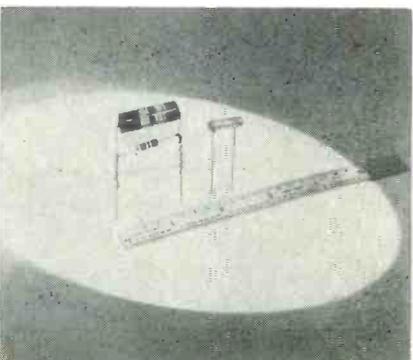
← Int'l. Rect. S6X4

Tube base mounted silicon replacements for vacuum tube rectifiers provide savings on filament power supply, cooler operation, long life and resistance to vibration and shock. The S6X4 is a direct replacement for the 6X4 tube and features: output, 85 ma dc maximum; input, 400 volts rms; maximum peak current, 225 ma; maximum PIV, 1250 volts; and a 6-volt drop at 70 ma. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 9-14)



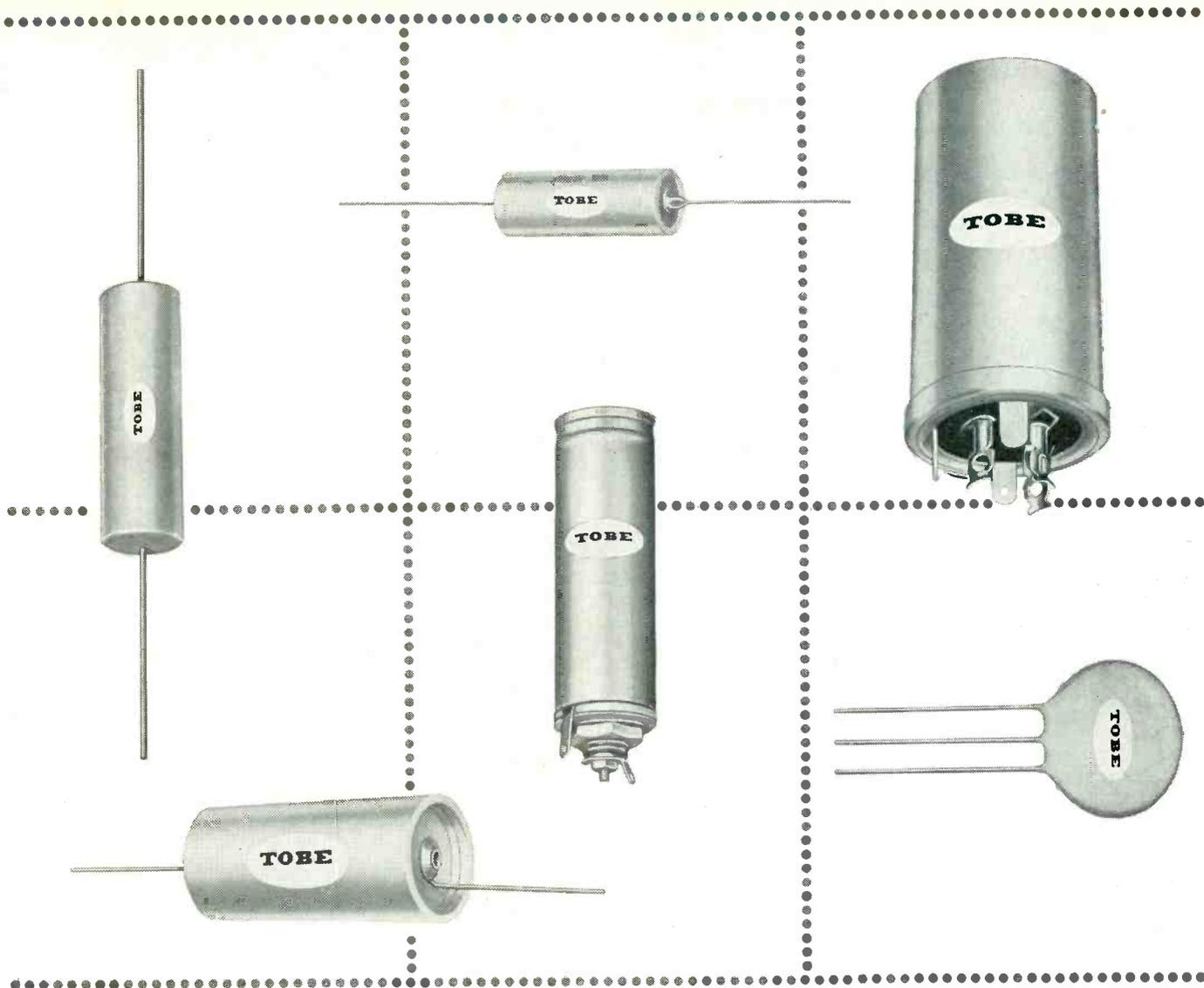
← Erie RESISTOR

"Hi-Stab" is a line of deposited carbon high stability resistors, available in molded, non-insulated and hermetically sealed ceramic encased types. They have been tested by exposure to a humid underground atmosphere for 3 years, during which time the average resistance change was only 0.3%. In another test these same resistors were immersed in tap water for 4,500 hours with negligible average resistance change. Erie Resistor Corp. 644 W. 12th St., Erie, Pa. (ELECTRONIC TECHNICIAN 9-15)



← Centralab TUBE-R-CAP

Two new sizes in the Tube-R-Cap, a resistor-capacitor unit that requires only the space of a tubular capacitor, incorporate on the same body, a resistor in parallel. The CC20 Tube-R-Cap has a standard capacity range of 400 μf to 2150 μf . The CC25 model has a range of 970 μf to 5000 μf . Both miniature ceramic types are rated at 500 volts. Centralab, Division of Globe-Union, Inc., 900 E. Keefe Ave., Milwaukee 1, Wis. (ELECTRONIC TECHNICIAN 9-16)



thousands of servicemen have happily discovered

TOBE QUALITY SERVICE CAPACITORS

have you?



Specify **TOBE** Capacitors • Pioneers since 1922

New Product Review

Measurements SIGNAL GENERATOR

These FM signal generators, with a tuning ratio of approximately 1.2 to 1 are available for use within the limits of 30 to 200 mc with a maximum frequency deviation of at least 150 kc. Features: wide deviation with low distortion; low spurious residual FM; individually calibrated, direct-reading carrier frequency dials, continuous output voltage monitoring with accurate barretter bridge; source impedance 50 ohms with low VSWR; operates at fundamental carrier frequencies; and vernier electronic tuning. Measurements Corp., Boonton, N. J. (ELECTRONIC TECHNICIAN 9-17)

Astron CAPACITORS

Five new miniaturized capacitors include: two "Safety Margin" electrolytics, Types EE and EM, designed for miniaturized low-voltage d-c equipment and transistorized circuits; a metallized Mylar, Type RLR, features less capacitance change and low power factor in a miniaturized size; a Mylar metallized Type ROL capacitor for reliability required by military equipment and critical industrial circuits; and a new miniature Mylar dielectric capacitor available in flat (TYPE XPF) or round (Type XPR) styles. Astron Corp., 255 Grand Ave., E. Newark, N. J. (ELECTRONIC TECHNICIAN 9-18)

GC RED INSULATING VARNISH

A new coating provides unusual protective insulation for electronics equipment circuitry. The new varnish is ideal for all solder connections, high-voltage points and anti-corona protection. Excellent adhesive qualities and resistance to heat, oil and acids are additional features. General Cement Mfg. Co., 400 S. Wyman St., Rockford, Ill. (ELECTRONIC TECHNICIAN 9-19)

Belden MIKE CABLE

New plastic insulated versions of several of the more popular rubber covered mike cables, are particularly recommended for use in high concentrations of ozone—which usually destroys rubber cables. The use of polyethylene insulation with a chrome vinyl jacket gives good appearance, very high insulation resistance and minimum capacitance per foot. 8403, 8404 and 8405 have 3, 4, and 5 conductors respectively, and are cabled with a jute filler. Belden Mfg. Co., 4647 W. Van Buren St., Chicago 44, Ill. (ELECTRONIC TECHNICIAN 9-20)

Mallory DUAL CONTROLS

A completely new concentric potentiometer control design can be assembled to form a custom dual concentric control in just 30 seconds. Technicians are assured of being able to get the exact dual control needed for any standard model radio or TV set and from a relatively small inventory. P. R. Mallory & Co. Inc., 3029 E. Washington St., Indianapolis 6, Ind. (ELECTRONIC TECHNICIAN 9-21)

Winegard IMPROVEMENTS

All Color 'Ceptor antennas (models CL-4 and CL-4X) now being produced have 3 improvements: new "TDM" insulators being used are practically unbreakable; in place of the dye formerly used in the anodizing process, a sunfast gold color pigment claimed to lose less than 10% of its brilliancy during the first year, even in direct sunlight; and to add extra strength and longer life to reflector elements, a new aluminum alloy of higher tensile strength is used. In addition, 16-inch aluminum dowels have been inserted in the center of each reflector. No increase in price. Winegard Co., 3000 Scotten Blvd., Burlington, Iowa (ELECTRONIC TECHNICIAN 9-22)

Raytheon TUBES

6DB5 and 12DB5 are heater cathode type beam-power pentodes of miniature construction having CWU heaters and are designed for use as vertical deflection amplifiers which makes them ideally suited for small TV sets. 3 new CRT's, the 21BTP4, 21CWP4 and 24AEP4 have a rectangular face, electrostatic focus and magnetic deflection. They also have a spherical filter-glass face plate. The 21CWP4 and 24AEP4 also has a reflective metal-backed screen to increase light output. The 24AEP4 does not require an ion-trap magnet. Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass. (ELECTRONIC TECHNICIAN 9-23)

Clarostat POTENTIOMETER

A tiny precision potentiometer for pad or trim resistance functions, the "Padohm," is screwdriver-adjusted and is available in resistance values from 100 to 20,000 ohms. Standard overall resistance tolerances of $\pm 10\%$ with standard linearity of $\pm 2\%$. In two types: Type L rated at 0.25 watt, and Type H, 0.40 watt. It is especially intended for extreme ambient conditions of temperature, moisture, shock and vibration. Clarostat Mfg. Co. Inc., Dover, New Hampshire (ELECTRONIC TECHNICIAN 9-24)

EMC TUBE TESTER

Speedi Tube Tester checks tubes in seconds. Requires only two settings. It checks for shorts and leakages, as well as quality. Over 375 tubes currently listed, including OZ4 tube. Checks octals, loctals, miniature, and 9-prong socket tubes. New listings will be printed as new tubes appear on the market. Can also be used, with adaptor, to check and rejuvenate CRT's. Model 301 is priced at \$47.50. Electronic Measurements Corp., 625 Broadway, New York 12, N. Y. (ELECTRONIC TECHNICIAN 9-25)

E-Z HOOK

Slips easily on or off a test prod and thus permits a speedy change from a sharp point which is useful for probing, to a self-holding connector which will hold the test prod firmly in place. Thus freeing both hands for control adjustments or other checks. Connections may be safely made, even in closely crowded spots, without danger of shorting to adjacent bare wires or terminals. E-Z Hook Test Products 1536 Woodburn Ave., Covington, Ky. (ELECTRONIC TECHNICIAN 9-26)

FOR MORE TECHNICAL INFORMATION ON NEW PRODUCTS OR BULLETINS

use this convenient coupon. Enter below the reference numbers for all items desired.

NEW PRODUCTS EDITOR
ELECTRONIC TECHNICIAN
480 Lexington Ave.
New York 17, N. Y.

Please send me more information on the following items:

My company letterhead or business card is enclosed.

Name

Address

Firm

My position

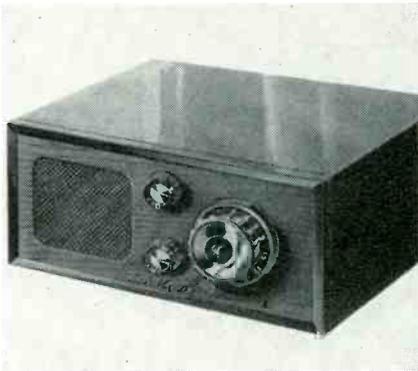
City

State

Business address (if different from above)

Tech-Master REMOTE CONTROL

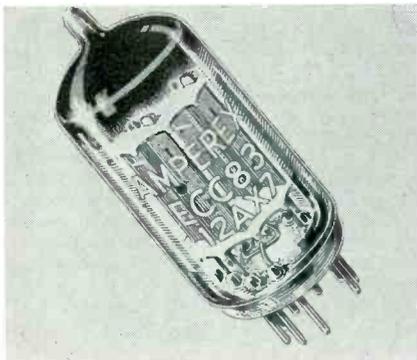
The Duo-Master is in effect a complete, super-sensitive TV receiver with audio and video output circuits, minus sync, sweep, high-voltage supply and picture tube. Installation consists of plugging in a thin remote-control lead into the TV receiver. The unit will permit selection of station, fine tuning and



adjustment of contrast up to 50' from the chassis. Equipped with: a loud-speaker; output jacks for a high fidelity amplifier, tape recorder, and headphones; and provisions for local or remote listening. Tech-Master Corp., 75 Front St., Brooklyn, N. Y. (ELECTRONIC TECHNICIAN 9-70)

Amperex ECC TYPE TUBES

The ECC Series twin triodes, ECC81, ECC82, ECC83 are designed as improved plug-in replacements for the 12AT7, 12AU7 and 12AX7 respectively. These tubes are designed for high-quality audio applications. They are electrically identical to their conventional equivalents, but differ from them in a number of important performance features. Hum level is significantly



lower because the filaments are wound as double helicals with mutually cancelling magnetic fields. This filament structure also contributes to longer tube life, since it eliminates the sharp bends of the conventional folded type, where burn-outs are most likely to occur. Lower tube noise and lower microphonics are due to the greater rigidity and immobility of the internal tube structures. Amperex Electronic Corp., 230 Duffy Ave., Hicksville, L.I., N.Y. (ELECTRONIC TECHNICIAN 9-33)

Simpson

announces

NEW

HANDISCOPE

model 466



KEEPS BENCH LESS CLUTTERED

SAVES SHELF SPACE, TOO!

EASY TO CARRY

perfect for:

- Hi-Fi troubleshooting
- Industrial maintenance
- Production line tests
- Communications equipment checks
- AM & FM radio servicing
- Useful for black and white TV, too

MEASURES ONLY 8" x 12 1/4" x 16 1/2"—Use this rugged little instrument for the 101 jobs where a big specialized scope isn't needed. It brings you quality features such as a filter type graticule, universal-fit bezel, and 5" screen, yet is economically priced. And like other Simpson test equipment, Model 466 is built to give you years of hard service.

Frequency Response of Vertical Amplifier: From 15 cycles/sec to 100 Kc/sec, flat within ± 1 db; 6 db down at 250 Kc/sec; useable to 1 Mc/sec.

Maximum Vertical Deflection Sensitivity: 30 Millivolts RMS/inch.

Frequency Response of Horizontal Amplifier: From 15 cycles/sec to 20 Kc, flat within ± 1 db; 6 db down at 100 Kc/sec.

Maximum Horizontal Deflection Sensitivity: 0.7 volt RMS/inch.

Z-Axis Sensitivity (Voltage Required to Extinguish Beam): 20 volts RMS.

Calibrating Voltage (at 117.5 VAC power source): 1 volt P-P $\pm 10\%$.

Maximum Input Voltage: 400 volts peak.

Input Resistance: 0.1 Meg (at atten. x 1); 0.5 Meg (at atten. x 100).

Input Capacitance: 40 uuf (at atten. x 1); 35 uuf (at atten. x 100).

Sawtooth Sweep Range: 15 cycles/sec to 80 Kc/sec.

Power Consumption (at 117.5 volts AC): 50 watts.

Model 466 with Lead, Operator's Manual.....

\$144⁹⁵

See your Electronic Distributor, or write

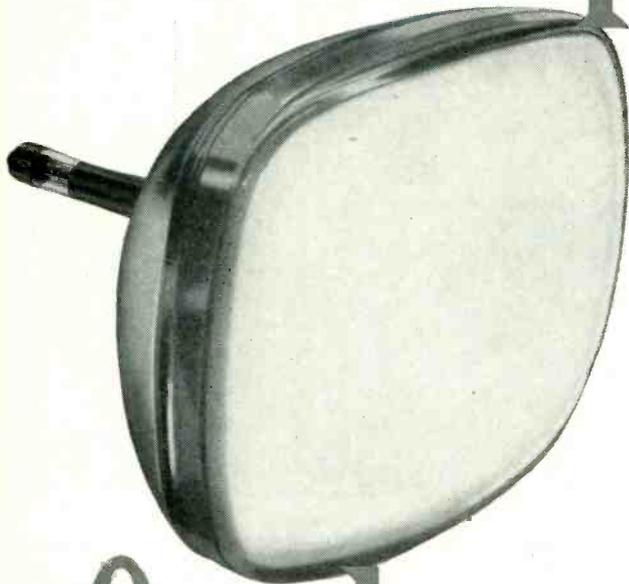
SIMPSON ELECTRIC COMPANY

5200 W. Kinzie Street • Chicago 44, Illinois • Phone: EStebrook 9-1121
In Canada: Bach-Simpson Ltd., London, Ontario



WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT

IT'S Blue Chip



Quality

Tung-Sol Magic Mirror Aluminized Picture Tubes mirror twice the light to create a picture twice as bright. They bring out the best in every set. Install these superior tubes and see the difference . . . the difference that pays off in smooth, callback-free service and satisfied customers. Tell your supplier you'd rather have Tung-Sol Tubes.

Blue Chip Quality

TUNG-SOL[®]

Magic Mirror Aluminized

PICTURE TUBES

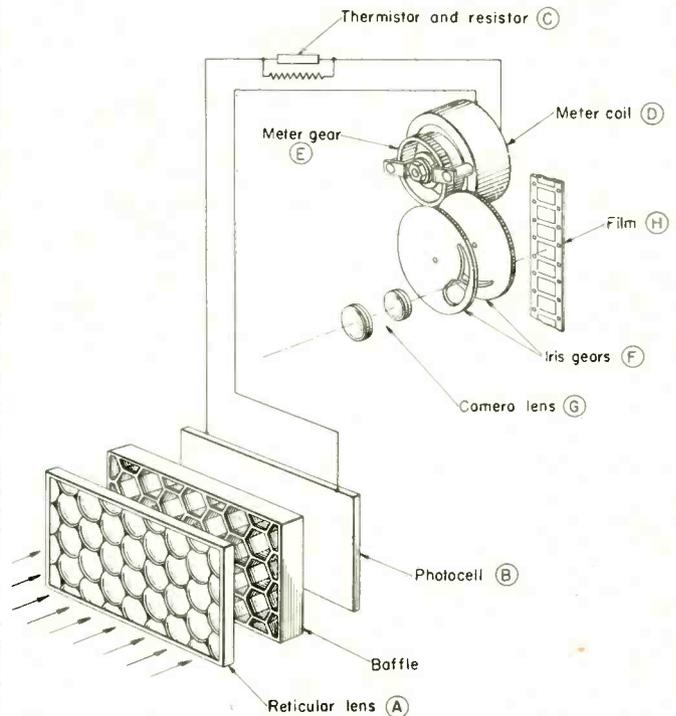
TUNG-SOL ELECTRIC INC., Newark 4 N. J. Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Texas; Denver, Colo.; Detroit, Mich.; Irvington, N. J.; Melrose Park, Ill.; Newark, N. J.; Seattle, Wash.

Solar Energy Controls Home Movie Cameras

• The energy from solar or light rays has been harnessed to set the lens of a new automatic 8 mm movie camera introduced by Bell & Howell Co.

The new camera is claimed to be the first in which light energy alone supplies the power to generate the electric current which adjusts the lens. No batteries, motors or springs are used for the exposure setting. The current is transmitted directly from the photoelectric cell to a mechanism controlling the lens iris.

The movie maker winds the camera, sights and shoots. The electric eye, which adjusts to changing light faster



As light enters the reticular honeycomb lens combined with a baffle (A), its angular coverage is controlled to match the coverage of the camera lens. The light then reaches the photocell (B) and generates an electric current, which flows through a resistor and thermistor (C), which compensate the current for temperature variations. When the current reaches the meter coil (D) it deflects the meter. On one end of the coil is the needle pointer on the face of the camera. A gear on the meter (E) engages the two iris gears or blades which create the iris opening (F). The rotation of the meter opens or closes the iris. The iris opening now permits the exact amount of light for correct exposure to come through the lens (G) to the film (H). All this has taken place in a fraction of a second.

than the human eye, sets the lens for proper exposure before the starting button is touched. No focusing is necessary.

An amber exposure beacon in the camera's viewfinder glows as long as the available illumination is adequate. It turns black to signal that there is insufficient light for movie making.

Through the use of thermistors the electric eye mechanism adjusts to temperature changes. The camera can be used at any temperature extremes the film itself will withstand.

Light reflected from the subject enters a reticular honeycomb lens which controls the angular coverage to match

that of the camera lens. Upon reaching the photocell, the light generates an electric current which is fed to the meter mechanism. The meter computes the correct exposure and opens or closes the lens as required. See Illustration for details.

Linked to the control mechanism is a needle pointer which moves back and forth along a visible scale, indicating the opening at which the lens is set in f/stops of 1.9 to 16. The camera can also be operated manually.

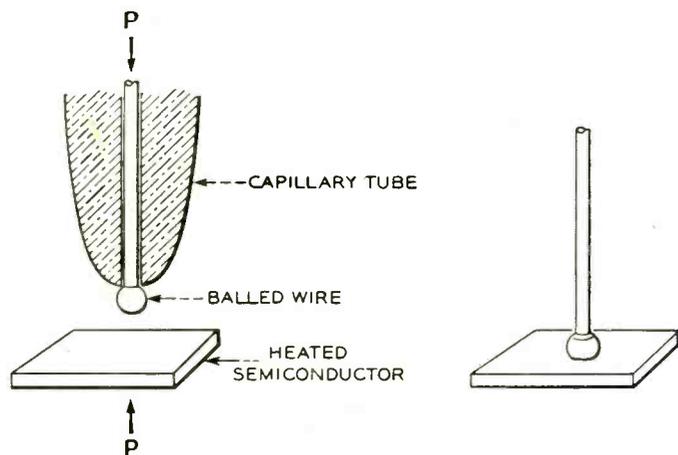
The Bell & Howell 8 mm electric eye camera is available at \$169.95. •

New Semiconductor Bonding Technique

• A new technique of attaching leads to semiconductor devices has been achieved at Bell Telephone Labs. A combination of heat and pressure are employed to provide a firm bond between various soft metals and clean, single crystal semiconductor surfaces.

Called thermo-compression bonding, this new technique provides a bond that is stronger than the lead itself. Temperatures and pressures required are not high enough to affect the electrical properties of the semiconductor material.

One method of forming a suitable bond is to employ a heated element such as a wedge, a flat or a point, to press the metal against the heated semiconductor with a pressure sufficient to cause a slight deformation of the lead. Adhesion occurs within a matter of seconds.



Pictorial representation of thermo-compression bonding technique in which a balled wire is attached to a semiconductor material.

Another useful connection may be made by butting the balled (or headed) end of a wire against the heated semiconductor by means of a capillary tube.

Thermo-compression bonding has a number of advantages over other methods of attaching leads to semiconductors. The bond is stronger; the technique is more readily adaptable to mass production; no chemical flux or other chemical contaminant is involved in the process; and leads may be attached to much smaller areas, an invaluable aid in fabricating high-frequency transistors.

Adhesion takes place in seconds with pressures of a few thousand pounds per square inch and temperatures well below the melting point of the alloy of the metal and semiconductor. A gold-germanium bond appears to be the easiest to make, but gold, silver, aluminum and a number of alloys can be readily bonded to either germanium or silicon. •

IT'S Tung-Sol



Quality

Tung-Sol receiving tubes for TV, radio and Hi-Fi replacement are exactly the same as those supplied to leading independent set makers. This one quality—Blue Chip Quality—is your assurance of long, trouble-free service that keeps customers with you year after year. Tell your supplier you'd rather have Tung-Sol Tubes.

Blue Chip Quality

ts TUNG-SOL®
RECEIVING TUBES

TUNG-SOL makes All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes and Semiconductor Products.

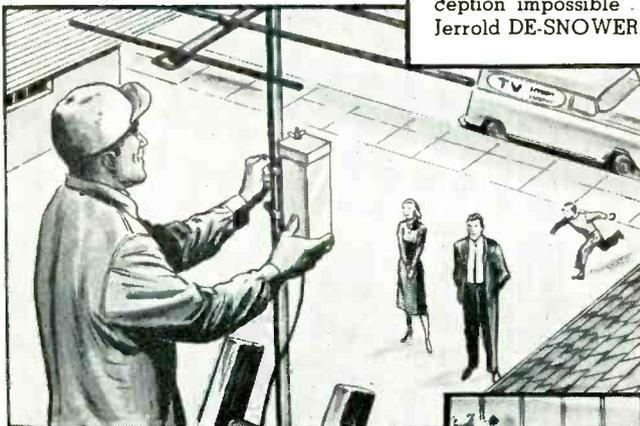
The Case of The Serviceman WHO KEPT IT CLEAN!



The fringe area Jones family wanted TV entertainment but got "snow". When Junior's favorite show was ruined once too often, the serviceman was called in.



He pointed out that even with a good antenna weak signals are affected by line loss and noise, making good reception impossible . . . recommended a Jerrold DE-SNOWER.



Antenna mounted, the DE-SNOWER captures the signal before loss and noise affect it, delivers it to the set over shielded coax . . . providing snow-free pictures.



Thanks to the serviceman and Jerrold the Joneses get high fidelity color and black and white pictures every time!

THE JERROLD DE-SNOWER

A high profit pre-amplifier accepted everywhere! Combines 25 db gain with low noise input—only 6 db. No AC outlet or separate wiring on mast.

Available in 3 models—Single Channel; Broadband Chs. 2-6, Broadband Chs. 2-13. Packed complete with remote 24 volt power supply.

See the DE-SNOWER line at leading distributors or write direct for illustrated brochure to: Dept. P. D. #16A

JERROLD

ELECTRONICS CORPORATION

23rd & Chestnut Sts.

Philadelphia 3, Pa.

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

Fine Tuning

(Continued from page 47)

automatic fine tuning receiver is shown in Fig. 2. The AFT passband has a much steeper slope near the sound-carrier frequency.

Drift

If the local oscillator drifts and thereby moves the picture carrier to P' and sound to S' as shown in Fig. 2, AFT automatically controls the local oscillator to return the sound

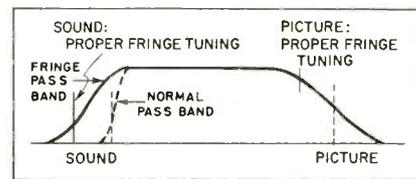


Fig. 4—Picture carrier is shifted to a higher response position in a fringe area.

to S' and picture to P'', thereby maintaining the correct picture-sound carrier ratio and good picture quality. With the steep sound slope, AFT is extremely sensitive, consequently P'' and S'' are very close to the correct frequencies, P and S.

Tilt

A certain amount of tilt as shown in Fig. 3, is often introduced into the over-all passband. This can be caused by attenuation and reflection effects of terrain, receiver antennas, or antenna lead-in connections. Attenuation or cancellation will vary over the frequency range, resulting in the "tilted" passband. Hence, a local oscillator operating at the correct frequency for the normal flat passband would produce a considerably distorted picture-sound ratio on the tilted passband. AFT automatically detects this distortion and corrects by moving S to S' and P to P' to restore the proper sound-picture ratio.

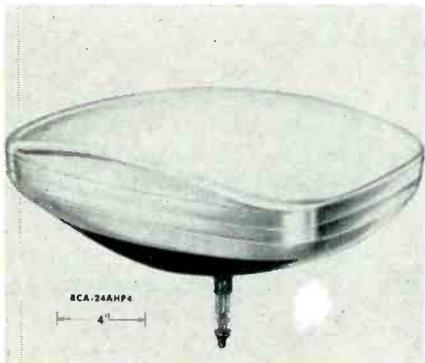
Fringe Signal Response

In fringe areas the signal is relatively weak and consequently the signal-to-noise ratio poor. Since a sharp picture is impossible under these conditions, picture sharpness can be sacrificed in favor of maximum picture-signal gain by moving the picture carrier frequency to a position of higher response. See Fig. 4. The AFT receiver i-f passband is altered for fringe-station reception as shown. This alteration is

accomplished by means of a "programming wheel." This wheel permits the customer to select either a fringe or local type performance for each channel in his area, in addition to the normal programming function of causing the station selector to stop-on or skip a channel. When the small nylon slider is in the external position, the channel selector will stop on that station with the AFT set for correct local station reception. If the slider is pushed in one notch, the channel selector will stop on that station, but with the automatic fine tuning set for correct fringe area reception as shown in Fig. 4, the local oscillator automatically moves P to P₁ and S to S₁. This can be done on the conventional i-f passband in Fig. 1, by manually tuning in the same direction, but AFT gives the advantage of automatically maintaining proper picture-sound carrier ratio while in the fringe position. •

RCA 24" 110° CRT

The 24AHP4 is a new rectangular, glass CRT with 110° diagonal deflection angle. It is approximately 5¼" shorter and 7 pounds lighter than the 24" types having 90° deflection. Equipped with a



straight electron gun, it does not require an ion-trap magnet. Other features are: low-voltage electrostatic-focus; magnetic deflection; filterglass faceplate; aluminized screen; and screen area of 332 square inches. RCA Tube Division, Harrison, N. J. (ELECTRONIC TECHNICIAN 9-31)

Int'l CRYSTAL

F6 Series crystals for standard 2-way commercial communication equipment are designed for close tolerance applications. All units are calibrated for the specific load presented by the equipment circuits and are housed in hermetically sealed metal holders. Tolerance over temperature range ±0.002% from -30° to 60°C. International Crystal Mfg. Co. Inc., 18 N. Lee, Oklahoma City, Okla. (ELECTRONIC TECHNICIAN 9-29)

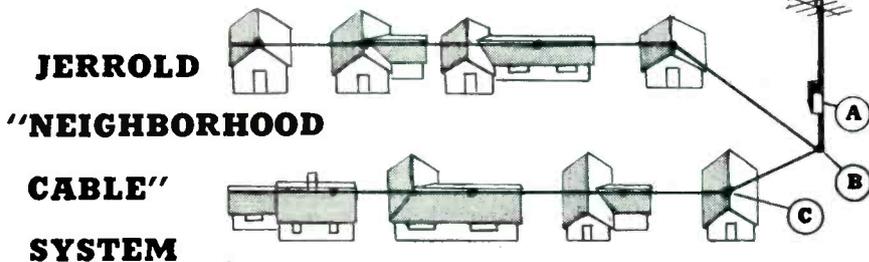
The Case of The Serviceman WHO TOPPLED ANTENNAS!



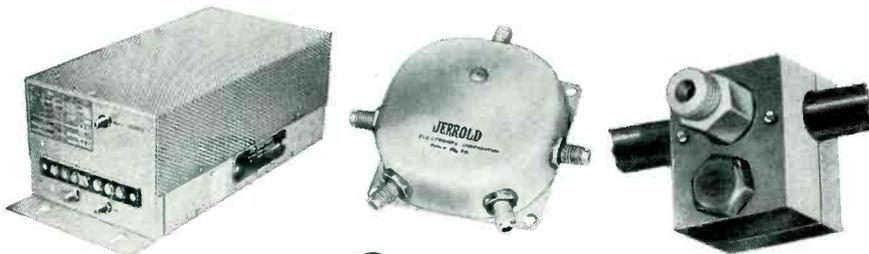
Suburbia was a good place to live, but distant TV stations and local hills made TV reception spotty. Each neighbor tried to outdo the others with costly antennas, but nothing worked . . . until an enterprising serviceman came along.



He sold them a Jerrold "Neighborhood Cable" System that captures a clean signal at one antenna location and delivers it over shielded coax to each home . . . giving high fidelity signals on all channels . . . at all receivers . . . and eliminating ugly, hazardous rooftop antennas!



CONSISTS OF THESE EASY TO INSTALL COMPONENTS



(A) AMPLIFIER

Distributes strong, clear pictures over shielded coax cable!

(B) SPLITTER

Divides amplifier output up to 4 ways. No tubes . . . can't overload!

(C) TAP

"Pressure" Tap. Taps line and isolates overload!

For complete details on "How to Sell and Install a Jerrold Neighborhood Cable System," write to: Dept. P. D. #16B

JERROLD ELECTRONICS CORPORATION

23rd & Chestnut Sts.

Philadelphia 3, Pa.

LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING

Right Or Wrong In Labor Relations

A roundup of day-to-day employee problems and how they were handled. Each incident is taken from a true-life grievance which went to arbitration. Names of some principals involved have been changed. Readers who want the source of any of these case histories may write to ELECTRONIC TECHNICIAN.

WHEN CAN'T YOU FIRE A WORKER FOR SWEARING AT HIS BOSS?

What Happened:

"Hey, handle that the way you're supposed to!" the boss called over to Fred Brand. Brand replied that he was handling it properly—only he used unprintable language. The boss fired him on the spot, maintaining that Brand's use of profane and obscene language to him interfered with discipline and efficiency and created a disturbance. But Brand protested that the words he used



were the way the whole work gang talked all the time. Besides, his work record was good, he'd always gotten along well with the boss before, and this was the first time he'd ever done anything wrong. Getting fired was too tough, everything considered.

Was The Worker:

RIGHT WRONG

What Arbitrator Spencer Pollard Ruled: "The Arbitrator believes that this incident does not indicate any basic unfitness of Brand for his job. He has a good work record with this company and a good record of cooperation with his boss and fellow workers. In general, the Arbitrator would say that discharge is too strong a penalty for a first offense by a good employee, especially where the offense is only verbal and no real damage to person or property is involved. Nearly all Arbitrators require a warning and a chance to correct behavior, where the employee's record is as good as it is in this case. It is the decision of the Arbitrator, therefore, that Mr. Brand was not discharged for just cause." The employee was reinstated.

WHEN CAN YOU REQUIRE EMPLOYEES TO WORK OVERTIME?

What Happened:

The service manager announced he would need 6 men to work the next Sunday, not a regular workday. Of the men assigned to the overtime job, 4 said they wouldn't be available. The manager said that the Sunday schedule was "an order" and they'd better turn up or else. The 4 men didn't show up.

They got a five-day layoff. "You can't do that to us," the men said, and put up the following reasons:

1. The rules say employees will be offered the opportunity to work overtime. You don't *have* to take something that's offered to you.
2. It also says to tell your manager when you won't be available for overtime. That means you have a choice.
3. Many workers have refused to work overtime before, and none of them ever got punished for it.

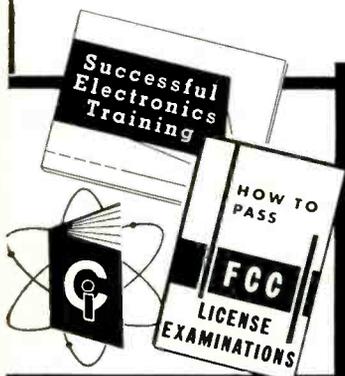
How to increase your income

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Find out how you can increase your monthly income by installing and maintaining the types of electronic devices listed above.

Anyone now in the radio-television servicing field can qualify. A Commercial FCC license will open the door to new profit areas . . . and the work is interesting.

Don't limit yourself to receiver servicing. Prepare yourself to handle the more profitable jobs in electronics. Fill out the coupon below and mail it TODAY. The information is free!



Cleveland Institute of Radio Electronics

Desk T-7, 4900 Euclid Bldg., Cleveland 3, Ohio

Please rush the Free booklets to

Name

Address

City

Accredited by the National Home Study Council

The manager answered:

1. The business requires some weekend work and we have to know ahead of time that we'll have enough men on hand.
2. That Sunday work was a definite assignment. We have the right to discipline workers who refuse to carry it out.
3. These men are a bunch of trouble-makers, anyway.

Was The Manager:

RIGHT WRONG

What An Arbitration Board Ruled:
 "This board finds from a careful reading of the rules that the company has contracted away its right



to schedule mandatory overtime. The words 'opportunity to work overtime shall be offered to the employees' certainly puts the working of overtime on a voluntary basis. This is borne out further in '... any employee may advise his supervisor that he will be unavailable for trouble call during time off.' There are no conditions attached to this sentence. "All the employees of this company must do is to advise their supervisor that they are unavailable. The employee does not have to be sick, have a death in his family, be called for jury duty, or any of the reasons that are generally found in contracts.

"The evidence showed that many employees had refused overtime on many occasions and were never disciplined. This leads the board to believe that it was the intention of the company to agree that overtime assignments would not be mandatory. The company cannot force the employee to perform weekend work by calling it a work assignment. The grievances are sustained." ●

Krylon GLASS CLEANER

A new, fast, convenient cleaner suitable for TV masks and screens, is now being marketed in a 15-oz. aerosol container. Foaming Clearex Window Spray is easy-to-use; slight finger pressure on the push-button valve sprays foam cleaning properties over a wide area, then wipe off. Krylon, Inc., 18 W. Airy St., Norristown, Pa. (ELECTRONIC TECHNICIAN 9-63)

for ENGINEERED
 exact
 replacements
 look to



Stancor exact replacement transformers are engineered—not copied. With manufacturers' original prints used as a basis for physical exactness, the circuit and operating requirements are carefully analyzed by the Stancor engineering staff. Where necessary, heavier wire, more insulation, protective coatings, corona rings, or heavier shielding are used to assure you of "better-than-new" performance. Even where the original may have been easily overloaded—it won't happen again with the Stancor replacement.

Chicago Standard has the largest engineering staff of any replacement transformer manufacturer—your assurance of a carefully and correctly designed transformer.

A free copy of the latest Stancor catalog and TV Guide is available at your distributor or direct from Stancor.

CHICAGO STANDARD TRANSFORMER CORPORATION

3513 ADDISON STREET CHICAGO 18, ILLINOIS

Export Sales: Roburn Agencies, Inc., 431 Greenwich St., New York 13, N.Y.

SERVICE MEN KNOW THERE IS JUST ONE

HUSH

Reg. U.S. Pat. Off.

Chemically engineered for tuners and switching mechanism



Hush comes in a 6 oz. pressure can with sufficient pressure to reach all contacts to wash-away that dirt, leaving clean and positive contacts, protected with a lasting lubricant film.

\$2.25 net

Hush also available in 2 oz., 8 oz., and 32 oz. containers.

EVER-QUIET

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Since 1949 the Original Volume Control and Contact Restorer

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon. Will not affect inductance, capacitance or resistance.



2-Ounce Bottle with Handy Dispenser (32 oz. sizes available)

only 59c

See your distributor or write to

CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

Catalogs & Bulletins

DC to AC CONVERTERS: Illustrated listings of re-designed Mark II Super Converters. Catalog #557, replacing #553, lists also: performance charts; dimensions; selector chart; installation instructions. Carter Motor Co., 2711 W. George St., Chicago, Ill. (ELECTRONIC TECHNICIAN No. B9-1)

CAPACITORS: 26-page Catalog covers new line of molded tubulars, metalized paper, ceramic discs, twist-prong elec-

trolytics, tubular electrolytics and industrial types. Full specifications as well as prices are given. Obtain from your local Tobe distributor or from Tobe Deutschmann Corp., 2900 Columbia Ave., Indianapolis, Ind. (ELECTRONIC TECHNICIAN No. B9-2)

RECTIFIERS: New, revised guide for using germanium rectifiers to replace selenium rectifiers in TV sets. Lists all American-made TV sets built since 1953, in which selenium rectifiers may be replaced by G.E. germanium rectifiers. Gives manufacturers name, model, chassis number, rectifier part number, and wiring instructions. Obtain from G.E. Tube and Transistor Distributors or General Electric Co., Semiconductor

Products Dept., Syracuse, N.Y. (ELECTRONIC TECHNICIAN No. B9-3)

POTENTIOMETERS: 4-page Catalog Data Bulletin A-3a covers type 2W Rheostat Potentiometers. Information on construction, dimensions, terminals, identification, hardware, etc., with detailed charts and graphs. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. (ELECTRONIC TECHNICIAN No. B9-4)

RELAYS: 36-page Catalog listing thousands of relays made by leading relay manufacturers, with model numbers and prices. Relay Sales, Box 186-ET, W. Chicago, Ill. (ELECTRONIC TECHNICIAN No. B9-5)

TRANSFORMER REPLACEMENTS: New catalog supplement sheet, cross referencing exact yoke, flyback coil and transformer replacements for Scott-Meck TV receivers. Intended for addition to Rogers' "Exact Replacement Manual." Rogers Electronic Corp., 49 Bleecker St., New York 12, N.Y. (ELECTRONIC TECHNICIAN No. B9-6)

CAPACITORS: Bulletin describes application notes, specifications and lists the many different sizes of the 600 series, Mylar dielectric capacitors, molded in Epoxy. Also lists other types. Good-All Electric Mfg. Co., 26 Rittenhouse Place, Ardmore, Pa. (ELECTRONIC TECHNICIAN B9-7)

CRYSTALS: Catalog, No. ET 57, of precision made crystals and equipment lists important data and how to order. It is an important reference for 2-way commercial communications equipment servicing. International Crystal Mfg. Co. Inc., 18 N. Lee, Oklahoma City, Okla. (ELECTRONIC TECHNICIAN No. B9-8)

**Our
Guarantee
is printed
on our
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On every packaged PLANET electrolytic capacitor sold through distributors you will find this statement:

GUARANTEED FOR ONE YEAR

Because PLANET CAPACITORS ARE "ENGINEERED FOR QUALITY", because they are carefully controlled through all stages of production and because the finished product is given a 100% electrical and mechanical check—our one-year guarantee is not only made possible, but is conservative.

Actually, thousands and thousands of Planet capacitors five, six and even seven years old are performing excellently, every day, in TV and radio sets all around the world. When you solder a Planet capacitor into a circuit your guarantee of satisfactory performance is right there in front of you—and will be in the circuit for a long, long time. So when you order capacitors—order PLANET.

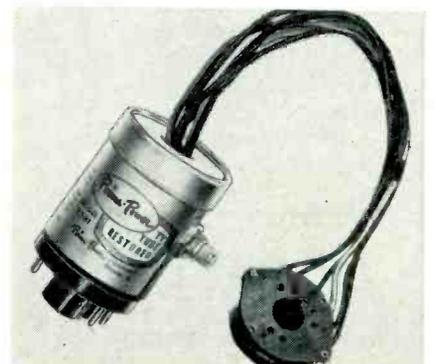
PLANET SALES CORPORATION

228 BELLEVILLE AVE.

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Perma-Power TUBE RESTORER

TV Tube Restorer Model K-201 is designed to restore the picture on any CRT with open grid, or control grid to cathode short only. It works on elec-



tro-static or magnetic focus picture tubes in series or parallel-wired filament TV sets. List \$2.49. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 9-32)

New Books

COLOR TELEVISION PICT-O-GUIDE. By John R. Meagher. Published by RCA Electron Tube Div., Harrison, N.J. 200 pages plus fold-out. Hard cover, 18-ring snap-open binder. Available without charge with purchase of RCA tubes from authorized distributors.

Though we are reluctant to use the word "best" in describing a new book, this volume must prove the exception: It is the best manual on practical servicing techniques for color TV receivers to come to our attention. This book should play the same vital role in the transition to color servicing that its predecessor did a decade ago in the transition from radio to monochrome TV.

Theory and mathematical formulas are essentially non-existent in the Pict-O-Guide. The entire focus is on practical servicing, with many color photos showing pictures and patterns exactly as the technician sees them on the color TV screen. Subjects covered include convergence, gray scale tracking, bandpass alignment, test equipment techniques, troubleshooting, signal tracing, interference and test signals. Add the information in this book to your present black-and-white know-how, and you are practically ready to tackle the next color repair job that comes your way.

ONE HUNDRED ELECTRONIC CIRCUITS. By Milton H. Aronson and Charles F. Kezer. Published by Instruments Publishing Co., 845 Ridge Ave., Pittsburgh 12, Pa. 168 pages. Paper cover. \$2.00.

Here is a handy collection of various types of circuits covering a wide range of applications. There are 15 different power supplies, with a brief discussion of each, 18 amplifiers, 15 oscillators and generators, 20 pulse circuits, 17 test instruments, 3 alarms, 3 phototube circuits and 9 miscellaneous. They range from a common transistorized preamp to the less common triple-coincidence circuit. Though this book will not serve as the answer to the technician's daily circuit-seeking for bread and butter repair jobs, it should prove a fine reference when looking for those out-of-the-way schematics. It's a worthwhile addition to your technical library.

SERVICING COLOR TV. By Robert G. Middleton. Published by Gernsback Library, Inc., 154 W. 14 St., New York 11, N.Y. 224 pages. Paper cover, \$2.90; hard cover, \$4.60.

This information-packed volume by a leading color TV servicing authority contains much data of value to the black-and-white TV technician preparing to take on color repairs. It is well written and liberally illustrated, though the black-and-white printing of the text precludes the use of helpful

color pictures. Subject matter is broken down into the following nine chapters: Preliminary servicing, color sync, chroma circuit, chroma demodulators, matrix, i-f amplifier, flyback, signal tracing and test equipment. Emphasis is on the practical servicing aspects of these subjects. The book should be well received by TV technicians.

ADDITIONAL 1957 TELEVISION SERVICING INFORMATION. Compiled by M. N. Beitman. Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. 192 pages. Paper cover. \$3.00.

This is volume TV-13 in the service manual series, covering sets issued since the publication of the early 1957 vol-

ume. Circuits, waveforms, voltage charts, etc., are included for 15 different makes.

ACOUSTICS. By Joseph L. Hunter. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N.Y. 407 pages. Hard cover. \$8.50.

Here is an advanced and informative text on the science of sound. Theory, mathematics and practice are discussed. Among the subjects covered are sound waves, speakers, microphones, recording, speech and hearing, architectural acoustics, acoustic measurements and ultrasonics. This book is recommended for technicians specializing in audio, and for engineers.

MORE USES - MORE INCOME
With New Adapter, the famous B&K CRT Now Also Tests and Repairs Color and 110° Picture Tubes

CATHODE REJUVENATOR TESTER

CRT 400 PROVES REAL MONEY-MAKER
Thousands of servicemen today make money and keep customer good-will by checking and correcting b&w picture tube troubles with the famous B&K CRT 400, right in the home without removing tube from set. Restores emission and brightness. Repairs inter-element shorts and open circuits. Checks leakage. Indicates picture quality customer can expect. Life Test checks gas content and predicts remaining useful life of picture tube. Makes new picture tube replacement sales easier!
Model 400 (without adapter) Net, **\$54⁹⁵**

NEW MODEL C40 ADAPTER DOUBLES VALUE OF B&K CRT
Designed for use with all B&K Models 400 and 350 CRT's. Makes it easy to test and rejuvenate TV color picture tubes and 110° picture tubes. Isolates and detects difficult color troubles. Tests and rejuvenates each gun of the color picture tube separately the same way as a black & white tube.
Model C40 Adapter Net, **\$9⁹⁵**

See your B&K distributor, or write for Bulletin 400-C40-T.

Makers of CRT, DYNA-QUIK, DYNA-SCAN and CALIBRATOR
B&K MANUFACTURING CO.
3726 N. Southport Ave. • Chicago 13, Illinois

Independent Technician

(Continued from page 41)

major portion of this service to independents wherever possible. This policy makes good sense to us because we would find it virtually impossible to duplicate the coverage we get from our established networks of service dealers and service agents. Not only would the cost be tremendous, but also we would lose

the efficiency and local know-how inherent in a small business.

We have over 200 service dealers and agents who handle our marine radar and depth sounders, for example. Our customer relations have prospered. We support our service dealers and agents by providing technical information and the opportunity to earn a reasonable profit.

We manufacture capacitance welding equipment, ultrasonic grinding equipment, and television relay equipment for the industrial market. Our utilization of independent service organizations for these products

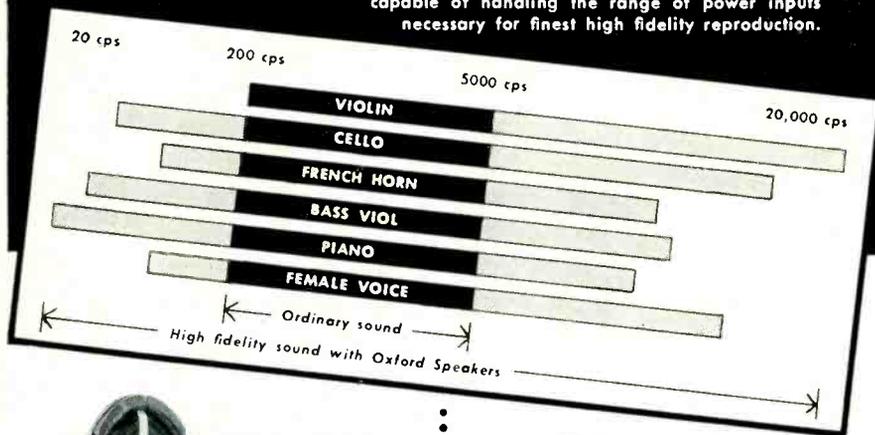
has been extremely limited and probably cannot be enlarged in the immediate future. This is because the nature of these products and the size of their markets do not create a situation in which we can offer an attractive proposition for the independent service businessman.

Consider our "Weldpower" welding equipments and our ultrasonic impact grinders, for example. They are designed for rugged industrial use and are not subject to frequent breakdown. The parts which wear out after long use are mostly mechanical rather than electronic, and are the kind of thing which the customer's production maintenance department is trained to handle. The low concentration of industrial equipment in all but the major industrial centers means that the frequency of equipment repair is too low to be financially attractive to the independent service organization.

OXFORD HI-FIDELITY SPEAKERS

Optimum Range at Minimum Cost!

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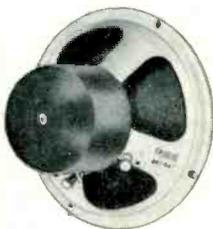
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EXTENDED RANGE SPEAKERS

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HF12JB 12"
HF12LN 12"
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F12J408 12"
Frequency response:
50-12,000 cps.
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Frequency response:
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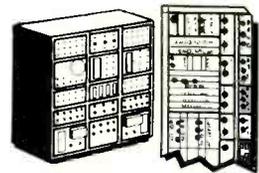
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Variations of these same facts apply to servicing our television relay equipment, limiting our present opportunity to delegate it to independent service businessmen. However, when we develop more new products for industrial markets we see a real opportunity for Raytheon to obtain the services of the same kind of independent service network for industrial products as we enjoy for our marine products. We will be willing to invest in training and supporting these agents as we build the new industrial service team.

Naturally, we will look for those businesses which are best prepared to cooperate with us. In particular, we will wish to be represented by a service businessman who considers our customer to be his own, and who places customer satisfaction and fair treatment ahead of immediate profit. We will expect his technicians to be interested in improving and maintaining their technical skills, because initial training is perishable when equipments seldom fail and the technician's know-how is not in constant use.

We are preparing for this future here at Raytheon and will wish to affiliate with independent service businesses who are making similar preparations for their own part.



Voltage Measurements

(Continued from page 57)

if the range switch is set to X 10 and the input signal produces a deflection of $2\frac{1}{2}$ inches on the screen, the peak-to-peak voltage is 25 volts.

Internal Calibrating Voltage

A different circuit arrangement may be used on other scopes. Figs. 1 & 5 show a dual-band width instrument having built-in calibrating facilities. The band-width switch provides for both narrow and wide-band responses and for the application of an internal calibrating voltage. To simplify voltage measurements volt-meter-type scales are located in front of the CRT. These scales are shown in Fig. 3. Calibration is accomplished simply by setting the band-width control to "Cal" and adjusting for a vertical deflection of 2 inches, as measured on the graph screen between the two horizontal lines, indicated by the arrows. If the graph-screen scales are to be read directly, the calibrating waveshape must be positioned exactly between these two lines. The short horizontal line centered between the two calibrating lines is provided as a reference point.

When the bandwidth control is set to "Cal," the probe, cable, and input attenuator circuits are automatically disconnected from the vertical amplifier, and the internal calibrating voltage is applied, as shown in Fig. 4. A straight vertical line is obtained if the sync-horizontal control is set to "Input." A sinusoidal waveshape is obtained in all other positions.

Calibration will hold for both the 4.5-Mc and 1.5 Mc bandwidth positions. After calibration, an input signal may be read directly in peak-to-peak volts by measuring the vertical deflection against the correct graph-screen scale. For example, to measure the horizontal driving pulse at the grid of the horizontal-output stage in a TV receiver, the "1.5-Mc" (narrow-band) position would be used. With the instrument calibrated and the displayed waveshape locked in, the pulse is positioned so that the negative peak rests on the bottom zero-line of the screen. The peak-to-peak voltage is then read from the appropriate vertical scale on the right-hand side at the point opposite the highest point on the waveshape as shown in Fig. 5. The setting of the vertical range switch, which has

positions marked 0.5, 1.5, 5, 15, 50, and 150, determines which right-hand scale is used. The procedure is very similar to that employed with a multi-range voltmeter.

Accuracy

Few manufacturers specify an accuracy figure for either the calibrating voltage or for voltage measurements for a number of reasons, particularly the electrical specifications of a scope are based on performance with the line voltage fixed at 117 volts, 60 cps. Voltages above or below this value will change the

peak-to-peak value of the calibrating voltage if the voltage is taken directly from the power transformer. The care and tolerance with which the transformer is wound will also affect the calibrating voltage, as will the shape of the line-voltage waveform. If the waveform is distorted, the peak-to-peak value will not be equal to 2.83 times the rms value, which is true for a sine wave, but will introduce an additional source of error. If a good-quality scope is operated at proper line voltage, however, it can be expected that the accuracy of measurements should be within $\pm 5\%$ of the actual value. •

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Association News

NATESA Toll TV

In a letter to the Federal Trade Commission, Washington 25, D.C.—Frank J. Moch, Executive Director of the National Alliance of Television & Electronic Service Associations noted with growing concern, the tremendous pressure being exerted upon the Commission to authorize "Pay as you see TV." He said in part, "It appears that those who are pushing the hardest are huge,

interlocking combines which would profit immensely from authorization of captive broadcasting. It appears that exclusive rights to movies, sporting events, etc. are tied up by these people and that manufacturing facilities are also already within these combines.

"With such potential monopoly so evident in other phases touching upon 'Pay as you see TV,' and in view of the fact that should authorization be forthcoming, control of the operation of all sets would become vital to the operators, it becomes crystal clear that the monopoly would be extended to include service and maintenance of TV sets. Small service businesses are good for the American economy in both peace

and war. With the rapid development of bigness in all phases of business, we believe service is the last frontier of free enterprise and that it must be preserved."

RTG Shopping Report

Long Island electronic parts distributors supplying radio and TV retail service dealers throughout that area were blasted for indiscriminate consumer sales recently. The action was taken by the Radio and Television Guild in Long Island, N.Y., after persistent reports from members indicated their objection to the number of parts jobbers who were selling to defense plant employees. They noted that if the more than 200,000 defense plant employees of the region made an average annual purchase of \$5.00 in parts from distributors, more than \$1,000,000.00 in retail sales would be routed away from the normal retail outlet. The association will fight any distributor bypassing the retail outlet.

ETGOM Unite

Organization of independent service associations on a state-wide level became a reality with the signing of a charter at a meeting held at Howard Johnson's Restaurant in Cambridge, Mass.

The need for a state association was first proposed at a meeting of the delegates to the RTTG Federation. It was felt that all associations in the state of Massachusetts had many common problems and therefore a state organization should be formed. The name Electronic Technicians Guild of Massachusetts was finally selected after many discussions, and the basis for its selection was to keep pace with the fast expanding electronic industry. There is no doubt that within the next few years the independent technician will be called upon to expand his operations beyond the field of radio and TV.

Officers for the coming year are as follows: Nichols A. Averinos, Pres.; Gilbert P. Clark, V.P.; Lawrence J. McEvoy, Sec.; and Albert N. Giddis, Treas. Remo DiNicola was appointed to serve as Presidential Assistant.

The initial charter has been signed by delegates from six chapters which include Boston, Brockton, Lawrence, Lowell, North Shore, and South Shore. Other chapters throughout the state of Massachusetts will be invited to join.

H-P AUDIO OSCILLATOR

20 cycles to 20 kc range in a single dial sweep is a unique feature of the new Model 207A audio sweep oscillator. The instrument employs a new variation of the time tested r-c oscillator circuit and achieves its extreme frequency range without bandswitching and with greater stability. Accuracy is $\pm 4\%$ including warmup drift and aging of tubes and components. Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 9-71)

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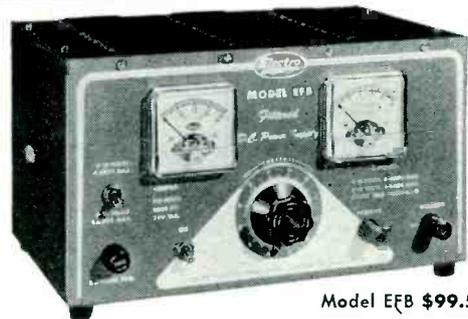
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Tough Dog

(Continued from page 42)

At first, I didn't believe my own eyes, so I replaced the old 6AX4, it was true, raster, no sound and no picture. Has anyone ever had this trouble before? Actually I am not sure how the damper tube could cause these symptoms. I would appreciate your opinion.—Lewis Cardy, Jr., Penna.

• It's getting to the point that when in doubt change the damper tube. There was a time when the 5U4 was the technicians' ace. Loss or depreciation of boost voltage would definitely reduce picture size. Any upset in the B+ supply would affect agc. Had the arcing in the 6AX4 occurred first, the low emission wouldn't have caused the high confusion.—Ed.

Shop Hints

(Continued from page 58)

should not be operated with a fixed pattern of high intensity for more than 15 minutes. In the event that a kinescope has a burn in a localized area it can normally be scanned off in a few hours. This may be done as follows. Tune in a strong b&w signal from a TV station and turn up the brightness and contrast controls. Adjust the vertical hold control until the picture rolls continuously.—George Gottesman, Los Angeles, Calif.

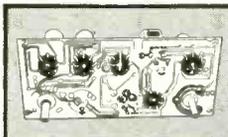
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High-fidelity authorities are not in agreement as to which is "best" among the handful of genuinely great power amplifier designs available today. But one thing they know for sure—at least 4 out of 5 of the contenders have 6CA7/EL34's in the output stage. No other comparable tube combines to the same degree the 6CA7's exceptional linearity, high power dissipation and low drive-voltage requirements. It is a true pentode design, with a separate suppressor grid that controls the space charge, resulting in greater linearity on reactive speaker loads than is possible with competitive beam-power tetrodes. A single pair of 6CA7's in push-pull has been successfully used in power amplifiers delivering up to 100 watts undistorted output.

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- EL84/6BQ5 9-pin power pentode; 17 W PP
- EF86/6Z67 Low-noise high- μ pentode
- ECC81/12AT7 Low-noise medium- μ dual triode
- ECC82/12AU7 low noise low- μ dual triode
- ECC83/12AX7 Low-noise high- μ dual triode
- GZ34 Cathode-type rectifier; 250 ma.
- EZ80/6V4 9-pin rectifier; cathode; 90 ma.
- EZ81/6CA4 9-pin rectifier; cathode; 150 ma.

At All Leading Electronic Parts Distributors

Amperex
ELECTRONIC CORP.

230 Duffy Ave., Hicksville, Long Island, N.Y.

Electronic Phono Drive

(Continued from page 47)

rpm by furnishing power at 30, 60, 81 or 141 cycles respectively. The desired frequency selected is by a single control switch. In effect, the motor now becomes a 4-speed device, and precision adjustments are provided for varying the turntable speed as much as $\pm 3\%$.

Because of this electronic drive, it is possible to do away with different size drive wheels, pulleys or gears to accomplish speed change-over, as is found in the conventional multi-speed turntable. Moving parts are reduced to a minimum. The electronic drive is capable of maintaining the selected output frequencies even though the input may vary from 50 to 60 cycles. As a result, it is possible to maintain accurate speed even with the use of auxiliary power supplies, battery powered inverters, and line voltage in most foreign countries.

Inasmuch as the frequency required to establish a turntable speed of $33 \frac{1}{3}$ rpm is 60 cycles, and the motor will work on 117 volts, the turntable can be used as a single-speed device, without the use of the electronic drive, and can be plugged directly into a proper a-c outlet. The unit is available with or without the electronic drive.

The 12BH7, VI, acts as the master oscillator whose frequency is determined by which set of capacitors and resistors is switched into the circuit. The 12AU7 is a push-pull amplifier and drives another 12BH7 which is hooked up as a cathode follower. The 25DQ6's also in push-pull furnish plenty of power to the motor.

Selenium rectifiers in a voltage-doubler hookup furnish B+. An autotransformer is used to supply filament voltage, and to boost the input voltage to the rectifiers.

Turntable performance more than meets NARTB specifications for rumble, flutter and wow and exceeds requirements for professional playback tables. •

Colman ANTENNA COILS

Several new antenna-matching coils for replacement in late model RCA TV sets are now in production. No. 1213 replaces coils with an X-shaped cross-section, and Nos. 1214 and 1230 replace 2 sizes of hollow-core coils. All are exact replacements. Colman Tool & Machine Co., Amarillo, Texas. (ELECTRONIC TECHNICIAN 9-27)

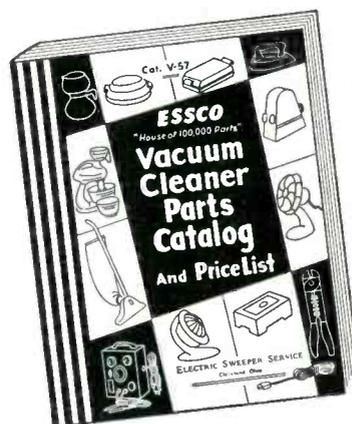
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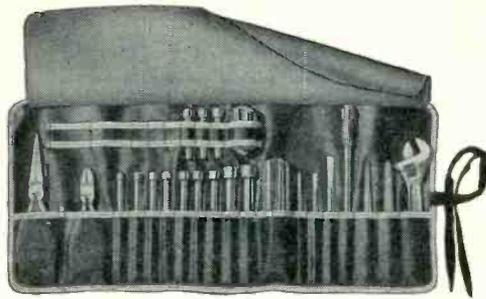
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Phono Cartridges

(Continued from page 53)

There is no permanent needle, it is conceded that even the diamond types will wear out. A periodic schedule should be followed to have the needle examined under a microscope. This could be based either on the number of hours or the number of records played. The actual time would of course depend upon the type of needle and conditions of use. Fig. 4 shows the difference between a good and worn out needle. A good needle can be recognized by how well its surface is polished, and by its symmetry. It should look like a half-ball point. A worn out needle, on the other hand, will have flat surfaces, the edges of which can cut into a record.

A record free from dirt and other foreign bodies is an important prerequisite. Here again a noisy record may cause an erroneous conclusion about defects in other parts of the equipment.

Hum, noise, and other stray pickup is a common complaint. Improperly grounded or shielded leads and components are the most likely suspects. The system should have a common ground. Variable reluctance and other types of magnetic pickups may be susceptible to stray magnetic fields especially those associated with the metal parts in the turntable. Increasing the distance between the table and pickup by installing a resilient pad on top of the table, will reduce this type of noise pickup, and also act as a shock absorber. Motor and other mechanical vibrations must be isolated from the tone arm assembly. The turntable assembly and motor should be properly shock mounted. A defect often found in the field is that the shock mounts are bolted down excessively and hence its action is choked off if not completely compromised.

What may seem to be noise pickup from the turntable may actually be coming from the amplifier. One method of isolating this type of difficulty is to substitute a dummy input for the cartridge. Usually a 1/2 megohm resistor is satisfactory. Merely detaching the phono input plug at the amplifier is not a proper test because the grid circuit of the first input tube would not be properly completed. Under those conditions, the amplifier would display a higher noise level.

A good test record may be used to determine the quality and re-

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404 PAGE

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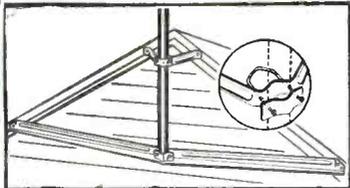
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sponse of the phono pickup provided that the rest of the system is in good working order, and capable of reproducing the desired signal.

Improvement & Modernization

There are many ways to improve and modernize record players. New techniques and materials can be used to render better sound and prolong the life of a record. More durable needles, particularly the diamond type, can be used. Recent price reductions should make the use of diamonds more popular. Where initial price is a consideration, or where there is comparatively little use, the sapphire needle is very desirable. A combination 1-mil diamond and 3-mil sapphire needle arrangement is used to a great extent on 3 or 4 speed record players where the bulk of the records played require the 1-mil needle. It is also true that a 3-mil needle is better able to withstand needle pressure than the 1-mil job because there is more surface to distribute the weight, hence there is a tendency towards less needle wear per record.

Some of the older types of multiple speed players use a single 2-mil needle, which is a compromise between the smaller and larger needles. Also some of the older pickups require very heavy needle pressure. A real service can be performed by installing a modern type cartridge equipped with dual needles. The tone arm could then be counterbalanced to reduce the needle pressure considerably.

New type phono pickups offer better frequency response and higher outputs. Some types of ceramic cartridges do not require an equalizer or preamplifier which helps to keep the conversion costs down. Other types require an equalizer to compensate for the various recording curves. Where pickup output is small, a preamplifier may be necessary. The resulting improvement in sound quality may stimulate requests for additional speakers and other improvements.

Some of the older crystal pickups employed an equalizer circuit similar to the one shown in Fig. 5. The highs are apparently accentuated by passing less of the mid and low frequencies. When using the newer types of cartridges which are capable of better high-frequency response, this network should be eliminated.

In some amplifiers where the pickup is fed into a volume control instead of directly to the grid of the input tube, especially where the control has a high resistance (1 megohm

(Continued on page 86)

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(Continued from page 85)

or more), it may be desirable to install about a 20 μ f capacitor between the top and center arm of the control as shown in Fig. 6.

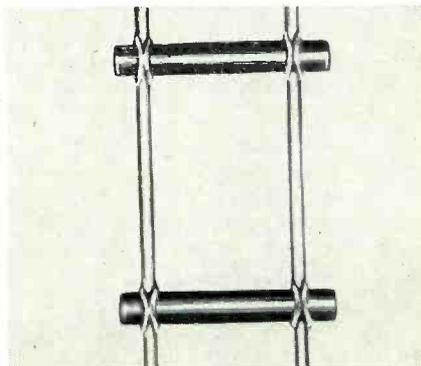
High frequency losses caused by the network consisting of the input capacitance of the tube, other stray capacitance in the wiring, and the voltage divider action of the volume control, especially at lower volume settings are thus compensated for. Compensated volume controls having one or more taps are available which enable the technician to provide a better compensation curve over a wider range of volume control settings. See Fig. 7.

When the output of the new crystal or ceramic pickup tends to overload the amplifier input, most manufacturers recommend the use of a small capacitor across the cartridge. A resistor-divider network could be used for this purpose, but more loss of highs would take place because of the action just described in volume control compensation.

Magnetic, dynamic and other low-output pickups may utilize a preamplifier and equalizer circuit similar to the one shown in Fig. 8. Output on most of these pickups are purposely kept low to improve other characteristics which effect quality reproduction. In addition to compensation and amplification requirements, improved response will be obtained if impedance match is maintained. •

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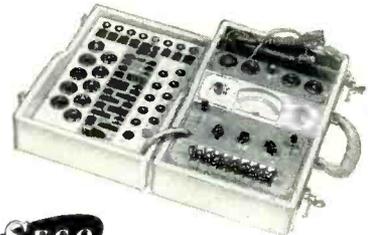
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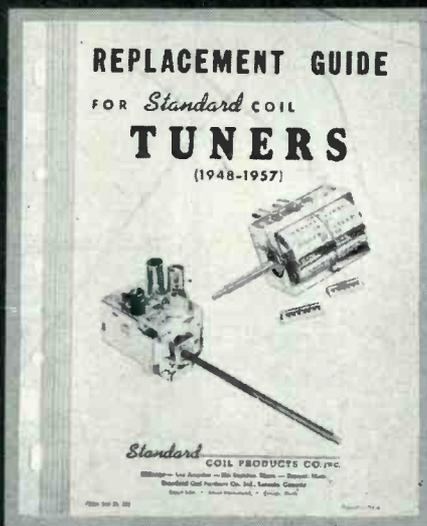
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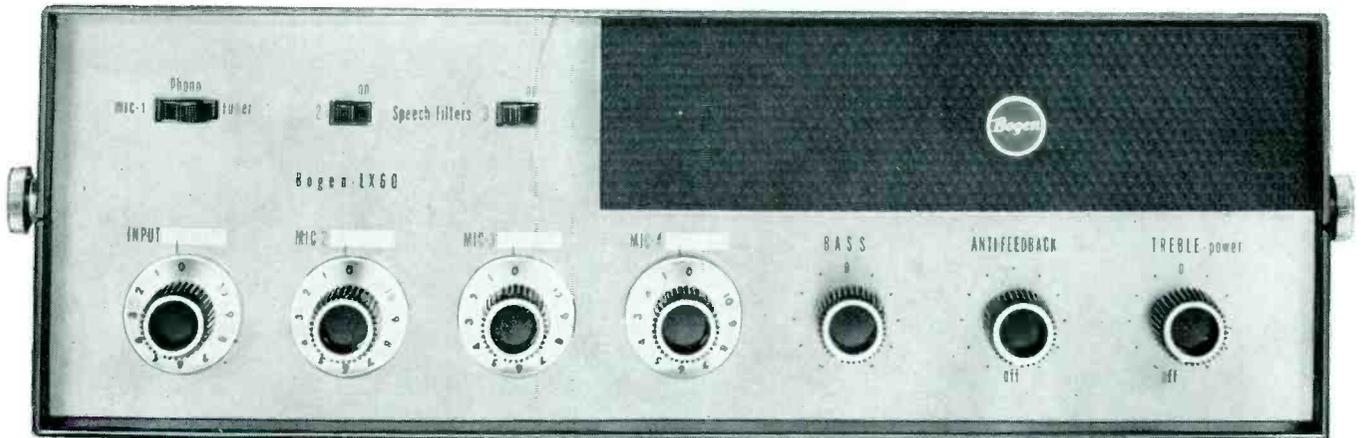
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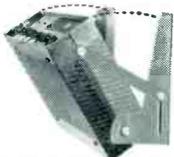
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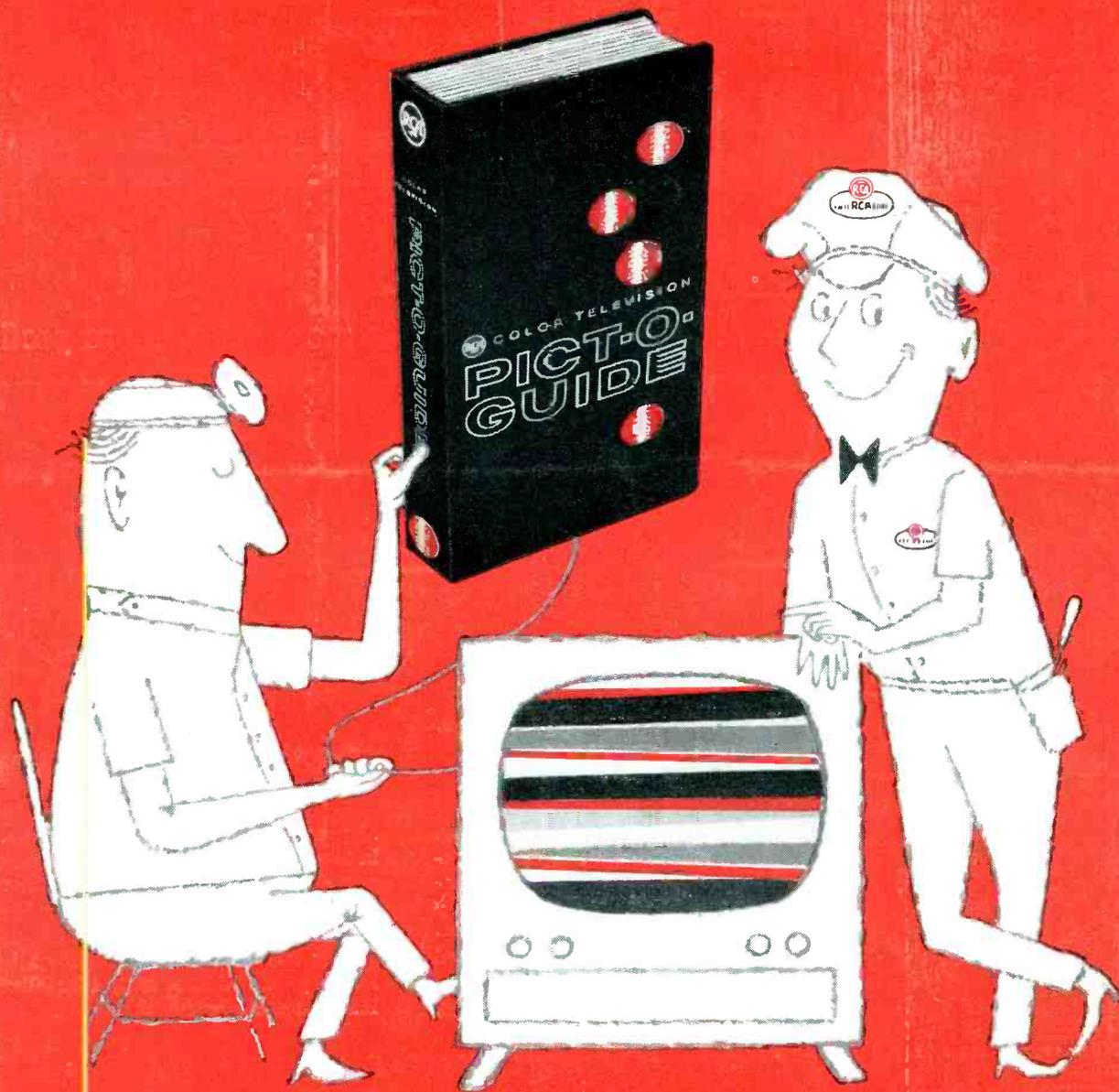
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