TECHNICIAN

& Circuit Digests

March 19
Caldwell-Clem

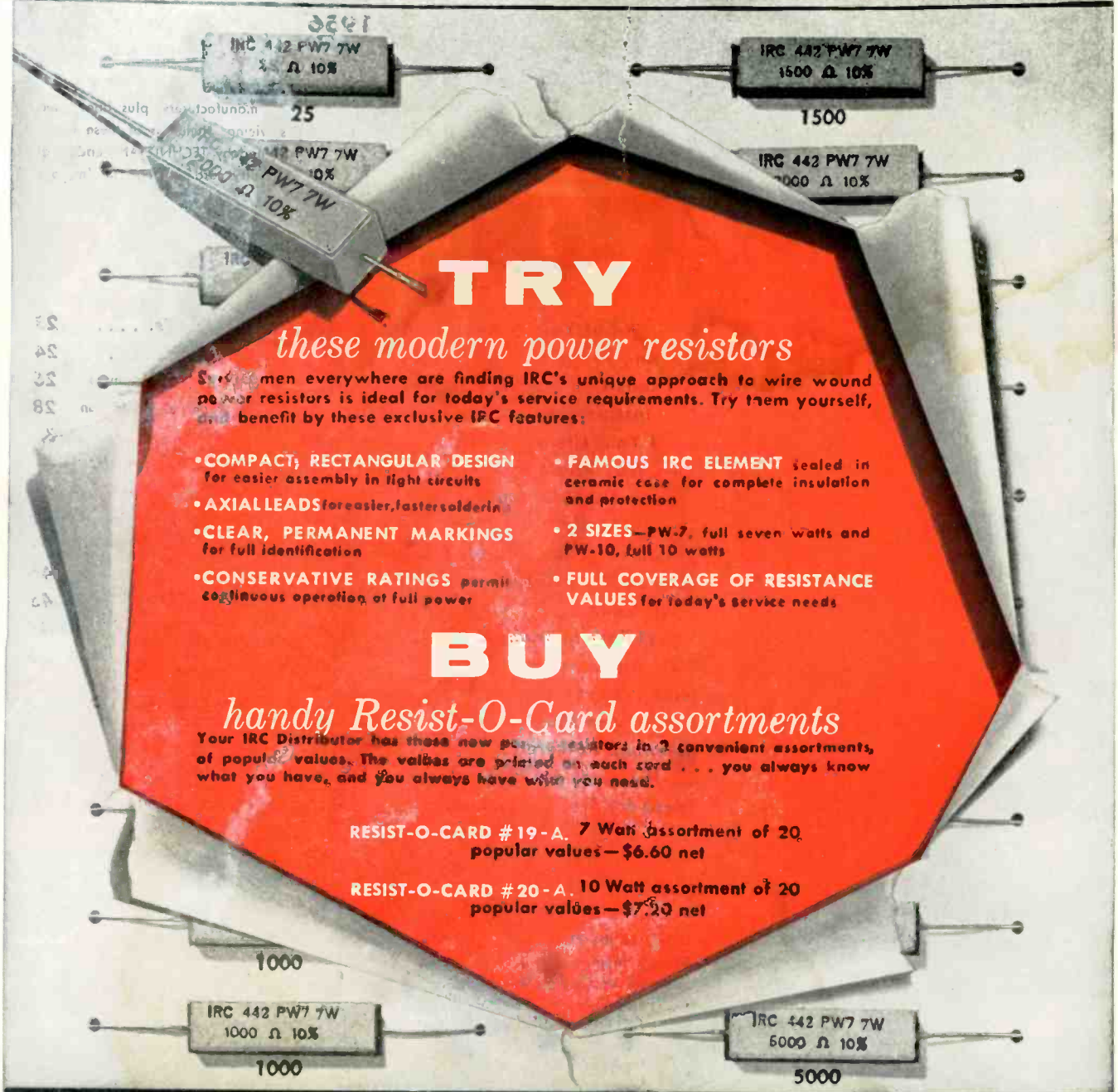
20 7 WATT RESISTORS

SELECTED POPULAR VALUES

RESIST-O-CARD

NEW TYPE PW-7 WIRE WOUND POWER RESISTORS • FULL 7 WATT RATING

$6.60 NET



TRY

these modern power resistors

Specifiers everywhere are finding IRC's unique approach to wire wound power resistors is ideal for today's service requirements. Try them yourself, and benefit by these exclusive IRC features:

- **COMPACT, RECTANGULAR DESIGN** for easier assembly in tight circuits
- **AXIAL LEADS** for easier, faster soldering
- **CLEAR, PERMANENT MARKINGS** for full identification
- **CONSERVATIVE RATINGS** permit continuous operation at full power
- **FAMOUS IRC ELEMENT** sealed in ceramic case for complete insulation and protection
- **2 SIZES**—PW-7, full seven watts and PW-10, full 10 watts
- **FULL COVERAGE OF RESISTANCE VALUES** for today's service needs

BUY

handy Resist-O-Card assortments

Your IRC Distributor has these new power resistors in 2 convenient assortments, of popular values. The values are printed on each card . . . you always know what you have, and you always have what you need.

RESIST-O-CARD #19-A. 7 Watt assortment of 20 popular values—$6.60 net

RESIST-O-CARD #20-A. 10 Watt assortment of 20 popular values—$7.20 net

INTERNATIONAL RESISTANCE CO.

Philadelphia, Penna.

FOR 10 WATT POWER RESISTOR REQUIREMENTS SPECIFY IRC ASSORTMENT #20-A.
ASSORTMENT #20-A INCLUDES 20 PW-10 RESISTORS IN SELECTED VALUES—$7.20 NET.

TECHNICIAN
& Circuit Digests

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MARCH, 19[illegible]

FRONT COVER Servicing aids and references printed by [illegible], books and correspondence courses, contain valuable data to speed servici[illegible]red. [illegible] these literature items are described on pages 30-39, and may be obtained [illegible] TECHNICIAN readers at little or no charge simply by filling out the postage-free inquiry [illegible] on page 33. Improve your efficiency—build your literature file now!

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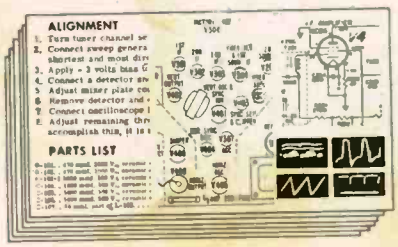

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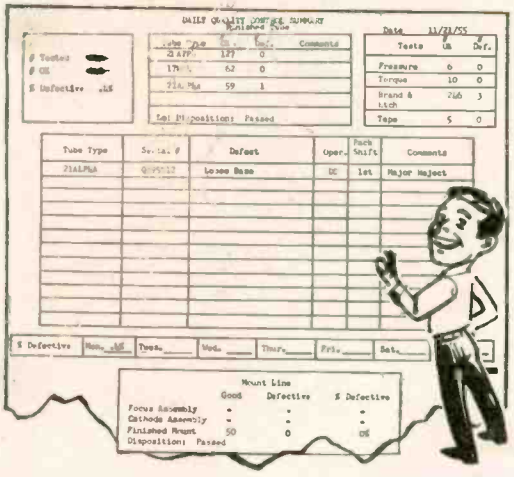
ONLY RAYTHEON PICTURE TUBES.

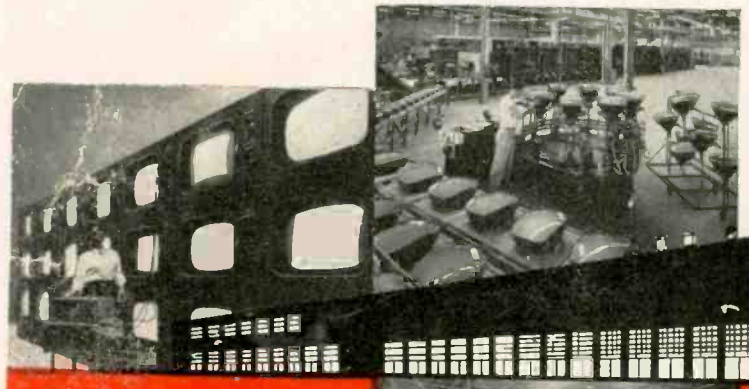
CORONA INHIBITOR

This Raytheon development insures brightness rain or shine. Ordinary tubes lose up to 10% of their brightness on humid, damp days. Not so, Raytheon Picture Tubes. Tests prove *no loss of brightness* even under a water spray on the high voltage contact — thanks to *Corona Inhibitor*.

CROSS-CHECK CONTROL



Raytheon Picture Tubes are *right* when you get them, thanks to RAYTHEON'S CROSS-CHECK QUALITY CONTROL. This comprehensive Raytheon quality control method includes daily tests made on tubes for pressure, base torque and outside coating adhesion. Engineering controls check screen color and brightness and tube life under both ideal and extremely adverse conditions. And, most important of all, a substantial percentage of every day's production is actually *unpacked and retested for physical appearance and electrical characteristics* before quality control headquarters will permit release of a single tube for shipment.



The largest exhaust machine in the world — shown in the background — holds 120 24 inch tubes in its oven at one time. Each tube travels 280 feet inside the oven.

Giant life test racks constantly check and guard the quality and life performance of Raytheon Picture Tubes.

Raytheon Picture Tubes are carefully baked out, here, in the largest oven of its kind ever made.

Raytheon Picture Tubes have the distinct advantage of precision production in one of the world's most modern plants. The Raytheon Cathode Ray Tube Plant in Quincy, Mass. houses some of the world's largest equipment and was designed and built solely for the manufacture of today's large screen Raytheon Picture Tubes.

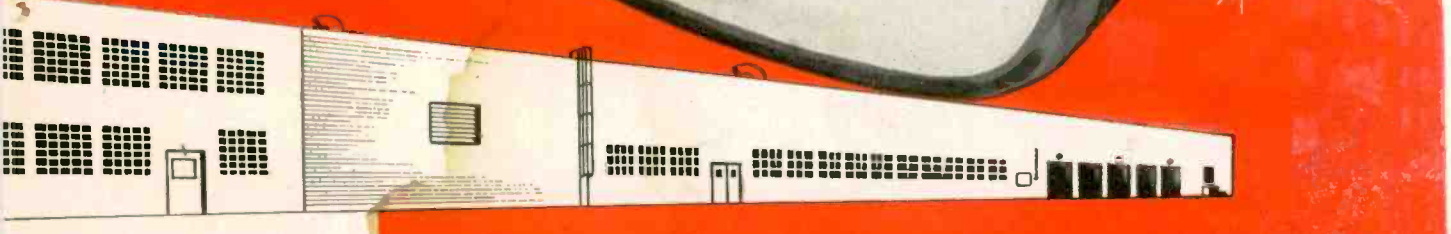
Circle number on free inquiry card, p. 33, for more product data.

. give you these major advantages

ALUMINIZED with *Lumilac*

LUMILAC — a lacquer especially blended and used exclusively by Raytheon — is the secret of the superiority of Raytheon Aluminized Picture Tubes. This amazing lacquer produces an extra smooth, unbroken surface for the pure aluminum coating, yet leaves no gas-producing residues which could impair cathode emission and shorten tube life.

The result — all the benefits of aluminized tubes, sharper picture, superior contrast, high light output — *plus excellent tube life.*



RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

Newton, Mass. • Chicago • Atlanta, Ga. • Los Angeles, Calif.

Raytheon makes all these — Receiving and Picture Tubes, Reliable Subminiature and Miniature Tubes, Semiconductor Diodes, Power Rectifiers and Transistors, Nucleonic Tubes, Microwave Tubes

RAYTHEON®

Excellence in Electronics

LETTERS
To the Editor

Overpriced Testers?

Editor, TECHNICIAN:

In entering your Test Equipment Contest, technician John Holland and I stated "no value" for CRT and flyback testers. Here's why. CRT testers on the market today are way overpriced. A filament transformer, double-pole 4-position switch, NE 51 indicator, socket, leads and a few resistors are all one needs. As to the flyback checker, if the shop is going to spend $50, it would be better to spend it on a good audio generator with range to 200 kc. With such an instrument and a scope or ac vtvm, any flyback can be checked. Most of them are designed to resonate between 50 and 75 kc (with yoke connected, width coil disconnected; flyback alone is 25 to 50 kc). If the resonant frequency is higher, as seen on the scope, then the flyback has shorted turns. An ohmmeter will check for opens.

H. M. LAYDEN
Chief Technician

Judd-Bennett Co.
New York, N. Y.

• *As we noted in our Feb. 1956 issue, p. 22, many technician contest entrants don't agree. CRT and flyback testers had high importance ratings. It's not a question of right or wrong. Rather it depends on personal preference, ingenuity and shop techniques.—Ed.*

Part Time Support

Editor, TECHNICIAN:

Let's see a bit of credit for the small or part time operator who is trying to do an honest job. Many times it is he who spends many hours to repair equipment which the big shops won't touch. We need the little beginner, the night crawler and the independent dealer. Without them we will have no replacements for men now working, and an insufficient number in case of emergency.

PAUL N. SMITH

Urbana, Ill.

Pricing Repair Jobs

Editor, TECHNICIAN:

Our TV department would like to have a list of prices for various repair jobs. For example, replacing picture tubes, checking tubes in set, etc. Can you help?

WILLARD J. GRABER

Hutchinson, Kansas

• *Coming up! We're just completing an industry-wide survey on prices techs charge for various jobs. Report will be published in TECHNICIAN as soon as our statistical department finishes its work.—Ed.*

(Continued on page 20)

Thompson Products

Automatic ELECTRONIC Superotor®

For accuracy, dependability, and ease of control, the new Electronic *Automatic* Superotor is years ahead of any other antenna rotator on the market. Electronic VP* Tuning, completely silent operation, and smooth, even rotation combine to bring you instantly, automatically, the finest TV picture you've ever enjoyed.

* *Vernier Precision*

INTERCHANGEABLE ROTATORS

Famous Superotor models "100" and "500" have both been designed for automatic operation.

OTHER THOMPSON PRODUCTS ELECTRONIC AFFILIATES

• *Bell Sound Systems* • *Dage Television* • *Ramo-Wooldridge Corp.* • *Pacific Semi-Conductors, Inc.*

ELECTRONICS DIVISION

Thompson Products, Inc.

2196 CLARKWOOD ROAD • CLEVELAND 3, OHIO

Available in Canada thru Atlas Radio Corp., Ltd., 50 Wingold Ave., Toronto

Dealers by the thousands are making the SWITCH to this great insulator idea!

when we say SWITCH we mean business!

New indoor antenna has gliding SWITCH

Only CHANNEL MASTER® STANDOUT insulators have this revolutionary 2 in 1 design

It's a wood-screw insulator
. . . it's a machine-screw insulator
. . . and it's ***BETTER*** *in both applications!*

STANDOUT insulators and buckles are already outselling all others — *after only a few months on the market!* This remarkable record provides positive proof of the solid acceptance STANDOUTs have won among dealers all over the country.

Why has the response to STANDOUTs been so enthusiastic? BECAUSE they cut space and dollar investments in accessories by more than 65% . . . BECAUSE they increase space and dollar turnover by more than 200% . . . BECAUSE they are easier to install, stronger, more durable.

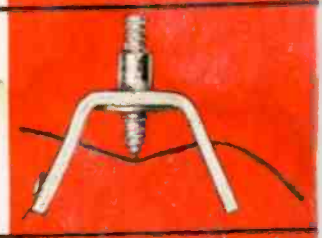
Millions already sold! Here's why:

"T-Nut" buckle with 8 threads.

More threads than any other buckle (nut type or extruded) — 8 full machined threads! Tighten as hard as you want, you can't strip it!

Pointed Screw makes positive contact.

Strap won't slip while you're tightening. Won't twist or slip on mast after installation. Straps have convenient "taper-tip."



Needle-sharp point

Finer thread, sharper point means easier starting — even in hardwood. Minimizes possibility of splitting.

All popular types and sizes available, including full assortment of specialized hardware. See your Channel Master distributor

CHANNEL MASTER'S new Glide-o-Matic INDOOR TV ANTENNA

The Glide-o-Matic's sensational low-loss ***gliding switch*** is different from all others! Provides highest electrical efficiency . . . AND — it's the most convenient to operate!

Glide-o-Matic also gives you:

- Maximum performance on *all* channels — VHF and UHF.
- Weighted tip-proof base — with "can't scratch" felt covering.
- Ready for COLOR TV.
- Powerful retail merchandising support.

Available in 4 popular color harmonies:

Mahogany	with brass	model no. 3700
Ebony	with brass	model no. 3701
Ivory	with brass	model no. 3702
Ebony	with aluminum	model no. 3703

A performance hit with men . . . A style hit with women!

Glide-o-Matic practically sells itself. Smartly styled . . . blends into any setting. Packed in colorful "tell and sell" carton with convenient "carry away" handle.

$9.95 list

Also available:

CHANNEL MASTER'S ALL-VU — model no. 381, all-VHF, all UHF. — $8.95 list

CHANNEL MASTER'S PRE-VU — model no. 380 all-channel VHF. — $7.95 list

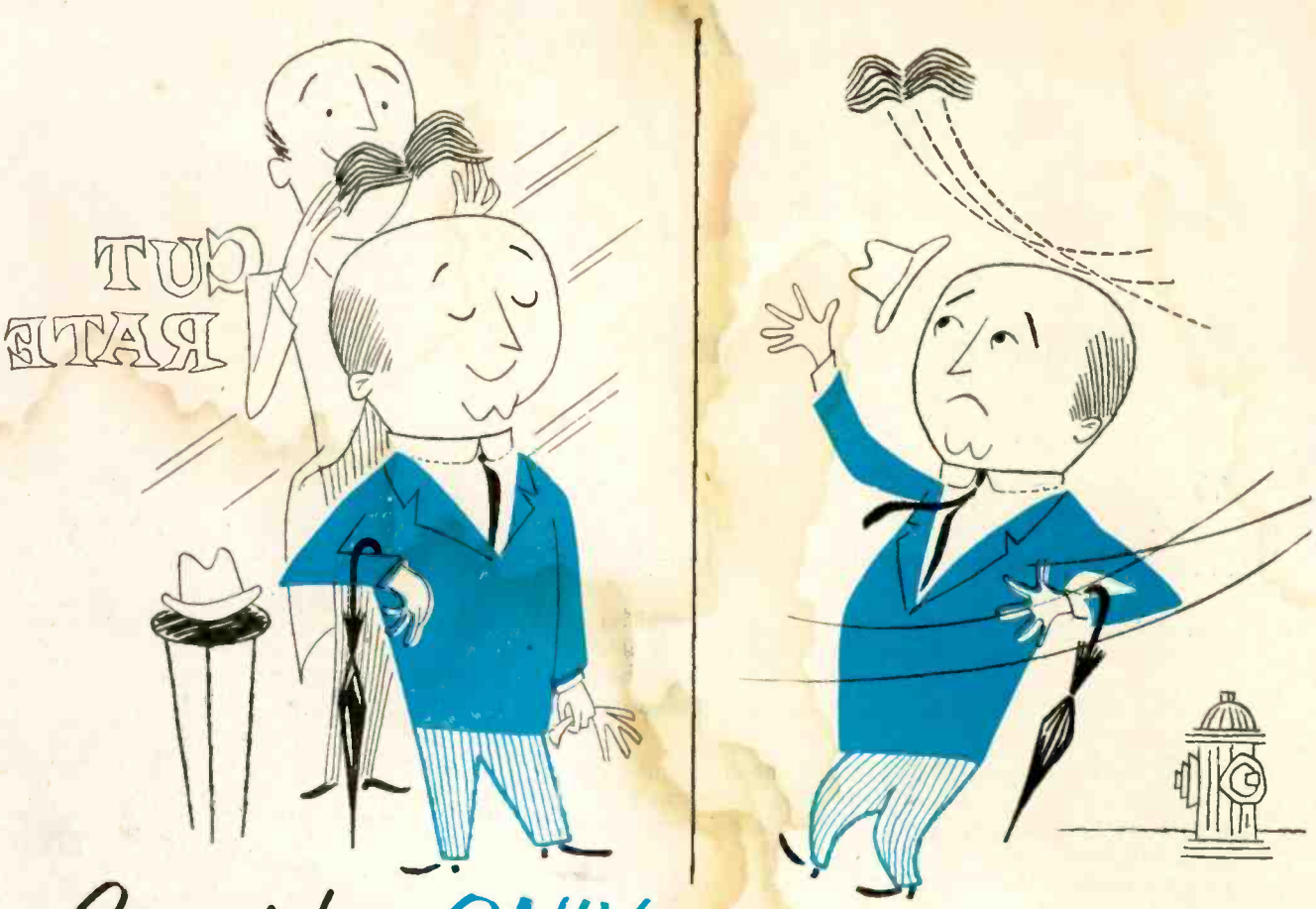
FIRST IN PREASSEMBLED ANTENNAS

Trade Mark Reg. U.S. Pat. Off.

CHANNEL MASTER CORP.

ELLENVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES



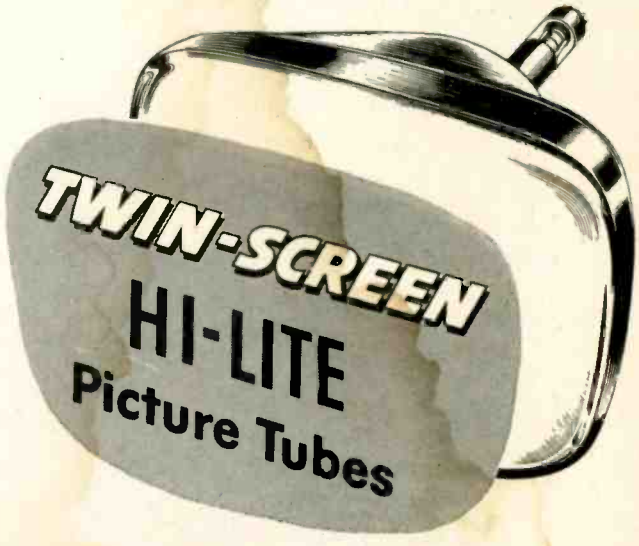
Consider ONLY a

PERFECT REPLACEMENT

when original quality disappears

When the *original* goes, the substitute should be a *Perfect Replacement*. Ordinarily there is only one perfect replacement—something that looks and works as good as the original when new—*or better*. When the original picture tube goes, the *perfect* replacement is a Du Mont Twin-Screen Hi-Lite° The set will sparkle with new picture life . . . you'll have "new set" quality—*or better*. A Du Mont Twin-Screen Hi-Lite picture tube *replaces* age with "like new" performance.

°*the ultimate in aluminized picture tubes.*



DU MONT®

CATHODE-RAY TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., CLIFTON, N. J.

 Circle numbers on free inquiry card, p. 33, for more product data.

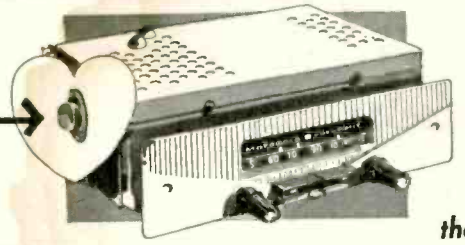
New Motorola®

Transistor POWERED

Car Radio

Tiny transistor replaces 15 vital car radio parts

WITH A "GOLDEN HEART THAT WON'T WEAR OUT"



Motorola Transistor-Powered Car Radio. (Model 6TAS-8, 12 volt) $99.95. Other new models from $39.95.

Most trouble-free car radio ever built—The amazing transistor heart won't ever wear out. And it replaces 15 parts that do wear out in conventional sets. (Including the vibrator and vacuum tubes.)

Cuts battery drain 50%—Transistors use hardly any power. Even with the engine off, this radio can play for hours without running down the battery.

Fits most cars—Custom fits instrument panels of most cars. Takes just a few minutes to put in. (Or, Motorola's Installation Depot can do it for you, in most cities).

MOTOROLA
World's Largest Exclusive Electronics Manufacturer

Now's the time to get into the plus-profit car radio business

Every fourth car lacks a radio. Car radio sales are up 30% . . . and still rising. And now, here's the hottest car radio ever developed. Backed by advertising in Reader's Digest (reaching every third person in America). Get the extra profit waiting for you in the car radio business. Send us this coupon now. No obligation.

Motorola, Inc., Dept. T-3
4545 W. Augusta Blvd.
Chicago 51, Illinois
Attn: Car Radio Department
Please give me all facts about the Motorola Car Radio business. Thank you.

Name_____

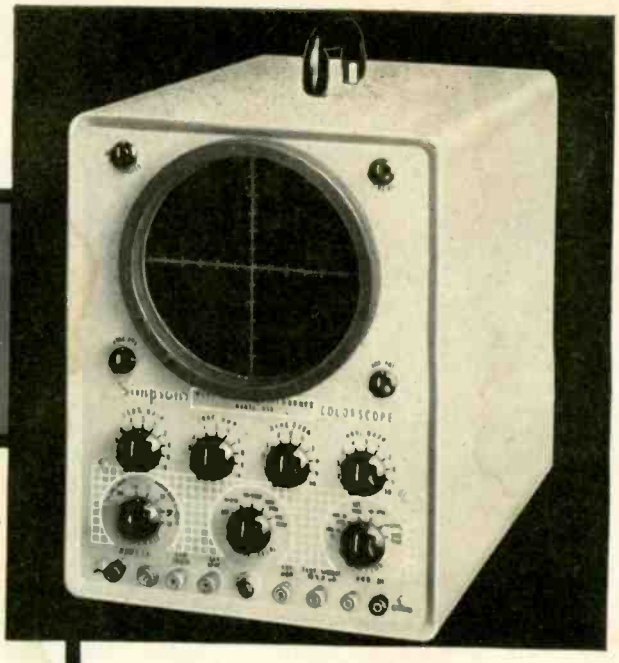
Firm_____

Street_____ City_____ State_____

Circle numbers on free inquiry card, p. 33, for more product data. 9

new!

Simpson 7" COLORSCOPE



MODEL 458

$229.95 complete with shielded input cable and manual

100% response at 3.58 mc colorburst!

DUAL BANDWIDTH—NARROW OR WIDE

Compare the new Simpson Colorscope Model 458 with any oscilloscope on the market. It is an advanced, seven-inch, high-gain, wide-band scope especially designed for color-TV service. (Ideal for black and white, too.) A big feature of the Model 458 is its *flat* frequency response—within 1 db to 4.5 mc! With its accessory probes, Model 458 can do more color-TV testing *jobs* than any scope in its price range.

ADDITIONAL FEATURES

- Dual bandwidth provides extra testing versatility.
- Properly compensated wide band vertical amplifier stages.
- High sensitivity and very good transient response.
- Compensated step attenuator.
- Vernier vertical attenuator for *continuous control* of the signal voltage.
- CRT balanced deflection.
- Excellent square wave response.
- Very small loading of circuit being checked.
- "Tilt" and "Overshoot" carefully checked and minimized.
- Very stable sweep and synchronizing circuits.

ACCESSORY PROBES

Voltage Doubler, No. 740 . . $10.95

Low Capacitance (input impedance of 10 megohms shunted by only 14 mmf), No. 741 . . $9.95

100:1 Voltage Divider, No. 742 . . . . . $9.95

Direct-Resistive Dual Purpose, No. 743 . . . . . $9.95

See Your Electronics Parts Distributor, or write

SIMPSON ELECTRIC COMPANY
WORLD'S LARGEST MANUFACTURER OF ELECTRONIC TEST EQUIPMENT
5200 W. Kinzie St., Chicago 44, Illinois
Phone: EStebrook 9-1121
In Canada: Bach-Simpson Ltd., London, Ontario

SPECIFICATIONS

VERTICAL AMPLIFIER FREQUENCY RESPONSE—Wide band position: *Flat* within ± 1 db from 20 c/sec to 4.5 mc/sec; *flat* within ± 2 db from 10 c/sec to 5.0 mc/sec.

Narrow band position: *Flat* within ± 1 db from 20 c/sec to 200 kc/sec; *flat* within ± 2 db from 10 c/sec to 300 kc/sec.

RISE TIME—Less than 0.05 microsecond (wide band position).

VERTICAL DEFLECTION SENSITIVITY—Wide band: 40 mv R.M.S./inch minimum. Narrow band: 15 mv R.M.S./inch minimum.

HORIZONTAL AMPLIFIER FREQUENCY RESPONSE—*Flat* within ± 1 db from 20 cycles/sec to 200 kc/sec.

HORIZONTAL DEFLECTION SENSITIVITY—Horizontal input "Hi", 115 millivolts R.M.S./inch minimum. Horizontal input "Low", 1.4 volts R.M.S./inch minimum.

VERTICAL INPUT IMPEDANCE—3.3 Megohms shunted by 20 mmf.

HORIZONTAL INPUT IMPEDANCE 1.1 Meg.

LINEAR SWEEP OSCILLATOR—Saw tooth wave from 14 cycles/sec to 250 kc/sec. Sixty-cycle sine wave also provided.

INPUT CALIBRATION—18 Volt P-P test voltage available on panel.

INTENSITY MODULATION—Provision for internal, external and 60 cycles.

"This portion of the Garry Moore Show is brought to you *in behalf of radio and television service-dealers* who use and recommend CBS Tubes.

"That's the way you're introduced. Later, I focus right on you — like this: '. . . television sets require trained service-dealers to keep them in good condition. And believe me, a qualified service-dealer *is* a *trained* technician. He has spent a lot of time and effort studying electronics, and a substantial amount of money for technical equipment.'

Garry Moore sells your service while he sells CBS Tubes*

"See how CBS-HYTRON works side by side with you. The easy way for you to cash in is to use and recommend CBS Tubes. Because I keep reminding my listeners there are no better tubes made than CBS Tubes — and they have the Good Housekeeping Guaranty Seal."

Garry Moore
famous CBS Television Star

You'll build profitable customer confidence and sales when you recommend CBS Tubes . . . the tubes with the Good Housekeeping Guaranty Seal.

*On the CBS Television Network.

CBS-HYTRON, Danvers, Massachusetts . . . A DIVISION OF COLUMBIA BROADCASTING SYSTEM, INC.

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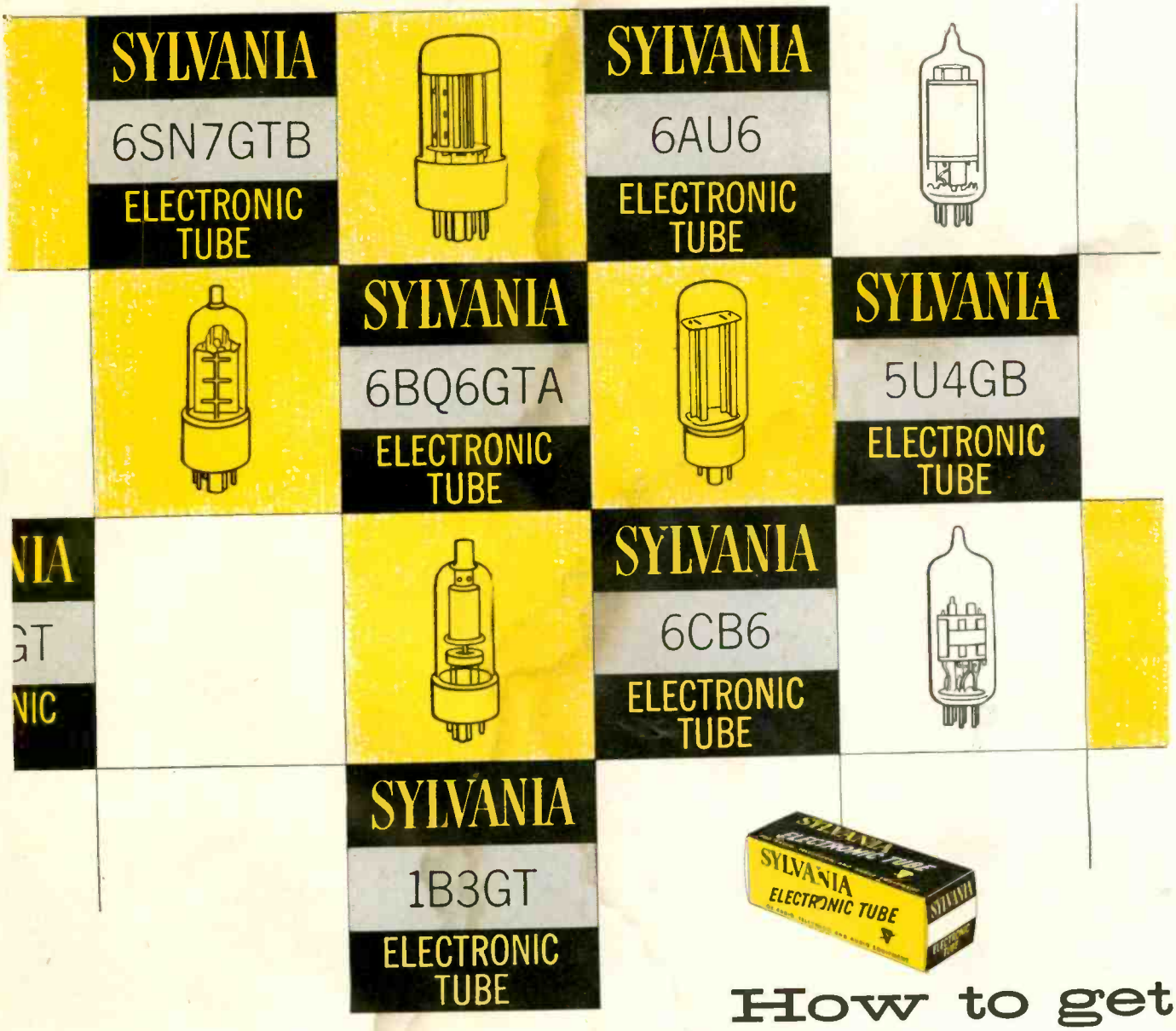

How to get the jump on call-backs in 6 easy moves

Here are six tube types called for most in your daily service work. Eliminate the call-backs from these types and your biggest share of headaches is over. It's easy to do just that, too, simply by getting into the habit of using only Sylvania tubes . . . in the familiar yellow and black carton.

These 6 types alone incorporate over 14 design and production improvements to eliminate the most common causes for "quick failures" and costly call-backs. It's no wonder more and more servicemen consider the yellow and black carton their "calling card of top quality service."

SYLVANIA®

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

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

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THIS IS THE GUN YOU ASKED FOR

BUILT TO SERVICE MAN'S SPECIFICATIONS

Designed TO INCLUDE ALL THE BIG FEATURES EVERYBODY WANTS

— ***LONGER REACH TIPS***

— ***LONGER LIFE TIPS***

— ***MORE RIGID TIPS***

— ***LIGHTER WEIGHT*** —25% less than comparable products

— ***SHATTER PROOF CASE***

Your No. 1 Gun—*ideal* for the kind of work you do—and it SHOULD be, because it was designed and built specifically to meet the service man's requirements. Develops AMPLE heat—*fast!* Cools quickly too. Is so light, so beautifully balanced, the work goes easier. And the long, narrow, rigid tips reach right into those tight "inaccessible" places. Automatically spotlights its work. Fully guaranteed.

WEN
NEW HEAVY DUTY
MODEL
288

DEVELOPS OVER 200 WATTS HEAT IN *5 seconds*

"Quick-Hot"
ELECTRONIC SOLDERING GUN

JUST
$9.95
LIST

AT BETTER JOBBERS EVERYWHERE

WEN PRODUCTS, INC.
5808 NORTHWEST HIGHWAY • CHICAGO 31, ILL.
Export sales, Scheel International, Inc., Chicago

Introducing the new champion . . .

RCA BATTERIES FOR TRANSISTORIZED RADIOS

Yes, the transistorized radio receiver is here to stay, and that means extra "transistor" battery business for you. Folks like the new transistorized receivers because of their compact size, perfect portability and economical use of battery power. They'll be taking these receivers everywhere. Be ready to fill "transistor" battery needs. Only a few battery types to stock to fill virtually all of your requirements; very little display space needed. In addition, RCA has a comprehensive line of batteries for all your portable needs. And remember, the famous RCA name on a battery means a battery practically pre-sold.

RADIO BATTERIES
RADIO CORPORATION OF AMERICA

Circle numbers on free inquiry card, p. 33, for more product data. 15

Editor's Memo

Uncle Sam's Federal Trade Commission has taken a swing against TV repair come-ons, listing them among the top 10 worst buys, reports United Press. FTC advice to consumers is to be wary of something-for-nothing offers, and deal with reputable firms whose claims can be trusted.

The other nine gyps are among:
Cure-all medicine.
Earn-big-money-at-home deals.
Hair restorers.
Correspondence schools that promise government jobs.
Lotions that positively prevent sunburn.
Grass seed for lawns that need no mowing.
Reconditioned articles advertised as lures.
Phony furs.
Do-it-yourself eyeglass kits.

Generally speaking, the public has confidence in the TV tech. This was proved in Elmo Roper's survey last year (see April 1955 TECHNICIAN, p. 61). But there are always a few who will soak the sucker for whatever the traffic will bear. A little story illustrating this point was brought to mind by the do-it-yourself eyeglass kit cited by the FTC.

An optician was teaching his son the eyeglass business. "But how do you know how much to charge?" asked the son.

"That's easy," replied the shrewd father. "When the customer asks you how much the bill is, tell him $10. If he doesn't start to argue, immediately add 'for the frames.' Then say to him, 'the glasses will be an extra $10.' Now you've got to act fast. Watch the customer closely. If he doesn't flinch at the price, quickly add on the word 'each.'"

Without excusing the sucker bait operator—I think he should be run out of business—people too often overlook the fact that a great many customers who are cheated have themselves to blame. It's an axiom of the confidence game that the victim or "mark" must have a touch of larceny in him for the swindle to operate. By thinking he can get something for nothing, or trying to put one over on the legitimate shop by patronizing an establishment that charges low, low prices, Mr. Consumer often lays himself wide open for padded bills.

The wisdom of a fair price for decent quality may be summed up in a statement attributed to British author and reformer, John Ruskin: "There is hardly anything in the world that someone cannot make a little worse and sell a little cheaper—and the people who consider price alone are this man's lawful prey."

Al Forman

NEW from Westinghouse...

the **6BS8**

Here is the latest example of Westinghouse leadership in TV receiving tube design . . . the new 6BS8 Reliatron® Tube, a very high Gm twin triode amplifier.

IMPROVED PERFORMANCE

With higher gain, lower noise, the new 6BS8 gives particularly superior performance in fringe areas, and also gives consistently better performance in tuner sockets in areas where stronger signals prevail.

REDUCED INVENTORY

The new 6BS8 greatly simplifies stocking problems. Now, you no longer have to carry both the 6BQ7-A and the 6BZ7 . . . the new Westinghouse 6BS8 is 100% interchangeable with both tubes. The 4BS8 is available for use in series-string circuits.

Be sure and ask your distributor for the new Westinghouse 6BS8 immediately. Due to tremendous demand, order now to insure your supply.

6ET-4107

YOU CAN BE SURE...IF IT'S Westinghouse RELIATRON® TUBES

WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, N. Y.

Versatile Magnetic Shield

A new low-cost sheet-rolled shielding material, flexible enough to permit shaping and forming depending on its application, can solve many problems involving the unwanted pickup of hum and other stray fields.

In its various forms, the material can provide protection against ac or dc high-intensity or low-intensity magnetic, electromagnetic or electrostatic phenomena. In one form, high-saturation Netic, it provides high level attenuation. Another version, Co-Netic, is a high permeability form for low-level attenuation only. Other versions, including Fernetic and Netic Co-Netic, provide combinations of characteristics of attenuation.

This choice of materials will be a boon to many who encounter hum and other stray pickup problems in a wide variety of equipment, including power supplies and other devices where transformers or coils are used, oscilloscopes and other devices using cathode-ray-tubes, and many Hi-Fi devices, including low-level input stages, recorders and turntables.

Sheets of these magnetic shielding materials are available for as little as 32 cents per sq. ft. Shields formed to accommodate a wide varietv of crt types are available for as little as $7.80 in single quantities, with reduced prices for quantity purchases. Shielded transformer cases are available for prices ranging as low as 65 cents each.

The material is manufactured and marketed bv Magnetic Shield Div., Perfection Mica Co., 1322 North Elston Ave., Chicago, Ill.

"Personal" 2-Way Radio

GE has come to the aid of ear-weary 2-way radio users by removing the chatter of radio calls intended for others.

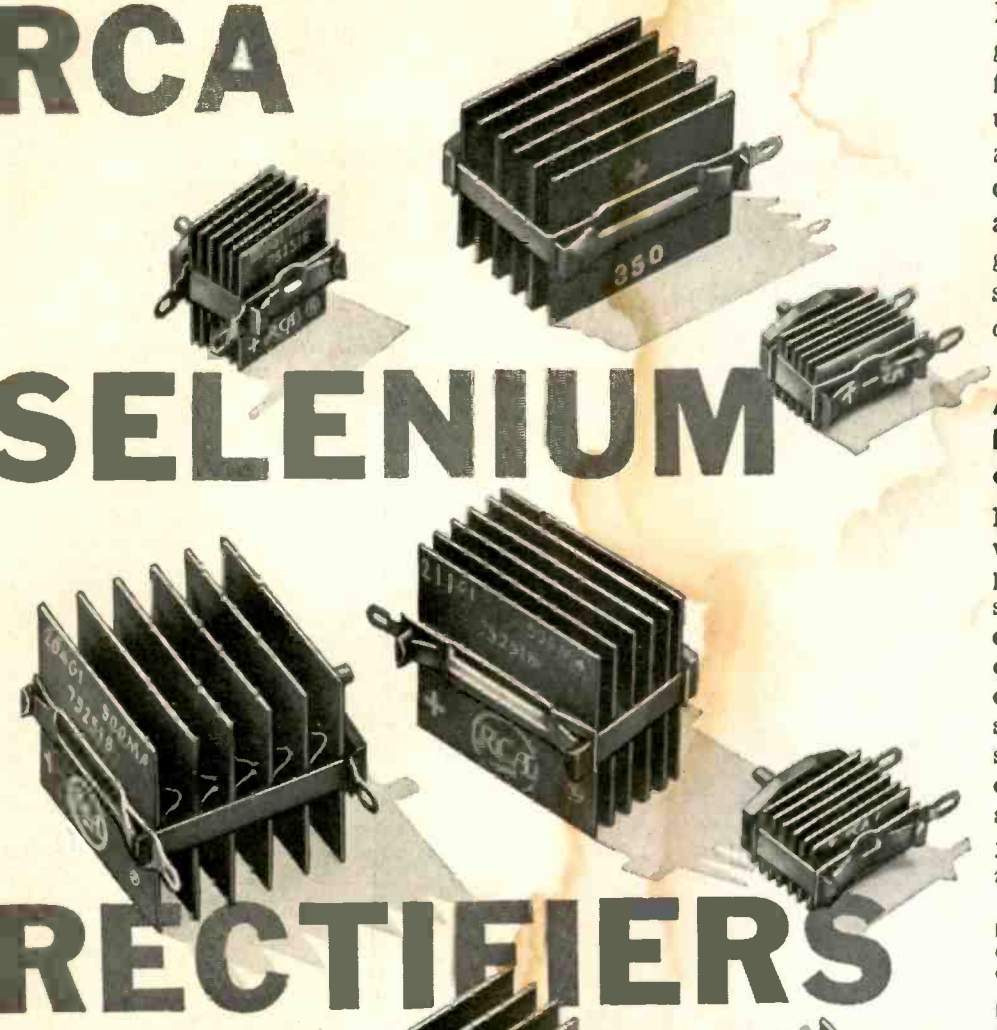
GE engineers have incorporated simple electronic tone-selecting equipment in standard 2-way radios. The tones turn the mobile receivers on individually, thus allowing a dispatcher to communicate with any radio-equipped car or truck without bothering the other vehicles in the network.

Use of the inexpensive "Personal Channel" system allows the same radio range as with standard 2-way systems. Complicated circuits were avoided by the use of tones in the normal voice range of an FM radio system. Thus, degradation transmitter signal strength is no problem.

Complete tone dispatching equipment for the base station is housed in a small desk-top cabinet.

Circle numbers on free inquiry card, p. 33, for more product data.

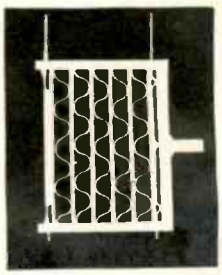
RCA SELENIUM RECTIFIERS



-one comprehensive line for virtually all replacement requirements!

Now, RCA offers you a top-grade line of selenium rectifiers for general replacement use in TV, radio receivers, and phonographs. Advanced design, select raw materials, and superior workmanship give you a *dependable line* of selenium rectifiers *for virtually all* service jobs.

Advanced Design for Dependable Performance and Long Life



Note the wide-open plate spacing for elimination of solid center "hot spot." Design utilizes corrugated spacers for *excellent heat dissipation and rigid construction for rugged service.*

NEW—smaller size . . . for any given current, they are smaller than other types.

NEW—quicker installation . . . integral mounting stud.

NEW—wide-open design . . . insures maximum heat dissipation, cooler operation . . . no center "hot spots."

NEW—rigid construction . . . for rugged service.

RCA SELENIUM RECTIFIERS—*a comprehensive line*—for consistently good performance, easier installation, longer life and customer satisfaction. ORDER FROM YOUR RCA DISTRIBUTOR TODAY!

WIDE SELECTION OF 12 TYPES

Max. Output ma	Max. Input volts	RCA Type
65	130	205G1
75	130	200G1
100	130	206G1
150	130	201G1
200	130	207G1
250	130	208G1
300	130	202G1
350	130	209G1
400	130	203G1
500	130	204G1
400*	130	210G1
500*	130	211G1

*Special thin types for use where available space will not permit the use of type 203G1 or 204G1.

RCA® **RADIO CORPORATION of AMERICA**
ELECTRONIC COMPONENTS HARRISON, N. J.

Circle numbers on free inquiry card, p. 33, for more product data.

LETTERS
To the Editors

(*Continued from page 4*)

Association Addresses

Editor, TECHNICIAN:

We are very much interested in getting the names and addresses of radio, TV and electronic associations throughout the nation.

B. JUDD
Television Service Assoc. of Michigan
Detroit, Mich.

• *Association addresses, along with all products, manufacturers, distributors, brand names, etc., are listed in the service industry's only Buyers Directory, published regularly as an annual feature of the May issue of TECHNICIAN.—Ed.*

Number One Problem

Editor, TECHNICIAN:

I enjoy your magazine very much, and if it had not been for a traveling salesman who stopped out here "in the country" I would not have known it existed. I find the number one problem confronting TV men today is the consumer practice of buying tubes wholesale. This is just as true in the small village, such as this one of 7000 people, as it is in the big cities. The problem of cut rate servicing usually does not exist in small villages as it does in metropolitan areas. Let's try to lick the wholesale tube problem.

MELVIN COHEN
Suburban TV Service Co.
Hudson Falls, N. Y.

Bargain Tube Ads

Editor, TECHNICIAN:

I have followed with interest your exposing of radio and TV tube rackets. For years, advertisements in different magazines have listed prices considerably below that of my local distributor. I have shied away from them, but I did order 25 'standard brands" once from a supposedly reputable source. Most of the tubes were OK, but 3 or 4 had shorts and had to be thrown away. Thus I did not gain a thing . . . like buying eggs at half price and having to throw half of them away.

I have noted that TECHNICIAN is not filled up with these bargain advertisers. Could you recommend those few tube distributors who do advertise in your magazine as being purveyors of first class merchandise?

C. CLAYTON
Meridian, Miss.

• *Our policy regarding the acceptance of bargain tube ads is very strict to protect techs and legitimate companies alike. To the best of our knowledge you're safe with TECHNICIAN tube advertisers.—Ed.*

Service to Readers

Editor, TECHNICIAN:

I would very much like to obtain a copy of the article, "Eliminating Vertical Retrace Lines" from your Sept. 1953 issue. I will gladly pay all costs.

D. S. MICHELL

Philadelphia, Pa.

• *We have a limited number of copies of past articles you may have missed. As long as the supply lasts, we will send readers single copies without charge. Where the supply has been exhausted, we can provide photostats at 50¢ per page.—Ed.*

VHF-to-VHF Converters???

Editor, TECHNICIAN:

Have you ever published any articles on TV converters which convert a high VHF channel to a lower one (9 to 6, 7 to 4)? These converters are being made and used around here in fringe areas. Most of the fellows use a standard front end tuner with a 42 mc output, reworking the oscillator and i-f to hit channel 4 or 6, using a small built-in power pack.

L. D. HOWARD

Tunnelton, W. Va.

• *Sorry, we haven't published anything on this. Can any readers help?—Ed.*

Tube Storm Ablowin'

Editor, TECHNICIAN:

Who in the world can keep up with the storm of new tubes? My caddy has the appearance of a tube factory stock pile. Each month each manufacturer announces at least 3 to 5 new tubes. Are they trying to outdo one another? Why do I have to keep five 12BE6's to one 12BA6? This is the first culprit I yank on radio sets. Did the set engineers get the wrong tube characteristic data? It looks like we're trying to keep up with the drug stores and all their pills. Let's have fewer pills, and those that do the trick.

CLIFFORD D. LESSIG

Milford, N. J.

Tote That Barge

Editor, TECHNICIAN:

The current issue of our small-town newspaper (pop. 1450) has an advertisement whereby high school students of the Future Farmers of America will steam clean farm buildings for $5 an hour if the farmer will transport the cleaner on his own truck. Woe be unto any of us radio men if we charged like that and made our customers haul our equipment to boot! If unskilled labor comes that high, then either the farmer is not so bad off as he says, or else we should be charging $10 an hour for our skilled labor. Maybe we poor "tinkerers" can get government subsidies or be paid not to do so much work to keep prices up.

EUGENE L. WALKER

Wyoming, Ill.

Circle numbers on free inquiry card, p. 33, for more product data.

TV-ELECTRONIC

TECHNICIAN
& Circuit Digests

CALDWELL-CLEMENTS, INC., 480 LEXINGTON AVENUE, NEW YORK 17, N. Y.

The World of Servicing at Your Fingertips

Wouldn't it be wonderful if we could gather together several hundred of the industry's TV-electronic specialists, and have them write all about the many products and techniques which servicing embraces? And wouldn't it be still more marvelous if we could illustrate and print this material to be funneled to service techs at little or no cost?

Well, that's exactly what we've done in this issue, thanks to the cooperation of a great many manufacturers. TECHNICIAN editors have reviewed a vast amount of material published by these companies—color code guides, data books, interchangeability charts, slide rule selectors, information-packed catalogs and many other reference items—and have written a brief description of each. All manufacturers in the industry were invited to participate in this editorial project, and suitable literature from firms that responded have been included in this compilation. The capsule literature reviews appear in this issue starting on page 30, and we are pleased to note that most of them are available to you free.

You can obtain any of the literature you want very easily. Just fill in the postage-free card on page 33, and circle the numbers corresponding to the code numbers on each literature review which you want to receive. If a charge is noted, enclose the card in an envelope along with the proper payment in cash, stamps or money order. TECHNICIAN will then route your request to the manufacturers.

Also presented in this compilation of "must" literature is a listing of many of the most important books and home courses for service techs, all valuable additions to your reference library.

There's an excellent reason for recognizing the importance of reference literature. As the electronic art becomes increasingly complex, it becomes more and more difficult to retain a significant portion of product and technique information in your mind. Engineers have long recognized this situation, and have striven to integrate their skills with data readily obtained from their technical libraries.

You must do the same to secure maximum efficiency in your operations. Fill in the card on page 33 to build your reference file. Keep the world of servicing at your fingertips!

Watch Out for Phony Products

We've picked up some disturbing information from the industry grapevine. It is alleged that a manufacturer in Japan is exporting electronic equipment carrying the brand label of a leading U.S. producer. The bogus version is styled to look like the real thing, but the quality is reportedly inferior.

This illegal copying of another's product, taking advantage of the confidence buyers have in a long established, reputable name, is not a new story. Some time ago there were reports of a European manufacturer slipping counterfeit TV components into the giant U.S. replacement market.

The best thing you can do to protect yourself is to make your purchases at reputable jobbers who are the backbone of our industry's distribution system. Also, it is imperative that you remain alert to any standard name-brand product that appears to have significantly inferior workmanship, or is selling at an extraordinarily low price.

Frankly, we do not know the extent of this racket. We need more concrete evidence to substantiate the reports received. You can do yourself and the industry a first rate service by informing TECHNICIAN editors of any phony products you come across.

Tuning In the

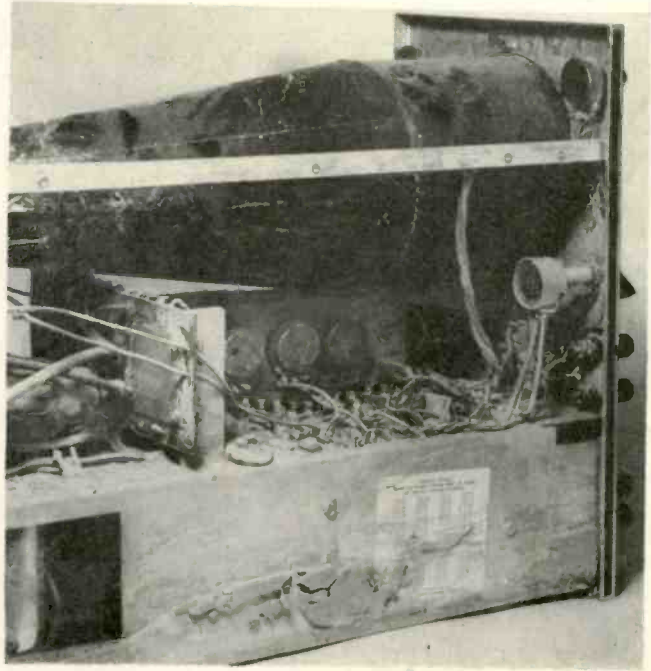
TV SET TANGLES WITH CADILLAC. The TV receiver won. At MGM-TV in Hialeah, Fla., a CBS 21-in. table model was sitting on a window bulkhead when the Caddy rammed into the store front. The impact knocked the set 20 feet into the store. The TV, while battered, operated perfectly. The car had to be towed away.

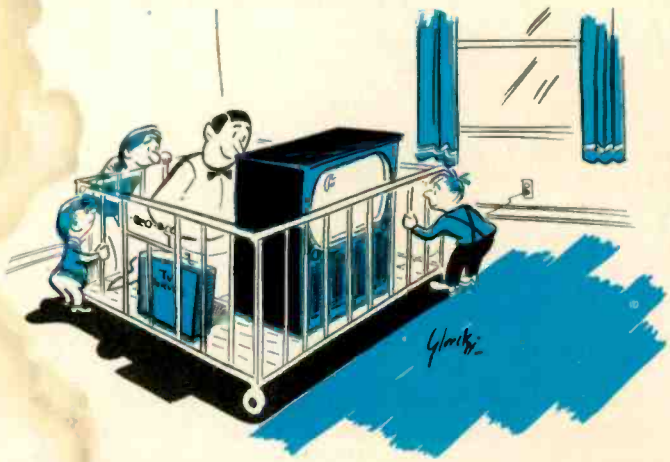
MENTAL PERFORMANCE is not significantly reduced under conditions of short-term, high intensity noise stimulation, says the Air Force.

BOLD TV SERVICE GUARANTEE plan, called the Gold Seal Program, has been initiated by Magnavox. On all receivers selling at $249.50 and up, the company offers a three-month free service contract including labor and a one-year guarantee of tubes and parts. Under this free service policy, claimed by Magnavox Pres. Frank Freimann to be the first of its kind in TV history, servicing will be channeled either through regular service agencies or dealers, with Magnavox paying the cost.

HOW MANY TUBES GO BAD within a new TV set's 90-day warranty period? One manufacturer estimates the average number at one per set. For color TV, average shouldn't be over two per set because of increased number of tubes used.

What happens to test instruments soaked in flood waters or buried for days under several feet of silt? Here's a case history of a DuMont scope soaked and impregnated with mud in E. K. Dayesne's TV repair shop in Woonsocket, R. I. When the instrument was received by the manufacturer for reconditioning, Dumont's instrument service techs fired it up. It worked fine!





MAGNETIC TAPE is expanding into new fields. A U. S. firm is planning to produce a Swedish tape juke box that has been selling for $1800. A 760-ft. long 35 mm tape at 5 ips is used instead of records. The tape has 16 channels, and is divided into 12 sections along its length to provide 192 different tunes. Another report, basically rumor, says that a leading Midwest TV maker may install 250,000 tape playback units in the new models of a major automobile manufacturer.

SMART ADVERTISING DOLLARS are being spent by some TV schools to promote the qualities of their technician graduates to the servicing industry. This can mean better jobs for the grads, and more students for the schools.

MARCH 1956 NETWORK COLOR TV SCHEDULE

MONDAYS through FRIDAYS			
March 1-2, 5-9, 12-16, 19-23, 26-30			
3:00—4:00 PM (EST)	NBC	"Matinee Theatre"	(Live)
5:30—6:00 PM (EST)	NBC	"Howdy Doody"	(Live)
MONDAY, March 5			
8:00—9:30 PM (EST)	NBC	"Caesar and Cleopatra" (Producers' Showcase)	(Live)
SUNDAY, March 11			
2:30—5:30 PM (EST)	NBC	"Richard III"	(Film)
TUESDAY, March 13			
8:00—9:00 PM (EST)	NBC	"Milton Berle"	(Live)
SUNDAY, March 18			
3:30—4:00 PM (EST)	NBC	"Zoo Parade"	(Film)
4:00—5:30 PM (EST)	NBC	"Taming of the Shrew" (Maurice Evans Presents)	(Live)
SUNDAY, March 25			
3:30—4:00 PM (EST)	NBC	"Zoo Parade"	(Film)
7:30—9:00 PM (EST)	NBC—	"Sunday Spectacular"	(Live)

This is the schedule available at press time.

Picture .....

"NATIONAL TELEVISION SERVICEMEN'S WEEK" falls on March 5 to 10 this year. This second annual event, sponsored by RCA, incorporates an extensive merchandising program which will be promoted in consumer magazines, TV, radio and newspapers across the country. It is all intended to improve technician business relations. Among the many sales promotion aids available to techs celebrating this week are "Code of Ethics" plaque, identification card, window displays, giveaway consumer booklets and safety glass cleaning cloths, and many others. Participants also receive free subscription to the RCA house organ "Radio & Television Service News." Details available at RCA distributors.

TRILLION KILOWATT-HOURS of electrical power will be consumed annually by 1965, predicts Sylvania Chairman Don Mitchell. This is more than double 1955's 480 billion figure. The West Coast will lead in growth. By 25 years from now, more than half the plants being built at that time will be nuclear powered. The 1956 electrical-electronic industry output should total $19 billion, an increase of $1.6 billion over last year, and double in the next decade.

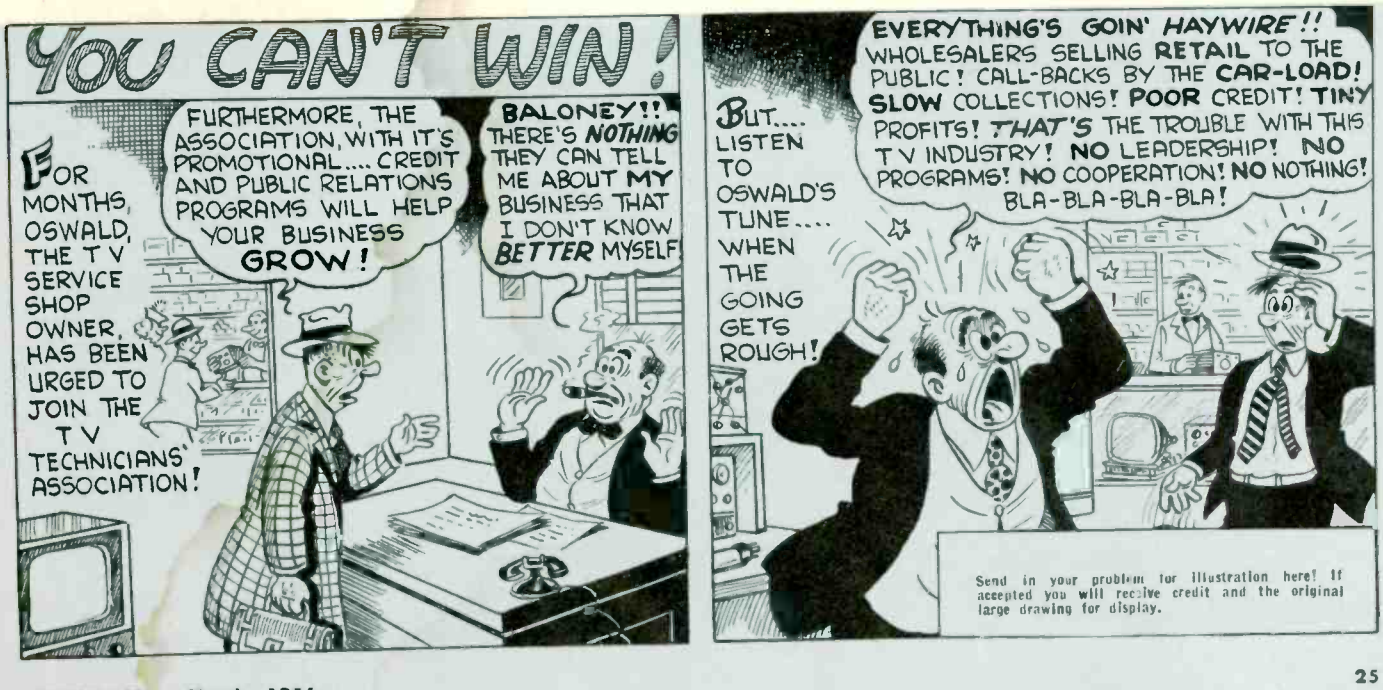
COOKING WITH MICROWAVES. Raytheon, which introduced the quick-cooking commercial "Radarange" using r-f power generated by a magnetron, has signed an agreement with Hotpoint to supply technical assistance and components for ovens to be made and marketed by Hotpoint for home use. Who will keep this oven in repair? You guessed it, electronic techs . . . another example of growing opportunities in electronic servicing.

CALENDAR OF COMING EVENTS

Mar. 2-4:	Third High Fidelity Music Show, Harrington Hotel, Washington, D. C.
Mar. 5-10:	National Television Servicemen's Week.
Mar. 12-16:	National Electrical Manufacturers Assoc., Edgewater Beach Hotel, Chicago, Ill.
Mar. 19-22:	1956 IRE National Convention and Radio Engineering Show, Waldorf-Astoria and Kingsbridge Armory, New York, N. Y.
Apr. 13-14:	Tenth Annual Spring Television Conference, Engineering Society of Cincinnati Bldg., 1349 E. McMillan St., Cincinnati, Ohio.
Apr. 14-27:	United States World Trade Fair, New York Coliseum, New York, N. Y.
Apr. 15-19:	The 34th annual convention of the National Association of Radio & Television Broadcasters, Conrad Hilton Hotel, Chicago, Ill.
May 21-24:	1956 Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.
May 22-23:	RETMA Symposium on Reliable Applications of Electron Tubes, Irvine Auditorium, University of Pennsylvania, Philadelphia, Pa.
June 27-30:	Jobber-Rep-Mfrs. Conference, Breezy Point Lodge, Brainerd, Minn.
July 22-25:	1956 National Audio-Visual Convention and Trade Show, Hotel Sherman, Chicago, Ill.

COMMUNITY TV VIEWERS in Tonopah, Nevada, receive a satisfactory signal from KRON-TV, located some 285 miles away in San Francisco.

OLD ALUMINUM PARTY GIMMICK has been revived by California TV dealer in selling his color line. He asks an enthusiastic customer to invite some friends to her home for coffee and cake—and to see color TV. She receives payment based on number of color sets sold to her guests.



Physical Grounds Are Not

Changes in Lead Length, Lead Dress, and Point of Return on the

A. R. CLAWSON

• Many headaches fall to the service technician due to the very nature of his work, and not the least of these are difficulties he gets into by some inadvertently committed oversight of his own. The case histories that follow will treat such errors that fall into the category of improperly placed grounds. Included are instances of improper lead length to ground. While leads in high-frequency amplifiers should generally be as short and direct as possible, there are a few instances where "improper length" means that a lead is actually too short. Let's look at cases.

A technician-dealer recently pulled a chassis on which the complaint was poor (nearly absent) picture and weak sound with noise. The receiver was an intercarrier type with the i-f in the 40-mc range. Routine testing easily revealed that the defect was in one of the i-f stages. The cause for failure was a burnt-up cathode resistor, which was plainly apparent. Furthermore, the associated bypass condenser showed signs of physical damage from the heat of the burning resistor. As a result, the resistor, the condenser and the tube were all replaced. Power was applied and then the trouble began.

On strong signals, all was in good order except for slight traces of regeneration which might pass inspection by the average customer. On medium and weaker stations the trouble mounted, and ranged all the way from moderate regeneration to all-out oscillation. "Maybe I put in too hot a tube," was the technician's first reaction. So several tubes were tried with no significant change in results. The possibility of misalignment was considered. There followed a fruitless attempt to realign the i-f section. Since no hint of regeneration could be found in an appraisal of the customer's original complaint, something had apparently happened during troubleshooting and repair.

"Stubs" & Long Leads

Inspection of the technician's replacement job showed that the resistor and condenser had been soldered together as a single unit (Fig. 1A). In removing the original resistor-condenser combination, two wire stubs, about a quarter inch in length each, had been left when the original components were clipped out of the circuit. The new combination unit was inserted by being "tacked" to these stubs. (Fig. 1B.)

To eliminate the new complaint, excess lead length was cut from the combination replacement unit. About an inch was cut from each wire coming out of the condenser, and the two stubs remaining from the previous wiring were also removed. The total length of series wire removed came to about 2½ in. This length had constituted a series inductance in the cathode. After physical re-replacement as shown in Fig. 1C, the set performed in satisfactory fashion.

This i-f stage had been designed at maximum gain for a tube type having certain specified values of G_m and grid-to-plate capacitance (C_{gp}), when gain was not reduced by agc action. Additional coupling exists, as shown in Fig. 2. Shown in the schematic of Fig. 2A are the "phantom" capacitances C_{gp} (grid-to-plate), C_{gk} (grid-to-cathode), and C_{sp} (suppressor-to-plate). Also shown is the normal inductance of wiring in the cathode circuit (L1) and the inductance added by the excess wiring (L2). The two main paths are simplified in Fig. 2B. The first path, which includes C_{gp}, shunts a second path made up of C_{gk}, L_k, the cathode-to-suppressor connection, and C_{sp}. Haphazard rewiring had changed these values and increased the coupling. The result was that a resonant circuit had been set up that encouraged oscillation at low values of agc voltage.

Case of the Ground Shield

Another case history parallels the one just recounted. A cathode resistor had been replaced in a design using no bypass unit. Fig. 3A shows the manner in which the technician had elected to return the resistor to ground, to a convenient point on the nearby shield. Eventually, the excess added lead length had to be removed and the resistor was returned to the less convenient original point

Fig. 1A—Resistor-condenser unit used for replacement. Unit as first wired into circuit. C—Final layout to stop regeneration.

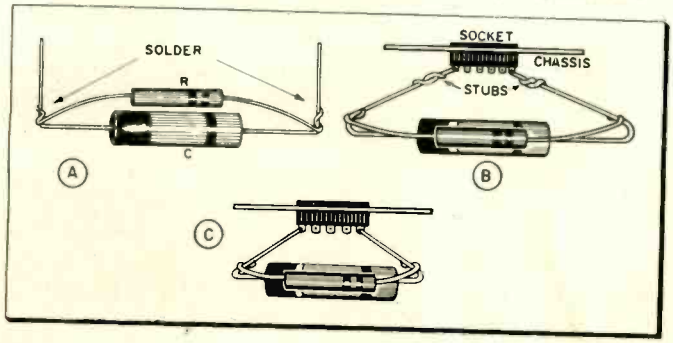
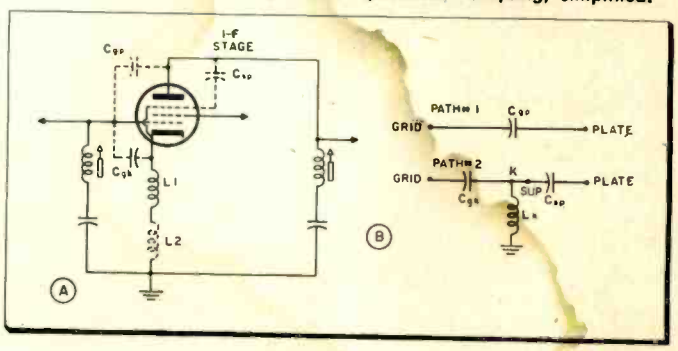


Fig. 2A—"Phantom" coupling in the circuit, not shown on ordinary schematic. B—The two paths of "phantom" coupling, simplified.



Always Electrical Grounds

Chassis Are Some Factors That May Alter Nature of the Circuit

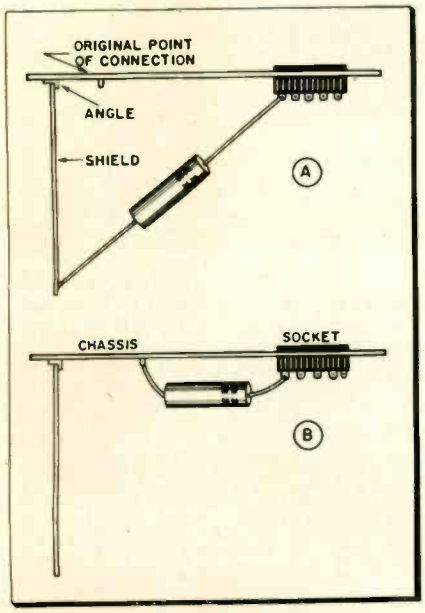


Fig. 3A—Replacement cathode resistor grounded to shield. B—Correct chassis return point.

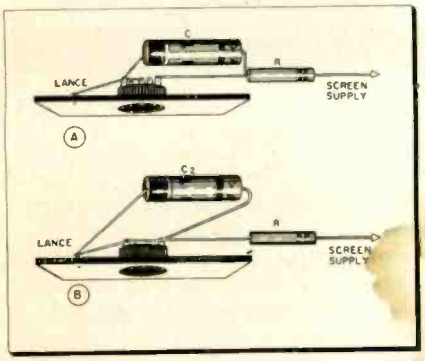


Fig. 4A—Circuit oscillated with wrong condenser rating, short leads. B—Fault corrected.

of connection, as designed (Fig. 3B). While this set had not begun to oscillate, after repair, to the same extent that had been the case with the first case discussed, too much regeneration was present to please the customer.

Consider the extra path length in the ground return added by the first attempt at repair. There was the added path of the shield. There were the two angle mounts that held the shield to the chassis (though only one is shown in the side view of Fig. 3, another one, which would fall behind the one shown, was present). There was added length along the chassis. There was also the extra lead length from the resistor. The normal cathode inductance, determined to be about 0.012 microhenry, had been more than doubled to about 0.028 microhenry. This was enough to cause the trouble.

This case illustrates the care that must be exercised in choosing the point to which a ground return is made. Shields and portions of the chassis itself may possess appreciable inductance, which becomes particularly important at elevated frequencies in the vicinity of 40 mc.

A final case history illustrates some factors that did not enter into the preceding examples. For one thing, it demonstrates the importance of using exact replacements insofar as possible, even for apparently minor components. It also shows that leads can sometimes be made too short, rather than too long.

Too Many Precautions

The i-f strip of the set under consideration was also in the 40-mc range. It was an intercarrier receiver with a leaky screen bypass condenser in one of the composite i-f stages. Naturally, screen voltage was low and the stage gain was near zero, with the usual destructive effects on picture and sound performance. The technician who made the replacement was conscientious. To guard against future breakdown, he chose a replacement with a higher voltage rating. In so doing, he also switched to a tubular type. He also made his leads short, cutting away what appeared to be some unnecessary lead length associated with the original part. (Also replaced was the dropping resistor shown in Fig. 4, but this does not enter into the problem.)

When the set was switched on, it turned out to be a "howling" success, literally. Oscillation was almost as bad as in the first case discussed. Fig. 4A shows the condenser as it was wired into the circuit on the first attempt at repair. After another attempt at wiring (Fig. 4B) the oscillation disappeared. For the second attempt, wiring of the original layout was followed as closely as possible, with lead length and connections carefully duplicated. Also, the condenser used was the same as the original in physical size, value of capacitance and voltage rating.

Leads Are Components

In original manufacture, the receiver in question had relied upon series resonance in this stage's bypassing, with the stage working near maximum gain. The inductance of the leads, as wired in manufacture, was used to obtain appropriate bypass action. Shortening the leads in the first attempt at replacement reduced this inductance and raised the resonant frequency. This was offset partially, but not completely, by the fact that the condenser with the higher voltage rating had more inductance than the original condenser. To be safe, the final replacement was made with a unit of the same type and rating as that specified in the manufacturer's parts list and original layout and dress were followed.

If series resonance is suspected as playing a part in bypass action, all capacitances and inductances, *including lead inductances*, should be exact replacements. Different types of condensers, such as postage-stamp units as compared to tubulars, not only vary from each other with respect to their inductance, but they also vary in Q. Furthermore, these factors vary within a given type depending on capacitance value and voltage rating. The Q of a condenser may also be important in a circuit, since a higher Q will result in a narrower resonant peak, and a lower Q will result in a broader band. The bandpass of a stage may thus depend on the condenser chosen.

While the three illustrative cases all involve i-f stages, the difficulties described would occur in r-f circuits, of course, and even, to a lesser extent, in video-detector and video-amplifier circuits. •

Test Instruments Used in

Part III: Don't Be Misled

ROBERT G. MIDDLETON,
SIMPSON ELECTRIC CO.

• Color TV servicing procedures often require the use of demodulator or detector probes in combination with oscilloscopes. For example, the detector (usually crystal) probe is used to demodulate a video-frequency sweep voltage that has been injected into a video amplifier, before this signal is applied to the oscilloscope. The procedure is fairly straightforward, but there are some limitations in probe response that must be recognized.

One of these limitations is the inability of the demodulator probe to rectify and filter video-frequency voltages completely, when these voltages fall below approximately 75 kc. Fig. 1, for example, shows the response of a Q demodulator in a color TV receiver, in which a large amount of "fuzz" appears at the low-frequency end (to the left). This fuzz consists of that portion of the video-frequency sweep signal which feeds through the probe, without being adequately detected and filtered by the short time-constant of the probe's filter network. The result is a semi-undemodulated display.

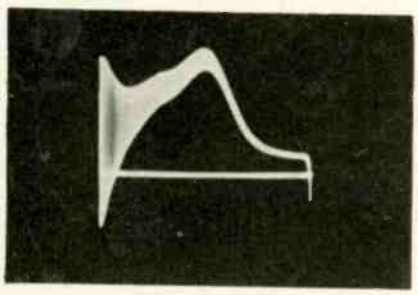
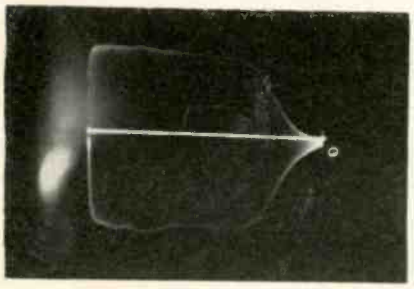


Fig. 1—Demodulated response of a Q demodulator circuit, showing semi-detected fuzz.

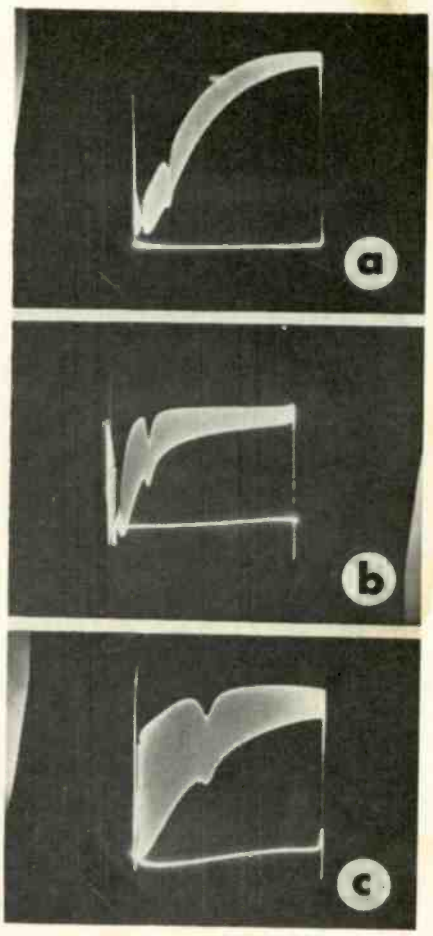
Fig. 2—*Undetected* video-amplifier response.



Of interest in this connection is the wholly undemodulated swept response curve shown in Fig. 2. This has been applied to the scope from a video-frequency amplifier through a low-capacitance isolating probe, rather than through a demodulator probe. It shows both the negative and positive (mirror-image) portions of the unrectified and unfiltered sweep signal, and illustrates the utility of the demodulator probe in developing the single-image wave envelope of this signal for scope observation, despite probe deficiencies.

Not only does the conventional detector probe fail to detect completely those sweep signals below about 75 kc, but it also attenuates them, giving a false picture of the actual response. While various probes may

Fig. 3—Details of low-frequency response of various demodulator probes, showing undemodulated fuzz and attenuation for all types.



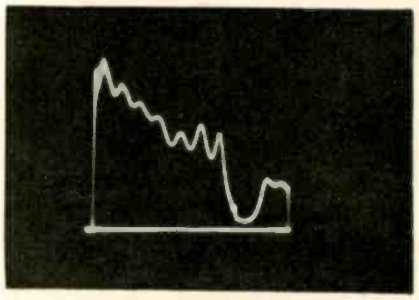


Fig. 4—Fuzz not too apparent in wideband circuit, like the Y amplifier curve shown.

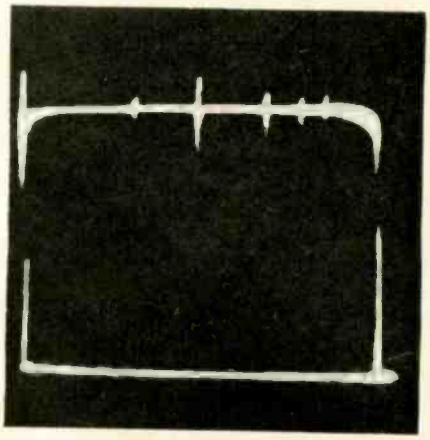


Fig. 5—Spurious beat-frequency markers.

differ somewhat in this characteristic according to their design—some are full-wave or half-wave rectifier types, some use series or shunt detectors, some have long or short time-constant filters—none are much use below the stated frequency. This is illustrated in Fig. 3, where the response of various probes to a flat applied sweep signal is shown. In each case, the dip in the response is an absorption marker at 50 kc, used for identification of response at that point. In each case, response is dropping off rapidly in this region.

When a *wideband* video-frequency circuit is swept, undemodulated fuzz, while present, is not nearly so evident in the pattern, because it has been compressed into a narrow region at the low-frequency end of the response curve. Thus, the Y amplifier response shown in Fig. 4 does not show much undetected fuzz (at the left), although the fuzz is actually present. It could be made apparent by greatly increasing the horizontal gain on the scope to show

Color Television Service

by Confusing Scope Indications

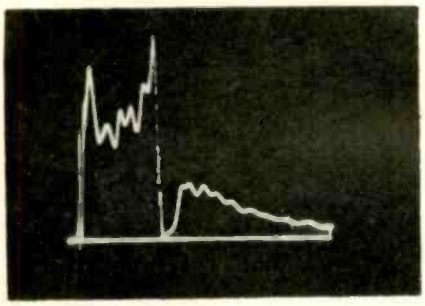


Fig. 6—Absorption marker may be hard to identify where ringing marks response curve.

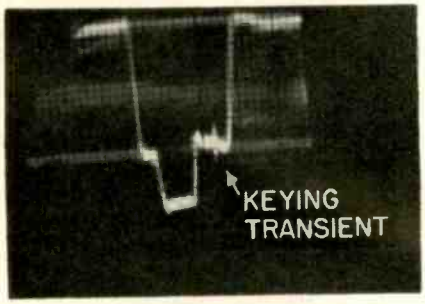


Fig. 7—Keying transient on horiz. sync pulse leaves misleading mark similar to sync burst.

an expanded view of the low-frequency portion of this response curve. In any case, checking low-frequency response by other means, such as by square-wave testing, is possible.

In Fig. 3, it will be noted, absorption markers were used to identify a specific frequency on the swept response curves, rather than the more familiar beat-frequency type of marker. In color TV service work, these absorption markers will often be preferred. Since video-frequency sweeps often have a high percentage of harmonics, beat-frequency markers will often produce misleading spurious markers, as shown in Fig. 5. The applied marker is shown at the center of the curve; spurious markers appear to the left and right of it.

When an absorption marker is used, much of this difficulty is avoided. Since an absorption marker is a passive rather than an active indicator, it has no harmonics as such and does not give rise to significant spurious indications. However, another sort of difficulty is sometimes encountered. The delay line incorporated in the Y amplifier of the color TV receiver tends to cause ringing, as may be seen in the Y-amplifier response curve of Fig. 4. This ringing is often coupled to some extent into other portions of the receiver, like the chrominance circuits, that follow the Y amplifier. Fig. 6 shows the response curve of a red (video) amplifier, which is marked by delay-line ringing as well as by an absorption marker. Some confusion occurs when an attempt is made to determine which undulation is being produced by the marker. However, if the technician touches his finger to the marker-coil terminal, the marker dip will move on the curve while the other oscillations remain stationary. This provides the necessary identification.

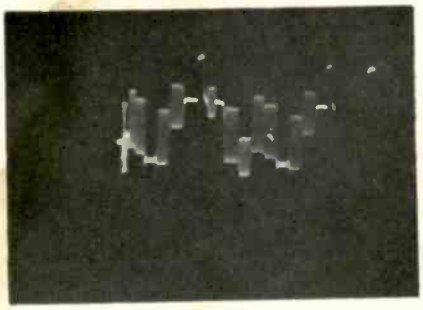


Fig. 8—Color bar output on wideband scope.

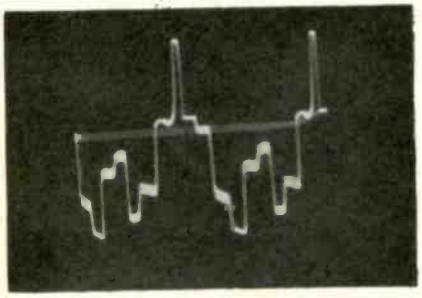


Fig. 9—Color bar output on narrowband scope.

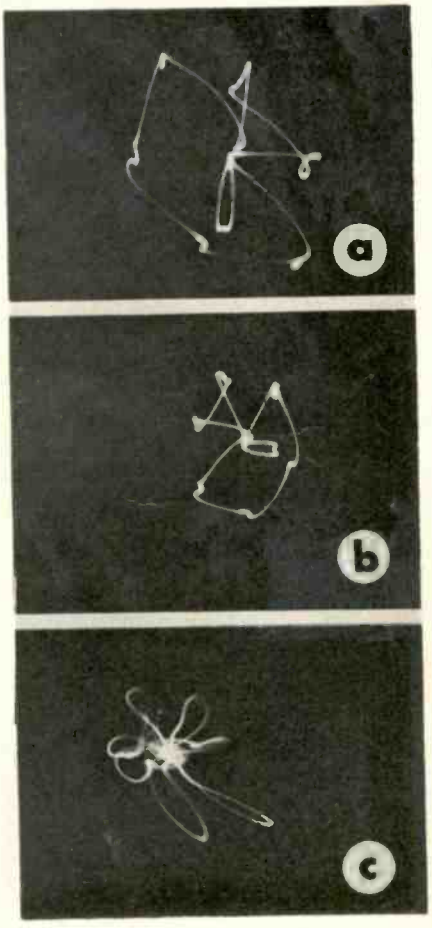
Occasionally when a color-bar generator is used to check the chrominance circuits, the technician may find it advisable at one point to switch off the chroma signal. At this time, expecting all evidence of the color-sync burst to disappear, he may be surprised to find that the back porch of the sync pulse is not entirely cleared. The pulse which is still present (Fig. 7) however, is actually a keying transient from the gating circuit, which is not entirely suppressed. There is no 3.58-mc voltage present, despite appearances, and the disturbance, which has a certain resemblance to burst signal, will not energize the color circuits; it is basically a low-frequency transient.

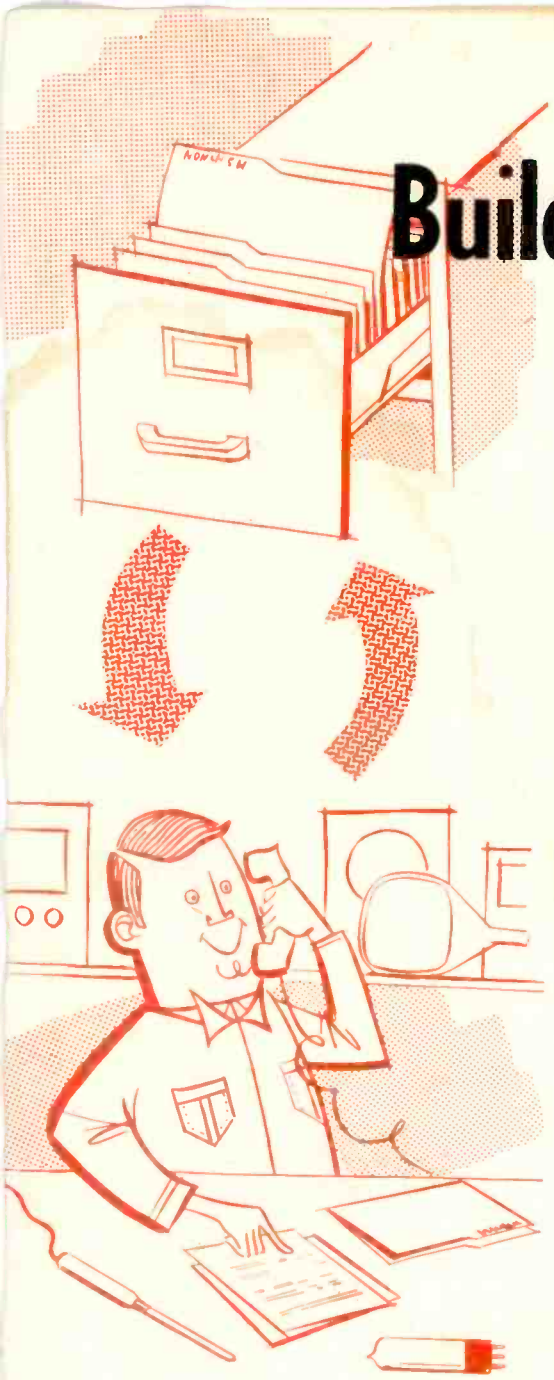
To check the output from a color-bar generator, a wideband scope is essential. The scope should have full response at the color-burst frequency of 3.58 mc, since the pattern will otherwise be misleading. Fig. 8 shows the display obtained when the output from a color-bar generator is applied to the vertical-input terminals of a wideband scope. The burst and the 3.58-mc component of the color bars are properly reproduced.

However, compare the display

(*Continued on page 71*)

Fig. 10—Vectorimeter patterns distorted by poor transient response of scope amplifiers.





Build Your Literature File

You can do this in minutes

Your literature file and technical library are valuable and necessary elements in the operation of an efficient TV-electronic service shop. You can benefit from the many printed service aids prepared by manufacturers for service techs. Most of them are available just for the asking. Also, books and home correspondence courses are valuable ways to learn and build your reference files.

The editors of TECHNICIAN have gathered together the cream-of-the-crop literature for the servicing industry. Each item is briefly described below, and assigned a code number corresponding to the number printed on the postage-free inquiry cards on page 33. To obtain the described material, all you need do is circle those numbers on the inquiry card corresponding to numbers assigned to the literature descriptions of interest, fill in your name and address, and drop in the mail. TECHNICIAN will funnel all requests to the proper sources. That's all there is to it! In a few weeks, the literature you want will be flowing into your mailbox.

Literature descriptions are divided into five sections.

1. FREE LITERATURE FROM MANUFACTURERS: Included in this group are reference data, interchangeability charts, inventory guides, component cross-references, data-packed catalogs, and similar valuable literature aids which will be sent to you without charge.

2. LITERATURE FROM MANUFACTURERS (AT NOMINAL CHARGE): These publications are similar to the free literature noted above. In most cases this material is more comprehensive and more costly for manufacturers to prepare, so a small fee is charged, the amount being noted in the description. Any item for which there is a charge is coded with the letter "c" at the end of the inquiry number. The proper amount in cash, stamps or money order should be enclosed with the card in an envelope when ordering.

3. FREE INFORMATION ON BOOKS: This roundup of top-notch technical and business books for service techs describes valuable additions to the shop library.

4. FREE INFORMATION ON HOME CORRESPONDENCE COURSES: Write-ups of courses and their cost offered by various schools to improve your service techniques.

5. FREE INFORMATION ON PRODUCTS ADVERTISED IN THIS ISSUE: Data will be sent without charge (unless noted otherwise) on any product advertised in this issue. Descriptions and code numbers are given on page 39. Inquiry card on page 33 may also be used to write in numbers requesting more material on new products and manufacturers' bulletins presented elsewhere in this issue.

FREE LITERATURE FROM MANUFACTURERS

Circle 101
"Ultra-Linear" audio output transformers are discussed in 16-page booklet. Of special interest are 7 pages of amplifier circuits, with 3 pages discussing operating details. Free. (Acro Products)

Circle 102
Storage bins of all shapes and sizes, in metal and plastic, help keep a neat shop with hardware and components right at hand. 16-pager shows many drawer and swing bin types. Free. (Akro-Mils)

Circle 103
Electric garage door openers, key lock and radio controlled, and TV antenna rotator, are described on sheets ready for notebook insertion. How "Lift-A-Door" works is briefly explained. Free. (Alliance Mfg.)

Circle 104
Auto radio vibrators, including circuit diagrams, interchangeability charts and specs, are presented in an 8-page brochure. Free. (American Television & Radio)

Circle 105
Phonograph cartridge replacement chart presents valuable information, including price, voltage output, frequency range, record speed and recommended needle, for many different cartridges. In addition, the 8 data packed pages list replacements for 12 different manufacturers. It's a real aid in phono servicing. Free. (Astatic)

Circle 106
Electrolytic and paper capacitors are among the hundreds of types shown in this 16-page pocket-sized guide to this important replacement component. Ratings and prices of single and multiple units listed. Free. (Astron)

Circle 107
Tube tester and crt rejuvenator-tester are accurately described, along with their use and profit-making benefits in several sheets of descriptive literature. Free. (B&K Mfg.)

to Speed Servicing

at little or no cost. Here's how

Circle 108
Master TV system installation manual, consisting of 12 information-packed pages, tells what these systems are, how they are connected, maintenance hints, charts, and how to calculate system requirements. In addition, a handy little booklet called "TV for 2, or 3, or More" gives the basic story about multi-set systems. Free. (Blonder-Tongue)

Circle 109
Boosting antenna signal level can be accomplished with a special broadband amplifier mounted on the mast. Description of unit, with schematic and parts list, is provided in large 4-page folder, along with installation data. Free. (Blonder-Tongue)

Circle 110
Complete battery manual is actually a 9 x 12 in. book loaded with information. In addition to showing a complete line of batteries with technical specs, there is a cross-reference guide for some 20 manufacturer and user type numbers, radio replacement guide by set make, test instrument replacements, transistor requirements and lots more. Free. (Burgess)

Circle 111
Miniature tube reference guide offers specs for 329 electron tube types, including 79 relatively new types, plus 135 basing diagrams. In addition to this helpful 12-page reference, a second booklet on TV series-string tubes is available, complete with specs and related tips useful to technicians. Free. (CBS-Hytron)

Circle 112
TV picture tubes will not cause designation worries if you have these two publications handy. One is a comprehensive listing of b&w and color pix tubes, from 3 to 30 in. sizes, with technical specs and basing diagrams. The other reference is a substitution chart, which shows exactly which types can be replaced with other pix tubes, and whether the interchange is direct or requires modifications. Free. (CBS-Hytron)

Circle 113
Component reference packs huge amount of data into this revised 16-page edition. Included are a great many volume controls, switches, capacitors, printed electronic circuits, steatite insulators, and shafts. Ratings, cost and designations are all given. Free. (Centralab)

Circle 114
TV antennas are closely examined in two technical brochures. In the 8-page "Rainbow" literature, a 4-page article describes the theory and design of an all-channel yagi. In the "K. O." brochure, a design achieving extremely high front-to-back ratios is discussed. Free. (Channel Master)

Circle 115
UHF TV installations often cause problems when techs are not familiar with the unique characteristics of those frequencies. "The 13 Questions Most Often Asked about UHF Installations" provides many of the most important answers. Free. (Channel Master)

Circle 116
Test equipment catalog covers specs and descriptions of laboratory quality voltage and resistance testers, current transformers and phase indicators in 20 pages. Free. (Davenport Mfg.)

Circle 117
TV picture tube data on giant (32 x 24 in.) chart ready for wall mounting. This much sought after reference for technicians lists all important crt specs in large, bold type, along with bulb information and basing diagrams. Dimensions, deflection, voltage, etc., for over 220 different pix tube types are given. Free. (DuMont)

Circle 118
Test instruments, 12 pages of them in kit and wired forms, are pictured and described in the new 1956 catalog. Included are meters, scope, generators, geiger counter, testers, probes and almost everything else needed for TV troubleshooting. Free (Eico)

Circle 119
CRT testers, what they are and how they work, are presented in a 36-page booklet called "When Mr. TV Has a Headache," and two smaller brochures on the "Volta-Chek" and "Vitameter." Latter instrument, useful on home calls, repairs TV pix tubes without removal from cabinet. Free. (Electronic Test Instrument)

Circle 120
Phonograph cartridge interchangeability guide, in the form of a double circular slide rule, provides direct replacement numbers for 8 manufacturers, covering all popular crystal and ceramic units. Spec table is also given. Free. (Electro-Voice)

Circle 121
High fidelity audio products, including speakers, microphones, cartridges, enclosures, amplifiers and tuners are described in these two booklets, one a 16-page catalog, and the other a 20-page brochure on choosing speaker systems. Free. (Electro-Voice)

Circle 122
Mikes, cartridges and sound powered telephones are briefly described in spec sheets. Free. (Elgin)

Circle 123
Storage cabinets and shelving of many different types are offered in this 16-page catalog. Also, handy booklet, "How to Solve Your Storage Problems." Free. (Equipto)

Circle 124
Antennas and transmission line are examined in two handy booklets. The first discusses gains, elements, radiation patterns and antenna design. The second offers design curves, attenuation and other characteristics for open lines, twin lead and coax. Free. (Fretco)

Circle 125
TV picture tube replacement guides, one a handy pocket-size 12-page booklet listing specs on all different types from 8-in. metal round to 27-in. glass rectangular, and the other a 4-pager on aluminized pix tubes, including a replacement chart and explanation of aluminizing, provide basic reference for all shops. Free. (General Electric)

Circle 126
Receiving and pix tube information can always be in front of you thanks to two highly useful wall charts. One lists the types and prices of receiving tubes, diodes, transistors and pix tubes (list prices for customers to see). The other chart is essentially the same as the comprehensive 12-page pix tube replacement guide, except that all data is printed on one side of a large sheet, ready for wall mounting. Free. (General Electric)

IT'S EASY TO OBTAIN THIS LITERATURE!

1. Read descriptions of literature on pages 30-39.
2. Circle code numbers of items you wish to receive on postage-free self-addressed card on page 33.
3. Fill in your name and address on card, detach card and mail immediately.
4. When ordering literature for which a charge is made (designated by "c" after code number), fold card and enclose in envelope with correct amount in cash, stamps or money order, in an envelope. TECHNICIAN assumes no risk for cash sent by mail.

Circle 127
Promotional and service aids, 16 pages of them, include business identifications, signs, direct mail advertising cards, sales packages, job tickets, stickers, tube puller, shop garments, and many other helpful items. Free. (General Electric)

Circle 128
Transistors and rectifiers are presented with with technical specs in this 8-page booklet covering junction pnp and npn and germanium stacks. Also, handy reminder card lists several germanium diode types that are interchangeable. Free. (General Electric)

Circle 129
Transistor spec sheets, 4 of them, describe maximum ratings, average characteristics and typical operation. Free. (General Transistor)

Circle 130
Hi-Fi furniture, including equipment cabinets and speaker enclosures, is attractively shown in this 1956 brochure containing 34 pages. Free. (G&H Wood, Cabinart)

Circle 131
Test equipment, nicely illustrated in a handy 8-page booklet, plus spec sheets, includes a digital vtvm, a vacuum tube vom, oscilloscopes, bar-dot generator and other high quality instruments of considerable interest to TV-electronic service technicians. Free. (Hycon)

Circle 132
Vibrator replacement and service guide for 12-volt auto ignition systems is printed on two pages of very heavy paper. Chart lists replacement for 22 auto vibrator makes and car brands. Free. (James Vibrapower)

Circle 133
TV antenna mounts and accessories are well illustrated and described in this 16-page catalog. Included are a great variety of mounts, brackets, anchors, screws and mast tubing. Free. (Kenwood Eng.)

Circle 134
Solder and soldering irons are presented in two handy-sized 4-page brochures. Free. (Lenk Mfg.)

Circle 135
The vibrator guide containing over 50 pages packed with data is a must for any tech who services equipment with vibrators. The first 32 pages list all set makes and models, together with replacement parts numbers and buffer capacitor values. Servicing notes, circuits and cross-references are also given. Normally selling for 15¢, it will be sent to TECHNICIAN readers free. (Mallory)

Circle 136
Electrolytic capacitor replacements, many hundreds of them, are presented with ratings and dimensions in 20 pages. They are listed twice, once by rating sequence, and once by catalog numbers. Free. (Mallory)

Circle 137
TV coil replacement guide, covering peaking coils, i-f transformers, antenna matching coils, linearity controls, oscillator coils and others, cross-references coil numbers against specific chassis numbers of various set manufacturers for easy replacement. Over 60 pages of this valuable data. Free. (J. W. Miller)

Circle 138
Public address audio equipment, including amplifiers, portable speakers, remote controls and rack assemblies, is illustrated and described in this 20-page brochure. Free. (Newcomb)

Circle 139
Wire meters, cutters and reels, excellent for any shop handling or selling considerable amount of wire and cable, are pictured in series of spec sheets. Free. (Olympic Instrument)

Circle 140
"Fernetic" and "Co-Netic" shielding gives electromagnetic and electrostatic protection. Applications include crt shields and r-f suppression. What this material is and how it works are explained in this 12-page brochure. Free. (Perfection Mica)

Circle 141
Electrical tape and printed circuits are the subjects of 3 brochures. Two 4-pagers give specs and application tips on different tape types. The 8-pager on printed circuits tells the story from basic laminate to finished chassis. Free. (Permacel)

Circle 142
Belt driven generators and stand-by power plants are shown in this 12-page brochure covering a variety of powers and ratings. Free. (Pioneer Gen-E-Motor)

Circle 143
Test equipment brochure, a brand new one, packs lots of technical data on generators, vtvm's, probes, oscilloscopes, tube testers, and multitesters in 12 large pages. Of particular interest are two pages explaining tube tester functions, requirements and circuit operation. Free. (Precision Apparatus)

Circle 144
Paper and electrolytic capacitors of all kinds —a wealth of useful data—are described in three separate brochures. The first is a 24-pager giving specs, ratings and prices on electrolytics, oil, metallized and regular paper types. Second is a 20-page brochure and wall chart on hermetically sealed miniature paper tubulars. Third is an 8-pager providing engineering data on metallized paper capacitors. Free. (Pyramid Electric)

Circle 145
Selenium rectifiers, their characteristics, performance and circuit applications, are shown in this punched 4-page brochure. Free. (Pyramid Electric)

Circle 146
Capacitor-resistor analyzer technical manual describes circuits, qualitative and quantitative measurements, and maintenance. Procedures for making tests given in this 16-page booklet. Free. (Pyramid Electric)

Circle 147
Volume control cleaner and lubricant are presented in a handy-sized 4-page brochure and distributor sheet. Free. (Quietrole)

Circle 148
Selenium rectifier replacement guide for radio, audio, TV and associated electronic products lists set maker's model and chassis numbers, parts number and replacement part designation in 28 data packed pages. Many less common set names like Alden, Consolidated and Hiners are included, in addition to all popular brands. Free. (Radio Receptor)

Circle 149
Pix and receiving tubes will not cause you inventory problems if you use this 1956 "Tube Movement and Inventory Guide," consisting of 22 pages listing all important tube types, with ruled spaces for writing in orders and inventory for every month. A second offering is the wall chart listing replacement aluminized pix tubes for older tubes, complete with specs. Free. (RCA)

Circle 150
Battery replacement guide, contained in this pocket-size 40-page book bound with metal spiral for easy reading, lists battery equivalents for various makes, replacements for all portable radios listed by model, and terminal designations. Extremely helpful in getting the right battery in the right set. Free. (RCA)

Circle 151
Phonograph cartridge guide consists of 4-page listing of RCA record changers with cartridge replacement numbers and outline drawings of units. Free. (RCA)

Circle 152
TV antennas and accessories of many different types are covered by this 25-page catalog. Included are UHF models, VHF conical and yagis, indoor and window types, mounts, couplers, masts and rotors. Free. (RMS)

Circle 153
Yokes, flybacks and coils are comprehensively covered in four separate pieces of literature. The 42-page catalog and 8-page supplement contain a complete replacement guide listing TV sets by makes and models, coil numbers and their replacements, and circuit applications. Also available are a price schedule and cross-reference chart of coil designations. Free. (Rogers Electronic)

Circle 154
Phonograph cartridges, with sheets functioning as visual replacement guides, aid servicing of automatic changers and manual players. Free. (Ronette)

Circle 155
Battery eliminators for 6 and 12 volt systems are described in this 2-pager. Free. (Schauer Mfg.)

Circle 156
Parts storage bins are shown in this 4-page brochure and extra price list sheet. Free. (Service Parts Systems)

Circle 157
Replacement needle reference guide for all phonographs makes it easy to replace worn needles. Just pick out the needle from any of the 442 drawings of different designs, and make replacement. Two other cross-references included in this valuable 22-page reference lists needles by phono maker and cartridge maker models. Normally selling for $2.50, this guide is available to TECHNICIAN readers free. (Recoton)

Circle 158
Cartridges, mikes and tape heads are among the many audio products presented in this 12-page brochure. Of particular interest are the cartridge replacement chart for 10 manufacturers, and head replacement chart for tape recorders. Separate sheet lists 132 cartridges which can be replaced by ceramic series. Free. (Shure Bros.)

Circle 159
Test equipment descriptions and performance are presented in two bulletins. A 6-pager covers multitesters, scope, generators and various meters for radio-TV servicing. A 4-page brochure shows instruments for repairing industrial equipment and appliances. This includes temperature, line current and watt meters. Free (Simpson Elec.)

Circle 160
Intercoms for home and commercial use are attractively described, along with types of system connections, in 7 brochures covering 30 pages. Different models from 2 to 24 stations are presented, offering techs new audio sales opportunities. Free. (Masco—Mark Simpson Mfg.)

Circle 161
Public address sound systems, from 5 to 125 watts, are presented in this 20-page brochure, plus a 6-page and 2-page bulletin. Portable amplifiers, speakers, phonos and accessories. Free. (Masco—Simpson Mfg.)

Circle 162
Ceramic capacitor replacement manual covering TV sets made since 1950 lists models produced by 76 set manufacturers, together with capacitor ratings, type numbers and circuit section component is used in. This 66-page reference should prove invaluable to every service tech. In addition, a large "Ceramichart" for wall mounting shows ceramic capacitor circuit applications, characteristic table, codes. Free. (Sprague)

Circle 163
Electrolytic capacitor replacements are fully presented in two highly useful reference manuals. One is a 66-pager covering 4,664 TV models made by 85 set manufacturers. Specs and replacements are cross-referenced to original parts numbers. The other is an 8-pager listing replacement electrolytics for all auto radios. Free. (Sprague)

Circle 164
TV accessories described in several sheets include crt tester adapter, loopsticks, i-f signal booster, and handy six-page brochure "How to Make an 'Extra Buck' on all Service Calls." Free. (Superex)

Circle 165
TV picture tubes and crt's, from the 3HP7 to the 30BP4, are listed in 4 references that are a must for every shop. There's the 24-page manual listing the specs of all magnetic and electrostatic types, with base diagrams. The wall chart on aluminized pix tubes shows replacements for original types. The pocket-size 12-page pix tube selector enables you to note specs immediately. Last, and far from least is the giant TV picture tube comparison chart ready for wall mounting. Free. (Sylvania)

Circle 166
Receiving tubes are comprehensively covered in this very desirable 48-page reference covering the characteristics and basing of any tube a technician would come across in his servicing. Free. (Sylvania)

Circle 167
Business and service aids are attractively illustrated in two booklets. One is the brand new 20-page "A Guide to Good Business," which tells how to plan operations, put up window displays, analyze earning power, and lots more. The other is the 8-pager showing store identifications, technical aids, tools, business forms and shop garments. Free. (Sylvania)

Circle 168
Crystal diode replacement problems? This informative guide ready for book insertion or wall mounting lists many silicon and germanium types. Free. (Sylvania)

Circle 169
Antennas, couplers and accessories for TV and FM are attractively presented, along

(Continued on page 35)

with gain characteristics and radiation patterns. A great many different types and models are shown in 30 pages punched and ready for insertion in your reference notebook. Free. (Taco—Technical Appliance)

Circle 170
TVI analyzer, filters, traps, boosters and other accessories are shown in this 8-page brochure. Free. (Telematic)

Circle 171
Transformers, yokes and coils of all kinds for TV are cross referenced under TV set manufacturer and models numbers, broken down according to coil function. A gold mine of useful data is included in this valuable 40-page replacement guide. A second brochure catalogs amplifier kits, with circuits, toroids, chokes and other transformers of interest to techs in 32 pages. Free. (Triad)

Circle 172
Panel and flashlight lamps are compiled in this 2-page chart. Lamps by 7 leading manufacturers are listed with specs and drawings. Free. (United Catalog)

Circle 173
High fidelity speakers, including the operating principles, tweeters, horns and other types, are discussed in simple terms in this attractive new 28-page booklet, "The Ultimate in Sound." Also a new guide to "Progressive Speaker Expansion." Free. (University Loudspeaker)

Circle 174
Tools for servicing are beautifully shown in this multi-color 40-page booklet which covers alignment tools, screw and nut drivers, pliers and many special designs. Free. (Vaco)

Circle 175
TV accessories, a great variety of them, are shown in 18 pages ready for notebook insertion. Included are attenuator, couplers, pix tube test and brightener, retrace eliminator, socket adapters and others. Free. (Vidaire)

Circle 176
Communications antennas, mobile mounts and adapters are described in this 10-page brochure. Free. (Ward)

Circle 177
Generators for color TV, white dot linearity and rainbow, are presented in two brochures. Free. (Winston Electronics)

Circle 178
Fusible resistor and temperature sensitive filament resistors are cross-referenced with various TV makes in this 2-sheet replacement guide of help to service techs. Free. (Workman TV)

Circle 179
TV guy wire basic specs are presented in this handy little 4-page brochure. Free. (Wright Steel & Wire)

Circle 180
Test instruments of direct interest to TV-electronic techs are effectively presented in two useful booklets. First is a brand new 24-page catalog of test gear, including tube testers, voltmeters, scopes, generators, etc. The second one, also well recommended, is a new 20-page tube tester "book of facts," including theory and operation of dynamic mutual conductance testing. Latter normally priced at $1, but available to TECHNICIAN readers free. (Hickok)

Circle 181
"Video Probe Meter" data explains how this instrument can test for signal loss, trace video from top of chassis, check audio and sync circuits, etc., simply by placing pickup coil at various locations of chassis, and reading meter. A simple yet clever device. Free. (Research Inventions & Mfg.)

Circle 182
Rectifiers and power supplies are listed with ratings in this new brochure. Also included are chokes and transformers. Free. (Technical Apparatus Builders)

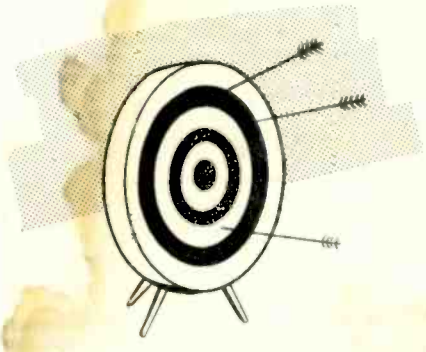
Circle 183
Voltage adjustor and automatic voltage control for detecting and correcting low voltage on TV receivers are profitable devices for service techs. Two bulletins provide all the info you need. Free. (Acme Electric)

Circle 184
Capacitors, resistors, printed circuit units, and filters are presented, covering a full line used by TV shops. Very good reference. Free. (Aerovox)

Circle 185
Parts and equipment supplies, some 26,000 items to be more exact, are described in this distributor catalog containing 324 pages, a virtual storehouse of the industry. Free. (Allied Radio)

Circle 186
Wire and cable brochure, including data on jackets, conductors, dielectrics, RG/U nomenclature and a cable selector chart, is a most worthwhile 34-page reference. Free. (American Phenolic)

Circle 187
TV transformer replacement guide, listing replacements for over 7000 models and chassis for 116 TV manufacturers, is a very useful reference to have around the shop. Free. (Chicago Standard Transformer)



DON'T MISS

any of the literature you want. Here's a tip - - -
Tear out the inquiry card on page 33, and place it on the page you're reading. Circle the card numbers as you decide on each item that you wish to receive.

Circle 188
Resistors and hardware, including standoffs, fed-thru insulators, sockets and spaghetti, are shown in this brochure. A second item of interest to techs are the revised sheets on fixed glass capacitors and glass resistors. Free. (Erie Resistor)

Circle 189
Rectifiers are effectively presented in three brochures for service techs. Titles include: "Diffused Junction Power Stacks," "Selenium Rectifier Design Data Guide," and "Diffused Junction Power Rectifiers." Free. (Federal Tel. & Radio)

Circle 190
Printed circuit repair information is compiled in this 6-page service manual of considerable interest to technicians. Booklet is punched for looseleaf binder insertion. Free. (General Cement)

Circle 191
Replacement transformers for TV, plus others for hi-fi and industrial uses, are contained in this brochure which will prove helpful in the service shop. Free. (Gramer Halldorson)

Circle 192
Picture tube replacements for TV are listed in this chart, with descriptions of each. Very useful when a big crt job is in the offing. Free. (Haydu)

Circle 193
Germanium diodes and power rectifiers are specified in two bulletins covering various types of applications of direct interest in servicing operations. Free. (International Rectifier)

Circle 194
Volume controls and resistors are detailed in two separate publications that every shop should have at hand as component replacement references. Foremost is the 8-page "Q Control" catalog showing different shafts, resistance values and tapers. The other is an informative technical bulletin in molded printed circuits. Free. (International Resistance)

Circle 195
Loudspeakers are presented in two bulletins which will definitely interest techs who do portable radio and hi-fi work. One is a technical bulletin on a speaker used in transistorized radios. The other is a handy 6-page booklet showing the numerous speaker kits available. Free. (Jensen Mfg.)

Circle 196
Mast-mounting booster for VHF, called the "Desnower Preamplifier," is described in this 4-page brochure. Free. (Jerrold)

Circle 197
Solder, one of the most basic materials used in electronic servicing, is described in literature listing various lead-tin combinations from small packages to 20-pound spools. Free. (Kester Solder)

Circle 198
Coils, transformers and related components for auto radios and TV sets are listed in these two separate replacement guides that contain so much valuable data, no tech should be without them. The 80-page 1956 Replacement Guide for coils cross-references 12,000 models and chassis over 155 brand names. The Auto Radio Replacement Guide covers all model cars. Free. (Merit Coil & Transformer)

Circle 199
Sales and promotion aids described in this wonderful booklet, "Ball-of-Fire Business Builders," shows how you can obtain everything from cardboard cutout truck to give children on house calls to giant window streamers, every item designed to boost your business volume. Free. (Raytheon)

Circle 200
Antenna towers and accessories, including masts and tubing, for all installations are described in this folder. Everything you need to get that antenna up in the air is presented. Free. (Rohn Mfg.)

Circle 201
Capacitors, with parts numbers cross-referenced with those of four other leading manufacturers of twist tab dry electrolytic TV replacements, are listed in this helpful catalog for TV servicing. Free. (Sangamo)

Circle 202
Speakers, including two new woofers, are described with technical specs in these catalog pages ready for notebook insertion. Included is a helpful little section on enclosure construction, with cabinet and vent dimension table. Free. (Quam-Nichols)

Circle 203
Selenium rectifiers, new high temperature types, are offered in this bulletin which includes ratings and characteristics. Service techs will find this data of interest. Free. (Sarkes-Tarzian)

Circle 204
Semiconductors, including diodes and transistors of various types, are described in these bulletins. Techs will be interested in current, voltage and temperature characteristics. Free. (Texas Instruments)

Circle 205
Yokes, flybacks and transformers that are exact replacements are listed in these cross-reference guides for various set makers. Units are made to original specs, including lead colors and mountings. Service shops should have this time-saving data at hand. Free. (Todd-Tran)

Circle 206
Antennas and rotators, their specs and prices, are offered in this booklet that's a helpful reference for new and replacement installations. Free. (Trio Mfg.)

Circle 207
Test equipment for radio, black & white TV, and color TV are nicely presented in this 16-page brochure. Free. (Triplett)

Circle 208
Cartoon sales aid booklet tells your customer and prospects about your training and reliability in some very easy to understand 16 pages. Good for educating your customers the right way. Free. (Tung-Sol)

Circle 209
Electronic kits, including test equipment, hi-fi and other electronic products, are shown in this 50-page booklet which will interest TV-electronic techs by its broad coverage of different products. Free. (Heath)

Circle 210
Electronic parts, including antennas, capacitors, resistors, vibrators, transformers, speakers, hardware, noise suppression material and auto radio controls, are colorfully illustrated in 7 informative bulletins. Free. (United Motors)

Circle 211
Test instruments, a complete line of them for servicing TV, communications and industrial electronic gear, are shown in this brochure sure to interest service techs. Free. (Weston)

Circle 212
TV antennas with a special element to assure good reception are described in this folder. Free. (Winegard)

Circle 213
"Television Almanac" of antennas, mounts and accessories presents the lowdown on video skyhooks, lightning arrestors and other related products. This brand new 1956 reference catalog is attractively illustrated. You'll want one. Free. (JFD Mfg.)

Circle 214
Color TV converter question and answer 6-page folder, just off the press, tells you how much the converter costs, which sets it works on, what device consists of, and many other facts you've no doubt been wondering about. Free. (Color Converter)

Circle 215
Battery replacement guides, one an 8-pager and the other a large double sheet, list radio makes and models with their battery replacement types, and cross reference this company's stock numbers with those of NEDA and 13 other makers. Free. (Eveready —National Carbon)

Circle 216
Semiconductor diodes, including germanium and silicon types for TV and general application, are presented with specs and physical dimensions in this informative 8-page brochure. Of notable interest is the 2-page interchangeability reference chart. You should have this one in your notebook. Free. (Raytheon)

Circle 217
TV antennas with versatile design for metropolitan and fringe reception are presented in literature telling you about the performance of antennas included in this manufacturer's line. Free. (Snyder Mfg.)

Circle 218
Capacitor tester, what it will do for you, how it works and other useful technical information to improve your servicing, are contained in this reprint of an interesting technical article. Free. (TeleTest Instrument)

Circle 219
Battery interchangeability chart, covering over 80 type designations cross-referenced for 16 manufacturers, is an excellent aid in speeding portable radio servicing. No need to hunt for the right battery. Just look it up and make the replacement. Free. (General Dry Batteries)

FREE SUBSCRIPTIONS

Circle 220
"The Capacitor" is a regular monthly magazine, generally running between 20 and 24 pages. It contains several pages of technical material on circuits components or equipment, followed by the unique "Trading Post" section where free ads from readers note technical equipment wanted, for sale or offered to swap. Free. (Cornell-Dubilier)

Circle 221
"Confidential Dealer Bulletin" that is published practically every month covers the technical and product aspects of various audio devices such as turntables and amplifiers. Free. (Fairchild Recording)

Circle 222
"Techni-Talk" is a bimonthly publication for radio-TV servicing. It contains practical troubleshooting short cuts, discussions of circuit operations and helpful bench notes that every tech will value. Free. (General Electric)

Circle 223
"Sylvania News" is a most valuable monthly publication which may often run about 12 pages. It contains service news, a very informative technical section, and helpful merchandising material. Also included are new tube spec sheets as they become available. Get on this list. Free. (Sylvania)

LITERATURE FROM MANUFACTURERS (AT NOMINAL CHARGE)

Circle 224C
Electrolytic replacement guide for all capacitors of this type used in TV sets contains cross-reference with manufacturer's parts numbers. It's brand new and up-to-date. All makes from Admiral to Zenith. 25¢. (Aerovox)

Circle 225C
Sound systems and what you should know about them are thoroughly discussed in this 24-page booklet. Everything from operating fundamentals to system installation is covered. 10¢. (David Bogen)

Circle 226C
TV service binder, in easel form to stand up on the shop bench, provides quick reference to company's sets with charts and data. Supplementary "Serv-U-Facts" charts issued to binder owners without extra charge. Also, free subscription to the bimonthly "Tech-Flash" which describes technical aspects of sets and servicing is included. $3.00. (Capehart-Farnsworth)

Circle 227C
Control guide, pocket edition, cross references resistive control replacements with radio, TV and audio manufacturers' parts listings. Issued quarterly. This data packed handbook, 96 pages last issue, should be at the fingertips of every tech. 20¢. (Centralab)

Circle 228C
Color code calculator for resistors & tubular ceramic capacitors is a slide rule type of device with 6 rotating discs. Just set the discs to the color markings and the component values are read directly. Helps prevent mistakes, saves time. 25¢. (Centralab)

Circle 229C
"Service News" subscription plan includes, in addition to this excellent technical monthly publication which discusses circuits and servicing in 8-pages, chassis schematics and time saving "Fix Faster" booklets. This reference literature service is worth its annual cost many times over. $3.00. (DuMont)

Circle 230C
Service data book, 1956 edition, is a valuable servicing aid, containing schematics, alignment procedures and parts lists for all of the manufacturer's TV chassis from 1946 to 1955, in chronological order. Over 80 giant sized pages. $2.25 (DuMont)

Circle 231C
Selenium rectifier handbook provides 80 pages of circuit applications, dimensional diagrams and characteristic curves for TV, radio, audio, mobile and industrial. Special section gives testing and troubleshooting data. Very informative. 50¢. (Federal Telephone & Radio)

Circle 232C
Selenium rectifier replacement guide is a large-sized 52-page cross-reference of TV and radio sets, listed by make and model, together with manufacturer's part number and equivalent replacement. Popular and hard-to-find brands are both included in this valuable work. 50¢. (Federal Telephone & Radio)

Circle 233C
Speaker enclosures, with detailed plans and instructions on building them, either from kits or plain lumber, are shown in 7 different booklets. Model 1B1, $1.50; models 1B2 to 6, $1.00; 1B7, $.75 (Electro-Voice)

Circle 234C
Tube handbook presents the characteristics of receiving, TV pix and special purpose tubes, as well as germanium diodes, with basing diagrams, in 192 data filled pages. This is one of the standard industry references found in shops across the country. 50¢. (General Electric)

Circle 235C
Color TV test equipment and how to use it in receiver servicing is clearly and simply described in this 14-page booklet giving response curves and related data. 50¢. (General Electric)

Circle 236C
TV service guide, containing 98-giant-sized pages, provides schematics, parts lists, tube and trimmer locations, and photographic index of models in company's line. Covers receivers made from 1946 to 1953. Volume 1, $1.50. (General Electric)

Circle 237C
TV service guide, similar to above #236C, covers sets made since 1953. Volume 2, $1.00. (General Electric)

Circle 238C
Hi-Fi speaker system manual with 18 enclosure designs which you can build yourself are covered in this highly desirable 36-page book. Complete drawings for cabinet work plus easy-to-follow instructions are featured, with interesting data on kits. 50¢. (Jensen Mfg.)

Circle 239C
Audio technical monograph series provides the technician with a wealth of important information. No technician can honestly claim to understand audio reproduction fully unless he comprehends the data in these publications. A real reference work. "Loudspeaker Frequency-Response Measurements," 15 pages. No. 1, 25¢. (Jensen Mfg.)

Circle 240C
Audio series similar to above #239C. "Impedance Matching and Power Distribution in Loudspeaker Systems," 19 pages. No. 2, 25¢. (Jensen Mfg.)

Circle 241C
Audio series similar to above #239C. "Frequency Range and Power Considerations in Music Reproduction," 14 pages. No. 3, 25¢. (Jensen Mfg.)

Circle 242C
Audio series similar to above #239C. "The Effective Reproduction of Speech," 14 pages. No. 4, 25¢. (Jensen Mfg.)

Circle 243C
Audio Series similar to above #239C. "Horn Type Loudspeakers," 16 pages. No. 5, 25¢. (Jensen Mfg.)

Circle 244C
"Servicing by Signal Substitution" is the name of this 92-page manual describing the use of the signal-marking generator in the systematic approach to service and alignment problems. This book can be a big step toward becoming an advanced technician. Among the many things you can accomplish quickly is i-f gain-per-stage tests, locate shorted or open coils, pick out hard-to-find open capacitors, and lots more. 40¢. (Precision Apparatus)

Circle 245C
Sine-square wave generator manual describes the instrument in great detail, followed by testing techniques, interpretation of scope waveforms, and procedures for determining the performance of audio and video amplifiers. 20 pages. 25¢. (Precision Apparatus)

Circle 246C
Sweep signal generator manual explains the principles of operation and setup procedure, followed by very detailed descriptions of how you go about aligning TV, FM and other high frequency receivers. The 32 pages contain a helpful section on scope waveshape analysis. 50¢. (Precision Apparatus)

Circle 247C
Wideband oscilloscope manual, with 20 data packed pages, describes scope functions and operation, followed by applications in FM amplifier alignment, color TV troubleshooting, servicing buzz, sync circuits, and more. 50¢. (Precision Apparatus)

Circle 248C
Receiving tube manual is one of the standard industry references found in many shops across the country. This important 336-page book lists practically every tube techs might come across. Theory, complete characteristics, curves, basing, etc., are given. It's a must. 60¢. (RCA)

Circle 249C
Picture tube replacement directory has 16 pages divided into two parts. First part gives ratings and characteristics of 60 types. Second part lists replacements for more than 150 industry types. Very useful. 20¢. (RCA)

Circle 250C
Receiving tube reference for AM, FM and TV has 28 up-to-date data-packed pages of tube characteristics and socket connections, with a special section for kinescopes. Basing diagrams are shown by tube type. 15¢. (RCA)

Circle 251C
TV servicing publication, consisting of compilation of practical technical articles in 48 pages, provides much useful data on alignment, deflection troubles, agc and hum problems, and much more. A 12-page supplement is called "Troubleshooting Tough Sets or Dogs," and offers many time saving analyses. 50¢. (RCA)

Circle 252C
"Practical Color Television for the Service Industry" is the name of this important and readable 84-page book which lays the groundwork for your entrance into the growing color field. Everything you want to know from basic circuitry to testing techniques is covered. $2.00. (RCA)

Circle 253C
"Large Screen Color Receiver" is 36-page supplement to above #252C, which provides detailed emphasis, with complete circuit, on the operation of the 21CT662. $.75. (RCA)

Circle 254C
TV service parts guide, listing original manufacturer's replacements, has 16 pages of stock numbers cross-referenced by chassis number. All of this set maker's models from 1946 to 1954 are covered. Very helpful if you're looking for a replacement of a component like a transformer that's not readily available. 15¢. (RCA)

Circle 255C
Reactance slide rule has 5 separate scales which enable you to solve resonant frequency and reactance problems quickly and easily. No need to fuss with formulas and arithmetic. 50¢. (Shure Bros.)

Circle 256C
"1001 Uses for the Model 260 Volt-Ohm-Milliammeter" is the title of this 50-page handbook which discusses vom applications in TV, broadcasting, communications, schools, garages, aircraft, industrial plants and many others. $1.00. (Simpson)

Circle 257C
Capacitor indicator slide rule provides quick way to decipher color codes on molded paper tubulars. Merely by turning dials to proper colors, it shows capacitance, tolerance and voltage. 15¢. (Sprague)

Circle 258C
Ceramic capacitor slide rule easily determines values of ceramic capacitors which can be connected in parallel to equal desired intermediate temperature coefficients of a specific capacitance. 15¢. (Sprague)

Circle 259C
"Scope Connections" is the title of this extremely helpful booklet covering everything from elementary data on scope function to information of determining overall video i-f response. $2.00. (Triplett)

Neither snow nor rain nor gloom of night will stop the postman from bringing you the literature you want

IF

you promptly circle the numbers and mail the card on page 33

ACT NOW!

Circle 260C
Technical tube manual, a most valuable standard reference book, contains complete data on all TV picture and receiving tubes, plus material on rc amplifiers, use of characteristic curves and much more. The many hundreds of pages are enclosed in a special looseleaf binder which enables you to insert additional free data sheets that are sent periodically as new tubes become available. A gold mine of tube info. $2.00. (Sylvania)

Circle 261C
"Servicing TV Receivers" has over 150 pages bound with metal spiral. After describing considerations in servicing various stages in the set, it presents dozens of photos of picture tube patterns caused by various troubles, plus explanations of symptom, analysis and procedure. Separate section on troubleshooting, alignment, etc. $2.00. (Sylvania)

Circle 262C
"Television Receiver Tube Complement Book" is the title carried on this 120-pager which lists over 100 makes and 3500 models of sets a few years old, together with the types of tubes used in each set. Special listing of set maker trade names and addresses is a good reference. 75¢. (Sylvania)

Circle 263C
"28 Uses for Junction Transistors" has over 50 pages, a real manual of practical applications. It covers theory, amplifiers, oscillators, controls and transistorized instruments. Circuits, explanations and response charts are all given. 25¢. (Sylvania)

Circle 264C
"Crystal Diode Circuit Kinks" has more than 40 pages describing 40 practical circuits using germanium diodes. Among them are voltmeters, probes, limiters, modulators, generators and many others of considerable interest to techs. 25¢. (Sylvania)

Circle 265C
Tube base diagram book in handy vest pocket size blueprints more than 350 bases for over 1300 tubes. Excellent quick reference. 75¢. (Tung-Sol)

Circle 266C
TV business forms, including bills and claim checks, stick-on service charts, account sheets, call tickets, service records, service contract forms and other items for keeping your business shipshape. Sampler 10¢. (Oelrich)

FREE INFORMATION ON BOOKS

(If you want to order book, enclose amount required, and state listing number and title.)

TECHNICAL BOOKS

Circle 267
"TV & Radio Tube Substitution Guide." 22 pages. Paper cover. 50¢. Suggested direct tube replacements, using types with similar characteristics for same sockets, is helpful where identical replacements are not obtainable. Receiving and pix types. More data free. (Cisin)

Circle 268
"Repairing Record Changers," by E. Ecklund. 278 pages. Hard cover. $5.95. Practical manual on repairing mechanical elements such as motors, drives and tripping mechanisms. Also pickups and needles. Magnetic recorder repairs included. More data free. (McGraw-Hill)

Circle 269
"Practical Radio Servicing," by W. Marcus & A. Levy. 565 pages. Hard cover. $8.50. Complete explanation of how radio set is constructed, how it functions, what can go wrong, how to find trouble and remedy it. More data free. (McGraw-Hill)

Circle 270
"Color Television Fundamentals," by M. Kiver. 312 pages. Hard cover. $6.00. Extensive coverage of basic color TV principles and operation of receivers. Shows how to install and service color sets. More data free. (McGraw-Hill)

Circle 271
"Television Fundamentals," by K. Fowler & H. Lippert. 524 pages. Hard cover. $7.00. Simple and authoritative treatment of basic principles. Description of elements in receiving system, from antenna to pix tube. More data free. (McGraw-Hill)

Circle 272
"Transistors: Theory and Applications," by A. Coblenz & H. Owens. 313 pages. Hard cover. $6.00. This reference discusses both silicon and germanium transistors, how they work, how they are made, and how they are used. More data free. (McGraw-Hill)

Circle 273
"Radio Operating Questions and Answers," by J. Hornung & A. McKenzie. 12th ed.

571 pages. Hard cover. $6.00. Specific information on radio law, operating practice and theory for those studying to pass FCC commercial radio exams of various license grades. More data free. (McGraw-Hill)

Circle 274
"Theory and Design of Television Receivers," by S. Deutsch. 550 pages. Hard cover. $7.50. Physical explanation for the behavior of various TV receiver circuits, and discusses their practical design. More data free. (McGraw-Hill)

Circle 275
"Advanced Television Servicing Techniques," by RETMA. Text: 176 pages. Soft cover. $3.60. Lab book: 32 pages. Soft cover. 95¢. Complete industry-approved servicing course designed to raise technical skill of professional techs. Broad coverage includes test equipment, servicing various sections of set, antennas and much more. More data free. (Rider)

Circle 276
"TV Field Service Manuals with Tube Locations," by H. Alsberg. 4 volumes. Soft cover. $9.00. Covers symptoms, check points and many illustrations of set models over 7 years from 1947. Alphabetical coverage of makes from Admiral through Hoffman. More data free. (Rider)

Circle 277
"TV Manufacturers' Receiver Trouble Cures." 7 volumes, over 115 pages each. Soft cover. $1.80 ea. Listed by manufacturer and set model, books give corrections for most faults. Each cure is factory authorized. Volumes cover different set makers. More data free. (Rider)

Circle 278
"Picture Book of TV Troubles," by Rider Staff. Vol. 1, 80 pages, $1.35. Vols. 2, 3, 4, 96 pages, $1.80. Faulty pix tube patterns are integrated with scope waveforms for quick trouble diagnosis. Vol. 1, horizontal afc, oscillator circuits. Vol. 2, vertical sweep, deflection. Vol. 3, video i-f, amplifiers. Vol. 4, agc circuits. More data free. (Rider)

Circle 279
"TV Troubleshooting and Repair Guidebooks," by R. Middleton. Vol. 1, 204 pages, soft cover, $3.90. Vol. 2, 160 pages, soft cover, $3.30. Down-to-earth servicing data in Vol. 1 includes alignment, sync troubles, video circuits, high voltage, and instrument use. Vol. 2 covers front ends, i-f strips, audio and horizontal circuits. All practical. More data free. (Rider)

Circle 280
"How to Use Meters," by J. Rider. 144 pages. Soft cover. $2.40. All basic info you need on vom's vtvm's, meter movements, etc. Adapting meters for audio, r-f. Applications. More data free. (Rider)

Circle 281
"TV Sweep Alignment Techniques," by A. Liebscher. 128 pages. Soft cover. $2.10. The whole story on alignment. TV sets, video, i-f, sound, with actual sweep curves, UHF data. Time-saving methods. More data free. (Rider)

Circle 282
"How to Install TV Antennas," by S. Marshall. 128 pages. Soft cover. $2.50. Sometimes called the "antenna bible." Covers precautions, erecting masts, fringe areas, antenna types, and masonry work. More data free. (Rider)

Circle 283
"How to Troubleshoot a TV Receiver," by J. Johnson. 128 pages. Soft cover. $1.80. On an intermediate level, book uses step-by-step guide to tell how to approach service problem, interpret symptoms and make adjustments. More data free. (Rider)

Circle 284
"How to Locate and Eliminate Radio and TV Interference," by F. Rowe. 128 pages. Soft cover. $1.80. Covers interference sources, locating equipment, filters, appliances, and elimination techniques. More data free. (Rider)

Circle 285
"Introduction to Color TV," by M. Kaufman & H. Thomas. 144 pages. Soft cover. $2.10. Down-to-earth explanation explains color phenomena, the NTSC system, color receivers and pix tubes. Important reference for growing new medium. More data free. (Rider)

Circle 286
"How to Service Tape Recorders," by C. Tuthill. 160 pages. Soft cover. $2.90. The recording heads, electronic circuits and drive mechanisms are all covered. Practical examples of troubleshooting recorders. Shop requirements noted. More data free. (Rider)

Circle 287
"How to Install and Service Auto Radios," by J. Darr. 128 pages. Soft cover. $1.80. Practical, detailed instruction for all types of auto radios, not schematics. Where to run lead-ins, how to install antennas, eliminate noise and test vibrators. Preventative maintenance. More data free. (Rider)

Circle 288
"Fundamentals of Transistors," by L. Krugman. 144 pages. Soft cover. $2.70. Techs will be running across more and more transistor servicing jobs. Book clearly tells how units operate, different circuit applications, amplifiers and oscillators. More data free. (Rider)

Circle 289
"Radio and Television Receiver Circuitry and Operation," by A. Ghirardi & J. Johnson. 669 pages. Hard cover. $6.50. Comprehensive basic work covers everything from amplitude modulation through TV sets and record changers. Non-mathematical. Generous glossary of terms. More data free. (Rinehart)

Circle 290
"Radio and Television Receiver Troubleshooting and Repair," by A. Ghirardi & J. Johnson. 820 pages. Hard cover. $6.75. Starting with a careful analysis of components, this giant reference goes through all details of troubleshooting many different kinds of receivers. 417 illustrations. More data free. (Rinehart)

Circle 291
"Practical Television Servicing," by J. Johnson & J. Newitt. 344 pages. Hard cover. $4.00. In addition to r-f and TV fundamentals, major emphasis is on repair problems, including video amplifiers, sweep, power supply, and antennas. Alignment and service hints included. More data free. (Rinehart)

Circle 292
"Basic Electronic Test Instruments," by R. Turner. 171 pages. Hard cover. $4.00. Over 60 instruments, from simple meters to special purpose bridges, are carefully described. Operation described in easy to understand steps. More data free. (Rinehart)

Circle 293
"Radio Servicing Course." $2.50. Book laid out like correspondence course, with self-testing questions, covers fundamentals through practical repair problems and use of instruments. More data free. (Supreme)

Circle 294
"Television Servicing Course." $3.00. Follows correspondence course format. Has lessons on circuits, faults, adjustments, short-cuts, UHF, alignment, antennas and troubleshooting. More data free. (Supreme)

Circle 295
"Simplified Radio Servicing by Comparison Method." 92 pages. $1.50. How to make repairs using only simple test gear. Over 1000 practical service hints. Troubleshooting blueprints. More data free. (Supreme)

Circle 296
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Circle 372
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Selecting & Installing

Two-Way Radio Systems

Consider Terrain, Area Coverage and Operating Frequency

JACK DARR,
Ouachita Radio-TV Service

• Satisfactory performance and low maintenance costs are the two major factors to be considered when planning the installation of any two-way radio system. This may be achieved only by the most detailed, painstaking planning of the entire system, well in advance. Power requirements for equipment, transmitter locations, antenna types, and many other details must be worked out well before the actual construction of the system is begun, if many future troubles are to be avoided.

The primary consideration, of course, is the coverage of the system. This may operate entirely within the city limits, or may be all over two or three counties, and the terrain may range from flat to hilly or even mountainous.

Frequency assignments are made by the FCC according to the type of service: power, marine, highway transport, etc. Power utilities, for instance, are assigned in two frequency bands, 25—50 mc and 152—174 mc. The system will be assigned a specific frequency in the band, according to local conditions. Our local unit for the Rural Electrification Administration, as an example, was assigned to 153.71 mc, because there were already several REA systems working on that frequency in our area. Thus, the mobile units of one system can work with base stations of another system, in emergencies.

For a complete listing of all frequency assignments, get a copy of the FCC *Rules Governing Industrial Radio Service, Part 11.* These may be obtained from the Superintendent of Documents, Washington 25, D.C., for fifteen cents, and you must have a copy of them in the files, anyway, to operate the system.

Let's assume you will be working in the high band, 152—174 mc. This makes antenna sizes smaller, but poses serious problems as to coverage, due to shadow effects in mountain terrain. The lower band will give much better long-distance service, if your system calls for this.

Choosing Antenna Site

Let's assume also that the terrain *is* mountainous, so as to consider the worst possible conditions. The selection of an antenna site for the transmitter will determine the performance of the entire system, much more so than even the power output. The primary requirement for this high band, of course, is *height.* Sufficient altitude will enable you to "shoot down" into valleys, behind mountains, etc., into places which would otherwise be "dead spots," of which you'll find plenty, anyhow.

In mountainous country, there will probably be hills near enough to the town to enable the use of one of them for the antenna site. If not, then the only answer is a very tall tower. By using the hill to gain the altitude, many problems are avoided.

Accessibility of power supply lines and telephone lines is another factor. All commercial base-station transmitters are capable of being remotely controlled: only one pair of wires is needed. These will carry audio currents for the receiver, modulate the transmitter, and in addition carry the small dc voltage that keys the transmitter, through a very sensitive relay. See Fig. 1.

If it is at all possible to construct these control lines yourself, by all means do so: the only other alternative is to rent them from the telephone company, and the rental charges over a period of years will pay for the cost of the line. This is especially feasible if the owner of the radio system is a power utility, such as REA.

Next factor to be considered, having selected a hilltop site, is the coverage available from there. If it is at all possible, actual transmissions should be made, using portable equipment, operating on or near the assigned frequency, so as to get an idea of the actual terrain covered. This is sometimes very different from the computed values, but usually is much greater than estimated. If this is not possible, a terrain map, preferably a contour map, should

(*Continued on page* 61)

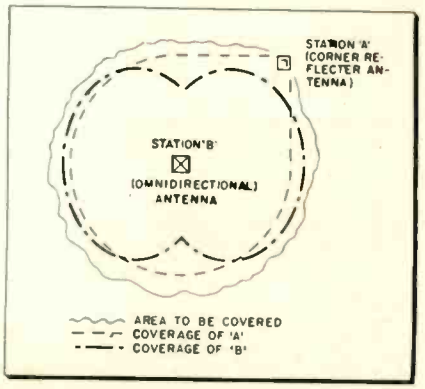
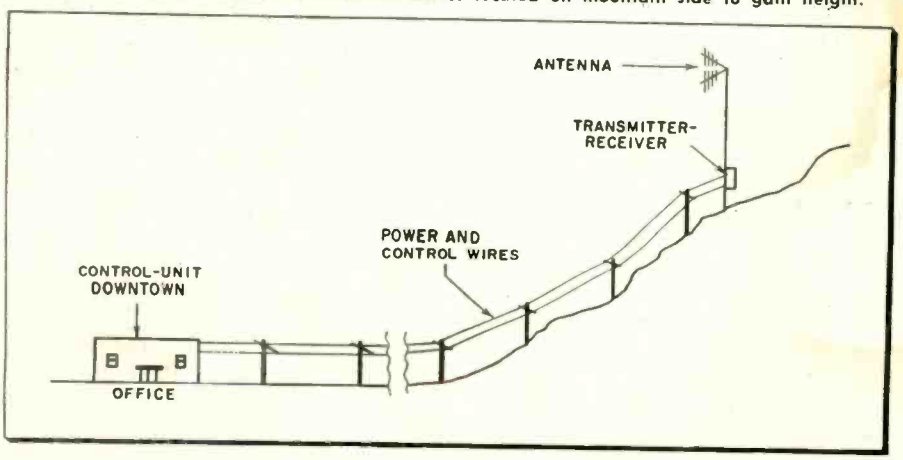
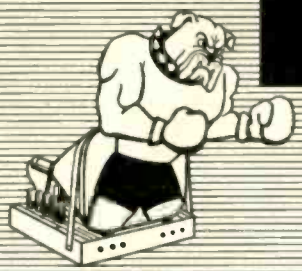


Fig. 2—Choice of the antenna type depends on its location within the area to be covered.

Fig. 1—Remote-controlled transmitter-receiver located on mountain side to gain height.





"Tough Dog" Corner

Difficult Service Jobs Described by Readers

CRT Causes Vert. Fault

This malfunction occurred in an RCA chassis KCS92 just a few days after the set had been installed. A bad case of vertical nonlinearity that could not be cleared up in the home caused the set to be brought into the shop.

A voltage check in the vertical oscillator and output stages disclosed a low plate voltage in the output stage. There was only 90 volts present although (see circuit) 155 volts is normal, supplied from the boosted B-plus through two dropping resistors and the height control. A check of the tube and all components in the plate and grid circuits for shorts, changes in value, etc., proved unproductive. With all normal possibilities eliminated, the search began for the less obvious relationships or connections.

More careful observation of the schematic and set wiring disclosed a lead running from the top of the height control, through the set's built-in phonograph switch, to the first anode (pin 10) of the 21AMP4 picture tube. In effect, the B-plus boost voltage was being supplied to the pix tube and the height control from the same point.

It then became obvious that first-anode voltage would be insufficient also. Instead of 450 volts we had 130 volts. However, the possibility of any defect in the picture tube was still considered remote, since the picture appeared to be of normal quality. Nevertheless, a resistance check of crt connections showed 300 k leakage between the first anode and the filament. Presumably, this leakage occurred between the leads to these electrodes in the tube base.

It was decided not to tamper with the base, since the picture tube was in warranty. Replacement of the big tube restored voltages and performance to normal, with acceptable vertical linearity now attainable.—*Bernard E. Hollembeck, Vandalia, Mo.*

Wrong Clues

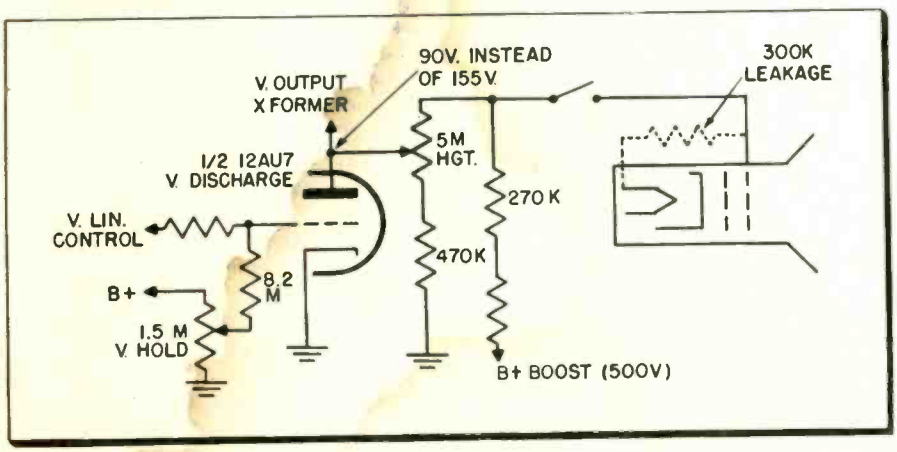
The customer's original telephone complaint on this Admiral 21A3 was that there was a horizontal line across the screen instead of a full raster before her husband had started fooling with the set. Now there was no picture at all. Also, would we please put the top back on a tube that her husband had pulled off. The sound was okay, she assured us.

When we arrived, she informed us that her two children were sleeping and asked us to please keep the set quiet for that reason. Accepting her reassurance that the sound was okay, we turned the set on with the volume control kept down and just observed the screen. There was no raster present. After substituting all horizontal and high-voltage tubes with no luck, we decided to pull the chassis.

After setting up in the shop, we checked the boosted B-plus and found it to be only 250 volts. This seemed like a clear-cut high-voltage problem until we measured the regular B-plus and found it to be only 135 volts—so the boost circuit was working. Since the B-plus reading right up to the cathode of the 5U4 low-voltage rectifier was still only 135 volts, we replaced the 5U4. This brought the straight line back to the screen instead of the raster. Replacing the vertical oscillator tube now brought back the full raster and normal picture.

The sound was turned up and appeared normal. However, when the old 5U4 was temporarily put back, there was a definite decrease in sound output, which the customer either hadn't noticed or had failed to admit. In any case, here is an instance where, because of confusing circumstances, a set was pulled to the shop when the repair—two simple tube replacements—could have been done in the home. The moral is this: Although it may take some diplomacy, be careful about relying on the customer's complaint, no matter how positive it is.—*Francis J. Boyle, Winter Park, Florida.*

Though this crt appeared to be okay, leakage affected the vertical output stage.



Voltage from Nowhere

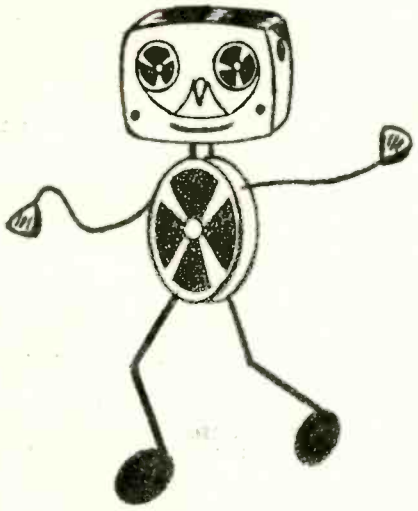
The complaint on a 17K1 Motorola was no horizontal sync. The oscillator, which was running way off frequency, wouldn't respond to horizontal control action. However, removal of the control tube (a 6AL5 phase detector) permitted the oscillator to run within its normal range.

A quick check of the afc circuit

(*Continued on page 72*)

Tape Recorder Case Book

Service Problems: Electrical & Mechanical



JAMES GRAFTON

Wow and Flutter

This problem child was a top-quality instrument, a Concertone, with more than its share of mechanical woes. Wow was evident when music was playing. When we played a tape on which a steady 3 kc tone had been recorded, a slow flutter became obvious as well.

At first it seemed the trouble would be fixed in a few seconds: the reel was warped, and kept rubbing against the tape. However, replacing the bent reel and repositioning it to sit lower on the spindle to prevent tape rub (not many recorders present this convenience of a reel-mounting level adjustment), had practically no effect on reducing wow and flutter.

The fact that direct motor drive is used on this model instead of belt drive eliminated the possibility of worn or oily belts as the usual trouble source. With the power off and the reel removed, the machine was engaged in the running position and the take-up motor was turned by rotating the spindle by hand. There it was! Ever so slightly, the spindle stuck momentarily as it spun. The motor or shaft was binding.

Since replacing the whole motor would be expensive, we took a gambler's chance. To remove the bind, the shaft was tapped quite vigorously with the wooden handle of a screwdriver. This removed the bind permanently. A quick visual inspection of the brake assembly showed the pad was not dragging due to incomplete brake disengagement; all else was well here.

When the 3 kc tape was now played, we were pleased to note the absence of wow. However, it was now easier to hear the flutter—a peculiar "multiple" kind of flutter, at that. Pressing a fingernail against the capstan while the drive motor was turning was convincing, for the time, that the drive shaft was not eccentric or loose. The only thing left was to replace the rubber pressure roller, although it looked clean and smooth.

That did it; wow and flutter were both undetectable to the ear. After the machine was returned, the owner showed us how he always left the machine *engaged* with the power off so he could turn it on immediately with a flip of the switch. He never realized that the capstan pressing against the roller in one spot for weeks at a time made tiny permanent deformations. You couldn't see the dents, but you could hear them.

Magnetized Heads

A frequent customer complaint when a tape recorder is brought in for service is a high level of background noise (tape "hiss") on all types of program material during playback, the level being much higher than was originally present with that recorder. The first thing to do, of course, is to confirm the customer's claim that the level has actually gone up—sometimes it has always been high, but the owner is just getting around to letting it bother him. This is done by playing back one of his older tapes, one that was recorded before the hiss level rose. The check can also be accomplished by playing a tape recorded on another machine to compare its hiss level on playback through the defective instrument against the hiss level on a tape just recorded on the machine under test.

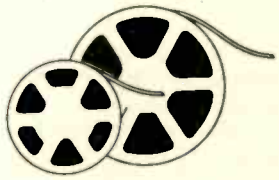
If the machine is actually recording an abnormal amount of hiss on fresh tapes—a certain amount is inevitable, especially with low level recordings—suspicion must first fall on the first stage of the recording amplifier. This tube is generally operating at high gain with a low-level input. If the tube itself is noisy at all, the noise will be quite evident and get itself recorded on to the tape. If changing the tube doesn't yield much improvement, the probability is that the recording head (often the combined record-playback head) has become magnetized. Periodic demagnetization is a necessary procedure with many recorders anyhow.

A demagnetizing coil, which is easily made up, should always be on hand wherever tape recorders are repaired. Any choke that will withstand ac line voltage—a power-supply filter choke is adequate—can be adapted for this use merely by having the leads from an ac line cord connected to its terminals, so that it can be plugged into a handy wall outlet.

To demagnetize a head, plug the coil into the ac source and place the coil up against the head in question. The coil is then *slowly* and steadily drawn away from the head. In essence, this is similar to the manner in which tape is erased (or demagnetized), as the tape is slowly transported away from the field of the erase head. After the demagnetizing coil is several feet away from the head—the greater the distance, the better—the coil is unplugged from the ac source.

Distorted Recording

Problem: tapes recently recorded on the instrument are highly distorted when played back. Instead of being reproduced smoothly, sound



from the tape appears to issue from the speaker in jagged bursts or burbles. Tapes recorded earlier on the same machine are clean, eliminating the instrument's playback system as the trouble source.

What has probably occurred is that the bias oscillator, used only in the record position, is inoperative or defective; and, more likely than not, simple replacement of the oscillator tube will clear up the difficulty. When this symptom occurs, the recorder will generally not erase efficiently, or at all, since the ac bias oscillator probably also supplies the current for the erase head.

To Cure Blocked Reception

Use a "Phantom" Antenna

Reradiator Relays Signal into Dead Spot without Wires

JAMES A. McROBERTS

• A typical reception problem in many localities, both urban and rural, is shown in Fig. 1. Some blocking structure, or more than one, prevents direct interception of the television signal. It may be a mountain, as illustrated in the figure, or it may be a tall building, as would be more usual in the urban situation.

When the set's antenna is oriented, in such cases, to pick up the best possible signal, this signal may be a wave that has been reflected several times and not capable of producing a very good picture. To overcome the difficulty, the set's antenna is sometimes placed on top of the obstructing hill or tall building, where a good signal may be obtained, and fed down to the receiver location via a transmission line, with or without booster amplifiers.

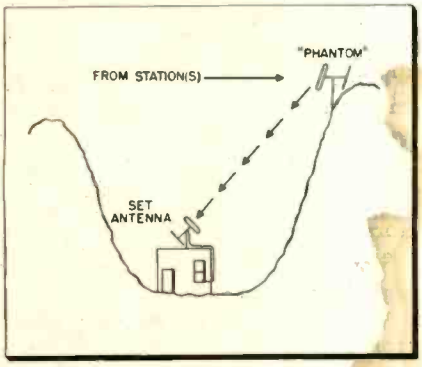
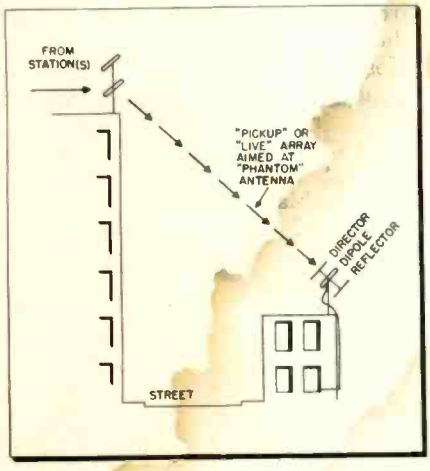


Fig. 1—"Dead spot" in a valley or between tall buildings, fed by phantom pickup unit.

Fig. 2—Alternate position of phantom unit.



In many such cases, a "phantom" antenna can solve the problem without the use of long runs of transmission line and boosters. The phantom is itself mounted in the clear with respect to signal so that it picks up signal efficiently and retransmits or reradiates to the set's normal pickup antenna. The phantom may be mounted on a hill (Fig. 1) or atop a building (Fig. 2). It may be farther from the signal source (Fig. 1) or nearer to it (Fig. 2) than the receiver's antenna. In many cases where long runs of line, such as from one building to another in metropolitan areas, are impractical, use of a phantom can save the day.

Orientation of Antennas

The phantom is oriented with the direction of reception, without regard to the location of the receiver antenna. To do its job it must pick up a reasonably strong signal. For this reason, a signal intensity check should be made before the phantom is erected. The check should cover all times of the day (and night) of interest to the set owner.

As for the set's normal antenna, it is connected in the conventional way, through a transmission line. Its orientation, however, is unconventional. It is beamed directly toward the phantom. This usually means it will not be mounted in a horizontal plane but will, in most cases, be angled up toward the higher phantom.

The receiver pickup antenna may be of conventional high-gain design, using whatever directors and/or reflectors are present in such a unit. However the phantom, as a general rule, does not have a reflector. If the installation is similar to the one shown in Fig. 2, for example, use of a reflector in the phantom would suppress retransmission in the direction of the set's pickup antenna, defeating the purpose of the installation. If the phantom is mounted behind the set's pickup antenna, as in Fig. 1, the reflector may be used to increase signal strength.

For efficient operation, the phantom antenna must be terminated in a resistor equal to its characteristic impedance, as shown in Fig. 3. This

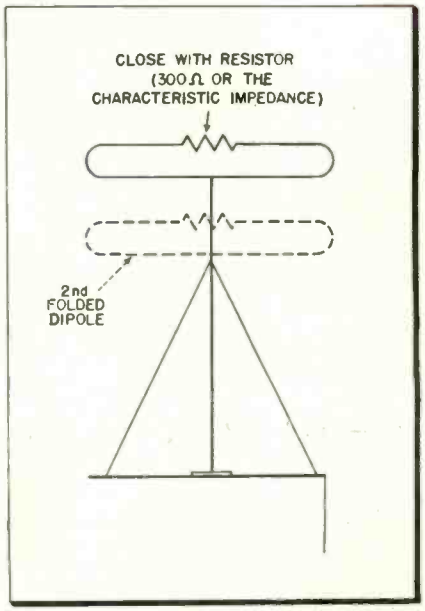


Fig. 3—Phantoms (one or more may be on a single mast) are terminated with resistors.

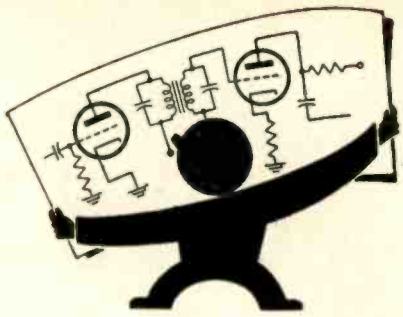
is necessary to make the antenna act like a tuned circuit and become, in effect, a retransmitter. With folded dipoles and many other conventional types, this value will be 300 ohms. To retransmit efficiently, the impedance of the phantom does not have to be the same as that of the final pickup antenna or of the receiver's input impedance.

Also as shown in Fig. 3, more than one folded dipole may be used in the phantom to increase signal pickup or to receive more than one channel. When two or more are used, the spacing between any two adjacent dipoles should be at least twice the length of the individual dipoles. This is to prevent undue interaction, which results in a lowering of the characteristic impedance of the dipoles. The dipoles *may* be placed closer together than this distance under one condition: the lowered impedance must be known so that suitable resistors, less than 300 ohms in value, may be used to close the dipoles

The two dipoles shown in Fig. 3 might also represent a high- and a low-frequency dipole mounted on the same mast, as is used in metropolitan areas to receive several different channels. Different dipoles

(*Continued on page 56*)

Let's Look at CIRCUITS



No. 7: Two Slopes for One—FM to AM Conversion, Concluded.

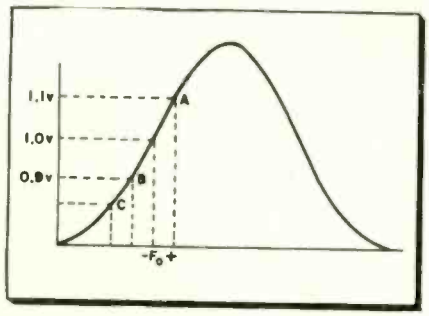


Fig. 1—How detuned receiver responds to FM.

SIDNEY C. SILVER
MANAGING EDITOR, TECHNICIAN

The last discussion described a manner in which a frequency-modulated carrier could be converted into a carrier with corresponding amplitude modulations. This system, called slope detection or conversion, is convenient in that it makes it possible to use a simple AM detector, an ordinary diode, to achieve final recovery of the audio signal while discarding the r-f or i-f carrier. As noted, however, this method is not conventionally used today in the form that was shown.

One of the reasons for avoiding the straightforward slope method is its relative inefficiency. Referring once more to the detuned i-f response curve that is used in this method, shown here as Fig. 1, let us re-examine what occurs when the carrier is swung to either side of the center or rest frequency, F_o. We have already seen what happens when the carrier swings out as far as point A or B: carrier amplitude coming out of such a tuned circuit is varied to correspond with the original deviations in frequency.

However, let us assume that a very loud modulation passage swings the carrier out to point C, which represents just as much a frequency change from point B on the baseline (frequency) as point B does from point F_o. On the vertical axis, representing voltage output, we have seen that output varies 0.1 volt from frequency F_o (1 volt) to frequency B (0.9 volt). When frequency changes to C, there should be a corresponding change in output of another 0.1 volt, to 0.8 volt. Actually, the change is less than this, as the diagram shows. In other words, beyond certain narrow limits, we cannot expect voltage output variations to correspond faithfully to frequency changes.

The reason for this lack of correspondence is that the slope or skirt of the i-f response curve is not linear over its entire length. Only the portion from A to B is close to being a straight line; only over this portion, therefore, can we expect a linear conversion of signal from one condition of modulation to the other. The usable linear segment, A-B, represents only a small portion of the total slope; the rest is wasted. In actual practice, the usable linear portion rarely exceeds 20 percent of the total length of the slope. Thus we have a highly inefficient conversion device that will fail us as soon as we require it to handle any appreciable signal amplitude.

Push-Pull Slopes

To overcome this hurdle, the arrangement shown in part A of Fig. 2 was introduced. The final i-f stage is followed by a somewhat unconventional transformer with a rather conventional tuned primary (L1), but with *two* tuned secondaries, L2 and L3. Disposition of the secondaries suggests a push-pull arrangement. In effect, that is what we have: signal in one of the secondaries is positive with respect to signal in the other.

Neither of the secondaries is tuned to the center carrier frequency, as was already noted with the single-slope method. Let us assume that L2 has been tuned to some frequency *below* the nominal value of the carrier. L3 is then tuned just as far away from the center frequency, but it is resonated to a frequency *above* it. Since our push-pull secondaries have opposite polarities, the curve showing the response of one is represented as going in the opposite direction from the response curve of the other. These curves showing response of L2 and L3 are depicted in part B of Fig. 2.

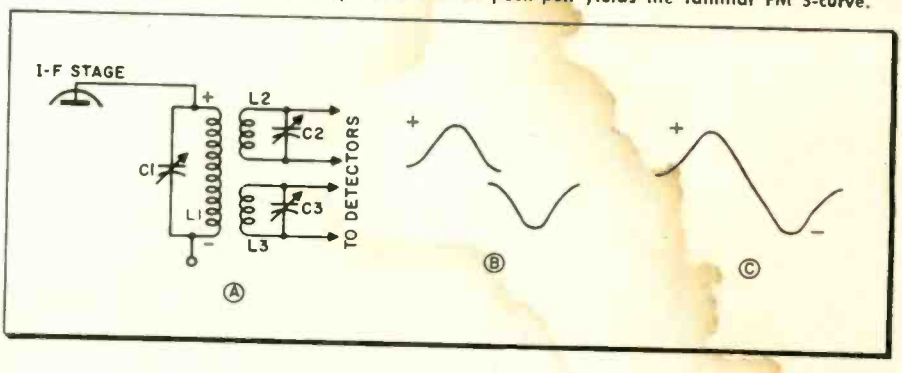
2 Slopes Equal 1 S-Curve

When we combine these two curves, to get a picture of response in the combined secondary system, we get the curve of part C—the familiar S curve. Note what portion of this combined output is linear. The straight-line segment, suitable for faithfully converting FM to AM, is more than four times as great as it was when we used a single slope. It is now possible to handle appreciable signal amplitudes.

This is not, of course, the whole story. In modern detectors that start out with the same basic operation, a single tuned secondary is now used, with an additional connection between the secondary and the primary. Changes in amplitude result

(*Continued on page* 69)

Fig. 2—The addition of two response curves in push-pull yields the familiar FM S-curve.



SHOP HINTS

to Speed Servicing

Cure for Noisy Speakers

When rattling or distorted output is the result of a defective speaker cone, I have found that coating the defective cone with ordinary shellac will instantly stop the noise in most cases. Apply shellac to the cone with the radio playing. By the time the application is completed, the noise should be all gone. Make sure to get the shellac on heavy around the edge of the cone.

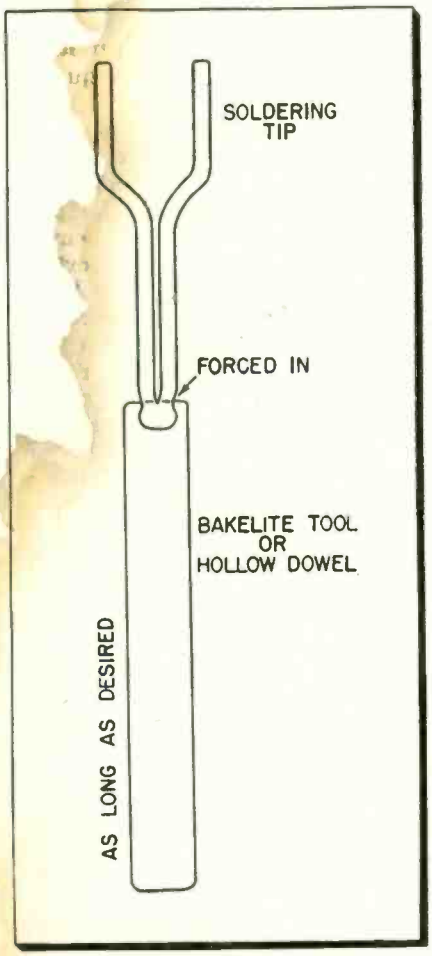
The writer has repaired many speaker cones in this way, several of which have been in use for six months or more. They are still working as good as new, with no apparent need to replace the cones.—*W. C. Beasley, Arcanum, Ohio.*

Salt Water Test Battery

The photograph shows the two leads from a meter immersed in a salt water solution. The meter is set on its 60-microamp scale. The current reading on the meter is about 20 microamp. This small home-made salt-water battery is excellent for testing meters, such as milliammeters and microammeters, as there is practically no possibility of damage to the meter movement due to the low output from this type of rudimentary battery.

The movement of nearly any device that uses a meter can be checked with this salt-water tester. The meter movement of a photoelectric exposure meter, for example, can also be tested in this way. It is a good idea to use a silver coin and a length of copper wire as the two electrodes in this solution, connecting each of these to one of the leads from the meter for the test.—*L. A. Williams, Brooklyn, N. Y.*

Salt water battery tests meter movements.



Easily made shorting bar for jumping fuses.

Handy H-V Jumper

When checking the horizontal output and high voltage circuits in a TV set where the fuse has blown, the tool illustrated here makes a handy jumper device for momentary shorting of the fuse-holder terminals. While prolonged jumping of the fuse terminals may cause damage in a defective circuit, it is often advantageous to short out the fuse temporarily to make observations. For example, arcing may thus become evident in one of the tubes or elsewhere in the circuit, which will aid in localizing the defect. With the prods of this tool shorting the fuse holder, the tool can be pulled away quickly at the first sign of trouble.

The shorting bar can be made up easily. The one shown was made from a Type 7300 Weller soldering-gun tip, used for older model Weller guns. Other similar types will serve as well. The tip is forced into the shaft of a hollow alignment tool, as illustrated, or into a hollow dowel stick. A tool of any length may be used, but about 6 to 8 in. is enough to reach almost any fuse location conveniently. The open ends of the soldering tip may then be spaced to fit across any fuse holder.—*Howard Lambert, Sioux Falls, So. Dakota.*

Phono Cartridge Check

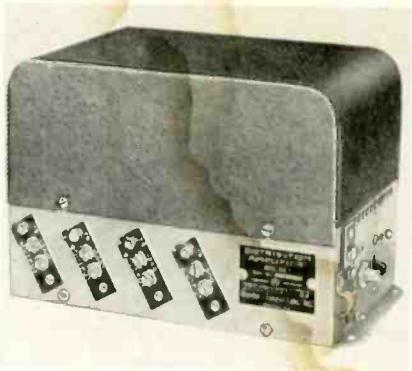
When it becomes necessary to check the output of a phonograph pickup cartridge to see whether it is working, a quick and simple test can be made with a pair of headphones or a single headset. The headset need simply be connected across the output terminals of the cartridge, or more conveniently, across the leads from the output terminals, so that the connections will not interfere with placing the pickup on the record. When the cartridge is then placed on the rotating record, one need simply listen to the output through the headset. Nearly all standard cartridges (crystal and ceramic types) provide enough output to cause the earphones to operate satisfactorily. The only exceptions are the magnetic and other low-level high-fidelity types of pickups, but even these can be checked through a suitable preamplifier known to be operating properly.

In addition to being quick and easy, the headphone method of checking can be used in the field as well as on the bench. It is only necessary to keep a single headset, which occupies a small amount of space, in the tool box.—*Ellisworth Bell, Anniston, Ala.*

New Products for Technicians

B-T TV DISTRIBUTION AMP

Low-noise Model DA8-B distribution amplifier provides eight isolated TV outlets with over 10 db all-channel gain for master TV systems. The DA8-B features all-triode circuitry and will handle either 300 ohm twin lead or 75 ohm coax. Included are grounding clamps, lugs and terminating resistors. More than 8 TV outlets can be provided by connecting a line splitter. The DA8-B does not require any tuning. Blonder-Tongue Labs., 526-536 North Ave., Westfield, N. J.—TECHNICIAN (Ask for No. 3-4)



Futuramic PROBES

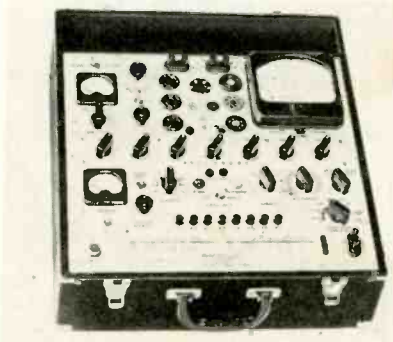
High-ohms probe extends ohmmeter range of VOM by a factor of 10. It converts the Rx10,000 ohms range to an Rx100,000 ohms range and permits measurement of resistance values up to 200 megohms. Probe can be used with any 20,000 ohms-per-volt VOM having a center-scale indication of 12 ohms, and an internal ohmmeter battery of 7.5 volts. Model 261 probe is put into operation in place of conventional test lead. Futuramic Co., 2500 W. 23 St., Chicago, Ill.—TECHNICIAN (Ask for No. 3-5)

Quam WOOFERS

Two new low frequency woofers include the 12A10L (shown in photo) with frequency response 40-4000 cps, ±5 db. Resonance point is 60 cycles and voice coil impedance is 6-8 ohms. Power handling capacity, 10 watts. Baffle opening 11 1/16 in.; depth 5 7/8 in. The 15A10L has a frequency response of 30-5000 cps, ±5 db. Resonance point is 45 cycles; impedance 8 ohms; power 10 watts. Baffle opening 13 7/8 in., depth 7 1/2 in. Quam-Nichols Co., 236 E. Marquette Rd., Chicago 37, Ill.—TECHNICIAN (Ask for No. 3-1)

Hickok TUBE TESTER

Model 539B dynamic mutual conductance tester provides 6 micromho ranges, 60,000 to 600, and a rectifier diode range and a VR range. Choice of 4 ac signals (0.25, 0.5, 1 or 2.5 volts) plus dc bias may be applied to the grid. AC meter measures line voltage. New short test measures resistance in ohms (to 50 meg), in addition to neon lamp for quick "good-bad" checks. Tests selenium rectifiers and germanium diodes. Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland 8, Ohio—TECHNICIAN (Ask for No. 3-2)



MORE INFORMATION WILL BE SENT TO YOU

on new products described here. Simply item of interest on postage-free inquiry write in number given at end of each card, page 33.

Weller SOLDERING AID

This soldering aid is a pencil-shaped plastic holder fitted at one end with a tapered metal point and at the other with a notched blunt metal end. It can be used to twist wires into tight connections prior to soldering, to untwist wires, to hold work being brought to soldering heat, and to hold springs and other parts clear of points being heated. Retail list is 50¢. Weller Electric Corp., 808 Packer St., Easton, Pa.—TECHNICIAN (Ask for No. 3-6)

Workman CRT REPAIRER

The "Bosipt" is a simple device which Burns Off Shorts In Picture Tubes, doing the job in two minutes. Just plug it into the 5U4 receiver socket, connect the other end to the pix tube base, and press two buttons. One button is for burning off cathode-to-filament shorts, the other for cathode-to-grid shorts. Dealer net is $3.67. Workman TV, Inc., Teaneck, N. J.—TECHNICIAN (Ask for No. 3-7)

EV 100-WATT AMPLIFIER

Model A100 professional, rack-mounted 100 watt high-fidelity amplifier for musicasting and industrial public address employs the new Wiggins Circlotron circuit. Specs include: Frequency response: ±0.5 db 20-50,000 cps, Harmonic distortion: Less than 0.5% at rated output. Intermodulation distortion: Less than 1.2% at rated output. Hum and noise: 85 db below rated output. Damping factor: Adjustable between 0.1 and 10. Electro-Voice, Inc., Buchanan, Mich.—TECHNICIAN (Ask for No. 3-8)

TVS CRT REACTIVATOR

The Dyna-Beamer is said to restore up to 75% of repairable picture tubes without removal from set. Restores emission, clears grid-to-cathode shorts, indicates whether "no raster" or "dim raster" is due to bad picture tube, or improper grid bias in set (leaky coupling condensers, etc.) Only one switch to operate. 10-day money-back guarantee. Tampa Video Service, Inc., Dept. DM, 6105 Interbay Blvd., Tampa 9, Fla —TECHNICIAN (Ask for No. 3-3)

Latest Test Instruments

GE TRANSISTOR CHECKER

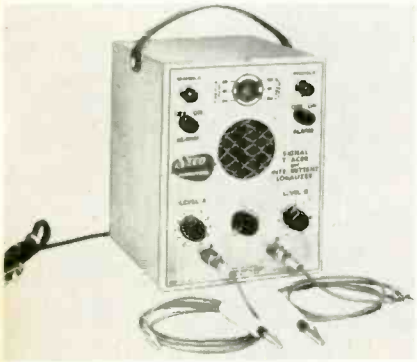
A new portable transistor tester, about the size of a pocket radio, may be used to check all junction transistors for short circuits, opens, leakage, and current gain. Separate plug-in sockets accommodate NPN and PNP types. Also included in the package are 5 universal type transistors, commonly used in transistorized radios and other circuits, and a transistor interchangeability chart. Suggested price is $39.95. General Electric Co., Electronics Park, Syracuse, N. Y.—TECHNICIAN (Ask for No. 3-17)

ASD TUBE CHECKER

The 400A automatic tester completely eliminates selector switches, knobs, load controls, and filament switches. Contacts for setup are made through the holes in a player-piano-type roll chart. The technician simply selects his tube number on the rollchart, and plugs the tube into the socket indicated. Electrical contacts automatically select proper settings. The tester uses a cathode-conductance test. American Scientific Development Co., 334-336 S. Main St., Ft. Atkinson, Wis.—TECHNICIAN (Ask for No. 3-18)

Seco TRACER-LOCALIZER

A device for "sounding off" an audio tone in the case of a break in the signal path, the Monitron monitors signal paths without requiring constant attention. An "eye" tube monitor signals level independently of alarm circuits, and lamp lights in channel in which failure occurs. The Monitron can trace signals and localize intermittent problems on any steady signal carrying circuit. SL10 Monitron lists at $119.50. Seco Manufacturing Co., 5015 Penn Ave. South, Minneapolis, Minn.—TECHNICIAN (Ask for No. 3-20)



Triplett LINE CHECK

Model 3000 enables the user to connect an electrical load equal to the appliance to be installed on the line. Easy to operate, it checks a line in only three steps: (1) plug wall cord into outlet to be checked; (2) Set load switch No. 1 to the load position (500, 1000 or 1500 watts) (3) Press and hold button No. 2 long enough for the meter pointer to give a steady reading. Net price for the unit is $34.50. Triplett Electrical Instrument Company, Bluffton, Ohio—TECHNICIAN (Ask for No. 3-19)

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on new products described here. Simply write in number given at end of each item of interest on postage-free inquiry card, page 33.

RCA JR. VOLTOHMYST

Model WV-77B embodies new features in addition to those of earlier versions. Measures from 0.05 to 1200 volts dc in 5 ranges, even in presence of ac; from 0.1 to 1200 volts ac (rms) in 5 ranges. Resistance from 0.2 ohm to 1 billion ohms in 5 ranges. A single-unit switch-probe and cable permits instant selection of dc or ac/ohms operation, and is completely shielded and insulated. Radio Corp. of America, 30 Rockefeller Plaza, New York 20, N. Y. —TECHNICIAN (Ask for No. 3-21)

E-O-V TUBE REACTIVATOR

A new principle of reactivation will renew both TV picture tubes and receiving type radio and TV tubes. Where failure is due to loss of emission by the cathodes, life can be extended far beyond normal time of discarding. In the Electron-O-Vac, reactivation is a controlled process. The instrument incorporates circuitry for checking picture tubes. Electron-O-Vac Corp., 4620 Leary Way, Seattle 7, Wash.—TECHNICIAN (Ask for No. 3-22)

RCP TUBE-TRANS. TESTER

Combination tube and transistor tester combines versatility and low cost required for radio and TV servicing. Model 325 tests NPN and PNP transistors as well as all radio and TV tubes —including b-&-w and color picture tubes, and all series-string heater types. Tests for dynamic mutual conductance, emission and shorts. Current amplification of transistors is accurately measured. Price is $129.50 net. Radio City Products Co., 26 Rittenhouse Place, Ardmore, Pa.—TECHNICIAN (Ask for No. 3-23)

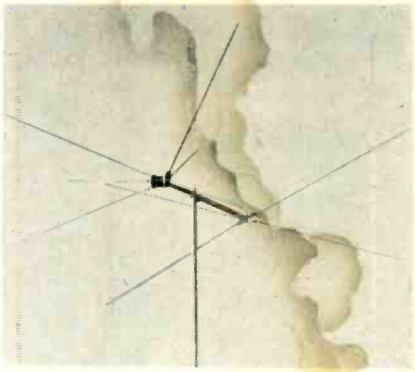
Sencc LEAKAGE CHECKER

Designed to check grid to cathode, cathode to heater and capacitor leakage, model LC2 also detects grid emission and gas in 70 popular tubes used in critical circuits in radio and TV. Leakage of 100 megohms or below registers bad except in electrolytics, where 50,000 ohms or under reads bad. In kit form at $19.95 net and $24.95 net assembled. Service Instruments Co., 171 Official Rd., Addison, Ill.—TECHNICIAN (Ask for No. 3-24)

New Antennas & Accessories

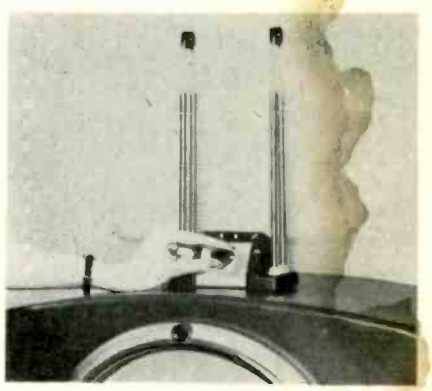
C-B CLICK-RIG CONICAL

Snap-open conical antenna, model C64, is designed so that all elements fold open and lock into position without tools. Assembly time of 11 seconds is reported. Insulator includes air-plastic spacing to prevent signal loss. Other features are a device for locking transmission line to insulator to eliminate strain on terminals, and end caps on elements to prevent wind howl. Six combinations are available in this line of conicals. Clear Beam Antenna Corp., Canoga Park, Calif.—TECHNICIAN (Ask for No. 3-25)



Snyder INDOOR ANTENNA

The Tenna Tuner Model 7D, can be attached quickly and safely to the antenna leads on the receiver. By pushing buttons and manipulating side elements, each station can be tuned in with maximum results. The development is attractive and designed for use on the set itself. It helps eliminate ghosts and interference, has no motors or moving parts. It is being sold at $9.95 list price. Snyder Manufacturing Company, 22nd & Ontario Sts., Philadelphia 40, Pa.—TECHNICIAN (Ask for No. 3-26)



Taco STAY-LOK ANTENNAS

Taco Trappers and Super Trappers are now available in two designs. Original models employing tension-booster design are supplemented by models 2880, 2885 and 2890, which utlize the new Stay-Lok design whereby elements automatically lock without tools. Construction provides rigidity and alignment of elements. Antenna may be collapsed by lifting of the locking tab Redesigned phasing lines provide additional gain. Technical Appliance Corp., Sherburne, N. Y.—TECHNICIAN (Ask for No. 3-27)

Channel Master TRANS-LINE

Transmission line with 20 wire strands per conductor, very soft and flexible, is offered in two series: Twin Twenty, and Challenger. Twin Twenty transmission line is made with pure, low-loss virgin polyethylene for long life. It is marked every 10 feet. Challenger line, aimed at the low-price market, incorporates quality features including 20-strand conductor and pure polyethylene. Twin 20 in silver or or brown; Challenger in brown. Channel Master Corp., Ellenville, N. Y.—TECHNCIAN (Ask for No. 3-28)

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on new products described here. Simply write in number given at end of each item of interest on postage-free inquiry card, page 33.

Finco ANTENNAS

Model B-6 Geomatic incorporates 4 coaxial capacitors in one folded dipole, causing the dipole to operate as one length on low-band, and a different length on high-band. The twin driven antenna produces high gain on both bands with high front-to-back ratio. It is preassembled with self-locking, self-aligning brackets. Model B-7 also includes two 3-element colinear directors on high-band and inductance-tuned low-band director. Finney Co., 4612 St. Clair Ave., Cleveland, Ohio—TECHNICIAN (Ask for No. 3-29)

Dynamic ACCESSORIES

Accessories for FM, UHF, VHF and color TV include Model T115 Attenuator: Removes overload in strong signal areas. Model T121 interference suppression Hi-pass TV-FM filter: eliminates antenna distubances caused by ignition, diathermy, X-Ray, fluorescence, neon, appliances, industrial RF and S.W. transmitters, passes all frequencies above 40 mc. Model T130 de luxe tri-set coupler. For operation of any combination of 2 or 3 TV sets or FM receivers from 1 antenna. Less than 6 db insertion loss, 40-50 db rejection ratio. Dynamic Electronics-New York, Inc., 73-39 Woodhaven Blvd., Forest Hills, L. I., N. Y.—TECHNICIAN (Ask for No. 3-30)

JFD OUTDOOR COUPLER

Designed for outdoor use, these couplers can be mounted on the mast to permit the running of the lead-ins outside the house to the rooms desired. Col-plast encapsulation seals the components rendering them impervious to climatic effects. Insertion loss is low. Increased isolation between sets. No. AC40 for 2 sets, AC60 for 3 sets, and AC70 for 4 sets, to 300 ohm antennas. JFD Mfg. Co. Inc., 6101-16th Ave., Brooklyn 4, N. Y.—TECHNICIAN (Ask for No. 3-31)

Medal ANTENNA KITS

Complete line of Antenna Kits is designed for the TV dealer. Carrying the Captain trade mark, they are packaged in cartons that double as point-of-purchase displays when opened. Kits incorporate all-aluminum antenna, plus mast, lead-in wire, mounts, guy wire, arrestor, and standoffs for a complete installation. Complete line for UHF and VHF. Medal Mfg. Co., 194 Silver St., Sharon, Pa.—TECHNICIAN (Ask for No. 3-32)

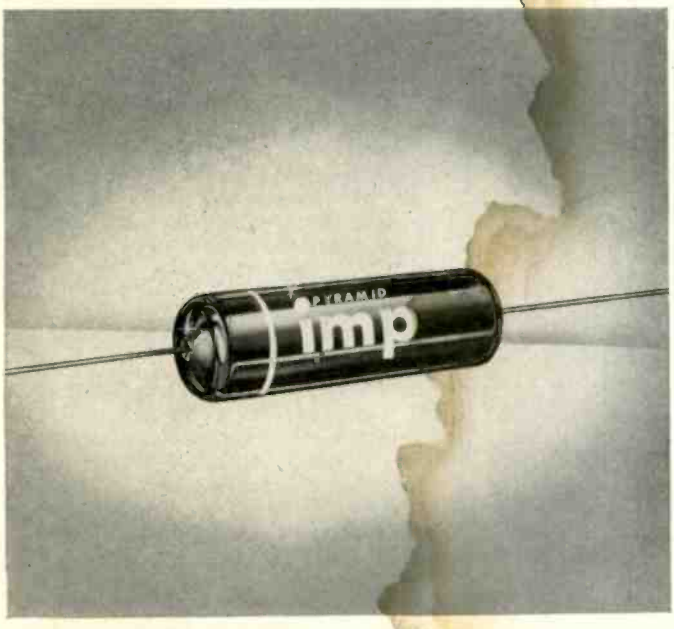
PYRAMID technical bulletin

NO. 57

THERE IS MORE TO A CAPACITOR THAN ITS DESIGN FORMULA:

$$C = \frac{K\,D}{A}$$

Pyramid's production and life tests of their capacitors are among the most stringent in the industry. Production test for voltage breakdown, capacitance, power factor, insulation resistance and seal are performed on 100% basis. In consisting of life, temperature and immersion cycling, vibration, and corrosion where applicable. These serve to guarantee that the capacitors you purchase are consistently as represented to be.



Pyramid capacitors also owe their exceptional performances to the type of materials used in their manufacture and the production methods which Pyramid engineers have devised. For example, in the new Pyramid IMP capacitor, a new, exclusive plastic molding technique was developed which bonds casing, impregnated element, and tinned copperweld leads into one compact assembly capable of withstanding severe physical abuse. In addition, this unit is heat and moisture resistant withstanding the RETMA humidity-resistance test to a remarkable degree. In another capacitor, type MT metallized paper units, vacuum impregnation is employed and the ends of the capacitor are sealed with plastic. Then, as a final step, the entire unit is completely coated with a highly moisture resistant wax. It is production techniques such as these which, in conjunction with high quality papers, impregnants (such as Halowax, Mineral Oil, or Silicone Base Synthetic Oil), and metals, that account for the excellent stability and long life that Pyramid capacitors exhibit.

Pyramid capacitors, particularly electrolytic capacitors, are specifically designed for long shelf life. To achieve this goal requires that the various materials and chemicals used in the manufacture of these units possess a high quality and long term stability. Another contributing factor to long shelf life is the care which is taken to provide maximum protection against the corrosive effects of chemicals in the atmosphere. This necessitates a container which is well insulated against the intrusion of moisture, i.e., one which is air tight and hermetically sealed.

* * * *

The number of different types of capacitors that Pyramid manufactures is extensive. Included in this line are the following:

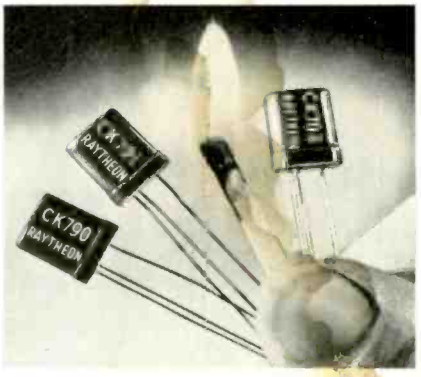
1. Electrolytic capacitors, type TD, with each unit sealed in a metal tubular case. Available in single sections, dual sections, and triple sections.
2. Electrolytic capacitors in screw base metal containers, type MC. Available in single and dual sections.
3. Twist-Mount electrolytic capacitors, type TM. Available in single, dual, and triple sections. Different sections may have different working voltages.
4. HI-TEMP Twist-Mount Electrolytic capacitors, type TWH. Designed for 100°C operation.
5. Dry Electrolytic capacitors in wax-filled, impregnated cardboard tubes, type CDB. Available in single, dual, and triple sections. Sections may possess individual leads or share a common negative terminal.
6. Plug-in Electrolytic capacitors, type DO, provided with 4 pins on standard octal base.
7. High-capacitance, low voltage electrolytic capacitors, type PFB.
8. Molded tubular paper capacitors, type IMP.
9. Miniature tubular paper capacitors. Type 85LPT.
10. Ceramic-cased tubular paper capacitors, type CT.
11. Bathtub-Type Oil-Paper Capacitors, types PDM, PDMT, PDMB.
12. Metal-tubular Oil-Paper capacitors, types PTIM, PTDMV, 4PTIM, 4PTIMV, 7PTIM.
13. Small-base oil-paper capacitors, types PKM, PKMF, PKMS, PKMT, and PKMB.
14. High-voltage oil-paper capacitors, types PLM, PLMF, PLMS, PLMU, PLMR.
15. Kraft-tube metallized paper capacitors, type MT.
16. Metal-can metallized paper capacitors, types MPGK, MPGM.
17. Metal-tube metallized paper capacitors, types MPTIK, MPTIM.
18. "Glasseal" subminiature paper tubular capacitors, and many others.

Pyramid capacitors are competitive in price because of the modern production methods that are empolyed throughout every phase of capacitor production. Whenever possible, automation techniques are being applied so that more uniform high quality may be achieved. Much of Pyramid's success is due also to the aggressiveness of Pyramid engineers in pioneering new products.

New Tubes & Components

Raytheon TRANSISTORS

PNP silicon transistors CK790, CK791 and CK792 are available for commercial applications. These three new silicon types are designed for high frequency operation at high ambient temperatures, thereby opening up new transistor applications. These transistors will be suited for low frequency amplifiers, switching circuits and as replacements for relays in equipment which must operate at high ambient temperatures. Raytheon Manufacturing Company, Newton 58, Mass.—TECHNICIAN (Ask for No. 3-12)

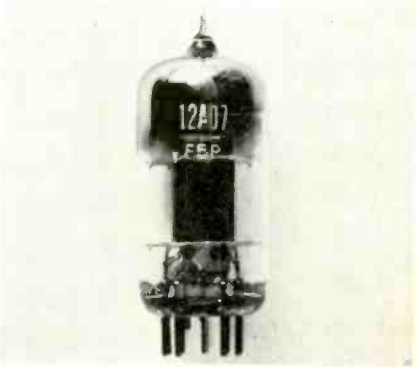


RCA 8DP4

The 8DP4 is a compact, directly viewed, rectangular, glass picture tube of the low-voltage electrostatic-focus and magnetic-deflection type. Intended for low-cost, compact applications, it has a spherical filterglass faceplate, a screen 7 3/16" x 5 3/8" with slightly curved sides and rounded corners and a minimum projected screen area of 35.5 sq. in. Employing 90° deflection, it has maximum overall length of only 10 3/4" and weighs less than 3 lbs. Tube Div., Radio Corp. of America, Harrison, N. J. —TECHNICIAN (Ask for No. 3-11)

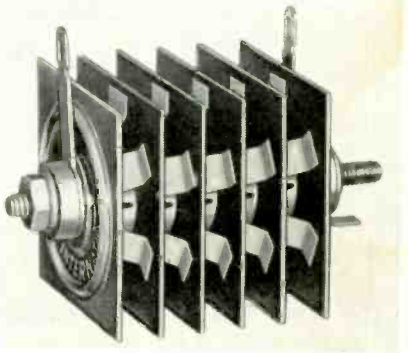
Sylvania TWIN-TRIODE

The 12AD7 double triode, a 9-pin miniature, fills the need for a low-hum preamplifier in audio applications. Extremely low hum level—less than 3.0 mv rms on the plate of each triode when operated in a typical resistance-coupled amplifier has been achieved by features that include a reverse-coil heater to help cancel magnetic coupling. The 12AD7 will at all times meet a minimum hum capability. Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.—TECHNICIAN (Ask for No. 3-10)



Int'l. SELENIUMS

Selenium TV rectifier series uses a new concept in surface contact while retaining "center support" construction. This construction, "AirKore," features an open-spaced six-contact spring which provides greater contact area and a uniform temperature rise across the surface of the rectifier plate to permit optimum circulation of air. AirKore is available in all standard sizes and is supplied in both stud and eyelet types. International Rectifier Corp., El Segundo, Calif.—TECHNICIAN (Ask for No. 3-9)



MORE INFORMATION WILL BE SENT TO YOU

on new products described here. Simply write in number given at end of each item of interest on postage-free Inquiry card, page 33.

Clarostat W-W CONTROL

For use in printed-wiring assemblies, a 2-watt wire-wound control is available with terminals that facilitate mounting and connections. A variation of Series 43, the printed-circuit control measures 1 1/8" in diameter by 9/16" deep, and is available with or without tap. Resistance values are from 1 ohm to 50,000. Clarostat Mfg. Co., Dover, N. H.—TECHNICIAN (Ask for No. 3-13)

R-R MIN. SELENIUMS

Miniature selenium rectifiers with special snap-in terminals designed for printed wiring boards will snap into the board with sufficient mechanical rigidity to hold firmly in place. Currently available are half-wave stack types 8Y1B and 8J1B, rated at 30 ma. and 65 ma., respectively, at off the line voltages, with a capacitive load in ambient temperature of 45 C. Radio Receptor Co., Inc., 251 W. 19th St., New York 11, N. Y.—TECHNICIAN (Ask for No. 3-14)

Triad FLYBACKS

Fourteen new correct replacement flybacks are designed for use in Admiral, Emerson, General Electric, Motorola, Philco, Sentinel, Wells-Gardner and Westinghouse television receivers, and are electrically and mechanically interchangeable with the manufacturer's original equipment. Complete line of TV transformers is listed in Catalog TV-155 periodic bulletins, copies of which may be obtained by writing. Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.—TECHNICIAN (Ask for No. 3-15)

G-P SILICON TRANS.

Precision durable silicon grown-junction transistors will operate at peak efficiency under a wide range of operating conditions, including very high temperatures. Characteristics include high input operating voltage, higher collector operating voltage, decreased collector series resistance. Available in two categories, one with emitter voltage of 2 volts and the other, with emitter voltage of 5 volts. Germanium Products Corp. (subsidiary of Bogue Electric Mfg. Co.), 52 Iowa Ave., Paterson 3, N. J.—TECHNICIAN (Ask for No. 3-16)

New Products

Knight CAPACITOR CHECKER

Capacitor checker kit tests capacitors while wired in circuit. It uses "magic-eye" to give indication of opens or shorts. Test for open can be made on any capacitor of 20 μμf or greater capacity, even if in parallel with resistance as low as 50 ohms. Test for shorts can be made on any capacitor up to 2000 μf, even when shunted by 20 ohms. Price $11.65.—TECHNICIAN (Ask for No. 3-33)

University SPEAKER

The 6303 is a high quality, triaxial speaker where the tweeter unit is fitted with a "reciprocating flares" horn through center of woofer and mid-range speaker assemblies. It handles 30 watts over range of below 30 cycles to beyond audibilty. Consumer net $80.10. University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y.—TECHNCIAN (Ask for No. 3-34)

Donner WAVE ANALYZER

Instrument for testing performance of music system amplifiers, Model 21, is used to measure distortion, amplitude and frequency over 30 to 50,000 cps range. It enables the technician to match tubes and determine deterioration of performance caused by aging of components. Donner Scientific Co., 2829 Seventh St., Berkeley, Calif.—TECHNICIAN (Ask for No. 3-35)

Phaostron VOM

Model 555A VOM, with meter movement protection up to 500 times overload, features only 2 jacks for all measurements, separate range and function switches. The 55A measures: dc volts from 1.5 to 1500 v. at 20,000 ohms/v.; ac volts from 1.5 to 1500 v. at 2,000 oms/v.; dc from 50 μa to 15 amps; ac from 1.5 ma to 15 amps; db from —10 to +50; resistance from 0.25 ohm to 10 megohms. Phaostron Instrument and Electronic Co., 151 Pasadena Ave., S. Pasadena, Calif.—TECHNICIAN (Ask for No. 3-36)

Win-Tronix SWEEP CIRCUIT ANALYZER

Model 820 dynamic sweep circuit analyzer supplies 60 cycle sawtooth, 15 kc horizontal sawtooth and horizontal output transformer drive for trouble-shooting of both sync and sweep circuits by signal substitution. Accessory probes produce sync pulses. Instrument provides a positive test of flyback transformers and yokes, using neon indicator. Winston Electronics, Inc., 4312 Main St., Philadelphia 27, Pa.—TECHNICIAN (Ask for No. 3-37)

MORE INFORMATION WILL BE SENT TO YOU

on new products described here. Simply write in number given at end of each item of interest on postage-free inquiry card, page 33.

Color TV in Mass Production

• Confident that the fall buying season will see the long awaited rise of mass sales in color-TV, RCA has now unveiled the fact that one production line in each of their two plants, one in Bloomington and one in Indianapolis have fully converted for color receiver production. These lines are geared to produce sets at a one-a-minute rate. Executive Vice-President Robert A. Seidel of RCA Consumer Products indicated that RCA expects to sell 200,000 sets in 1956 with the bulk of sales occurring after June. Present sales are reported as being approximately 1000 sets a week. It was also reported that contrary to the popular belief that current prices for color sets would enable sales to the higher income groups only, the bulk of present sales are being made to lower and middle income families, largely as installment purchases. There are no immediate price cuts in sight on current models. After mid year, however, new designs are expected to offer some reduction in cost.

Plan tube production of over 30,000/month.

The conversion of the Bloomington plant to color production has involved an expense of more than $5,000,000. It has a total of five production lines and the remaining four can readily be converted from their two-shift black and white operation with demand for color. There are four assembly lines in the Indianapolis plant.

Circle numbers on free inquiry card, p. 33, for more product data.

The chassis presently being manufactured is a 26 tube design embodying some 2000 component parts. This contrasts to approximately 1200 component parts in a black and white receiver. Not too great a cost reduction can be made on the components being used in a color receiver since many of these items are the same as used in a black and white receiver, and thus are already priced by suppliers on a mass production basis. In the color receiver both the video and sound i-f strips are on individual printed circuits boards. On sets to be introduced later in the year the number of printed circuits boards are expected to go from two to six thereby effecting some manufacturing savings.

Scene in RCA's Bloomington, Ind., plant as color TV goes on one-a-minute schedule.

Present receivers are supplied to provide both VHF and UHF reception. Actually two tuners are employed, one for VHF and the other for UHF. The latter is "piggy-backed" or behind and mechanically ganged to the VHF tuner. When in use it feeds through the VHF tuner which meanwhile through switching has been converted into an additional i-f amplifier. If receivers were to be produced on a VHF or UHF only basis additional cost reduction would undoubtedly be possible here. Another expensive manufacturing cost lies in the extensive test and inspection facilities required. At Bloomington nearly ⅓ of the lines are involved with inspection and test and ⅔ are on actual production.

Pix Tube Bottleneck

One of the big bottlenecks frequently mentioned by set makers has been the availability of color tubes. W. W. Watts, Executive Vice President, indicated that approximately 220,000 sq. feet of additional floor space had been added at the Lancaster plant and that employment in color-TV tube production will be upped 50% during 1956. The previously announced production ca-

(Continued on page 54)

Color TV Production

(Continued from page 53)

pacity of 30,000 tubes per month by the last quarter of 1956 will be surpassed under present schedules. Additionally RCA is now buying color tubes from other manufacturers such as Sylvania, Thomas Electronics and Tung Sol.

"Trial in the home" is reported as being the most effective way in which to sell color sets. The lighting and provisions for exhibiting color receivers in a dealers store are detrimental rather than helpful in confirming a sale.

Color Upswing Assured

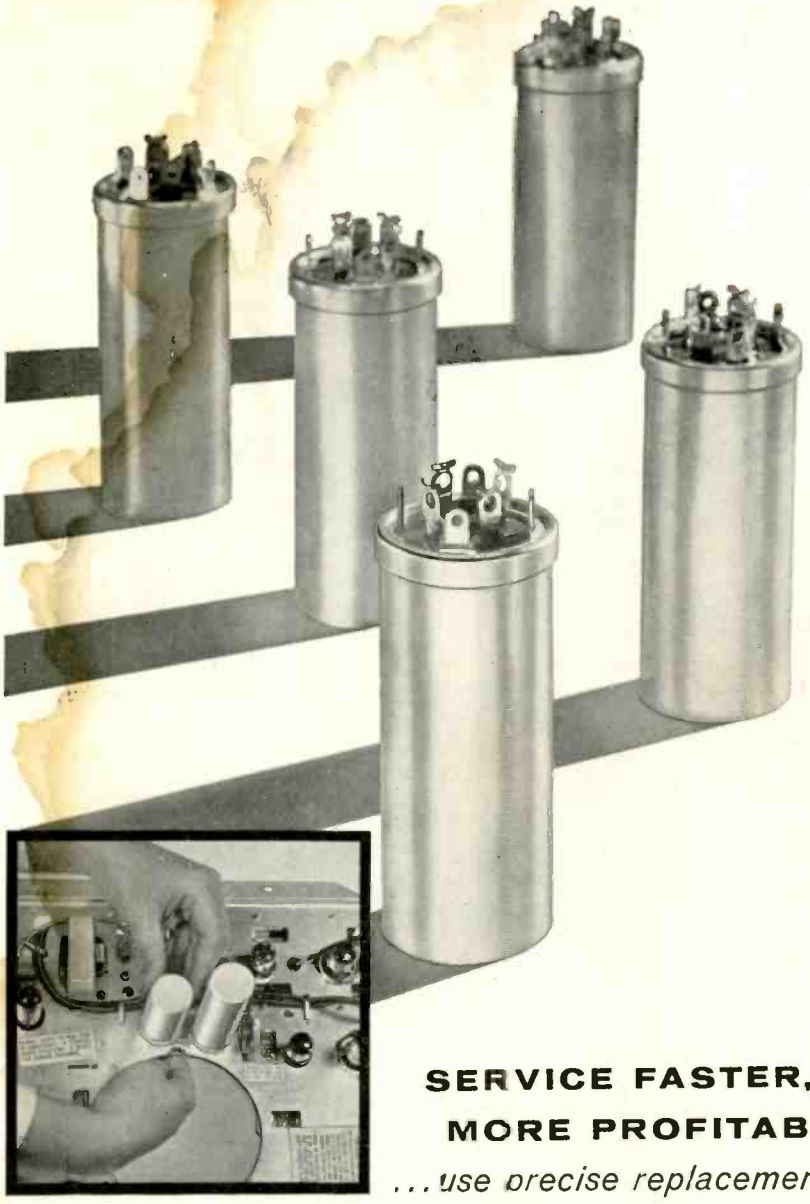
Other factors which were mentioned as strengthening the outlook for the upswing of color in the fall include: the recent reduction in the cost of service contracts to the consumer from $139.95 to $99.95. This contract includes installation and unlimited service during a twelve month period. Increased programming and increased color-TV origination facilities through the new NBC all color broadcasting station in Chicago starting in April, new studio facilities in the Ziegfeld Theater in N. Y., an additional color studio in Brooklyn and new control facilities in Burbank, Calif. R. A. R. Pinkham, Vice President in Charge of Television Network Programs for NBC said that the present 40 hours a month of high attraction programming could well double by Fall. NBC expects to continue the 90 minute spectaculars. Next month they will premier for the first time anywhere Richard III with Sir Laurence Olivier. It should prove an interesting experiment because TV viewers will see it first free. Movie goers will have to pay box office to see it! •

Selenium Powered "Goofometer"

The following information is reprinted from the Sales Bulletin of Federal Telephone & Radio Co. TECHNICIAN editors assume no responsibility for patents, short circuits or fist fights resulting from the publication of this unique data.

The Components Division announces the successful development of a new type of electronic measuring device, which will be marketed under the trade name of Goofometer. The instrument is used in the detection and evaluation of goofs, errors, fumbles, mistakes, boners, blunders, oversights, slips, flaws, and snafus.

The Goofometer contains a 1 millivolt/1 megampere Federal selenium rectifier power supply; it operates solely on reverse current.



Slightly overexposed photo of Goofometer being used in a typical application

Five independently adjustable ranges are available, from milligoofs to kilogoofs, with an alternate scale calibrated in irks per density squared for the direct measurement of goofage coefficients. Also provided are, a reciprocal indicator for measuring goofficiency and a vernier attachment having an accuracy of plus or minus one microgoof for precision fault-finding.

A high input impedance oscilloscope for visual off-beam indication may be used in conjunction with an encephalographic display for detecting transients, squares, and other repulsives.

ATTACHMENTS:

1. High-sensitivity Goofprobe with excellent inverse response characteristics. To install, the Goofprobe is simply hammered into the cerebellum.

2. Small sledge hammer for above purpose or for vigorous direct application where exceptionally high goofage coefficients are obviously present.

An unprecedented sale throughout industry is expected.

Use "Phantom" Antenna

(*Continued from page 43*)

may be used in the phantom for each channel desired, or for those that are widely separated from each other in frequency. The same idea is practical for UHF signals, with a simple antenna acting as the phantom.

The receiver's pickup antenna may be of the same type used in the phantom, or it may be different. Usually a high-gain type is desirable. A directive type is also desirable, since it can be beamed on the phantom and discriminate against other ghost-producing reflections. In some cases, an all-wave type will serve the purpose where more than one channel is required. This should be determined by a field-strength check after the phantom is up.

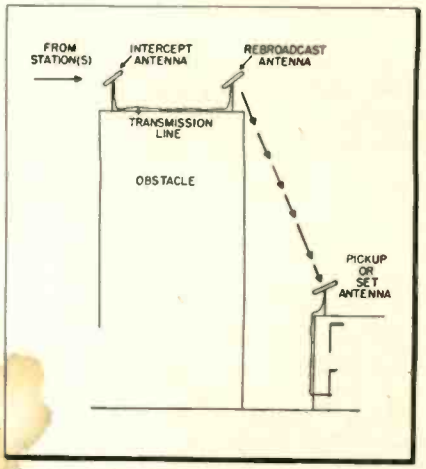


Fig. 4—Twin phantom system (2 antennas).

Another variation in the phantom principle is shown in Fig. 4. In this instance, good pickup for the phantom was only possible at the forward edge of the obstructing building. From this point, however, signal reradiation into the "valley" where the set's pickup antenna had to be located was not possible. For this reason, the functions of picking up signal initially and of retransmitting it could not be combined in a single antenna. The phantom therefore consists of an interceptor antenna connected, by a run of transmission line, to a rebroadcast antenna at a favorable spot on the opposite edge of the roof. To prevent interaction, the two elements of the phantom should be several wavelengths apart —but this is usually the automatic result of the nature of such an installation. Where such a system is used, it may be possible to interpose a booster amplifier in the transmission line between the two antennas for still greater signal strength. •

"Package" TV Components

A new "package" of TV components that will insure good reception at reduced cost, in color as well as monochrome sets, was unveiled by Standard Coil Products, Inc.

The package consists of a tuner, i-f strip, sync generator and delay line. Circuitry for the 4 major units in the package will be made available free to manufacturers who wish to make the equipment themselves. The finished units may also be purchased directly from Standard.

Edison Award to Blind Ham

Robert W. Gunderson, blind since birth, has been awarded General Electric's Edison Radio Amateur Award for designing more than 30 types of test instruments for the blind. Bob Gunderson, W2J10, publishes the only braille electronics magazine.

Selenium Conservation Kit

To spur its previously announced plan to help the government in its efforts toward conserving scarce selenium, Federal Tel. & Radio Co. is sending its distributors conservation program kits.

For use by the distribs themselves, dealers and service techs, the kits contain reproductions of the government's appeal to salvage selenium, letters explaining the manufacturer's program, and banners and circulars for wall display to act as a constant reminder. Federal is offering 8 to 12 cents each for returned rectifiers, depending on size.

Sylvania Investment

To show graphically the amount Sylvania Electric Products Inc. spent in engineering, designing and tooling up for its 1956 television sets, the Bank of America piled five-million dollars in cash around a "Cabinet of Light" set. Enjoying the affluent feeling are Jeanne Kessey, "Miss San Francisco," and Bernard C. Holsinger, General Sales Manager of Sylvania's Radio and Television Div.

36-Hr. Week for Technicians

How Would You Like a Full Year's Pay—With 26 Weeks Off?

• Harper Electronic Lab, a TV-electronic repair business at 485 Dearborn Ave., Toledo, Ohio, has come up with a plan that has solved the "sundown service" problem and that also pleases its staff of 18 employed technicians. Providing TV service in the evenings was quite a problem, what with overtime pay, until the plan went into effect. Here's how:

Employees are divided into two shifts. One shift works 12 hours a day—from 8 a.m. to 9 p.m. with two "breaks" for lunch and supper—on Thursday, Friday, and Saturday. This same shift is off Sunday. Then it works 12 hours a day on Monday, Tuesday, and Wednesday. Then the following work week, beginning with the following Thursday, it is off duty for an entire week. During this time, the second shift takes over for a similarly divided work week. With both shifts thus alternating, the shop is operating 12 hours a day for 6 days a week.

Old Plan vs. New

Before the Harper plan went into effect, employees put in a regular 40-hour 5-day week, with the shop closing down at 6 p.m.—and thus losing the cream of the repair business, evening servicing. Now they draw the same salary for the 36-hour week. Although employed technicians lose their 2-week vacation with pay, this 80-hour pay-without-work period is made up for by the fact that the 36-hour week gives them 208 hours less of working time at the same pay they were getting with the old 40-hour week. If a worker wants 2 weeks off in a row, he can switch with someone on the other shift. One strict rule on which the Harpers insist is that employees refrain from taking on other jobs during their alternate weeks off. It is felt that this would impair their job efficiency.

Employees Like It

Employee reaction to the plan is favorable. One of the Harper bench men says, "It's just like having a vacation every other week." This technician, Richard S. Baldwin, uses his time off to indulge in his favorite sport, skin diving, and to build radio-controlled model planes. Other Harper men use their time off for various other pursuits and hobbies. Experimental electronics, ham radio, gardening, working around the house, hunting, and fishing are some of the activities made possible on a full scale by the novel work-week arrangement. Frequent family vacation trips in the summertime are also made possible.

There are many pros and cons that can be argued over the plan, but it would seem to have definite advantages for people who like to break up the work routine frequently. In any case, the plan has worked out for the Harper establishment. •

Association News

RSA Elects

Radio Servicemen's Association, Trenton, N.J., has elected its officers for 1956-57: Pres. Francis Wolf, Vice-Pres. David Van Nest, Sec. Michael Toth, and Treas. Charles Rebman.

NEDA Statement Scored

An article in the January issue of *NEDA Journal* claiming that proponents of licensing laws are a handful of local servicemen with poor reputations who hurt the independent has been attacked by association leaders. NATESA Pres. Frank Moch has lashed out at this stand claiming that responsible professionals want to remove the service industry from the tinkerer status, and to eliminate present jungle business methods. Forrest Baker, chairman of recently formed American Electronics Council, countered the NEDA statement with the claim that five years ago less than 20% of established, ethical operators gave licensing a passing thought; today more than 80% have been forced to conclude that licensing is the independent's only salvation.

FTRSAP Officers Sworn

The Federation of Television-Radio Service Associations of Penna. have sworn in the following officers: Chairman Bert Bregenzer, Vice-Chairman Wm. Morrow, Sec. Leon Helk, Recording Sec. Ray Blackwood, Treas. L. B. Smith.

RTA Elects

Radio & Television Association, Springfield, Ohio, reports the election of Pres. Marvin Miller, Vice-Pres. Paul Boller, Sec. Wade Campbell, Treas. Adolph Stamguts.

Proposed Licensing Provisions

The proposed ordinance regulating TV repair, sponsored by Television Service Association of Michigan provides that all repair establishments be licensed, and each must have a licensed technician responsible for all work. Penalties include a possible loss of license, $500 fine and 60 days in jail. The mayor-appointed 7-man board of examiners, which conducts license exams and hears complaints, would include three techs, TV school staff member, TV station engineer, one man from the City Safety Engineering Dept., and one from Police communications.

Customer Poll on Service —Alameda County, Calif.

TV Flashes, official organ of the Television Radio Association of Alameda County reports on a survey among TV owners to determine how they choose a technician when their sets break down. Most people look for a nearby service establishment, it was found, regardless of how they determine which one in the neighborhood will be used.

Recommendations from friends and neighbors ranked high in determining the particular choice. Some people use the classified section of the phone book, and pick the nearest service tech to them that is listed.

Dealer Identity Cards —Fort Worth, Texas

With the cooperation of local distributors, the Fort Worth Radio and Television Association has succeeded in contacting local purchasers of parts for the various phases of the radio and TV field. Each man has been checked and classified as to the category into which he falls, such as full-time professional, part-time, trainee, ham operator, or

(*Continued on page* 60)

Association News

(Continued from page 59)

experimenter. Identification cards were issued on this basis, with the classification clearly stamped on each card, for use in making purchases from local distributors. Sales made to card holders are made in accordance with fair trade practices and with respect to classification.

The project has been undertaken to help the service industry as a whole and to protect the public, points out C. E. Morey, pres. of the Ft. Worth Association. He also states that service shops report an increase in business since the program was put into operation. Many part-time and other marginal operators appear to have lost interest since written applications have become necessary to procure the wholesale electronic purchase cards.

NATESA Convention Set

The 1956 NATESA convention has been set for Sept. 14-16 in Chicago. A program of lectures, seminars and fellowship is planned. Departing from the practice of previous years, a parts show exhibition will not be held. A special convention section will be published in the *NATESA Scope*, to be distributed at the meeting.

Group Meets to Form New National Association

Representatives of associations whose membership voted against accepting the affiliation proposals brought back from the Indianapolis unity meeting held last fall gathered in Chicago to discuss the formation of a new national service association. Temporary officers elected to head the group, known as AEC, American Electronics Council, until an official name is selected, are: Forrest Baker, Director TEA of Texas, Chairman; Bert Bregenzer, Pres. FRSAP of Penna., Vice-Chairman; Howard Wolfson, Chairman ARTS of Chicago, Secretary; and Murray Barlowe, Pres. R&TGLI of New York, Treasurer.

Self-Imposed Licensing

Disillusioned by unsuccessful attempts to get a licensing bill through the City Council, a group of New York City service technicians have taken steps toward licensing themselves.

The Associated Radio & TV Servicemen of N. Y., membership 400, is adopting a program of self-imposed licensing that will embrace the protective features of a bill which died in a City Council committee in 1954.

"We want this to be an honorable profession," says Max Liebowitz, chairman of the ARTSNY board of directors. "We propose to grade our own members technically and supervise their activities. Each will take an oath to a code of ethics and, if it is determined that a member has dealt unfairly with the public, he will lose his association license."

The program is expected to get under way about May 1.

FTRSAP Nixes NATESA

As reported in an earlier issue of TECHNICIAN (February 1956), local delegates to the Federation of Television-Radio Service Associations, P.O. Box 61, Carbondale, Penna., carried to their respective chapters the decision as to whether the Federation should join NATESA for the sake of unity in a single national group.

At a subsequent meeting of FTRSAP, delegates reported that their local chapters had rejected the proposed plan for affiliation. As a result, the Pennsylvania Federation is making no plans for joining NATESA.

Two-Way Radio Systems

(*Continued from page 40*)

be very carefully studied.

Size and shape of the area to be covered is quite important, as it determines the type of antenna needed. If the base station is at or near the center, an omnidirectional antenna, such as the various "ground-plane" types, should be used. See Fig. 2. If the station is located at the extreme edge of its territory, as we were, then some form of directional antenna should be used, both to gain efficiency and eliminate interference with other stations using the same frequency. Our base is located at the northwest corner of our territory; therefore, we selected a corner-reflector antenna. The pattern of this unit gave us much better coverage, and eliminated unnecessary radiation of signals into other areas.

Accessibility Important

One more important factor in the selection of a transmitter site is all-weather accessibility, for motor vehicles. This will not only simplify construction problems, but make maintenance much easier. Periodic checks upon equipment must be made, and also emergency repairs. A site that is accessible only by jeep, as ours is, makes this task much more onerous, especially in very bad weather!

Selection of equipment is also very important. Several major manufacturers, among them Motorola, Dumont, RCA, GE, and others, are making two-way radio equipment, and this is usually well-built equipment. Beware of the so-called "bargains" in this kind of equipment. They can easily prove more costly in the long run, and that is what must be considered when installing a system like this. High-quality parts and competent engineering are far more important than price. In addition, the reliable manufacturers provide a variety of invaluable services: they will help you get the FCC license, select the equipment, provide field engineering help in working out any special problems that may arise, and also maintain parts depots all over the country to give faster service on special parts which might be needed. Take advantage of these; they will speed up the job immensely.

When making application for license, be sure to include more mobile units than actually will be needed. In other words, if your system now calls for three mobile units, apply for five, or better still, ten. This does not imply any obligation to install all of them now: it merely saves you much paper work later, if more mobile units are added. If you apply for three and install three, additional mobile units require a complete refiling of your application, with much unavoidable delay. If your application calls for ten mobile units, you simply install the new unit, write the FCC a letter of notification, and the job is over.

Maintenance work on these systems requires the possession of a FCC license, of at least 2d-class Radiotelephone or higher. If no one in the community has such a license, there are usually maintenance firms within a short distance who specialize in this kind of work. They have the necessary frequency monitors, and other equipment needed to make the periodic checks required by FCC. Power output, frequency, and modulation must be measured every six months, by FCC regulations, and the results entered in the log. This is the maintenance technician's responsibility. The receivers, of course may be serviced by any competent

(*Continued on page 70*)

News of the Industry

After years of research in semi-conductors, **SPRAGUE ELECTRIC CO.** is starting production this year of transistors. First in production will be surface-barrier transistors, under a licensing agreement with PHILCO CORP. . . . **R. C. SPRAGUE**, founder and board chairman of SPRAGUE ELECTRIC, was named chairman of the Federal Reserve Bank in Boston.

JAMES H. CARMINE is stepping down as president of **PHILCO CORP.** to get away from the burden of day-to-day duties, but will continue as an active member of the Board of Directors and Finance Committee.

In Operation Cue, AEC test atomic blast in Nevada, several **JFD** antennas and other products were installed at the test site. After the explosion, the antennas had suffered only superficial bending, although the buildings on which they were mounted were demolished.

TEXAS INSTRUMENTS INC., electronics and geophysical firm noted for its pioneer work in transistors, has acquired the BURLINGTON INSTRUMENT CO., maker of electrical indicating instruments.

GUS and BEN SNYDER, heads of **SNYDER MFG. CO.**, are mapping out an expansion plan for their Canadian subsidiary. A program for stepped-up SNYDER sales throughout the world was formulated at an international sales meeting in Philadelphia.

SECO MFG. CO., test equipment maker of Minneapolis, Minn., has appointed J. WARREN BOSIGER as its Technical Field Rep.

The **MAGNAVOX CO.** and the **SPARKS-WITHINGTON CO.** have concluded an agreement whereby Magnavox will take over the service of SPARTON radio and TV receivers, formerly manufactured by Sparks-Withington. Magnavox is now manufacturing a line of fringe-area TV receivers to supply former Sparton dealers . . . Magnavox has also opened a Color TV Service School, in Chicago, for its midwest dealers and authorized service agencies.

THOMAS C. FLYNN was named public relations rep for the **FEDERAL TELEPHONE AND RADIO CO.** of Clifton, N. J.

The position of Mgr. of Govt. Sales and Specifications at **ERIE RESISTOR CORP.** has been filled by the appointment of J. C. VAN ARSDELL.

MERIT COIL & TRANSFORMER CORP. has a new vice president and comptroller. He is KENNETH H. GRADY.

To create consumer demand for its radio and TV tubes, **GENERAL ELECTRIC** is launching a big spring promotion pitched as "The Greatest Show of Worth."

MERLE W. KREMER has been appointed asst. gen. mgr. of the Parts Div. at **SYLVANIA ELECTRIC PRODUCTS.**

ROHN MFG. CO. now uses a tractor-trailer for delivering its antenna towers that serves a dual role. The custom-designed trailer, with a few tower sections set around, makes a crowd-gathering spectacle in front of a dealer's store. Dealers interested in the display can write direct to the manufacturer or contact local Rohn reps.

Directors of **MOSLEY ELECTRONICS, INC.** elected 2 new vice presidents. **JACK R. MOSLEY** is vice president and asst. mgr. **GEORGE E. MOBUS** is vice president in charge of sales and advertising.

New president of **UNIVERSITY LOUDSPEAKERS, INC.** is SIDNEY LEVY. New secretary-treasurer of the company is ARTHUR BLUMENFELD.

GENERAL DRY BATTERIES, INC. has set up 11 warehouses across the country to insure fast delivery (48-hr. shipment) for its customers. Warehouse locations are Atlanta, Ga.; Boston, Mass.; Cleveland, Ohio; Dallas, Tex.; Denver, Colo.; Dubuque, Iowa; Los Angeles, Calif.; Memphis, Tenn.; Portland, Ore.; San Francisco, Calif,; and Silver Springs, Md.

Appointment of WILBERT H. STEINKAMP as vice president in charge of sales was announced by **WESTON ELECTRICAL INSTRUMENT CORP.**, a subsidiary of **DAYSTROM, INC.** Also appointed, as vice president and gen. mgr. of Weston, is SAMUEL J. CHILDS.

(*Continued on page 68*)

Reps & Distributors

JENSEN MFG. CO. of Chicago has named 3 more wholesalers to handle 2-step distribution of its quality loudspeakers: CHEMCITY ELECTRONIC DISTR. of Charleston, W. Va., **REED** RADIO & SUPPLY CO. of Springfield, Mo., and PRECISION RADIO LTD. of Honolulu, Hawaii.

CARTWRIGHT & BEAN of Memphis, Tenn., will represent the **QUAM-NICHOLS CO.** in the Southeast.

WILLIAM I. DUNCAN will be capacitor representative for the Industrial Div. of **JFD MFG. CO.** in the Middle Atlantic area. Mr. Duncan's territory will range from southern N. Jersey to northern Virginia.

At a well-attended meeting of the **EMPIRE STATE CHAPTER OF "THE REPRESENTATIVES,"** the following were re-elected to office for 1956: JOHN L. STONE, pres.; GORDON LE ROY, vice pres.; MARSHALL BALL, secy.; and JOSEPH S. MARCY, treas.

PRECISE DEVELOPMENT CORP. of Oceanside, N. Y. has named LEN FINKLER as Eastern Canada rep.

HARRISON REYNOLDS CO., New England reps, announces an organizational change. The newly formed **SALES ENGINEERING CO.**, with offices at Sugar Lane, Newtown, Conn., will involve most of the personnel of the former Reynolds organization.

The addition of two more men to the sales and engineering staff of **PERLMUTH-COLMAN AND ASSOCIATES** of California brings the total of salesmen and engineers to 18. Newcomers are HARRY LINDEN, field engineer, and EMERSON (BUD) MILLER, technical sales.

Catalogs & Bulletins

RECEIVE THESE CATALOGS described here. Simply write in number given at end of each item of interest on postage-free inquiry card, page 33.

TV ACCESSORIES: Data sheets on rotary stripper for shielded cables, model TV-42 2-set TV coupler, and DA8-B distribution and isolation amplifier for up to 8 TV sets on a single antenna. Blonder-Tongue Laboratories, Inc., 526-636 North Ave., Westfield, N. J. (Ask for B3-1)

SPEAKER ENCLOSURE KITS: Brochure 78A8 illustrates and describes a variety of Hi-Fi speaker enclosure Kwikits of several sizes. Desk LA8, University Loudspeakers, Inc., 80 S. Kensico Ave., White Plains, N. Y. (Ask for B3-2)

ELECTRONIC SUPPLIES: 72-page supplement to distributor's main 1956 catalog. Supplement No. 155. Allied Radio, 100 N. Western Ave., Chicago 80, Ill. (Ask for B3-3)

SHIELDING MATERIAL: Release 102 gives characteristics and applications of low-level Co-Netic shielding. Magnetic Shield Div., Perfection Mica Co., 1829 Civic Opera Bldg., 20 N. Wacker Dr., Chicago 6, Ill. (Ask for B3-4)

PHONO STYLII: Dealers' price list No. 56212, distrib price list No. 5621, and Supplement 1 to 5th edition of replacement needle guide are available. Recoton Corp., 52-35 Barnett Ave., Long Island City 4, N. Y. (Ask for B3-5)

SILICON RECTIFIERS: 8-page brochure presents electrical and mechanical characteristics of line of miniature silicon rectifiers. Sarkes Tarzian, Inc., Rectifier Div., 415 N. College Ave., Bloomington, Ind. (Ask for B3-6)

AUDIO, HI-FI: 1956 High Fidelity Audio Guide, a 132-page catalog, lists equipment for hobbyist and professional, Hi-Fi and PA. Terminal Radio Corp., 85 Cortlandt Street, New York 7, N. Y. (Ask for B3-7)

(Continued on page 68)

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New Books

TV REPAIR QUESTIONS AND ANSWERS. *By Sidney Platt. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 128 pages. Paper cover. $2.10.*

Over 115 technical questions concerning the practical aspects of servicing horizontal and vertical oscillators and sync systems, and AFC circuits, are answered in considerable detail. Charts list tubes used in these circuits in common receivers. This volume should be highly appreciated by the already experienced technician.

SPECIALIZED HI-FI AM-FM TUNER MANUAL, Vol. 1. *By John F. Rider Laboratory Staff. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, 208 pp. Paper cover. $3.50.*

This first of a series of specialized manuals presents schematics, service data, technical information, response curves and other pertinent material on the 1950-1955 production of 21 leading manufacturers of this type of equipment. Included are FM-only tuners, combination tuners, and tuners that incorporate complete preamplifier or preamplifier-amplifier facilities. Service techs interested in Hi-Fi service should find the volume an invaluable aid.

TELEVISION—HOW IT WORKS (2nd Edition). *By J. Richard Johnson. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 352 pages. Leatherette-finish paper cover. $4.60.*

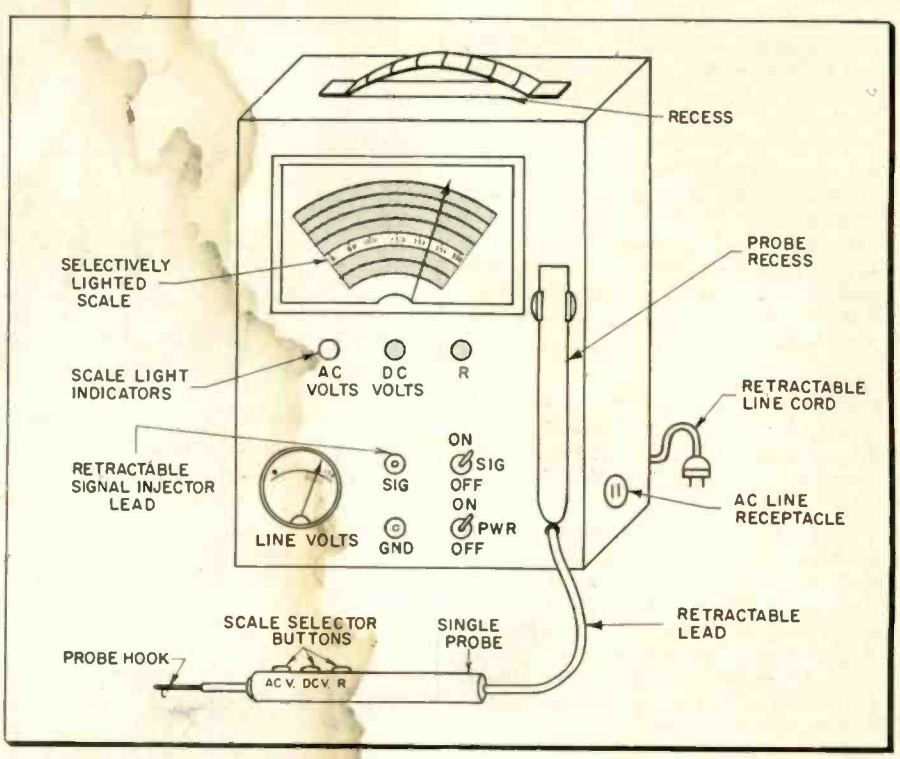
Stabilization of TV receiver circuitry since the original edition of 1948 has provided the author with the opportunity to make this edition a comprehensive and definitive exposition of the receiver, with all variations considered. He has made good use of the opportunity. The pitfalls involved in merely bringing an existing volume up to date have been avoided; this book is all new from beginning to end. Graphic illustrations well-integrated with the text enhance the impression of complete yet comprehensible treatment. This is in the nature of a standard reference for the practicing technician and the student.

LIMITERS AND CLIPPERS (Review Series). *By Alexander Schure, Ph. D., Ed. D. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 64 pages. Paper cover. $1.25.*

The functions and applications of limiters and clippers form the basis for this slender text, including treatment of various types. Series and parallel diode limiters are illustrated and explained, as well as triode limiters. Also covered are the differences between saturation and cutoff limiting.

(Continued on page 67)

Ideas for Test Equipment 1



This is the first in a series of short features summarizing some of the key features techs want to see in instruments for TV servicing. It is a combination of highlight suggestions contained in several entries to TECHNICIAN's Test Equipment Contest, and consequently can not be credited to any one entrant.

The combined "dream" instrument shown in the illustration is a self-setting VTVM with simple signal source. The heart of the unit is a single probe for ac, dc and ohms, which contains one or more remote control buttons for selecting the desired setting. Pressing the button actuates a stepping relay or similar device in the unit which sets the instrument for a particular measurement. At the same time, only one scale on the meter face is selectively lighted to correspond with the measurement setting, making readings quick and unambiguous. One of three scale light indicators light up to show at a glance whether reading is ac volts, dc volts or ohms.

A small line voltage meter constantly monitors the line power source, and an ac line receptacle is provided for soldering iron or other equipment.

An additional feature is a simple signal source which may be injected into a circuit by a small probe to obtain a fundamental indication of the set's functioning. It may consist of a noise generator such as a built-in buzzer and step-up coil to produce spark induced r-f and a-f. This can locate dead sound circuits by noise, dead video by horizontal bars, and dead i-f and r-f by noise pattern. Another one of many alternatives is a single-transistor Colpitts oscillator operating at an audio frequency to make a quick check when a sweep or signal generator is not required.

A small hook on the probe allows it to be hung on a connection under test, leaving the hands free. All leads and handle are retractable into the case or recessed for flush mounting. Overload and polarity reversal protection is provided, and unit is shock mounted.

TV Plays Traffic Cop

Scotland Yard chiefs and top British Army brass attended a recent demonstration of air-to-ground TV at Filton, England.

An industrial TV camera was mounted in the door of a helicopter to pick up and transmit pictures of highway traffic, docks, shipping, and harbor installations, from heights between 500 and 1000 feet. A transmitting antenna was attached to the helicopter's tail skid. From stationary pickups on the ground, observers were able to get a bird's-eye view of traffic conditions.

 Circle numbers on free Inquiry card, p. 33, for more product data.

New Books

(*Continued from page 65*)

RADIO PHILATELIA. *By Herbert Rosen. Published by Audio-Master Corp., 17 E. 45 St., New York 17, N.Y. 48 pages. Paper cover. $2.00.*

Here is an unusual and specialized book for techs interested in stamp collecting. Many stamps from all over the world, all devoted to telecommunications, are reproduced. Many commemorate the great men and events in radio-TV history.

THE VTVM. *By Rhys Samuel. Published by Gernsback Library, Inc., 25 West Broadway, New York 7, N. Y. 224 pages. Paper cover; $2.50. Hard cover; $4.60.*

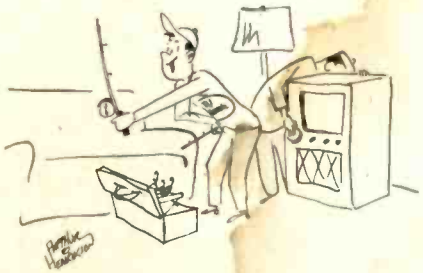
Characteristics of the instrument, as compared to other types of practical meters, are given due consideration, together with examination of the whys and wherefores of VTVM operation. Also presented are the many applicaitons of this versatile aid in the several areas of electronics, including the use of such accessory devices as probes and cables. Also treated are the role of the VTVM in troubleshooting, and maintenance and repair of the instrument itself.

TV FIELD SERVICE MANUAL, VOL. 5. *Edited by Harold Alsberg. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N.Y. 148 pages. Paper cover. $2.40.*

Another in the publisher's growing series of quick-reference servicing information, this volume covers Motorola and Philco TV receivers from 1949 to 1955. Tube and chassis layouts are conveniently arranged facing lists of usual symptoms and their trouble sources. Plastic binder allows pages to remain open flat on work bench.

PRACTICAL RADIO SERVICING. *By William Marcus and Alex Levy. Published by McGraw-Hill Book Co., 327 W. 41 St., New York 36, N.Y. 559 pages. Hard cover. $8.50.*

Assuming the reader has no previous knowledge of radio, this substantial volume explains how radios are repaired, instruments used and basic troubleshooting shortcuts.



"Hey Jeff! What happened to your tool kit?"

News of the Industry

(*Continued from page 62*)

A 40-HOUR COURSE in color TV, intended to train 20,000 color TV service technicians throughout the country, has been inaugurated by PHILCO CORP. Servicers representing all PHILCO distributors are being brought to Philadelphia factory headquarters in groups of not more than twenty. After training, they will return to their respective areas to conduct local color TV schools.

SIMPSON ELECTRIC CO., Chicago, honored its founder, RAY R. SIMPSON, on the occasion of his fifty years in the electrical instruments industry.

KENWOOD ENGINEERING CO., INC., Kenilworth, N. J. named SAMUEL YURMAN as sales mgr. of the firm.

BROOKS A. KAFKA has been appointed sales manager in the GENERAL ELECTRIC cathode ray tube sub-department at Syracuse.

A. C. ELLES has been appointed general sales manager of INDUSTRIAL DEVELOPMENT ENGINEERING ASSOCIATES, INC. (I.D.E.A.), Indianapolis, Ind.

Catalogs & Bulletins

(*Continued from page 63*)

DISPLAY: Colorful poster to stress antennas is offered by Taco for window display or store use. Also available are cards for mailing to customers inviting antenna check. Write to Technical Appliance Corp., 1 Taco St., Sherburne, N.Y. (Ask for B3-8)

CATHODE REJUVENATOR TESTER: Data sheet describes portable CRT tester which can be used to test and repair picture tubes without removing tube from the receiver. Complete with carrying case. Bulletin No. 102, B&K Mfg. Co., 3731 N. Southport Ave., Chicago 13, Ill. (Ask for B3-9)

TUNER: Bulletin T-90 describes new uhf television tuner developed to meet radio frequency interference objectives of both RETMA and the FCC. Radio Condenser Co., Davis & Copewood Sts., Camden 3, N.J. (Ask for B-3-10)

TEST EQUIPMENT: Combination condensed catalog and direct-mailer describes the complete EICO Kit and Instrument Line. Laid out to facilitate addressing or to "ride free" as an envelope stuffer. EICO, 84 Withers St., Brooklyn 11, N.Y. (Ask for B-3-11)

Let's Look at Circuits

(Continued from page 44)

from differences in the phase relationships of the signals as they vary on either side of center (resonance). The manner in which the diode detectors are connected across the output of the secondary also varies.

There is also the matter of disposing of any misleading amplitude variations, such as those introduced by noise pulses, so that the only amplitude variations appearing in the final output are those that correspond to the original audio modulation. However, the basic processing through which the FM signal goes has been described here. It is wisest to hold other considerations and variations for separate discussion.

Westinghouse Color TV

Sometime in the middle of this year, Westinghouse plans to undertake quantity production of color TV receivers. Heart of the set will be a new 22-in. rectangular all-glass color crt.

With the use of compact receiver design around the tube, the sets are not expected to be much larger than current 21-in. monochrome table models. Compact table sets will be available in the line.

One of the factors enabling reduction in size will be the extensive use of printed-circuit boards. The sets are expected to be competitively priced with color sets using smaller round pix tubes.

Visual Tube Inventory

Tube needs can be kept at the fingertips with See-Lect-a-Tube method now available from GE distribs. Dispenser holds 250 tubes in minimum space. Tubes stay stacked neatly, in order, without falling out or sliding against each other. With type numbers visible, stock can be checked at a glance. Only 38 in. long, the unit can be wall mounted.

Two-Way Radio Systems

(*Continued from page* 61)

radio technician; a license is required only for servicing the transmitters.

There is no practical limit to the usefulness of a radio system of this type, and their numbers are growing with amazing speed. Even in the smallest town, radio-equipped cars are a common sight today: a few days ago, I counted seven in the four blocks of our small Main Street! Their maintenance and installation is a growing and profitable business. It will be well worth the technician's time to obtain the needed licenses and equipment, to get into this lucrative field. •

Closed T-V in School

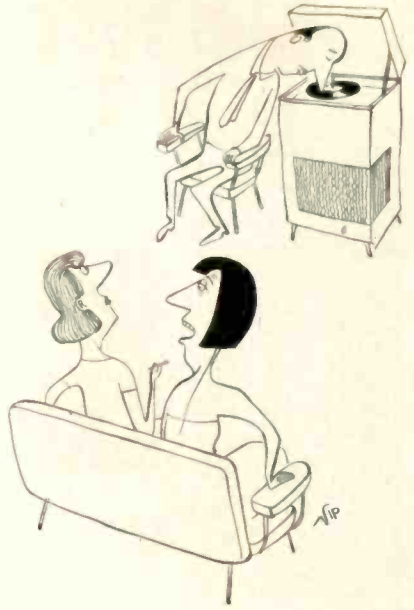
Gov. Robert E. Smylie of Idaho recently conducted a class in political science at Idaho State College which was witnessed simultaneously over TV by youngsters in 11 different Idaho elementary schools in the nation's first demonstration of a completely televised public school system.

Gov. Smylie and other state officials participated in a panel discussion on state government. Also televised was a fourth-grade reading and social studies class watched by fourth graders and student teachers. A third class involved a demonstration on the use of radar in highway safety.

The closed-circuit educational network was financed jointly by Jerrold lectronics Corp. of Philadelphia and Bannock Cable TV, Inc., of Pocatello, Idaho. The two companies had made a grant of $5000 to Idaho State College for the purpose of establishing the chair of TV co-ordinator to head up the educational network.

The network, whose programs originate at the State College, is connected to an existing community antenna system, so that educational programs can be watched by youngsters and parents right in their own homes.

The new network makes it possible for a few specialized teachers, who formerly traveled from school to school, to reach a much larger student body by broadcasting from the college studio. Since only a single film library, at the college, is now necessary, money formerly spent on duplicate films and equipment will be used instead to enlarge the single combined library.



"He does have a nose for good records, but you must try a JENSEN NEEDLE."

Color Instruments

(Continued from page 29)

illustrated in Fig. 8 with that of Fig. 9; although the waveform *should* appear the same in both cases, the 3.58-mc chrominance component is practically wiped out in the display of Fig. 9. These illustrations serve to show that a scope which may be quite satisfactory for alignment work, to display demodulated response curves, may be completely unsuited for the display of color signals.

Also important in the response of a scope for color-TV work is the transient characteristic. When the output from the R-Y detector is applied to the vertical-input terminals, and the output from the B-Y detector is applied to the horizontal-input terminals of the scope, a typical vectorimeter pattern is obtained. The vectorimeter pattern normally has a hexagonal form; but if the scope has poor transient response, confusing displays such as shown in Fig. 10 will be obtained. Of course, any scope can be successfully used as a vectorimeter if the R-Y and B-Y outputs are taken from a high-level point in the receiver where the deflection plates of the scope can be driven directly, or if low-level signal is applied to the deflection plates through a separate wideband amplifier. •

Fireproof TV

Guaranteed to stop consumer traffic is this fiery display atop the metal cabinet containing the latest Westinghouse television receivers. Treated with a special chemical finish, the cabinet is doused with lighter fluid and a flame applied to it. Watching the demonstration are Joseph Rudnick, Sunset Appliance Stores, New York, (left) and Ira Kaplan, Times Appliance Co., Distributor.

Tough Dogs

(*Continued from page* 41)

showed that all the pulses were there, and that they were of correct amplitude and shape. The center point of the afc circuit was about 2 volts positive, but it was assumed that this voltage had been developed due to the difference in frequency between the oscillator and the incoming sync pulse. After some further probing failed to produce results, this point in the afc circuit was checked again—this time with the 6AL5 out of the circuit. The 2 volts positive was still there!

This was it, I thought. The only place the voltage could come from was leakage of the 0.1-mfd capacitor coupling the reference horizontal pulse to the phase detector. A new 0.1—and still no dice. The 2 volts was still there. The only things left in the circuit were two solid-looking 150 k resistors that were feeding the reference pulse to the 6AL5. They checked on the money with the ohmmeter but, when they were out of the circuit, the 2 volts disappeared! When they were changed, the set popped into sync.

Later on, intrigued by the mystery of the two resistors, I set out to learn how they produced the 2 volts. I discovered that they had turned into little rectifiers, apparently by setting up a layer of copper oxide at the point where the carbon of the resistor body met the lead. The effect was so slight that the resistors measured substantially the same in both directions on the ohmmeter. However, by applying voltages to duplicate the operating conditions found in the set, the resistors could be made to act as rectifiers outside the receiver circuit.—*Ed Townsend, Worth, Ill.*

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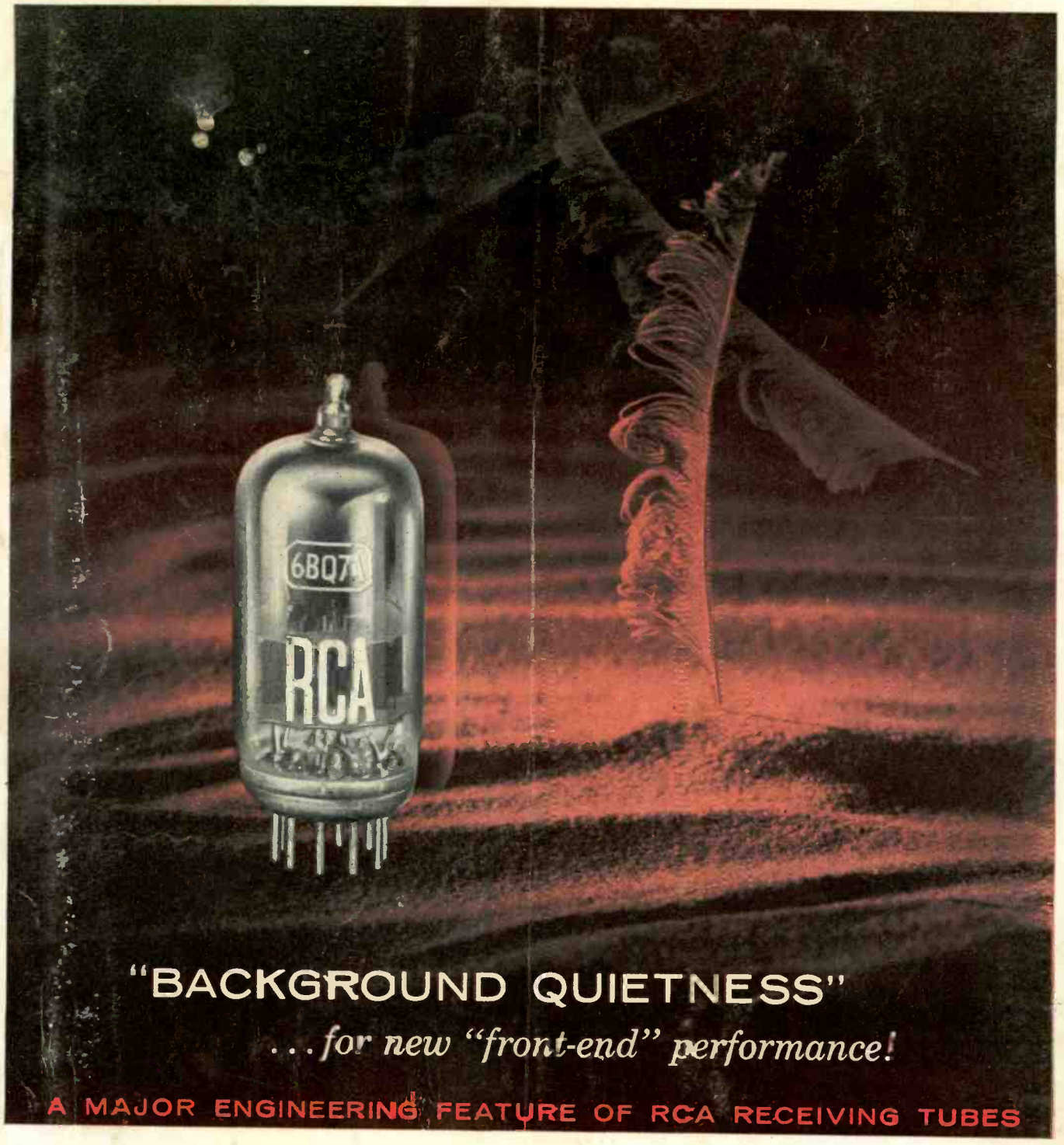

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