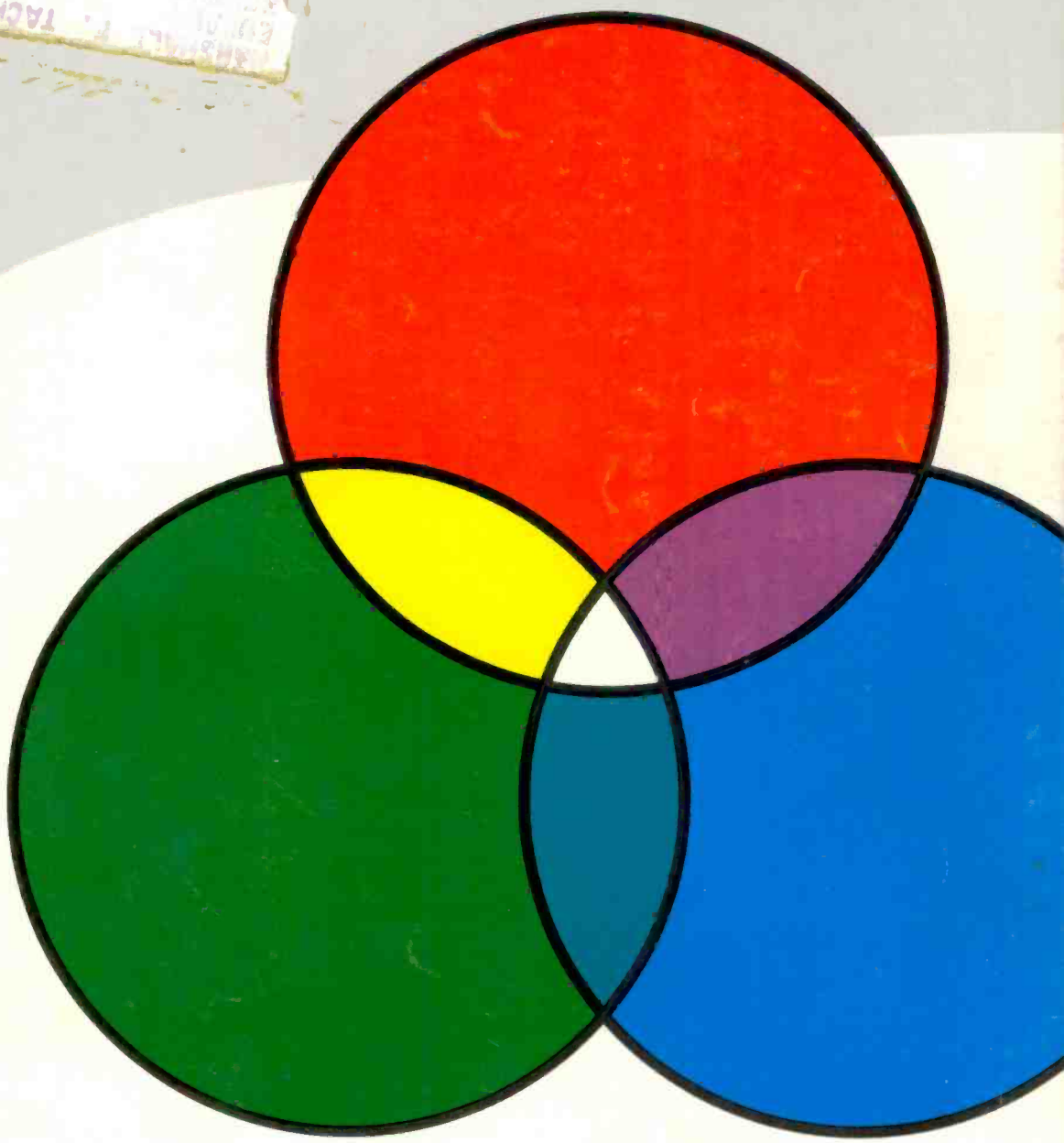
ELECTRONIC TECHNICIAN



COLOR TV FROM A TO Z — PAGE 22

AUGUST 1962

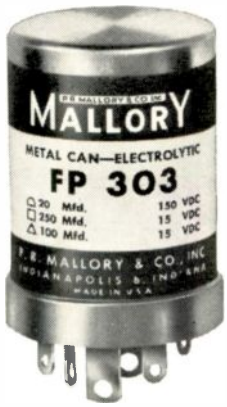
60¢

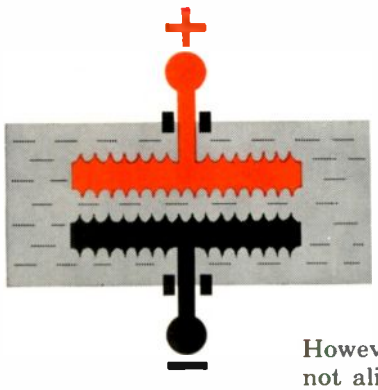
P. R. MALLORY & CO. Inc.
MALLORY

Tips for Technicians

Distributor Division, P. R. Mallory & Co. Inc.
P. O. Box 1558, Indianapolis 6, Indiana

Why some filter capacitors develop hum... and some don't





Aluminum electrolytic capacitors are widely used as filters in DC Power Supplies. This is because of their large capacitance in relatively small size. All in all, they do an efficient job of reducing ripple (hum) to acceptable levels.

However, all electrolytic capacitors are not alike. This is often why some types seem to allow hum to rise to objectionable levels more quickly than do others. In order to understand why, we must investigate actual construction methods.

As you know, electrolytics are basically made by depositing a film of aluminum oxide on aluminum foil to form the positive anode. The oxide is the dielectric. A semi-liquid electrolyte surrounds the anode and is actually the negative cathode. In order to connect this semi-liquid cathode to a terminal, a second piece of aluminum foil is used. This is often *called* the cathode, but it is not. It is actually only the *cathodic connection*. (The preceding describes a "polarized" electrolytic capacitor.)

When high ripple currents are applied to polarized electrolytics, a thin oxide film forms on the so-called "cathode". It begins to assume the characteristics of a second anode. This in turn, has the same effect as placing two capacitors in series. Consequently, overall capacitance is reduced. Inevitably hum increases.

This action is especially noticeable in electrolytics which use plain foil as the "cathode". This is simply because the oxide builds up over a relatively small area.

Mallory avoids this problem by etching the "cathode" on electrolytics. As a result, oxide build-up is spread over a vastly increased area. Therefore, ripple currents are maintained at very low levels for very long time periods.

Of course etched "cathodes" cost a lot more to make. But you get them from Mallory at *no extra cost*. There's much more to the Mallory capacitor story, but we'll leave that to another TIP.

Meanwhile, see your local Franchised Mallory Distributor for capacitors, resistors, controls, switches, semiconductors, and batteries. In fact, he's the man to see for *all* of your electronic component requirements.

. . . for more details circle 33 on page 46

Sells best because it works best

JERROLD®

TRANSISTOR POWERMATE PREAMPLIFIER

BY FAR THE BEST antenna preamplifier in the business—that's POWERMATE! On black-and-white, and where it *really counts*—on color TV—POWERMATE's superiority shows up across the country.

The better VSWR (impedance match), flat response, ultra-high gain, special broad-band neutralizing transformer, and better power-supply filtering—all add up to an outstanding product. No polarity problems . . . no call-backs . . . transistor protected from lightning-coupled surges . . . remote a-c power supply feeds 2 sets.

Step up to POWERMATE, and step up to a tremendous new profit opportunity. See your Jerrold distributor now.

Model APM-101 $39.95 *list, complete*

JERROLD ELECTRONICS CORPORATION

Distributor Sales Division, Dept. IDS-243, Philadelphia 32, Pa.

Jerrold Electronics (Canada) Ltd., Toronto • Export: CBS International, New York 22, N. Y.

. . . for more details circle 30 on page 46

WORLD'S LARGEST

ELECTRONIC TRADE

CIRCULATION

ELECTRONIC TECHNICIAN

August • 1962 Vol. 75 • No. 8

AN OJIBWAY PUBLICATION

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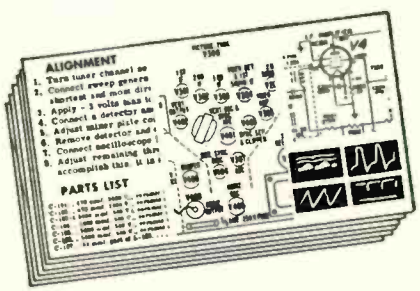
ELECTRONIC TECHNICIAN and Circuit Digests, published monthly at 1 East First Street, Duluth 2, Minnesota, by Electronic Technician, Inc., a subsidiary of Ojibway Press, Inc., Marshall Reinig, president; Robert Edgell, executive vice president; Lawrence Rosenthal, vice president; H. B. Fryberger, Jr., secretary; E. A. Kuefner, treasurer. Single copies, 60c. Subscription rates: United States and Canada $5 for one year; $8 for two years; $10 for three years. Pan American and Foreign countries, $9 for one year; $14 for two years; $18 for three years. With subscription correspondence, include mailing label from most recent issue. Second-class postage paid at Waseca, Minn.
POSTMASTER: SEND NOTIFICATION (Form 3579) TO ELECTRONIC TECHNICIAN, 1 EAST FIRST STREET, DULUTH 2, MINNESOTA.

COVER More than two-thirds of NBC's evening schedule will be in color this autumn. Don't miss out on this growing market. Broadcast and receiving principles as well as color mixing, and circuit functions are described in the article beginning on page 22.

FEATURES

DEPARTMENTS

CIRCUIT DIGESTS ..... PRECEDING BACK COVER



DELCO: Garage Door opener Receiver-Transmitter Models R59 and T-59-12V

ELECTROHOME: TV Chassis, Models Kimberly and Kalmar

GENERAL ELECTRIC: Stereo Phonograph, Model RP2060A

MOTOROLA: Auto Radio, Models 202, 203, and 204

TRUETONE: TV Chassis 1095-232

ZENITH: Color TV Chassis 27KC20 and 27KC20Q

EDITOR'S MEMO

While driving to work the other day, a TV service truck whizzed by me. Not only was he speeding, but he passed on a curve, just barely missing an oncoming car.

Frightening. Just think how TV techs are making hundreds of thousands of house calls every day. Being on the road so frequently means that you are risking life and limb.

Consider that last year 37,600 people died and 3,057,000 were injured because of auto accidents. Based on the statistics the Automobile Manufacturers Association and The Travelers Insurance Company, I estimate that at least one outside TV tech out of every 25 will be injured in an auto accident this year, and more than one in every 2000 will be killed while on the job, still more on their own time.

Here are some figures which I hope will be good cause for sober reflection. Collision with another auto produced 39.1% of deaths, 74.7% of injuries; noncollision, 25.9% deaths, 10.1% injuries; striking pedestrian, 18.9% deaths, 7.7% injury; hitting fixed object, 11.4% deaths, 5.4% injuries.

Driver error causes 82% of casualties. 37.4% of injuries were caused by speeding, 22.1% by not having right-of-way, 17.6% by reckless driving, 8.8% by driving off roadway, 7.1% on wrong side of road (16.9% of deaths this way), 2.6% cutting in, and 2% failing to signal.

Drivers 25 years old and under are involved in about one-third of all fatalities, though they account for only 19% of all drivers.

Don't blame women drivers for the road mayhem, either. Though 39% of all drivers are females, the ladies drive in only 13.4% of fatal accidents and 19.8% of non-fatal accidents.

Get seat belts, take it easy on the road. Act as if your life depended on it. It does.

Remember this epitaph:

Here lies the body of William Jay,
Who died maintaining his right of way;
He was right, dead right, as he sped along,
But he's just as dead as if he'd been wrong.

Al Forman

SPRAGUE CERAMIC CAPACITORS

THE Complete LINE THAT OFFERS MORE THAN MERE "CAPACITY"

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

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

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

CERA-MITE® CAPACITORS

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

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

HYPERCON® CAPACITORS

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

"UNIVERSAL" CAPACITORS

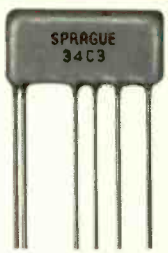
Have multiple leads. Quick-fix capacitors for on-the-spot repairs. By using certain leads for terminals, connecting certain leads together, and removing certain leads, various ratings may be obtained. Available in General Application as well as High-K types.

DOORKNOB CAPACITORS

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

BUTTONHEAD CAPACITORS

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



BULPLATE® CAPACITORS

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

SPRAGUE®
THE MARK OF RELIABILITY

WORLD'S LARGEST CAPACITOR MANUFACTURER

. . . for more details circle 39 on page 46

. . . for more details circle 22 on page 46

LETTERS TO THE EDITOR

Double Leverage

EDITOR, ELECTRONIC TECHNICIAN:

I have found that frozen powdered iron core slugs in transformers and coils can be freed by using one alignment tool at each end of the coil. This provides twice the force which will almost always free the slug . . . I believe a good plastic tool is less likely to break the slug than an Allen wrench.

GERALD MOCK

Norwalk, Calif.

• *This should work fine with single-slug coils having adjustment notches in both ends of the slug.—Ed.*

Union vs Licensing

EDITOR, ELECTRONIC TECHNICIAN:

I have been reading your magazine steadily for 3 years. Also I have seen many of your older issues. Always there is the same old story: licensing, yes! and licensing, no! I have had it full up with this old baloney! . . . What we do need can be told in one five letter word: U-N-I-O-N. That's right, a good, strong, honest, powerful union. The one thing that is necessary is to set minimum prices on service calls and labor. Believe me, licensing is not the answer . . . .

ARNOLD WAXMAN

Detroit Mich.

Technician's Co-op

EDITOR, ELECTRONIC TECHNICIAN:

I am pleased to announce the formation of a new Co-operative. I believe it will fill the void for those discriminating television servicemen, desirious of associating themselves with an organization designed to protect them and to assure good working conditions and still belong to a Co-operative and technical society of men, well trained in their fields. Regretfully, certain present groups admit anyone regardless of their qualifications or sincerity of purpose . . . . The group will be known as the "Professional Electronic Technicians Engineering Co-operative," or simply "PETEC."

D. W. COOK, Executive Director

Kenmore, N. Y.

Monophonic Minded

EDITOR, ELECTRONIC TECHNICIAN:

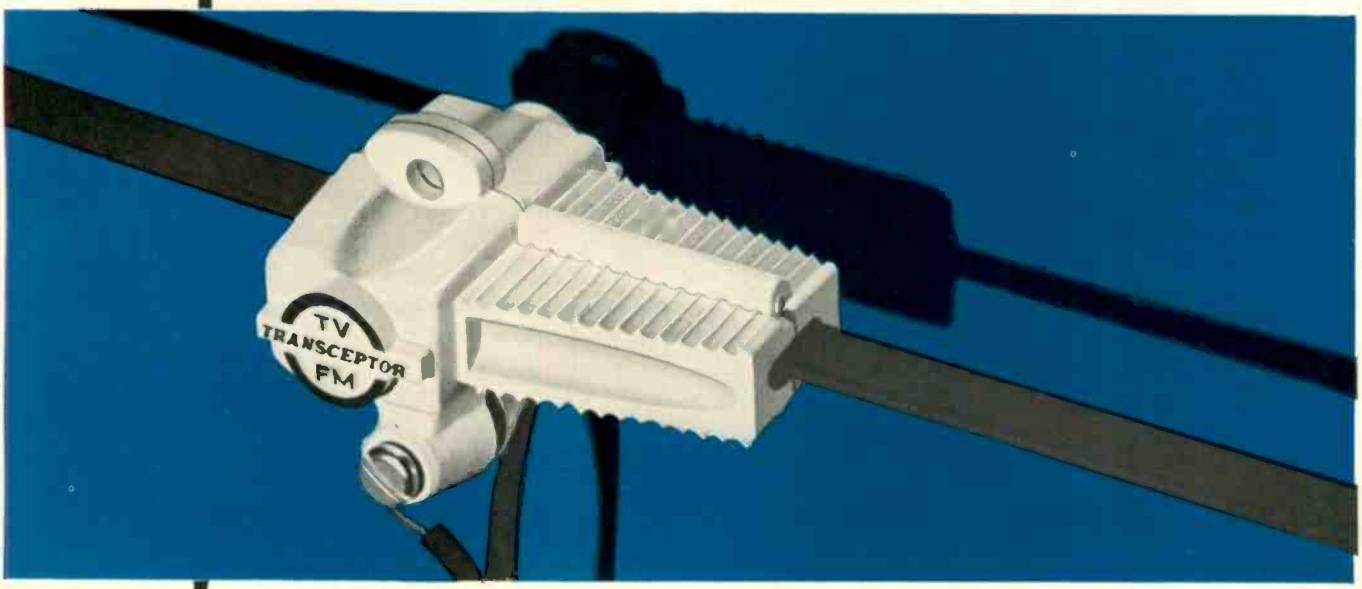
I recently heard that ELECTRONIC

15,000,000 MULTIPLE-SET OWNERS NEED

TRANSCEPTOR®

THE HOUSEHOLD SET COUPLER

ANYONE CAN INSTALL IN SECONDS



improves reception for additional TV, color TV, FM, stereo FM
provides most efficient signal delivery
automatically matches impedance
proved in more than 50,000 installations
snaps on without tools
eliminates extra antennas, rabbit ears
packaged and designed for consumer appeal
more than 2 million new customers annually

Foolproof, simple, rugged TRANSCEPTOR was designed especially for the fifteen million multiple-set owners in this country. Now, with easy-to-install TRANSCEPTOR, they can run any combination of TV and FM sets — two or more, one at a time or all at once — *off one antenna* without amplification in normal signal areas. And, because TRANSCEPTOR uses electro-magnetic pick-up instead of resistance splitting of the signal, the line is not cut, there is minimum signal loss, and better set-to-set isolation.

Result: More customer satisfaction. More sales. More profits.

* * * INDIVIDUALLY PACKAGED ON SELF-MERCHANDISING COUNTER DISPLAY CARDS. AVAILABLE FROM YOUR LOCAL DISTRIBUTOR

$2.98 RETAIL

ÆROGAP CORPORATION
1680 NORTH VINE STREET
LOS ANGELES 28, CALIFORNIA

INSTALL IN SECONDS

- - - for more details circle 46 on page 46

G-E SEPT TUNE-UP SPECTAC

*

Hugh Downs

Joe Garagiola

Mel Allen

8 G-E WORLD SERIES FEATURES

ON THE NBC TODAY SHOW

Full Lineup of 155 Local Stations
Covers 95% of U. S. Audience

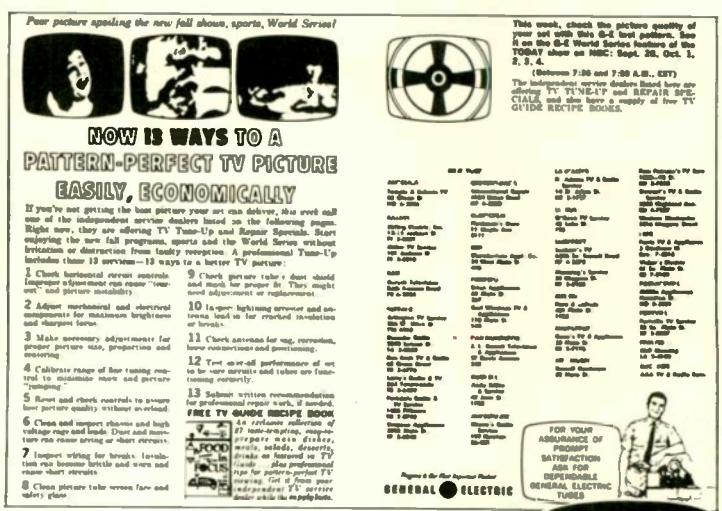
Joe Garagiola hosts sports personalities on this timely show. **Mel Allen,** with unique "Test Pattern Commercial," sells immediate need for your service to your customers through your local station. Starts Sept. 10.

These commercials direct viewers to your name, address and phone number in your local TV Guide.

SEE AD AT RIGHT ▶

*

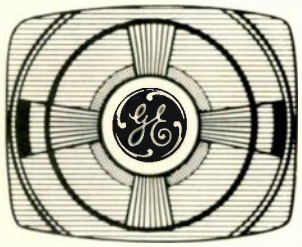
FULL-PAGE AD PLUS YOUR NAME, ADDRESS, PHONE NUMBER IN SEPTEMBER 29 ISSUE OF YOUR LOCAL TV GUIDE



TV GUIDE

This hard-hitting ad sells your professional repair and maintenance service . . . refers to local TV Tune-Up Commercials on TODAY show . . . directs customers to you through your name and address listing *in your local edition.*

EMBER

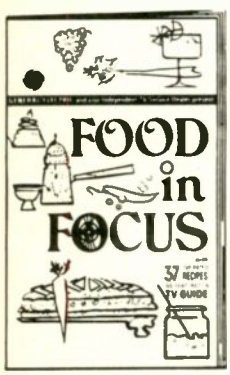


3-part program sells immediate need for your service before & during World Series*

ULAR!!!

*

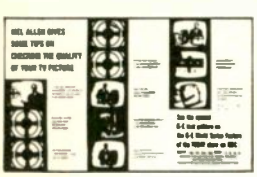
COMPLETE PROMOTION AND DISPLAY KIT



TV GUIDE RECIPE BOOK

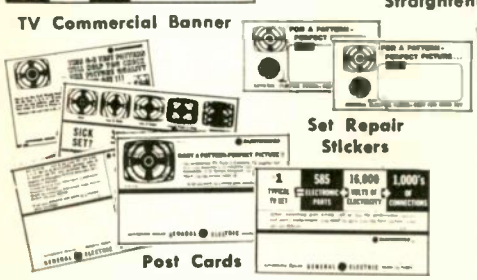
First time available—this exclusive collection of recipes as featured in TV Guide, plus professional tips for TV viewing enjoyment. Unique new premium is yours *exclusively;* helps you build goodwill and the need for your services.

Window Banners



TV Commercial Banner

Tube Pin Straightener



Set Repair Stickers

Ad Mats

Post Cards

G-E reporter, Roland Kempton, tells how September Tune-Up Spectacular

BUILDS BUSINESS FOR YOU 3 WAYS

1. Your customers prove to themselves the need for a tune-up and repair.
2. Through local television, local TV Guide and promotion materials.
3. In your city, your neighborhood, with your customers and prospects, you cash in on this TV TUNE-UP SPECTACULAR.

SEPTEMBER TUNE-UP SPECTACULAR is your campaign. It's easy to tie in. Proven effective. No red tape. Get full details from your G-E tube distributor, now. Names of participating dealers must be in by August 27. General Electric Company, Distributor Sales, Electronic Components Division, Room 1748, Owensboro, Ky.

Progress Is Our Most Important Product

GENERAL ELECTRIC

. . . for more details circle 26 on page 46

LETTERS TO THE EDITOR

TECHNICIAN Magazine will again publish its annual stereo issue in September. Stereo, I believe, is nothing more than a "gimmick" to squeeze more money from recorded music lovers. Please bear with me a moment while I express my personal views.

I believe you can readily agree that only a small percentage of the population is interested in true Hi-Fi. An even smaller percentage can afford it. Mass sales over the past few years can be attributed to high-pressure psychological selling jobs and a desire of the public to "keep up with the Joneses."

When the Hi-Fi boom of the '50s began to fade, it became "fashionable" to own stereo equipment—a "new sales approach" concocted by some of Madison Avenue's "super salesmen." Now that stereo is slipping, (ET "Tuning in the Picture," July), it is only logical to inquire: What new "serum" is being brewed to give the audio industry another "shot-in-the-arm?"

Rock-'n-Roll — usually recorded through echo equipment from a closet— can be reproduced through a cheap a-m radio with little or no bad results. But the great music of today and the past was written so that every note from a number of orchestral instruments would blend and reproduce pleasant overtones.

To me, the most pleasing sounds from a live concert are those heard at the rear of a well designed concert hall—not while sitting directly in front of or on top of the orchestra.

There is no discernible separation of instruments at a reasonable distance from an orchestra. Stereo, however, is recorded by placing microphones near the performers. Of course this would not be objectionable if the playback was rendered under precise recording conditions: with the listener's seat placed far back from the loudspeakers. But this cannot be done in small rooms.

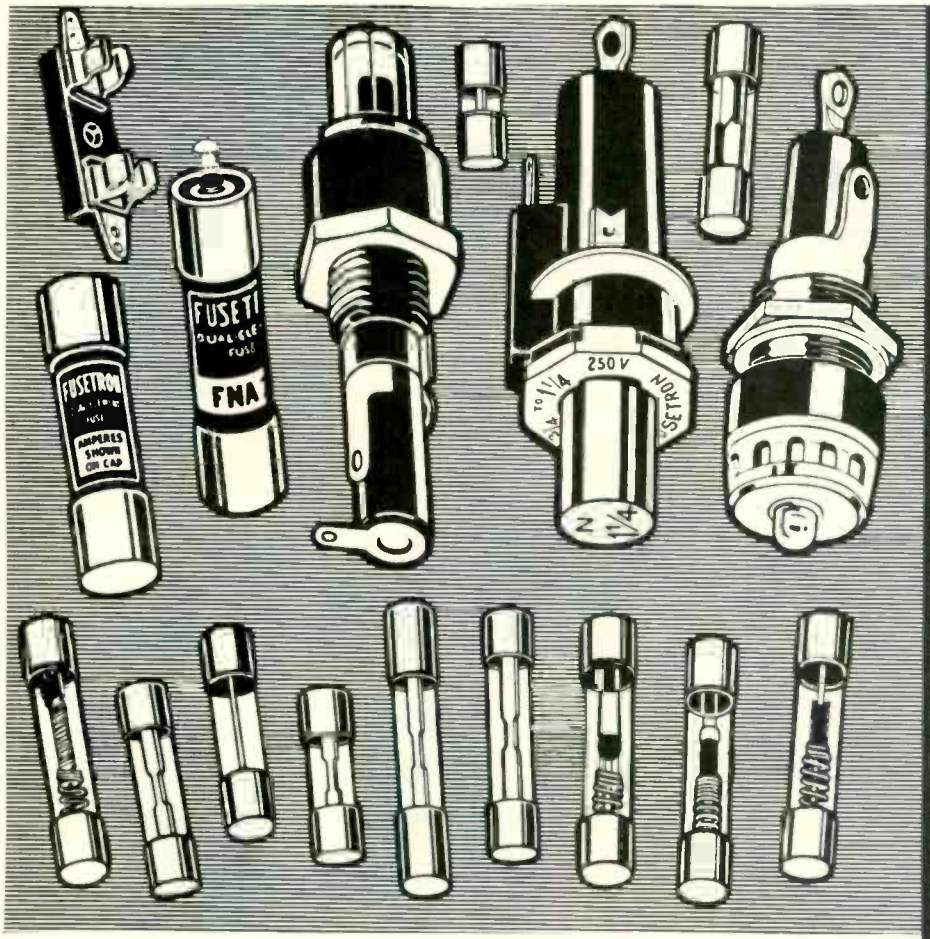
Hi-Fi manufacturers were already making significant progress in the direction of realism in music reproduction before stereo. And monophonic reproduction requires less precise seating, less equipment and it reproduces the original performance more faithfully.

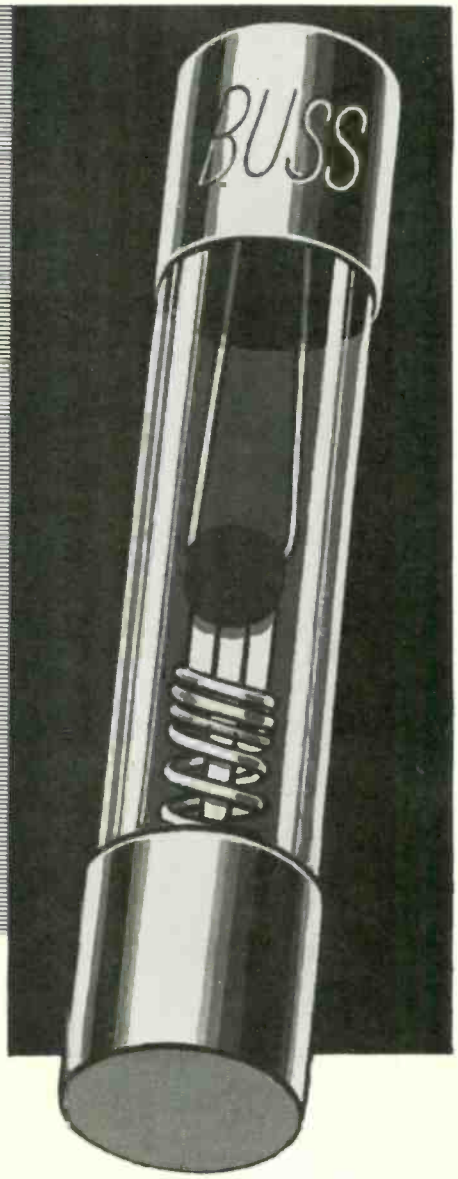
I wonder how much further along we would be in true life-like Hi-Fi if stereo had not stymied monophonic research and development? It is generally acknowledged that response is sacrificed in most stereo recording techniques.

Let's call off this slaughter of good music and return to logical methods of reproducing music: With a single channel system. No, it won't reproduce the *effect* of a passing locomotive, or a covered wagon train in a "stereophonic movie," but it *will* reproduce music as it *actually* sounds in a concert hall.

E. M. FRICKERT

New York, N. Y.





You'll save time, trouble... by turning FIRST to BUSS

for fuses of unquestioned high quality

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

BUSS fuses are made to protect— not to blow needlessly

When you install BUSS fuses—you are sure your customers receive maximum protection against damage due to electrical faults. And just as important, your customers are safeguarded against irritating, useless shutdowns caused by faulty fuses blowing needlessly.

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

Capitalize on the BUSS trademark

The universal trade and consumer acceptance of BUSS fuses is based on the millions upon millions of BUSS fuses used in homes, on farms and in industry for over half a century. Handling BUSS fuses—and other KNOWN items—helps safeguard your reputation for service and quality.

For more information on BUSS and FUSETRON Small Dimension Fuses and Fuseholders . . . Write for bulletin SFB.

BUSS: The complete line of fuses and fuse mountings of unquestioned high quality.

FUSETRON
BUSS
McGRAW EDISON

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

662

. . . for more details circle 17 on page 46

TUNING IN

AN ELECTRONIC BETTING SYSTEM enabling patrons at parimutuel race tracks to place bets without queuing up at betting windows is being demonstrated in operation. The patron drops a pre-purchased ticket of any denomination into a machine, punches one button to indicate the horse of his choice, and a second to indicate which position he expects that horse to finish. By means of punched holes, the machine instantly registers on the ticket, the horse and position bet, the date and the number of the race. The machine passes this information on by means of electronic impulses to the Central Station.

MICROFORM SPHERES as small as 0.0003-in. in diameter, 1/10th the diameter of a human hair, are believed to be the world's smallest manufactured part. The spheres, produced by Anchor Alloys, are used as junctions and doping agents in the manufacture of transistors and other electronic components. Anchor's research section has developed new sorting techniques to assure consistency of specified sizes, in the case of 0.003-in. spheres, to a range of ±0.0001-in.

Vapor Circuits

Thin-film microcircuits are formed on a high-strength ceramic wafer smaller than a postage stamp and one-hundredth of an inch thick by vaporizing materials with intense heat in a high-vacuum chamber. A Sylvania pilot production line operator is shown loading a circuit wafer into a mask holder alignment fixture on the evaporator prior to processing. Hundreds of custom-built microcircuits can be produced daily for military application.

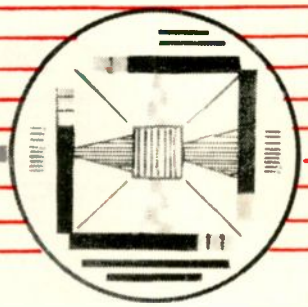
"Say look, do you suppose we could extend my repair bill until the end of the month?"

SPACE AGE COMPUTERS may some day help doctors understand complexities of the human brain. And conversely, the medical professional achievements in neurology and psychology may help engineers build a machine that thinks for itself. This electronic-biomedicine relationship was the main topic at a conference in Chicago sponsored by the Office of Naval Research and the Armour Research Foundation of Illinois Institute of Technology.

NAB PRESIDENT, LeRoy Collins, named nine leading broadcasters as members of the Television Code Review Board of the NAB. The Review Board serves as the appellate body in administering the NAB Television Code which is the guide to TV stations and networks in their programming and commercial presentations.

A BREADBOARDING DEVICE manufactured by Circuit Structure Labs, fits into an attache case for quick assembly of experimental circuits without the

THE PICTURE



use of solder or spring clips. It measures 8½ x 11 in. and contains 130 junction cells on ¾ in. centers in 10 rows of 13 cells. Each gold-plated brass cell has an elastic rubber core protruding through it and can accommodate up to seven component pigtails. The lightweight board is letter and number coded for efficient organization of circuit modules.

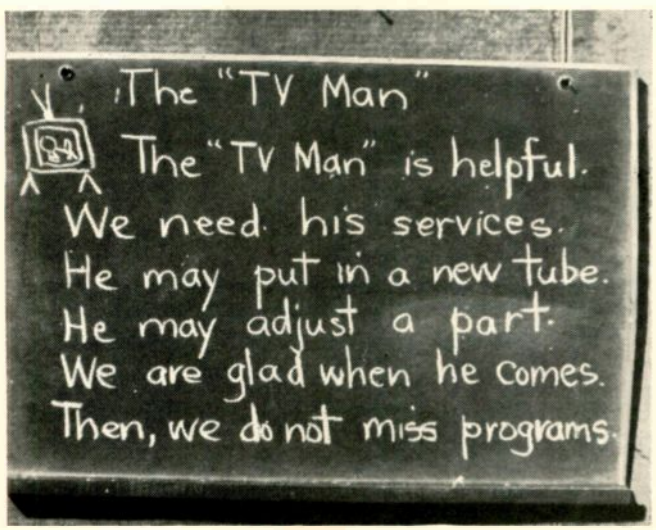
SCIENTISTS take their first careful look at a different kind of light from the stars. Observations will be made in space from Aerobee rockets launched by the National Aeronautics and Space Administration and could lead to a better understanding of the nature of the universe. The experiments, planned by physicists at Lockheed Missiles & Space Co. labs, will study soft X-rays, a part of the light spectrum just below the ultra-violet in wave length. Soft X-rays are those between 100 v and 16,000 v sent out from very hot parts of stars, from very hot stars, or other objects.

ELECTRONIC DISTILLATION of "Great Books of the Western World," will be performed for visitors at the Seattle World's Fair by a UNIVAC solid-state computing system. Excerpts from great literary works on the subject of "Man—The Differences and Relations Between Men and Women," and five other subjects will be supplied on a high-speed print-out system within seconds after a request is made. The computer is installed at the American Library Association "Library 21" exhibit.

CALENDAR OF COMING EVENTS

August 21-24:	WESCON, Western Electronics Show and Conference, Sports Arena, Los Angeles, Calif.
August 20-28:	EIA Annual Maintainability Conference, University of Colorado, Boulder, Colo.
August 31-Sept. 9:	1962 World's Fair of Music, McCormick place, Chicago, Ill.
October 1-3:	8th National Communications Symposium, Hotel Utica & Municipal Aud., Utica, N. Y.
October 8-10:	National Electronics Conference, McCormick Place, Chicago, Ill.
November 12-14:	Radio Fall Meeting, King Edward Hotel, Toronto, Ont., Canada.
November 13-15:	NEREM (Northeast Res. & Engineering Meeting), Boston, Mass.
December 6-7:	PGVC (PG on Vehicular Communications) Conference, Mayfair Hotel, Los Angeles, Calif.

The TV Man



What a second-grade class thinks of TV-radio technicians of one community was clearly demonstrated on a school-room blackboard recently in a Maryland town. Another class put the "TV Man" on a map of the town. A field visit to the TV shop or a visit to the school by a local TV technician is frequently noted with interest by grade schoolers.

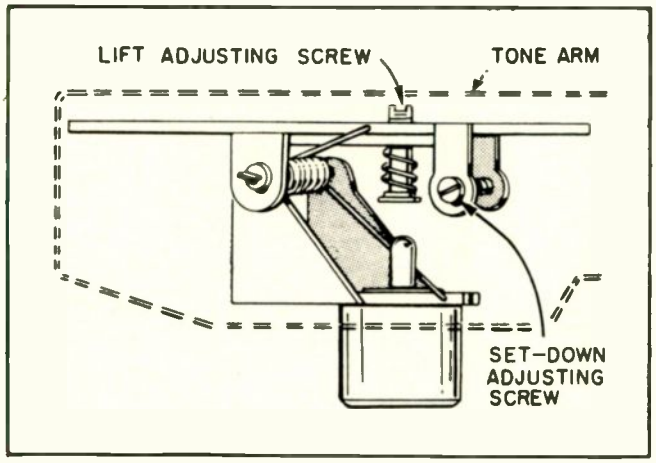
BATTERY POWERED fluorescent lamps give a minimum of 15 continuous hours of light at an intensity equivalent to a 50 w incandescent lamp. The flashlight-battery operated lamp is expected to prove useful for power failure emergencies, mining operations, aircraft maintenance, pleasure boating, camping, and many other applications. The self-contained fluorescent lamp was developed by IT&T engineers.

NUCLEAR ENERGY was used to detect a pipeline leak at the Pan American Airways hangar when all standard methods for detecting the leak were found inadequate. A task force from Tracerlab, a division of Laboratory For Electronics, Inc., imbedded a radioactive source containing Cobalt 60 in a ⅝ in. diameter ball. To keep it free flowing, the ball was sufficiently weighted. After the ball was introduced into the leaking solvent, its progress was watched with a radiation monitor. When the ball stopped moving it was assumed it had reached the point of leakage. This was confirmed when the exposed pipe was inspected. The ball was easily retrieved and the entire operation took less than one hour.

EMERSON

Record Changer Model 81981 — Tone Arm Adjustments

The lift adjusting screw is accessible through a hole in the top of the tone arm. It should be adjusted until the tone arm clears the bottom of a record on



Stylus set down and tone arm height adjustments.

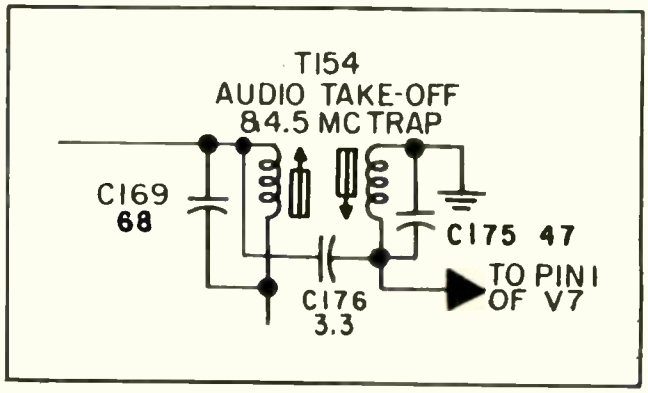
the spindle shelf by ⅛ to ¼ in. when the changer is in cycle. A clockwise adjustment raises the arm, counterclockwise lowers it.

The set-down screw is accessible through a hole in the left side of the tone arm. It should be adjusted for proper stylus setdown on a ten inch record; seven and 12 in. records should require no additional adjustments. The set-down point is moved away from the spindle by counterclockwise adjustment and toward the spindle by a clockwise adjustment.

GENERAL ELECTRIC

TV CHASSIS M579 — Z Code Production Changes

1. Audio take-off transformer T154 and 4.5 mc trap should be changed from No. R4953 to No. R5809.
2. C169 should be changed to 68 pf.
3. C176 should be added. It is part of the R5809 transformer.
4. C175 should be added.



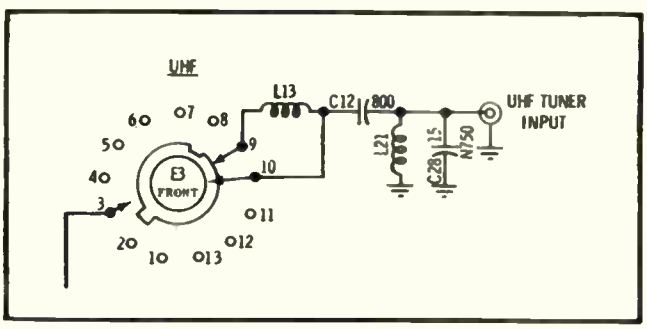
New circuit for G-E TV chassis M579 audio take-off circuit.

MOTOROLA

TT303B VHF Tuner — Improved Oscillator Stability

Oscillator stability in these tuners can be improved by the following modification:

1. Change V2 from 4BL8 to 5EA8.
2. Change C14 from 10 pf, N150 to 10 pf, N250.



Regeneration is eliminated by the addition of capacitor at UHF input.

TT305YB VHF-UHF Tuner — To Eliminate Possible Regeneration

Possible regeneration in this tuner is eliminated by adding C28, a 15pf, 10% capacittor in parallel with the UHF input.

TT307YB VHF-UHF Tuner — Elimination of Drift Caused by Moisture

To eliminate the possibility of excessive initial oscillator drift caused by moisture accumulation, the following changes should be made:

NEW LOW PRICES—ONLY CHANGE WE COULD THINK OF

TO MAKE THESE SPEAKERS SOUND BETTER THAN EVER!

simply say Delco

You've *always* been able to install Delco Auto Radio Speakers with complete confidence in their quality. *Now* you can sell this popular line at competitive prices as well!

And Delco hasn't sacrificed a single one of these outstanding features: Highest sensitivity for greater range of distortion-free sound from precision-engineered magnetic circuits • Extra-efficient, premium grade Alnico-V magnets • Continuous life testing program to assure dependable performance under the most severe climatic conditions.

There's news in Delco *packaging,* too. Your choice 6 x 9's in new bulk-packs, 20 speakers to a carton, or individually boxed speakers if you like. Now that you can sell top quality Delco Auto Radio Speakers at new, competitive prices, better stock up and start cashing in! Call your supplier and—simply say Delco. **Delco Radio** Service Parts are distributed nationally through **United Delco.**

DELCO RADIO, Division of General Motors, Kokomo, Indiana

. . . for more details circle 21 on page 46

TV MANUFACTURERS TECHNICAL DIGEST

1. Fine tuning coil part No. 24P65121A03 changed to part No. 24P65120A13.
2. To accommodate the fine tuning coil, oscillator wafer part No. 1P65121A03 is changed to part No. 1P65121A04.
3. Plunger and coil assembly part No. 1P65121A-07 changed to part No. 1P65121A08.

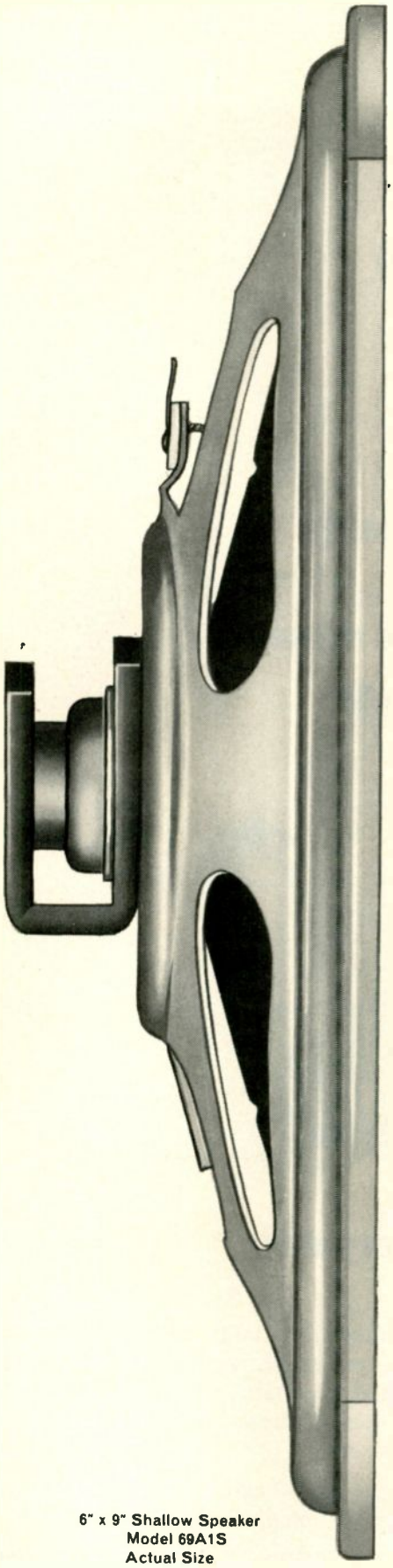
PHILCO

RK-1 Reverb Kit — Improved Bass Performance

When the RK-1 reverb kit is installed in Hi-Fi models K-1635, K-1636X and K-1638 a noticeable loss of bass control may occure. To improve the bass control performance, coupling capacitors C3 and C4 in the reverb unit should be changed from their present value (0.01/μf to 820 pf).

IF YOU CHANGE YOUR ADDRESS

Notify us at 1 East First Street, Duluth 2, Minn. Please include the address label from a recent issue and allow 30 days for the change.



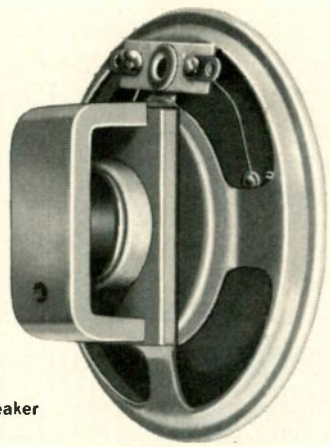
6" x 9" Shallow Speaker
Model 69A1S
Actual Size

For those special applications choose a Quam speaker

When you need a 2¼" unit for a transistor radio—or a shallow 6" x 9" for a Thunderbird replacement—Quam has it!

When you need a special voice coil impedance or special field resistance—Quam has it!

Quam gives you the widest selection and the highest quality in the entire speaker industry! Ask for Quam, the Quality line, for all your speaker needs.



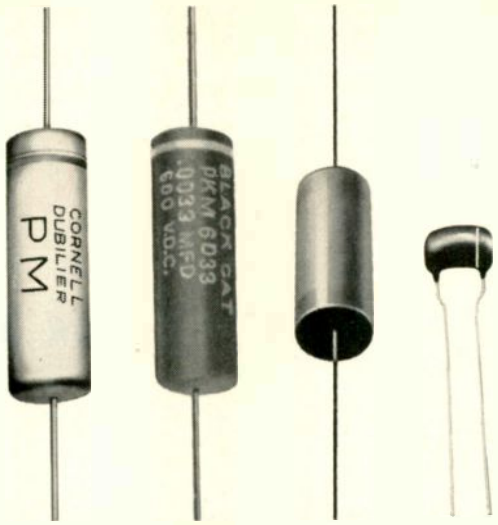
2¼" Transistor Radio Speaker
Model 22A06Z8
Actual Size

QUAM

QUAM-NICHOLS COMPANY
226 N. Marquette Road
Chicago 37, Illinois

. . . for more details circle 34 on page 46

Type PM Molded Mylar*/Type PKM Molded Paper-Mylar/Type WMF Mylar Wrap/Type DPMS Dipped Paper-Mylar



In your lifetime, you'll probably never use all the 284 tubular bypass capacitors we make.

PM KIT

List Price $25.90
Dealer Net $15.54

DPMS KIT

List Price $26.40
Dealer Net $15.84

But you'll use these 2 kits every day.

Need a bypass capacitor? You know where to find it—in our 40-page Service Selector or under "Cornell-Dubilier" in the Radio-Electronics Master. You know where to get it, too—off the shelf, at your CDE Distributor. And you know that the price is right—we haven't been a leader in this industry for more than a half century without good reason.

But for your day-to-day needs, you're better off with these two kits. Each contains 80 units, all 600 WVDC and ± 10% tolerance. The large plastic case comes equipped with hinged cover, separate compartments and a durable selector chart. You pay only for the capacitors...the case is free. Your CDE Distributor has them in stock, too.

When it comes to bypass capacitors, you can afford to bypass all names except:

CORNELL-DUBILIER ELECTRONICS, DIVISION OF FEDERAL PACIFIC ELECTRIC COMPANY, 50 PARIS ST., NEWARK 1, N. J.

*DuPont TM

CDE CORNELL-DUBILIER

the only Company that makes them all

. . . for more details circle 20 on page 46

ET VIEWPOINT

Color TV Is On The Move

Color TV sets sales should hit 450,000 units this year. Some authorities think it will be closer to 400,000 sets because of a shortage of color picture tubes. Either way it will be a good year for color.

We see 1963 as the year when color sales will come close to 700,000 units. And 1964 should see this volume push the million mark. That's big business. When you think that color sets in use account for less than 2% of all sets in homes, and fast rising color sales account for over 6% of all TV sales, TV service dealers had better be prepared for a substantial market. By 1965 color will probably account for 15% of sales.

Now is the time for technicians to be prepared for color. Start servicing now. Test instrument manufacturers have an excellent variety of color test instruments on the market, and the million sets now in use offer a good starting point to be ready as color business expands.

Practically every set manufacturer is now selling color sets. The few who are not will be making them by 1963.

The number of color programs on the air will be an important factor in accelerating color sales. NBC, which has retained a meaningful color programming during the lean years, is increasing color programs about 30% next season to a total of over 2,000 hours. As a matter of fact, about two-thirds of NBC's evening shows will be in color. ABC, which has lagged behind the other two networks in the early color years, will start a modest color schedule next season. No doubt the emphasis here will be on color films. It is expected that CBS, which once did make a serious color effort, will be pressed to move into the field again.

In addition to network activity, over 100 local stations can originate color TV programs, and about 70% can handle network-originated color programs.

Thousands of readers sell sets, as well as service them. There is an attractive profit margin in color. While profit margins on black-and-white might run 15 to 25%, color margins more typically range between 25 and 30%. And don't forget these percentages are of a much higher dollar figure for color. How many black-and-white sets do you have to sell to make the $150 profit on one color sale?

In addition, the antenna requirements are more stringent with color, building up the sales and profits for antennas, transmission line, rotators and related items.

Still another attraction is that hourly rates for color servicing run higher than black and white.

There will be many new developments breaking thick and fast. New color tube designs are moving close to the production stage. Imported Japanese color TV sets have started in token numbers, and will be increasing.

The important point is that the fellow who gets in there first will reap the major benefits.

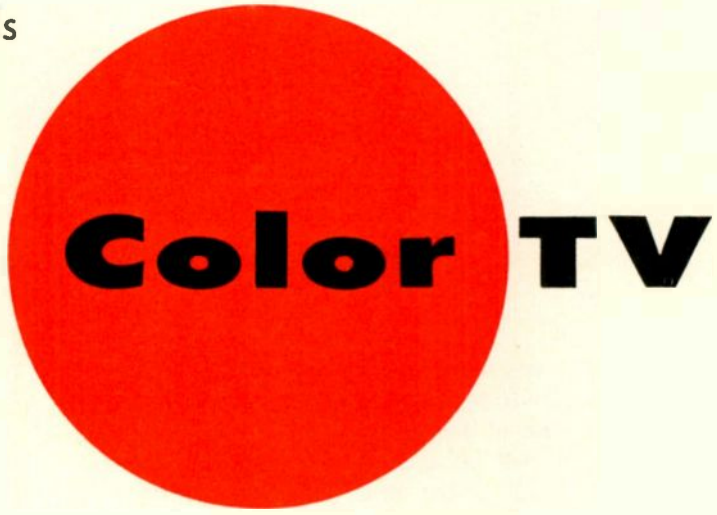
Memo to EIA: Remember Service

The Electronic Industries Association has kicked off a consumer electronics public relations program to tell the story of the future of electronics in the American home. The start is a four-session symposium on "What's Ahead for Consumer Electronics?" Topics include what's ahead for educational TV, color TV, radio and phonographs.

We are disappointed by the absence of a session on, "What's Ahead for TV Service?" It should be remembered that consumers do not buy a new set year in and year out. But they do have their set serviced year in and year out.

EIA has an excellent Service Committee comprising the service managers of the various set manufacturers. Certainly from among these capable people EIA could have come up with an interesting session to educate the consumer on a subject that is near and dear to his heart — and pocketbook.

Basic color transmission standards; chroma and sync circuit fundamentals



by L. C. Powell

■ Shops all over the country are passing up color TV service profits for no good reason. If your shop is average, you're losing this business too. Many technicians turn down one or more color TV calls each week because they are afraid of problems beyond their experience or training.

It is interesting to note in this connection that many of these same technicians began servicing B/W TV receivers with modest theoretical training — some in the first days of TV — and they learned by trial and error. Experience is still the primary catalyst of success. An understanding of basic color principles and color circuit operation is necessary, however, if you are to gain experience while making a minimum of errors.

Elementary Principles

All colors in the visible spectrum come from white light. Conversely, of course, white light is composed of these colors. White light can be derived from mixing or blending certain percentages of three basic colors. The three colors used in color TV are red, green and blue. When these colors are mixed in quantities of 30 percent, 59 percent and 11 percent, respectively, white light is produced. This principle is used in the TV camera for color separation as well as in the receiver for color and B/W reproduction. By changing relative quantities of these primary colors a wide range of other colors can be produced.

Each of these colors is selected by optical filtering as shown in Fig. 1. Blue filters appear blue because they let only blue light pass; red lets only red light pass and green

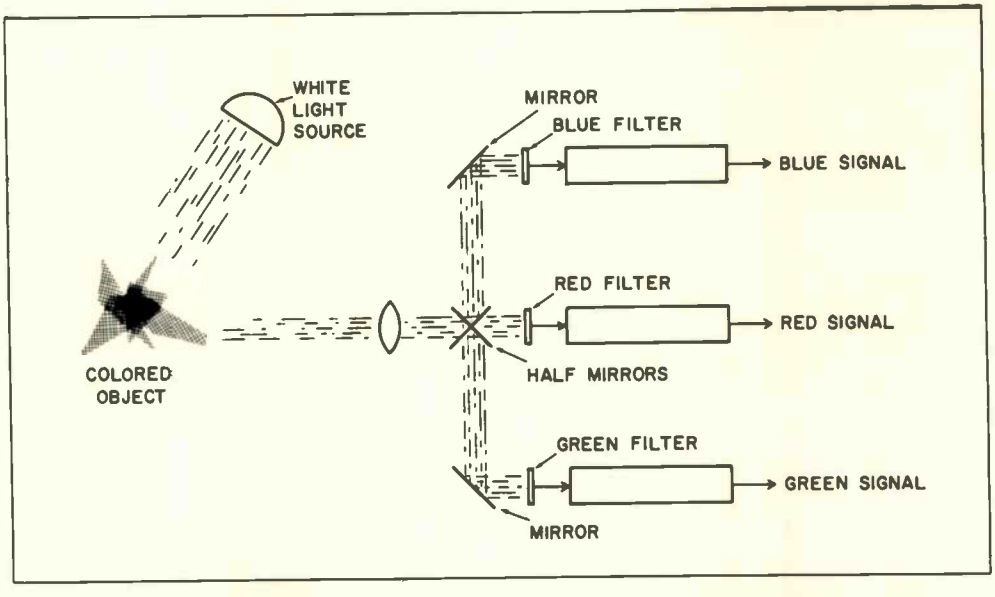


Fig. 1—The color TV camera depends on an optical multiplexing system to provide light of the proper color to each camera tube. 'Half mirrors' used in the camera are front-surfaced to pass only half of the light and reflect the remainder.

From A to Z

passes only green light. Each of the three separate camera tubes pick up only the color reflected from objects which will pass through its associated filter. This information is transmitted to the receiver and reproduced. A deficiency in human vision makes the reproduction of many colors possible by employing closely positioned colored phosphor dots on a CRT screen. By changing the quantity of light from each of the three primary color dots, the eye blends these to form colors like those in the original scene. Construction principles of the standard three gun color tube is shown in Fig. 2.

Color Broadcast Standards

The National Television System Committee (NTSC) established TV standards before color telecasting began — which created problems. The biggest problem was inserting the chroma or color information in the alloted B/W 6 mc wide band. If a portion of the B/W bandwidth were used to allow addition of color information, picture detail would be impaired. This problem was solved by interleaving or multiplexing color information between the B/W information.

This is possible because the standard monochrome signal information is contained in energy groups that are evenly spaced at harmonics of the horizontal scan frequency. This is shown graphically in Fig. 3.

Harmonics of half the horizontal frequency fall between the scan frequency harmonics or video energy points. This is where the chroma information is inserted for telecasting. In order to minimize the interference to B/W receivers during

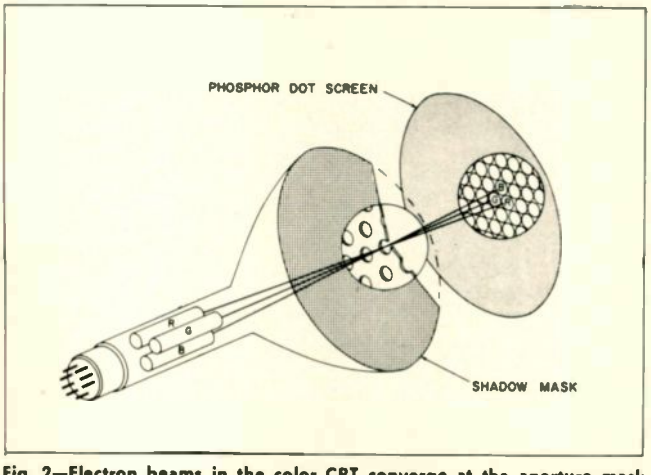


Fig. 2—Electron beams in the color CRT converge at the aperture mask and impinge on their respective phosphor dots on the screen. By varying the relative intensity of the three beams, phosphor illumination changes the over-all screen color. The CRT screen dot pattern is visible under magnification.

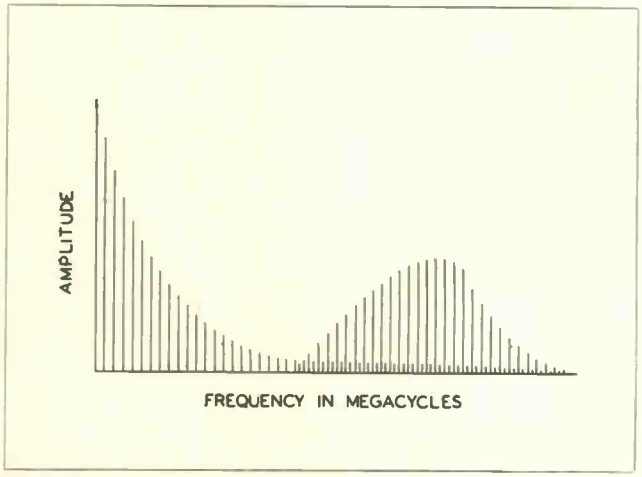


Fig. 3—The entire spectrum of one TV channel is composed of energy bursts which are harmonics of the horizontal scan frequency. Color information is interleaved between these harmonics at the high end of the channel.

color broadcasts, the color subcarrier is placed as high in the frequency band as possible because less picture information is transmitted at higher frequencies. Since the sound carrier is located on the high end of the band, 3.6 mc was set as the high limit for the color subcarrier frequency. Interference from sound carrier beat frequencies and the nearest horizontal multiple, however, necessitated a slight change. It was found that the interference was least objectional when the sound carrier was a multiple of the horizontal scan frequency.

Changing the sound carrier to this extent would not allow existing B/W receivers to receive the sound, so the color horizontal scan frequency became 15,734.6 kc — this made the 4.5 mc sound carrier the 286th harmonic of the line frequency. In order to maintain a normal two-to-one field interlace, the vertical frequency had to be 59.94 cps. Both of these scan frequencies were within the normal limits for B/W reception and a color transmission system became practical.

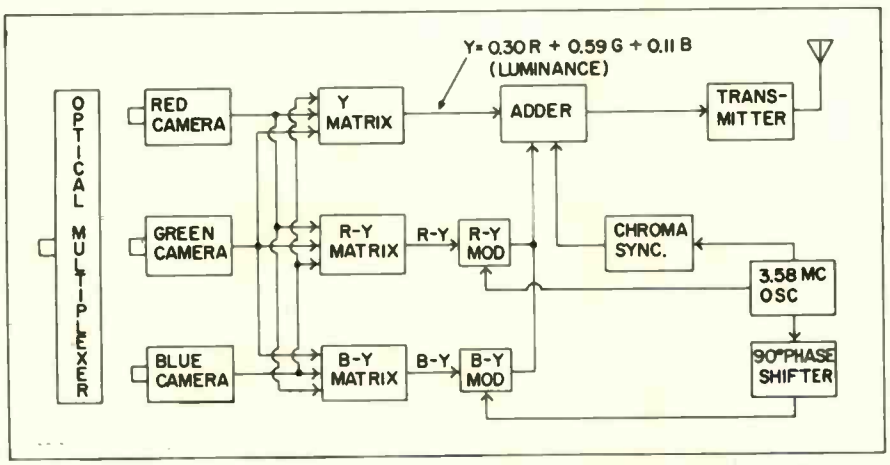


Fig. 4—Only two colors are transmitted with the luminance (white) information. The third color is reconstructed in the receiver by subtracting the two transmitted colors from white. Each of the transmitted colors modulates the subcarrier which is fed 90° out of phase to the modulators.

Color Modulation and Sync

The extreme accuracies necessary in multiplexing a color signal may be appreciated by looking at tolerance limits for the color subcarrier frequency: 3.579545 mc ± 0.0003 percent with a frequency deviation not to exceed 0.1 cps/ps. The subcarrier frequency is the 455th harmonic of one half the line frequency.

A block diagram of the broadcast equipment is shown in Fig. 4. The 3.58 mc signal is developed by a crystal controlled oscillator. A part of this signal is used to synchronize the vertical and horizontal oscillators in order to keep the video properly interleaved with the color information. Another part of the subcarrier oscillator signal is fed to the modulators; one through a phase shifter so that the modulators will be 90° out of phase. In this manner the two color signals which are to be modulated can be recovered at the receiver, since the sidebands are transmitted without the carrier.

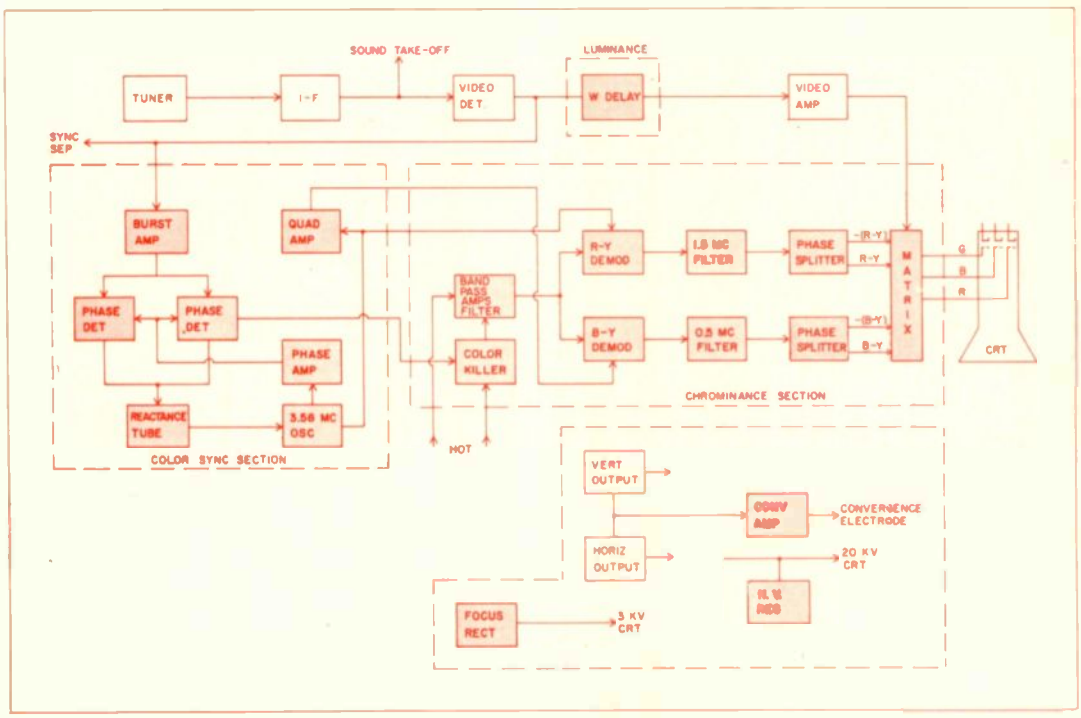


Fig. 5—Block diagram of the color receiver. Sections not found in B/W set are shown in shaded blocks. Note phase shift used from the local oscillator frequency to demodulate the chroma information.

The signals to be fed to the modulators contain the color information obtained from all three color amplifiers; the signals are matrixed so the output is a "Y" (white) signal (the luminance channel in color — standard signal in monochrome sets —), R-Y and B-Y signals. The last two are obtained by subtracting the "Y" from the red and blue signals. Although some systems use R-Y and G-Y signals, the principles involved are the same.

The "Y" signal is transmitted in the conventional monochrome manner. The R-Y and B-Y signals are modulated 90° out of phase and added to the normal signal. Remember, this additive signal will have no effect on B/W receivers, since it is interleaved in the normal signal. Green information is reconstructed at the color receiver by subtracting R and B from Y.

The Color Receiver

At first glance much of the color receiver appears to be the same as a B/W receiver. The tuner, i-f and sweep sections are very similar. The tuner has a low drift oscillator; slight drifting in the oscillator has a marked effect on color reception. The i-f is basically the same except that it is somewhat flatter in response and has a wider bandpass. A delay line and additional amplification is included in the video luminance circuits.

High voltage is generated in the conventional manner with a regulated output fed to the CRT anode. A shunt regulator is used for the approximately 3 kv needed to focus the color CRT. Sweep failures, loss of video, sound problems, noise, and other B/W problems will all been encountered in color servicing. These problems are treated as they would be in a B/W set. A few adjustments or corrections may affect the color operation of the set but these can be readily understood and should create no unusual difficulties.

Three sections have been added to the color receiver which are not found in a B/W set: The chrominance, color sync and convergence circuitry.

Chromanance & Color Sync

A block diagram of a typical color set is shown in Fig. 5. The object of these sections is to take the transmitted information, demodulate and matrix it to obtain red, blue and green outputs for the picture tube. Of course these will be in the same proportions as picked up by the camera tubes. Effectively, this is accomplished by reversing the process used to transmit the signal.

In order to sync the color signals and demodulate them, an accurate 3.58 mc source is needed since the carrier was suppressed before transmission. This is accomplished by using a local crystal oscillator in the receiver. To maintain the exact phase and frequency relationship with the telecaster's subcarrier, a short frequency burst is used to sync the oscillator. Nine cycles (± 1 cps) are transmitted on the back porch of every horizontal sync pulse. The horizontal blanking and sync pulse is shown in Fig. 6. This burst signal may be used to sync the local oscillator directly or for afc type control of the circuit

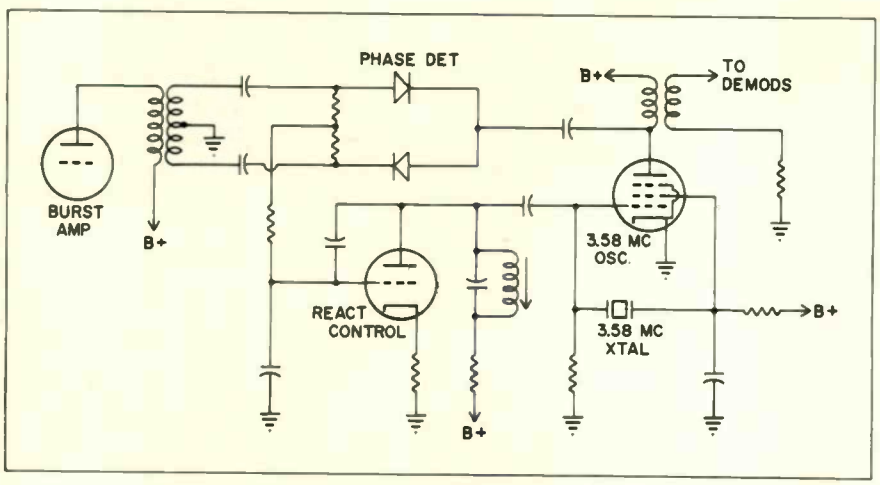


Fig. 7—Typical oscillator and control circuitry used in color receivers to reconstruct subcarrier. The local oscillator frequency is compared with the burst signal with a phase detector. The phase detector output then controls a reactance tube which readjusts frequency diviation.

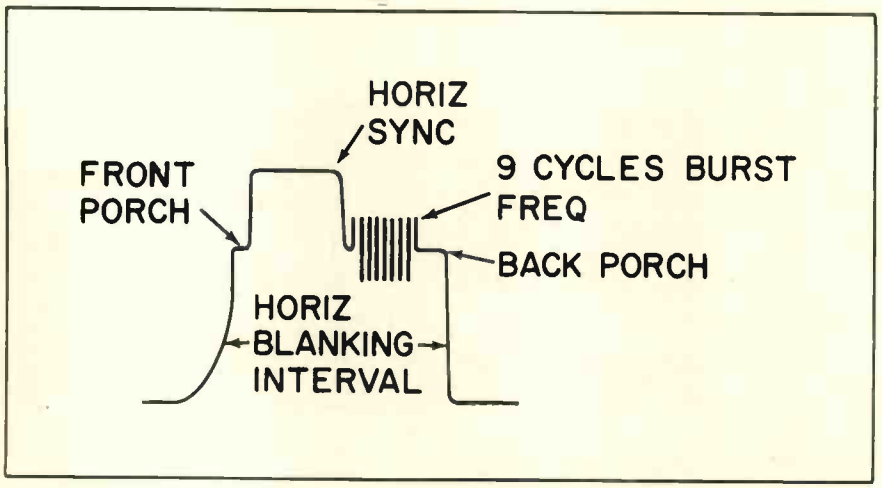


Fig. 6—Horizontal sync pulse transmitted with a color telecast contains a short 3.58 mc frequency burst to synchronize the local oscillator in the receiver.

through use of a reactance tube. The oscillator and its control circuitry is shown in Fig. 7.

You will recall that one of the R-Y and B-Y signals was modulated with the basic oscillator frequency and the other with the same frequency 90° out of phase with the first. In order to demodulate the color information, the phase detectors must also be fed two signals which are 90° out of phase.

Several types of detectors may be used to demodulate the signals though the multigrid detector is the most common. R-Y and B-Y are recovered and the matrix regenerates the R, B and G signals.

Information from the "Y" channel is fed to the matrix where demodulated R-Y and B-Y information are added. The resultant is R, B, and G information. Each of these signals is applied to its respective color tube gun. Some systems apply information from the demodulators directly to the CRT guns. The cathodes are all fed "Y" information and matrixing is accomplished in the picture tube.

When B/W signals are received on a color set, a color killer circuit is actuated to prevent spurious signals in the color circuits from coloring the picture. This circuit is shown in Fig. 8.

The killer is normally adjusted with no signal on a "dead" channel until the colored noise in the picture disappears. The setting should be double checked, however, to assure that the setting is not killing color signals by tuning in a color program.

Convergence Circuits

If you have ever attempted to converge a color set, you know there are two types of convergence: Static (d-c) and dynamic. Several convergence methods have been used in sets made in the past, but most color sets now being manufactured use basically the same circuits.

The need for convergence can be understood by recognizing that it is necessary for each gun beam to land on its associated color dot at all points of the CRT screen. This is accomplished with the two aforementioned sets of adjustments. Static adjustments are most often made with permanent magnets located on the neck of the CRT. These are somewhat similar to ion trap magnets. Consult the manufacturer's manual — these could be confused with the purity magnets also located on the CRT neck. These magnets should be moved until the three beams coincide at the CRT center.

Coils also located on the CRT neck are fed voltages from the vertical and horizontal output to deflect the beam properly for each area of the tube being swept. Each convergence coil is situated so it has maximum effect on its associated CRT gun. A wave shape of a typical voltage which is applied to the convergence coils is shown in Fig. 9. The amplitude and tilt of these signals are controlled by resistances and reactances so that convergence can be achieved for almost any set of conditions.

Problems You'll Encounter

One thing you'll learn quickly in servicing color receivers is not to adjust anything unnecessarily. Height, linearity, and width controls all have an effect on convergence and purity of the picture. Knowing what a good picture looks like is half the battle: if the picture looks good, don't try to make it better. The improvement in picture quality will probably not merit the necessary time. Of course, if the picture is obviously misadjusted, you're obligated to spend additional time and get a top quality picture for the owner.

Converging a color set has been considered a trying task. No one knows how this rumor got started or covered so much ground – but those who have overcome this psychological hurdle have found little more than a comparatively lengthy job. Just follow the manufacturer's directions. Less equipment is required than used to align an i-f strip and you'll find it much easier after a couple of trials.

Purity adjustments are also easy. Don't rush — demagnetize the CRT and associated components first. You may find that this will clear up convergence and purity problems without further adjustment. Dynamic convergence rarely needs readjustment. ■

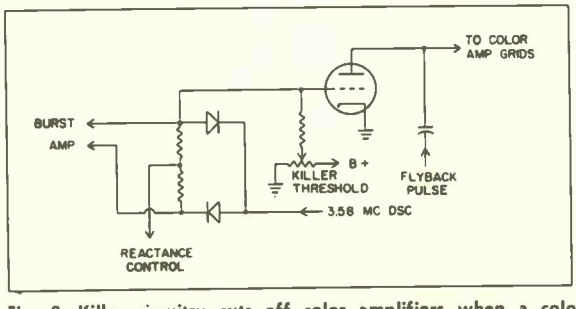


Fig. 8—Killer circuitry cuts off color amplifiers when a color signal is not being received. When no signal is present, the triode is biased into cut-off. During saturation, the triode rectifies the flyback pulse which biases off the color amplifiers.

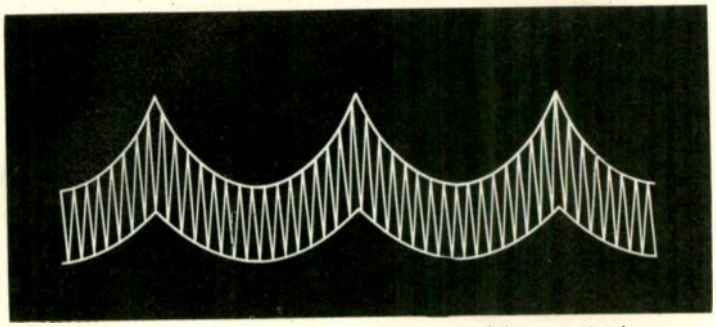


Fig. 9—Voltage on the convergence coils vary slightly to maintain convergence over the entire screen area. Voltage applied to these coils is usually obtained from sweep output tube cathodes.

No slide rule or logarithm tables are required when this method is used to determine amplifier power gain

KNOW YOUR db

by Frederick E. Wuebker
Radio Corp. of America

■ Rapid decibel computations without the aid of a slide rule or log tables is possible with an approximate accuracy within ±0.5db. This method is based on the powers of 10. When it is realized that db expresses nothing more than a ratio, it becomes quickly obvious how the system is possible in expressing power gain in db.

How It Works

Let's assume a certain amplifier has a power gain of 10 to 1 (10:1). This ratio would be expressed as 10 db Suppose a second amplifier has a power gain of 100:1. This would be expressed as 20 db. And a third amplifier with a power gain of 1000:1 would have its gain specified as 30 db. In other words, the db value corresponds to 10 times the exponent of 10.

For the 100:1 gain amplifier, as an example, 100 to 1 = 10^2 to 1 = 2 x 10 = 20 db.

If a technician has difficulty with the powers of 10, all he has to do is subtract the number of zeros from the large ratio number, write it down, and multiply the remainder by 10. A 10 db increment scale, derived from the powers of 10, and extending from 0 to 80 db, is shown in Table I.

A method must now be found to express the smaller db values in one db increments. To do this, only three numbers need be remembered. These numbers are: 1.25, 1.6, and 2.0. These numbers correspond to 1, 2, and 3 db, respectively.

Suppose you want to find the power ratio corresponding to 4 db. All you have to do is set these three numbers in a simple table form, count backward three places, and double the third number value.

For example, with three basic numbers, 1.25, 1.6, and 2, let's find the power that corresponds to 4 db:

1.25 to 1 = 1 db (3)
1.6 to 1 = 2 db (2)
2 to 1 = 3 db (1)
Thus 1.25 x 2 = 2.5 to 1 or 4 db

Again, find the power ratio that corresponds to 5 db.

1.25 to 1 = 1 db
1.6 to 1 =2 db (3)
2 to 1 = 3 db (2)
2.5 to 1 = 4 db (1)
And 1.6 x 2 = 3.2 to 1 or 5 db.

Table II illustrates a second group of db values from 1:10 db in 1 db increments.

With the two easily constructed tables, solution of db problems becomes a simple operation. Two things must be remembered: powers of ten and the three basic numbers, 1.25, 1.6, and 2. Let's apply this system to a practical problem.

Suppose we have an amplifier with a 1 w input, and a 400 w output. The problem is to determine the amplifier's gain in db. Upon inspection, it is apparent that the db value will be larger than 20 db (100:1 ratio) and smaller than 30 db (1000:1 ratio). The ratio of input to output is, of course, 400:1.

Rate the amplifier in db.

1. **Power ratio: 400:1 = 4 x 100:1**
2. **100:1 = 20 db (Table I)**
3. **4:1 = 6 db (Table II)**

Therefore: 400:1 = 20 + 6 or 26 db.

Conversely, the power ratio of an amplifier rated at 26 db can be found by reversing the procedure:

What is the power ratio of an amplifier having a 26 db gain?

1. **20 db = 100:1 ratio**
2. **6 db = 4:1 ratio**
3. **20 db + 6 db = 26 db**
4. **100:1 x 4:1 = 400:1 ratio**

Again, what is the power ratio of an amplifier having a 35 db gain?

1. **30 db = 1000:1 ratio**
2. **5 db = 3.2:1 ratio**
3. **30 db + 5 db = 35 db**
4. **1000:1 x 3.2:1 = 3200:1 ratio**

To make it still simpler, just find the ratio that corresponds to the small increment and add the number of zeros as indicated by the first integer of the db value.

An easy method for finding the ratio equalling 26 db is to look at Table II and go down the db column to 6 db. Then place a 2 in front of the 6, giving you 26. Next go over to the corresponding figure in the ratio column and add two zeros (effectively moving decimal point two places) to the number in that column, giving you 400. This system also works in the opposite direction.

If given the ratio of 400:1, you would go down the ratio column until you reach 4. It is necessary to add two zeros, or move the decimal two places to the right, to get 400—then place a 2 in front of the 6 in the db column to come up with 26 db.

KNOW YOUR db

Although it is apparent that this system cannot compete with a slide rule, it has sufficient accuracy for field use. The accuracy is approximately plus or minus ½ db. For values that lie between the table values for power ratios, simply round off to the nearest value.

For Greater Accuracy

For applications that require greater accuracy, this system can be expanded very easily to include the tenth db values. To do this start with the first of the basic numbers, 1.25. To derive a table for 0.1 db increments, remember three numbers; 2, 3, 3. Once again set 1.25 at the top of the list, and subtract from each succeeding value the amount in hundreds, as indicated by the sequence.

1. **1.25 to 1 = 1 db**
2. **0.9 db = 1.25 — .02 = 1.23:1 ratio**
3. **0.8 db = 1.23 — .03 = 1.20:1 ratio**
4. **0.7 db = 1.20 — .03 = 1.17:1 ratio**
5. **0.6 db = 1.17 — .02 = 1.15:1 ratio**
6. **0.5 db = 1.15 — .03 = 1.12:1 ratio**

Notice the sequence of 2, 3, 3.

RATIO			DECIBELS
1	to	1	0
10	to	1	10
100	to	1	20
1000	to	1	30
10,000	to	1	40
100,000	to	1	50
1,000,000	to	1	60
10,000,000	to	1	70
100,000,000	to	1	80

Using the system of 2,3,3, a table of 0.1 db increments can be constructed (see Table III).

It is a simple matter to use Table III, in conjunction with Tables I and II. The computations are exactly the same with an additional step added.

Find the power ratio that corresponds to 28.4 db.
20 db = 100:1 ratio
8 db = 6.4:1 ratio
0.4 db = 1.09:1 ratio
20 + 8 + 0.4 db = 28.4 db.
100 x 6.4 x 1.09 = 697.6:1 ratio

Now rate the amplifier gain in db. Assume 1 w input and 697.6 w output.

1. **Ratio is 697.6:1 = 6.976 x 100**
2. **100:1 = 20 db**
3. **The smallest number value nearest to 6.976, from Table II, is 6.4**
4. **6.4:1 = 8 db**
5. **To find out how much greater 6.976 is than 6.4 divide 6.976 by 6.4 for a result of 1.09**
6. **1.09 to 1 = .4 db (from Table III)**
7. **20 db + 8 db + 0.4 db = 28.4 db = 697.6:1 ratio**

Rate the db gain of an amplifier having a 1 w input and a 6000 w output:

1. **Ratio is 6000 to 1 = 6 x 1000**
2. **1000:1 = 30 db**
3. **Nearest ratio to 6 is 5 (from Table II)**
4. **5:1 = 7 db**
5. **6 divided by 5 = 1.20**
6. **1.20:1 = .8 db (from Table III)**
7. **30 db + 7 db + 0.8 db = 37.8 db = 6000:1 ratio**

For power ratios that do not coincide with those in Table III, round off to the nearest value.

The system discussed can also be applied to voltage or current ratios where input and output impedances are equal. To use the charts discussed for voltage or current db work, simply remember that a voltage db will express the same ratio as ½ that value when it is a power db. For example,

60 db (voltage) = ½ of 60 = 30 db power
60 db (voltage) = 1000:1
30 db (power) = 1000:1

Once the conversion has been made, the computations for voltage or current db are the same as the computations discussed for the power db.

Express the ratio as a db value with a 1 v input and a 40 v output.

1. **Ratio is 40:1 = 4 x 10:1**
2. **10:1 = 10 db**
3. **4:1 = 6 db**
4. **40:1 = 16 db (power) x 2 = 32 db (voltage)**

And again: What is the voltage ratio that corresponds to 36 db.

1. **36 divided by 2 = 18 db**
2. **10 db = 10:1 ratio**
3. **8 db = 6.4:1 ratio**
4. **10 + 8 db = 18 db**
5. **18 db = (power) 10 x 6.4:1 = 36 db (voltage)**

The secret of the system is memorizing three numbers: 1.25, 1.6, and 2. Memorizing those three numbers, applying the powers of ten, and if greater accuracy is desired, remembering the 2, 3, 3, sequence, db computations become a very simple thing. As with any system, proficiency can only be gained through practice. With practice, these computations can be made mentally. Although the system does not offer precision obtained from a slide rule, or log tables, it has the advantage of being completely independent of these devices. ■

RATIO			DECIBELS
1.25	to	1	1
1.6	to	1	2
2	to	1	3
2.5	to	1	4
3.2	to	1	5
4	to	1	6
5	to	1	7
6.4	to	1	8
8	to	1	9
10	to	1	10

RATIO			DECIBELS
1.25	to	1	1.0
1.23	to	1	0.9
1.20	to	1	0.8
1.17	to	1	0.7
1.15	to	1	0.6
1.12	to	1	0.5
1.09	to	1	0.4
1.07	to	1	0.3
1.04	to	1	0.2
1.01	to	1	0.1

Read Voltages to find those transistor circuit troubles

TRANSISTORS the Easy Way

by William C. Caldwell

■ Ever since the first election was forced to move through a conductor, voltage measurements have been giving more revealing testimony in a court of radio felonies than any other witness. This is true in tube circuits and is even more important in transistor circuitry.

However easy it may be to read voltages and compare them to those listed on a schematic, this "evidence" will mean very little to technicians unless circuit operation is thoroughly understood.

A simple triode tube circuit is shown in Fig. 1A. Input and output loads are designated R_1 and R_L, respectively; they would represent resistors in a resistance coupled amplifier, or transformers in an r-f or i-f stage.

Comparing Tube-Transistor

As every technician knows, the "filament" heats the "cathode," which emits electrons. These electrons pass through the "grid" on their journey to the "plate," and then follow a path through the load, R_L, the battery and return to the "cathode." It takes energy for these electrons to get through the load, R_L, and this results in a "voltage drop" across R_L—the greater the resistance, the larger this voltage drop. The voltage drop is also proportional to the amount of current, Ip, flowing in the circuit, and is often used to calculate the amount of current. For example, a plate voltage far below normal indicates a large voltage drop at R_L and high

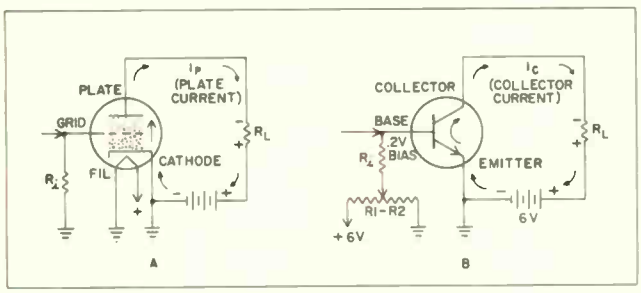


Fig. 1 (A)—Simple triode stage shows proper battery polarity and current flow. (B)—An NPN transistor stage with an adjustable bias network. Note that the battery polarity in respect to emitter and cathode is the same in tube and NPN stages.

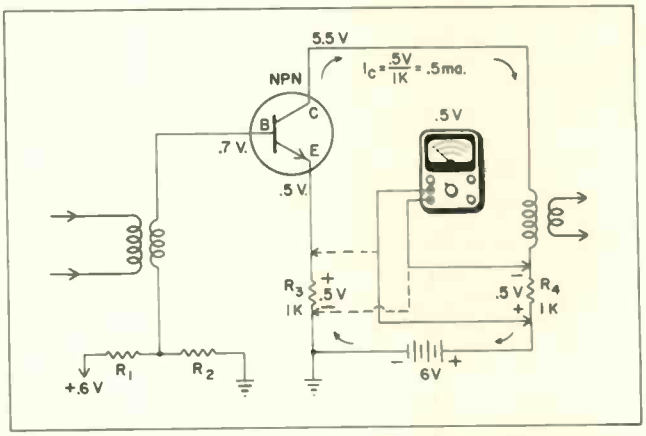


Fig. 2—Voltage measured across the emitter or collector resistor indicates the current flow through the transistor (I_c). No voltage would indicate no conduction.

plate current; a plate voltage above normal means less drop in R_L, and less current flow. These conclusions are based on a normal battery voltage and normal R_L resistance, of course.

The same principles apply to the equivalent transistor circuit shown in Fig. 1B. The collector can be compared closely to the plate of the tube; the base of the grid; and the emitter to the cathode. The transistor, however, has no filament. It relies on a small voltage from voltages divider R1-R2, applied to the base element, to start electrons flowing through the transistor. The 0.2 v differential between base and emitter is called "forward bias" and will be mentioned again later. Electrons are drawn from the emitter by this bias and sent into the collector circuit. They follow the same path as those of the tube circuit through the load, R_L, the battery and into the emitter circuit.

Estimating Collector Current

A typical i-f amplifier stage is shown in Fig. 2. Note that it is similar to the circuit in Fig. 1B, except that transformers are shown in the base and collector circuits. Also, the variable resistor R1-R2 is replaced by two fixed resistors R1 and R2. This sets the base voltage to the proper value. Resistors are also inserted in series with the emitter and collector circuits. R3 between emitter and ground and R4 between the output i-f transformer and 6 v. Collector current I_c, flows through both of these resistors, producing a voltage across them, which is proportional to the amount of current flowing.

Collector current can be estimated by measuring the voltage across R3 or R4. If the current stops flowing for some reason, the voltage across R3 would decrease to a very small value and the voltage across R4 would disappear, sending collector potential to 6 v. One of these two resistors may not be present in some crcuits, but both are seldom eliminated. Their presence helps to tell whether the transistor is conducting without opening any leads to measure current.

If you are interested in estimating the value of current through R3 and R4 fairly closely, simply measure the voltage across one of them and divide by the resistor value. For example, if the voltage in Fig. 2 is 0.5 v; divide by the resistance value of 1000Ω and the answer is 0.0005 amp or 0.5 ma.

A Typical PNP Circuit

A basic PNP transistor circuit is shown in Fig. 3 which resembles the NPN circuit except that the battery polarity is reversed. This reversal is necessary because the internal polarity of the transistor material is opposite from the NPN transistor. The emitter is now the most positive element, the base is next, and the collector is nearest ground. The same principles apply except that in the PNP circuit the electrons flow in the opposite direction around the circuit (see arrows). There is still about 0.2 v difference between base and emitter for "forward bias" but the emitter is now the most positive element in the transistor.

It is possible that either R3 or R4 may not be present in this circuit, but both are rarely omitted. In the case where R3 is not present, the voltage at the collector is used to figure collector current. If R4 is not present, the voltage at the emitter may be used to estimate collector current. In audio circuits, the transformer resistance in the collector circuit and the voltage across it may be used to figure collector current, since the current and transformer resistance are sufficient in most cases to produce a readable voltage at the collector.

A typical power transistor output stage is shown in Fig. 4. Resistances are much lower in this type of circuit because the internal resistance of the transistor is much lower than the type discussed previously. Collector current is checked by measuring collector voltage, which is actually measuring voltage across the output transformer, RL. With a transformer resistance of 1Ω, including speaker, and a collector current of 1.0 amp. the potential would read 1.0 v ($E=I_c \times R$). By adjusting bias control R2, the correct collector voltage is set when a new transistor is installed. The speaker must be connected, and the proper input voltage sup-

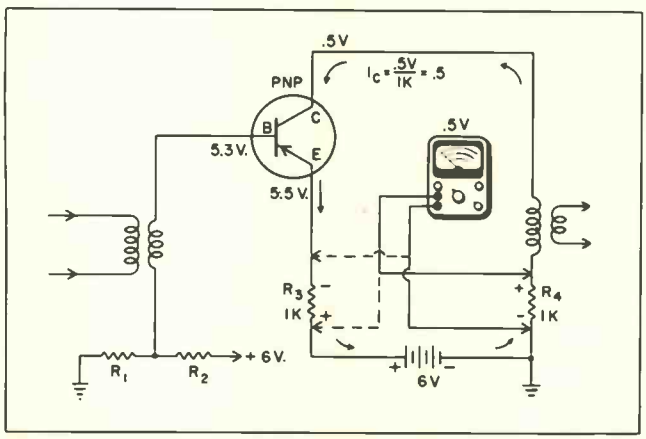


Fig. 3—When a PNP transistor is placed in a circuit similar to Fig. 2, the battery polarity must be reversed. The electrons in this circuit travel from the collector to the emitter.

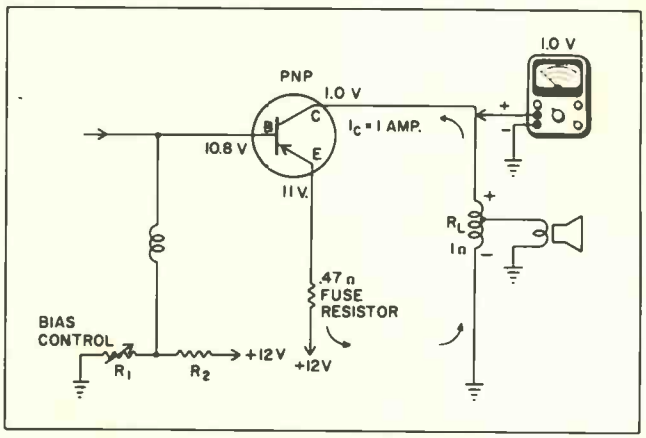


Fig. 4—In an auto radio output stage, the collector voltage indicates current flow. No voltage at the collector would indicate no conduction and a probable open fuse resistor and shorted transistor.

plied to the radio when this is done. Some circuits use a grounded collector where the transformer is found in the emitter circuit. The presence of voltage across the transformer is usually a tip off that the stage is conducting and working normally.

Relationship of Element Voltages

The relationship of voltages between transistor elements assumes equal importance with collector current. In an NPN circuit, the emitter is the least positive, or most negative voltage; the base is slightly more positive; and the collector is nearest to the positive battery potential. In the PNP circuit, however, the opposite is true: The emitter is most positive, or least negative; the base is slightly less positive; and the collector is farthest away from the emitter voltage.

This rule is illustrated in Fig. 5. In NPN circuits the emitter is used as a reference. With the negative meter lead placed on it, the base is slightly positive and the collector considerably more positive with respect to the emitter. In the PNP circuit, the emitter is again used as a reference, but with the positive voltmeter lead placed on it. The base is slightly negative and the collector considerably more negative with respect to the emitter reference.

An exception to this rule is sometimes seen in converter or mixer circuits, where the emitter-to-base relationship may be reversed from normal because of oscillator signal voltage in the stage. A zero or reversed emitter-to-base voltage in other stages usually means that there is an open in the emitter circuit, or a leaky transistor which is drawing excessive collector current. A zero emitter-to-collector voltage can be caused by an opening in the collector circuit, or a shorted power transistor if it is a power output stage.

Voltages are usually measured with respect to ground and compared to those indicated on the schematic. Then, if a noticeable error exists in a stage, the voltage relationships in the stage are checked element to element, using the emitter as a reference. (See Fig. 5). The collector current can also be quickly estimated as previously described. In most cases there is nothing to worry about in a stage if voltage relationships are normal and the transistor is drawing collector current. About the only exception would be faulty alignment of a tuned circuit, or an open capacitor in the i-f transformer or other point.

AGC Voltage and its Meaning

Automatic gain control (agc) is accomplished by feeding back some rectified and filtered i-f voltage to the "front end" of the receiver, (See Fig. 6). The voltage is actually a degenerative voltage, reducing the gain of the receiver on strong stations to prevent overloading and distortion. It is usually obtained from the audio detector diode and volume control system, but may have a separate diode of its own to rectify the i-f output. It is then filtered and applied to the 1st i-f or r-f stage—usually to the base element, but occasionally to the emitter instead. This changes the bias and collector current in that stage.

Very little trouble is found in most agc systems. A general rule is that if the voltage on the agc line varies when the radio is tuned through a strong station all is well with the system. If no change takes place, the agc diode or some component along the agc line may be defective, but it should always be remembered that a defect anywhere in the "front end" or i-f strip will also result in poor agc action.

Complete lack of agc usually causes distortion only on very strong

Continued on page 65

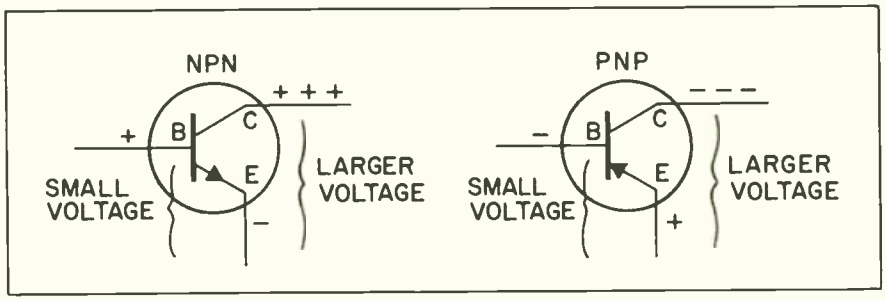


Fig. 5—Relationship of voltages in typical transistor circuits using the emitter as a reference. Converter circuits often have B and E voltages reversed from this condition when the oscilator is functioning.

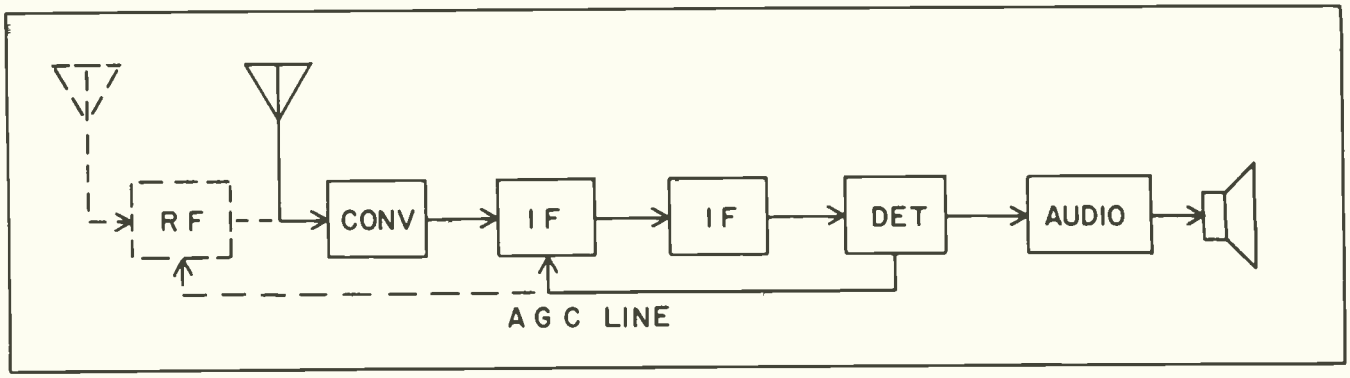


Fig. 6—Block diagram of a radio showing agc connections. Dotted lines represent the sections which may be found in some radios.

Your Stake In Color TV

More alert TV technicians are preparing to take advantage of higher profit margins on rising color TV sales and service volume

■ No one anticipates a public buying spree in color TV receivers approximating that enjoyed by black-and-white sets in the early '50s. But barring an unforseen general economic reversal, objective conditions exist today for a steady growth in color TV receiver sales.

W. Walter Watts, a Radio Corporation of America vice president, said recently before a symposium of EIA, "I sincerely believe that one million color sets could be sold in 1963.

"Speaking for RCA, we intend to give the customer the best possible value for his money while providing fair profit margins at all levels of distribution . . .

"While we expect to see a strong, healthy, black-and-white market continue in the years ahead, this market would be mainly in the area of lower-priced, lower margin sets."

As most TV-radio service-dealers already know, RCA has spent many millions to develop and promote color TV.

Some Other Company Positions

A few months ago the national service director of Zenith, Frank Smolek, made it clear that his company has both feet solidly planted in a color TV manufacturing and promotion program. More than 10,000 independent TV-radio service dealers have already completed service training seminars through company distributors. Additional numbers were reported attending the seminars which are being continued to take care of the demand. The company is already manufacturing two color chassis, one with manual control and one which includes the "400" Space Command remote control system.

Sylvania has introduced three new 21-in. color TV sets. Robert J. Theis, president of Sylvania Home Electronics Corp., marketing subsidiary of Sylvania, said the expanded Sylvania color TV line includes two low-boy consoles and one vertical console. Suggested retail prices range from $695 to $775.

The position of Motorola, as stated a few months ago by Edward R. Taylor, executive vice president, is that Motorola does not plan to introduce a color receiver at this time. Motorola is developing its own rectangular 23 in. picture tube which it hopes to have ready for the market within a year. His company believes this tube will open the door to greater color set sales through creation of a more compact package and ultimately lead to lower color TV set prices.■

Installation, alignment and maintenance of audio modulated VLF and CB remote control equipment

by F. A. Kenom

■ Installation and maintenance of garage door openers is a "natural" for wide-awake TV-radio technicians looking for additional sources of income. Most technicians are already familiar with TV remote controls which are similar to those used for electronically controlled door openers. The electro-mechanical "operators" used with these devices are relatively easy to handle.

The repair of garage door openers is usually left to the equipment distributor. The retailer is generally not prepared to service them, and time is wasted when they are returned to the factory. Repairs are also unnecessarily expensive when both the transmitter and receiver are sent to the factory. "Prepaired," matched frequency units make substitution out of the question for the do-it-yourselfer.

Remote controlled door openers are no longer a "rich boy's toy." They are not only practical but are being installed more widely in one-car garages.

Control Types

Several control types are now being marketed. Most manufacturers have settled on r-f signal transmitters located in the car. Additional controlling points near the door or inside the house are usually wired directly to the operator control relay. Types now being produced include transistorized transmitters and receivers. The transmitters may be small hand held types, like those used in TV remote controls, or larger under-the-hood types operated from the car battery. These models are push button controlled from the car's instrument panel.

Most technicians are acquainted with remote devices which are activated by light and sound. These units, operating from the car's horn or lights, inadvertently may be "touched off" by passing traffic. Light operated controls are frequently difficult to adjust with sufficient range to prevent accidental operation by sunlight. Both sound and light operated types, however, may be coded for optimum reliability. Three blinks of the headlights or three horn toots, can be employed, for example.

At least one manufacturer markets a control which operates on very low frequency (VLF). The unit is transistor powered and available preset to one of 25 different frequencies from about 7000 to 10,000 cps.

If you plan to sell door openers all of these types should be considered. Each has its advantages and disadvantages. Some have short control distances, others require licenses for operation. Most license requirements are for Citizens' Band frequencies, however, and require only that the user make application for a permit. The technician must have at least a 2nd class license, however, to fully service CB transmitters.

Mechanical Considerations

The type of unit or the manufacturer may be determined by the construction of the door or garage where the control will be installed. Overhead clearance is the most important item. Units presently on the market require anywhere from 1½ in. to several inches of clearance between the door and the nearest structure above the door as it is opened.

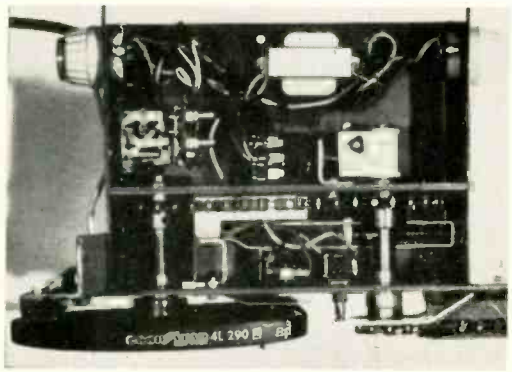
The balance of the door should be as good as possible to prevent unnecessary wear to the "operator." Most operators are able to lift heavy doors without any problem. Changing seasons can also present a problem, especially on spring loaded type doors. During the cold season, pressure applied to the system through spring contraction can cause erratic operation because of pressure applied to the limit switches.

Specific installation problems are usually well covered in instructions supplied with the system.

Typical Systems

Although the system may contain transistors or tubes and may be op-

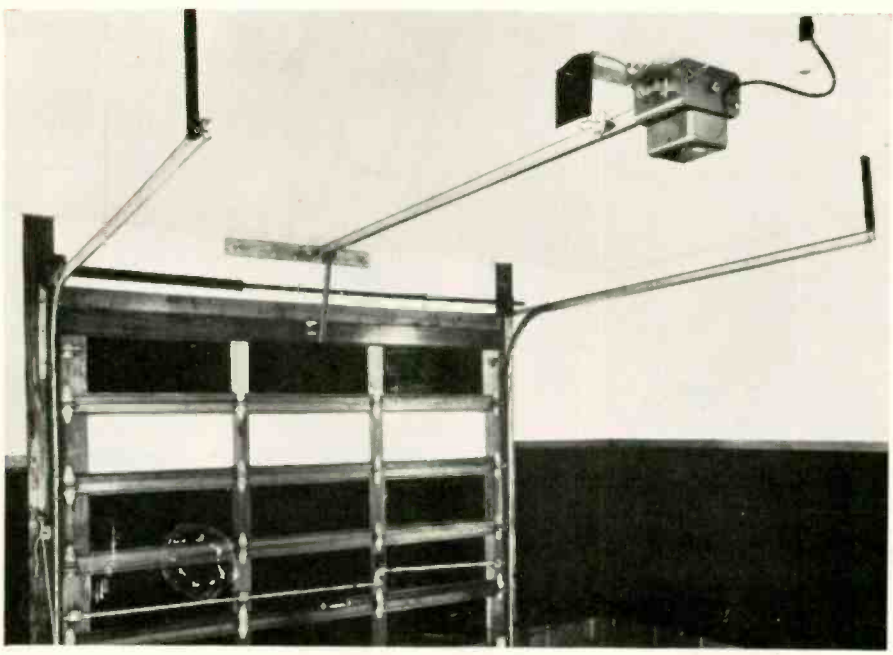
A complete remote control system made by Tamar Electronics Inc., showing two hand-held transmitters. The transmitters have clips for attaching to the sun visor when not in use.



An Allister operator with cover removed to show the chain drive, limit switch, relays and garage light socket. The lamp lights when the door is opened.

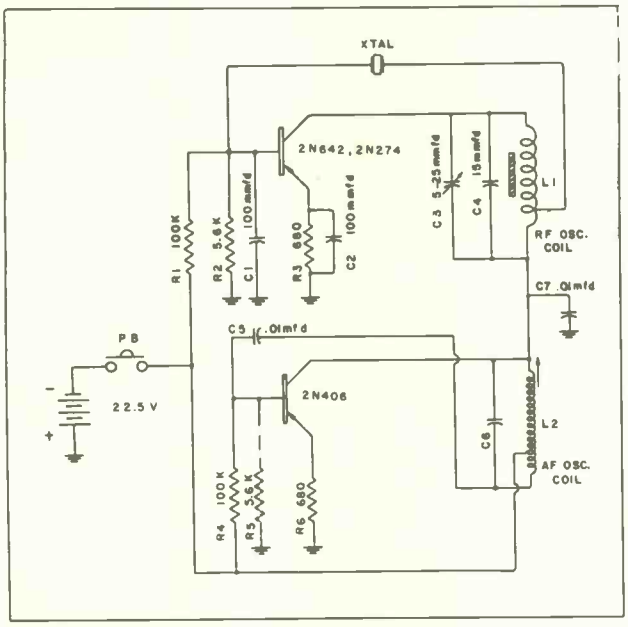
Servicing Remote Controlled Garage Door Openers

Perma Power's small hand-held transmitter can be used on any car with no modifications or installation problems.



Installation of a "Genie" operator unit in a garage. This particular model lifts the door by screw action and is made by Alliance.

Multi-Products Companys' transmitter may be mounted under the car's dash or hood.

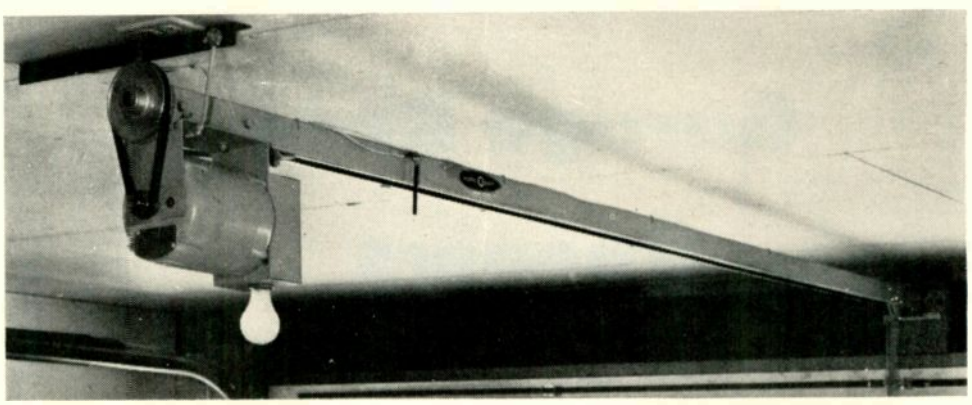


Crystal controlled transmitter uses only two transistors for carrier and modulation.

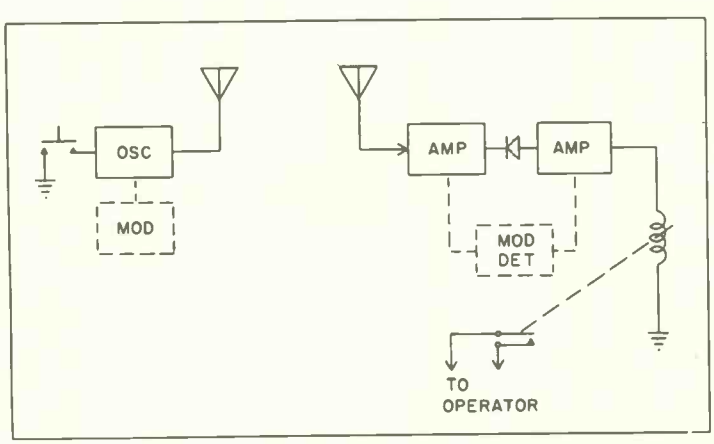
erated from a hand-held transmitter or built into the car and operated from its electrical system, the principle of operation is basically the same.

In order to avoid "phantom operation" many of the systems use a modulated carrier. A modulation detector in the receiver then rejects any signal without the proper modulating frequency. Also, in this manner only a few modulating frequencies plus a few carrier frequencies result in a large number of usable non-interferring signals. This modulation is impressed on the signals in several different ways.

One method uses a relay weighted and balanced so it closes at a specific frequency. The relay shunts



Mounting the Moore-O-matic operator is made with two bolts through an angle iron secured to the ceiling.



Basic block diagram of a garage door control system. Optional modulator and modulation detector are shown in dotted lines. When modulation of the proper frequency is not detected, the rectified input is cut off at the amplifier.

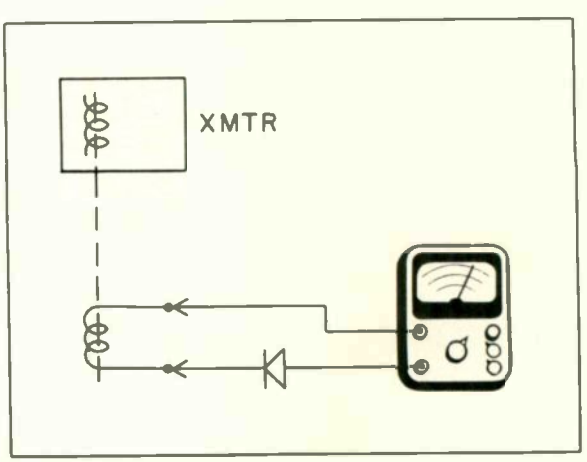


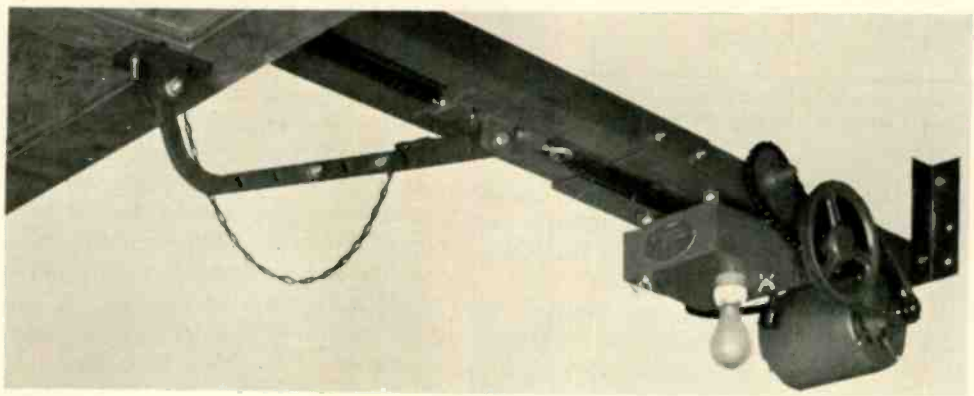
Fig. 1—Output from most transmitters can be checked with a standard VOM set to a low microampere scale and connected in series with several turns of wire and a crystal diode.

a large capacitor across the r-f output thus modulating the output signal. The modulating frequencies used in these relays is from 15 to 25 cps.

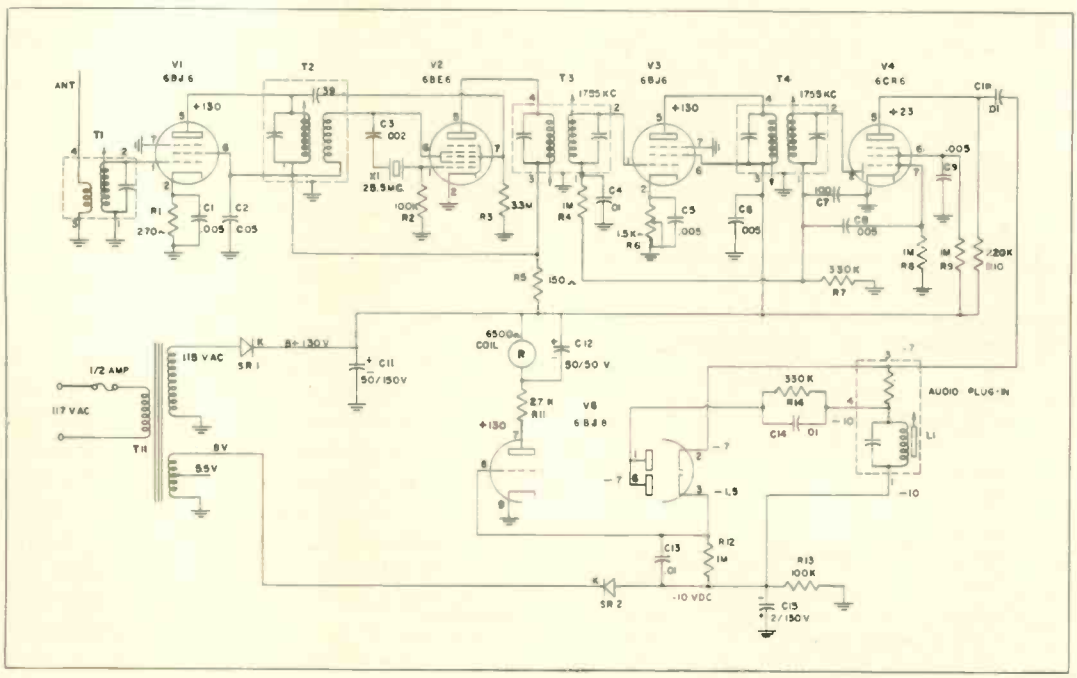
The receiver uses the same type relay for the demodulator. The relay coil is tied in series with an amplifier tube cathode. If the incoming r-f is properly modulated, the relay operates and energizes the door opening relay. This relay is often hooked to a larger power relay which operates the motor.

Though transistors have been used in a large number of transmitters, the tube is still popular in receivers. Probably because size and portability are not necessary in a receiver and the economy

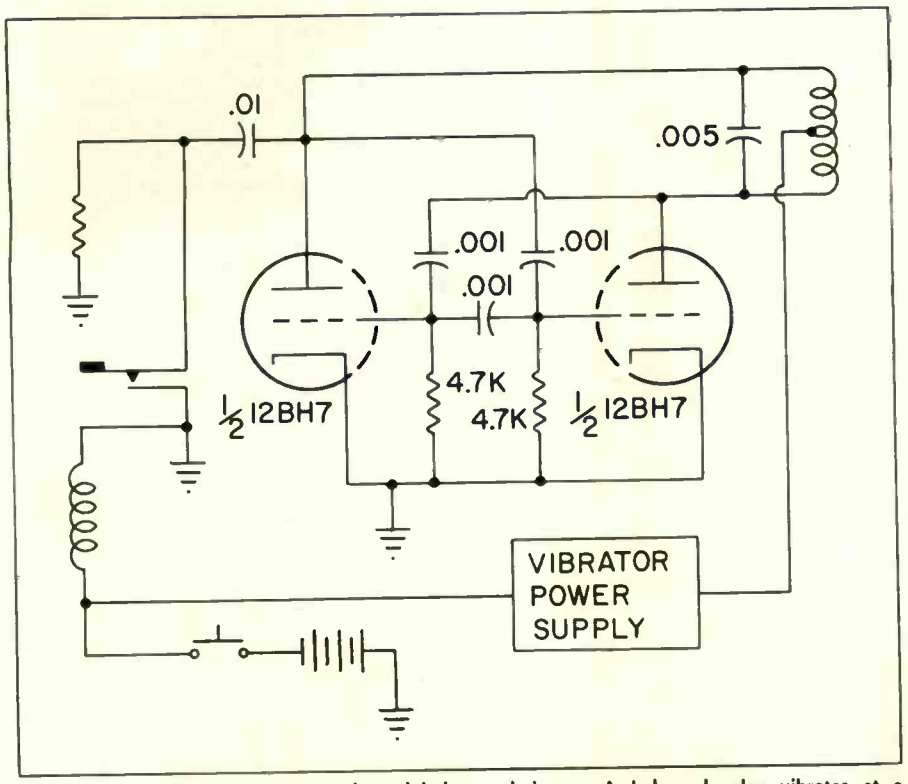
The Multi-Elmac receiver is typical of most tube type garage units. The power consumption is less than 20 w.



Chain drive is used most frequently for door operators. Hunt & Martin Manufacturing Company's lift arm is constructed in two pieces with multiple holes to adjust arm length.



Tube type receiver operates in the Citizens Band range. The modulation detector in this unit is a plug-in tank circuit which can be changed for the desired frequency.



Tube type transmitter uses unusual modulation techniques. A balanced relay vibrates at a specific frequency which shorts a large capacitor across the tank in the transmitter.

of changing products is less than desirable.

Alignment

Depending on the equipment, alignment can be very simple or as complex as peaking a superhet radio. For example, one manufacturer's transmitter tuning recommendations are shown in Fig. 1. The transmitter is crystal controlled and only needs to be peaked for maximum output.

A coil of seven or eight turns is wired in series with a good diode detector and the lowest scale on a 20,000Ω/v meter or a special 100 μa scale. When the coil is positioned on the same axis as the transmitting coil the meter will give an indication of relative output.

Receivers can of course, be aligned with a good r-f generator (up to the demodulator) where it is necessary to use an accurate audio generator. In most cases the receiver is peaked for maximum signal at the relay coil.

Peaking trimmers are located in the antenna circuits of both the transmitter and the receiver. Because of variations in different installations, the antenna will not necessarily be tuned to maximum efficiency. A meter located at the relay coil in the receiver will give the best signal strength indication while tuning the trimmers for maximum with the transmitter on. Use caution in operating most transmitters for more than a few seconds. They are designed to operate only for a very short time with sufficient time to cool off between operation.

If the trimmer adjustment seems to be too wide in response, back the transmitter away from the receiver till it becomes sharp. Maximum operating distance can also be determined in this way.

Manufacturer's instructions usually give alignment data and frequently tell how to align the system with only the transmitter as a frequency source.

Maintenance

Detecting the transmitted signal to find out which unit is in operation is usually the first step in troubleshooting a remote system. This can be accomplished with a detected meter circuit as shown in Fig. 1 If the transmitter has failed voltage and resistance checks should help you find the trouble rapidly. Only a few components are used in most transmitters so all components can be checks in a short time if necessary.

It is possible to get an indication that the transmitter is operating using this method, however, even if the modulator is inoperative. This is most easily detected at some point before the demodulator in the receiver using a scope to view the waveform. A very high gain scope is needed for this check. Depending on the modulating frequency, earphones may be substituted for the meter for a "go-no-go" check on the modulator.

Since the transmitter should not be operated for long periods of time, a signal generator should be used to check the receiver. A meter can be connected to the relay coil on the output stage and signals can be injected at each stage, moving from the last stage to the first. When the meter fails to indicate the signal, the dead or weak stage has been found. Larger signals are needed near the output stage than at the input stage, of course. ■

Four Camera Tubes Used In

NEW EXPERIMENTAL COLOR TV CAMERA

C. H. Colledge and Dr. H. N. Kozanowski (holding image orthicon) with the TK42x camera. The new color camera employs four pickup tubes instead of three used in conventional color cameras. The fourth tube superimposes a black and white picture over the color for a high quality picture.

■ A 4½-in. diameter camera tube is the eye of an experimental RCA camera, model TK 42X, which produces color television pictures having richer hues and finer detail than previously attained with studio cameras.

In the new camera, the image orthicon picks up the black-and-white signal, while three one-inch diameter vidicon's are used for the red, blue and green picture information.

The imposition of a clean precise black-and-white signal from the one image orthicon tube on to the three primary color signals, a technique similar to that used in four-color printing, enriches picture hues and provides sharper definition. This composite signal also provides superior black-and-white pictures on B/W TV sets during color telecasts.

The color camera was constructed by the RCA Broadcast and Communications Products Div. as the forerunner of equipment for future TV stations. It was demonstrated at the National Association of Broadcasters convention in Chicago.

Present color cameras employ three camera tubes, one each for the red, blue and green channels that are combined to form the color information as well as the "monochrome" black-and-white picture information. The experimental color camera utilizes the fourth pickup tube to provide a separate clean and sharp monochrome picture signal. The tube contributes to the camera's improved picture resolution, signal-to-noise ratio and gray scale rendition.

This same image orthicon is currently employed in high-quality black-and-white TV cameras. Its excellent capability over varied light conditions makes it well suited for outdoor or studio pickup.

The three 1-in. diameter vidicons handle the color picture information in the new camera. These camera tubes have electrostatic focus and electrostatic deflection. Because these tubes are very small and require no deflection coils, the new camera which uses four camera tubes is smaller than present cameras using only three pickup tubes. Present day color sets will receive color with no modifications. ■

TOUGH DOG CORNER

Difficult Service Jobs Described by Readers

High Voltage Burns AGC Control

We had an RCA CTC11 Color chassis come in for repair. Intermittently the agc control smoked as soon as the receiver warmed up. The chassis was removed from the cabinet and not only was the agc control, R-133 burned but resistor R-146 was damaged. An ohmmeter was placed from the 6BK4'S heater to ground and there was no short. The next time the a-c cord was plugged in, it took about 10 minutes before the control started to smoke. The circuit again was checked and no short could be found. The shunt regulator tube was checked in a good tube tester, but showed no short. On a hunch the shunt regulator tube was replaced and the chassis "fired up" again. No smoking, everything was fine, so the agc control and R-146 were replaced. The chassis has been working okay since. The 6BK4 tube was, no doubt, leaking between the heater and cathode when the tube warmed up, placing excessive voltage across the agc control and R-146.—*H. L. Davidson, Ft. Dodge, Iowa.*

Short Burns Out Three Tubes

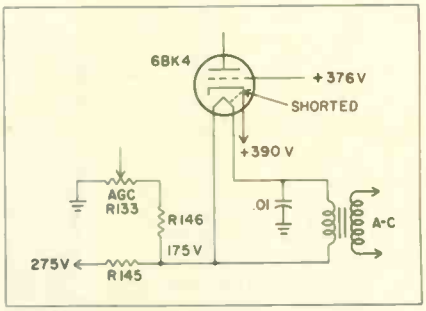
Some months ago a call was made to a customer's home to repair a Crosley 431-1 TV. The picture tube was defective and a new one was installed. After all adjustments were made the chassis was installed in the cabinet. The set then developed a hum, and the picture and sound both disappeared. The first three tubes in the series string had burned out. The 12L6 had a cathode-to-heater short, so it was assumed that this was the cause of the trouble, as no other short could be found. A cathode-to-heater short would bypass all the other tubes but the three mentioned would have several times normal voltage across the heaters. Three new tubes were installed and the set was turned on. It worked fine. One month later the customer called and said that the set had gone dead. A trip was made to the house and the three tubes were again found burned out. The 12L6 had a cathode short and so did the 12DQ6 and the 12AX4!

A new investigation was begun under the assumption that an intermittent grid capacitor in the 12L6 circuit was shorting, overheating the tube and starting the triple tube burnout. The capacitor was replaced, and resistor values in the grid circuit were checked and found normal. The series filament resistor value was checked and found to be low, so a 15Ω, 15 w resistor was temporarily wired in the circuit. The 12L6 potential was now 12.45 v.

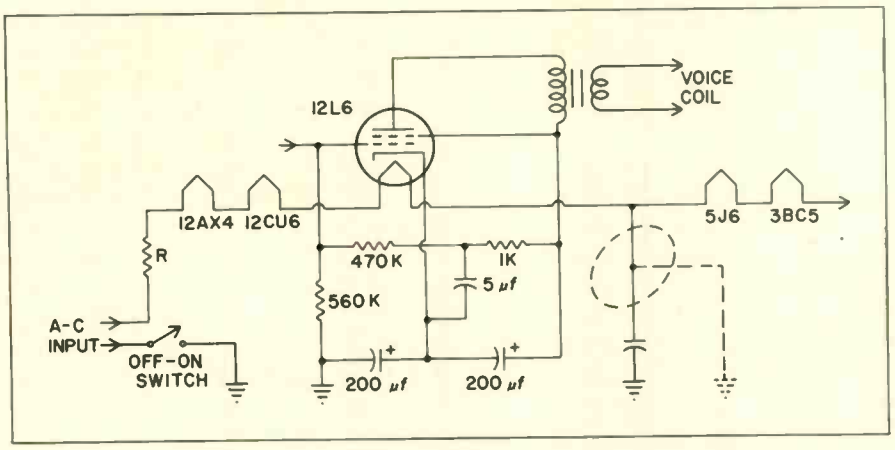
After checking for a leak or short from the 12L6 cathode and heater circuits, none was even found while jarring the chassis. A set of three tubes was installed and the set turned on. It worked fine again and after waiting around for half an hour, I left with a prayer on my lips.

About a month later, we had an-

Continued on page 66



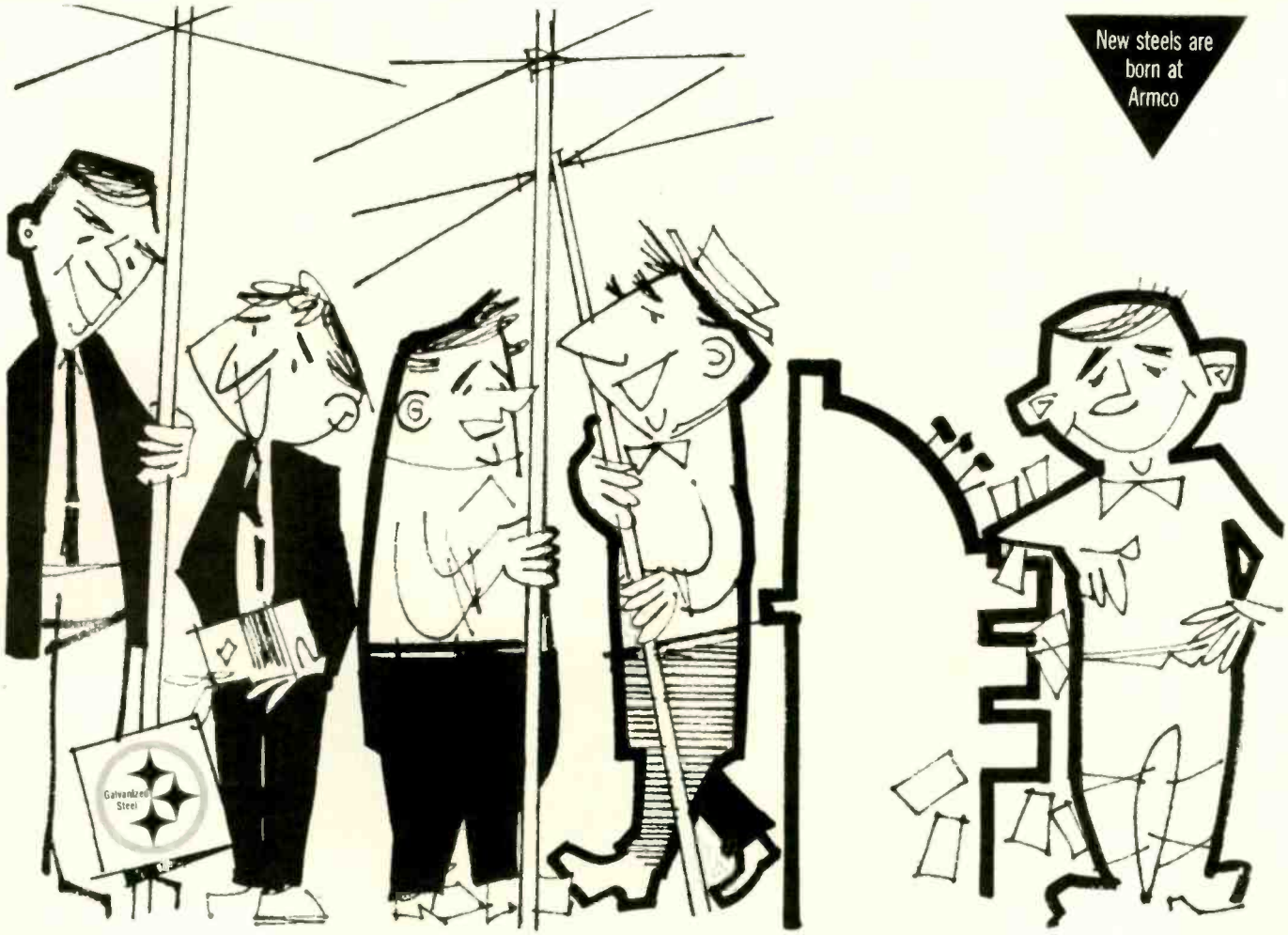
High voltage was impressed across the agc control when the shunt regulator in a color set developed leakage.



A short in the tuner was caused by excessive solder on a feed-through capacitor.

TOUGH DOGS WANTED

$10.00 paid for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photographs are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Tough Dog" Editor, ELECTRONIC TECHNICIAN, 1 East First St., Duluth 2, Minnesota.



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. . . for more details circle 12 on page 46

TEST INSTRUMENTS for Bench and Caddy

OSCILLOSCOPE

Conar Oscilloscope Model 250 at $139.50 Wired, $89.50, Kit — The model 250 is an adequate instrument, with some of the features found in much higher priced equipment.

The scope has a vertical frequency response which can handle color service work, being only 1.5 db down at 3.58 mc. The horizontal sweep is extended to 500 kc so the burst frequency is actually visible. An interesting modification is suggested to allow the scope to accurately check for faulty yokes, flybacks or linearity coils. A pulse from the horizontal circuitry is fed to the "Z" axis input jack and externally connected to the vertical input jack. A coil connected across the vertical input then is pulsed so that its ringing frequency is displayed on the scope. Shorted turn faults are easily found in this manner.

The scope has a 5-in. screen which is powered by 2400 v. Sufficient amplification is used, however, to give the scope a vertical sensitivity of 0.23 v/in. The trace remains clearly visible under good bench lighting conditions at the highest sweep frequencies. Direct p-p readings of complex waveforms are obtained with calibrated controls.

A brushed aluminum panel with black lettering is used for excellent legibility of the scope panel. A good instruction manual is included with the scope giving instructions on use of the scope for general and TV service work. A set of four probes designed for the scope are also available in a convenient roll-up pouch at additional cost.

The oscilloscope is built by Conar Instruments Div. of the National Radio Institute.

VOLT-OHM-MILLIAMMETER

RCA Volt -Ohm -Milliammeter, Model WV-38A, at $43.95 Wired, $29.95, Kit — The VOM is probably one of the most-used instruments in the radio-TV shop. This instrument should be rugged, easy to read, and accurate. The RCA WV-38A qualifies on all counts. The unit tested was well within the ±3 percent tolerance specified by the manufacturer for the d-c scales and within the 5 percent specified for the a-c scales.

Eight d-c ranges and seven a-c ranges are incorporated in the meter with 20,000Ω/v d-c and 5000 Ω/v a-c input resistance. There are also six d-c current ranges which have a 0.25 v insertion loss. The scale is calibrated in db (-20 to +10) which is invaluable to anyone working with audio. A single function switch selects a-c or d-c operation as well as the polarity for d-c operation. This eliminates changing both leads when measuring different voltages in a chassis. Both d-c and a-c meter functions are calibrated for 5000 v.

A 5¼-in. "extended view" meter, mounted in clear plastic case, allows good visibility and avoids lighting problems. A vinyl case and HV probe are also available.

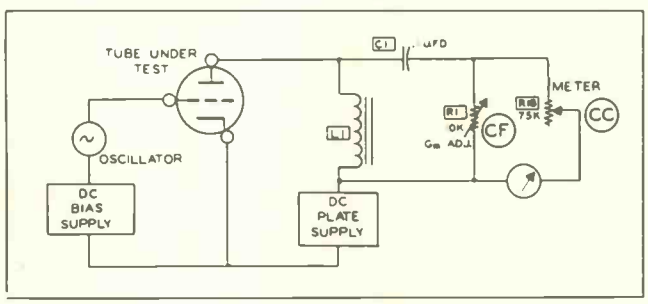
TV TEST SET

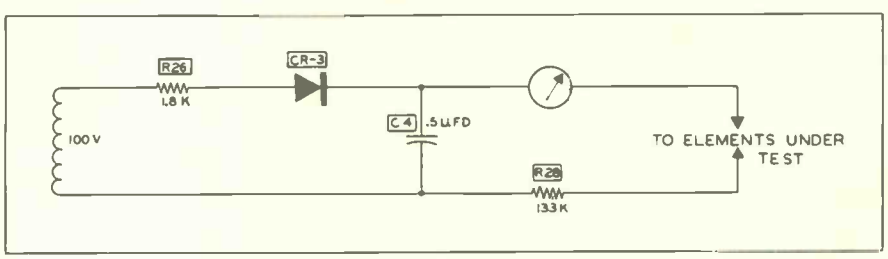
B & K Television Analyst, model 1076 at $299.59. Evidence of advancing sophistication in TV test equipment is obvious in the model 1076. It is a complete TV set and transmitter which can inject a video signal into any point from the antenna terminals to the picture tube. The set also has built-in horizontal and vertical sections which can inject a sync signal or be used to drive the sweep tubes, transformers or yoke. The instrument is also capable of checking yokes and flyback transformers after they are isolated.

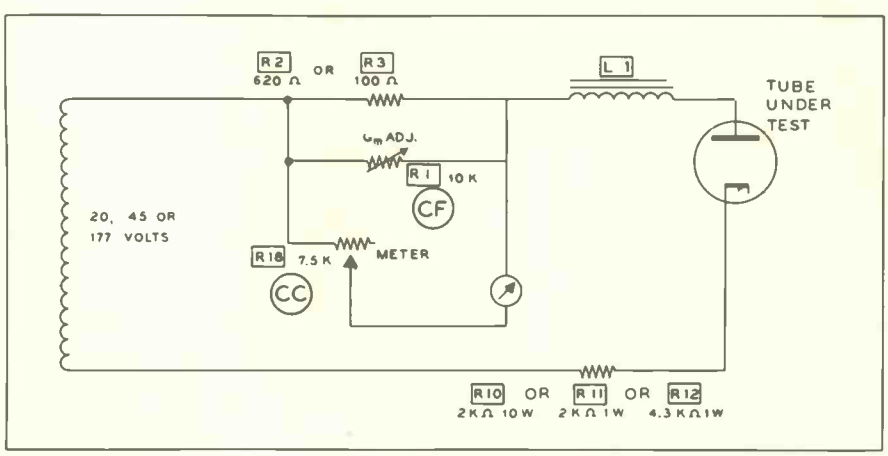
Color signals can be generated to trouble-shoot the chroma circuitry. A rainbow pattern is generated by phase shifting the test sets subcarrier 15,750 cps from the television sets burst frequency.

After using the Analyst a short time the technician should be able to isolate a receiver's faulty stage in a few minutes. In many cases the tester will even isolate the faulty component. A handy neon high voltage indicator is supplied with the test set to indicate the presence of high voltage while substituting various stages in the horizontal or high voltage sections of the receiver.

A complete set of slides are supplied with the unit for a test pattern, line, rainbow, dot and no information. Other slides can be made for "broadcasting" to a TV set for advertisement or instructional purposes. The 50 page instruction manual supplied with the Analyst is complete in every detail. It is a course in itself on logical trouble analysis in television receivers.







Simplified test circuits used in the Heath TT-1A tube tester.

TUBE TESTER

Heathkit Tube Tester, Model TT-1A Kit at $149.95 —

Many shops are having trouble keeping up with the multitude of new tube types which are appearing on the market. Tube testers built only two years ago are now being revised or junked. New tube testers must be able to accommodate five and seven pin nuvistors, compactrons, 10 and 11 pin minia-

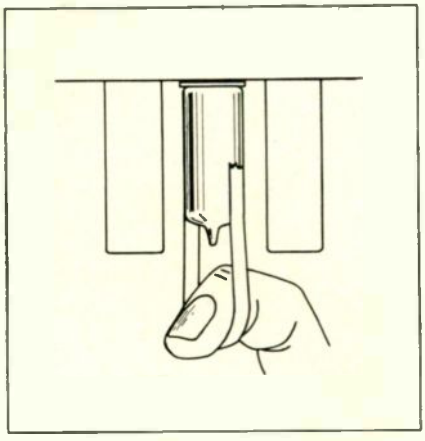
Continued on page 66

SHOP HINTS

TIPS FOR HOME AND BENCH SERVICE

Tube Puller

Tubes in hard-to-reach places, between i-fs in car radios for example, can be pulled easily with the



Tube puller for hard-to-get-at tubes can be fashioned from short strips of masking tape.

aid of a short piece of masking tape. Simply stick the tape to each side of the tube so that a loop is formed. Put your finger in the loop and gently wiggle the tube loose.— *Clyde Pearce, Whiteville, N. C.*

Rubber Holds Radios

When working on transistor radios, a piece of foam rubber about 12 x 12 in. and ¼ in. thick can be placed on the bench to prevent slipping. The rubber will also prevent the radio from being scratched if the work is being done with the radio in its case. — *Wayne N. Potter, East Canton, Ohio.*

Tape Tips

Using tape in a tight spot is often a problem. The whole roll of tape is too big and a piece long enough to do the job usually picks up enough dirt so that it won't stick. To simplify this job, simply roll off sufficient tape to do the job and roll it back on itself. This miniature roll can then be handled in a tight spot.

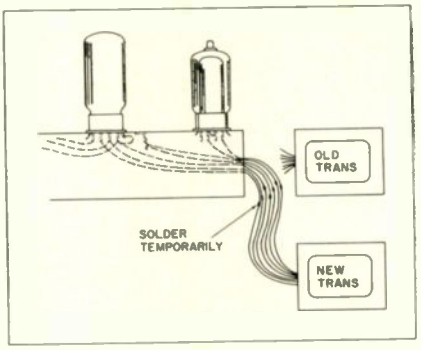
A pyramiding tape roll can be halted if the cardboard center used in the roll is removed by cutting it out. The moisture evidently causes the cardboard to swell, causing the roll to pyramid outward from the center. — *Sid Elliot, West Palm Beach, Fla.*

Load-Check Meter

An ammeter which costs about $3 can be a valuable test instrument for your bench work. I have a 5 amp unit in series with the line used for testing TV sets. The line is fused for protection and the meter gives me a continuous indication of the current the set is drawing. Most important, loads can be observed through warm-up periods when a shorted rectifier or filter might be detected too late to save the transformer. Also, a simple calculation gives me the power consumption of the set which can be compared to the rated power. — *Nicholas B. Cook, Paterson, N. J.*

Transformer Replacement

When replacing power transformers on some TV sets, the job can be done easier if the following pro-

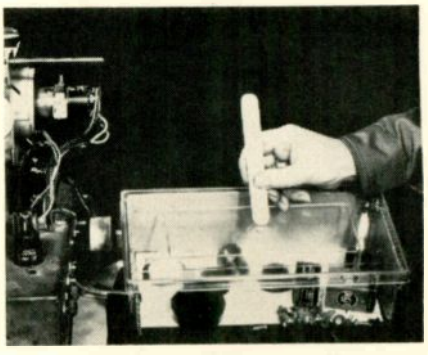


Transformer leads are easily routed through the chassis if new transformer leads are first fastened to the old transformer leads.

cedure is observed: The transformer should be unmounted and pulled out far enough to enable cutting the leads next to the transformer. Temporarily solder the full length new transformer leads to the old wires which are attached inside the chassis. Now pull the wires through the hole in the chassis and fasten the new transformer. The old wires can now be disconnected at their terminals inside the chassis, and are very helpful for putting the new leads through. This will automatically route and properly dress the new leads and assure connecting each wire to the proper terminal.— *Walter Savelly, Detroit, Mich.*

Parts Box

When making TV repairs, a clear plastic parts box will save time and will keep parts together when wait-



Clear plastic box makes an excellent parts box for old TV components.

ing for a customer "go-ahead" on replacement parts. All parts in the box are visible allowing quick identification. Plastic shoe boxes are about the right size and are tight enough to prevent parts loss if tipped over. — *H. Leeper, Canton, Ohio.*

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FREE LITERATURE

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

COMPONENTS 300

This distributors general component listings cover 24 pages. Many hard-to-find items in potentiometers, power rheostats, switches, sockets & plugs, capacitors and transmitting micas are detailed. Derf Radio Co.

TOOLS 301

A 12-page catalog lists displays of screw drivers and other shop tools designed for the electronics trade. Vaco Products Co.

ELECTRONIC PARTS 302

A 94-page electronic parts catalog includes eight sections and covers 55,000 parts. The sections are capacitors; resistors and RC networks; antennas and antenna accessories; auto radio, antennas and accessories; fuses, switches, lamps and controls; rectifiers, diodes and transistors. Consumer Products Div. of Philco Corp.

TUBE TESTERS 303

Catalog describes a line of shop and do-it-yourself type tube testers and test adapters. Mercury Electronics Corp.

TWO-WAY RADIOS 304

A brochure details a line of new 25 and 75 w high band and 35 and 100 w low band mobile units. Communications Company, Inc.

I-F TRANSFORMERS 305

Bulletin #609 gives specifications on two new series of miniature top-tuned i-f transformers. Twenty-four units are outlined. Stancor Electronics, Inc.

ANTENNAS 306

Electric powered antennas for CB, a-m and a convertible model for both, are described in a series of data sheets. All three units are designed for 12 v operation and can be mounted on most late model cars. Tenna Mfg. Co., Inc.

INTERCOMS 307

A variety of intercommunication systems designed for consumer, commercial and industrial applications is detailed in this catalog. Both tube and all transistor models are included. Fanon Electronic Industries, Inc.

SALES AIDS 308

A knob hanger for local advertising and an estimate sheet are intended to help technicians do a better job of selling antennas. The hanger stresses the manufacturers product and technicians' professional services. Channel Master Corp.

EPOXY SOLDERS 309

Application data and design considerations for epoxy silver "solders" and conductive epoxy paint are given in a four-page information bulletin. The report describes a new silver conductive paint and six different formulations of "epoxy solder."

CAPACITORS 310

Capabilities and specifications on Cerol Capacitors, are provided in this bulletin. The capacitors are rolled ceramic types in the high capacitance range of paper and plastic film dielectrics but are considerably smaller in size. Aerovox Corp.

MOTORS 311

Standard fractional horsepower motors, normally carried in stock, are listed in this revised six-page publication. List prices and motor characteristics are also included. Westinghouse Electric Corp.

INDUCTORS 312

Five new f-m stereo multiplex inductors and two new miniature i-f transformers are described in bulletin 611. The Multiplex coils are designed for, or can be used in constructing a multiplex adaptor. Stancor Electronics, Inc.

CUT HERE

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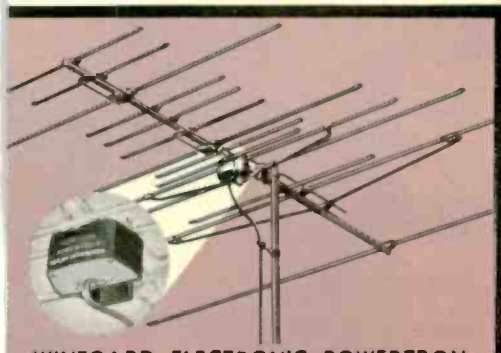
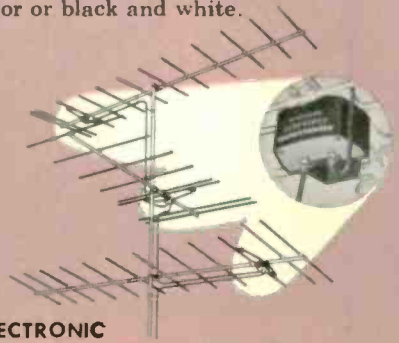
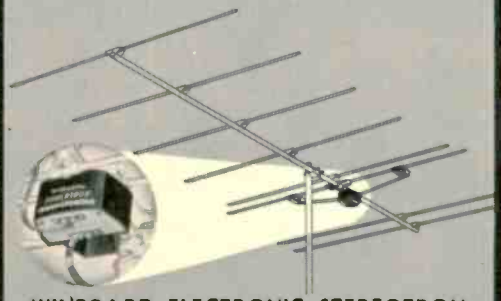


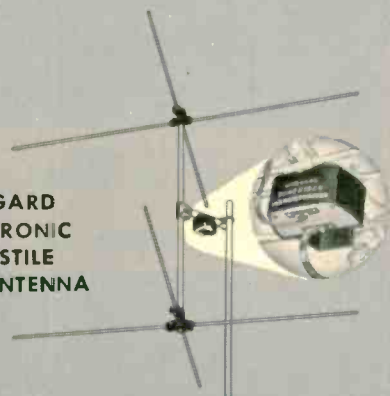
WINEGARD ELECTRONIC POWERTRON TV ANTENNAS—TUBE AND TRANSISTOR MODELS. World's first and most effective electronic TV antennas. More Winegard Powertrons have been installed than all other amplified TV antennas combined. Choose from 3 transistor or 3 tube models. Transistor models for FRINGE areas (nearest TV or FM station some distance away). Tube models for MIXED signal areas (locations with TV station close to set, and other stations far away). Both Powertrons come complete with built-in amplifiers, all AC power supply. Patented antennas have exclusive "Tapered T" driven elements. electro-lens director system. Six models, GOLD ANODIZED from $74.95 to $104.95 list. Excellent for color or black and white.



ELECTRONIC CUT-TO-CHANNEL POWERTRON YAGIS. Where you require the finest installation, motels, hotels, hospitals, institutions, deep fringe locations, there is no antenna made that compares to Powertron cut-to-channel yagis. Highest gain (28 DB), powered by transistor amplifier peaked for perfect results. Six (8 element) cut channel and broad low band models—eight (12 element) cut channel and high band models. Run up to 8 antennas from one power supply. ALL MODELS GOLD ANODIZED. Perfect for color or black and white. Write for models no's. and prices.



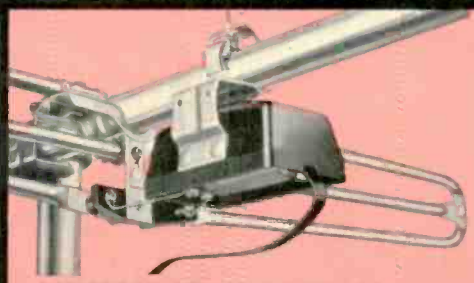
WINEGARD ELECTRONIC STEREOTRON FM ANTENNAS. For the ultimate in long distance FM and STEREO, Stereotron is world's most powerful FM antenna. Comes with power supply and built-in transistor amplifier. Guaranteed to bring in 85% of all FM stations in a 200 mile radius over normal terrain with rotor. Has minimum gain of 26 DB over folded dipole. Recommended for use where signals are from 1 to 20,000 microvolts. GOLD ANODIZED. **Model PF 8 (300 ohm) or PF 8C (75 ohm), $64.25 list.**



WINEGARD ELECTRONIC TURNSTILE FM ANTENNA

Non-directional, has 16 DB gain, receives in all directions to 125 miles . . . no rotor needed. Has built-in transistor amplifier and comes complete with power supply. GOLD ANODIZED, built to last for years of service. Complete with two 300 ohm terminals on amplifier; one for down-lead connection to the set and one for connection to a Powertron antenna.

Model PF-4 (300 ohm). $55.80 list



WINEGARD TENNA-BOOST. Mounts on any antenna. Excellent antenna amplifier mounts on antenna, mast or wall. Has 19 DB gain. All AC power supply built-in two set coupler. Next best thing to Winegard Powertron.

Model MA-30C, $34.95 list.

WINEGARD "BOOSTER-PACK" Single Set Amplifier or Home System Amplifier. Demonstrate right at set with unique "convincer" switch that switches from antenna only, to half power and full power. See the picture improvement with the touch of a switch. Takes only a couple of minutes to install. Has 16 DB gain on low band and 14 DB on high band. Transistorized, costs only 27c a year to operate. **Model AT 6X, $34.95.**

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Signal booster and set coupler combined. Has one tube, 4 sets of no-strip terminals, on-off switch, antenna disconnect plug. Runs 1-4 sets. All AC—no hot chassis. Installs anywhere. **WBC-4X, $27.50 list.**

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. . . for more details circle 44 on page 46

A Sylvania exclusive from your participating Distributor

Big news for dealers who appreciate Sylvania quality and what it means to bigger service profits. Now you can profit and save at the same time through the many Distributors participating in Sylvania's big receiving tube stamp plan.

Start saving America's most valuable stamps for the things you and your family have been meaning to buy. Get them free. Get them faster, if you're one of the millions of families already saving S&H Green Stamps.

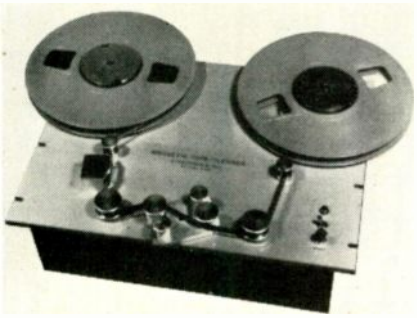
Select your gifts from the big new 144-page S&H catalog that's chock-full of America's most valued merchandise. Everything from home furnishings to fabulous furs.

NEW PRODUCTS

FOR MORE INFORMATION CIRCLE PRODUCT NUMBERS ON PAGE 46

TAPE CLEANER 200

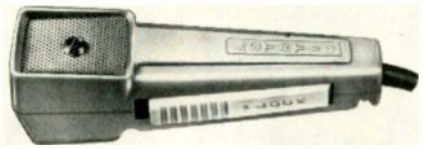
Rapid cleaning of both blank and recorded tapes is accomplished by the model E magnetic-tape cleaner. The unit



removes lint, dirt, loose oxide, or Mylar particles from both sides of the tape. The cleaning process is entirely dry, requiring no hazardous solvents, and it does not affect the data stored on the tape. In addition to tape cleaning, this unit functions as a tape rewinder. Dimensions 19x14x8 in. and can be rack mounted or used as a portable table model. Cybetronics, Inc.

DYNAMIC MICROPHONES 201

Especially designed for heavy-duty industrial use, Model 551, is said to stand-up under extreme conditions. Can be



shifted to high or low impedance, the choice being made by simply changing one wire on terminal strip inside microphone. Has a shielded transformer for very low hum pickup and high signal-to-hum ratio. The Astatic Corp.

POWER SUPPLIES 202

Factory wired d-c power supplies, EC-1 and EC-2, are designed as portable 5 amp units. Specifications for the EC-2 include: d-c output, 0-16 v, ripple, less than 0.5% at 5 amp, regulation, 1.8 v/amp (no-load to F. L.) and a weight of 9 lb. The EC-1 features a 12 v output, 1.4 v/amp regulation and a weight of 10 lb. EC-2 $39.95, EC-1 $29.95. Electro Products Labs, Inc.

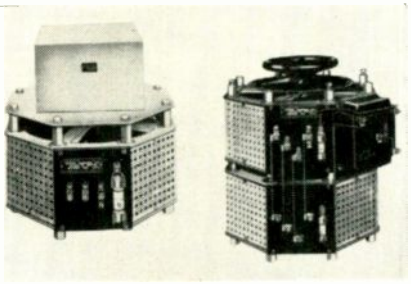
SOLDER TOOL 203

This plier action soldering tool grips the pieces to be soldered. Pressing the

handle controls all three basic soldering operations: grip, heat and hold. Powered by a 250 w dual heat transformer, that permits either high or low controlled heat temperatures, the "Mark V" Triton Tool is furnished with removable tapered Carbon Tips. Triton Mfg. Co.

VARIABLE TRANSFORMERS 204

A heavy-duty type Powerstat provides greater flexibility in application, connection, installation, ordering and inspection.



The 1156D-1256D series are available as single units or as standard ganged assemblies up to nine units parallel, either manually-operated or motor-driven. As many as twenty-seven units can be ganged and mechanically interlocked for requirements up to 244 kva. Available for 120, 240 or 480 v, single and three phase service with current ratings up to 405 amp. The Superior Electric Co.

EDUCATIONAL FILM 205

A 25 minute color sound film, titled "The Finco Horn of Plenty," is designed to be of assistance to the service dealer by pointing out various ways to increase TV antenna sales. Done in a semi-

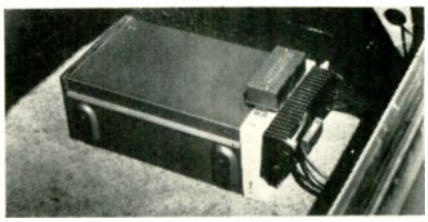
humorous style, the film is both entertaining and educational. Available without charge to distributors and service dealer groups. Finney Co.

CRANK-UP TOWER 206

The No. 6 Tower is now available as a "crank-up" type in heights from 18 to 54 ft. A winch and cable is used to lift the various sections upward with ease and safety. The tower, available in heights of 18, 26, 37 and 54 ft, is completely hot dipped galvanized. Rohn Mfg. Co.

NOISE SUPRESSOR 207

Automatic noise suppression circuitry for tube-type two-way mobile radios and base stations operating on low band (25-50 mc) frequencies has been announced. Known as "Extender" Operation, the circuitry blanks out vehicle ignition noise interference to increase useable communication range and improve message clarity in heavily congested traffic areas. The circuitry eliminates ignition noise interference caused by the radio-equipped vehicle and all other vehicles in the same area. Designed to operate with "T-Power" radio and "Twin-V" radio lines and all base

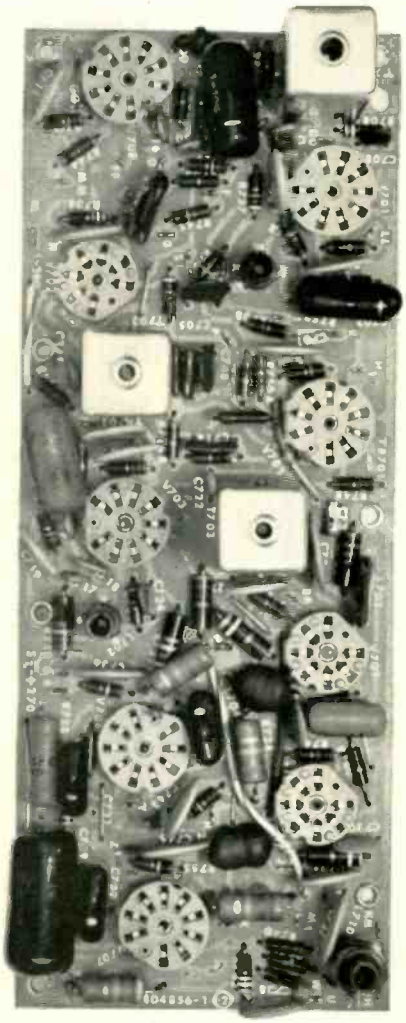


stations operating on low band channels. Motorola Inc., Communications Div.

SEMICONDUCTORS 208

Thirteen new types of semiconductors serve as the basis of a complete line of "universal" entertainment replacement parts. Heading the new product group are eight universal replacement transistors which reportedly can be used in lieu of at least 700 known domestic and foreign types originally installed in radios and other entertainment equipment. Numbered GE-1 through GE-8, these transistors include four PNP and four NPN types. They are designed for service as mixer-oscillator converters, and as a-f, high-power a-f, and i-f amplifiers. Also available are power rectifier, type GE-504, with a 45 amp surge rating which needs no surge limiting resistor, and four crystal diode types. These types, 1N34AS, 1N60, 1N824 and 1N295,

Old



New

Now, RCA VICTOR takes the tangle out of TV's toughest circuitry

The advantages of the new RCA Security Sealed Chroma Circuits are plain to see. The simple fact that they're Precision Crafted Security Sealed boards tells you most of the good news . . . clean; easy to get at; "road-map" tracking, and just generally a cinch compared to their old, hand-wired counterparts.

This newly developed RCA chroma board sets many more benchmarks. For example, the color bandpass amplifier circuit operates near Class "A," providing linear amplification of chroma signals. Color video amplifier outputs are 100% DC coupled to reduce drift in color temperature set-up.

The chroma circuit also features two new multi-grid pentode color demodulators to improve color with better matrixing. No "short cuts"—this is full-function circuitry...demodulators *plus* amplifiers for extra color brilliance and stability! This circuit is very stable, and tube change has almost no effect on performance of matrixing.

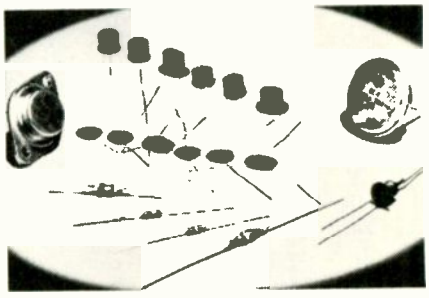
The new Precision Crafted Security Sealed Chroma Circuit board is part of RCA's continuing program for faster, easier servicing of today's fastest-growing home entertainment medium . . . Color TV.

See Walt Disney's "Wonderful World of Color" Sunday's, NBC-TV Network.

RCA The Most Trusted Name in Television

Tmk(s)®

NEW PRODUCTS



will serve as replacements for 98% of the wide variety of crystal diode types now used in entertainment equipment, according to the manufacturer. General Electric Co.

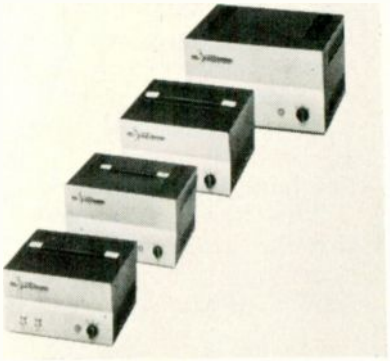
CB TRANSCEIVER 209

A 12-channel CB transceiver, the Hallmark 2-12, has a frequency range of 26.965 mc to 27.255 mc. It features

useable sensitivity to better than 0.3 mv. It is said adjacent channel rejection is better than 30 db with r-f output over 3 w. Provides 12 crystal controlled channels, push-to-talk operation, illuminated "S" meter, and sensitive, adjustable squelch. Has a dual power supply, 12 vac or 115 vdc. Texas Research and Electronic Corp.

ULTRASONIC CLEANING 210

A standard line of ultrasonic cleaning systems provides a selection of 10 generators and 16 transducerized cleaning



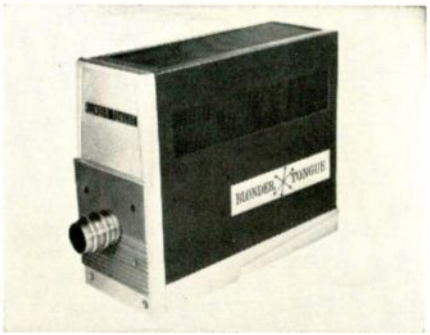
tanks featuring automatic control. These systems which range from 90 to 1000 w with tank capacities up to 45 gal. generate ultrasonic frequencies of 40 and 20 kc in cleaning solutions. Sonic Systems, Inc.

. . . for more details circle 16 on page 46

NEW PRODUCTS

TV CAMERA 211

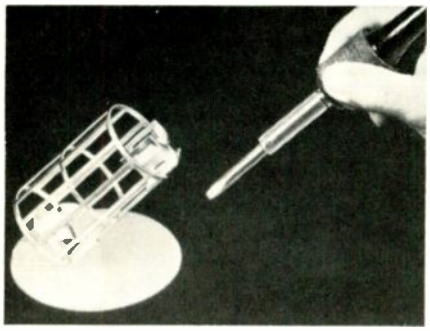
A low cost transistor camera, the TC-1, has been developed for closed-circuit TV systems. The camera re-



portedly can be operated as easily as a home movie camera, and requires no special training. Lens opening and focus are the only functions to be controlled. $850. Blonder-Tongue Laboratories, Inc.

SOLDERING IRON HOLDER 212

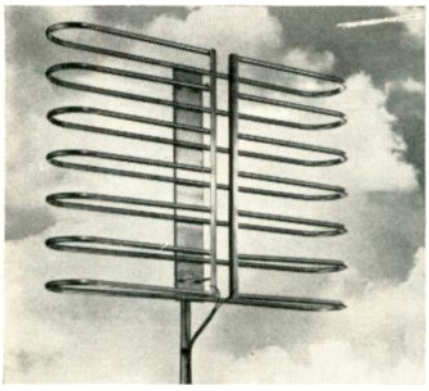
The Model H-200 soldering iron holder reportedly meets industry's safety requirements for a holder which does



not allow the soldering iron to build up high idle temperature which tends to shorten both the tip and element life. This unit is adjustable to various iron sizes. Features include a "Sta-tinned" solder cup which keeps the iron tip immersed in solder when not in use. Base is 4½ in. dia and height is 5½ in. $1.95 each. Macdonald & Co.

F-M ANTENNA 213

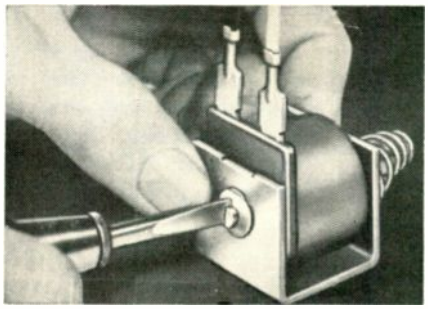
A 7-element f-m antenna, the "Mark



Stereo 7" is omnidirectional, horizontally polarized and unaffected by guy wires. Designed for stereo multiplex reception, the unit may be mounted indoors, as well as outdoors. The antenna is 30 x 22 x 5½ in. deep and comes complete with all hardware for mounting. B&K Mfg. Co.

SOLENOIDS 214

A solenoid designed to eliminate a-c hum, employs a trim-tab that enables the user to adjust the unit for minimum hum at time of installation. Field adjustments, if necessary, can be made in seconds with a screwdriver. Production is presently limited to a few sizes, but



will shortly be increased to include a wide range of sizes and styles. Anderson Controls, Inc.

VARIAC 215

The latest addition to the Variac line is a cased 5-amp unit with a meter to indicate output voltage. The Type W5WT3VM incorporates all the standard Variac features: patented Duratrak brush-track coating to prevent oxidation, rugged construction, ability to withstand short-term overloads up to 1000%, and protective thermal trip device. Operates from 120 v, 50-60 cps, providing output voltage continuously adjustable from 0 to 140 v, at 5 amp max. The meter indicates output voltage ± 3% of full

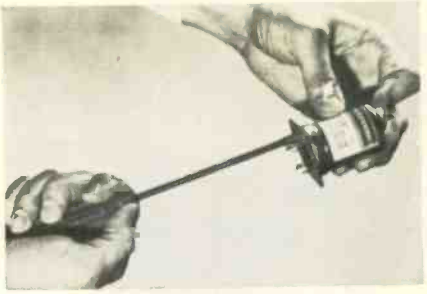
scale. With the output control set at line, the meter monitors input voltage. $54.00. General Radio Co.

TAB ADJUSTER 216

Quick twisting of tabs on electrolytic capacitors is permitted with a new service aid. Called "Capacitor Tab Adjuster," it is claimed the tool saves time in the shop and on service calls, and is easier to use than pliers. The adjuster looks like a screw driver but has a slotted end

. . . for more details circle 28 on page 46

NEW PRODUCTS



instead of a blade. The slot fits over the capacitor mounting tabs and a quick twist facilitates removing and installing can-type capacitors. General Electric Co.

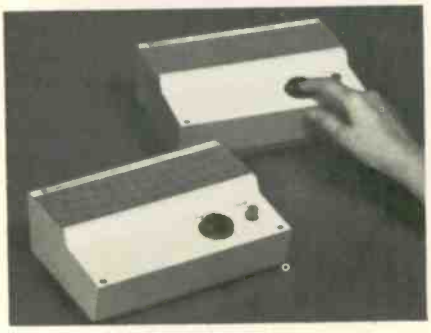
TESTER-REJUVENATOR 217

An all purpose picture-tube tester and rejuvenator, model Cr-60, has been engineered to test all black and white, and

color picture tubes. Utilizes beam current test which checks all tubes for proportionate screen brightness by qualitative measurement of the electron beam. $64.95. Precision Apparatus Co., Inc.

WIRELESS INTERCOM 218

A transistorized intercom system in kit form is completely portable and has no cables or wires to install. The two-station system operates by simply plugging into any a-c outlet or d-c power source. Any number of additional stations may be added. Each station is a "master," employing a large press-to-talk button which can be locked in the "on" position. No "on-off" switch is provided since each station draws no



Find it and Fix it in ½ the time!

EASILY SOLVES "TOUGH DOGS"... INTERMITTENTS ... ANY TV TROUBLE

B&K MODEL 1076 TELEVISION ANALYST

BLACK & WHITE AND COLOR

Just As Easy to Use As a VOM!

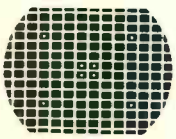
By Easy Point-to-Point Signal Injection, You see the Trouble on the TV Screen and Correct it—Twice as Fast and Easy!

Simplified technique stops lost hours never recovered on **"tough dogs", intermittents,** and **general TV trouble-shooting.** This one instrument, with its complete, accurate diagnosis, enables any serviceman to cut servicing time in half ... service more TV sets in less time ... satisfy more customers ... and make more money.

With the Analyst, you inject your own TV signals at any time, at any point, while you watch the generated test pattern on the picture tube of the television set itself. This makes it quick and easy to *isolate, pinpoint, and correct* TV trouble *in any stage throughout the video, audio, r.f., i.f., sync and sweep sections* of black & white and color television sets—*including intermittents.* No external scope or waveform interpretation is needed. Checks any and all circuits—solves any performance problem. Gives you today's most valuable instrument in TV servicing—*proved by thousands of professional servicemen everywhere.*

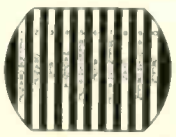
Available on Budget Terms. As low as $30.00 down. Net, $299.95

SIMPLIFIES COLOR TV SERVICING, TOO



Enables you to troubleshoot and signal trace color circuits in color TV sets, or facilitate installation.

Generates white dot, crosshatch and color bar patterns on the TV screen for color TV convergence adjustments.



Generates full color rainbow display and color bar pattern to test color sync circuits, check range of hue control, align color demodulators. Demonstrates to customers correct color values.

Time-Saving, Money-Making Instruments Used by Professional Servicemen Everywhere

Model 960 Transistor Radio Analyst

Model 360 V O Matic Automatic VOM

Model 375 Dynamatic Automatic VTVM

Model 700 Dyna-Quik Tube Tester

Model 440 CRT Rejuvenator Tester

See Your B&K Distributor or Write for Catalog AP 20-T

B & K MANUFACTURING CO.

Division of DYNASCAN CORPORATION

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Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

... for more details circle 15 on page 46

. . . for more details circle 29 on page 46

. . . for more details circle 25 on page 46

NEW PRODUCTS

more power than an electric clock—a maximum of 4 v. Decorator-styled moulded plastic cases 3 by 8¼ by 5¾ in., are available in Eggshell White and Oxford Gray. Basic system kit (2 units), $45.90. Single station kits, $22.95. Allied Radio Corp.

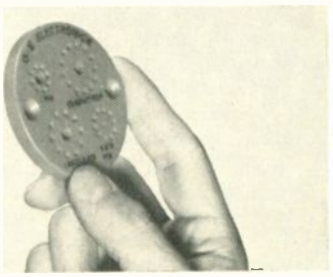
MULTIPLEX RECEIVER 219

A complete high-fidelity f-m multiplex stereo/ a-m receiver-amplifier features new multiplex demodulation system. The

MX-7 includes f-m multiplex, an f-m tuner, an a-m tuner and a master control 30 w stereo amplifier. Special features include a nuvistor r-f amplifier tuner and and a temperature-sensitive line current limiting resistor. All components reportedly are operated well within their maximum ratings. Radio Corp. of America.

PIN STRAIGHTENER 220

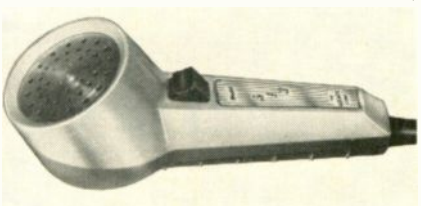
A pin straightener for five kinds of receiving tubes, consists of a flat disc of hard plastic ¼ x 2½ in. It contains



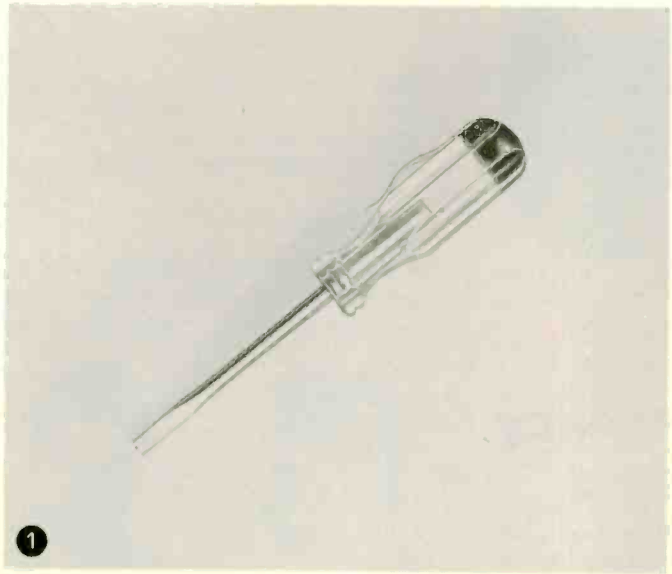
straightening-hole configurations for 7-, 9- and 10-pin miniature tubes, large-circle 9-pin tubes, and 12-pin compactrons. Bright orange in color, it is easily spotted on the workbench or in the tool case. Technicians who prefer to mount the straightener permanently can do so with the two screws supplied with the device. $0.60. General Electric Co.

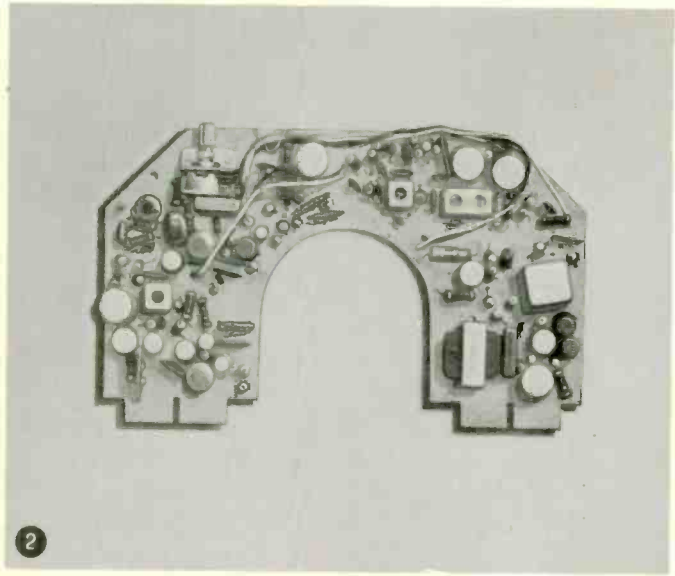
MICROPHONES 221

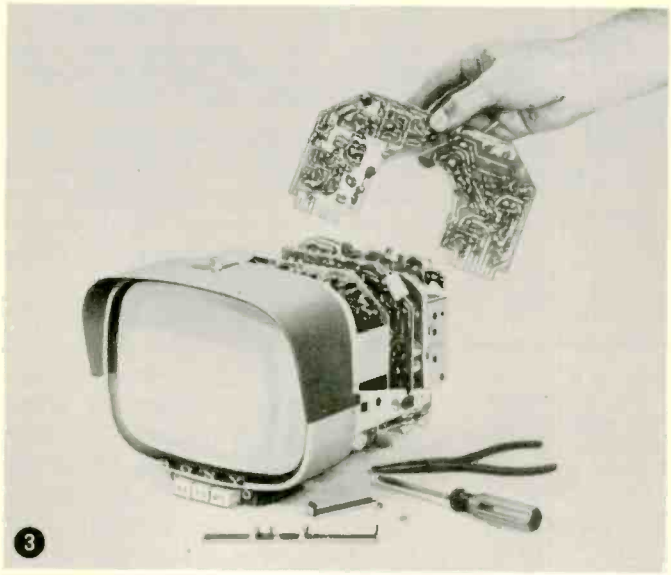
The #513H Dynamic Microphone is easily disassembled for field repair and is shielded against pick-up from stray



4 good reasons why...







SONY®

RESEARCH MAKES THE DIFFERENCE

Is the Easiest TV to service

The remarkable SONY 8-301W TV is a serviceman's dream. Unlike ordinary sets, SONY TV is a pleasure to work on. An ordinary screwdriver lets you open the cabinet (1) and expose the complete chassis. Standard trouble-shooting procedure isolates the defective component (2). Snap out the circuit board, one of 3 on which nearly all SONY parts and transistors are mounted (3) and send it off to SONY (4) That's all there is to it. Within a surprisingly short time, the board, with the defective component replaced, will be returned, and the set will be as good as new. Cost? Low enough to return you a full profit and keep a customer satisfied.

SONY CORP. OF AMERICA

514 Broadway, New York 12, N. Y.

Regional Offices:
Central: 4959 W. Belmont Ave., Chicago 41, Ill.
Western: 627 South Towne Ave., Los Angeles 21, Calif.

Sony Corp. of America, Dept. T-7 514 Broadway, New York 14, N. Y.
Gentlemen: I am interested in the SONY portable television. Please rush full details.

STORE NAME .....
NAME ..... TITLE.....
ADDRESS .....
CITY ..... ZONE..... STATE.....

. . . for more details circle 38 on page 46

NEW PRODUCTS

fields. The high impedance, high output unit can be mounted either horizontally or vertically. Made of high impact lightweight plastic. Astatic Corp.

WANTED

■ Ronald Willis Terrentine is being sought by the Federal Bureau of Investigation for "unlawful flight

RONALD WILLIS TERRENTINE, alias George Collins, Melvin Collins, Ronald W. Terrentine, Ronald Terrentine, Roland Terrentine.

to avoid confinement for the crime of armed robbery." While an inmate of the Ohio State Penitentiary, Terrentine took courses in electronics and may be employed as a radio or television repairman.

On July 29, 1955, he escaped from the London Prison Farm, London, Ohio, where he was serving a 10 to 25 year sentence for armed robbery. On September 20, 1955, a Federal warrant was issued for his apprehension because of his escape. Since he was carrying a loaded .45 caliber automatic at the time he was arrested for armed robbery, he should be considered armed and dangerous.

Terrentine is a Negro American and was born on June 16, 1923, at Cleveland, Ohio. He has also indicated his date and place of birth as June 16, 1921, Cleveland, Ohio. He is 5'8½" tall, weighs approximately 170 pounds, has black and kinky hair, brown eyes, a medium build and brown complexion. He has scars on his right thigh, left side of upper lip, center of back and back of right shoulder. He also has a bump on his right shoulder and two dog bite scars on his right leg, and might possibly wear glasses.

Should you learn of this fugitive's whereabouts please notify the nearest FBI office immediately. The FBI's telephone number appears on the first page of all local telephone directories. ■

REPS AND DISTRIBUTORS

Lesa of America Corp. announces the appointment of representatives to sell its complete line of phonographic materials. The new reps are: Jack Geartner Co., Miami Beach, Fla.; Heaton & Keyser, Inc., Redwood City, Calif.; Sam Little Co., East Point, Ga.; August J. Nelson Co., Ellicott City, Md.; Pribble & Associates, Dallas, Tex.; Waxman Currant Sales, Buffalo, N. Y. and Martin Weinberg Associates, Philadelphia, Pa.

Olympic Radio & Television Sales Corp., establishes a Special Radio Sales Div. to expand distribution of radio and portable phonographs. The new division is established in response to growing activities of stamp plans and other special dual distribution outlets.

Electronic Industry Show Corp. reveals that the Electronic Parts Distributors Show will continue in its present tradition. A report prepared by **Professional Research Associates, Inc.,** indicates that the needs of both manufacturers and distributors can be served best by holding only one annual distributor show.

The month of May is the preferred time and a central location appears to best serve industry needs.

Sprague Products Co., the wholly-owned electronic distributors' supply subsidiary of the Sprague Electric Co., appoints **Arthur Lassers** as sales manager. Mr. Lassers will be responsible for the sale of capacitors, transistors, resistors, transformers and other electronic components through a network of over 1000 replacement and industrial electronic parts distributors in the U. S.

Ortho Industries Inc., Paterson, N. J.; announces the appointment of **Leonard D. Allen, Inc.,** Syracuse, N. Y., as sales rep covering New York State, exclusive of the metropolitan area. Allen, who also maintains offices in Buffalo and Vestal, will handle the entire Ortho line of products including filters, transformers, rectifiers and power supplies.

Sylvania Home Electronics Corp. appoints **John R. Willey,** manager of distribution for commercial products. Mr. Willey will be responsible for distribution of the company's closed circuit TV systems, and other commercial electronic products. He will also coordinate the Sylvania hospital television leasing plan with **American Hospital Supply Corp.**

Alpha Wire appoints **August J. Nelson Co.** as representative covering Maryland and the District of Columbia. Mr. Nelson was formerly associated with **Be-Esco Sales** of New York who represented Alpha in this territory for several years. Be-Esco has recently announced their withdrawal from this area and as a result Mr. Nelson has formed his own independent sales organization covering this same market.

ASSOCIATION NEWS

Florida

TSDA, St. Petersburg, is preparing for a half hour program "Good TV Service Costs Money," in cooperation with WSUN-TV. This is an initial joint public relations effort in the locality.

Indiana

FESA, Fort Wayne, reports their resignation from NATESA. In a letter to executive director Frank Moch, FESA said " . . . we feel the only solution to the discord in NATESA is for Frank Moch to resign as executive director of NATESA. . . . There is only one alternative for FESA. That is to resign."

IESA, Elkhart, has also severed its affiliation with NATESA. Reasons given for the resignation was a general dissatisfaction with the manner in which NATESA is being operated and the lack of worthwhile accomplishments on a national basis.

IESA, Indianapolis, reports that large cable TV companies are fighting for the right to install cable TV systems in northern Indiana. IESA says the systems are not needed in this area and that TV antenna installers and technicians will be driven out of business. Although the cable companies say they do no service work, interviews with customers and technicians in Illinois, where the system has been in effect for about a year, indicate this is contrary to the facts.

New York

TESA, Buffalo, conducted a successful color course for local technicians. A large turnout of both members and non-members was reported. The clinic was held for the purpose of laying the foundation for more advanced future clinics on color servicing.

Ohio

TESA, Columbus, announces that their state organization has withdrawn membership from NATESA. No details are given at this time.

Pennsylvania

ESDA, Pittsburgh, has called for a hearing on their expulsion from NATESA. It was reported that Mr. Moch, NATESA executive director, would not comment until he reviews a copy of the charges.

TESA, Pittsburgh, "rendered a complete vote of confidence" in NATESA by unanimously voting for membership in the national organization. TESA will be filling the spot left by ESDA when their relations were severed by NATESA

TSA, Philadelphia, received a letter from Arthur H. Lassers, sales manager of Sprague Products Co., supporting TSA's stand against the city magistrate who belittled TV technicians in a crowded court room. A full report was published in the May issue of ELECTRONIC TECHNICIAN Magazine.

NEWS OF THE INDUSTRY

Electronic Chemical Corp. appoints **David Schneider** as general manager. The firm produces a "No-Noise" line which includes a Volume Control and Contact Restorer.

Raytheon Co. announces that its **Uniline** receiving and picture tubes have been awarded the Good Housekeeping Seal of Approval. As the only independent tube manufacturer to receive the Good Housekeeping Seal, Raytheon is making available, through distributors, to all radio and television dealers, a window and in-store display featuring the new consumer identification. The "seal" will be shown on all entertainment-type Raytheon receiving tubes and cartons.

Pacotronics, Inc. appoints **Samuel J. Piaser** as sales promotion manager. In his new capacity, Mr. Piaser will handle the sales promotion activities of all three subsidiaries, Precision Apparatus Co., Inc.; Paco Electronics Co., Inc. and Pace Electrical Co., Inc.

Sylvania Electric Products Inc., announces it is resuming production of color television picture tubes. The company previously produced and marketed color tubes from 1953 through 1957. According to a company spokesman, a 21 in., 90 degree, shadow mask, round glass tube will be available in 1963. The tubes will be manufactured at Seneca Falls, N. Y., headquarters of Sylvania's Picture Tube Operations.

International Resistance Co., St. Petersburg Div. appoints **Abraham Osborn** quality control manager. IRC also announces the appointment of **G. Jack Wilson** as marketing manager of the Florida operation.

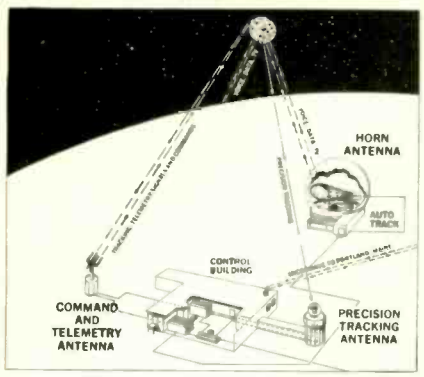
Zenith Radio Corp. estimates net consolidated profits of $4,728,794 for the three month period ended March 31, 1962. This is 37 percent higher than the $3,446,030 reported for the same period last year, the company's second best

first quarter, and 23 percent ahead of the record first quarter earnings of $3,855,129 reported for 1960. First quarter earnings, after estimated taxes of $5,421,043 are equivalent to 52¢ per share on the 9,033,177 shares outstanding at March 31, 1962, as compared to first quarter earning of 39¢ in 1961 and 43¢ in 1960 on the shares then outstanding, adjusted for the three-for-one stock distribution effective Nov. 3, 1961. Production and factory unit shipments of Zenith's black and white television receivers are the highest of any quarter in the company's history.

TV Programs from France And England Received in U. S. via Telstar Satellite

International TV transmission and reception via a communications satellite became a reality in July. After preliminary experiments with telephone conversations via the satellite Telstar, TV broadcasts were made direct to the United States from France and England.

Project Telstar is a cooperative effort of the National Aeronautics and Space Administration (NASA), and the American Telephone & Telegraph Company (AT&T). Cost



of the project is being paid by AT&T, who designed and constructed the satellite.

The 34 in. sphere, weighing about 170 lb, carries receiving equipment and a broad band transmitter having an output of approximately 2¼ w. It contains only one electron tube, a one-foot long traveling wave amplifier tube, and has 1064 transistors and 1464 diodes.

Power to operate the receiver and transmitter is supplied by 19 rechargeable nickel-cadmium cells which are charged by 3600 solar cells mounted on the satellite's skin.

The receiver is tuned to 6390 Mc while the transmitter radiates a signal on 4170 Mc.

A second communications satellite in the Telstar Project is expected to be orbited in the near future.

NEW BOOKS

HINTS and KINKS FOR TV, RADIO, AUDIO. *Edited by Martin Clifford. Published by Gernsback Library, Inc. 128 pages, soft cover. $2.35.*

Hundreds of gimmicks and gadgets for TV, radio, and audio equipment, shops, and instruments are presented here. They have been selected from items previously published in periodical form. Many will interest technicians; some will probably be used to substitute for unavailable gadgets that could simplify a particular task.

BENCH SERVICING MADE EASY *By Robert G. Middleton. Published by Howard W. Sams & Co., Inc. 160 pages, soft cover. $2.95.*

Prolific author Bob Middleton offers a great number of timesaving TV service methods here. He presents detailed troubleshooting steps in various circuit areas of TV sets to illustrate how to track down a defect quickly. Many fine drawings, schematics and photos accompany the excellent text, including numerous scope traces. This is an especially fine book for learning how to increase bench repair efficiency.

ELECTRONIC ENGINEERS MASTER. *Published by Tech Publishers, Inc. 2090 pages, hard cover, or microfilm, $15.*

"The difficult jobs we do immediately—the impossible ones we haul down to the shop!"

This year the EEM is available in microfilm as well as the standard cloth bound edition. The microfilm is designed for use with most microfilm viewers.

The Manufacturers Directory lists 6300 electronics manufacturers, their names, addresses, phone numbers and key personnel, as well as the addresses and phone numbers of their sales offices. The product directory lists more than 3000 products with their respective manufacturer's names and addresses. A Brand Name Directory is also included which lists more than 6800 brand and trade names and their associated manufacturers.

COMING NEXT MONTH

BIG 1963 STEREO SPECIAL

A YEAR — 'ROUND REFERENCE ISSUE
Including
HI-FI
Manufacturers Directory

TRANSISTORS

Continued from page 32

local stations, with more distant stations sounding good. Unless this condition exists, agc is seldom suspected as a trouble source.

An extremely strong agc voltage which does not change when tuning through local station frequencies, may be produced by an i-f stage which is oscillating. Bridging a good capacitor across "A" line electrolytics and bypass capacitors in the i-f stages will usually locate the reason for the oscillation.

Other Considerations

If distortion is present on all stations, voltages should be checked in the audio stages. If all of these voltages are near normal, it is possible that the transistor gains are not matched in the push-pull output stage. The variation in gain will often not cause a voltage irregularity, but can produce distortion. But

don't forget that a speaker can also cause distortion!

To sum it up, most defects in transistor circuits will cause faulty voltages in the defective stages. A few exceptions have been noted, including transformers and mismatch of PNP transistor, and alignment, but the voltage readings remain one of the most revealing criteria shooting transistor circuits. The exceptions should not be considered until volages are carefully measured in all suspected areas. ■

TOUGH DOG

Continued from page 40

other call for the same trouble and the same three tubes were burned out. This time the set was brought into the shop and a point by point check was begun. For over two hours no abnormality was found. Then, while the ohmmeter was connected from the 12L6 heater to ground, the meter showed zero for just a moment. Making sure the leads couldn't have come loose we tried jarring different areas of the chassis. Finally we came to the tuner. Every time it was jarred at a certain point, a dead short from the 12L6 to ground appeared. The cover plates and small shield plate were removed from the tuner. Along side a feed-through capacitor "out" lead was a gob of solder, barely holding on to the capacitor/wire junction to the 5J6 tube socket. This "blob" had been there since the set was manufactured 7 or 8 years before. Once more a set of three tubes was installed, the chassis was given a check for correct afc. adjustment, sound adjustment, etc. We had no hesitation in jarring the set with the new tubes in place feeling fully convinced that we had found the trouble.—*M. G. Goldbert, St. Paul, Minn.*

TEST INSTRUMENTS

Continued from page 43

ture tubes. The TT-1A checks all of these with a simple and neat modification to the model TT-1 tester.

The six additional sockets are mounted on a matching panel and installed in the tester's lid. The adapter's electrical connections are made with two short cables which plug into sockets on the basic tester. Four switches for the adapter are also mounted on the adapter panel. Two blank holes have been left in the panel for future modifications. Chrome plug buttons are installed in the holes.

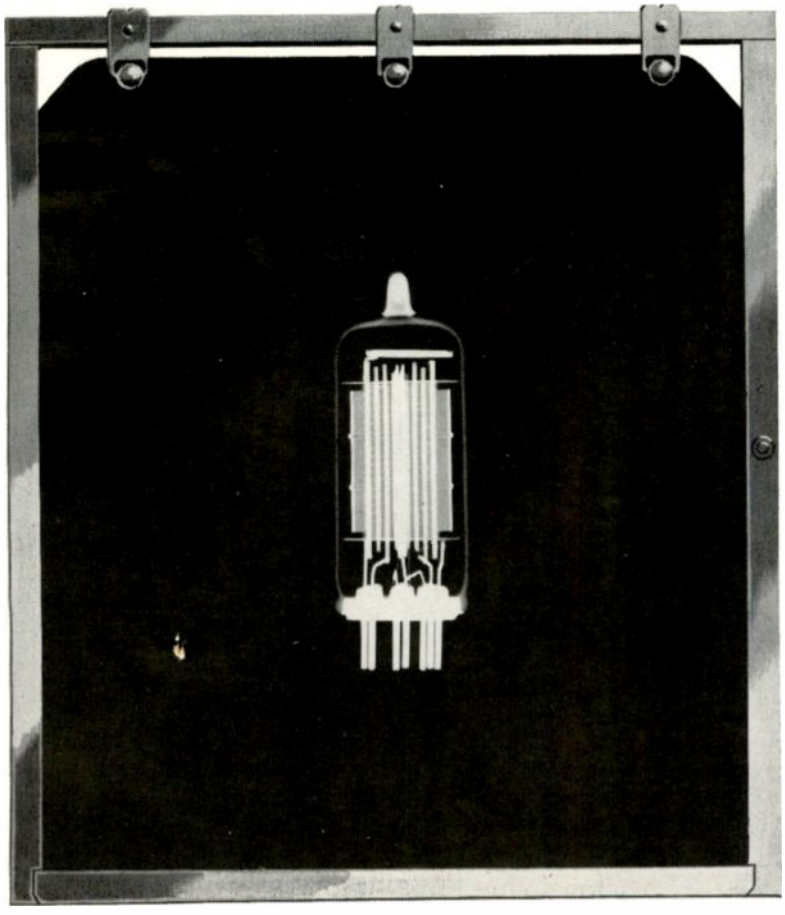
Good circuit design has been employed throughout the instrument A 5000 cps voltage is applied to the grid for dynamic tests in order to approach actual equipment operating conditions. In an attempt to keep the tester's roll chart at minimum length, infrequently used tubes are listed in a separate booklet. In this manner, tubes which are tested more often can be found quickly.

ADVERTISERS INDEX

NEW AUDIO AMPLIFIER TUBE SUPPLIES FULL-RANGE TONE FIDELITY IN RECEIVERS

NEWEST addition to Tung-Sol's family of fine audio amplifier tubes is the type 4GZ5 pentode. Thorough exposure to realistic combinations of operating and environmental hazards during development shows this tube will lead its class in television, radio and high-fidelity service. Even after accelerated life testing, the subject remains full of pep, providing large power output with remarkably low distortion over the full audio range from loud cry to subdued chortle.

Tung-Sol takes lavish parental care of this baby during its formative stages. Internal elements are welded and brazed on hospital-clean production lines after sterilization in bakeout ovens to prevent gas, leakage and spurious emission. Rigidized construction cures low-frequency rattles and other forms of tube distress. Alclad plates spread body heat evenly for efficient cooling.



FORMULA FOR GOODWILL

Customers will love the way this model tube makes stereo, radio and tv audio come alive. Foster good customer relations by adopting the 4GZ5 as your first choice in replacement tubes. Others in Tung-Sol's family of audio amplifiers are: 6CU5, 6BQ5, 12CU5, 6AQ5A, 6GK6.

TUNG-SOL®
AUDIO AMPLIFIER TUBES

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

. . . for more details circle 42 on page 46

This many picture tubes from one box?

YES!

Because RCA Universal Silverama® Picture Tubes Make Possible Multiple Replacements

78 Universal Silveramas replace virtually every type on the market

Every time you deliver an RCA Universal Silverama Picture Tube carton, you deliver the equivalent of *many replacements*—not just one!

RCA—pioneer of the Universal Picture Tube concept—has converted its entire Silverama Picture Tube line into Universal types. And made life a lot easier and more profitable for you, the electronic distributor.

With the Universal Silverama line—78 types take care of just about any replacement call that comes up. One Universal alone—the RCA-21CBP4A—replaces 19 industry types.

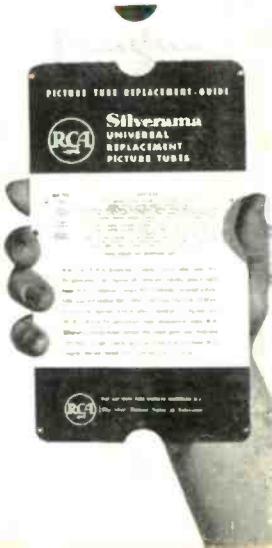
Think what this means. It means you can keep a complete picture-tube inventory in less space, with far less capital investment, than before.

It means tremendous simplifications in inventory, record-keeping, and reordering.

It means faster, better service to your customers . . . with no more missed sales because you don't have a certain type in stock.

This handy slide-guide lists all 78 RCA Universal Silverama types, and the 291 industry types they replace. Order a good supply of these convenient guides today. Your customers will be asking for them.

RCA ELECTRON TUBE DIVISION, HARRISON, N. J.



Every RCA Universal Silverama Picture Tube is made with an all-new electron gun, the finest parts and materials, and a gloss envelope which, prior to reuse, has been thoroughly inspected, cleaned, and rescreened.

RCA The Most Trusted Name in Television