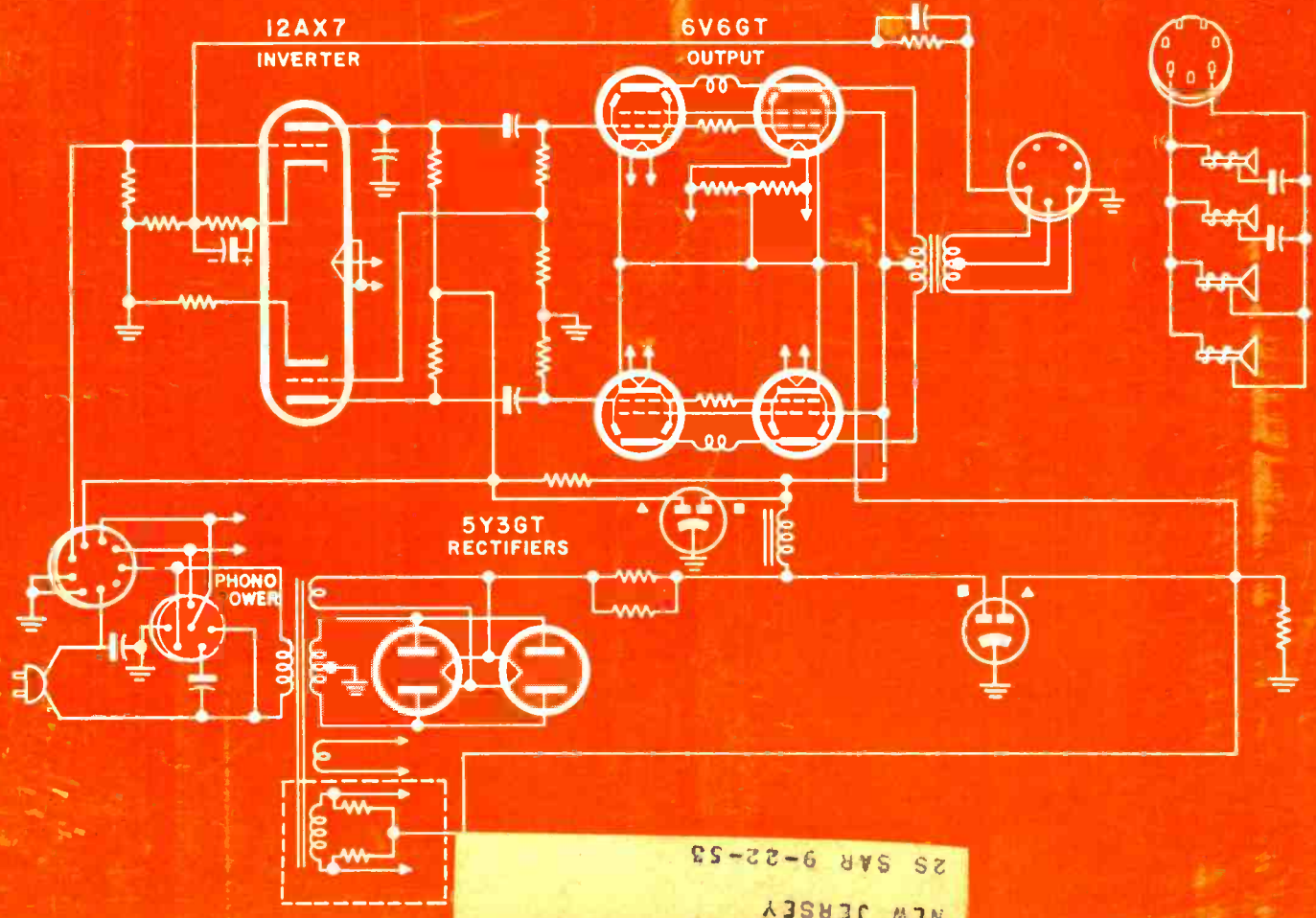
RADIO · TELEVISION · ELECTRONIC

SERVICE

VOL. 23

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

JUNE
1954



Four-speaker pentode/twin-triode power amplifier for packaged hi-fi phono system.
[See circuit analysis, this issue]

RADIART

Seal-Vent VIBRATORS

are TOPS

The complete rugged service line of vibrators that has dominated the field for years. Exclusive design plus controlled manufacture guarantees long-life performance! Built to "take it", they work under the most adverse conditions. You too will agree RADIART VIBRATORS are the STANDARD of COMPARISON!

the Complete Replacement Line

THE **RADIART** CORPORATION
CLEVELAND 13, OHIO

TV ANTENNAS • AUTO AERIALS • VIBRATORS • ROTORS • POWER SUPPLIES

BE SURE YOU USE...

the right tool for every Alignment!

NOW . . . MORE THAN 70

G-C ALIGNMENT TOOLS

AVAILABLE FOR TV SERVICING

LIGNMENT SCREWDRIVER
¼" dia., 6" long $0.27 Net
7732" dia., 6" long .27 Net

TV-FM ALIGNMENT TOOL
.066 3/16" shaft dia., 2½" long $0.33 Net

TV ALIGNING WRENCH
6080 7/32" shaft dia., 6" long $0.51 Net

K-TRAN TOOL
5097 5/32" fibre tip, ⅛" metal tip, 6" long $0.51 Net

TV CHANNEL TUNING TOOL
8195 ⅛" shaft dia., 7¼" long $0.54 Net

G-C NYLON TV LONG-REACH ALIGNER
No. 8607 .195" shaft dia., 12¼" long $1.08 Net

G-C TV "X" 57 PLASTIC LONG SLIM" SCREWDRIVER

No.	Blade Length	
8987	7"	$0.60 Net
8988	12"	.90 Net
8989	16"	1.20 Net

G-C TV I.F. OSCILLATOR ALIGNER
No. 8272 ¼" tip dia., 6½" long $0.72 Net

G-C TV ALL-PURPOSE ALIGNER
No. 8273 7/32" shaft dia., 8" long $0.56 Net

G-C TV CORE ALIGNER
No. 8279 7/32" shaft dia., 7½" long $0.66 Net

G-C TV ZENITH UNIVERSAL ALIGNER
No. 8275 ⅛" shaft dia., ¼" handle, 5" long
$0.48 Net

G-C RCA-ZENITH TV "SHORTY" ALIGNMENT TOOL
No. 9058 7/32" shaft dia., 2½" long
$0.45 Net

G-C RCA-ZENITH TV ALIGNMENT TOOL
No. 9050 .182" shaft dia., 3" long
$0.18 Net

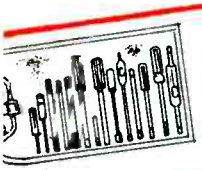
G-C TV LONG REACH ALIGNER
No. 8274 ⅛" shaft dia., 9" long
$0.72 Net

No matter what kind of set you're working on, there's a specially made G-C Alignment Tool to do the job. It's all part of G-C's continuing program to design and manufacture new service aids for you as soon as a new TV chassis is announced. Remember — you save time, labor, avoid damage to the chassis . . . when you use the right alignment tool for every alignment. And of course the right one is always . . . a G-C Alignment Tool!

8821 Type A
8896 Type B
8897 Type C

G-C LONG ARM TV TOOL
(7/32" shaft dia., 18" long)

No.		
8821	Type A	$0.90 Net
8896	Type B	.90 Net
8897	Type C	.90 Net



MATCHED G-C ALIGNMENT TOOL KITS for Handy Home Servicing

You save money when you buy a G-C Alignment Tool Kit . . . and the tools are always handy when you need them. Many types and sizes . . . like this new set G-C DELUXE TV ALIGNMENT TOOL KIT. Durable roll type leatherette case with 16 matched tools (total value $15.00).
No. 8280 $7.74 Net

IT'S FREE! Your illustrated G-C Catalog 156. At your favorite jobber . . . or write direct.

GENERAL CEMENT MFG. CO.
901 TAYLOR AVENUE • ROCKFORD, ILLINOIS

When It's Designed and Built by BLONDER-TONGUE...

There's a BIG Difference

B-T LABS UHF Converter MODEL "99" $19.95 LIST

...and for ULTRA PERFORMANCE THE B-T LABS *Ultraverter*

Model BTU-2

at $39.95 LIST

still leads every other unit in the field, regardless of price, because of:

- Higher Gain
- Precise Impedance Match
- Automatic 'on/off'
- Lower Noise Factor
- Dual Speed Tuning
- Exclusive B-T Ultratuner

When B-T designs and builds an all-channel UHF converter to sell for less than $20.00, you can be sure that it will outperform any other converter in its class...at least 4 ways:

1. TUNED INPUT – Tracks with oscillator – Rejects spurious signals – Suppresses oscillator radiation.
2. PRECISE IMPEDANCE MATCH – Maximum signal conversion – No line ghosts – No picture smear.
3. ONE-KNOB TUNING – No VHF channel switching.
4. DRIFT-FREE PERFORMANCE – Thermally compensated oscillator circuit.

Check with your supplier today... or write to Dept TF-8

B-T LABS

BLONDER-TONGUE LABORATORIES, INC.

WESTFIELD, NEW JERSEY

Manufacturers of TV Amplifiers, Boosters, Accessories, and Originators of the B-T 'Add-A-Unit' Master TV System.

Vol. 23, No. 6

RADIO • TELEVISION • ELECTRONIC
SERVICE

June, 1954

LEWIS WINNER
Editor

B. BLOCK
F. WALEN
Assistant Editors

Including SERVICE—*A Monthly Digest of Radio and Allied Maintenance;* RADIO MERCHANDISING and TELEVISION MERCHANDISING. Registered U. S. Patent Office.

CIRCUITS

COVER

SERVICING HELPS

Manufacturers

5

Published monthly by Bryan Davis Publishing Co., Inc.

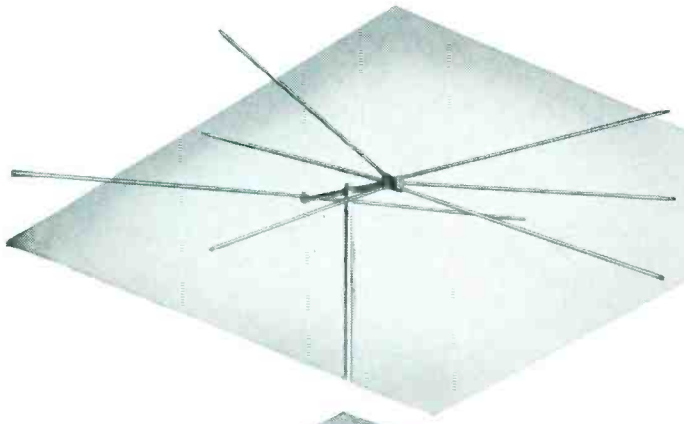
52 Vanderbilt Avenue, New York 17, N. Y. **Telephone MUrray Hill 4-0170**

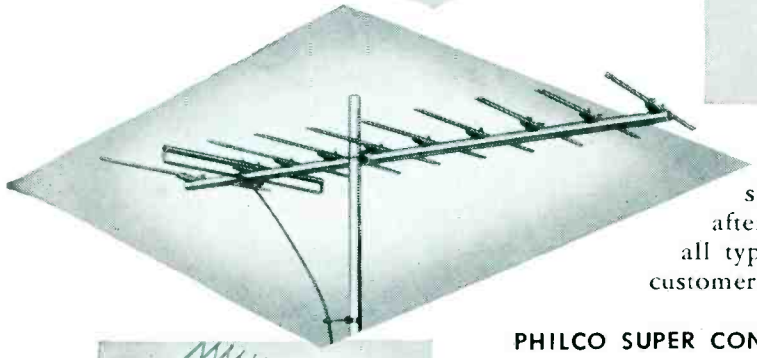
Bryan S. Davis, Pres. F. Walen, Sec. John Iraci, Adv. Mgr. A. Goebel, Cir. Mgr.

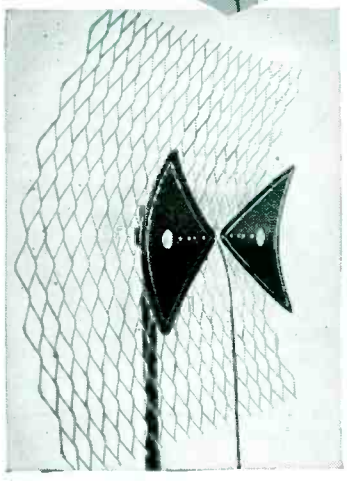
Mid-West Mgr.: Stuart J. Osten, 333 N. Michigan Ave., Chicago 1, Ill. Tel.: DEarborn 2-3507
East-Central Rep.: James C. Munn, 2253 Delaware Dr., Cleveland 6, O. Tel.: ERieview 1-1728
Pacific Coast Rep.: Brand & Brand, 1052 W. 6th St., Los Angeles 17, Cal. Tel.: MAdison 6-1371

Entered as second-class matter June 14, 1932, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Subscription price: $2.00 per year in the U. S. A. and Canada; 25 cents per copy. $3.00 per year in foreign countries; 35 cents per copy.

PHILCO announces 3 new super-performance TV antennas







The finest TV antennas in their class . . . designed by the world famous Philco Laboratories after thorough research into receiver requirements in all types of locations . . . designed to give complete customer satisfaction . . . to meet competition on any level!

PHILCO SUPER CONICAL UHF-VHF ALL-CHANNEL ANTENNA

Full 45" dowelled aluminum antenna elements and full 53" dowelled aluminum reflector assure strong signal pickup on VHF channels 2 through 13 . . . top quality performance on UHF channels 14 to 83. Single or stacked array Super Conicals produce new balanced performance . . . super picture quality plus high gain. All-aluminum construction in the Super Conical . . . it's easy to erect: Part No. 45-3096.

PHILCO SUPER YAGI VHF ANTENNAS

Quick-rig model with ten elements gives top fringe-performance on VHF channels 2 through 13. Excellent front to back ratio (6 to 1). This Super Yagi eliminates ghosts in strong signal areas . . . selects signals from adjacent weak area channels or co-channel stations. 10 db to 12 db gain depending on channel. Strong, all-aluminum; Part No. 45-3112. (Single channel 2 thru 13 and broadband 2 thru 6; 7 thru 13; 4, 5, 6).

PHILCO PARAFLECTOR ALL-CHANNEL UHF ANTENNA

Light weight pre-assembled all-channel UHF antenna. Outstanding performance in far-fringe areas. High gain . . . 8 to 10 db. Exceeds gain of corner reflector of like dimensions. Impedance matched to 300 ohm line. Completely assembled, all-aluminum construction . . . can be mounted on existing masts for immediate use . . . all-channel paraflector weighs only 1½ lbs: Part No. 45-3071.

See them today at your Philco Distributor

PHILCO *Famous for* QUALITY *the World Over*

PHILCO CORPORATION

ACCESSORY DIVISION

"A" and Allegheny Ave., Philadelphia 34, Pa.

20% Increase in Paid Circulation in twelve months

24th year of publication

NOW

OVER

50,000

NET PAID A. B. C. CIRCULATION

Audit statement issued by the Audit Bureau of Circulations is available upon request. This statement, which covers the A.B.C. audit of both paid status and occupational classifications, shows the following circulation increase.

Paid Circulation April 1953 — 41,581
Paid Circulation December 1953 — 47,275

Integrity is an important ingredient of these A. B. C. Figures

Bryan Davis Publishing Co., Inc.—52 Vanderbilt Ave.—N. Y. 17, N. Y.

333 N. Michigan Ave., Chicago 1, Ill. 2253 Delaware Dr., Cleveland 6, Ohio

1052 W. 6th St., Los Angeles 17, Calif.

There's BUSS — the one Source for all FUSES."

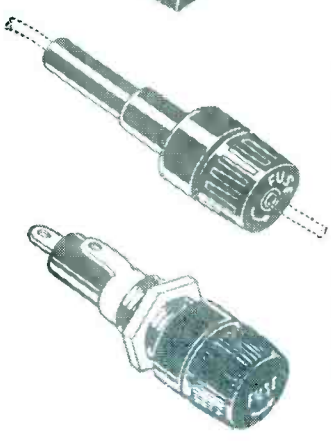
For your exact fuse needs, there's a BUSS fuse. A complete line of fuses for the Electronic Industries — in sizes from 1/500 amperes up . . . plus a companion line of fuse clips, blocks and holders.

Besides meeting your specifications, BUSS fuses are known for their ability to give accurate and dependable electrical protection under all service conditions.

To make sure that a BUSS fuse will never let you down — every BUSS fuse normally used by the Electronic Industries is tested in a sensitive electronic device that rejects any fuse that is not correctly calibrated, properly constructed and right in all physical dimensions.

That's why manufacturers and service organizations throughout the nation rely on BUSS as the one source for fuses of unquestioned high quality.

And in sales and service, furnish the fuse your customer knows. The BUSS trademark has been firmly established by the millions and millions of installations in home, farm, and industry. Sales are easier and there won't be customer "kicks" caused by faulty fuses. It's just good business to handle only *genuine* BUSS fuses.



Makers of a complete line of fuses for home, farm, commercial, electronic and industrial use.

FUSETRON

TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION

BUSS

For more information mail this Coupon ▶

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.

Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____ S-651

CAN YOU HANDLE

7 DAYS' WORK

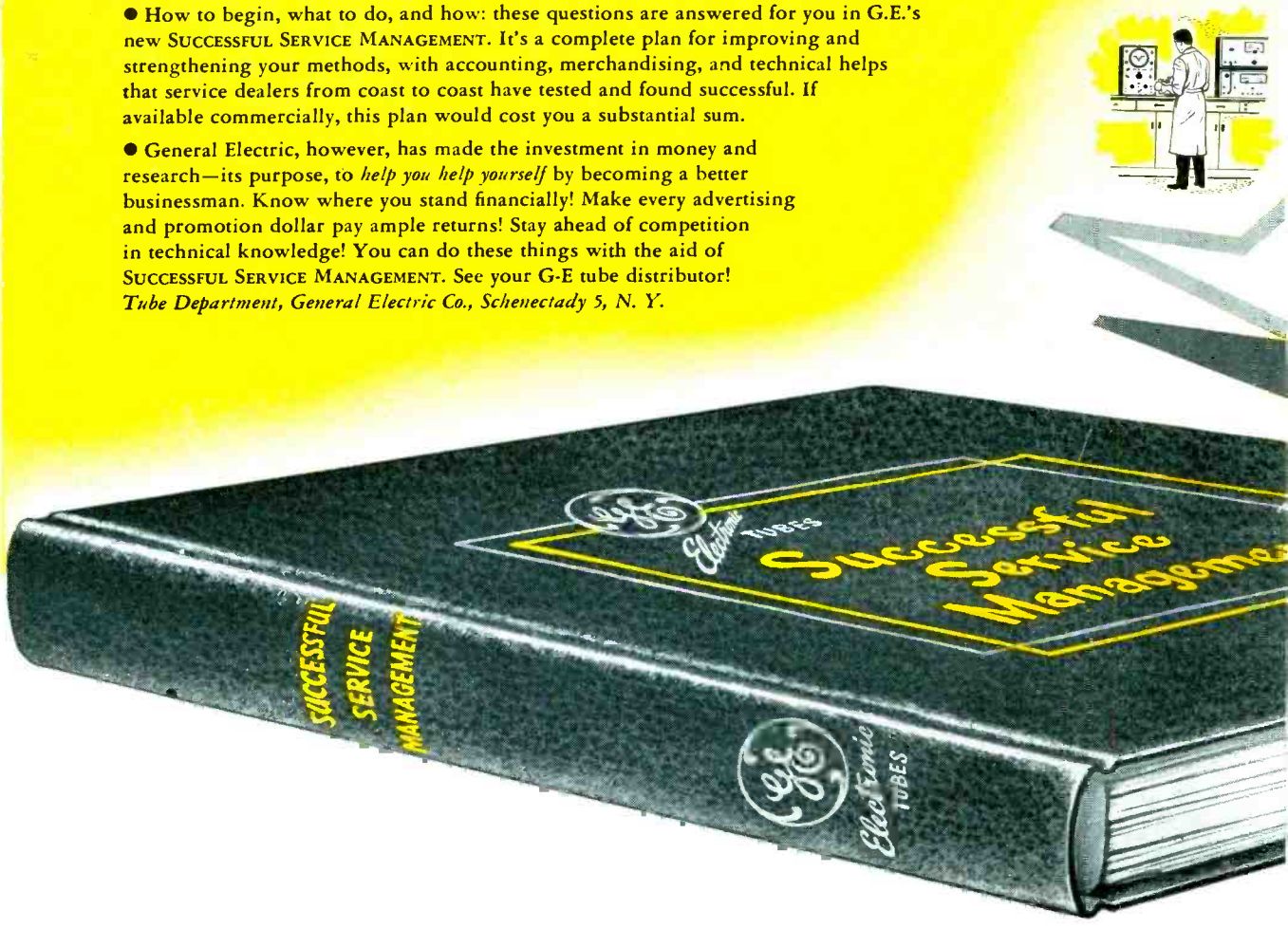
G.E. SHOWS YOU HOW—with a field-tested plan that has helped hundreds of other TV-radio service dealers. Only plan of its kind in the industry!

Authorities agree that the normal growth of the TV-radio service industry can bring an increase in your business next year equal to one extra day's work a week. To get your full share of this new business, and at the same time boost your profits, you need to organize *now* for top efficiency.

● How to begin, what to do, and how: these questions are answered for you in G.E.'s new SUCCESSFUL SERVICE MANAGEMENT. It's a complete plan for improving and strengthening your methods, with accounting, merchandising, and technical helps that service dealers from coast to coast have tested and found successful. If available commercially, this plan would cost you a substantial sum.

● General Electric, however, has made the investment in money and research—its purpose, to *help you help yourself* by becoming a better businessman. Know where you stand financially! Make every advertising and promotion dollar pay ample returns! Stay ahead of competition in technical knowledge! You can do these things with the aid of SUCCESSFUL SERVICE MANAGEMENT. See your G-E tube distributor!

Tube Department, General Electric Co., Schenectady 5, N. Y.



"Customers bring own sets in for service"

CHARLES W. RHODES

"Back-breaking chassis tugging belongs to the past"

L. B. HALLBERG

"Another wonderful feature—easier circuit tracing"

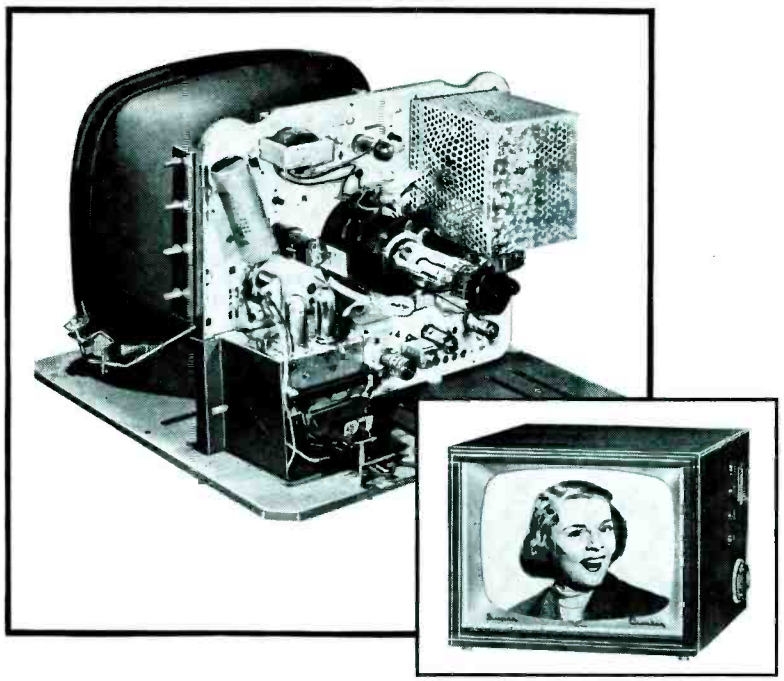
ROY R. THOMPSON

CROSLEY SUPER-V IS A SERVICE MAN'S DREAM

—read these letters

"I now find many customers bring their own sets in for service because the Super-V has reversed the trend toward heavy, bulky sets. I can service more sets per day, and my overhead is less by truck expenses. The Super-V is not only a low-priced set, but a set that can be maintained at a low price, which is equally important."

Charles W. Rhodes, Electronic Service Mgr. Robert L. Rice & Co., Portland, Oregon



"By removing the cabinet back, every tube is right in front of one's eyes. No more groping and twisting to relocate tube-socket pins. Back-breaking tugging of the chassis belongs to the past. If a repair or check of chassis components is necessary, a few screws are removed and the cabinet lifts off like a bonnet. The separate diagram showing the actual filament wiring makes the search for an open filament a matter of seconds."

L. B. Hallberg, Manager, Service Dept. Hardware Products Co., Sterling, Ill.

"The Crosley Super-V is a service man's dream; the new vertical plane chassis allows the changing of any tubes in a very few minutes. When service of a more complicated nature is required, the entire cabinet can be removed by loosening 6 screws; this leaves the entire chassis accessible for service. Another wonderful feature is that the picture-tube chassis and bracket are incorporated in one common mounting board along with the points wired on terminal strips for easier circuit tracing."

Roy R. Thompson, General Service Manager Saginaw Distributors, Inc., Saginaw, Mich.

Crosley Division AVCO Cincinnati 25, Ohio

IN 6 NEXT YEAR?

EVERYTHING you need to set up an organized and efficient service business is included in G.E.'s SUCCESSFUL SERVICE MANAGEMENT. You learn step-by-step how to manage your—

BUSINESS PRACTICES . . . Are you sure you're making money? . . . Accounting for the TV-radio service dealer (a complete course, with all records and how to keep them) . . . Preparing your income-tax return.

MERCHANDISING . . . Why advertise, why promote? . . . Identification . . . Advertising . . . Direct-mail . . . Window and store display . . . other effective ways to increase your business.

TECHNICAL ACTIVITIES . . . TV trouble-shooting with an oscilloscope . . . Alignment techniques . . . U-h-f servicing . . . other technical instruction, all detailed in its treatment and fully illustrated.

★ ★ ★

Plenty of operating examples make it easy to understand and apply SUCCESSFUL SERVICE MANAGEMENT. Instruction is down-to-earth and practical throughout. For the first time, you have in compact form both an aid to scientific operation of your business, and a guide to its healthy future growth.

Your G-E tube distributor has SUCCESSFUL SERVICE MANAGEMENT. See him today!

"We find the business practices material especially good, and use the forms 100% in our bookkeeping."
Silverton TV Service & Sales, Cincinnati, Ohio

"Plan is very helpful and appreciated. We like the technical section especially well."
Cecil N. Chaney, Humansville, Mo.

"I have been delighted with the information sent us, and cannot at this time think of anything that would improve it."
David S. Hyde, Bloomfield, N. J.

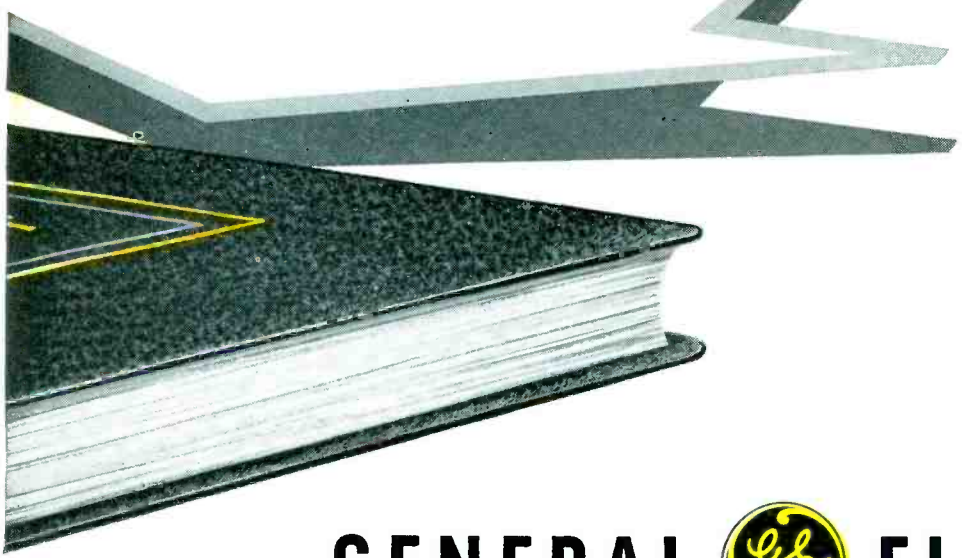
"Information has been excellent and valuable, with the technical data especially useful."
Phil Miller, Kansas City, Mo.

"I have been pleased with the service. It has been very beneficial."
Ralph Moore, Leavenworth, Kan.

"This has been the most helpful material we have yet encountered. It is simply written and easy to understand."
Central Radio & TV Service, Inc., Hastings, Mich.

"This material is the finest I have ever seen."
J. C. Wightman, Akron, Ohio

"Your manual has been a wonderful help."
Sterling Electronics, Lincoln Park, Mich.



GENERAL ELECTRIC

161-1AS

Free! HEAVY-DUTY TOP-QUALITY PLIERS KIT

with 10 CBS-Hytron Pliers Kit Stamps

LIMITED OFFER

From July 1 through August 31 . . . Your CBS-Hytron distributor will give you 1 Pliers Kit Stamp with your purchase of 25 CBS-Hytron receiving tubes.

PICK UP THESE FINE IMPORTED TOOLS. Examine the beautiful finish of their drop-forged tool steel. Try their comfortable handle grips. Feel the precise balance . . . the powerful leverage. Go ahead! Cut some eight-penny nails. Like cutting cheese, wasn't it? And not a trace of a nick in the tough, carefully matched jaws.

You will be proud to own these husky, quality pliers. Tested . . . guaranteed . . . they can take it. And did you notice that two are unique? Nothing else just like them . . . they are "musts" for your tool kit. Yes sir, this free Pliers Kit (packed in an attractive, handy plastic case) is an offer you cannot afford to miss!

The 6½-Inch Diagonals are husky, box-joint, fully polished side cutters with precisely matched jaws. Size is right: Compact, but big enough . . . with comfortable, full-fashioned, full-polished handles . . . to do repeated, tough cutting jobs with ease.

The 8-Inch Long-Nose is unique. Extra-long (2¾ inches), spring-tempered jaws combine with extra-long, knurled handles for powerful leverage. Hand-honed cutting knives. Beautifully chrome-plated.

The 6-Inch All-Purpose is also unique. Combines: Flat and round nose. Jaws shaped for positive gripping. Two wire strippers. Two side cutters. Finish of handles is gun-metal; jaws are fully polished. This tool has everything.

Get This Pliers Kit Stamp Book . . . and stamps from your CBS-Hytron distributor: One Pliers Kit Stamp for 25 CBS-Hytron receiving tubes. Each Stamp is imprinted with *your* CBS-Hytron distributor's code number. Redeem your Stamps with him.

This offer is valid only in areas where such offers are legal . . . and it is limited: July 1 through August 31. Don't miss it. Be sure to get *your* free CBS-Hytron Pliers Kit. See it at your CBS-Hytron distributor's . . . today!

CBS HYTRON

Manufacturers of Receiving Tubes Since 1921

CBS-HYTRON Main Office: Danvers, Mass.

A Division of Columbia Broadcasting System, Inc.

A member of the CBS family: CBS Radio • CBS Television • Columbia Records, Inc. • CBS Laboratories • CBS-Columbia • CBS International • and CBS-Hytron

RECEIVING • TRANSMITTING • SPECIAL-PURPOSE • TV PICTURE TUBES • CRYSTAL DIODES AND TRANSISTORS

bases loaded
you're at bat

GET ON REGENCY'S LEAGUE LEADING TEAM
RUN HOME WITH THE MONEY

Make increased profit with Regency's TV accessories

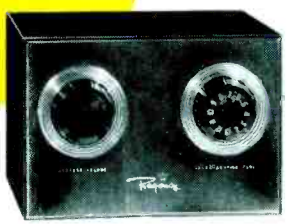
Regency Division of I.D.E.A., INC.

RC-53
UHF CONVERTER
$19.95 List

The only 19.95 converter fully transformer powered. AC only. Underwriters Approved

DB550
CASCADE TWO-STAGE VHF BOOSTER
$37.50 List

You cannot miss with Regency DB550! TV picture improvement absolutely guaranteed where improvement is needed.



RT-700
CHAIRSIDE TV CONTROL
$69.95 List

For those who can afford the best of everything—improved reception plus chairside TV control.
Cascode tuner changes channels, sharpens contrast, and controls volume as far as 100 feet away from set.
Less than 30 minutes to install.

MAKERS OF VHF BOOSTERS, UHF CONVERTERS, PROFESSIONAL HIGH FIDELITY EQUIPMENT AND TELEVISION REMOTE CONTROL

Here's the most terrific Time and Trouble saver you've ever seen

the CLASSY CHASSIS CARRIER!

SEE HOW IT SAVES!

1. Saves effort and energy . . . a breeze to wheel . . . a snap to carry!
2. Saves extra steps and extra labor. Carries your TNT Kit . . . everything all at once.
3. Saves valuable service time . . . permits more calls per day . . . you make more money.
4. Prevents damage to tubes, wiring and set.
5. Prevents damage to customers' furniture, woodwork and floors.

You'll say it's stupendous . . . the greatest and most valuable helper a TV Serviceman ever had!

An easy-wheeling, aluminum carrier that lets you move a heavy TV chassis (up to 27-inch tube) anywhere . . . with no lugging, no straining, no bumping. And no risk to tubes, floors, or polished surfaces. You save time, save money, save effort, and win renewed confidence from your customers.

Yours FREE!

This sensational work-saver now yours FREE with your purchases of Sylvania Tubes.

But don't delay! Offer expires August 31st. So, order your Sylvania Tubes and get your carrier reservation in NOW! Call your Sylvania Distributor for full details *today!*

SYLVANIA ELECTRIC PRODUCTS INC.
1740 BROADWAY
NEW YORK 19, N. Y.

SYLVANIA

In Canada:
Sylvania Electric (Canada) Ltd.
University Tower Bldg.
St. Catherine St.
Montreal, P. Q.

LIGHTING · RADIO · ELECTRONICS · TELEVISION

"For over twelve years, the U.S. Rubber Company..."

HARRY E. HUMPHREYS, Jr.
President,
United States Rubber Company

"For over twelve years the United States Rubber Company has offered its employees the Payroll Savings Plan, whereby they can systematically and regularly save in United States Savings Bonds. Over those years, tens of thousands of our employees have joined the Payroll Savings Plan with direct benefits to themselves and their families. Such employees are better employees because with more personal security and freedom from economic worry, there is less absenteeism and personnel turnover, fewer accidents and greater employee responsibility. Such regular investment in Bonds contributes also to the economic strength of the nation. By thus promoting a sounder dollar, business also directly benefits itself. That's why we at United States Rubber endorse the Payroll Savings Plan for Savings Bonds."

Mr. Humphreys cites three important benefits of the Payroll Savings Plan: Payroll Savers build personal security ... production curves reflect serious-minded workers and reduced absenteeism ... the national economy is strengthened by a growing reservoir of future purchasing power—more than 49 billion dollars in U. S. Savings Bonds, *cash value*, held by individuals.

There is still another big advantage in the Payroll Savings Plan: it is easy to install and maintain.

If you do not have the Payroll Savings Plan, or if you have the Plan and your employee participation is less than 60%, here's all you have to do to help your employees, your company and the country:

Write today to Savings Bond Division, U. S. Treasury Department, Washington, D. C. Tell them you want to join the United States Rubber Company and the 45,000 other companies that are making an important contribution to national security and a sounder dollar.

Your State Director, U. S. Savings Bond Division, will contact you promptly. He will explain the simple procedure of installing the Plan and will show you how to conduct a simple, person-to-person canvass that will put a Payroll Savings Application Blank in the hands of every man and woman in your plant and offices.

That's all you have to do. Your employees will do the rest. They are as interested in their own future as you are in yours. Give them an opportunity to build personal security for themselves and a better America for their children.

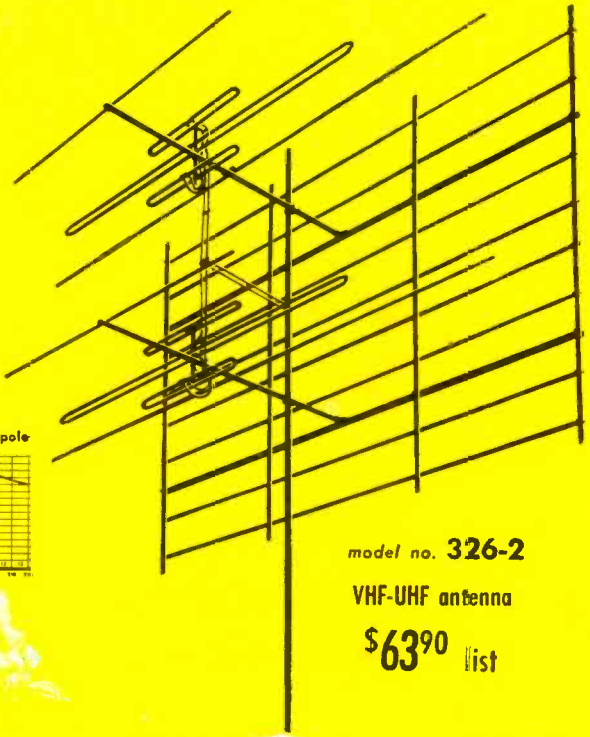
The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

SERVICE

The BACKSTOP

STOPS co-channel and adjacent-channel interference caused by rear signal pick-up!

- Highest front-to-back ratio ever built into an antenna!
- No rear pick-up; eliminates "venetian blinds"!
- Largest screen area: 70 square feet!
- Very high all-channel gain. Incorporates basic Champion design, including Tri-Pole, with additional elements!
- Completely preassembled!

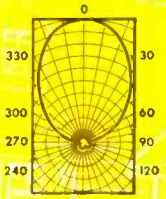


model no. **326-2**
VHF-UHF antenna
$63.90 list

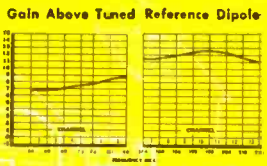
Table of Front-to-Back Ratios (Relative Voltage)

Channels	Front-to-Back Ratios
2	9:1
3	10:1
4	11:1
5	20:1
6	18:1

Only Low Band channels shown, since co-channel interference is not encountered on High Band channels.



Channel 5



IMPORTANT . . . don't be misled by polar patterns representing relative POWER. Remember, power is the square of voltage. All Channel Master polar patterns are presented in relative VOLTAGE.

2 radical new antennas by CHANNEL MASTER

The most beautiful antenna ever made! The only indoor antenna featuring powerful outdoor design principles — Bow-Tie and Screen.

Wonder Bow* VHF-UHF indoor antenna

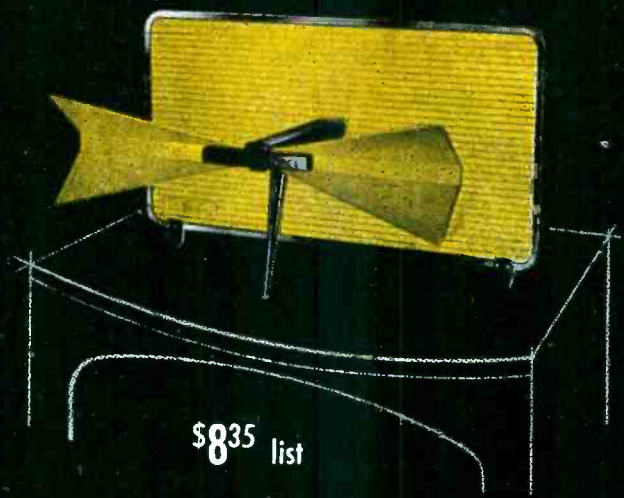
DESIGNED FOR POWER!

On **UHF:** For primary and secondary areas. In many cases, performance is equal to actual outdoor installations. Good directivity on all channels.

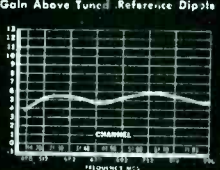
On **VHF:** Ideal in areas of strong VHF signals.

STYLED FOR BEAUTY!

Designed by a well-known industrial designer, the WONDER BOW is proof that indoor antennas *can* be beautiful as well as powerful. Wins customer approval on beauty alone!



The first gain figures ever to be published for an indoor antenna!



Gold and black
model no. **416**
Silver and black
model no. **417**

$8.35 list

CHANNEL MASTER CORP. ELLENVILLE, N. Y.
The World's Largest Manufacturer of TV Antennas

Write for complete technical literature.

*Pat. No. D-171560

RADIO · TELEVISION · ELECTRONIC
SERVICE

Studded With Wisdom

COMMITTEE REPORTS are often dull, wordy affairs, strewn with parliamentarian phrases that rarely do little else but confuse. Recently though, in Philadelphia, at the Eastern Conference meeting, several alert committees decided that it was about time for a change. They scuttled the old form of presentation, and offered a series of streamlined earthy reports teeming with inspired suggestions that every Service Man and every association group should read and re-read carefully.

Reviewing the bustling opportunities that are still around, contrary to what some say, one report declared that no one should discount the possibilities in, for instance, the field of electronic control devices, which every TV service shop can handle. Those desiring to expand have a long, long list of projects that merit consideration: electronic organs; industrial protective equipment; electronic-controlled garage doors (now really a lively affair); marine, aircraft and other commerical 2-way systems. A survey made recently among marine service organizations revealed that this is one of the fastest growing operations in the service-engineering world; and there is a crying need for trained Service Men. Several marine installation companies reported to ye editor that they just can't handle all of the calls that have been coming in. If at all possible, said the committee, one should make every effort to look for diversification in their business and enter the foregoing fields; such a move, offers greater protection against slump and slow-business periods.

And Service Men should not forget the broad outlets in the audio world, particularly in the maintenance of the new hi-fi phonos, and also modernization of the older models, the association boys said, too. The old reliable public address, and upcoming intercom business, also represent a fine opportunity. Contacting plants, playgrounds, schools, industrial establishments, hotels and restaurants, churches and clubs, through letters, phone calls and direct-mail promotion, has always been found to produce results, continued the report. In undertaking *pa* work, it has always been found wise to start in a small way and build up, and enlist the help of manufacturers specializing in the production of the required gear. They always have a number of helpful recommendations to offer, based on experiences of their many customers, and are always willing to lend a hand.

One should not forget the general radio repair business, the association group added, for this is still a very solid, profitable entity. Portable radio and auto chassis are increasing in popularity and require substantial attention. To find markets here, the group said, one can solicit car dealers for auto-radio work; contact jobbers and manufactures for appointments as official service stations; consistently remind customers that you are an authorized establishment, and via direct mail advise customers regularly of the services you perform.

Preventive maintenance was the theme of another intelligent report by an Eastern Conference committee. They recommended the sponsorship of a *TV Trouble Prevention Month,* not later than May 30 of each year, hammering away on TV, radio and the newspapers; TV set owners would be told of the importance of annual checkups on receivers, antennas and allied equipment.

Color also received a frank appraisal in the report, the group pointing out that one the greatest services associations can perform now for their members is the continuing presentation of valuable color service training programs. This is the year that Service Men should prepare for color. And so all in the industry, the report stressed, should accept the challenge, and prepare through clinics and wise reading of technical material, appearing in such journals as SERVICE.

In a sizzling attack on misrepresentation, the Conference boys lashed out condemning all misleading advertising, false claims, and trick and gimmick approaches on the part of any TV Service Man. Everyone should subscribe to a strict, written code of ethics, and publicize the fact that such a code is in operation and being faithfully followed. Such self-policing has always been successful, and will continue to win the admiration and good will of Mr. and Mrs. Viewer and Listener.

Elsewhere, association committees have also been on-the-ball preparing easy-to-read and practical useful information for their membership. In Boise, Idaho, a timely interpretation of what happens to the radio-TV service dollar was conceived by local association members. Slicing a coin in four parts, they showed that 33 cents of the dollar is spent for merchandise at cost; 18.4 cents of the dollar is required for bookkeeping, rent, taxes and advertising; 18.6 cents of the servicing dollar goes out for maintenance of utilities, truck expenses, depreciation and insurance; and the remaining 30 cents is channeled over to wages. Believing that the consumer would be interested in these revealing figures, they have been imprinted on 3″ silver dollar background cardboard discs. The Service Man's name also appears on the card coin.

To these astute committees who have probed so many pertinent problems of the day so skillfully, and arrived at such plausible conclusions, studded with wisdom, everyone we are sure is extremely grateful. A roaring toast to these discerning gentlemen.

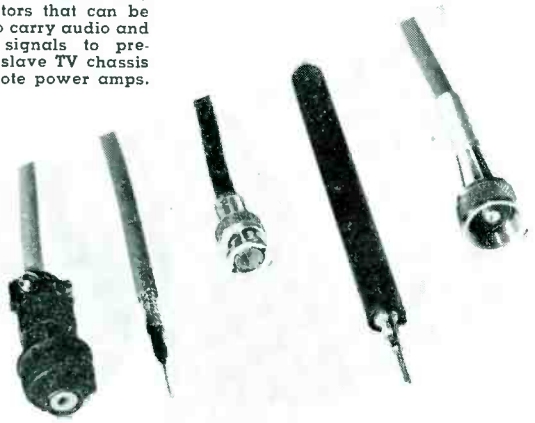
Our Annual Audio Review

THROUGHOUT the year, in every issue of SERVICE, audio receives featured attention. And, as has been our custom for over two decades, in the month of June, we offer a detailed survey of the art with a number of comprehensive reports based on field experiences.

Thus, you will find in this issue, the accent is on audio, with information on such topical subjects as coax lines for interior applications, series, parallel and series-parallel speaker hookups, multi-speaker hi-fi packaged phonos, public address installations, hearing aids, amps and preamps, needles, biasing in hi-fi, and notes on repair and maintenance.

We sincerely hope you enjoy these articles, and find the information useful. Your comments will be deeply appreciated.—L. W.

Views of several types of coax cables and connectors that can be used to carry audio and video signals to pre-amps, slave TV chassis or remote power amps.



COAX CABLE Audio-Video Line Application Considerations

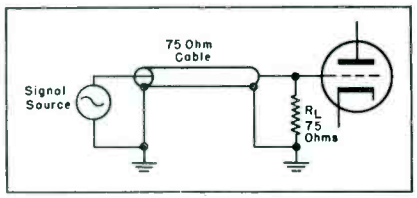
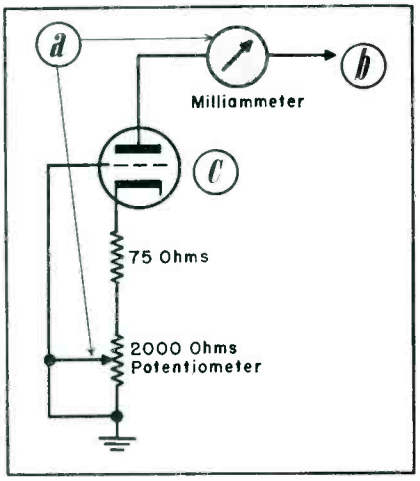


Fig. 1. Coax. cable terminated in its characteristic impedance.

Fig. 2. Schematic of setup used to design a cathode follower output stage. Potentiometer at a is adjusted and milliammeter is observed for maximum current. Point b is connected to the lowest available B+ in chassis power supply. At c is a low-mu triode or pentode.

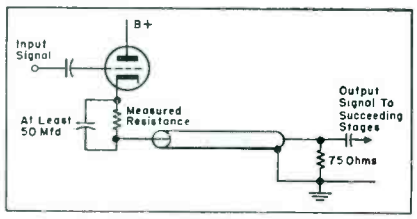


(Below)

Fig. 3. Circuit of designed cathode follower.

(Below, right)

Fig. 4. Short coax cable not terminated in characteristic impedance and its equivalent circuit: $E' = E\ R_L/R_{out} + R_L$; L = length in feet; R_{out} = output resistance; R_L = load resistance; C' = effective capacitance, and $R' = R_{out}\ R_L/R_{out} + R_L$ = effective resistance.



MODERN HOME HI-FI and remote TV systems require relatively long lines to carry audio and video signals to such assemblies as preamps, slave TV receivers, or remote power amplifiers. Coax cables, used as transmission lines, have been found to minimize signal loss and distortion problems, if used properly. Such cables, compared to two-wire transmission lines, offer low power loss per unit length, prevent signal distortion, and provide excellent shielding, reducing hum and noise pickup. It has also been found that *cross-talk and radiation between coax cables and other transmission lines or radio antennas are reduced to an absolute minimum.* This is important because the harmonics of TV video signals, which can range from 60 cycles to 4.5 mc, when radiated, can interfere with radio sets or possibly other TV chassis.

Unfortunately, the mere substitution of coax cables for other types of transmission lines in present or planned audio or video systems is unwise. One must determine, and very carefully, whether the use of coax cables will insure improvement over the present transmission characteristics, and if so, what type of cable should be selected.

In selecting cable one must evaluate the electrical characteristics (impedance and capacitance per foot) of the line; these factors are determined by the type of circuit in which it is to be employed. After the cable-type decision has been made, one problem remains: What is the maximum allowable length the cable can be before distortion and power loss become excessive?

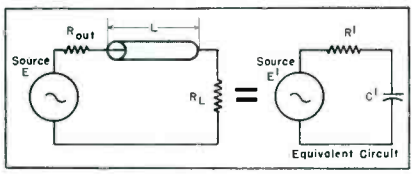
Coax cables are often operated in circuits that permit their termination in the characteristic impedance of the cable. This means that if a *75-ohm* cable is used, the receiving end of the cable *sees* a 75-ohm resistance. When the cable is operated in this manner, the maximum frequency bandwidth is obtained, and losses are kept relatively low; usually less than .5-db per 100′ length at 4 mc. Unfortunately, most of the audio or TV equipment built for home use is *not* designed to permit the use of this circuit, since the driving source must have extremely low internal impedance, less than 100 ohms. This makes it necessary to use cathode-follower or transformer coupling in the driving stage, and to keep the signal level on the cable at a low value. For example, a triode cathode-follower (e.g., 12AU7) can only develop about .25-volt *rms* across the 75-ohm resistor before distortion sets in.

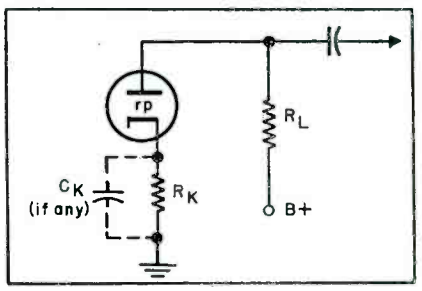
A cathode follower can be added to the driving equipment by means of the following *short cut* design method:

(*1*) The tube type to be used, based on the available filament supply and

(Right)

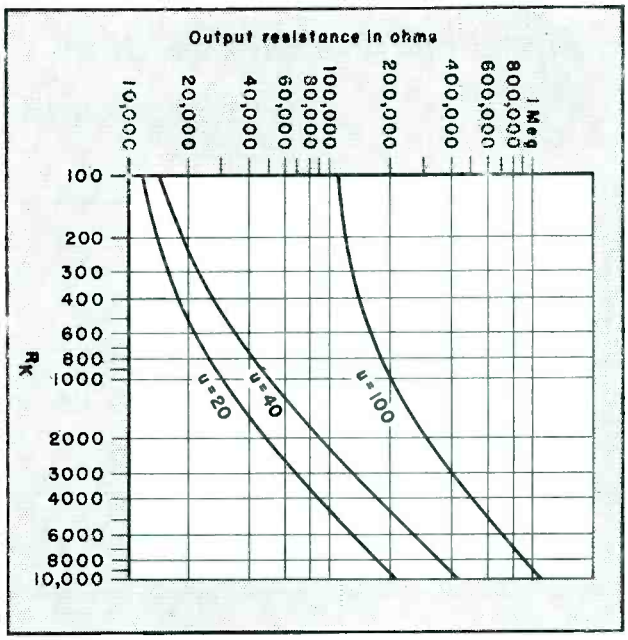
Fig. 5. Determination of a plate-coupled output stage resistance. Triode $R_{out} = r_p + (u + 1)\ R_K$. Pentode $R_{out} = R_L$.





Selecting Proper Types of Coax . . . Determining Required Line Lengths to Carry Audio-Video Signals to Preamps, Remote Power Amplifiers and Slave TV Receivers

by OSCAR LOWENSCHUSS and JULIAN M. SIENKIEWICZ



chassis space, should be selected. A high-transconductance triode or pentode will be found best.

(*2*) The tube should then be connected in a test circuit as shown in Fig. 2. The potentiometer slider should be set at the ground end, and power turned on.

(*3*) Potentiometer should then be adjusted until the milliammeter indicates maximum allowable plate current. This current depends on the available power supply, and the maximum tube ratings. High current should be used for high gain and output voltage.

(*4*) The active potentiometer resistance (that portion not shorted out) should then be measured.

(*5*) The resultant circuit is shown in Fig. 3.

If the cable run is short, and the frequency not hgher than 6 mc, it will not often be necessary to terminate the cable as described. Instead, the cable can be regarded as a distributed capacitance, as illustrated by the equivalent circuit in Fig. 4, where C' = effective capacitance = length L times capacitance per unit length C_o and

$$R' = \frac{R_s R_L}{R_s + R_L}$$

= resistance of R_s in *parallel* with R_L.

This approach permits the use of cables of appreciable length if the transmitter internal impedance or the load impedance is low. For example, if the stage from which we couple is a triode (e.g., 12AU7) having a bypassed cathode resistor, we can use up

(*Continued on page* 56)

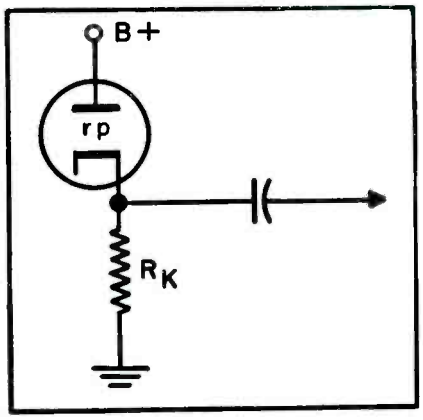
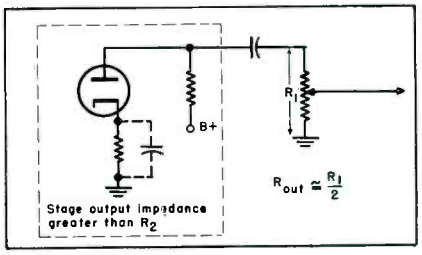


Fig. 7. Determination of a cathode-coupled output stage resistance; $R_{out} = \frac{R_k}{1 + g_m R_k}$

Fig. 8. How to determine resistance of a potentiometer-controlled output stage.

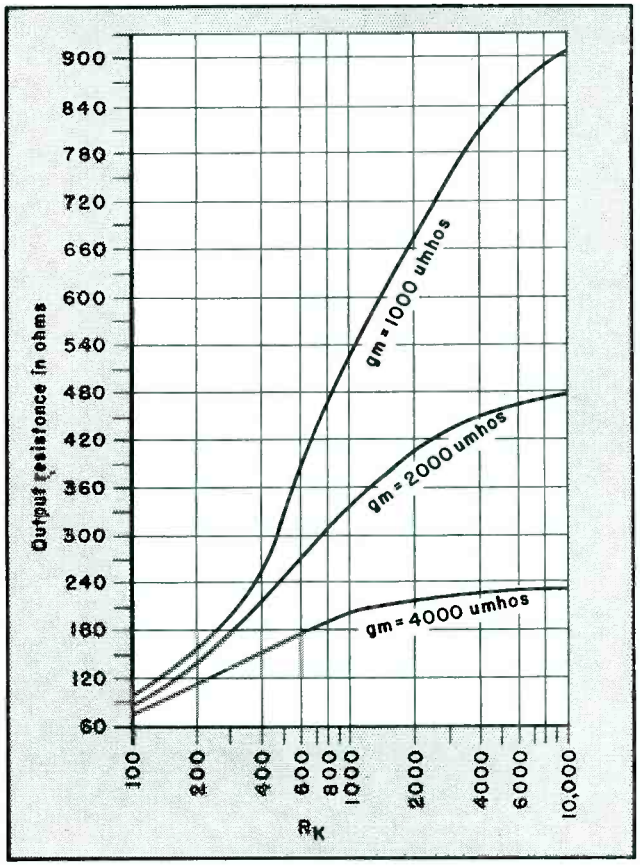


(Above, right)

Fig. 6. Plot designed to permit graphic determination of output resistance of a triode amplifier. Low-mu triodes include 6C4, 6BF6, 6C5 and single-triode sections of 6SN7, 12AU7 and 12AH7. Medium-mu tubes include 6J6, 6AB4 and triode sections of 6BF7, 6BG7 and 12AT7. The high-mu triodes include 6AQ6, 6AU6, 6K5, 6SL7 and triode sections of 6AT6, 6SC7 and 12AX7.

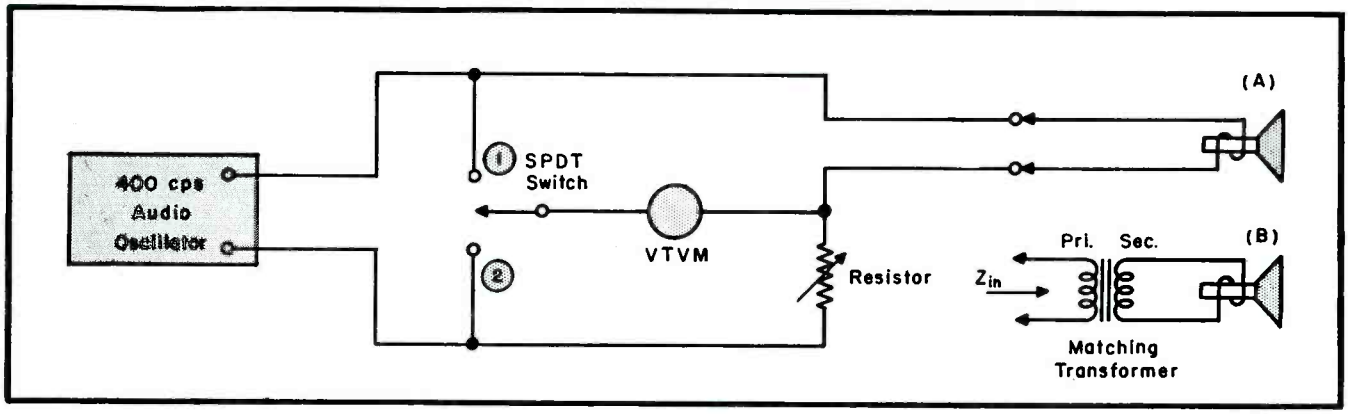
(Right)

Fig. 7a. Plot that can be used to determine output impedance of a cathode follower. Tubes with Gm of 1,000 include 6AQ6, 6AV6, 6K5, 6AQ7 and the single-triode sections of 6AT6, 6SC7 and 12AX7. In the 2,000 Gm category are 6SL7, 6BF6, 6C5 and single-triode sections of the 6SN7 and 12AH7. The 4,000 Gm tubes include 6C4, 6J6, 6AB4 and the single-triode sections of the 6BF7, 6BG7, 12AT7 and 12AU7.



Series and Parallel Multiple-Speaker Field-Application Data

Connecting Up

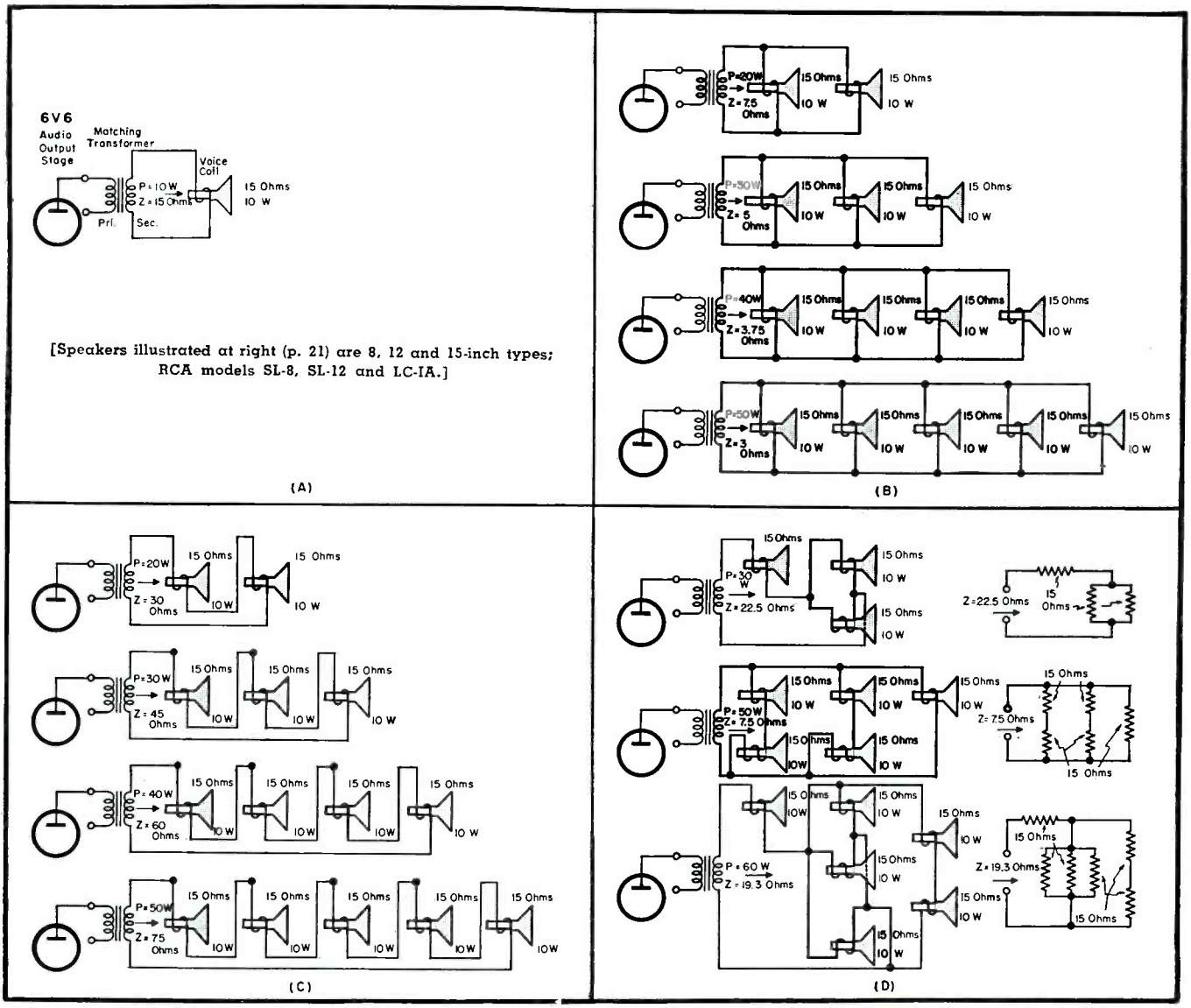


(Above)

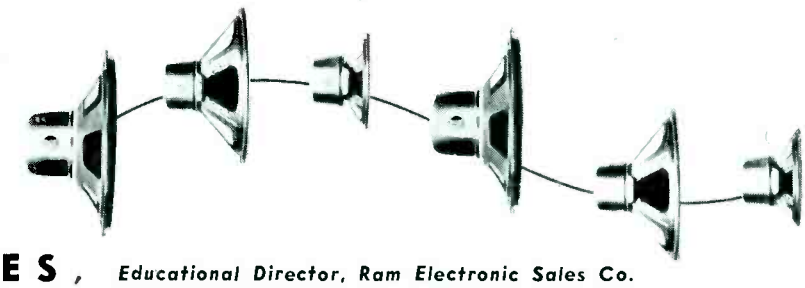
Fig. 1. One method used to determine the impedance of a loudspeaker (a) and of a transformer-loudspeaker combination (b).

(Below)

Fig. 2. Impedance and power values obtained by connecting a 10-watt, 15-ohm loudspeaker across a matching transformer (a); loudspeakers of the same value in parallel (b); in sereis (c); and, in series-parallel (d).



LOUDSPEAKERS



by JESSE DINES, *Educational Director, Ram Electronic Sales Co.*

IN SPEAKER installations, one of the most important factors is impedance. Usually, this information appears in catalogs; typical speaker values shown are 4, 5, 8, 10, 15, 16, and 32 ohms. The value chosen indicates that this is the best assignable impedance for proper loading to insure a maximum power transfer from amplifier to speaker with minimum loss.

When speaker impedance is not known, it is possible to determine this factor by connecting up the speaker in the circuit shown in Fig. 1. With the *spdt* switch in position *1*, the 400-cps audio oscillator output must be adjusted so that a maximum reading is obtained on the *vtvm*, making sure that the oscillator output does not exceed the speaker power rating. With the switch in position *2*, the resistor should then be adjusted for a maximum *vtvm* reading. Then the resistance of the resistor should be measured; this is, for all practical purposes, the impedance value of the speaker as well. The impedance at all other audio frequencies can also be determined by means of the same method, and thus an overall response curve can be drawn from it. At (*a*) in the illustration the impedance of a voice coil of a speaker is being measured. In the same manner, the impedance of a matching transformer (*mt*) can be determined; this is shown at (*b*). Here the measured impedance is that which is obtained by *looking into the primary*.

It is not too difficult to determine what type of speaker or *mt* should be used in a circuit. The method of connecting two or more speakers to an amplifier is a bit involved, but not as troublesome as one might suspect. The majority of speaker problems can be solved by applying just a few laws and relationships: Ohm's Law, the law of parallel and series resistors, and turns-ratio relationship.

Typical Problems

The most elementary speaker problem, an amplifier feeding a single conventional speaker, is illustrated in (*a*) of Fig. 2.

Here we see an audio output stage feeding the primary of the *mt* and the secondary coupled to the voice coil. The purpose of the *mt* is to match the amplifier to the speaker. (Practically speaking, audio output stages require an impedance of about 750 to 35,000 ohms, whereas the impedance of the voice coil ranges from about 4 to 45 ohms.)

To determine the primary impedance and turns ratio of an *mt* in this instance, let us assume that an *mt* is needed to match two 6V6s, operating as class *AB1*, to a speaker with an impedance of 15 ohms and 10-watt power rating. The tube manual indicates that the effective load resistance of the 6V6 is 10,000 ohms (the primary impedance of the *mt*) and the maximum undistorted signal power output is 10 watts (with an operating voltage of 250 and control grid voltage of 15). The turns ratio can be calculated by using formula *7*:

$$TR = \sqrt{\frac{Z\ (\text{primary})}{Z\ (\text{secondary})}} = \sqrt{\frac{10{,}000}{15}} = 25.9:1$$

(1) $I = E/R$
(2) $P = E^2/R$
(3) $R\ (\text{total}) = R_1 + R_2 + R_3 \ldots .$ (for series resistors)
(4) $R\ (\text{total}) = \dfrac{R_1 \times R_2}{R_1 + R_2}$ (for two parallel resistors)
(5) $R\ (\text{total}) = \dfrac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$ (for more than two parallel resistors)
(6) $\text{R (total)} = \dfrac{R\ (\text{of 1 resistor})}{\text{Number of resistors}}$ (for more than two parallel resistors *equal in value*)
(7) $TR = \dfrac{E\ (\text{primary})}{E\ (\text{secondary})} = \sqrt{\dfrac{Z\ (\text{primary})}{Z\ (\text{secondary})}}$
(8) P (dissipated across load) = P (delivered) x Efficiency (transmission line)

Z may be substituted for R in any of the foregoing, and vice versa.

Z = impedance in ohms; I = current in amps; E = voltage in volts; P = power in watts; R = resistance in ohms; TR = turns ratio.

Typical formulas used to solve speaker hookup problems.

If an *mt* of the proper impedance is not used (if it deviates more than ±10% from the specs), the maximum undistorted signal power output of the speaker will be less than 10 watts and, consequently, speaker efficiency will decrease. If one is limited in choice of *mt*'s, it is wise to select one which has a higher, rather than a lower, impedance. Thus if two *mt*'s are available, an 11,000 to 16-ohm and a 9,000 to 16-ohm, the former should be chosen.

When two or more speakers are connected to an amplifier, the impedances and turns ratios should be computed in the manner described. The speakers may be hooked in series, parallel, or in series-parallel. The advantage of speakers in series lies in the fact that if the voice coil of one speaker shorts, the other speakers will still operate; on the other hand, parallel speakers are advantageous in that if the voice coil of one speaker opens, the other speakers will continue to operate.

Usually, however, the choice of whether to use series or parallel connections is dependent primarily upon the impedance needed to match the amplifier properly. Generally speaking, when low impedances (about 10 ohms or less) are needed, parallel connections are used; by the same token, series speakers are employed when higher impedances (about 10 ohms or more) are required. To illustrate, let us examine the speaker connections shown in (*b*) and (*c*) of Fig. *2*; all speakers are 15 ohms and 10 watts. Only the total power and total impedance, *looking away from the secondary of the mt's* were computed. The total power values are determined by *adding* the power values of all the speakers, whether they are in series or parallel; thus, three 10-watt speakers, in series or parallel, dissipate 3 x 10 or 30 watts. In (*b*), the total impedance was computed by using formula (*6*) and in (*c*) by using formula (*3*).

Examples employing series-parallel connections are shown in (*d*) of Fig. 2. To simplify the computations of such circuits, it is suggested that an equivalent circuit using resistors be drawn, as shown. The impedances here were calculated by using formulas *3*, *4*, and *6*.

[Next Month: Amplifiers and Speakers]

Hi-Fi Amplifier

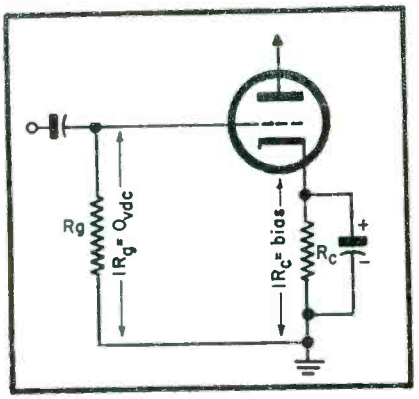


Fig. 1. Cathode bias circuit. The IR drop across Rc makes the cathode positive with respect to ground, and since there is no dc current through Rg, the grid is at the same dc potential as ground.

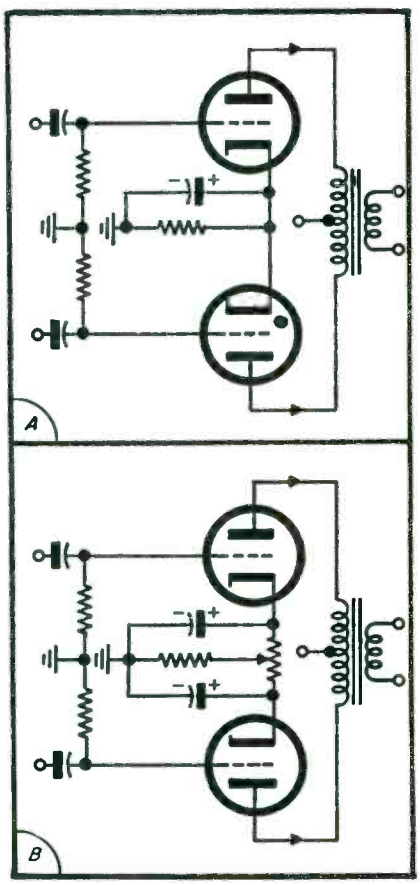
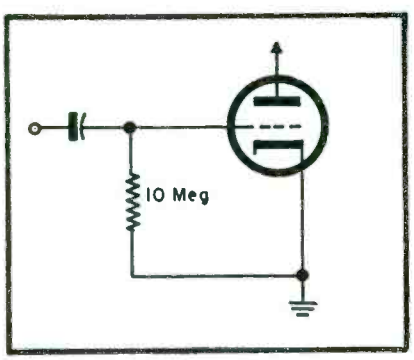


Fig. 2. Cathode bias used in a push-pull stage. In B the relative bias on each tube can be adjusted for balance of the currents in each tube.

Fig. 3. Contact-potential bias circuitry. The cathode is grounded and the grid resistor must have a very high value.



THE PROBLEM OF FURNISHING the proper bias voltage for an amplifier stage (making the grid negative relative to the cathode) used to be solved in a very simple manner; a *C* battery was connected between grid and ground, with the negative terminal towards the grid. If the stage began acting up due to insufficient bias voltage the battery was replaced and that was all there was to it.

The *C* battery has gone the way of tickler coils and goose-neck speaker horns. Bias voltages in current audio amplifiers are secured in various ways, without the aid of batteries. Keeping the grid bias at its correct value becomes very important in *hi-fi* work, where distortion must be low; it is therefore necessary that the Service Man understand the different circuit arrangements used to provide bias.

Cathode Bias

The most common source of bias is the cathode resistor, whose use is illustrated in Fig. 1. The flow of tube current through the resistor creates an *IR* drop across R_c; cathode positive with respect to ground. Since there is no *dc* current flow through the grid resistor there is no voltage drop across R_g, and the grid itself is at the same *dc* potential as ground. Thus the cathode is positive with respect to both ground and the tube grid; the grid is negative with respect to cathode.

Assuming no faults in the grid circuit, cathode bias voltage may usually be measured with any *dc* meter. Even a meter with as low an impedance as 1,000 ohms-per-volt will not affect the reading for the output stage too much, where the bias is high and the cathode resistor low in value. (Voltage amplifier bias, on the other hand, which may consist of one volt across a resistor of several thousand ohms, must be measured on a meter of higher impedance.) The voltage, measured between cathode and ground, should be within 15% or so of the correct value. The value of the correct bias may be furnished by the amplifier manufacturer or can be determined from tube manuals. Bias voltage is listed in manuals as *grid voltage*, and values are given in terms of other circuit conditions, such as *B+* supply voltage or load impedance.

The cathode-to-ground method of measuring bias voltage, while it has the advantage of not requiring a high impedance meter, may under certain conditions be entirely misleading. The cathode voltage will indicate the grid-to-cathode bias voltage only so long as the grid-to-ground *dc* voltage is zero. Such may not be the case in a defective amplifier, in which a leaky coupling capacitor can apply a positive voltage to the grid. The sure way of measuring cathode bias is therefore to use a *vtvm* and connect the test leads directly between grid and cathode. Cathode bias circuits used in push-pull stages are illustrated in Fig. 2. The cathode resistor is common to both tubes, and requires twice the wattage rating called for by a single-ended stage. The circuit in *b* of Fig. 2 illustrates a method of providing *dc* balance (indicated by zero *dc* voltage across the primary of the output transformer) by adjusting the relative bias on each tube.

The most common causes of improper bias in cathode-biased stages (besides leaky coupling capacitors that affect grid voltage no matter what the source of bias), are leaky or shorted cathode bypass capacitors, which lower or eliminate the bias voltage, and open or partially open cathode resistors, which create an increase of bias voltage.

Occasionally the bypass electrolytic for the cathode resistor is omitted in the original design. This constitutes negative current feedback for single-ended stages, and results in reduced distortion, reduced gain, and an increased danger of picking up hum from heater-to-cathode coupling. A bypass capacitor that has opened will, of course, have the same effect. On the other hand, a bypass capacitor which is not entirely open, but which has lost a large part of its capacitance will introduce negative feedback at bass frequencies only, and will be responsibile for bass attenuation in the output signal.

Contact potential bias is used only

BIAS Circuitry

by MARK VINO

Circuit Arrangements Used For Cathode Bias, Contact Potential Bias, Fixed Bias, Back Bias Automatic Bias Control, Direct-Coupled Bias

in voltage amplifier stages which do not have to handle large signal amplitudes. This type of bias may be found in the first voltage amplifier following the *rf* detector, or in a phono preamp. The cathode is grounded directly, as shown in Fig. 3, and the grid resistor is assigned a value of the order of 10 megohms. The use of a grid resistor with the more common value of several hundred-thousand ohms will destroy the bias, and is unsuitable in this circuit.

Fixed Bias

The bias voltages that are produced by the foregoing circuits do not remain constant at all times. They are influenced by tube operation; cathode bias by the flow of cathode current, and contact potential bias by the possible flow of grid current. Although *C* batteries have gone out of use, fixed bias from a separate power supply, whose voltage does not vary with signal current flow, may be found in certain amplifiers. A bias voltage power supply is illustrated in Fig. 4. This is distinguished from the ordinary rectifier power supply because:

(*1*) The output voltage is negative with respect to ground. (*2*) The power supply does not have to be designed for any appreciable current flow. (*3*) The output voltage is exceptionally well filtered. (*4*) The output voltage is low, usually between 20 and 70 volts.

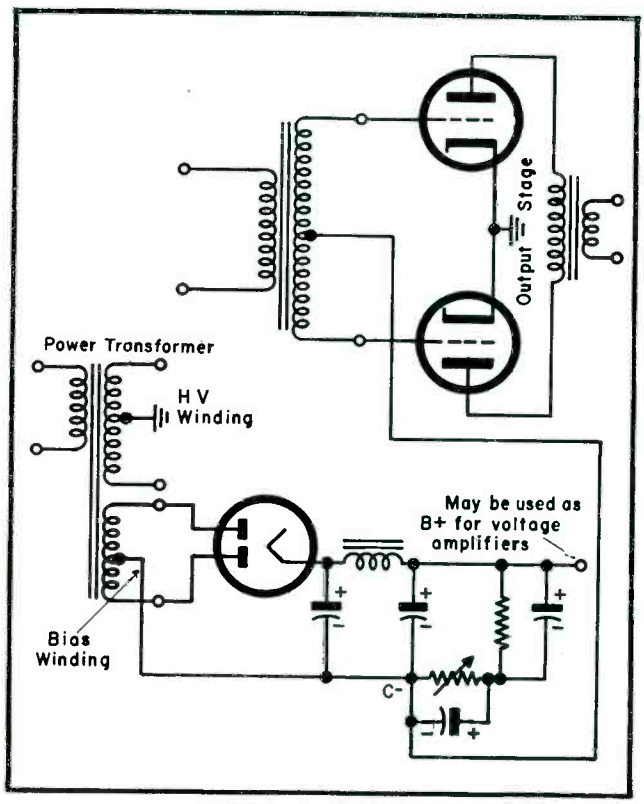
Fixed bias allows more power to be drawn from a given output stage than cathode bias, without increase of distortion. It is most commonly found in transformer-coupled, high-powered amplifiers made for public address. Loss of capacitance in the electrolytic filters of the bias supply, just as in the case of the *B* supply, will create hum.

Manual Data

Although tube manuals list superior high-power operating characteristics for output tubes using fixed bias, compared to the characteristics for the same tubes with cathode bias, it is not to be inferred that fixed bias provides

(*Continued on page* 60)

Fig. 4. Fixed bias power supply.



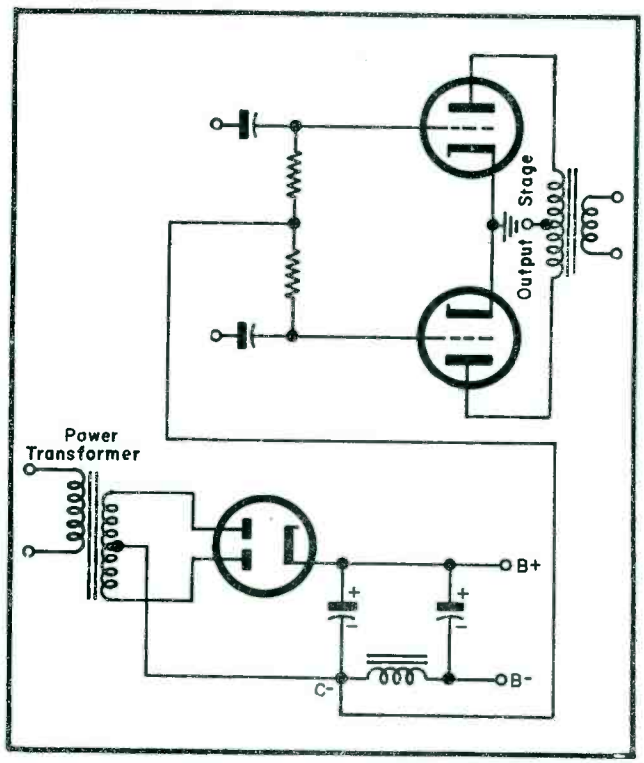
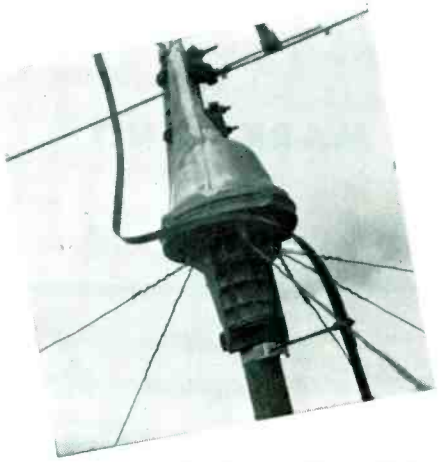


Fig. 5. Back bias, secured from a series resistor, choke, or field coil in the B-line.



Closeup of rotator installation. Note rotator-loop of leadin cable, to enable antenna to turn. Extra-long standoffs, and short piece of polyethylene flat tubing over leadin serve to prevent breakage from flexing. Numerous guy-wires are used for extra strength.

Fastening Guy Wires . . . Mounting On Flat and Peak Rooftops . . . Selecting Proper Clothing and Shoes For Installation . . . How To Use Open-Lines . . . Precautionary Measures On Roofs and Bases

High Masts and Towers In Fringe Areas

by JACK DARR

WHEN INSTALLING towers or masts, the fastening of guy wires involves more than merely twisting of a wire around the eye or loop. This operation is important for it can insure the needed strength for the guys. Using stranded guy wire, the wire should be passed through the thimble, leaving about ten inches in the *standing-part*, as the gobs say. The wire can be kept from jumping out of the thimble by crimping the ends of the thimble slightly with pliers. Now, holding the thimble tightly in one hand, one can begin wrapping the end of the guy wire around the guy itself. There are two ways in which this can be done; the *tight-wrap* and *laying*. If the first method is used, at least ten turns of wire are made around the guy, as nearly at right angles as possible. This will make a strong joint, especially for the lower end of a guy. For top joints, such as fastening wires to a rotator, a long smooth joint is required, since the *rotator-loop* in the leadin must not find anything to snag itself on as the antenna turns. In this case, the *laid* joint is better. First about ten inches of wire should be run through the hole in the rotator base; then noting which way the wires are laid, the remainder of the wire can be wrapped around the guy. The wires should be held firmly, one in each hand, so that they cannot twist while wrapping. A bit of experimenting will show the proper way to do this; the wires should *lay* together, and the whole joint should be smooth and strong.

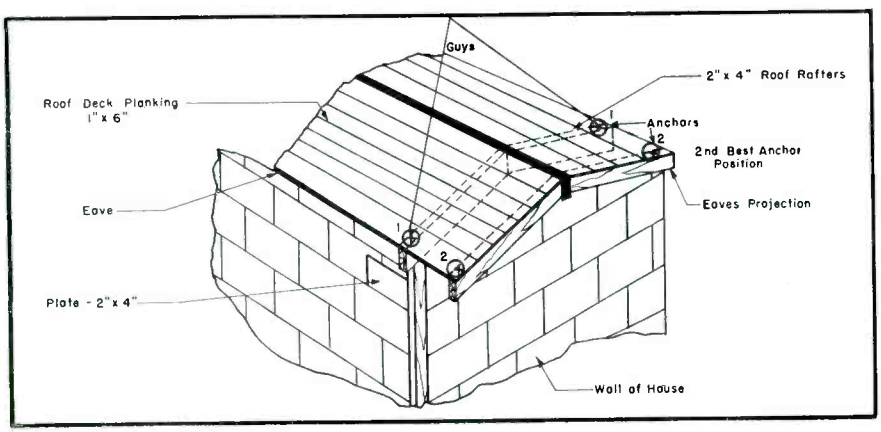
If turnbuckles are used, when making the final fastening at the lower ends of the guy wires, joints should be made with enough wire, to leave sufficient wire for safe tying of the turnbuckles. After all adjustments are made, the end of the wire should be passed through the center of the turnbuckle, so that it cannot turn and come loose, or even unscrew completely. Due to the twist of the wire, a *rotary strain* is placed on the turnbuckles; this will cause them to unscrew completely, if not safe-tied. This note is based on bitter experience; one of our first jobs went down because this precaution was not followed. Since then, every turnbuckle used has been well safe-tied.

For anchoring single, lightly-loaded guys, such as on a very short mast, or middle guys on a three-guyed tower, heavy screweyes or screwhooks can be used, provided they are driven into a rafter and tightened well. One should always place a dab of roofing cement around the base to prevent water from going in and rotting the board, causing failure of the guy.

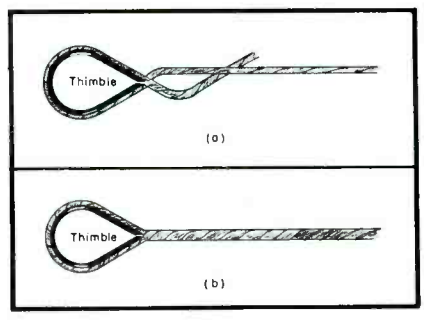
For setting the mast or tower into a true vertical position, a carpenter's level can be used; special mast-leveling devices are available. The latter usually consists of two *level-bubbles* mounted in a right-angled block of

(*Continued on page* 54)

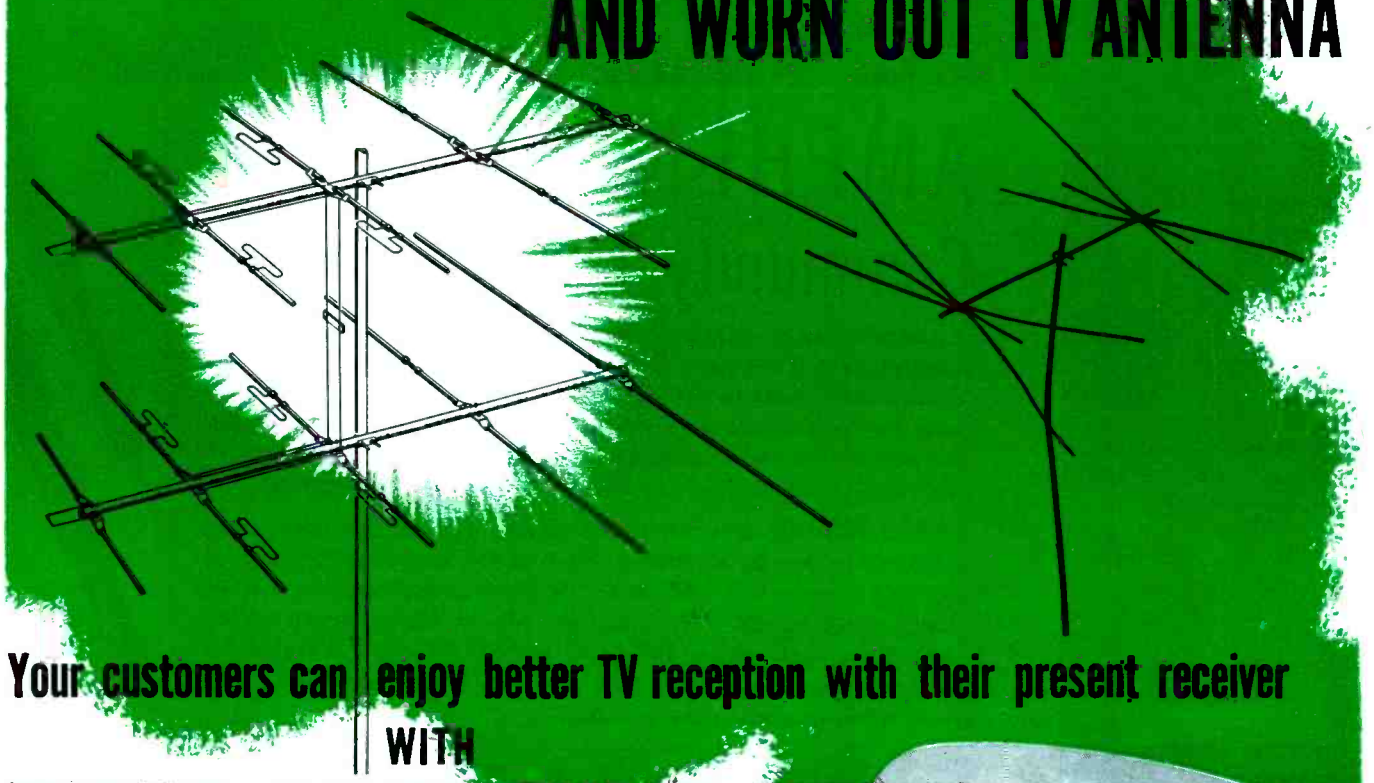
Sketch of typical roof construction, with roof-rafters made of 2x4s and roof-decking one-inch planking. When locating guy anchors, one should always see to it that at least one lag-bolt goes into the roof-rafter.



Splicing: At a the beginning of a splice of guy wire around thimble is shown. End of wire is started in such a way that it will lay into strands of remainder. End should be brought up and over wire to right. Finished splice is shown in b. Note smoothness of joint, and the manner in which the strands of wire are interwoven with each other, providing a joint as even as a properly made rope-splice.



Right now ....IS THE TIME TO REPLACE THAT OUT-MODED AND WORN OUT TV ANTENNA



Your customers can enjoy better TV reception with their present receiver WITH

BRIGHTER, CLEARER, SHARPER PICTURES

Provide your customer with greater enjoyment with his present TV receiver—put new life into the pictures on the screen—supply him with the equipment necessary to bring in all the available channels better, clearer...with the installation of a new Taco antenna.

We all know that there is a tremendous amount of replacement antenna and installation business to be had. The next few months will have a great effect on your overall business for the year.

SEE YOUR TACO DISTRIBUTOR—HE WILL TELL YOU WHAT TACO IS DOING FOR YOU.

Mr. Serviceman:

Postcards with your message directed to your customers and bearing your imprint and telephone number are available through your Taco distributor. Your customers will thank you for sending him this reminder that he needs television antenna service.

ESPECIALLY WITH A GENUINE

TACO

HIGH-GAIN ANTENNA

Technical Appliance Corporation, Sherburne, N. Y.

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

AMPHENOL *Quality*
Community TV Components

AMPHENOL today makes all of the cable types and all of the RF connectors that are used in Community TV Systems. These have always been made to the quality standards of AMPHENOL—standards that have demanded extreme care in all phases of production. RF connectors and coaxial and triaxial cables are manufactured with strict controls, are carefully inspected before shipment.

sweep testing Now an added quality control has been made available to you by AMPHENOL. Each of the two cable types used for long lengths in Community TV System installations will be sweep tested by AMPHENOL when so ordered. Under sweep testing procedures each reel of RG-11/U and 21-125 cable is tested for each VHF channel, 2 to 13. You are then furnished with a notarized affidavit stating the results.

see your AMPHENOL *distributor for full details about RF connectors and* SWEEP TESTED *cables for Community TV Systems.*

AMPHENOL

NATIONAL COMMUNITY TELEVISION ASSOCIATION

Convention: PARK SHERATON HOTEL, NEW YORK

Booth 9 on the 28th floor — JUNE 14, 15, 16-1954

SERVICE...The National Scene

INSTRUMENTS (BW/COLOR), AUDIO AND ANTENNAS STAR AT PARTS SHOW--An intriguing variety of equipment for the shop, for the field, and consumer use, too, was unveiled at the Conrad Hilton a few weeks ago during the annual Electronic Parts Show in Chicago. . . . Along instrument row, one manufacturer displayed a team of test items, including a calibrator, sweep generator and 'scope, designed, it was said, to simplify check/alignment. Explaining one feature of gear, engineers noted that circuitry employed in units obviated need for connecting or coupling calibrator to TV chassis; spurious markers, which can be generated by intermodulation of calibrator signal with that of TV set signals, were claimed to be eliminated by this technique. It was also disclosed that with the marker insertion method used intensity markers could be maintained on the 'scope screen on the overall response curve, including trap frequency points. . . . Another instrumentation development--for color-- a chromatic probe and booster amp, designed for alignment and adjustment was said to permit rapid conversion of the b-w sweep marker systems used in equipment of this manufacturer.

A COLOR-BAR/WHITE-DOT GENERATOR, which included a white dot and cross hatch output providing 8 dots horizontally and 6 dots high for convergence and linearity adjustments, was also on view. Unit features a crystal-controlled color-burst oscillator and color-bar generator producing five overlapping bars (orange, red, white, magenta and blue).

SOLUTIONS to the thorny co-channel or adjacent-channel interference problems, appeared in several new antenna designs featuring high front-to-back ratios. Models were claimed to eliminate venetian-blind effects experienced in areas which lie within the field of two different transmitters broadcasting on the same or adjacent channels. One model, with a reflecting screen area of 70 square feet, was said to have a front-to-back ratio of 20:1 (in relative voltage) on channel 5. . . . Also on parade were many rotators, now more popular than ever because of their import in controlling accurately antenna position to insure maximum pickup in uhf, and fringe vhf areas.

FOR OPERATORS OF COMMUNITY ANTENNA SYSTEMS, who want to transmit either live or film over a closed-circuit system, because of lack of on-the-air features, one company showed a complete studio set-up, including a compact camera chain, monitoring equipment, disc playback, and the required measurement gear. Equipment is now being used in Kentucky, providing reception over channel 2.

THE EXCITING POSSIBILITIES OF ELECTRONIC CONTROL shone during demonstrations of a 2-way system, opening and closing huge garage doors through pulse transmission from a compact unit under a hood of a car. A small receiver, mounted on the garage door, picking up the signals, served to actuate a relay and motor connected to a pulley system. To avoid interference that might obtain, when the systems are used within a single zone, each setup, it was said, could use different channels.

AUDIO was quite a headliner, too, at the Conrad Hilton, with scores of pace-setting exhibits about. Featured were streamlined slide-control replacement cartridges for lp and standard discs, assorted wide-range speaker combinations, featherweight lapel and breast mikes, and needle check devices. . . . Several manufacturers indicated that audio will really spurt in '54; sales may rise anywhere from 20-30% over the '53 record. To substantiate this forecast, one expert noted that the disc sale jump during the past few years could be used as an excellent barometer. According to association figures, domestic record income jumped from approximately $190-million in '52 to nearly $205-million in '53. . . . The Service Man was hailed as a key factor in the audio market by many. The general sales manager of one of the nation's largest changer and tape recorder companies in the mid-west said that it is the Service Man who represents the most important source of direct sales. For, it was emphasized, he makes thousands of calls to homes where his comments for or against any product carry a lot of weight, since most consumers consider the able Service Man an expert in his business, and rightly so; as an authority, his recommendations are eagerly sought after and remembered.

POSSIBILITIES OF TAPE were extolled, too, at the show, some declaring that the medium would soon match discs in popularity. This factor was highlighted in announcements that many libraries of pre-recorded tape would soon be available. Last year, the pre-recorded tape was in the experimental stage. Today, it appears to have become a solid item on the audio agenda.

SERVICE...The National Scene

PROPOSED PRIVATE-LABEL PARTS CO-OP BUYING PLAN CENSURED--A new attempt to set up a co-operative parts-buying deal for jobbers, discussed at a special distributor's conference during the Chicago show, has been sharply criticized by many. In one blast, the distributor-sales vice prexy of a New England parts maker, a veteran in the business, said that the move would create chaos. "The proposed co-op buying of private-label stuff at manufacturer's cost or even better all sounds so simple or enticing," said this old timer. "Gullible distributors might well be hypnotized by the idea of getting longer discounts for greater profits, but . . . such merchandise would no longer carry established brand names that inspire confidence. And, we have a precedent to guide us in such a situation, namely, grocery chains who have never been able to kill off brand names in favor of private-brand stuff at lower prices." Continuing, this seasoned merchandising expert said that it took years to bring the radio parts business from basement, attic or back street to main street ground floor, and particularly, to attractive jobber stores. Eliminating that extra margin in the makeup of present list prices and discounts, in his judgment, could easily wipe out all the difference between today's sound merchandising and yesterday's free-for-all grab-bag chaos.

ULTRAHIGHS HOLDING THEIR OWN SAYS COMMISSIONER--Notwithstanding the ringing arguments in Congress and among some broadcasters that uhf is a very sick child, one FCC Commissioner declared during a recent meeting in Washington that the ultrahighs were performing quite a noble service. He pointed out that there are about 129 high-band stations now in operation providing excellent coverage to communities of almost 30 million. Moreover, he added, a recent study has indicated that in 45 communities with uhf stations, more than 50% of the set owners have uhf gear. It was also pointed out that a recent survey indicated that nearly 2-million have had their sets converted for ultra-high reception. . . . Quoting a report of the FCC's chief economist, the Commissioner disclosed that: "Many substantial communities must look to uhf for their only local station, and many others need uhf to obtain an adequate number of program choices. For example, among the 100 largest metropolitan areas of the nation, 35 must look to uhf for the first and second local stations. It is inconceivable that uhf should not succeed eventually in these markets.". . . Defending the parade of station drop-outs, the Commissioner pointed out that the bulk of the returned approvals were solely paper grants or authorizations. . . . The Commissioner admitted that he and his colleagues were apparently too optimistic at the time the station assignment report was issued, feeling then that at least 400-kw output would be available for transmission, and that eventually 1 megawatt would be used. It appears now, he added, that it might be at least a year before these powers will be available. But, he emphasized, even at the lower powers now used pickup is very good in many zones.

IN SUPPORT of this optimistic view, one consultant in Washington declared that not too long ago channels 7-13 were considered quite worthless. And there was a time, too, when even channel 6 was considered very inferior to channels 1 and 2. He also cited the alarm of many when FM was moved from the 40 to 88-mc band. Many bitterly complained that FM just couldn't work on these so-called higher bands. . . . Another expert viewed uhf as completely equal to vhf in coverage and signal clarity in all markets, provided, of course, higher powers were available. In the meanwhile, he added, boosters or satellites, or perhaps community TV, could be used to cover the shadowed areas. . . . In still another viewpoint, a Washington engineer pointed out that the continuing drive to improve rf front ends, and booster and converter design, as well as even more efficient antennas and leadins, will go a long way to brighten the ultrahigh scene.

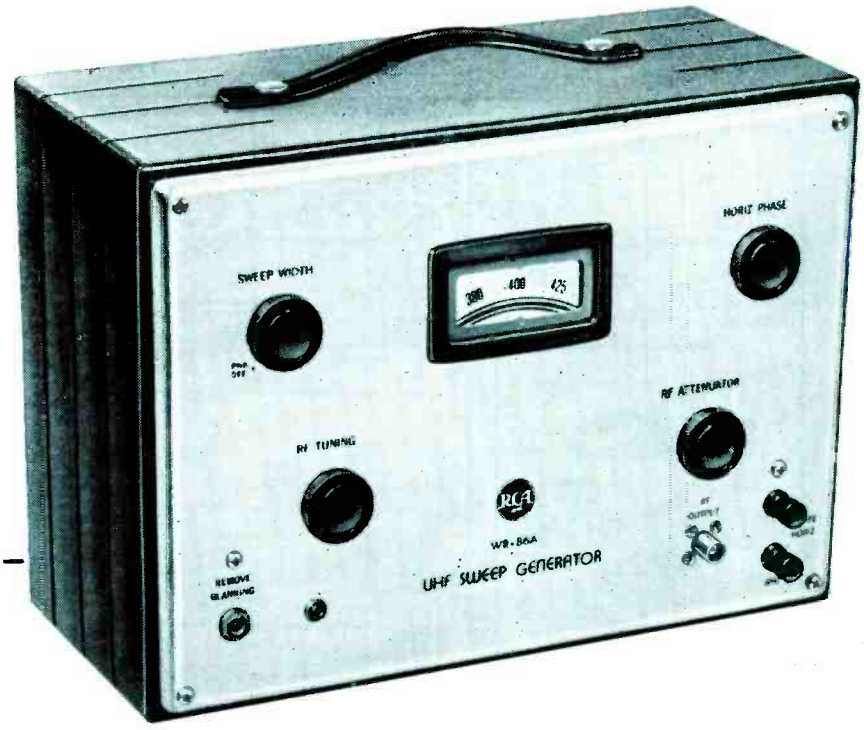
COMMENTING ON THE UHF PROBLEM before a congressional committee, RETMA's prexy declared that it wasn't felt that a reworking of the allocation plan would solve the present uhf situation. It is too late, he said, to go back and re-engineer the general allocation plan, and there would be no point in issuing a freeze at this time. He felt that those uhf applicants who are confident, and have prospects of healthy economic operation on these high bands, should certainly be allowed to proceed. The uhf problem, he felt, is one which calls for a synthesis of expert information and experienced judgment in several fields, of which experimental research and manufacturing is only one.--L.W.

Now—the RCA WR-86A

...a UHF Sweep Generator

for research, production and servicing for the price of a service instrument

only $275.00 (Suggested User Price)



CHECK THESE FEATURES

- **Wide frequency range**—continuous from 300 to 950 Mc.
- **Wide sweep range**—continuously adjustable up to 10% of indicated dial frequency for any frequency up to 750 Mc; up to 75 Mc for frequencies from 750 to 950 Mc.
- **Flat output**—maximum voltage amplitude variation 0.1 db/Mc over swept range.
- **High output voltage**—0.6 volt across 50 or 300 ohms.
- **Wide range attenuation**—continuously adjustable over a range of 60 db.
- **Electro-mechanical sweep** of rugged, time-tested design.
- **Phased blanking circuit** provides essential zero-reference line.
- **Phased horizontal deflection** voltage for oscilloscope.
- **50- and 300-ohm outputs**—balanced 300-ohm output provided by shielded, padded 50- to 300-ohm balun.

Specification

- **Power Supply:** 105-125 volts, 60 CPS.
- **Dimensions:** 13½" long, 9¾" high, 7½" deep.
- **Weight:** 14 lbs.
- **Finish:** Blue-grey hammercid.

Now, for the first time, RCA offers a UHF Sweep Generator having the precision and stability of laboratory types, for the price of a service instrument. Because of advancements in engineering design, the new WR-86A UHF Sweep Generator is suitable for both production-line testing and for general service applications on color and black-and-white UHF receivers, converters, tuners, filters, antennas, transmission lines, and other equipment operating in the range from 300 to 950 Mc.

The sweep oscillator uses an RCA-6AF4 UHF triode in a specially designed circuit providing excellent sweep linearity and a maximum amplitude variation of 0.1 db/Mc combined with a large sweep width.

The oscillator compartment and its associated components are specially designed and sturdily constructed to assure maximum stability and reliable performance over extended operating periods. Critical parts are silver plated, and the entire oscillator section is enclosed in a silver-plated compartment to minimize leakage.

A blanking circuit is included to provide a reference base line on an oscilloscope. Horizontal sweep for the 'scope can be obtained from front-panel terminals.

The RCA WR-86A comes completely equipped with 4-foot rf output cable, 50- to-300-ohm padded balun, and instruction book.

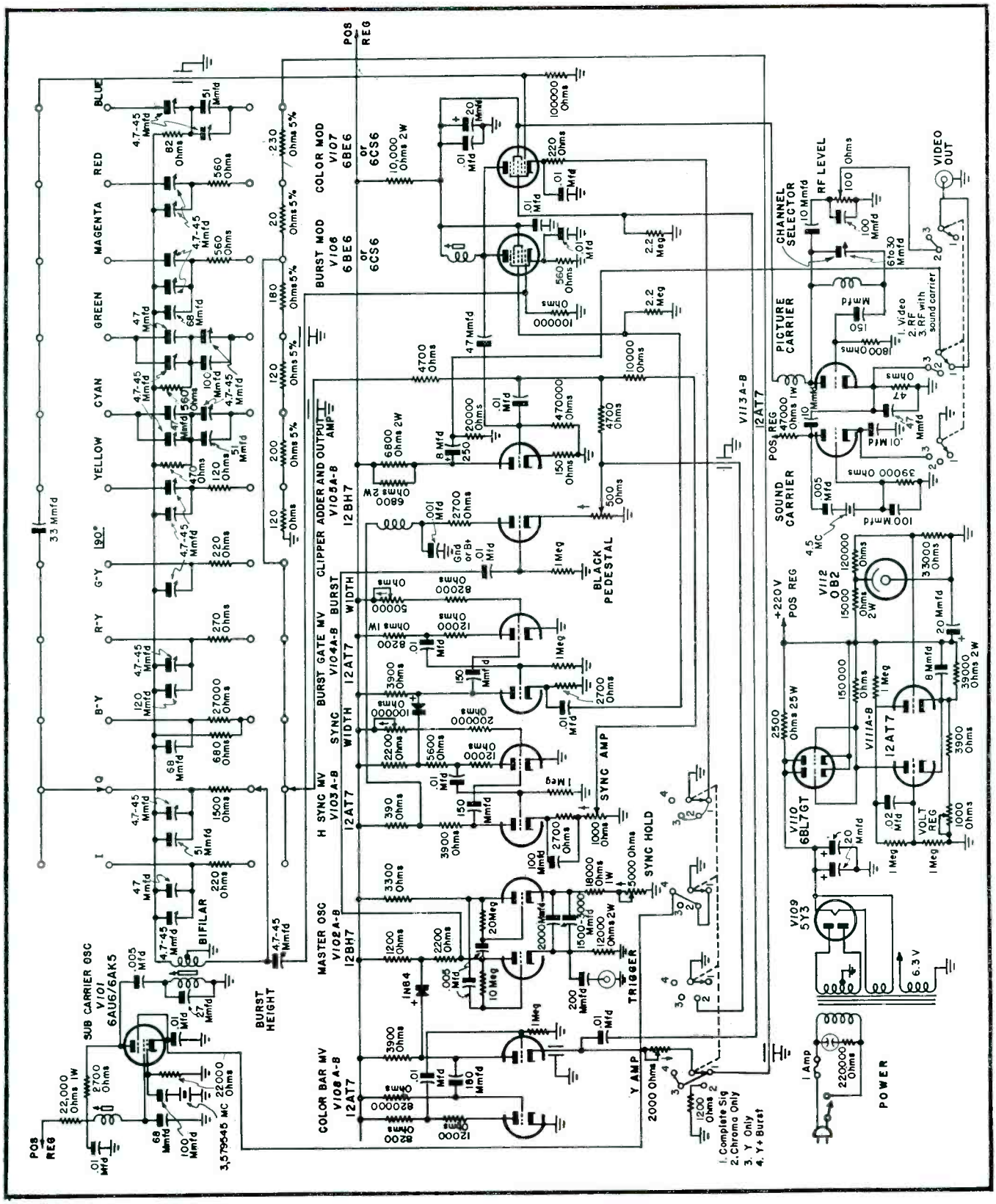
Get full details today from your RCA Distributor or clip coupon and mail to:

RCA Commercial Engineering
Section F-44-W, Harrison, N. J.
Please send me information on the RCA WR-86A UHF Sweep Generator.

Name_____
Address_____ Zone_____ State_____
City_____
My local RCA Distributor is_____

RADIO CORPORATION of AMERICA
TEST EQUIPMENT HARRISON, N. J.

The CRTSA Color TV Symposium: Report 2 On A Color Bar Generator Which Delivers 11 Separate Colors at Press of Individual Buttons



Schematic of Telechrome bar generator which delivers eleven separate colors via a key push-button system.

COLOR TV developments

by A. D. SOBEL

Telechrome Manufacturing Corp.

FOR TEST OR ALIGNMENT purposes a color bar generator has many advantages over a camera pickup or flying spot scanner. Its features are low cost, simplicity of operation, perfect linearity, and freedom from noise. A degree of color saturation not obtainable by any other means, plus the ability to generate color difference signals, make it a most useful instrument.

To generate a composite color TV signal for alignment and test applications, there has been developed an instrument‡ which consists of (in a modified form) a color bar generator, sync and blanking generator, burst gate, color subcarrier, encoder and *rf* oscillators for both sound and picture.

The unit's circuits can be broken down into four essential functions; timing, phasing, modulation and power.

The timing circuits include a color bar multivibrator (V_{106}) master oscillator (V_{102}), horizontal sync multivibrator (V_{103}), and burst gate (V_{104}).

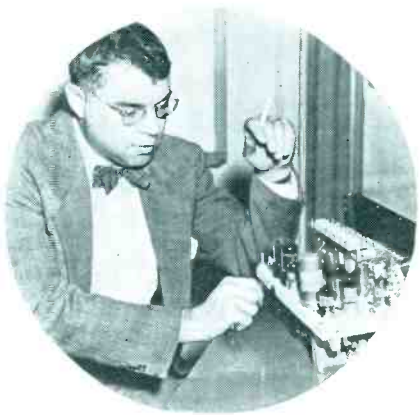
In the phasing circuits are the 3.58-mc color subcarrier (V_{101}) with phasing and attenuating circuits.

The modulation circuit section features burst and color modulators (V_{106} and V_{107}) modulated by color bar signals and *Y*, as phased and attenuated by a push button switch with network, and V_{118A} and V_{118B} *rf* oscillators for sound and picture.

Power supply is regulated, consisting of a 5Y3 rectifier, 6BL7 regulator, 12AT7 for control and OB2 as a voltage reference tube.

The instrument has been designed for either fixed or mobile use.

As a mobile field unit, it is self-contained, depending only on the availability of an *ac* line. As a fixed unit in laboratories or plant production floors, it can be tied into a master system, interlocking any number of instruments, while allowing corresponding test or lab positions to select the correct signals required for any particular use.



J. R. Popkin-Clurman, chief engineer of Telechrome, who analyzed Chromalyzer during the recent CRTSA color TV symposium in Philadelphia.

For the Service Man faced with the problem of checking and aligning home color receivers, the equipment provides all of the standard color signals required.

As a portable unit, in the field where shock is the greatest of all hazards, this generator has been found to be dependable and operative through a wide range of conditions.

Principles of Operation

An eleven-position push button switch is used to select any one of eleven colors, which include the three basic colors (green, red and blue), three complementary colors (yellow, magenta, and cyan), and color difference signals (R-Y, B-Y, G-Y /90°, I and Q). In addition to these signals, black and white bars show simultaneously with all colors.

A selection of four different operating conditions is available.

Position 1: All quantities . . . sync, blanking, burst, black, luminance, chroma, and white.

Position 2: Sync, burst, *chroma, no Y (luminance) signal.*

Position 3: Sync, blanking, black, white, *no chroma, no burst luminance (gray scale).*

Position 4: Sync, blanking, black, *white with burst (no chroma).*

The signal is available at video or *rf* with phase accuracy of all color signals held at 2% or better. A novel feature of this instrument is a signal phased 90° from *G-Y*, called *G-Y* /90°. This signal facilitates matrix checks by providing a null signal for the *G-Y* adder. (Same 90° relationship and balance function as *B-Y* to *R-Y*).

The *rf* portion uses a dual triode. The first half is a 4.5-mc crystal-controlled oscillator; the second half is the picture oscillator, continuously variable from channels 2 to 6. Both signals are fed into a common receptacle on the front panel. The sound portion is switched off when the color signal is properly tuned in.

A connector on the front panel serves to lock the unit with a master sync generator. Pulses can also be obtained from this connector for external trigger applications.

A connector on the front panel serves to lock the unit with a master sync generator. Pulses can also be obtained from this connector for external trigger applications.

The instrument has all the essential elements of a standard RETMA encoder and bar generator except that it does not make a vertical interval. The subcarrier generator V_{101} is a 6AU6 or 6AK5 electron coupled oscillator, tuned to bring the crystal into oscillation. The output is fed through electron coupling to a bifilar phase splitter. The output of this phase splitter, consisting of two 3.58-mc signals of zero and 180° phase is fed to a num-

(*Continued on page* 58)

‡*Chromalyzer.*

Four-Speaker Packaged Hi-Fi Phono

SER-CUITS

[*See Front Cover*]

by M. W. PERCY

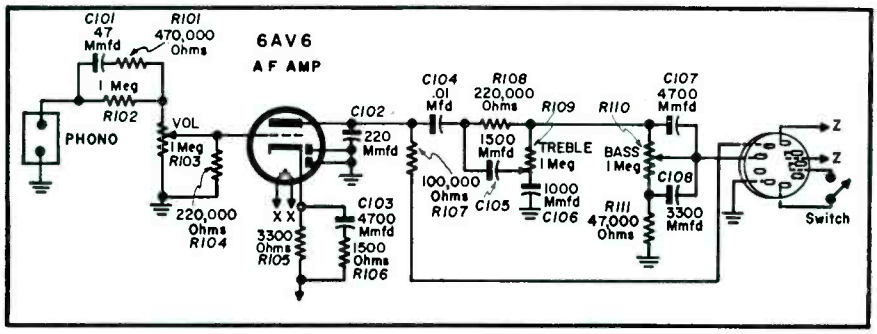


Fig. 1. Schematic of the Magnavox 129 preamp.

THE CURRENT BRAND of packaged *hi-fi* phonos are unique in that they include a number of amplifier circuitry features and components which have been associated with custom-built equipment.

An illustration of this trend is shown in the circuits on this page and on the *cover*, where we have a 4-speaker phono,[1] employing a power amp and auxiliary preamp.

Pickup is provided by a crystal unit with sufficient lateral compliance of the stylus and freedom from stylus resonances within the audible reproduction range.

The preamp[2] consists of a small subchassis containing all operating controls and a single high-gain triode stage. It derives its filament and plate power from the power amplifier chassis by means of a plug-in cable. All compensation required for adjusting the frequency response of the system is performed within the preamp.

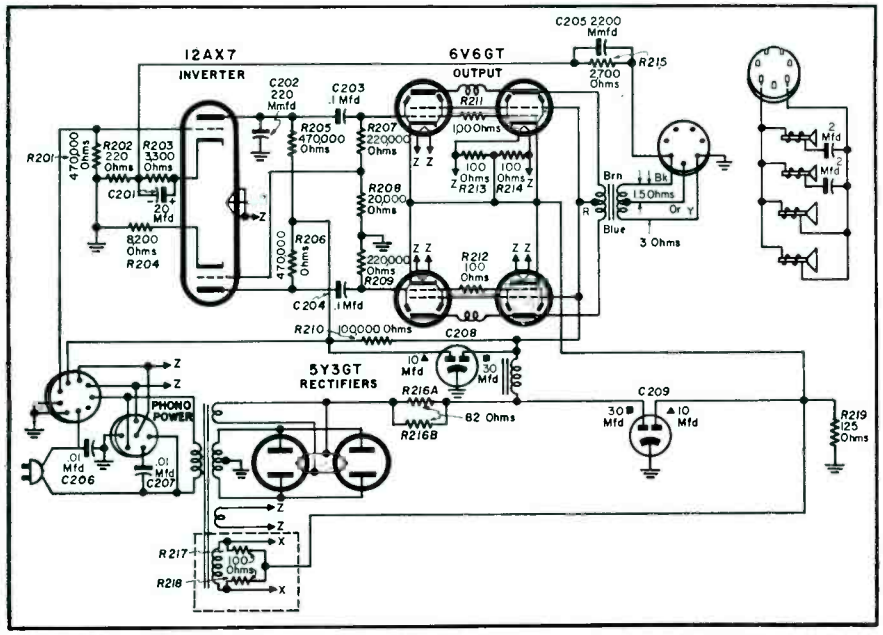
An *rc* network (R_{101}, C_{101} and R_{102}) compensates the output of the crystal pickup to conform to an average of the various recording characteristics manufactured into current phono records.

A 6AV6 triode was chosen as the first amplifier because of its high gain characteristic. The abundance of gain available from this tube allows the use of degeneration in its cathode circuit with its attendant reduction in distortion. A 4,700-mmfd capacitor, C_{103}, reduces the amount of degeneration for frequencies above the middle range, thus allowing a rise in response at the higher frequencies. A 1,500-ohm resistor, R_{106}, serves to flatten the rise in response caused by C_{103} at the top of the treble range. As an *rf* filter, a 220-mmfd capacitor, C_{102}, is used. Since the two diode elements in the 6AV6 serve no useful purpose they are grounded.

The treble-control circuit is a filter consisting of 220,000-ohm and 1-megohm resistors (R_{108} and R_{109}) and 1,500 and 1,000-mmfd capacitors (C_{105} and C_{106}). The series-resistor, R_{108}, by itself provides essentially equal attenuation at all frequencies, but depending upon the setting of the treble control (R_{109}), high frequencies are either shunted around R_{108} for treble boosting or bypassed to ground through C_{106} for

(*Continued on page* 60)

Fig. 2. Circuit of pentode-triode amplifier (model 128) used in Magnavox phono.



From report prepared for* SERVICE *by* ***Charles C. Kayhart,* *Magnavox Service Training Director, and* ***Dan Graef,*** *designer of the Magnavox phono system detailed in article.*

[1]Magnavox Magnasonic. [2]Magnavox 129.

TRIO, LEADER IN ANTENNA DEVELOPMENT

NOW PRESENTS

most complete line in the industry!

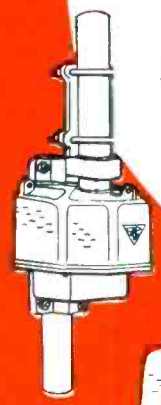
No matter what antenna type is your favorite, TRIO now makes it—in better quality construction and at lower cost!

This is possible because TRIO has installed its own tube mill, added the most modern tool and die department, built a new production plant—and manufactures its own components. TRIO can thus control production and offer higher quality and better performance at *substantially lower prices.*

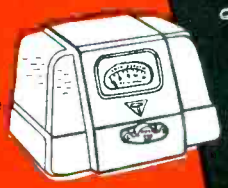
You are assured of fast delivery too, because TRIO now owns and operates its own trailer trucks, the most modern fleet in the industry.

See your jobber or write for the new TRIO catalog. It describes the most complete line available.

Illustrated below is only part of the TRIO line

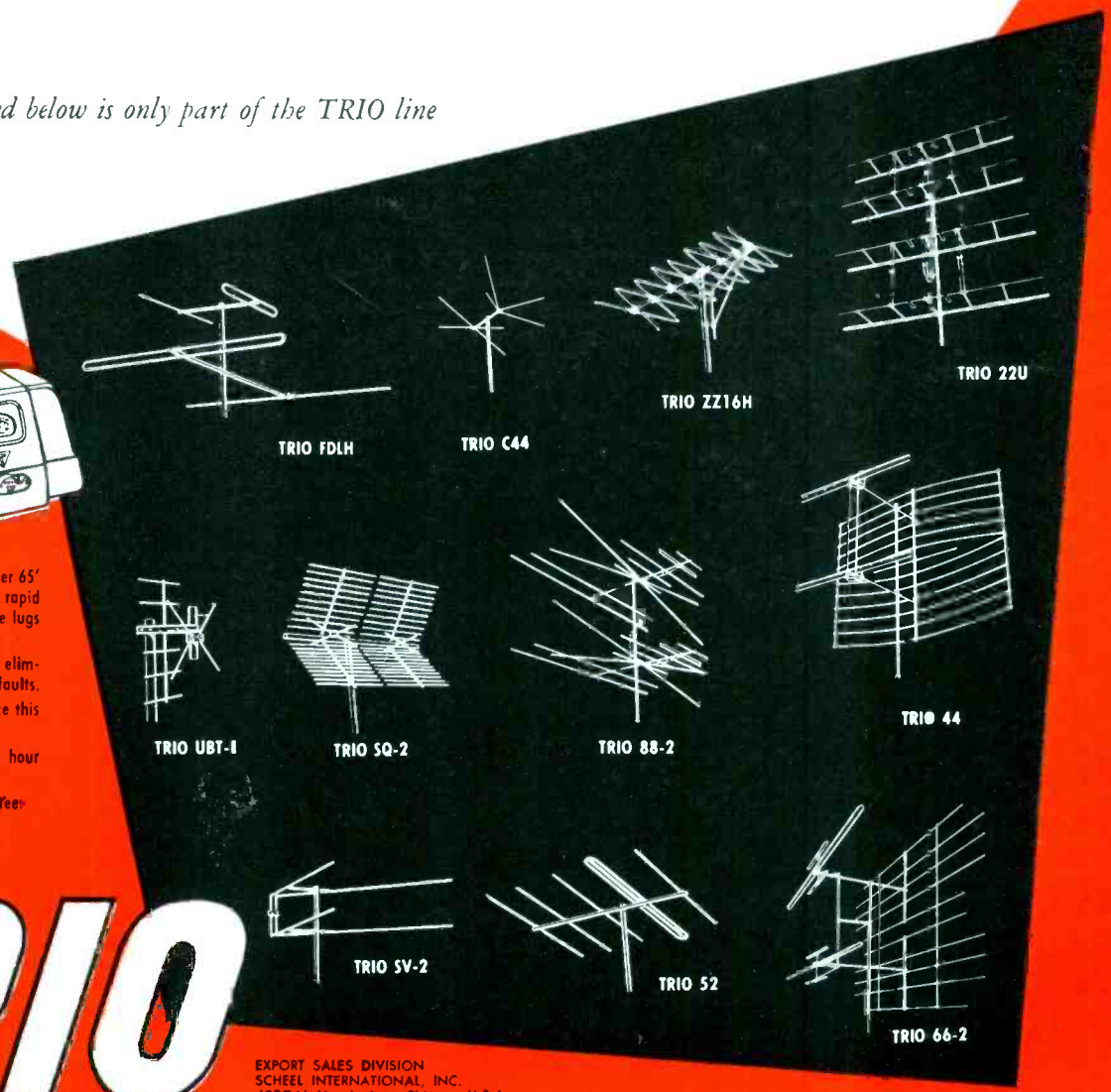


Available in Blonde or Mahogany



ONLY TRIO HAS THESE FEATURES:

- Now available pre-wired with either 65' or 90' of control cable for the most rapid installation. Merely connect spade lugs to control case terminals.
- Each rotator checked with its cable; eliminates defective cable and wiring faults.
- Not a single rotator returned since this feature added.
- Only rotator that receives a two hour bench test.
- Only rotator with two year guarantee.



TRIO

EXPORT SALES DIVISION
SCHEEL INTERNATIONAL, INC.
4237 N. Lincoln Ave., Chicago, U.S.A.
Cable Address: HARSCHEEL

TRIO MANUFACTURING CO. • GRIGGSVILLE, ILLINOIS

COLOR TV Servicing

by D. J. MARISEN

Part II of CRTSA Color Symposium Report on Admiral Color Chassis‡:

Servicing the Matrix Network . . . Sync and Chrominance Stages

WHEN A 3-gun color set is used for b-w operation, many odd effects might obtain. In the Admiral color-chassis report, last month, reviewing these factors, it was pointed out that since the appearance of white on the color screen depends upon each electron beam striking its dots with a certain intensity, any change that disrupts this condition will produce a coloring of the picture tube on the screen.

For example, if the red system is somehow prevented from supplying its electron gun with enough driving voltage, then the number of electrons striking the red phosphor dots will decrease, leading to a lowered intensity of red light. This will permit the green and blue light to predominate and the image will assume an over-all bluish-green (or cyan) hue.

These three conditions, while causing color to appear on an otherwise b-w picture, are distinguishable from each other. Misconvergence, for example, will cause the red, green and blue colors to be seen individually and will tend to give the effect that the picture is defocused. Misconvergence may affect only one area of a screen or it may affect the entire image.

For the second condition, when the chrominance channel is permitting extraneous signals to pass through it, the only visual effect we can obtain is one that affects the entire image. Furthermore, there will be no definite pattern to the colors produced; that is, a random sprinkling of colors will appear.

Finally, when one of the color channels beyond the matrix network is affected, the visual effect is as though a filter were placed over the screen, coloring all of the light that passes through it. If each of these distinctions is kept in mind, the Service Man should have little difficulty in picking out the circuit where the trouble is located.

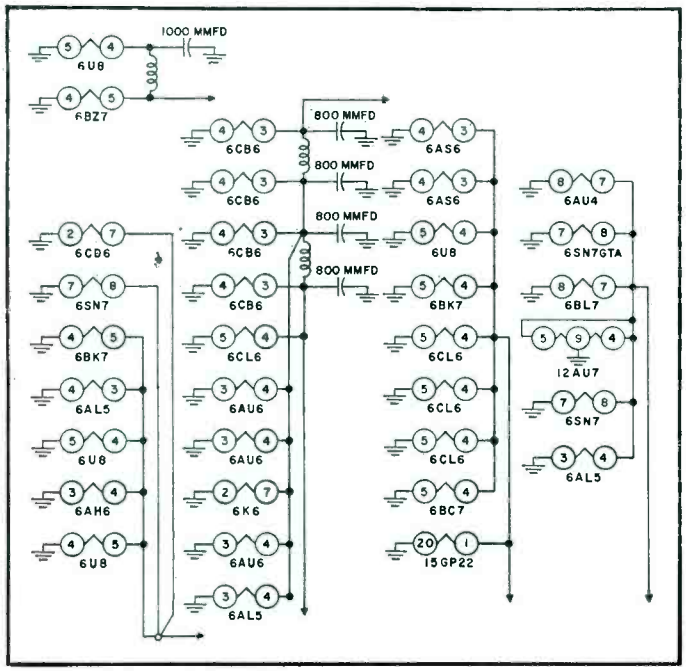
The color section of the receiver includes the color sync system and the chrominance stages. The chief function of the color sync system is to generate a 3.58-mc signal which possesses the proper phase. This latter condition is most important because when this 3.58-mc signal is recombined with the *I* and *Q* sidebands, the colors that are produced on the screen will be directly governed by the phase of the 3.58-mc signal.

The generated subcarrier may go awry, and the first inkling a Service Man will have of this will occur when one complains that the colors in the picture are *all wrong*. A good reference color is a person's flesh tones. A color test pattern is another reference, although this will appear rather infrequently. Probably the best check can be made with a color bar generator. This instrument develops a number of bars each having a specific color. If every one of these colors is improperly reproduced on the screen, then the color sync section may not have the correct phase output or may be malfunctioning.

As noted, at present, Admiral sets have a concealed front-panel auxiliary control called color fidelity. Rotation of this control will cause the various colors in the image to change and if, at some position, the colors return to their proper hue, then we can normally assume that the only trouble was control misadjustment. However, if no position of the control can be found where the correct colors are obtained, then trouble in the color sync section is indicated.

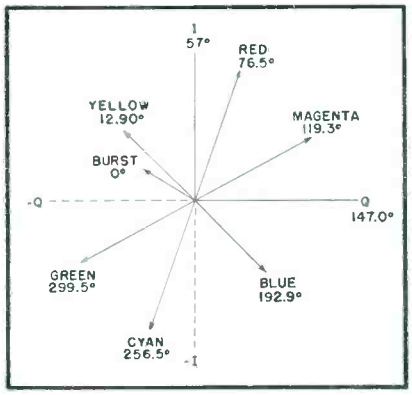
There is another condition that can lead to incorrect picture colors and that will occur if the 3.58-mc signal fed to the *I* demodulator is not exactly 90° out-of-phase with the 3.58-mc signal applied to the *Q* demodulator.

Progressing deeper into the color section, we see that there are two channels through which the color signals travel. These are the *I* and *Q* channels, each complete with its own demodulator or detector, its own amps



Filament circuitry of complete b-w and color-tube lineup in Admiral receiver.

‡*Based in part on information appearing in Admiral manual,* Introduction to Color Television, *and* ***talk*** *on color circuitry presented by* ***Frank F. Hadrick,*** *director of Admiral color-TV service training, during Philadelphia color-TV symposium conducted by* ***ye editor*** *and co-sponsored by the Council of Radio and TV Associations of Philadelphia.*



Color vector phase diagram. The axes are displaced to Q and I vectors in horizontal and vertical positions. (Courtesy Admiral)

and its own phase inverters and phase splitters.

If a defect occurred in these channels, the I and Q, certain types of information would be observed on the picture screen. To analyze let us study the equation for the Q and I signals; $Q = .21R - .52G + .31B$; $I = .60R - .28G - .32B$.

It will be noted that the predominant component of the Q signal is that contained in the green voltage. Hence, any lowering of amplification in the Q channel will most markedly affect the green in a picture, either by lowering its intensity or else removing it altogether. The visual effect on the eye is thus to accentuate whatever reds there are in the picture.

On the other hand, if the I channel is affected, then we see that the predominant color in this signal, *red,* is reduced in saturation or eliminated altogether. The visual effect on the eye is thus to accentuate or point up the green and blue left in the picture.

There is another and better way of analyzing a picture in terms of the colors it will lose when one of the channels (either I or Q) is defective; that is, by working with a color phase diagram, illustrated above. Here different angular positions represent different colors. The I and Q axis or vectors are also shown in the drawing, and by carefully noting their positions with respect to the colors around the chart, it can be seen exactly what happens when either the I or Q signals are adversely affected.

Let us consider the I signal first. It is positioned close to the red vector at one end (actually, a reddish-orange) and near cyan (blue-green) at the other end. This means that the I signal carries information concerning reddish-orange and blue-green. If we reduce the I signal, or remove it altogether, then only the Q signal is left and this latter signal is positioned between blue and magenta, and green-

(*Continued on page* 59)

Service Engineering — field and shop notes

by

THOMAS K. BEAMER

Servicing and Maintaining Communication and All-Wave Chassis

THE REPAIR of *communication* receivers and multi-band short-wave sets, sometimes owned by *hams,* but often by just Mr. and Mrs. Listener, represents an extremely lucrative activity for the Service Man.

The chassis used in most models embody special circuits and features not often found in home-type receivers, and demand skillful service plus accurate testing equipment. To trouble-shoot the crystal filters, beat-frequency oscillators, variable-selectivity *if* transformers, *rf* gain controls, noise limiters, bandspread tuners, etc., employed, one must have a thorough understanding of the basic circuit principles involved.

General Features

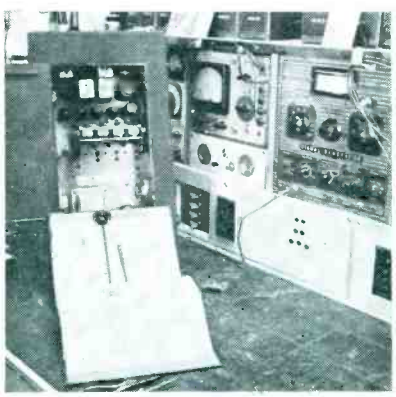
Basically all models are superhets, with one or even two stages of tuned *rf* amplification. Some use separate oscillators, some the familiar pentagrid converter. At least two, and occasionally as high as four stages of *if* amplification are found. Some, as mentioned, use crystal filters in the *if*'s, and a beat-frequency oscillator (*bfo*) is almost standard equipment. Detectors are diodes, with often a separate diode for *avc,* often run through a switch to enable one to switch it out of the circuit if desired. Output stages may be either single-ended or push-pull class *A*. Noise limiters will be found in many of the larger sets, using usually the *Lamb noise silencer* circuit, originated a few years ago by *Charles Lamb,* and very effective in eliminating partially the effects of pulse-type noise. Tuning meters, the *S-meter* of the ham, are used too; these are usually merely *avc* meters, reading the developed *avc* voltage, serving to indicate the strength of the received signal. Many sets incorporate separate gain controls, one in the conventional audio grid circuit (labelled *af gain*), and an *rf* gain control in the *rf* cathode circuit. Quite a few chassis have a *send-receive* switch on the front panel; this removes the *B* voltage from the receiver, leaving it in a *standby* condition. These switches are used, in the main, when the receiver is tied to a transmitter, to prevent blocking of the receiver when the transmitter is keyed.

Based on report prepared for SERVICE *by* ***Jack Darr.***

Special Circuits

The *bfo* is simply an oscillator, operating 1 kc above or below the set's *if*. A set using 456 kc *if,* for instance, would have the *bfo* set at 457 or 455 kc. Usually a pentode is used, with an oscillator transformer, in a tickler-feedback circuit, turned on or off by a *bfo* switch on the front panel. This is sometimes marked *cw,* since it permits the reception of unmodulated or continuous-wave (*cw*) telegraph signals. As these signals have no tone modulation, they would normally be inaudible, making only a small puffing sound in the speaker. In effect, the *bfo* adds the modulation to the signal after it is received. The output of the *bfo* is coupled into one of the *if* circuits, usually the last, by means of a *gimmick,* or a very small capacity formed by winding one or two turns of wire from the *bfo* transformer output around the plate lead of the last *if* tube, not connected in any way, but coupled. The signal from the *if* beats with the *bfo* signal, resulting in a 1-kc beat note, which is heard as a *beep*. The tone of this note may be altered by a very small trimmer, located on the front panel, labelled the *bfo pitch control*. This changes the *bfo* frequency by a few cycles, so that the operator may adjust it to the tone he likes best; average tones run from 400-1,000 cps. Service on these is generally simple; if the tube is good, and the transformer windings not open, it will oscillate. Incidentally, if the need arose, this circuit could be added to any broadcast receiver, by using a standard *if* transformer and an additional tube. One need only hook up the transformer and the tube to form a *tptg.* (*tuned-plate-tuned grid*) oscillator circuit, add a switch, and couple it into the last *if* plate lead with a turn or two of insulated wire.

Tools needed to service communication-type receivers: Test instruments, tuning-tools, and manuals.



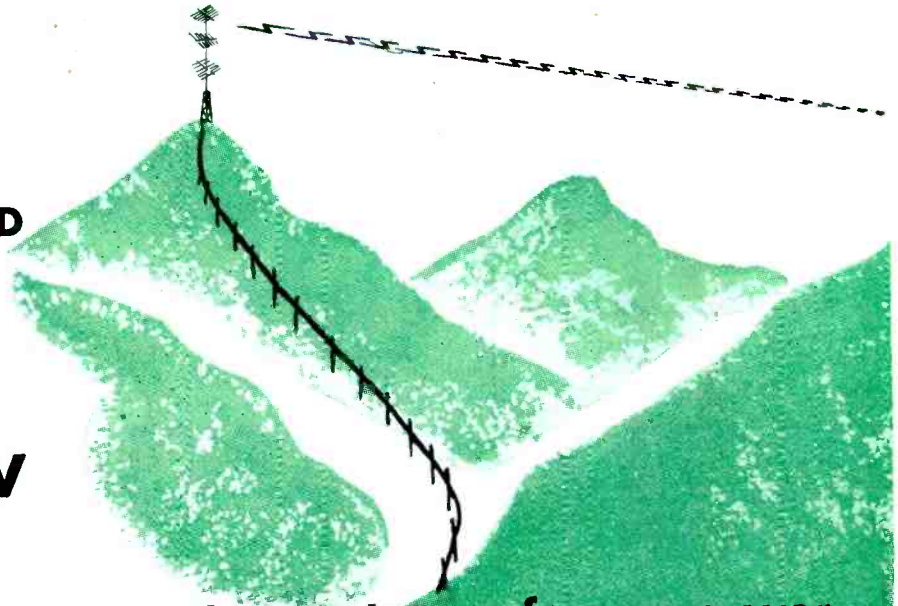
Variable Selectivity IF

Many of the larger sets use variable selectivity *if* transformers. The means of accomplishing this vary with individual designers, of course. Hallicrafters, a few years ago, in their *Super-Skyrider,* used extra or tertiary windings on the last two *if* transformers, which could be switched in or out of the circuit, for *broad* or *sharp* tuning. Hammarlund's *Super-Pro* uses ganged, variable slugs, which can be moved in or out of the *if* coils, thus varying, in effect, the coupling and changing the selectivity. A bandwidth variation of from 3 to 15 kc is possible with this system. In the narrowest position, the selectivity curve obtained is a mere *spike,* and in the broadest

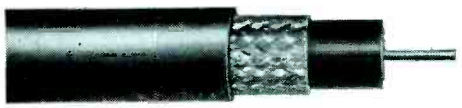
(Continued on page 38)

CONQUERORS of CANYONS!

Federal's QUALITY-CONTROLLED BIG 5 COMMUNITY TV LEAD-INS



Engineered to give your customers top performance over the longest link . . . with fewer amplifiers needed!



K-14 — Primary Lead-in

RG-11/U — Secondary Lead-in

RG-59/U — Tap-off Lead-in

NON-RADIATING LEAD-INS

K-125 — Alternates for RG-11/U

K-126 — Alternates for RG-59/U

SWEEP-TESTED

TO ORDER—*backed by notarized proof!*

Federal's K-14—the primary lead-in famous for lowest line loss, long cable runs and fewer amplifiers—and Federal's RG-11/U and RG-59/U are the coaxials you can specify with utmost confidence . . . for Community TV Distribution Systems in any area . . . for any amplifier system.

When profit-eating signal leakage occurs the answer is Federal's K-125 and K-126 (non-radiating alternates for RG-11/U and RG-59/U).

All five are made to Federal's high standards of quality—and that means dependable, all-weather transmission . . . anywhere!

ORDER SWEEP TESTING—BE *DOUBLY* SURE!

Upon request, Federal will sweep test K-14, RG-11/U and K-125 . . . check attenuation from 50 mc up to 220 mc . . . for VHF channels 2 to 13. A notarized statement certifies that the test has been made . . . that attenuation does not vary over .5 db from the nominal values throughout the spectrum. There is a small additional charge for this valuable service.

Be *doubly* sure you're getting today's finest lead-ins for Community TV . . . specify Federal's "Big 5" . . . backed by sweep testing!

Principal Characteristics of Federal's "Big 5" of Community TV

TYPE	ZO Impedance Ohms	Capacitance per ft. micro-micro farads	DB per 100 Feet 50Mc	100Mc	200Mc	400Mc	Jacket OD Mils	Weight per 1000 Ft. (lbs.)
K-14	71	21	.57	.90	1.42	2.3	885	392
RG-11/U	75	20	1.5	2.15	3.2	4.7	415	89
RG-59/U	73	22	2.7	4.0	5.7	8.5	250	36
K-125 (5P-75)	75	20	1.5	2.15	3.2	4.7	470	127
K-126 (5P-76)	73	22	2.7	4.0	5.7	8.5	325	79

America's leading producer of solid dielectric cables

FEDERAL TELEPHONE & RADIO — FTR — DIVISION OF IT&T

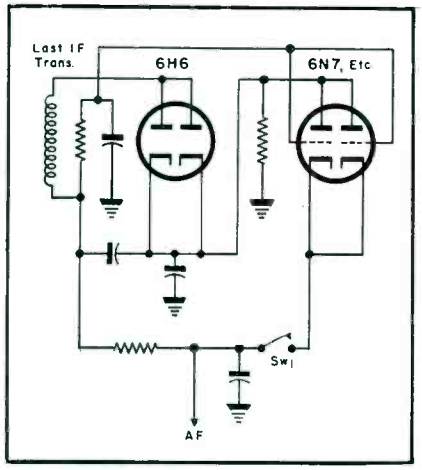
Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

COMPONENTS DIVISION 100 KINGSLAND ROAD CLIFTON, N. J.

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

WRITE DEPT. D-256 for complete data on Federal's "Big 5" of Community TV and Certified Sweep Testing



Typical noise-limiter circuit, as used in Hammarlund model 200 series. This is a clipper-type limiter, intended to remove impulse noise, such as auto-ignition. Switch SW1 may be used to remove the limiter from the circuit if not needed.

position, the curve is very flat-topped and the bandwidth large.

IF Crystal Filters

Crystal filters in the *if*s use a crystal ground to the exact *if* frequency, and are connected in series, so as to provide razor-sharp selectivity, when needed. These are usually used only on code, for the bandpass is so narrow causing severe distortion to voice or music. Special trimmers provided on the panel, labelled *crystal-phasing*, serve to balance out the capacitive effects of the crystal-holder and other parts for best reception. The switch is provided so that the crystal may be switched in or out.

Tuning Drive Features

Slow-speed tuning drives are used for fine tuning; most sets have some sort of *bandspread* arrangement. This usually consists of a small auxiliary variable, mounted close to the main tuning capacitor, and connected in parallel with it, just as the trimmers on a broadcast receiver. These controls have their own dial, calibrated from 0-100. The front end and oscillator must be aligned with the bandspread set correctly; otherwise calibration will be off.

Frequency Ranges

Frequency coverage of these receivers is usually wide.

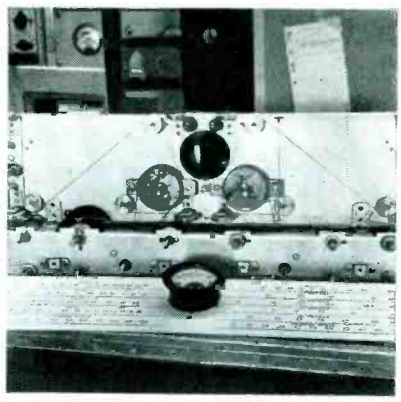
The Hallicrafters' models for instance, cover a range of 540 to 62,000 kc, in six bands without skips. Most of the other models cover approximately the same frequencies, with the addition of the amateur FM band; this is used for ham narrow-band operation.

Calibration

Communication receivers are usually very accurately calibrated. The accuracy of calibration depends largely upon the correct alignment of the *if* stages. Most sets use at least two stages of *if* amplification. This means that there are at least three transformers to align. The *if*s run close to conventional broadcast sets, 455, 456, 470 kc, etc. One must have the manufacturer's alignment instructions on hand before any alignment is attempted, for location of trimmers and transformers vary widely with different manufacturers, and some require special procedures for alignment.

IF Alignment

Alignment of the *standard if*s follows conventional procedure, if no crystals or variable-selectivity stages



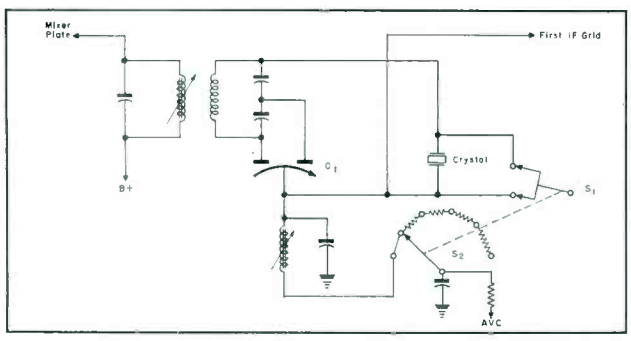
Rear view of communications-type receiver illustrating slow-speed tuning drive mechanism, including a band-spread setup which features an auxilliary variable capacitor in parallel to main tuning variable.

are used. For best results, all stages should be peaked with an output meter, and then an FM signal applied, with the response curve checked on a 'scope. In this way, any tendency toward instability or oscillation may be readily detected and cured. Exchanging the *if* amplifier tubes may remove any tendency toward small oscillations, although replacement may be necessary if oscillation is severe enough.

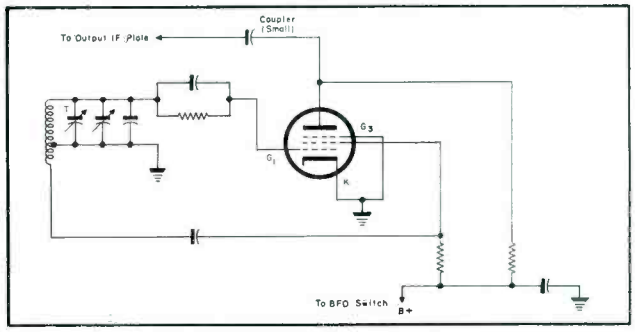
Incurable oscillation or renegeration in the *if*s may be due to defective screen bypasses or open plate return bypasses. Quite a few sets use individual 1,000-ohm filter resistors and bypass capacitors (usually .05 mfd) on the plate return for each stage. Individual screen-dropping resistors and bypasses are occasionally encountered, although they are rare. Because of the high sensitivity of these *if* amplifiers, extra care must be taken to make the alignment job good.

[Next Month: Crystal Alignment]

Typical crystal-filter circuit. Tapped switch and resistors are used to vary degree of selectivity of crystal filter. S_1 shorts out crystal when not used in circuit. Variable C_1 is used to tune-out capacitive effects of crystal holder to sharpen circuit.



Typical bfo circuit. This particular one, an eco, operates at a frequency only one kc from the if frequency, thus giving approximately a one-thousand cycle beat note, depending on the setting of the pitch-control trimmer, T. The pitch may be varied to suit the liking of the operator.



50 YEAR TUBE COMPANY ASSOCIATES

Harvey W. Harper, left, chairman of the board, and Louis Rieben, president, of Tung-Sol Electric, Inc., who recently observed their 50 years of association at a gala reception-banquet in Newark, N. J., attended by leading radio-TV-electronic engineers and executives, and key members of Tung-Sol. All at affair received a handsome souvenir, a 60-page photo-story book, describing Life at Tung-Sol. The two New Jersey industrialists, who met when Harper hired Rieben as his first office boy, have worked together since 1904.

19-INCH TRICOLOR TUBE

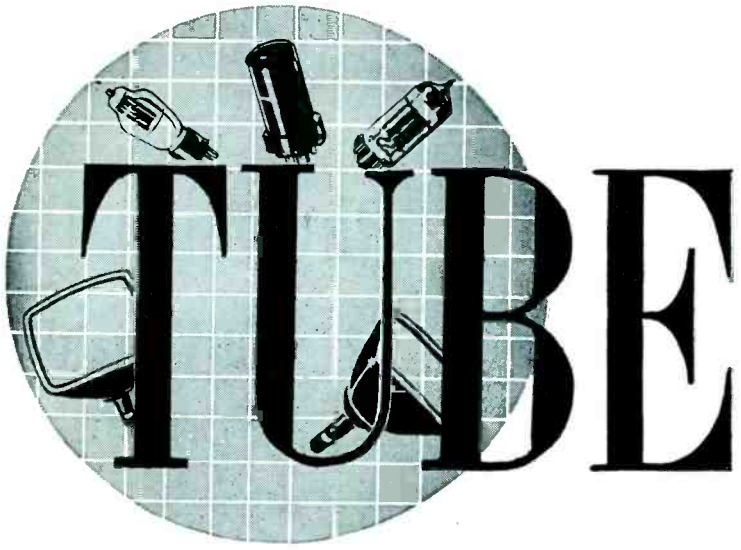
Dr. Allen B. Du Mont with the three-gun (narrow beam) Du Mont 19-inch Chroma-Sync color tube, which has a viewing area of 185 square inches.[1]

HEADLINER IN TUBE CONTEST

Stan Musial, St. Louis Cardinal outfielder, who is featured in Westinghouse Electronic Tube Division's League Leaders and Dealers Aid baseball contest, discussing contest with John A. Ritz, Penn Hills Electric, Pittsburgh service dealer, leading contestant in Pittsburgh area.

[1]National Scene, SERVICE; May, 1954.

Automatic Damping in Vertical Deflection Circuits...Headlight Dimming Tubes



TUBE News

by E. A. TEVERSON

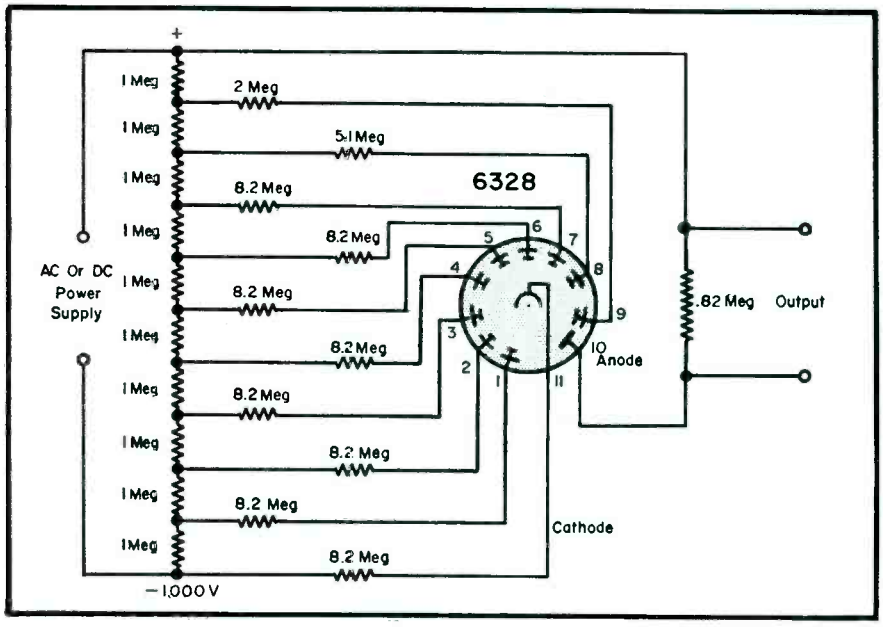
THE DESIGN of vertical output systems in conventional TV receivers is governed by the deflection requirements of the picture tube and the character of the scanning currents required to deflect the tube's electron beam. In transformer coupled output circuitry, adjustments must be provided to obtain linear output and regulate the height of the raster. Fixed constant circuits are usually employed to damp the transient voltages developed during rapid reversal of the scanning currents. Adjustable control of transient damping has seldom been employed due either through neglect or the lack of importance attached to its effect on performance characteristics.

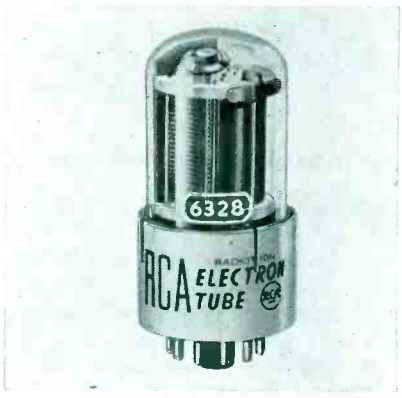
Discussing the problems and means of controlling such transient damping at the recent IRE annual meeting in New York City, *H. E. Thomas, S. DeMars* and *M. Jones*, of Federal Telecommunication Labs, said incorrect damping circuit performance can affect the linearity at the top of the raster, although these effects attract little notice since poor scanning performance in this region does not usually persist after the blanking is completed. It has been noted that there are times when it is desirable to view an entire perfect raster when adjusting for wide ranges of height; at such times, an unsuitably damped transient will distort the scanning lines and even carry on into the useful viewing region enough to distort its linearity. Changes in vertical driving oscillator output also affect damping, it was noted, since its governing factors vary with the voltage drive applied to the output tube.

In conventional receiver circuits, this transient is damped almost entirely by the plate resistance of the output tube; the exact amount of damping was described as being determined by the degree of preshaping of the grid driving voltage waveshape during the retrace period. This grid voltage reflects control on the amount of plate resistance over which the output tube is allowed to operate and thus regulates the shunting effect in damping transients during this period.

Reviewing preshaping of the driving sawtooth waveshape, the *crt* experts said this is done in the sawtooth generating circuits by what is commonly known as peaking of the waveform; superposition of the initiating sync pulse, appearing at the generator grid, on the most negative portion of the retrace section of the sawtooth waveform. Circuit-wise, this is accom-

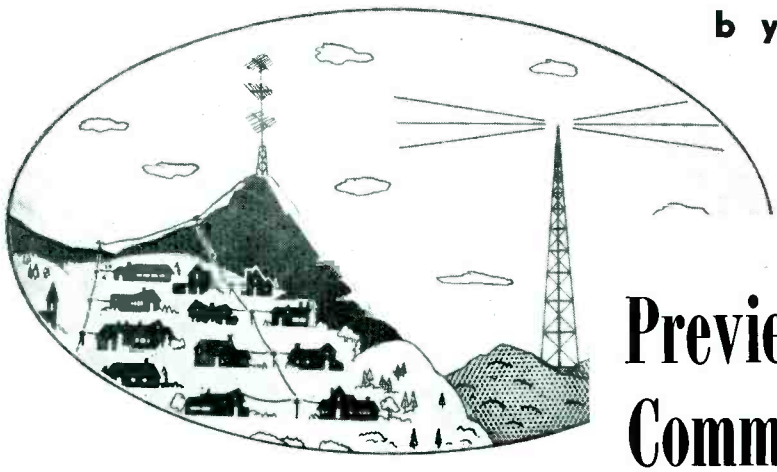
(*Continued on page* 59)





Recommended voltage-divider network for RCA 6328 phototube in headlight-dimmer service. This net has been found to provide linear operation within the range normally required for dimming. At higher light levels, the network design limits the tube output to a safe value. The design values indicated provide dimming operation for an anode current in the range between 5 and 10 microamperes.

by WYN MARTIN



Preview of Third Annual Community-TV Convention

COMMUNITY TELEVISION, which has become quite a factor in industry during the past few years, with over 300 systems planned or operating, will be heralded during a bristling three-day June convention in New York City, sponsored by the National Community Television Association.*

On view will be exhibits of new developments in coax, preamps, chain amplifiers, towers, antennas, feeders, special hardware, etc. Technical clinics, held under the direction of the country's outstanding specialists, will feature reports on a variety of community-TV problems. In addition, general sessions will cover system administration, promotion, telecasting, legal and tax matters.

Booster, Satellite and Relay Talks

Discussions on transmission will include an analysis of boosters and satellites and multi-channel community-TV systems, and their effect on the future of the art,[1] by *Milt Shapp* of Jerrold. The subject of microwave signal relaying for community TV use[2] will be covered by *T. G. Morrissey* and *William Daniels* of C. T. Systems, Casper, Wyo.

Subscription TV and Color Reports

Problems and progress achieved in subscription TV[3] will be analyzed by *Carl Maurer,* International Telemeter Corp. And color TV and its relation to community TV[4] will be reviewed by *R. C. Abbott* of RCA.

In another important session *Sidney Pickles* of Mag-Electrical Products, will cover antenna arrays for reduction of co-channel and adjacent interference.[5]

The heart of the community system, the amplifier, will receive considerable attention. Amplifiers in general use in community systems[6] will be described by *Caywood Cooley* of Jerrold. And *Fitzroy Kennedy,* of Spencer-Kennedy Labs, will detail the theory and operation of chain type amplifiers[7], while single channel amplifiers[8] will receive the attention of *Don Kirk* of Jerrold.

Cables and Radiation

Cables, often described as the arm of the *CT* system, will be analyzed by *E. J. Merrell,* of the research department of Phelps-Dodge; he will review semi-flexible air dielectric Styroflex coax cable for CT.[9] And, the critical problem of radiation from community TV cable systems,[10] will be discussed by *Dr. Walter Brown, Jr.,* U. S. Wire and Cable consulting engineer.

Dr. Brown will review the symptoms, methods of measurement, and consequences of cable system radiation. Mechanisms by which various system components produce radiation will be described and the effects of different system design practices considered. Methods for reducing radiation in existing systems will be thoroughly discussed.

Transmission line design, operational characteristics and installation techniques will be the subject of a paper by *Leon Brodsky*[11] of Federal Telephone and Radio Corp.

Moderators

Martin F. Malarkey, Jr., prexy of the association sponsoring the convention will serve as chairman of the opening and business sessions. *Dr. Frank G. Kear,* partner in the consulting firm of Kear and Kennedy, will moderate the second and third sessions, during which papers on amplifiers, color TV, coax, and boosters and satellites will be presented.

Business Sessions

During the business sessions, streamlined accounting systems[12] will be disclosed by *Edward J. Mallon* of the William E. Howe Co. The general legal problems facing the CT industry[13] will be reviewed by *E. Stratford-Smith* of Welch, Mott and Morgan, a Washington firm, and a report of tax problems[14] will be offered by *E. P. Morgan* of the same company.

Charles Snitow is serving as manager of the show.

Martin F. Malarkey, Jr., president of the National Community Television Association, who is also in charge of committee on arrangements for the June convention, the third annual meeting of the group.

*Meeting will be held at the Park Sheraton Hotel, June 14, 15 and 16.

[1] *Tuesday, June 15, 3:45 P.M.*
[2] *Monday, June 14, 3:15 P.M.*
[3] *Tuesday, June 15, 1:15 P.M.*
[4] *Tuesday, June 15, 11:15 A.M.*
[5] *Monday, June 14, 1:45 P.M.*
[6] *Tuesday, June 15, 9:00 A.M.*
[7] *Tuesday, June 15, 9:45 A.M.*
[8] *Tuesday, June 15, 10:30 A.M.*
[9] *Monday, June 14, 2:30 P.M.*
[10] *Tuesday, June 15, 2:00 P.M.*
[11] *Monday, June 14, 4:00 P.M.*
[12] *Wednesday, June 16, 9:00 A.M.*
[13] *Wednesday, June 16, 9:45 A.M.*
[14] *Wednesday, June 16, 11:10 A.M.*

THE GREATER TRi-PLEX

BY JENSEN

The new TRi-PLEX is the result of further research directed toward the enhancement of all the qualities for which this famed Jensen 3-way system has been noted.

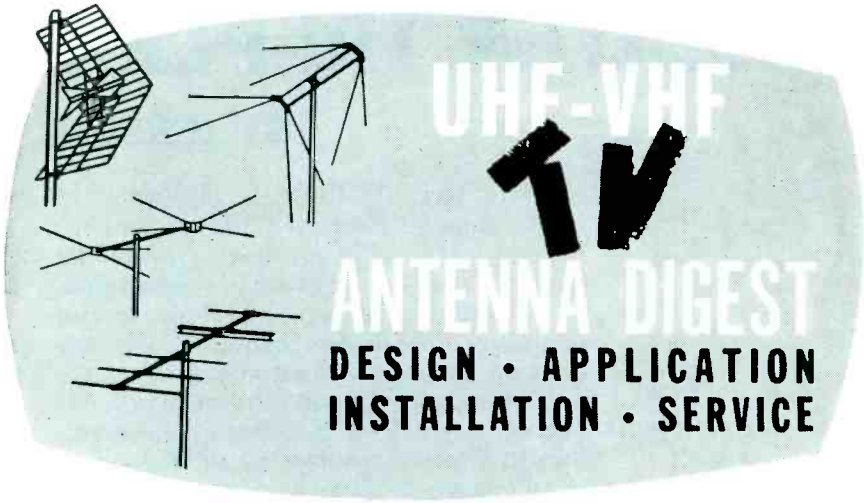
Musicians, record collectors, sound engineers and laymen contributed to the concept and participated in the five years acoustical research and exhaustive psychoacoustic tests. Even the slightest false coloration effects have been eliminated—there is no raucous tinkle or exaggerated percussion, stridency is missing from the violins. And there is an extreme smoothness of response and a precisely adjusted intra-range balance—the individual instruments stand out in true dimensional separation. The vocalist steps out in front of the musicians. You're bound to agree that here is fine listening indeed.

At **$312.70** net the TRi-PLEX in mahogany factory assembled complete with individual certificate of performance—in korina blonde **$316.80** net. Jensen back-loading improved bass cabinets only—Model BL-220 (12-inch speakers) mahogany **$89.50** net, korina blonde **$92.50** net—Model BL-250 (15-inch speakers) Mahogany **$128.00** net, korina blonde **$130.90** net.

Burton browne advertising

Jensen

MANUFACTURING COMPANY
DIVISION OF THE MUTER COMPANY
6601 S. LARAMIE AVENUE, CHICAGO 38, ILLINOIS
IN CANADA: COPPER WIRE PRODUCTS, LTD., LICENSEE



Operation and Use of Interaction Filters*

by RALPH G. PETERS

To RECEIVE all the available channels in any given area, television Service Men are, with increasing frequency, facing the necessity of installing two or three separate antennas. The problem of multiple antenna installation raises the question of whether one should use separate leads or combine all the antennas into a single transmission line. Many installation men have indicated their preference for the latter for reasons of economy, appearance and efficiency, not to mention the convenience factor on the part of the set owner.

When two or three different antennas are installed for use with a single transmission line they must be tied together and isolated with an interaction filter. If these antennas were to be tied to a single transmission line without a filter, trouble would arise from two sources:

(1) The antenna(s) not being used would shunt the antenna that is being used, causing an impedance mismatch and consequent signal loss.

(2) The antenna(s) not being used are likely to pick up undesired side lobes and pass them down to the set, creating ghosts, noise, and other serious interference.

Interaction filters serve to isolate electronically the antenna(s) not being used.

In trying to design interaction filter networks so that antennas operating on the different bands can be combined into a single transmission line, two problems must be solved.

(1) The filters must be made broad enough so that they will cover the entire band (or bands) to be filtered out.

(2) It is necessary to maintain a good impedance match to each antenna and to the transmission line going to the set.

The low-high *vhf* and *uhf* bands with which we are concerned have different bandwidths; this fact must be considered in designing the filter. The width of each band, (expressed in per cent) is arrived at by this formula:

$$\%Bw = \frac{W}{F_m} \times 100$$

Where: $\%Bw$ is percentage bandwidth
W is total width of band
F_m is mid-frequency of band

In applying this formula to the three bands we find that the *vhf* low band has a width of 49.4%; the *vhf* high band, 21.5%; *uhf*, 61.8%.

There are two possible approaches to the problem.

The parallel resonant circuit can be used. This will present an impedance to any current attempting to pass through in accordance with the curve shown in Fig. 1. It can be seen that at the resonant frequency it will present a very high impedance and therefore very little current will be passed. As the frequency varies off resonance, in both directions, the impedance decreases rapidly and the current will flow more readily. The bandwidth of this type of circuit may be increased by lowering the Q. This results in a much broader curve, as shown in Fig. 2, but it also results in a considerable loss of efficiency.

A filter composed of this circuit can be designed up to a bandwidth of approximately 20%. Since, as we have seen, the bandwidth of the *vhf* high band is 21.5%, this circuit can be applied to a filter for combining *vhf* high and low-band antennas into a single transmission line. Such a filter is shown in Fig. 3.

Let us see how this filter works, when a *vhf* low-band antenna is connected to the appropriate terminal. Since the circuit is tuned to the middle of the high band, or 195 mc, it will present a low impedance to the low-band current and therefore it will pass with negligible attenuation. The low-band antenna will also pick up high-band currents, but they will not be passed through the circuit, because the filter presents a high impedance to these currents.

If a high-band antenna is connected to the set terminal, the high-band currents picked up by this antenna will feed directly to the set. Since this antenna will not pick up low-band signals, no filter is needed between the high-band terminal and the set terminal.

Our first prerequisite for an effective filter has been met, for the circuit

(*Continued on page 65*)

Fig. 1. Impedance curve of a high Q parallel resonant circuit. F_o = resonant frequency of circuit.

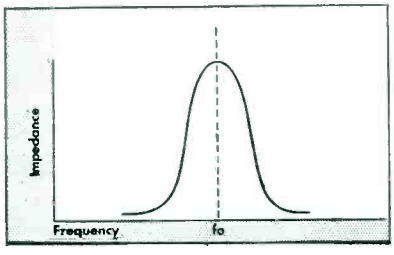


Fig. 2. Impedance curve of a low Q parallel resonant circuit. F_o = resonant frequency of circuit.

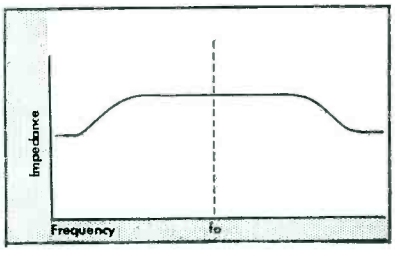
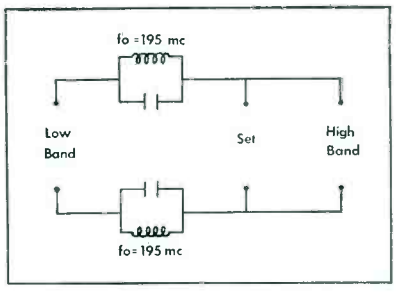


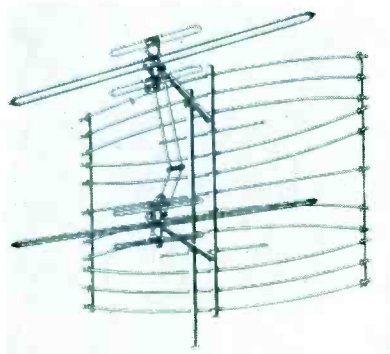
Fig. 3. Parallel resonant circuit applied to a filter.



New VHF/UHF Antennas, Leadins, Lightning Arresters, Tuners and Rotators

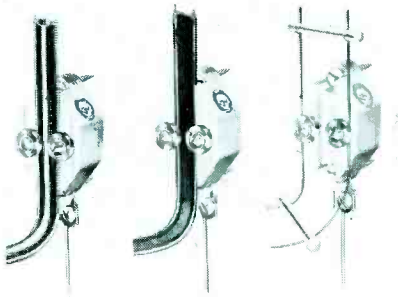
UHF-VHF TV leadin that employs a moisture proof cellular polyethylene core claimed to eliminate moisture and maintain constant characteristics. Core is constructed of separately sealed cells filled with inert gas. Conductors are embedded in outer wall of brown polyethylene. No end seal is said to be required. (8275 Celluline; Belden Manufacturing Co., Chicago, Ill.)

Multiple-TV set coupler for use with three receivers. Available for dual and four-set feed. Circuit arrangement is said to permit the use of less than the maximum number of sets for which a unit is designed without loss of signal. Can also be used in multiple to feed a number of sets. Measures 2½"x4½"x¾" deep. (820-2-3-4; Technical Appliance Corp., Sherburne, N. Y.)



All-channel vhf antenna available for fringe areas and with ½-wave spacing for super-fringe areas. Antenna combines dipole assembly with a radar type, double bulls-eye reflector screen. Uses 1/10 wavelength spacing in the reflector elements. (Tri-King TK 1500 and TK 1800; Clear Beam Antenna Corp., 100 Prospect Ave., Burbank, Calif.

Coax-type uhf converter in 6½ x 4⅛ x 4⅛ plastic cabinet, which features preselection, circular continuous-tuning dial, selector-power switch, and an additional stage of amplification. (Challenger SLU; Granco Products Inc , 36-17 20th Ave., L.I.C., N.Y.)



Lightning arrester for uhf-vhf flat, tubular or open-wire leadin. Unit is resistor type with cavity around resistors filled with a compound to provide perfect seal. (114-328; American Phenolic Corp., Chicago 50, Ill.)

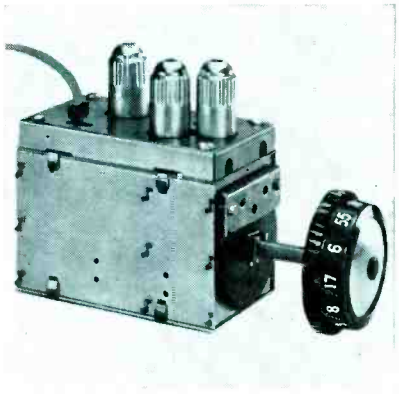
UHF converter that features a shielded tuner, two-stage pre-selector, and continuous vernier tuning at approximately 20:1 ratio. Converter operates on channels 2 through 6. (CT-1; The Astatic Corp., Conneaut, Ohio.)

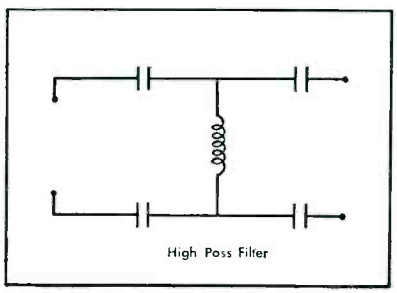
(Left)

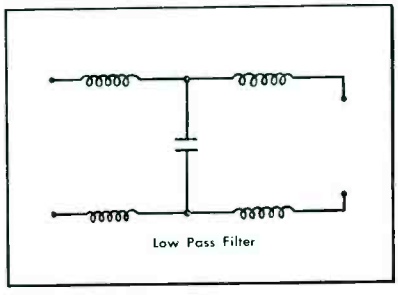
Clock-antenna, consisting of an electric automatic clock and swivel-top uhf-vhf indoor antenna with 6-position switch. Unit, which has brass elements and matching trim with mahogany-colored base and ball, automatically turns TV set on at a predetermined time. Shown demonstrating device is Martin Bettan, sales manager, flanked on the left by Sidney Pariser, president, and Sam Shaw (right) N. Y. rep. (C1-2 Clock-Tenna; RMS, 2016 Bronxdale Ave., New York 62, N. Y.)

(Right)

Turret tuner for 82-channel uhf-vhf operation. Employs two 6AN4s, one used as an rf amp which functions on all 82 channels, and the other in place of a crystal mixer, which is said to provide a gain rather than conversion loss. A 6T4 oscillator operates at the fundamental with full output claimed even on channel 83. Pretuned fixed frequency channel segments can be snapped into rotor; accommodation for total of 12 channels available. (TV 900; Anchor Radio Corp., Chicago, Ill.)

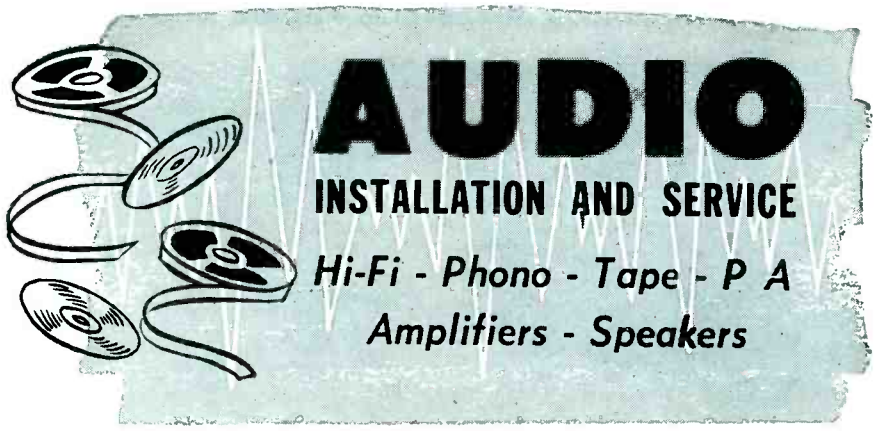






Figs. 4a (left) and b (right). Configuration of high and low-pass filters.

From an exclusive report prepared for* SERVICE *by* **Sam Schlussel, *Channel Master Corp.*



Phasing Speakers for Best Results in Public-Address Systems‡

by KEN STEWART and PAUL EDWARDS

IN PUBLIC-ADDRESS system installation, servicing and maintenance, phase is an extremely important factor.

To illustrate, differences in phase can be noticed even when there is only one loudspeaker being used; this is due to acoustic echoes from various wall surfaces, resulting in sound from the original source being heard along different paths with time differences. In single-speaker installations careful placement of the speaker can minimize this echo effect, giving the best intelligibility for the conditions in the particular hall. Larger auditoriums, however, benefit by the use of more than one speaker, and here it becomes very necessary to give careful attention to phasing.

Every building has its natural reverberation or echo characteristics; to minimize the time-difference effects due to the reflections, rather than to emphasize them, one must pay attention to phasing.

If speakers are so arranged that individuals can hear the sound coming to them from opposite sides, then some are bound to notice a time difference because only a few listeners can occupy the available positions that are equidistant from the two loudspeakers. This is illustrated at Fig. 1. A setup of this type offers a strong argument against the placement of loudspeakers so that listeners might hear sounds coming to them from opposite directions. At the same time an aim in any good installation should be to arrange sound projection so that any one in the audience will only hear sound coming to them from one general direction, preferably in front.

It is in this type of installation that the question of phase becomes important. Let us consider the arrangement of loudspeakers shown in Fig. 2, which represents a square type of auditorium with all the speakers arranged along one wall. If all these speakers issue their soundwaves in phase, the effective total sound will be that of a plain wavefront travelling from one side of the hall to the other; if the listeners were facing the wall on which the speakers were placed, individual listeners would hear the sound coming from a point opposite to them on this wall. However, if one of the speakers were out of phase, one in the field of this loudspeaker would experience a confusion of sound, since this loudspeaker, in conjunction with its neighbors, would produce a crossways sound field pattern. There would then obtain the effect of an exaggerated echo, not noticeable to other listeners where the soundwave would be correctly concentrated. This point is illustrated at Fig. 3.

A similar problem arises when the loudspeakers are so suspended from the ceiling that they are at an equal

Figs. 1 and 2. Below we have a condition that one should avoid. Here most of the listeners are not equidistant from the units they can hear. At top is a typical example calling for correct phasing. With the units phased, as shown, there will be a progressive sound wave, and echo effects will be minimized.

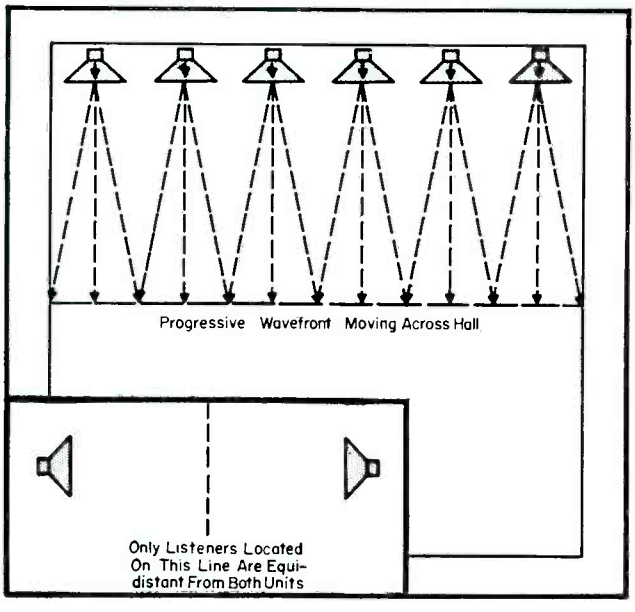
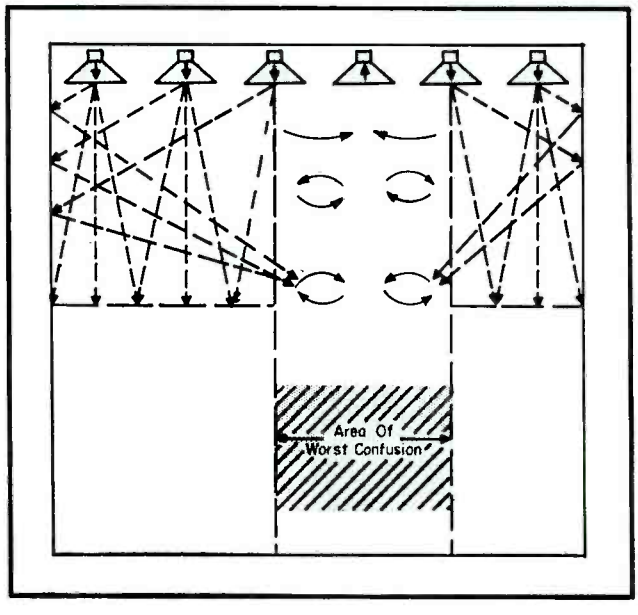


Fig. 3. In the arrangement of Fig. 2, a unit out of phase would produce an area of confusion, with the progressive wave almost absent, and echoes much more pronounced.



distance from the floor. In such an installation the output should again be in phase; in this case a minimum level can be used to avoid unnecessary echo effects. If one loudspeaker is out of phase with the rest, those in the vicinity will again experience the kind of confusion mentioned and the natural echo effects of the auditorium will be exaggerated at this point rather than minimized.

How can one check phasing to insure that all loudspeakers are in phase? Most loudspeakers are designed so that if all of the left-hand terminals are connected to the same side of the line and all the right hand terminals to the other side of the line, a positive pulse from the left to the right-hand side will cause all the loudspeaker diaphragms to move in the same direction. However, often one does not use loudspeakers produced by the same manufacturer; in such cases there is no guarantee of the phasing consistency between these models. It is then that some means of phase checking must be used.

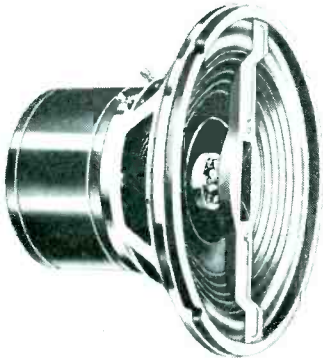
One phasing method available is to apply a *dc* potential from, say, a flashlight battery to the terminals of the loudspeaker unit, observing which way the diaphragm moves. Then one can mark the terminal to which positive must be connected to make the diaphragm move foreward. However this method is not valid when a transformer is included in the loudspeaker, because the *dc* surge through the transformer causes the diaphragm to move both ways in quick succession, and sometimes it is difficult to see which way the initial pulse of *dc* moves it.

For this reason, and also because wiring is not convenient to phase, it is simpler to check phasing after the loudspeakers have been placed in position. This can be achieved by carefully listening to the sound field that they produce in combination. To do this one should feed some suitable sound, such as music in which there is preferably a wide range of frequencies, and stand equidistant from the two units being checked. Then, facing the two units and moving slightly, one should listen carefully for the position when both units offer equal loudness. When this position has been found, and if the units are correctly phased, the apparent source of sound will be between the two units in front of the listener; but if the units are not correctly phased, the apparent source of sound, when the two units

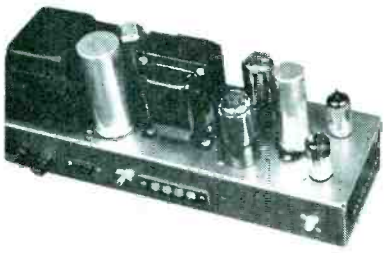
(*Continued on page* 61)

‡*Based on report prepared for* SERVICE *by* ***Norman Crowhurst.***

New Audio Equipment: Speakers, Enclosures, Amps, Tape Recorders

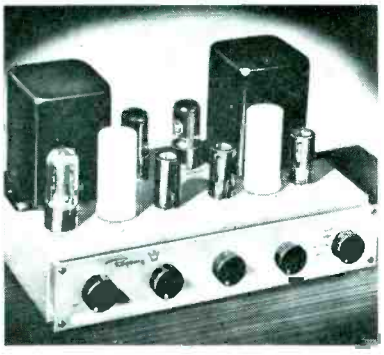


Concentric-type 12" and 15" 3-way loudspeakers which combine a veryhigh frequency driver, treble propagator, and bass cone in one assembly. Can be installed in direct radiator type cabinets or in E-V recommended folded horn enclosures. Has ½ section m-derived crossover network. Edgewise wound voice coil design. Models 12TRX and 15TRX; Electro-Voice, Inc., Buchanan, Mich.)

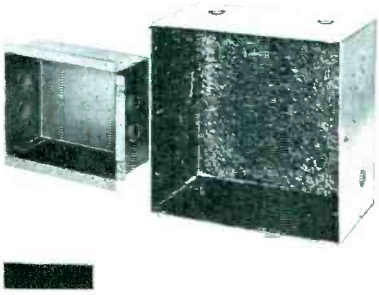


Ten-watt Williamson type linear amplifier. Frequency response said to be 20 to 30,000 cps, +1 db; total harmonic distortion less than ½% at full rated output. Output lead impedance 4-8-16 ohms. Inverse feedback; 20%. Tubes include one 12AT7 voltage amplifier and phase inverter; one 12AU7 driver; two 6V6 beam power in output, and one 5Y3 rectifier. (Model 920; Freed Electronics and Controls Corp., 200 Hudson St., N. Y. 13.)

Hi-fi phono with 3-speaker system; two 5" x 7" and one 6" x 9", plus bass reflex chamber. Has a loudness control and an auxiliary input for playing AM, AM-FM radio or TV tuner. Auxiliary output for external speaker is also provided. Additional features include a 5-watt amplifier, muting switch, and ceramic cartridge with twin sapphire needles. (Model 560 Fidelis; V-M Corp., Benton Harbor, Mich.)



High fidelity amplifier with preamp and power supply. Has five controls: bass, treble, loudness, level control and record compensation and input selector. Tube complement: One 12AX7 (magnetic pickup amp and compensator); one 12AU7 (amp and equalization); one 12AX7 phase inverter; two 6V6GTs in push-pull stage and one 5Y3GT rectifier. Rated output of 12 watts; frequency response 20 to 40,000 cps within ½ db. (Model HF-150; Regency Division, I.D.E.A., 7900 Pendleton Pike, Indianapolis 26, Ind.)



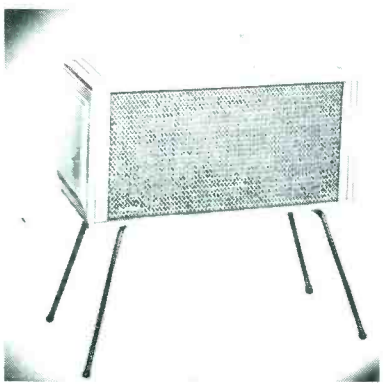
Speaker enclosures featuring heavy undercoatings. Many models are available with adjustable plaster flanges. Have ¾" knockouts for pa and intercom wall and ceiling installation. Speaker boxes are constructed of 18-gauge steel. Depth range 4"-9". (Lowell Manufacturing Co., 3030 Laclade Station Road, St. Louis 17, Mo.)

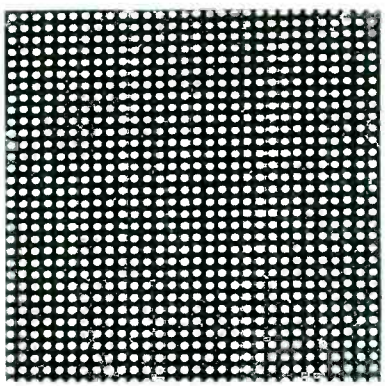
Portable two-speed tape recorder with tape index timer, two-speaker woofer and tweeter, record ready light, automatic shutoff, built-in magnetic pickup preamp, monitor switch, pause button, dual imput jacks (multi-purpose), dual output jacks and microphone. Other features include 7½" and 3¾" tape speed control, record level distort light, individual bass and treble controls and record safety switch. (Model 700; V-M Corp.)

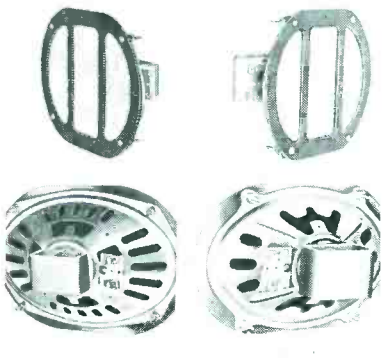
Cabinetry for Duette (with 8" woofer, multicell horn compression driver tweeter, and built-in dividing system) line of two-way hi-fi loudspeaker systems. Available in mahogany and blonde oak. Size: 23¼" l, 11" h and 11" d. Weighs 21 pounds. (Jensen Manufacturing Co.)

Speaker grille with perforated fiber that is said to omit need for grille or grille cloth backing. (Acousto Grille; Walsco Electronics Corp.)

Rear deck speaker kits featuring 6" x 9" and 5" x 7" elliptical speakers. Both speakers have 2.15-ounce Alnico V magnets and ¾" voice coils. Kits are complete with hardware and grille plates. (Models RD-69 and RD-57; Oxford Electric Corp., 3911 S. Michigan Ave., Chicago, Ill.)







Rep Talk

WALLY B. SWANK, of the Empire chapter of The Reps, has been elected national president. *Dean A. Lewis,* California chapter, was elected first vice president; *Ross C. Merchant,* Wolverine chapter, was named second vice president; and *John J. Kopple,* New York, third vice president. *Harry Hulinton,* of Chicago, will serve as national treasurer, and *Dave M. Lee,* Pacific Northwest chapter, national secretary. . . . *Lee Rocke* and *Sam Egert* have been elected to the board of governors of the N. Y. chapter of the Reps. . . . Mississippi Valley chapter has changed its name to *Great Midwest* chapter. *Theodore B. Lowell* has been elected president. Others elected include: *Herbert Knaggs,* vice president, and *Norman W. Kathrinus* (reelected), secretary-treasurer. . . . A directory of products and services of member reps and their manufacturers will soon be distributed throughout the New England states by the New England chapter. *Henry P. Segel* is chairman of the directory committee, assisted by *Ray Perron* and *K. C. Stevens.* . . . *Forrest C. Valentine* has been elected president of the Hoosier chapter. . . . *Robert Whitesell* has become vice president; *Charles N. Hoemig,* secretary; and *Walter Bieberich,* treasurer. . . . *Howard Feiner* has joined the staff of Land-C-Air Sales Co., 42 Oak Ave., Tuckahoe, N. Y. Feiner will head a branch field engineering office in Syracuse and will cover upstate New York. . . . *William C. Cartwright,* Dixie chapter associate member, died recently. . . . *George Petitt* has moved to 349 Ashland Ave., River Forest, Ill. . . . Other rep moves include: *Yale Saffro* to 227 W. Chicago Ave., Chicago 10, Ill.; *Bruce Cumming,* now at 6029 W. Belmont Ave., Chicago 34; *Allen I. Williams* to 124 W. 12th Ave., Denver, Colo.; *R. C. Nordstrom,* now located at 530 N. Woodward Ave., Birmingham, Mich.; *Don H. Burcham Co.* to 510 N.W. 19th Ave., Portland 9, Ore., and *Frank C. Nickerson Co.* is now at 901 Bernina Ave., N.E., Atlanta 6, Ga. . . . *Logan Sales Co.,* 530 Gough St., San Francisco, Calif., has been named rep for Astron Corp., in Fresno and northern California. . . . *W. E. Pugh, Jr.,* will handle hi-fi merchandising sales at R. Edward Stemm, 5681 W. Lake St., Chicago. . . . *Lowry-Dietrich Co.,* Pittsburgh, Pa., are now reps for Oxford Electric Corp., in western Pennsylvania, West Virginia and the border counties of Ohio. *Joe Clancy and Co.,* have added Ohio to their coverage for Oxford. . . . *L. J. Smith Co.,* has been named rep for Pickering and Co., in southern California. . . . *Zimmer Sales Co.,* 21 East Bloomington St., Iowa City, Iowa, have been appointed reps for the Winegard Co., in Iowa, Nebraska, Kansas and western Missouri.

John Zimmer

by T. L. GILFORD

Design and Installation of Hard-of-Hearing Devices for Private TV Chassis Listening . . . 45 Spindle Bending Cure

TO ENABLE THE hard-of-hearing to listen in to TV programs comfortably, and without disturbing others, it is necessary to install a control system. There are several types of controls that can be used.*

In one method, evolved recently, using *armchair control*[1] *automatic volume compression* has been included. A *hot wire* volume compression circuit automatically compresses loud passages so essential in some cases of deafness. Tone control is also available. A low cut of nearly 6 db per octave can be achieved in this system by alternating output sockets from *normal* to *high*. This unit also includes an *extension cord*, a 12′ round twin-conductor cord, designed to be connected in parallel to the speech coil of the loudspeaker, or plugged into extension speaker sockets. For listening, a low-impedance magnetic earpiece is supplied.

In another model,[2] automatic volume compression has been replaced with a balanced switch, a 5-ohm load taking the place of the speech coil when the loudspeaker is switched off; this serves as a hearing aid for the hard-of-hearing listeners without picking up and amplifying backroom noises.

*SERVICE: January, 1954.
[1, 2]Adaphone models M-3 and M-5; Fenton Co.

Installation

In connecting up the unit, the wire which connects the speech coil of the TV loudspeaker to the secondary of the output transformer should be broken. In the event one side is connected to the chassis, the other connection should be broken. Care must be taken that the connection to the speech coil only is severed.

Then the green lead in a 3-wire cable is connected to the tag on the speaker and a red lead to the tag on the speaker transformer in place of the wire removed. A black lead should now be connected to the other tag on the secondary transformer, in addition to the existing connection.

For safety each unit is subjected to a 2,000-*v* transformer leakage safety test, a safety margin much higher than that for which many of the conventional home appliances are tested. For additional protection, if the set has a floating secondary, it can be grounded. If the secondary of the output transformer is connected to a hot chassis, the unit should not be grounded.

[3]From Magnavox service notes.

Phono Flutter Correction[3]

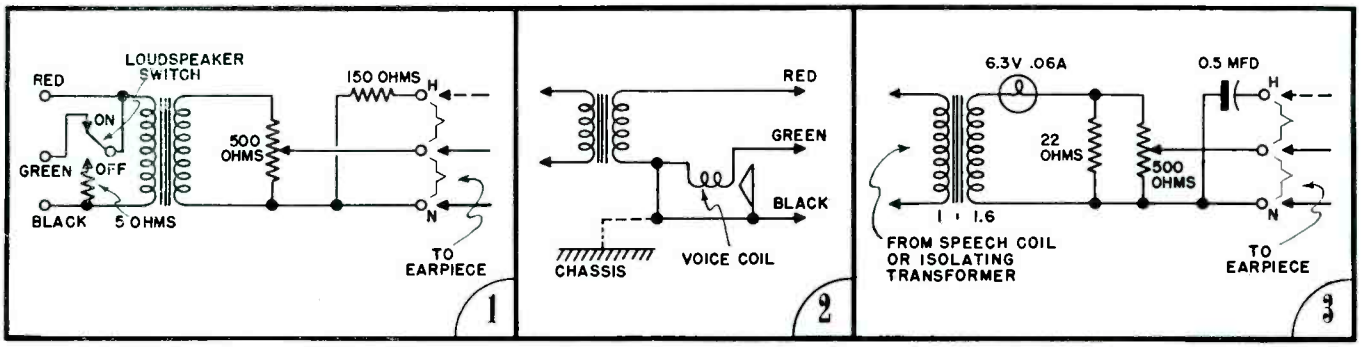
If certain frequencies have a tremelo or fluttering sound while records are played on current Magnovox record changers, this can probably be corrected by increasing the vertical friction of the pickup arm.

The pickup arm should be lifted to a 45° angle and with a pair of long-nosed pliers the left side of the hinge assembly should be bent as shown in Fig. 2. One should bend outward or in the direction that will increase the friction between the pickup arm hinge and its mounting assembly.

Bending Adjustments

Care should be exercised in bending; one should not bend too far or the pickup will not track properly. In other words, the needle will not move up and down as necessary to ride the full area of the record grooves. If this vertical friction is increased beyond the required amount one should bend back slightly and check adjust-

Fig. 1. At left, schematic of hard-of-hearing unit, with balanced switch, connected to TV chassis. Center circuit shows ground connection that can be made if receiver transformer has a floating secondary. At right is circuit of unit with automatic volume compression system. H and N indicate high and normal tone response available.



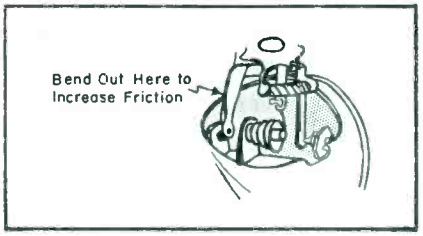


Fig 2. Removing flutter by increasing friction between pickup arm hinge and its mounting assembly. (Magnavox.)

ment with a record to determine if the flutter is eliminated.

Use of Gram Scale

If a gram scale is handy, the scale should be read while lifting the arm; then a new reading should be taken while lowering the arm. When the difference between the two readings is one gram, the vertical friction of the pickup arm is correct.

If in some cases, the flutter cannot be eliminated by the adjustment described, the record changer motor may be at fault and should be replaced.

45 Spindle Bending Cure[4]

It has been found that careless placement or removal of the 45 *rpm* centerpost (1½" diameter) on the center spindle (¼" diameter) will result in bending of the center spindle. When the center spindle is bent, it may result in erratic operation of the 45 centerpost. The centerpost should be placed over or removed from the small diameter spindle with a *straight vertical motion.*

[4]For RCA 930409/930800 automatic record changers.

Needle Checking

Demonstrating two key steps in new needle inspection program disclosed by Duotone at recent parts show in Chicago. Check is conducted by making several impressions of needle in test area of a special test card; card can be returned to Duotone for a lab report or brought to Service Man, who through the use of a special microscope can determine condition of needle. Theme of campaign is . . . "Remember . . . worn needles damage records."

Catalogs and Bulletins

JAMES VIBRAPOWR CO., 4036 N. Rockwell St., Chicago 18, Ill., has published a '54 vibrator replacement guide, which incorporates a post-war cross reference of auto replacement, communications and aircraft equipment using vibrators.

* * *

RADIO RECEPTOR CO., INC., 251 W. 19th St., New York 11, N. Y., has prepared an 8-page bulletin, *G-23*, describing 32 different types of germanium diodes, supplemented by charts, voltage curves, diagrams and product applications.

* * *

J. W. MILLER CO., 5917 S. Main St., Los Angeles 3, Calif., has issued a 32-page catalog, *55*, describing assorted TV and electronic components. Detailed are chokes, coils, filters, capacitors, dials, tuners, transformers, TV accessories, etc.

* * *

SYLVANIA ELECTRIC PRODUCTS CO., 1740 Broadway, New York, N. Y., has published a 42-page booklet, *Industrial Uses for Germanium Crystals*. Four main chapters cover relays and relay applications; timing circuits; power supply applications, and applications to industrial instrumentation. Priced at $.25.

* * *

INTERNATIONAL RESISTANCE CO., 401 N. Broad St., Philadelphia 8, Pa., has released a catalog sheet, *F-3*, describing high-frequency resistors.

* * *

LOWELL MANUFACTURING CO., 3030 Laclede Station Rd., St. Louis 17, Mo., has prepared a 16-page brochure, detailing speaker baffles, protective speaker enclosures, grilles, mounting accessories, and intercom equipment enclosures for all types of construction. Also described is a combination speaker baffle and circline flourescent light fixture.

* * *

AEROVOX CORP., New Bedford, Mass., has published a bulletin, providing attenuation characteristics of screen-room filters. Covered are single-, double- and triple-section filter units.

* * *

SNYDER MANUFACTURING CO., Philadelphia 40, Pa., has released an envelope stuffer, describing the *4D Directronic*, a portable, indoor, TV antenna.

* * *

ACE ENGINEERING AND MACHINE CO., 3644 N. Lawrence St., Philadelphia 40, Pa., has issued a book on *Evaluating Shielded Enclosures*, by Richard B. Schulz. Points covered include: attenuation versus insertion loss, how each is measured and what they mean in terms of actual performance; screen rooms versus solid sheet enclosures and where each should be used in terms of both physical and electrical considerations; and the advantages and disadvantages of shielding materials available today.

* * *

ERIE RESISTOR CORP., Erie, Pa., has issued a 16-page catalog, *D-54*, with details on a line of temperature compensating tubular *Ceramicons*, as well as disc types.

* * *

TRU-OHM PRODUCTS, 2800 N. Milwaukee Ave., Chicago 18, Ill., has prepared a catalog describing resistors and power rheostats.

* * *

CHICAGO STANDARD TRANSFORMER CORP., Addison and Elston, Chicago 18, Ill., has released a 40-page edition of the *'54 Stancor TV Transformer Replacement Guide*, and transformer catalog, listing over 6800 TV models and chassis of 115 manufacturers, including private label sets, as well as 172 TV replacement components.

On Book Row

How to Install and Service Auto Radios. . . . By Jack Darr: An extremely practical book, covering field auto-radio installation and service techniques. Some of the subjects covered include: auto-radio antenna installation; remote control heads; noise elimination; installation of separate speakers; power supplies; preventive maintenance; servicing intermittents; remote control shafts; speakers; realignment; test instruments, and business practices. Described also are hand and power tools needed for service and installation work, parts stock for car radios, and showmanship in the service shop. (Some of the data are based on auto-radio articles which appeared in Service)—*128 pages, 5½" x 8½", paper bound, priced at $1.80; John F. Rider Publisher, Inc., 480 Canal St., New York, N. Y.*

* * *

Television Servicing Course. . . . Compiled By M. N. Beitman: Text designed to streamline TV repair work. Discussed in sequence are: adjustments to correct poor pictures; circuit faults indicated by a poor pattern; finding of bad tubes by observing picture faults; antenna principles and practices; TV signal in service work; picture tubes; noting what is at fault; TV circuit explanations; stagger-tuned *if* receiver analyses; *uhf* converters and tuners; TV test equipment and alignment; and troubleshooting by picture analysis. Many of the chapters actually use manufacturers' notes for detailed explanations of circuits and trouble-shooting techniques.—*192 pages, 8½" x 11½", paper bound, priced at $3.00; Supreme Publications, Chicago, Ill.*

* * *

TV Field Service Manual, Vol. I. . . . By Harold Alsberg: A loose-leaf manual prepared to help the Service Man expedite home-service calls. For receiver models and chassis covered, (Admiral, Affiliated Retailers (Artone), Aimcee (AMC), Air King, Air Marshal, Allied Purchasing, Andrea, Arvin and Automatic), there's an individual listing of trouble symptoms (audio and video), as well as directions for their cure via a troubleshooting chart. Troubles are described pictorially in the form of test patterns; information on how to make horizontal oscillator, tuner oscillator, picture tube and *afc* adjustments are also provided. Tube lists, top-view chassis layouts, and key voltages are included, too. —*128 pages, 5½" x 8½", paper bound, priced at $2.10; John F. Rider Publisher, Inc.*

* * *

Proceedings of the National Electronics Conference. . . . Vol. IX: An invaluable report with all of the technical papers (98) and key addresses presented before at the conference in Sept. '53. Fields covered include: circuits; magnetic amplifiers; audio and microphonics; servomechanisms; ultrasonics; materials and components; filters; television; electron tubes; nucleonics; computers; network synthesis; transistors; instrumentation; microwaves; engineering management; and communication.—*958 pages, 6" x 9", priced at $5.00; National Electronics Conference, 852 E. 83rd St., Chicago 19, Ill.*

* * *

TV Manufacturers' Receiver Trouble Cures, Vol. 5. . . . By Milton S. Snitzer: Fifth in a series of volumes which deals with specific TV receiver troubles and their cures, based on TV manufacturers' own answers to chassis problems. Models covered are Sparton, Stewart-Warner, Stromberg-Carlson, Sylvania, Tele King, Trad TV, Transvision, Trav-ler, Wells-Gardner, Western Auto (Truetone), Westinghouse, and Zenith.—*120 pages, paper bound, priced at $1.80; John F. Rider Publisher, Inc.*

High Masts and Towers

(*Continued from page 24*)

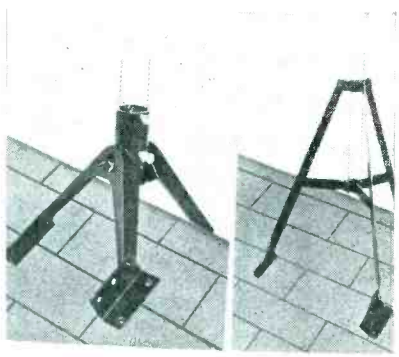
wood, fastened to the mast itself by a spring and hook. When both bubbles are centered, one can be sure that the mast is level. If a carpenter's level is used, at least two sides of the mast should be plumbed.*

Although the lighter antennas may be assembled, fastened to the mast, and the whole assembly raised as a whole, the long, unbalanced fringe-area antennas are usually very difficult to mount in this fashion, due to their size and construction. Directors, reflectors, and antenna elements are easily bent while handling; therefore, the mast should be installed and then the antenna mounted. This method will prevent damage to the antenna, and also take up less time and personnel. If a rotator is used, the guy wires can be fastened to the holes provided, the mast base and guy anchors mounted, and the mast raised and plumbed. A ladder can then be set up the mast and tied to it with a short rope; the antenna can then be easily dropped into place and oriented. This is not as complicated as it sounds, and will be found quite easy, after a bit of practice. If the antenna is to be fixed, the same procedure may be followed, using guy-rings clamped to the mast instead of the rotator.

Special equipment for this type of work will make the whole job much easier. Ladders, of course, are essential. It has been found that a 24' wooden extension type, usually used in two pieces rather than as a unit, is ideal. The bottom ends of the uprights

*Plumbing an object means holding the level against it, and moving it until bubble mounted horizontally in end of level is centered. When two sides are plumb mast is perfectly vertical.

Rooftop antenna mast mounts said to require no guying. Designed to support up to 10' of mast measuring up to 1½" in diameter. Model at left features a combination steel and cast iron base which can be mounted over the ridge of a roof or a flat roof or surface. The mount's legs are adjustable to the angle of the roof. Antenna base at right can be used for mast installations higher than 10'; it is approximately 24" high. (Models 9060 and 9063; Television Hardware Mfg. Co. (Division of General Cement Mfg. Co.), 919 Taylor Avenue, Rockford, Ill.)



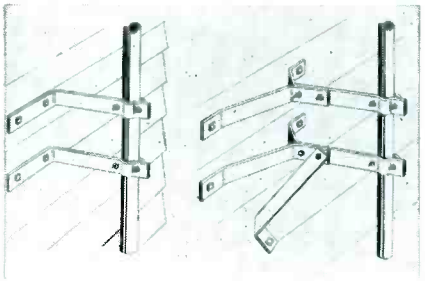
should be *shod* with rubber to prevent slippage and roof damage. Pieces of discarded bicycle tires are perfect for shodding. Several ropes, half-inch manila, are also useful; two about 50′ long, and four or five pieces about 8′ to 10′ long. Immediately after these are purchased, one should *whip* the ends, to prevent unraveling; this can be done either with waxed string, as the sailors often do, or by wrapping the ends with several turns of friction tape. Practice in making the various knots is also essential.[1] One of the short pieces of rope can be used as an economical safety-belt when working atop towers or masts.* Two turns around the waist, secured with a *square knot*, will enable one to remain on top of the tower, even though he should slip, and free his hands for working. The long pieces will be useful not only for raising antennas, masts, etc., to the rooftop, but also as temporary guys for masts or towers.

Clothing and shoes are very important in tower-mast work. The clothes worn should feature enough pockets for tools that should be easily accessible, and at the same time be free of any tags, which might catch on protruding bolts, wires, etc.

Shoes are especially important. They provide safe and sure footing. But their soles and heels must be of some composition which will not damage the roof surface and cause leaks. Although golfer's spiked shoes would satisfy the first requirement, they would certainly fail in the second. Therefore, a compromise is necessary. The rubber *lug* soles found on several sport shoes, hunting boots, etc., have been found to fit the bill nicely. These soles resemble the lugs on a *mud-snow* tire, and provide sure gripping on practically any type of roof surface. For summertime work, when roofs are dry and warm, the thick sponge-rubber or *crepe-rubber* soles are perhaps even better, for the lugs will damage a very hot, soft roof, if asphalt composition shingles are used. Of course, if roofs are wet, one shouldn't be up there anyhow, and the type that will hold on a wet roof is unnecessary.

*See illustration, page 18, SERVICE; May, 1954.

[Next Month: Roof Installation Notes]

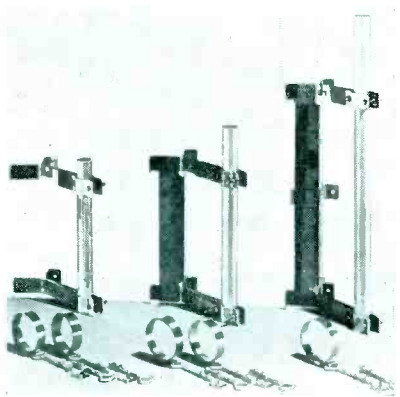


(Left)

Wall mounts of heavy duty steel, protected with a permanent type coating. The Y type mount (right) is recommended when greater strength is required for a heavier type installation. (WML and WMY series; Rohn Manufacturing Co.)

(Right)

Chimney mounts with galvanized and stainless steel strapping. Types include Z, snap-in, two-strap and one-strap. Both two-strap and one-strap types are supplied with 12" and 18" spaced brackets. All accommodate masts up to 1½" or 1¾" diameter. (Commercial Products, 147 Main St., Toledo, O.)



[1]Darr, Jack, *Ropes and Ties for Television Antenna Work*, SERVICE; April, 1952.

Coax Cables

(*Continued from page 19*)

to 140′ of RG29/U cable to transmit *hi-fi* audio signals with an attenuation of only 1 db at 20 kc. Fig. 9 shows the permissible cable length as a function of R' for several common coax cables at audio and video frequencies.

The value of R' for use in the graph of Fig. 9 will depend upon the type of circuit in which the coax cable is driven. The value of R_L is usually easy to find if resistance coupling is used. R_L is simply the grid leak resistance of the input stage. However, in usual audio and video practice, the value of R_L is much higher than that of R_{out}, and can therefore be neglected.

The value of the output resistance, R_{out}, will depend on the driver stage in use. The three most common driver stages are triode or pentode plate-coupled output, cathode-coupled output, and potentiometer controlled output.

The output resistance, R_{out}, of a plate-coupled pentode amplifier is approximately equal to its load resistance, R_L (Fig. 5—p. 18). For a plate-coupled triode output stage having an adequately bypassed cathode resistor, R_s is somewhat less than the plate resistance of the tube as found in tube manuals. The determination of R_s for a triode stage having any unbypassed cathode resistor is involved. To avoid computation and the possibility of errors, a graph has been prepared; it is shown in Fig. 6 (p. 19) and yields the output resistance of a plate-coupled triode stage for several common tube types, if the cathode resistor value is known.

The output resistance of a cathode-coupled stage (Fig. 7—p. 19) is determined by the cathode resistor, R_k, and the transconductance of the tube type used in the cathode-coupled stage. The transconductance value can be found in any tube manual, but it must be remembered that a tube's transconductance can decrease with age. In Fig. 7*a* we have a graph whose curves are similar to the characteristics of tubes whose transconductance are 1,000, 2,000, and 4,000 umhos. This graph can be used to avoid computation of output resistance of triodes or pen-

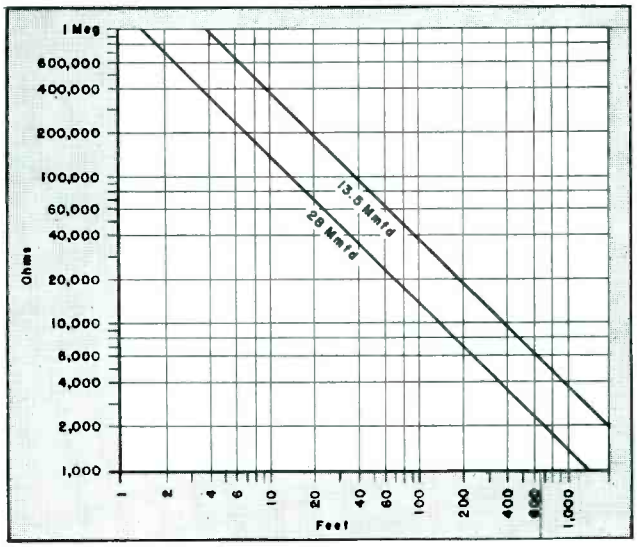


Fig. 9. Chart designed to permit determination of maximum coax cable length versus effective resistance at 20 kc, allowing 1 db drop only. The 13.5 ± 2.6 mmfd-per-foot cables include RG7/U, RG22/U, RG62/U and RG71/U. In the 28 ± 5.6 mmfd.-per-foot category are RG8/U, RG10/U, RG17/U, RG18/U, RG19/U, RG20/U, RG29/U, RG34/U, RG35/U, RG117/U and RG118/U.

todes, triode-connected, by just selecting the correct g_m curve and cathode resistance.

Sometimes the amplitude of the signal input to a coax cable is controlled by a potentiometer; Fig. 8, p. 19. When the impedance of the final stage is considerably less than the potentiometer resistance, the output resistance *seen* by the coax cable will be found to be slightly less than one-half the potentiometer resistance.

Now that the output resistance of the final stage feeding the coax cable has been determined, let us approach the coax-cable selection problem. A wide selection of coax cable for home installation is available.

When purchasing a coax cable for interior audio/video application, it is not necessary to select a cable with several shields, silver or tinned conductors, underground types, or those with armored shields.

For portable installations, a light, flexible coax cable should be chosen. And for permanent installations, coax cable with good electrical characteristics should be selected.

After selecting a coax cable for an installation, one should determine the maximum allowable length the cable may be when it is connected to an output stage. Earlier the method used to determine the output resistance of several different types of circuits was analyzed; now we can calculate the coax cable's maximum allowable leugth before signal distortion becomes excessive.

First, it is necessary to determine the highest frequency that must be passed through the coax cable, allowing only a 3-db signal drop. Then the following equation should be applied:

$$L = \frac{1}{2\pi f C_o R_{out}}$$

where R_{out} is the output resistance of the driving stage, f is the maximum frequency to be passed through the cable, C_o is the capacitance of the coax cable per foot of length, and L is the maximum allowable length of the coax cable. Every manufacturer supplies information as to the capacitance per foot of length (C_o) in each type of cable produced.

Since calculations are time consuming a graph has been designed (Fig. 9) to help determine the maximum allowable coax cable length. Most cables fall into two groups; those whose capacitances per foot are in the vicinity of 28 mmfd, and those in the vicinity of 13.5 mmfd. These two capacitance groups are indicated in the plot. The vertical scale is calibrated in ohms (output impedance of the driver stage, in parallel with load resistance), and the horizontal scale in feet (maximum allowable length). The graph has been based on a 1-db signal drop at the highest desirable frequency to be passed; Fig. 9 was drawn for a maximum frequency of 20 kc. To use, one should select the correct capacitance line. Then one locates the point on the vertical scale which corresponds to the output resistance of the stage, and draws a line to the selected capacitance line. Where the drawn line intersects the capacitance line on the graph, another line should be drawn through this point straight down to the horizontal scale. The horizontal scale indicates the maximum allowable length in feet that the selected coax cable may be for the drive circuit employed.

If the maximum cable length, determined by calculations using the graph, yields a maximum cable length too short for practical use in an installation, then one of two methods can be used to enable the usage of longer cable lengths. Either, one should use a different cable whose capacitance per foot is lower, or the output resistance of the existing driver stage should be decreased.

[To Be Continued]

Color TV Developments

(*Continued from page* 31)

ber of *rc* phase shifting networks wired into the push-button switch. In each case the *rc* is so chosen as to give correct phase and amplitude for each color output; both of these functions are adjustable. While *I*, *Q*, *R-Y*, *B-Y*, and *G-Y* /90° are independent of amplitude, the amplitude chosen for these values has a pedestal so that the color subcarrier for anyone of these phases would not be higher than sync and, therefore, not cause any trouble during alignment. For yellow, cyan, green, magenta, red and blue, the phase is correctly set first. Then the amplitude of the color information is adjusted by a series-output attenuator.

As part of the same switching arrangement, the pedestal for the amount of brightness (*Y*) is also varied so that when a push button is engaged, for, say, yellow, it automatically adds the correct proportion of *Y* component. (The amount of *Y* component is proportional to the brightness of each color.)

The master timing oscillator in this unit is a cathode-coupled square-wave multivibrator, V_{102}. This oscillator is adjusted so that the signal is at black level at the beginning of the trace for ⅓ of its time; then at white level for the remaining ⅔ of its trace. The master oscillator triggers a color bar multivibrator, V_{108}. This multivibrator in turn generates a pedestal which adds from white toward black, so that for any given color signal, we have a pedestal from white towards black corresponding to the amount required for the *Y* component. This is accomplished by feeding the output of the color-bar multivibrator to the attenuator steps on the push-button switch. For maximum pedestal, it would equal black. For any other intermediate pedestal, it is set by the *Y* attenuator. The master oscillator generates a black pedestal which is not quite square; it is passed through a clipper, V_{105A}, for squaring and a delay line to delay the starting time of the horizontal sync generator, V_{103}. This provides the sync with a front porch in the standard manner.

The *Y* pedestal output, sync, black pedestal, and color information, is added to V_{105B} (output).

The trailing edge of the horizontal-sync multivibrator, V_{103}, is fed to a burst gate multivibrator, V_{104}. The output of V_{104} supplies a gate pulse whose duration is adjustable, governing the length of time that the burst will be on. The output of V_{104} is fed to a burst modulator V_{106}, which may be a 6BE6, 6CS6, 6BY6 or 6AS6. This

burst is fed into grid *3* of V_{106} and at the same time a sample of the zero phase 3.58 mc is fed into grid *1* of the same tube. An attenuator control is used for adjusting burst amplitude. It is normally set to be equal in amplitude to sync pulse. (The burst information at the plate of V_{106} is on for only the burst gate time.)

The color-bar multivibrator generating the *Y* pedestal also provides the color bar gate to allow the color modulator V_{107} (6BE6, 6CS6, 6BY6 or 6AS6) to open, passing through the different phases and amplitudes of chroma, depending upon the position of the push buttons. The output of V_{106} and V_{107} (modulators) show both burst and color information.

The output of the burst and color modulators is fed to adder output V_{105B}. At the same time, the pedestal generated in the color-bar multivibrator and fed through the *Y* attenuator (in the push-button network) is added to the chroma information. Sync, as well as black pedestal, is also added, so that in V_{105B} the complete signal is put together.

[To Be Continued]

Tube News

(*Continued from page* 41)

plished by inserting a resistor of the proper size in series with the discharge capacitor used in the plate of the generating tube.

The amount of waveform peaking determines the amount of damping contributed by the output tube. Two systems for using variable amounts of damping, both automatically added and synchronous with driving voltage adjustments, were said to be available now.

In attacking the problem of variable peaking, a study was made of the conditions that determine damping in the typical output system. Equivalent damping factors were mathematically derived and a study made of the tube and circuit parameters necessary to attain and control these factors.

From this background two systems of control of variable damping were developed, one stemming from simultaneous control of damping and height control, and the other giving fully automatic damping with driving voltage.

Headlight-Dimming Tubes

For auto headlight-dimming control, a nine-stage phototube,* with instantaneous response essential for the critical timing requirements of automatic off-on light control, has been developed. The tube is said to permit the use of an amplifier having relatively low-impedance input. Its low electrode dark current makes feasible the use of high-resistance voltage-divider networks to minimize power requirements.

•

Color TV Servicing

(*Continued from page* 35)

yellow. Thus, by removing the *I* signal, the resulting picture swings over entirely to the colors carried by the *Q* signal, which means that the red and cyan are dropped out, leaving us with a picture that carries basically only green and some magenta. So, by removing the *I* signal, the only colors that can be reproduced on the screen are those represented by the *Q* vector, or the colors green and magenta. All other colors will appear as shades of grey or black.

On the other hand, if the *Q* signal is reduced or removed altogether, the picture tends to lose much of its green and magenta coloring.

The color-phase diagram (p. 35) is extremely useful for the color analysis of a picture and this is the reason for its emphasis. With *I* and *Q* signals both present in proper strength, every color on the color phase diagram can be reproduced. However, with only one signal present, the colors seen on the screen will be those which that signal, by itself, can produce. What these colors are is evidenced by the positions of the *I* and *Q* vectors on the color phase diagram.

Beyond the matrix, where the green, red and blue signals are each handled separately, any trouble is readily detectable by simply noting which primary color is missing from the picture. If, for example, the green signal is prevented from reaching the screen, then wherever green is used by itself, we have black or a dark area. If green is used in combination with some other color or colors, then removal of the green will simply serve to point up the color or colors remaining. As an illustration, when green is removed, yellow (which is formed by a combination of red and green) simply becomes red. White will, under the same conditions, turn to a magenta. The same type of analysis can be carried out with every other color.

*RCA 6328.

Hi-Fi Amplifier Bias

(*Continued from page 23*)

corresponding superiority at lower power. As long as the input signal does not change the average value of the tube current, that is, as long as the stage is operating in class *A*, cathode bias is as steady as fixed bias and the operation of the stage with the one bias source is the same as with the other.

Back Bias

A circuit which provides a compromise between the complete independence of the fixed bias voltage and the dependence of the cathode-bias voltage on tube current flow is illustrated in Fig. 5 (p. 23). The voltage drop across the resistor in the *B minus* line is only partly dependent on the current flow in the output stage; since all of the amplifier or receiver current flows through the bias resistor, the voltage across it does not vary as much as does the output stage current. For this reason the circuit in Fig. 5 is sometimes referred to as providing a *semi-fixed bias.*

If a choke or speaker field coil, rather than a resistor, appears in series with the *B minus* line it is the *dc* resistance only which creates the bias voltage drop, the inductive reactance having no effect on the *dc.*

As in the case of cathode bias, *back-bias* voltage may be measured with an ordinary voltmeter across the relatively low value bias resistor. The surest method, however, is to use a *vtvm* between grid and the grounded cathode.

•

Ser-Cuits

(*Continued from page 32*)

treble cutting. Maximum treble boost is accomplished with the arm of the control set at the top (clockwise) position. Maximum treble cut is accomplished when the arm is set at the bottom. With the arm in the center of its range the response is essentially flat. Capacitor C_{106} serves to limit total treble cut to the desired maximum.

Bass Control

Bass control is provided by virture of *rc* filter network R_{110}, R_{111}, C_{107} and C_{108}; 1-megohm and 47,000-ohm resistors and 4,700 and 3,300-mmfd capacitors. C_{107} and C_{108} act as a capacitive voltage divider and provide an essentially flat attenuation of all frequencies with the arm of the bass control (R_{110}) set near the center of its range. With the arm of the control set at the top (clockwise) end, the voltage division is upset and all frequencies are shunted around C_{107} to the amplifier output; however, any increase in high-frequency output at this setting is prevented by the high-frequency shunting action of C_{108} to ground through R_{111}. Maximum bass-frequency cut results from setting the control at the bottom (counter-clockwise) position since both C_{107} and R_{110} now represent a high impedance to low frequencies. Middle and high frequencies pass readily through C_{107}, but are limited at the circuit output by the voltage-dividing action of C_{111} and R_{111}, which acts as an end resistor to set the overall attenuation of the bass control circuit.

The circuit parameters of both the bass and treble circuits were so chosen that, regardless of the settings of either control, constant loudness can be maintained without resorting to readjustments of the volume control.

Power Amplifier

The power amplifier section shown on the *cover* and in Fig. 2 (p. 32) consists of four 6V6GT pentodes in a push-pull-parallel power output stage driven by a twin triode (12AX7)

phase-inverter-amplifier stage. The *dc* power supply has two 5Y3GTs in a full-wave rectifier circuit, with a three-section power-supply filter. The first two sections, consisting of 82-ohm parallel resistors, R_{216A} and R_{216B}, and a choke, L_{201}, together with two 30-mfd sections of an electrolytic contained in C_{208} and C_{209}, provide filtering for the plates and screens of the output tubes, which operate at approximately 280 volts. The third filter section, R_{210} (100,000 ohms) and the 10-mfd section of C_{208}, provides further filtering for the plate supply to the first amplifier and phase inverter stage.

All amplifier filaments are supplied from a single 6.3-volt winding on the power transformer which is balanced to ground for hum reduction by means of 100-ohm balancing resistors, R_{213} and R_{214}, in series with a 125-ohm 6V6 cathode-biasing resistor. This connection provides a positive bias of 17 volts on all amplifier filaments, precluding the possibility of hum caused by filament to cathode emission.

The output signal from the amp is connected to the grid of the top triode of the 12AX7 through a shielded conductor in a remote power cable. This stage operates as a conventional resistance-coupled amplifier to drive the top pair of output tubes. Phase inversion is provided by the bottom 12AX7 triode by taking a portion of the top triode's output voltage appearing across R_{207} and R_{208} (220,000 and 20,000 ohms) and applying it to the grid of the phase-inverter triode. The output voltage of the phase-inverter triode serves to drive the grids of the bottom pair of output tubes 180° out of phase with the top pair. To assure equal driving voltages to both pairs of output tubes, the portion of voltage fed to the grid of the phase inverter is made inversely proportional to the gain of the phase-inverter stage. This has

(*Continued on page 63*)

Audio

(*Continued from page 47*)

are being heard at equal volume, will become confused and one will have the impression that the sound might be coming from all directions, rather than from directly in front.

By checking two speakers first, and then phasing other speakers with each of these, in different directions, it becomes possible to phase up a complete installation.

Proper phasing has served not only to provide the best possible listening conditions in all parts of many auditoriums, but it has minimized some of the worst acoustics encountered.

(Right)

Microphone connectors designed for use with single conductor microphone cable. Cable connector provided with flexible cord protector spring assembled into body, cable braid and spring clamped by hollow point set screw. Available in straight connector, single contact, female type with coupling ring; straight connector, single contact, male type; panel connector, single contact, male type; panel connector, closed circuit, male type. Panel receptacles mount in .385" hole for connection to chassis; for insulated mounting 2-conductor applications, insulating washers should be used—½" diameter mounting hole. Closed circuit type identical, spring actuated contact closes when connector is disengaged; ideal for grid input circuits. (Series 2500; Switchcraft, Inc., 1328 N. Halsted St., Chicago 22, Ill.)

ASSOCIATIONS

RTSM, N. J.

THE RADIO AND TELEVISION Service Men of New Jersey, headed by *Dusty Rhodes*, held their third annual dinner-dance recently at the Suburban Restaurant, Paramus, N. J.

Honored guests included *ye editor, Max Liebowitz*, former ARTSNY board chairman, *O. Capitelli* of ESFETA, and *H. Howard Schoonmaker, Jr.*, chairman of the BBB of the Greater Paterson Chamber of Commerce.

Serving as toastmaster, *Palmer Murphy*, secretary-treasurer of RTSM, paid warm tribute to *ye ed* for his keen devotion to the interests of Service Men, and the outstanding lecture-shows he has arranged for associations. Murphy also applauded *ye ed's* efforts in organizing the successful Philadelphia color-TV symposium, which featured seventeen talks and over twenty exhibits.

Prexy Rhodes presented the association's *Friend of Service Award* placque to *Schoonmaker*, for promoting the cause of reliable, independent service.

Commenting on the spirited relation of the BBB and RTSM, Rhodes said that it was because of the interest and desire of the BBB committee in '50 to foster reliable TV service that the association was formed. That year, he said, the Chamber called together a group of established TV service companies for the purpose of establishing high standards of service to protect the public, and build public acceptance of reliable independent TV service.

Rhodes added that all members of RTSM are members of the Greater Paterson Chamber of Commerce, and are indebted to the Chamber for its support and assistance; and are especially grateful to the committee (on which two association members are serving) for its cooperation.

In a toast to president Rhodes, Murphy said that the group was proud that he had been elected first permanent chairman of the Eastern Conference, the result of bold leadership shown in the service field, both locally and nationally. Murphy also noted that Rhodes was eastern regional secretary of NATESA, and chairman of NATESA's national awards committee.

In studio of WFIL-TV, Philadelphia, during a recent CRTSA telecast, left to right: Al Haas, council chairman; TV personality Allan Prescott, and James Dailey of PRSMA.

ESFETA

JOHN WHEATON, treasurer of the Long Island Radio-TV Technicians Guild, was elected president of the Empire State Federation of Electronic Technicians Association at a recent meeting held in Binghamton, N. Y.

Others elected to executive posts include: *O. Capitelli*, secretary; *Andy Wentworth*, vice president; *Charles Kohl*, treasurer; *H. Eskin*, chairman of credentials committee; and *Max Leibowitz*, chairman of program and publicity.

TEN YEARS AGO

JAMES H. CARMINE, vice president in charge of merchandising of Philco, predicted that every major city in the country would have a TV station as soon after the war as transmitter deliveries could be made and FCC standards set. He also felt that it would be possible to produce and sell table model TV receivers for as low as $125, and larger projection-type sets with a 24" x 18" picture for $400. Carmine also announced that the *ion-trap*, developed at Philco, would remove the ion blemish from the screen of the picture tube. . . . *Herb Clough*, of Belden, serving as chairman of the Electronic Parts and Equipment Industry conference declared that the meeting would be held in October. Others on the committee included: *Robert P. Almy*, Sylvania; *Charles Golenpaul*, Aerovox; *Harry Kalker*, Sprague; *Roy S. Laird*, Ohmite; *A. E. Schaar*, Talk-A-Phone; *Jack Berman*, Shure Brothers; *A. H. Peterson*, Amphenol; *A. E. Akeroyd*, Raytheon; and *Jesse Fishel*, Federal Manufacturing. . . . *Henry A. Hutchins* returned to his sales executive post at National Union Radio Corp., after 20 months of service in the Navy.

Ser-Cuits

(*Continued from page 61*)

been done by selecting the values of R_{207} and R_{208} to provide this result. The 8,200-ohm cathode resistor (R_{204}) is unbypassed to assure a flat frequency response from the phase inverter stage.

Low distortion operation of the power output stage is provided by a 5,000-ohm plate-to-plate load of the output transformer primary and the 17-volt bias developed across the 125-ohm cathode bias resistor, R_{210}. This resistor is bypassed by the 10-mfd section of electrolytic C_{209} to maintain proper operating bias and minimum distortion in spite of below-normal operation of one or more of the output tubes.

Considerable reduction of distortion is provided by the use of degenerative feedback from the voice-coil winding of the output transformer to the cathode of the 12AX7 driver stage. The amount of feedback voltage is set by the voltage-divider circuit R_{215} and R_{202}; 2,700 and 220 ohms. A 2,200-mmfd capacitor, C_{205}, placed in parallel with R_{215} provides proper phasing of the feedback voltage in a supersonic range. As a precaution against possible parasitic oscillation in the power output stage, two *rf* chokes and two 100-ohm resistors (R_{211} and R_{212}) were included in the 6V6GT plate and grid circuits, respectively. Maximum power output of the entire amplifier system is 20 watts with a total harmonic distortion of 3.3%. The frequency response of the amp, by itself, is 20 to 20,000 cps, ±1 db; overall amplifier response is 30 to 15,000 cps.

4-Speaker System

The reproducing system contains four speakers matched to a 3-ohm secondary of the output transformer.

Two parallel-connected 12″ speakers having 6.8-ounce Alnico V-permanent magnets serve to reproduce the low end of the range from 30 to 5,000 cps.

Two 5-inch high-frequency *pm* speakers, each in series with a 2-mfd capacitor, are connected in parallel with the voice coil winding of the output transformer. A high-frequency speaker is mounted coaxially within the forward cone space of each 12″ speaker. A cone-shaped sound diffuser, part of each speaker assembly, serves to control the distribution of high frequencies about the listening area. The 2-mfd series capacitors provide a crossover frequency of 5,000 cycles with the high-frequency speakers only reproducing the range from 5,000 to 15,000 cps. The load is distributed over all four speakers between 4,000 and 6,000 cps.

TRUCK FLEET OF ANTENNAS

Mr. and Mrs. J. B. Mooney, (second and third from left), owners of Mooney Radio Supply Co., Wichita Falls, Texas, receiving trailerload of antennas and rotators from Trio Manufacturing Co. Trailers are being used nearly exclusively by Trio to facilitate delivery of antennas and rotators to distributors. Others on hand were (left to right): Bob Sinks, Trio's southwestern sales rep; Louise Roten, secretary; Nancy Parnell, stock control; Ralph Parker, W. C. Wetmore and Carl Knox, salesmen; Glen Garrett, counterman; Dan McBee, salesman; George Newton, store manager, and Roy Alamon, warehouseman at Mooney's.

PERSONNEL

CARLOS L. BAILIFF, covering Alabama, Columbus, Ga., and Pensacola, Fla.; GEORGE MCALISTER (Florida), and HUGH L. OVERBEY, JR. (S. C., Ga., Chattanooga, Tenn.), have been appointed district sales managers for Channel Master Corp., Ellenville, N. Y.

G. McAlister, C. L. Bailiff, H. L. Overbey, Jr.

* * *

JOSEPH A. HATCHWELL, former mid-Atlantic regional sales manager, has been named director of service of the Allen B. DuMont Laboratories' TV receiver division, Clifton, N. J.

* * *

RALPH C. SEILER is now assistant sales manager for Triad Transformer Corp., Venice, Calif.

Ralph C. Seiler

Roy J. Wade

ROY J. WADE has been named sales manager of the Trio Manufacturing Co., Griggsville, Ill. Appointment follows the purchase of Falcon Electronics, of which Wade was general manager, by Trio, a short while ago.

* * *

JAMES P. CODY is now vice president of Burton Browne Advertising, Chicago, Ill. Cody joined the firm as a copywriter, and for the past year has managed the agency's service department.

James P. Cody

Robert L. Klabin

ROBERT L. KLABIN has been named vice president and general manager of the newly-created Elizabeth division of General Instruments Corp.

* * *

NORMAN C. OWEN has been elected president of Webster-Chicago Corp., Chicago, Ill. . . . E. J. MORITZ, general manager of the laminations division, has been elected vice president in charge of manufacturing. . . . Other officers reelected include: WALTER P. ALTENBURG, vice president and general counsel; G. W. WALLING, vice president-engineering; and C. B. DALE, vice president-research.

* * *

J. R. PITTLE has been named sales manager of U. S. Wire and Cable Corp., Union, N. J.

TV Antenna Digest

(*Continued from page* 44)

is broad enough to isolate the entire *vhf* high band. Our second requirement, however, involving the maintaining of a good impedance match has not as yet been met.

Obtaining Impedance Match

A properly-designed antenna will have a 300-ohm frequency only at the frequency (or frequencies) for which it was designed to operate. Our high-band antenna looks like a small dipole on the low band, with a very low impedance at a low-band frequency. If we connect this antenna directly across the transmission line terminals, it would present a very low impedance at the low band and, therefore, load our impedance down very badly.

This particular problem can be solved by using the well-known quarter-wave impedance transformer. A section of transmission line that is a quarter wavelength long will transform impedance, in accordance with the following formula—

$$Z_m = Z_i \times Z_o$$

Where: Z_m = Characteristic impedance of transmission line

Z_i = Input impedance

Z_o = Output impedance

It has been seen that the high-band antenna will present a very low impedance to the low-band frequency. If we connect it through a length of transmission line one-quarter wavelength long at the middle of the low band, this section of line transforms the low impedance into a veryhigh impedance that will not load down our low-band signal.

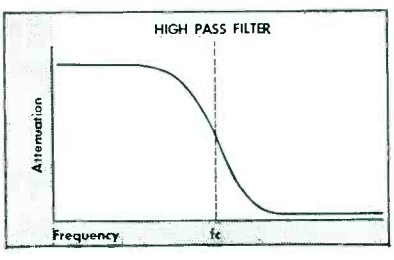
This type of filter has two disadvantages:

(1) If the filter is to operate efficiently on *vhf*, one must cut the leads to a specified length; if not, a serious impedance mismatch will result.

(2) It is not efficient on *uhf* because the circuit cannot be designed to cover such a wide bandwidth.

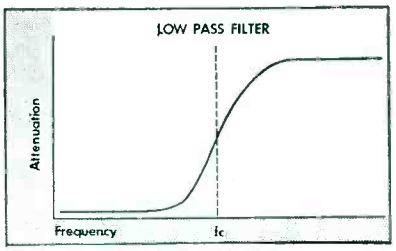
Separate Hi-Lo Filters

The second approach is with a separate high-pass and low-pass filter, which has the configuration shown in Fig. 4 (p. 44). The attenuation curves of both the high and low-pass filters appear in Fig. 5. We can see that the attenuation in the stop bands is extremely high and therefore practically no signal will be passed. As we approach the cut-off frequency, attenuation drops sharply until in the pass band there is no loss in signal at all. By combining a high- and low- pass filter into a single unit an effective isolation filter can be obtained.



(Left)

Fig. 5a. Attenuation curve for a high-pass filter. F_c = cutoff frequency.



(Above)

Fig. 5b. Low pass filter attenuation curve. F_c = cutoff frequency.

NEWS

WESTINGHOUSE BASEBALL CONTEST UNDER WAY

A *League Leaders and Dealers Aid* baseball contest, aimed at electronic tube distributors and their Service Men customers announced recently by the Westinghouse Electronic Tube Division, Elmira, N. Y., is now in full swing.

Contest, which opened on April 1st, and closes June 30th, offers distributor salesmen, countermen, and shipping clerks the opportunity of winning $15,000 in cash and merchandise prizes, while Service Men compete for $8,000 cash and merchandise prizes.

Service Men entering the contest are required to purchase 25 receiving tubes or one picture tube, answer a cartoon question, and have their entry certified by a Westinghouse distributor salesman. Winners will be judged on their ability to answer the cartoon question from a consumer customer: *"All that money to replace this little tube?"*

* * *

WARD AUTO-RADIO PACKAGE

A yellow-and-black package for auto antennas, included in floor and counter display racks for dealers and jobbers, is now available from the Ward Products Corp., 1148 Euclid Ave., Cleveland, Ohio.

Display rack can be used for 36 antennas in rack, and also for mounting three antennas for demonstration. Another rack, *Super-6*, similar to the larger floor model, can hold six auto antennas.

* * *

PETER JENSEN BIOG IN NATIONAL MONTHLY

A national mass magazine has published a biographical article on *Peter L. Jensen*, president of Jensen Industries, Inc., 329 South Wood St., Chicago, Ill.

Story, entitled *Forgotten Man of Sound*, describes Jensen's 50-year career in electronics starting in Denmark, highlighted by his invention of the public address system in California in 1915. Also disclosed are the noise neutralizer aircraft microphones developed by Jensen and his associate for the Air Force in World War I, and the story of Jensen's experiences in Denmark as the world's first disc jockey.

Peter Jensen

* * *

RCP MOVES TO EASTON, PA.

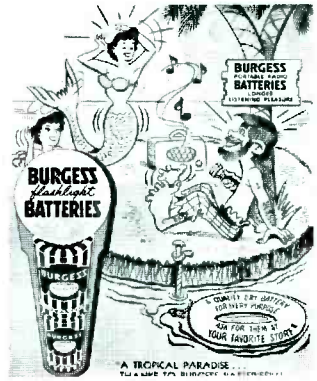
The engineering department, development laboratories, and general and administration offices of Radio City Products Co., Inc., have been moved to a new plant at Easton, Pa.

Purchasing division and the New York district sales offices are at 101 W. 31st St., New York City.

BURGESS FEATURES AD CARTOONS IN '54 CAMPAIGN

A cartoon-type advertising program, promoting the line of flashlight, portable radio, photo-flash and industrial batteries, and the key-chain Zebra Light, has been announced by the Burgess Battery Co., Freeport, Ill.

Program consists of a series of single-panel cartoons depicting Burgess flashlight batteries.



TV Parts... Accessories

JACKSON COLOR-BAR/WHITE-DOT GENERATOR

A color TV test instrument, *712*, designed to produce color bars, white dots, or a crosshatch pattern, has been announced by the Jackson Electrical Instrument Co., 16-18 S. Patterson Blvd., Dayton, Ohio.

Instrument provides a NTSC system color difference signal, as well as all required sync signals. A 4.5-mc crystal-controlled oscillator provides for tuning of the color set's fine tuning control. A 3.58-mc crystal-controlled burst oscillator, with its associated color lock control, is said to assure locking with the color burst generator in the set.

Test signals from the generator may be introduced into either the front end or video channels of the set. When introduced through *rf* circuits, generator is tunable from channels 2-6 with a fixed output. For video circuit introduction, generator includes a variable attenuator as well as a polarity switch.

When producing color bars, either single bars or a multi-bar pattern are available. Single bars include red, blue or green; and multi-bars consisting of orange (*I* signal), red (R-Y), white (multiple), magenta (*Q* signal), and blue (B-Y) are available.

Produces a white-dot pattern made up of 6 rows of 8 dots each for convergence adjustments of tri-color tubes. Crosshatch pattern is also available for linearity adjustments. Employs 18 6J6s and one 5U4.

Jackson Color-Bar/White-Dot Generator

* * *

EICO FLYBACK AND YOKE TESTER

A flyback transformer and yoke tester, *944*, in kit or wired form, has been introduced by Electronic Instrument Co., 84 Withers St., Brooklyn 11, N. Y.

Operating on a grid-dip principle, instrument is said to detect even one shorted turn. Features separate calibration for air-core and iron-core flybacks. Can check and test the continuity of any inductance whose impedance is not too low, such as coils, speakers, etc.

WHEN YOU CHANGE YOUR ADDRESS

Be sure to notify the Subscription Department of SERVICE at 52 Vanderbilt Avenue, New York 17, N. Y., giving the old as well as the new address, and do this at least four weeks in advance.. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

AT THE CHICAGO ELECTRONIC PARTS SHOW

Left: Reviewing new product line in General Cement booth, left to right: Margaret Valiulis; Julius Brown, Brown Distributing Co., Indianapolis, Ind., Robert W. Shields, Bristol Radio Supply Co., Va., and G-C prexy Stanley B. Valiulis. Shields is examining a Telco (Division of G-C) TV lead-in tube and lightning arrester combination.

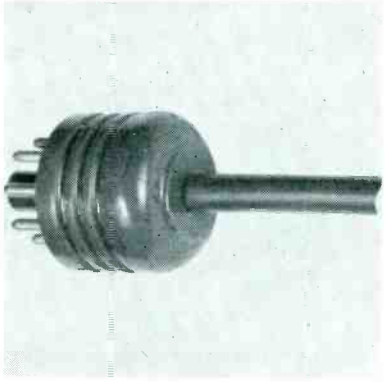
Right: Rotator featuring built-in thrust bearing, replaceable motor unit, and adjustments for masts as large as 1 11/16" od displayed at show by Brach. Gear mechanism is said to have high torque and provide anti-drift positioning. Has a flexible worm gear which is self-compensating and adjusts to antenna load. First production prototype (shown) was presented by Marty Migatz, of Brach's development section, to Ira Kamen, vice president-sales. Looking on, John Keough, Brach sales staff.

Tools . . . Parts . . . Instruments

PHALO POWER SUPPLY PLUG

A power supply plug, molded directly to the cable and ready for connection with any standard octal radio socket, has been announced by Phalo Plastics Corp., Worcester, Mass.

Molded-on plug can be ordered to meet any application where from 1 to 11 pins are required. Can also be supplied without the usual phasing pin, which is ordinarily keyed for easy seating in the socket.



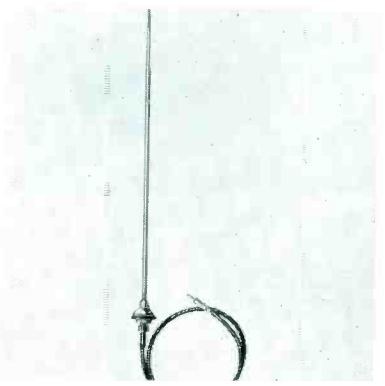
Phalo Power Supply Plug

* * *

C-D AUTO ANTENNA

An auto-radio antenna, *Spee-Dee*, developed for one-man mounting, has been introduced by the Cornell-Dubilier Electric Corp., 333 Hamilton Blvd., South Plainfield, N. J.

Antenna can be installed in three steps without looking under the fender. Adjustment up to 30° in all directions is said to guarantee snug fit for all body and fender contours. Measures 57½" extended with an extra long, full 42" polyethylene leadin. Features *super-chrome* finish and high-tensile brass mast topped off with a *static muffler* ball. All upper mounting hardware is chrome on nickel.



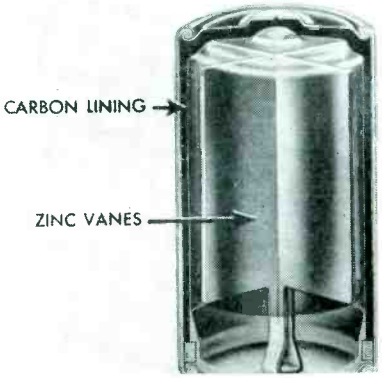
Coming Event

Western Electronic Show . . .
Pan-Pacific Auditorium, Los Angeles, Calif,
August 25, 26 and 27, 1954

EVEREADY BATTERIES

A flashlight battery, *Eveready D99*, that is said to incorporate a new principle in cell construction, has been developed by the National Carbon Co., 30 E. 42nd St., New York, N. Y.

Cell construction features the use of carbon as the outside of the casing, and four zinc vanes inside the cell, instead of the older method of zinc walls and a carbon inner electrode. Construction is claimed to result in a leakproof battery that will not swell, stick or jam in the flashlight.



Eveready Battery D99

* * *

AEROVOX AC-TYPE CERAMIC DISC CAPACITORS

A series of ceramic disc capacitors, *ACD*, for *ac* operation, have been announced by the Hi-Q Division, Aerovox Corp., Olean, N. Y. Capacitors are especially intended for electric-razor noise suppression, and for certain TV bypass applications.

* * *

TRIAD INSTRUMENT TRANSFORMERS

Instrument power supply transformers, designed for use in voltage regulated power supplies, picture-tube supplies, preamplifiers and *vtvm*'s, have been introduced by the Triad Transformer Corp., 4055 Redwood Ave., Venice, Calif.

Complete line of transformers, including series instrument power supply transformers, is covered in catalog *TR-54*.

•

COLOR TV CLINIC AWARDS

At Sylvania's recent Color TV clinic in Paterson, N. J., where over 400 Service Men listened to Sylvania's Peter L. Langer explain problems of color television. Session featured award presentations by Roxanne to Howard Buckner, Lester Pawlyk, Frank Carbone, James Forzono, and William Dunn; left to right in photo. Grand prize, Sylvania's new 506 color dot generator, went to Dunn.

ADVERTISERS IN SERVICE

JUNE, 1954

JOTS AND FLASHES

THE URGENT need for more Service Engineers to install, service and maintain special types of electronic gear, was stressed at the recent Chicago parts show during demonstrations of closed-circuit TV, drive-in sound systems, and particularly, garage door-openers. Commenting on the 2-way pulsed systems developed to open and close auto doors, one manufacturer said that this method has tremendous appeal and will attract a growing number of car owners who have their own garages. Here, he emphasized, is a field of activity tailor-made for the talents of enterprising Service Engineers*. . . . *Egert and Fields Co.*, 11 Park Pl., New York City, are now reps for U. S. Wire and Cable Corp., in metropolitan New York and northern New Jersey. *Frank W. Taylor Co.*, P.O. Box 222, DeWitt, N.Y., will cover central and upper New York State. . . . *Robert C Sprague*, chairman of RETMA's board of directors, was awarded the Medal of Honor for his outstanding contributions to the industry during the association's annual convention in Chicago. . . . *Cinema Engineering Co.*, division Aerovox Corp., Burbank, Calif., has opened a direct factory office at 101 Park Ave., New York 17, N. Y. . . . *Clarostat Manufacturing Co., Inc.*, held its '54 sales meeting at its home plant in Dover, N.H., recently. Among those at the meeting were executive vice president *George Mucher; William Mucher*, chief engineer; plant manager *Walter Mucher; I. J. Youngblood, Fran Chamberlain*, and *Alden Joy* and *Luther Lawrence*. . . . *Radio Merchandise Sales* held the first in a series of planned golf tournaments for their metropolitan distributors recently. RMS president *Sidney Pariser, Martin Bettan*, director of sales and engineering, and *Sam Shaw*, of S.A. Shaw Co., N.Y.C. reps, attended the luncheon and tournament. . . . *J. Steven Katonah*, former eastern sales manager for the Deepfreeze division of Motor Products Corp., has been named field sales manager for DeWald Radio Manufacturing Co., Long Island City, N.Y. . . . *James Lynch* has resigned as sales manager of the Kelton Co., Boston, Mass. *Thomas Murphy*, vice president of Kelton, has assumed Lynch's duties. . . . *Jerrold Electronics Corp.* has acquired Kallmann patent 23,954,917 for master TV antenna systems. . . . The *Fensholt Advertising Agency*, Chicago, has been appointed to handle the advertising account of Simpson Electric Co., 5200 W. Kinzie St., Chicago.

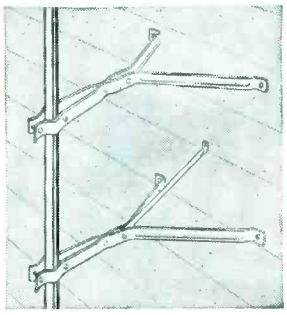
*For additional part show news, see *National Scene*, page 27, this issue.

BANISH CORRODED CORROSION!

END RUST STREAKING CAUSED BY INFERIOR SUBSTITUTES!

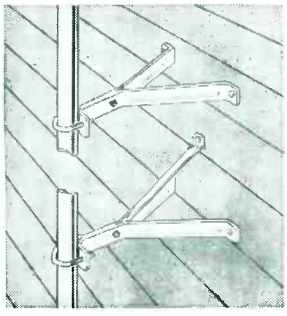
USE A SOUTH RIVER HOT-DIP GALVANIZED PRODUCT FOR AN EVERLASTING RUST-PROOF FINISH

Only SOUTH RIVER gives you such a wide variety of *rust-proof* Hot-Dip Galvanized antenna mountings and accessories



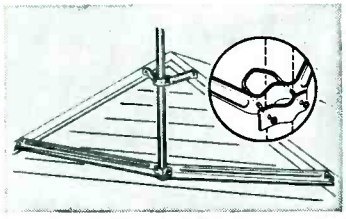
12" WALL BRACKET
(Snap-In Type)
Model SN-12

Features snap-in type mast holder permitting the mast to be held temporarily while screws are tightened. Hot-dip galvanized steel to prevent corrosion and rust-streaking. With hardware. Available in 6", 12", 15", 18" and 24" sizes.



12" WALL BRACKET
Model WB-12

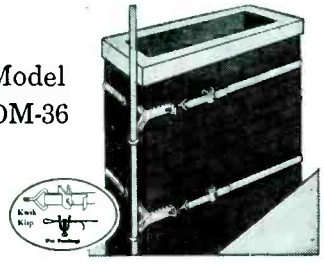
Constructed of heavy-gauge embossed steel, hot-dip galvanized for an everlasting rust-proof finish. Complete with installation hardware. Available in 6", 12", 15", 18" and 24" sizes.



EAVE MOUNT Model EM-48

Heavy-gauge embossed steel lower bracket with generous 48" spread permits secure, rugged installation of mast on homes with varied pitched roofs. Embossed 3" steel upper bracket permits ample clearance of roof edging. Hot-dip galvanized to prevent corrosion and for lasting rust-proof finish. Accommodates masts up to 1½" O.D. Complete with lag screws and mounting hardware. Also available with 60" lower bracket . . . EM-60.

Model DM-36



DUO-MOUNT ANTENNA BASE*

Two piece mount of alloy steel rivet construction, finished in an everlasting, hot-dip, galvanized finish. Specially designed "U" bolts accommodate masts from ⅝—1½" O.D. Exclusive "KWIK-KLIP" feature provides convenient means of fastening loose end of banding. Only South River has this SIMPLE, QUICK strap-fastening device. Also available with stainless steel banding (DM-36 ST); without "KWIK-KLIP" (DM-LKK); with stainless steel banding less "KWIK-KLIP" (DM-LKK ST). **Snap-in type chimney mount also available . . . Model SN-50.**

*U. S. Patent No. 2482575
Can. Pat. No. 463261

Here are many more Hot-Dip Galvanized SOUTH RIVER Products. A Complete Line is Available to Suit Your Individual Needs.

- Steel Tubing, Hot-Dip Galvanized INSIDE and OUTSIDE
- Tight-Twist Guy Wire
- Snap-in Type Chimney Mounts
- Chimney Uni-Mounts
- Chimney Mount Antenna Bases*
- Thrift Mounts
- Eave Mounts
- Ground Rods
- Large Mast Adapters
- Extension Adapters
- Mast Couplers
- Wall Brackets

Write for your copy of South River's complete 1954 catalog.

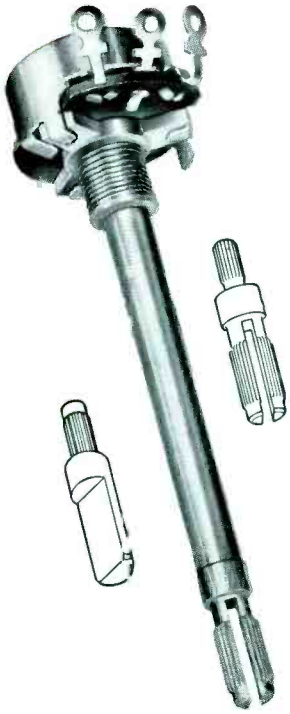
South River
METAL PRODUCTS CO., INC.
South River, New Jersey

In Canada—A.T.R. Armstrong Ltd., Toronto

PIONEER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTINGS

The easy way is the right way . . .

when you use Mallory Midgetrols®



Easy because the round, tubular shaft of the Mallory Midgetrol can be cut accurately and quickly. Easily adapted to split-knurl, flatted, or set screw type knobs. And you save additional time because AC switches can be attached instantly without control disassembly.

Right because Mallory Midgetrols are engineered to match the electrical characteristics of original equipment of any radio or TV set . . . give equal, often better, performance than the original control.

For Jobs done right the easy way, always use Mallory Midgetrols. You'll save time and trouble. And, equally important, you can depend on Mallory Midgetrols for performance that makes satisfied customers.

To make your auto radio repair work easier . . .

The new Mallory Auto Radio Control Guide speeds selection of the proper control for every job that comes your way. Ask your Mallory Distributor for a copy . . . or write to P. O. Box 1558, Indianapolis, Ind.

P R MALLORY & Co. Inc

MALLORY

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS
RECTIFIERS • POWER SUPPLIES • CONVERTERS • MERCURY BATTERIES

APPROVED PRECISION PRODUCTS

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

"Selling RCA Batteries was a 'natural' for me,"

says GEORGE S. SRDJAK of the Maple Heights Record Center, 15815 Libby Road, Maple Heights, Ohio

"MY WHOLE SERVICE business benefited when I started promoting RCA Batteries—the radioman's battery," Mr. Srdjak said, "My customers recognize the famous monogram on the RCA Battery carton. This makes selling this quality product that much easier."

"The Radio Battery for the Radio Trade" is popular with radio dealers and technicians everywhere. Reason is simple. Radio dealers and technicians build repeat business selling RCA Batteries. Take advantage of the merchandising magic of the popular RCA monogram found on every RCA Battery carton. You'll find your customers stray less to other outlets for battery replacements when they know you sell RCA Batteries.

The strong RCA Battery sales volume you can build at your store will produce an extremely favorable inventory turnover picture on your books.

* * *

Ask your RCA Distributor salesman to give you a copy of the new "1954 RCA Battery Sales Planner" booklet. Then order a good stock of the ten top-volume types and start enjoying *plus profits* selling RCA Radio Batteries.

Here's how RCA helps you sell more Radio Batteries

- NATIONAL TV and RADIO ADVERTISING
- POWERFUL SALES PROMOTION
- COMPLETE LINE
- GREATEST NAME IN RADIO
- RADIO TRADE DISTRIBUTION

RCA®

RADIO CORPORATION of AMERICA

RADIO BATTERIES — **HARRISON, N. J.**