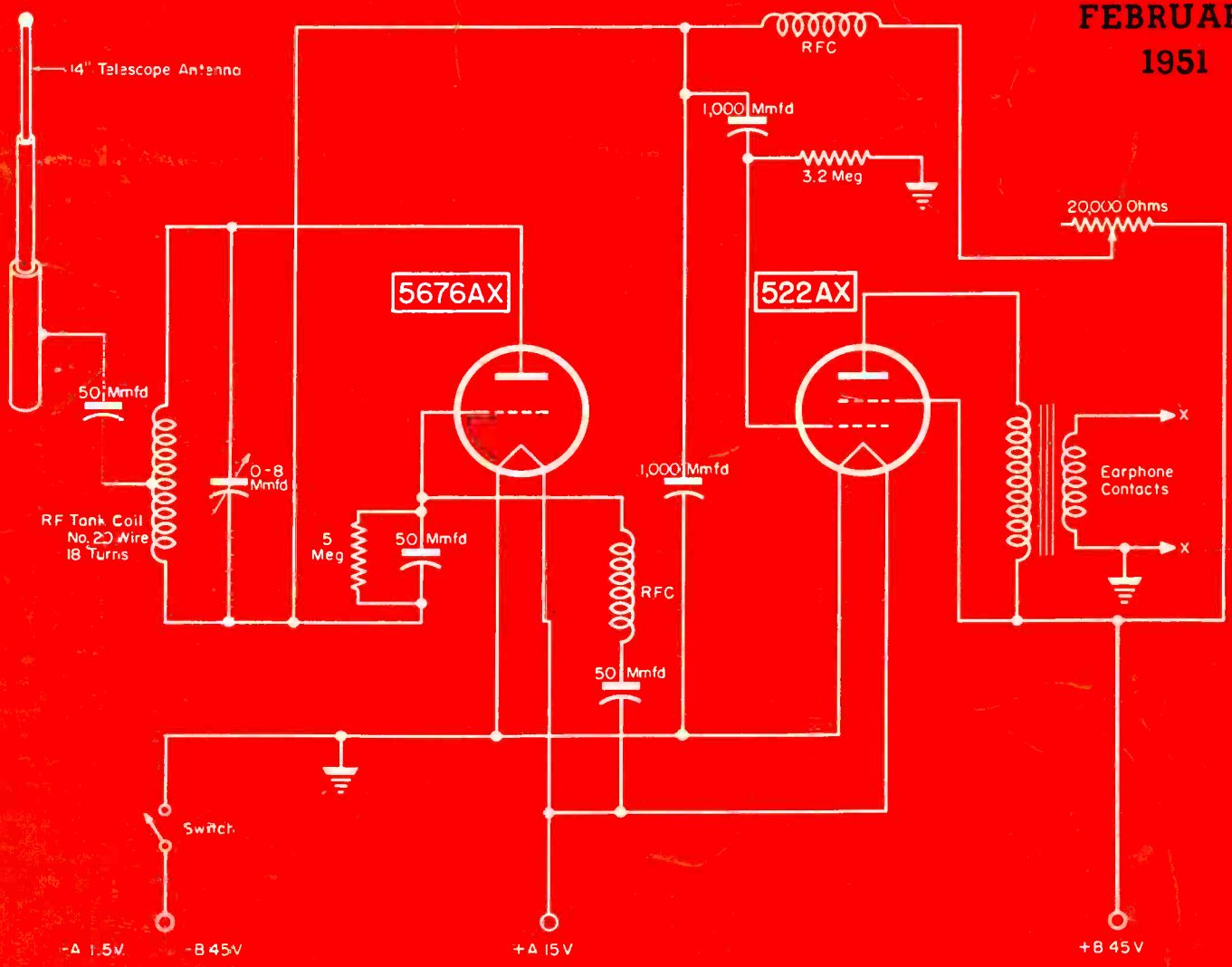
RADIO • TELEVISION • ELECTRONIC

SERVICE

FEBRUARY
1951



FM portable featuring use of a superregenerative detector.

[See page 2

THE TECHNICAL JOURNAL OF THE RADIO TRADE

C-D

the only electrolytic
with built-in extras

blue beavers*

Now smaller, yet better than ever!

they eliminate comebacks

When a set comes into your shop, the chances are that the original characteristics have been changed—either by previous servicing, aging of components, or by climatic conditions. That's why it's smart to use "Blue Beavers," designed and built exclusively for servicemen.

"Blue Beaver" Electrolytics have that extra "safety factor" that makes allowance for changes that may have taken place in the set after it left the factory.

That's why servicemen like to "play it safe" by using C-D "Blue Beavers" — Proved Best by Field Test.

"Blue Beaver" Electrolytics are available in all the popular capacity and voltage ratings required by servicemen. For further details, see your jobber or write for Catalog 200B. CORNELL-DUBILIER ELECTRIC CORPORATION, Dept. S-21, South Plainfield, New Jersey. Other plants in New Bedford, Brookline and Worcester, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, Ohio.

See your local Classified Telephone Directory for nearest C-D jobber.

40TH ANNIVERSARY
CORNELL-DUBILIER CAPACITORS
1910 1951

CONSISTENTLY DEPENDABLE

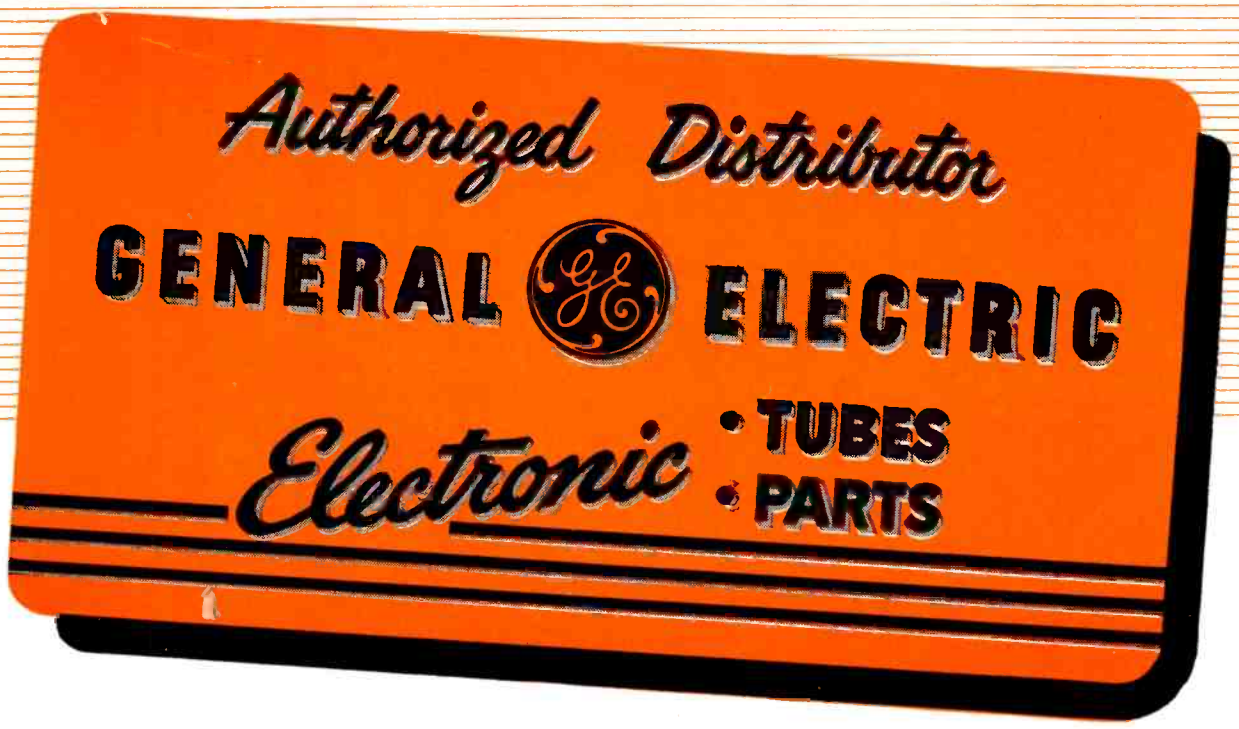
CORNELL-DUBILIER

CAPACITORS · VIBRATORS · ANTENNAS · CONVERTERS

RADIART
SUBSIDIARY

Sure, TUBES ARE TIGHT

. . . but the man with this sign remains your best friend!



YOUR G-E tube distributor is interested, first of all, in supplying you, as a serviceman, with the tubes you need—or, when these can't be had for love or money, with types you may substitute.

However, he's under a handicap. Let's be frank: nobody . . . but *nobody* . . . is getting all the tubes they want. That's true also for radio-TV set manufacturers . . . broadcast stations . . . communications and industrial users. Allocation is the order of the day. New millions invested by General Electric in more tube facilities, are helping G-E distributors and dealers —aiding the whole industry. Yet the work horse, production, can't match speed with a pair of track sprinters, TV popularity and national defense needs, that have taken the bit in their teeth.

Tube shortages exist, and will continue. Meanwhile, your customers count on you to keep their sets operating. Grappling with these facts that oppose each other, isn't easy.

Your G-E tube distributor wants your business tomorrow, next year, five years from now. He'll see you through! That's his job . . . and that's his pledge. *Electronics Department, General Electric Company, Schenectady 5, New York.*

You can put your confidence in—

GENERAL ELECTRIC

181-KA2

Vol. 20, No. 2

RADIO - TELEVISION - ELECTRONIC
SERVICE

February, 1951

LEWIS WINNER
Editor

F. WALEN
Assistant Editor

Including *Radio Merchandising* and *Television Merchandising*.
Registered U. S. Patent Office

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Pacific Coast Representative: Brand & Brand, 1052 W. Sixth St., Los Angeles 14, Calif. Tel.: Michigan 1732
Suite 1204 Russ Building, San Francisco 4, Calif. Telephone: SUtter 1-2251

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Never Before a Sales Boosting Campaign Like This-all for You!

This SYLVANIA star-studded program will keep your service business booming during 1951

Appealing Life-Like Window Displays

Colorful Counter and Store Displays

Bright window streamers

Sales-getting postal cards

New giant mailers

Reminder stickers for every set you service

Radio spot announcements for every month

It's ready and waiting for you now . . . the most colorful and appealing Service Dealer advertising campaign ever planned!

Featuring famous stars of screen, television and radio, it ties in with the national advertising your customers will see in *The Saturday Evening Post, Life, Look,* and *Collier's Magazine,* and with Sylvania's weekly CBS-TV Show, "Beat The Clock"!

So, win with Sylvania in '51. Send for this material NOW . . . and display it *prominently.* It identifies you as the expert with the super-fine Sylvania tubes . . . the tools and the know-how for the finest radio and TV service.

All of the display material, stickers and radio spots are FREE. You pay only 1¢ apiece for the four mailing pieces you send to your prospects. So, see your Sylvania Distributor or mail coupon NOW!

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

SYLVANIA ELECTRIC

Sylvania Electric Products Inc.
Dept. R-2602, Emporium, Pa.

Please send me full details about Sylvania's great 1951 Dealer Promotion Campaign.

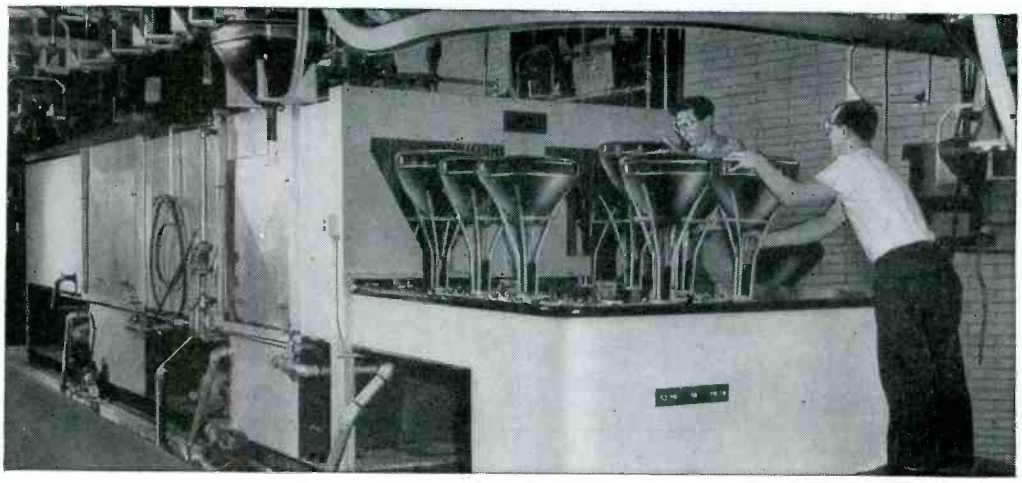
*Name*_____

*Street*_____

*City*_____ *Zone*___ *State*_____

no washday blues . . . .

at Sheldon



The new Sheldon giant washing machine that uses over 1,000 gallons of water every hour of the day. Sheldon's Irvington, N. J. plant uses 360,000 gallons of water per day much of which comes from wells within the plant.

The sensational, extra-fast washing and trouble-free efficiency of our newest type glass-blank washing machine allows us to take care of the tremendous demand for Sheldon Television Picture Tubes . . . and to maintain the perfect screen quality of these tubes.

This specially designed automatic washing machine actually washes our glass-blanks in three cycles: First, the inside face of the glass-blank gets an acid wash; then it is rinsed with water. Next, the inside face is given a caustic wash, and then rinsed again with water. As the final step, the inside face is rinsed for several minutes with a high pressure stream of "thirsty water" — water from which all minerals and foreign substances have been removed by our special equipment and techniques.

When the glass blank leaves our washing machine, the inside surface of the glass-blank is bacteriologically clean and medically pure . . . so pure, in fact, that it is "thirsty" or "hungry" to reabsorb foreign substances . . . PRIMED to receive the phosphor coating. The phosphor coating is applied over this "thirsty" surface to consistently produce the uniformly perfect blemish-free, "TELEGENIC" screen for which Sheldon Picture Tubes are famous.

WRITE today for the latest "Sheldon 'TELEGENIC' Picture Tubes—General Characteristics & Dimensions Wall Chart" containing the new Sheldon VITATRON Glass-Metal 19AP4B and 19AP4D, and the New Rectangular 20CP4!

TELEVISION MIS-INFORMATION NO. 4 is off the press! Write for your copy today!

SHELDON ELECTRIC CO.

A Division of ALLIED ELECTRIC PRODUCTS INC.

68-98 Coit Street, Irvington 11, N. J.

Branch Offices & Warehouses: **CHICAGO 7, ILL., 426 S. Clinton St. • LOS ANGELES 26, CAL., 1755 Glendale Blvd.**

SHELDON TELEVISION PICTURE TUBES • CATHODE RAY TUBES • FLUORESCENT STARTERS AND LAMPHOLDERS • SHELDON REFLECTOR & INFRA-RED LAMPS
PHOTOFLOOD & PHOTOSPOT LAMPS • SPRING-ACTION PLUGS • TAPMASTER EXTENSION CORD SETS & CUBE TAPS • RECTIFIER BULBS

VISIT SHELDON BOOTHS NO. 390-1-2 AT THE RADIO ENGINEERING SHOW, MARCH 19-22, GRAND CENTRAL PALACE, N. Y.

HIAWATHA WAS A PIKER!

"Go out into the world," said Pops*
"and don't come back 'till you're proved tops!"

The water test he passed with ease,
Earning a feather was just a breeze...

Heat was applied to test his worth
In "hot spots" he then won a berth...

The life test took a long, long time
Though others quit—he kept his prime...

His leads proved strong—his casing tough
It did no harm to treat him rough!

His Pops was pleased when he came through
We know you'll like the Redskin, too!

Sangamo's New Molded Paper Tubular Capacitor gives LONG LIFE under severe conditions!

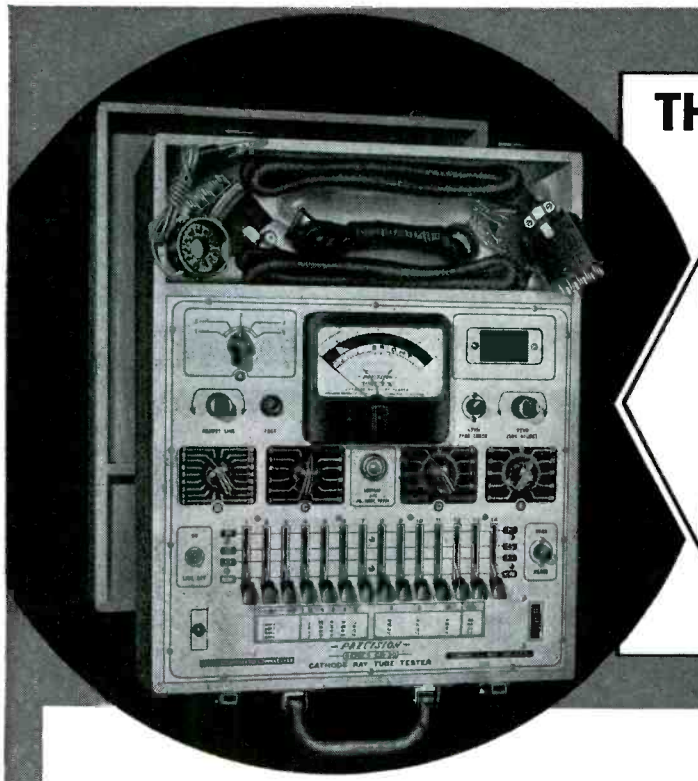
The REDSKIN is easy to work with—on production line or on the bench—because the especially designed flexible leads resist breakage and can't pull out! It offers greater mechanical strength because of its plastic construction. It is molded under *low* pressure, assuring elements undamaged in fabrication, longer life and greater dependability. It is an 85° C tubular which offers assurance of long life under television and other severe operating conditions.

A trial of these *better* molded tubulars will convince you. See your jobber—if he can't supply you, write us.

*Big Chief Sangamo

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS
In Canada: Sangamo Electric Company Limited, Leaside, Ont.

8C50-4



THE NEW PRECISION CR-30 CATHODE RAY TUBE TESTER

TESTS ALL TV PICTURE TUBES

(MAGNETIC AND ELECTROSTATIC)

'SCOPE TUBES AND INDUSTRIAL CR TYPES

for True Beam Current (Proportionate Picture Brightness)

Tests ALL CR Tube Elements—Not Just a Limited Few

IN FIELD OR SHOP

Tests CR Picture Tubes Without Removal from TV Set or Carton!

The new Precision CR-30 fills an obvious gap in the test equipment facilities employed by TV service and installation technicians.

Because of the absence of a reliable cathode ray tube tester, up to 50% of so-called "rejected tubes" are found to be fully serviceable and should rightfully never have been "pulled out."

Proven product of extended development, the CR-30 has been specifically engineered to answer the question, "Is It the TV Set or is it the Picture Tube?"

The *Precision* CR-30, a complete and self-contained *Electronic Instrument*, incorporates a TRUE BEAM CURRENT Test Circuit. The CR-30 checks overall electron-gun performance for *proportionate picture brightness* as well as additional direct testing facilities for accelerating anodes and deflection plate elements.

The Precision CR-30 should not be confused with mere adapters connecting to ordinary receiving tube testers which were never designed to meet the very specialized needs of CR tube checking. Similarly, it is not to be confused with neon-lamp units or similar devices of limited technical merit and which do not check all CR tubes or all tube elements.

GENERAL AND TECHNICAL SPECIFICATIONS

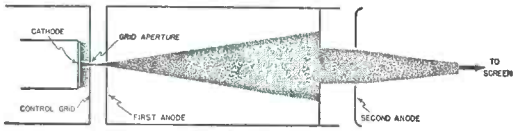
★ **Tests All Modern Cathode Ray Tubes:**—Magnetic and Electrostatic, 'Scope Tubes and Industrial Types.

★ **Tests All CR Tube Elements:**—Not just a limited few.

★ **Absolute Free-Point 14 Lever Element Selection System,** independent of multiple base pin and floating element terminations, for Short-Check, Leakage Testing and Quality Tests. Affords maximum anti-obsolescence insurance.

★ **True Beam Current Test Circuit** checks all CR Tubes with Electron-gun in operation. It is the **Electron Beam** (and NOT total cathode emission) which traces the pictures or pattern on the face of the CR tube.

Total cathode emission can be very high and yet Beam Current (and picture brightness) unacceptably low. **The CR-30 will reject such tubes** because it is a true **Beam Current** tester. Conversely, total cathode emission can be low and yet Beam Current (and picture brightness) perfectly acceptable. **The CR-30 will properly pass such tubes** because it is a true **Beam Current** tester. The significance of the above rests in the fact that Beam Current (and picture brightness) is primarily associated with the condition of the **center** of the cathode surface and not the overall cathode area. (See illustration below)



★ **Voltage Regulated, Bridge Type VTVM** provides the heart of the super-sensitive tube quality test circuit. Such high sensitivity is also required for positive check of very low current anodes and deflection plates.

★ **Micro-Line Voltage Adjustment Meter-monitored** at filament supply.

★ **Accuracy** of test circuits closely maintained by use of factory adjusted internal calibrating controls; plastic insulated, telephone type cabled wiring; highest quality, conservatively rated components.

★ **Built In, High Speed, Roller Tube Chart.**

★ **Test Circuits** Transformer Isolated from Power Line.

★ **4⅝" Full Vision Meter** with scale-plate especially designed for CR tube testing requirements.

★ **Heavy Gauge Aluminum Panel** etched and anodized.

★ **PLUS** many other **"PRECISION"** details and features.

• • •

SERIES CR-30—In hardwood, tapered portable case, with hinged removable cover. Extra-Wide Tool and Test Cable Compartment. Overall Dimensions 17¼ x 13¾ x 6¾". Complete with standard picture tube cable, universal CR Tube Test Cable and detailed Instruction Manual.

Shipping Weight:—22 lbs......**Code: Daisy**

NET PRICE:—$99.75

See the new CR-30 *on display at leading electronic equipment distributors. Place your orders now to assure earliest possible delivery.*

PRECISION APPARATUS CO., INC.

92-27 Horace Harding Boulevard, Elmhurst 6, New York

Export Division: 458 Broadway, New York, U.S.A. • Cables—Morhanex

In Canada: Atlas Radio Corp., Ltd., Toronto, Ontario

NEW INDICATOR ION TRAP

a Rauland "Exclusive"

Speeds Service – Builds Profits

Rauland's new Indicator Ion Trap is winning the cheers of more service men and dealers every day – because of the time and trouble it saves in Ion Trap Magnet adjustment, and because it eliminates mirrors and guesswork.

Now it's a matter of seconds to adjust the ion trap magnet with absolute precision. The service man simply moves the magnet until the signal glow is reduced to minimum.

This important new Rauland development is incorporated in all Rauland tubes produced today – as a feature of Rauland's new Tilted Offset Gun. This gun offers the additional advantages of giving only a single Ion Trap Magnet and of maximum sharpness of focus.

Only Rauland offers this advanced feature – one of half a dozen post-war developments from Rauland.

For further information, write to . . .

RAULAND

The first to introduce commercially these popular features:

Tilted Offset Gun

Indicator Ion Trap

Luxide (Black) Screen

Reflection-Proof Screen

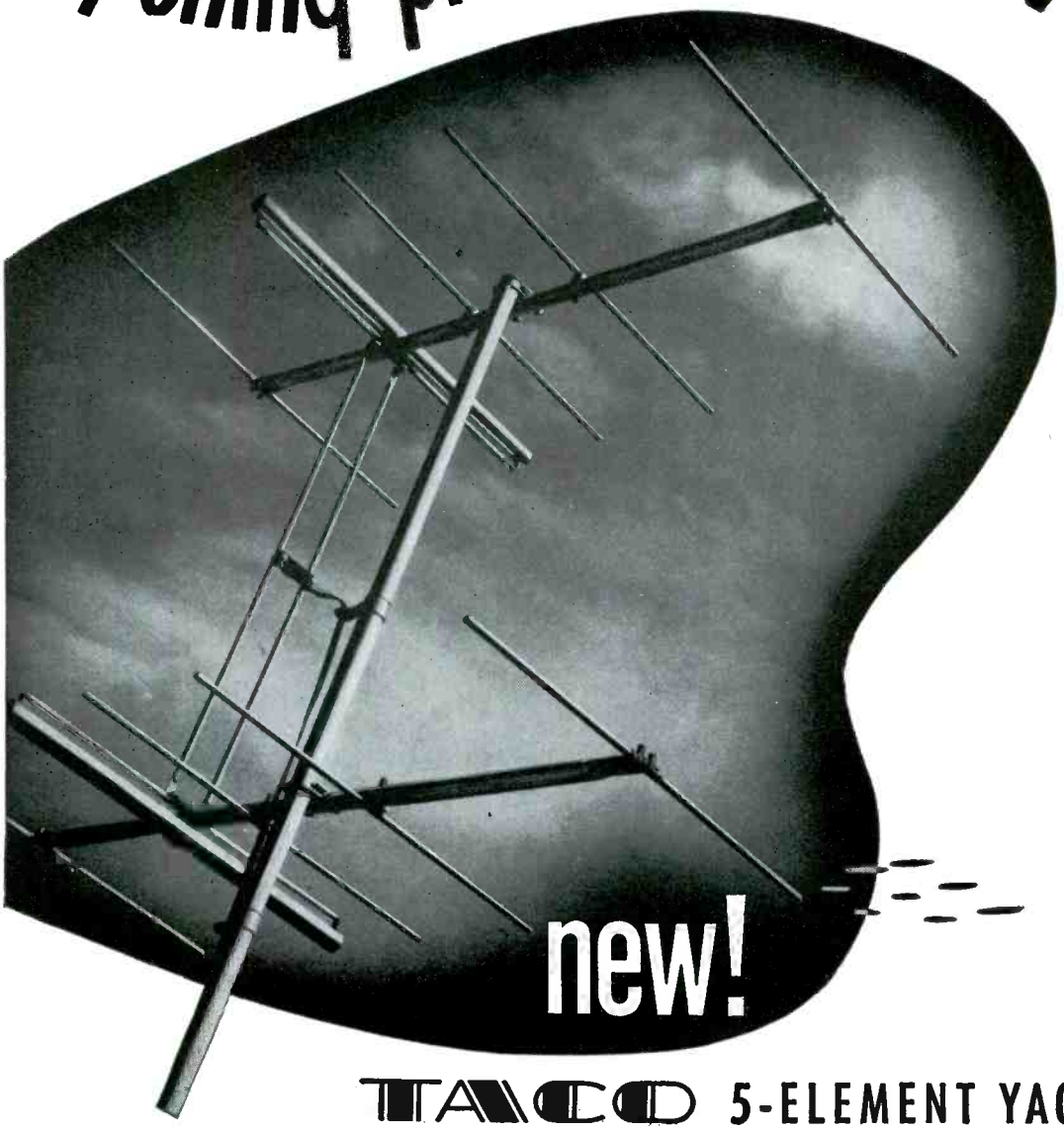
Aluminized Tube

THE RAULAND CORPORATION

Perfection Through Research

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS

Opening profitable new T-V areas.



TACO 5-ELEMENT YAGI

OPENS TV sales areas beyond present limits. Picks up where 4-element antennas leave off in fringe area reception. Extra director steps up gain and minimizes interference. Two-diameter antenna element increases bandwidth.

Available for any channel — high or low-band.

High-band is "Click-Rig" assembled (snaps in place in less than 1 second). Low-band is TACO "Jiffy-Rig" assembled. Can be stacked for extra-high gain. Special harness available to permit use of one lead-in for several high and low-band antennas.

SEND TODAY FOR CATALOG 32.
Complete technical information on antenna types. Curves and directivity patterns.

RADIO & ELECTRONIC EQUIPMENT

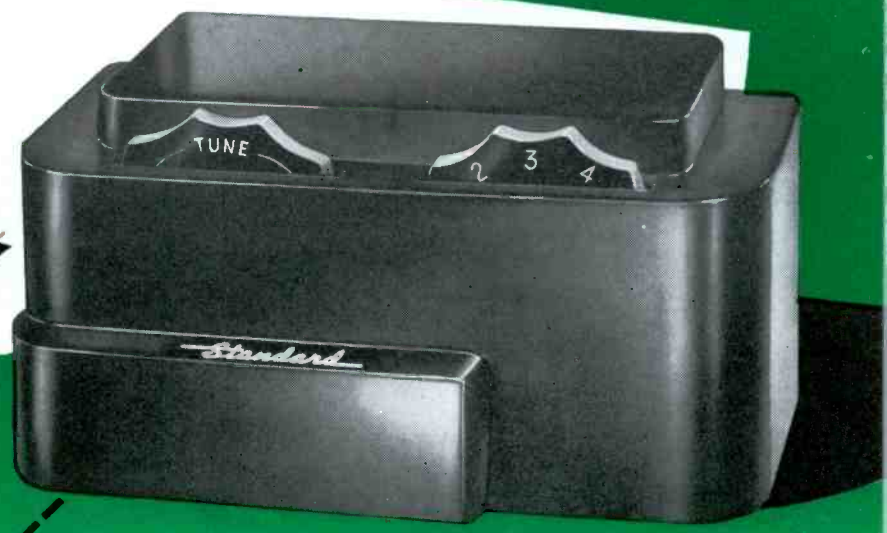
TACO

TECHNICAL APPLIANCE CORPORATION

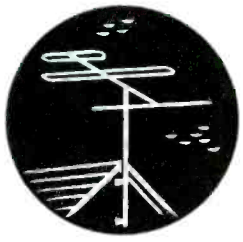
SHERBURNE, N. Y. IN CANADA: STROMBERG-CARLSON CO., LTD., TORONTO 4, ONT.

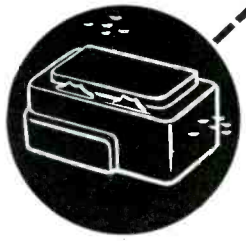
THE NEW... IMPROVED "STANDARD TV BOOSTER"

Model B-51



Manufactured by the leading designer and producer of TV tuners "The Standard Tuner"





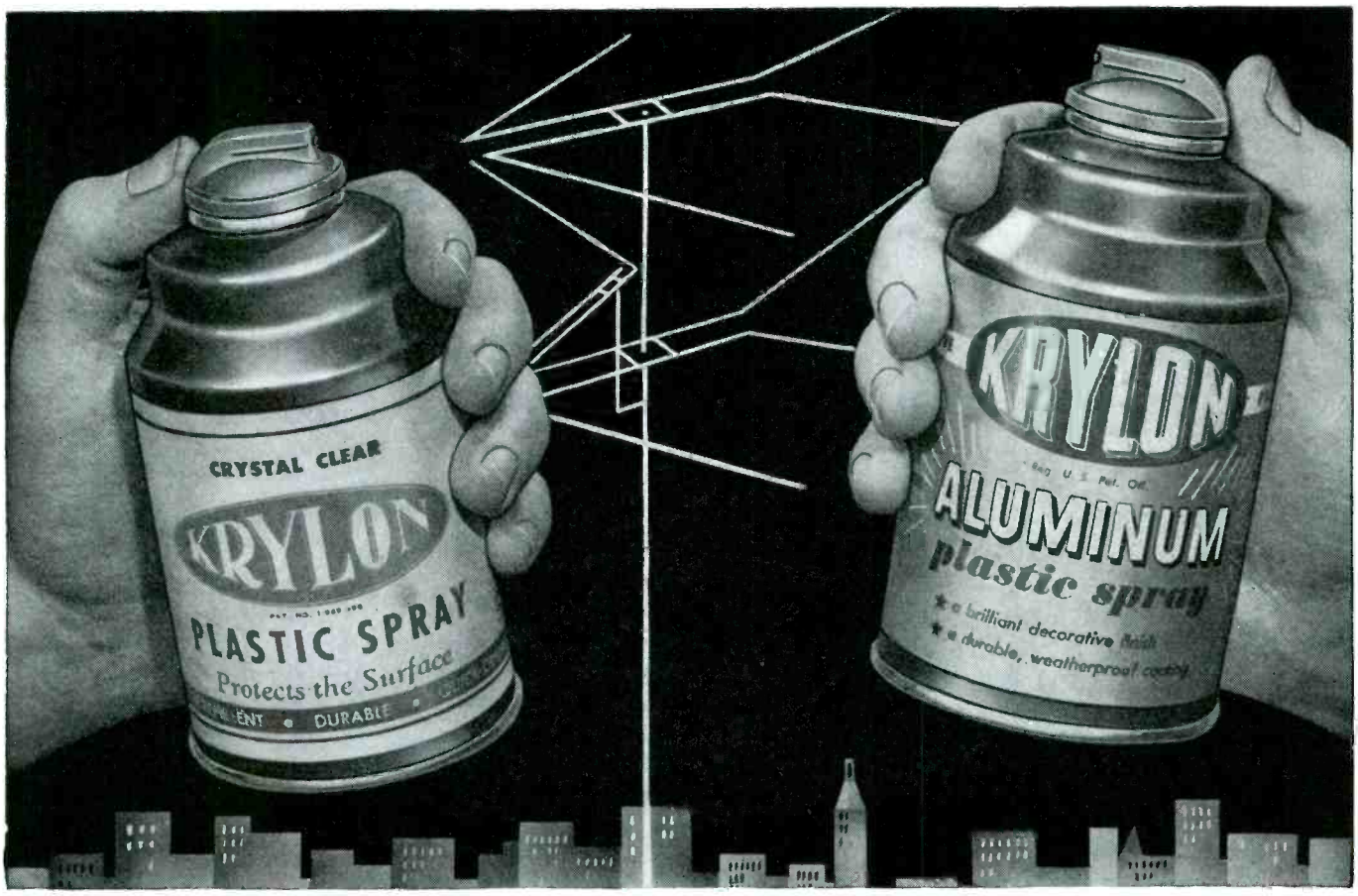
INCLUDES THESE KEY FEATURES

- ★ Attractively styled
- ★ Dark brown plastic cabinet
- ★ Large two knob control
- ★ Four purpose switch
  - **Off:** Signal by-passed to set
  - **Set:** Filament on, signal by-passed to set
  - **On:** Plate voltage applied, booster in operation
  - **Tune:** Fine tuning for sharper picture or sound reception
- ★ Detent Tuning—positive channel selection
- ★ Continuous one knob tuning—no switch from high to low
- ★ Simple installation
- ★ Single tube operation
- ★ High gain, all channels
- ★ Low noise factor
- ★ Printed circuits
- ★ Iron core transformer input
- ★ 300 ohm operation
- ★ Fully shielded
- ★ Easy, simplified servicing

These and many more outstanding features are incorporated into the new B-51 "Standard Booster"

Standard COIL PRODUCTS CO. INC.

CHICAGO • LOS ANGELES • BANGOR, MICH.



CUT DOWN TV SERVICE CALLS

with

KRYLON

ELIMINATES CORROSION OF ANTENNAS, HELPS PREVENT CORONA... KEEPS PICTURE QUALITY FROM BREAKING DOWN

Krylon is liquid magic that puts dollars in your pocket. Thousands of service dealers from coast to coast are using it on *every* installation. It cuts down service calls and builds good will—because it's an important aid to keeping picture quality at its peak. You measure its cost per installation in pennies.

Krylon is an *acrylic* plastic coating, packaged in 12 oz. aerosol dispensers. All the service man needs to do is press a button and *spray* it on. It dries in a few minutes to form a permanent protective coating of high dielectric strength.

Spray Krylon on the antenna and antenna lead-ins . . . it seals them against the rust and corrosion that can ruin picture quality. Spray it on high voltage wiring and transformers . . . it helps prevent corona and breakdown. Two types—clear and non-conducting aluminum. Stock both, because you'll need both. List prices: clear $1.95, aluminum $2.25 per 12 oz. spray can. Also available in gallons for application by brushing or dipping.

Don't wait another day before you start cutting down *your* service calls with Krylon! See your jobber—or write us direct.

JOBBERS! Franchises still open for this staple product that offers steady, effortless repeat business. Inquire today!

KRYLON, INC.

2601 N. Broad St. Philadelphia 32, Pa.

"... $26,500,000 worth of U.S. Savings Bonds a year under company Payroll Savings Plan..."

CHARLES E. WILSON

"General Electric employees are buying more than $26,500,000 worth of U. S. Savings Bonds a year under company payroll savings plans. Since the inception of our savings plans in 1917, General Electric employees have saved $445,000,000 of which $280,000,000 consisted of the purchase of United States Savings Bonds since May, 1941. The record speaks for itself."

The record of General Electric Company, and the records of more than 21,000 other large companies, prove that employees *want* to save the easy, automatic way—the Payroll Savings Plan.

As of November 1, 1950, more than 8,000,000 employees were buying U. S. Savings Bonds *every month*. While the figure was impressive, it was not as large as it should have been—a fact recognized by many companies.

In November and December, top executives of literally thousands of large companies (employing one hundred or more) decided to check their Payroll Savings Plan and endeavor to increase participation to 60% or more.

Here are a few December reports: in one of the larger units of a leading steel corporation, participation went from 20% to 80.6 per cent . . . a well-known independent steel company (13,710 employees) reported 82% participation . . . another large steel company (100,000 employees), 75% participation . . . one plant of a large rubber corporation climbed to 94% (company average, all plants, 70%—and still going up). Tabulation of all companies exceeding 60% participation in December would literally fill this page.

Higher participation in the Payroll Savings Plan is good for the men and women for whom it builds security. It is good for the company because a saving employee is a better workman, a better citizen. It is good for the country because the month after month purchase of U. S. Savings Bonds by millions of Americans is a most effective check on inflationary tendencies.

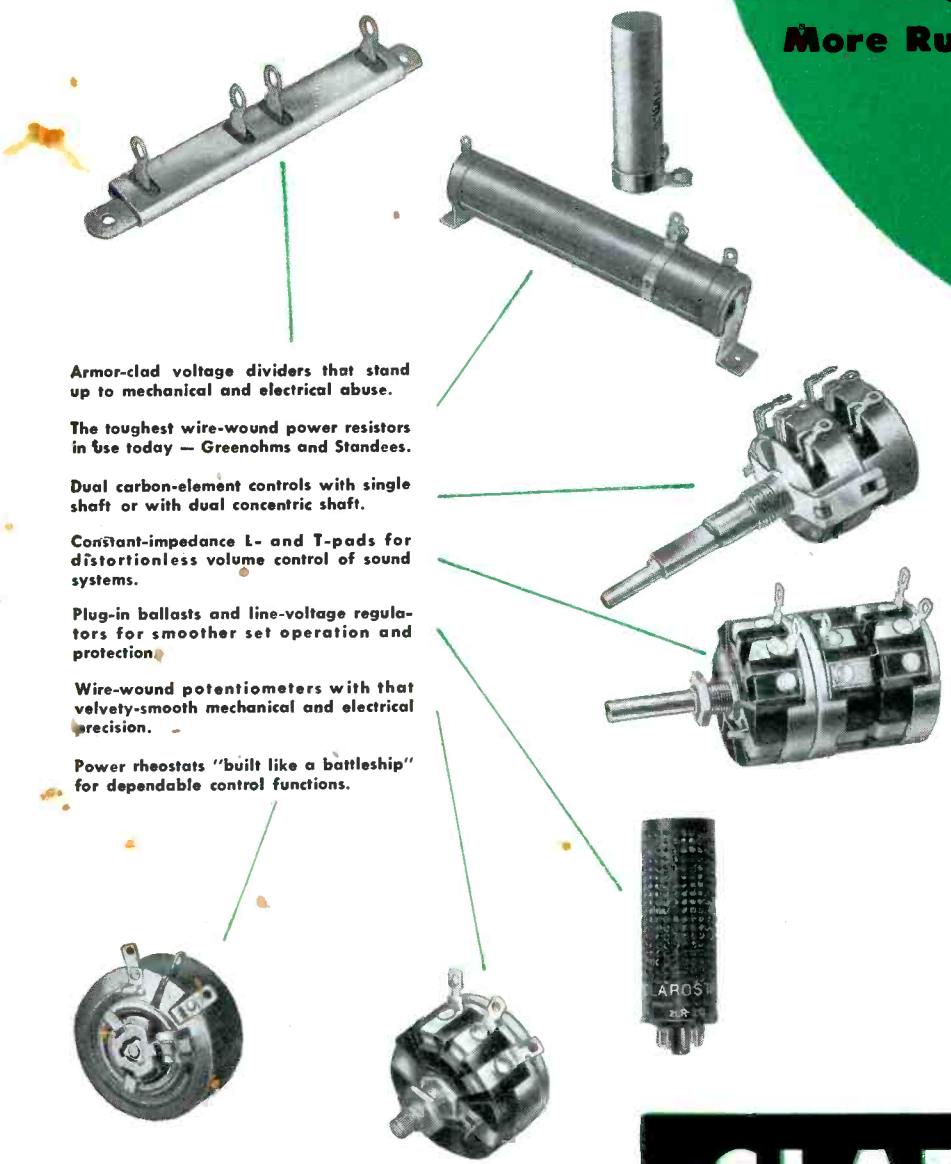
Phone, write or wire, now, to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D.C. Your State Director has a simple, four-point promotion plan, concluding with a person to person canvass that puts a Payroll Savings Application Blank in the hands of every employee. That's all you have to do—and you'll be surprised at the response from employees who *want* to save.

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

SERVICE

DESIGNED FOR SERVICE

More Rugged Electrically
More Rugged Mechanically
More Rugged in Safety Factor
More Rugged for Longer Life



Armor-clad voltage dividers that stand up to mechanical and electrical abuse.

The toughest wire-wound power resistors in use today — Greenohms and Standees.

Dual carbon-element controls with single shaft or with dual concentric shaft.

Constant-impedance L- and T-pads for distortionless volume control of sound systems.

Plug-in ballasts and line-voltage regulators for smoother set operation and protection.

Wire-wound potentiometers with that velvety-smooth mechanical and electrical precision.

Power rheostats "built like a battleship" for dependable control functions.

★ The fact that you'll find Clarostat controls and resistors in the majority of today's TV, radio and electronic assemblies, speaks for itself. It's generally conceded that Clarostat parts are *tougher, more dependable,* and *last longer.*

And Clarostat not only supplies such initial equipment but also the replacement parts used in the servicing of such assemblies. Clarostat's up-to-the-minute servicing data insures the *correct control or resistor,* every time.

Ask your Clarostat jobber for the latest Clarostat Catalog. Also for those TV Replacement Data Sheets. Or write us.

CLAROSTAT

CLAROSTAT MFG. CO., INC. DOVER, NEW HAMPSHIRE

PERFORMANCE IS WHAT COUNTS!

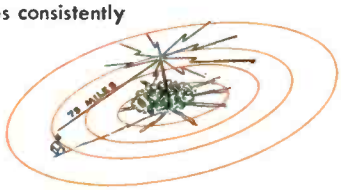
ANCHOR'S

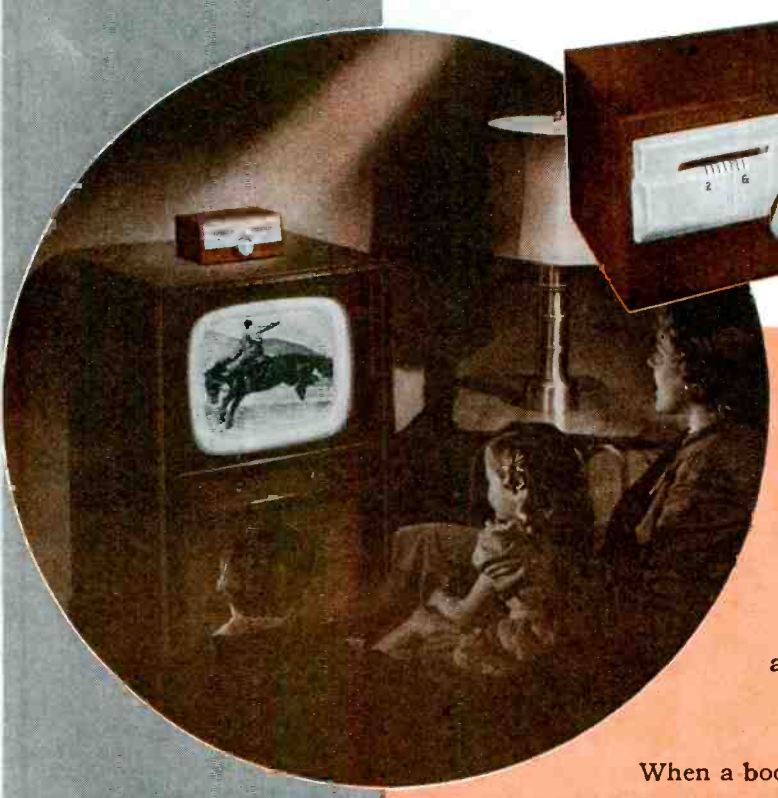
superiority of performance

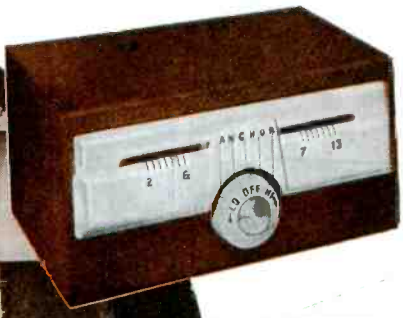
remains unchallenged!

THE ANCHOR *Suburbanite*

Single-Stage Booster—for low signal areas in or near cities. Assures consistently good reception up to 75 miles.

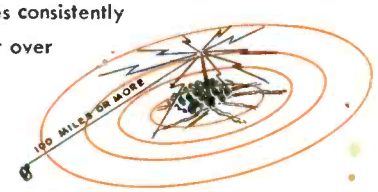






THE ANCHOR *Granger*

Two-Stage Booster—recommended for distant rural areas. Assures consistently good reception for over 100 miles.



Despite critical material shortages, Anchor not only is offering the same high quality standards so widely hailed by the TV set industry, itself, but it is still making as many boosters as a year ago. To meet the current unprecedented demand, however, Anchor would have to expand, which is naturally not possible now! Therefore they have had to institute a very strict allocating system. No preference on deliveries to anyone has been or ever will be practiced.

When a booster is needed to complete a perfect installation, Anchor's outstanding performance under all conditions has made it the first choice of those who buy and sell. So always buy the *best*—first!

ANCHOR ENGINEERING ALWAYS A YEAR AHEAD!

ANCHOR RADIO CORP.
2215 SOUTH ST. LOUIS AVENUE • CHICAGO 23, ILLINOIS

RADIO · TELEVISION · ELECTRONIC
SERVICE

On Trial Again

TV SERVICING, which has become so towering a factor in the business of installation and repair, and often broadly applauded for its general record of achievement, has unfortunately become a victim of several disconcerting incidents, which have begun to cause frowns everywhere. Notwithstanding warnings, some TV Service Men have continued to discount their obligations to set owners, offering empty excuses for service, advertising sensational performance claims which they knew would be impossible to meet, and in addition, employing technicians which it was known were not qualified to effect proper repairs. Of course, there have been instances when a bit of the thorny situation could be attributed to temperamental consumers just difficult to placate. For Service Men have been besieged by calls for servicing when the problem involved nothing more than a better knowledge of tuning. However, these disturbances, extensive in the early days, have become fewer and fewer, and today the irksome problems have perched themselves right on the TV Service Man's doorstep.

Consumer Goodwill Programs

Aware that all can be blamed for the faults of a few, many, many TV Service Men have been cleaning house and striving to set standards of procedure which will assure satisfaction under all possible normal conditions. Associations have been particularly active in this effort campaigning for consumer confidence through members who are reputable and technically competent. From these groups and others have come the declaration that it is now extremely urgent that order and stability of operations be maintained not only in the shops of a few, but in the shops of everyone. Strict self-policing must prevail on all fronts at all times, they have warned.

This admonishment we are sure will be accepted with a complete appreciation of the serious repercussions that can follow if any malpractices continue. The disturbing news about servicing in TV has even found its way to Washington, where a member of the House of Representatives has introduced a resolution calling for a complete investigation of servicing contracts and activities which can be considered *false* or *misleading*. In addition, there are several bills pending in the New York State legislature, as well as before the assemblies of other states, calling for regulation. Yes, the errors of a few have been heard widely and may affect many.

Need for Self-Disciplining

Service Men themselves can effect a tight control over their activities, through strict obedience to codes, codes which spirited servicing in the broadcast receiver era to striking heights and which certainly can be equalled in these video-sound days. The contention that licensing can solve the problem was proved wrong a decade ago, and is wrong today, for such control offers no guarantee of work caliber. But, unless the Service Man shows substantial proof, as he has in the past, that he can deliver reliability and proficiency, he may be saddled with political regulation. The Service Man is on trial again, but we feel confident that he will win with an unanimous verdict.

These New TV Terms

WITH THE ADVENT OF TV, there has appeared a series of terms which many have found difficult to explain. In an effort to provide simplified definitions of some of these popular, but little understood phrases, two gentlemen from the long-lines department of the telephone company, I. E. Lattimer and Richard B. Williams, have prepared some extremely interesting interpretations.

Defining scanning lines, for instance, Lattimer and Williams note that it is one trace or strip of picture produced by one trip of the electron beam across the screen from left to right. Although there are 525 scanning lines, only about 485 are visible, since the remainder fall within the intervals between the end of one field and the start of the next.

Streamlined Definition

Reviewing the term *persistence of vision*, the experts say that this is a characteristic of the normal human eye by which it retains an impression of what it sees for a small fraction of a second after the image on the retina is gone. In TV, this characteristic first integrates into a complete picture, the succession of spots or lines of light of varying intensity appearing on the face of the tube, and then it secures an impression of a continuous screen from the series of pictures produced on the tube.

There are a host of other simplified definitions in this *long-lines* dictionary. If you would like to see them, just say the word and we'll present 'em.

Seven Keys to Success

IN A RECENT REPORT on planning for the year, Joseph B. Elliott of RCA declared that shop owners should: (*1*) Study merchandising trends to guide advance purchasing; (*2*) Concentrate on established brand names for stable values; (*3*) Keep stocks clean, well organized and fairly diversified; (*4*) Reward personnel doing exceptional work; (*5*) Weed out sources of avoidable expense and waste, such as misrouting of trucks, poor maintenance or equipment, etc.; (*6*) Go over costs to make sure that operation is profitable and sound; (*7*) Keep the premises in good condition, clean and well illuminated to hold a prosperous appearance and assure traffic for the shop! Seven simple rules, but each bristling with wisdom.—L. W.

SERVICE...The National Scene

ELECTROSTATICS SLATED TO BECOME PICTURE TUBE VOGUE--The focusing systems of picture tubes, which have been in the main based on em principles, are now entering a new phase of design featuring electrostatic techniques. In an effort to conserve copper and cobalt, which must be stockpiled for the defense program, several tube makers have announced complete lines of electrostatic-type tubes in both rectangular and round shapes, with the former receiving most attention. In one new series*, rectangulars in 14, 17 and 20-inch sizes have been included featuring 70° diagonal deflection, with second anode potential ratings ranging from 12,000 to 14,000 volts, the focusing electrodes requiring approximately from 2500 to 3000 volts dc. The tube designers state that the focusing-electrode voltage, at essentially zero current drain, can be obtained from a flyback type of power supply operating from the primary side of the horizontal output transformer. The 1V2s can be used as rectifiers. In announcing the new tubes, one manufacturer indicated that the omission of the em focusing coils would effect a saving of around two pounds of copper per set.

NPA TASK COMMITTEE OFFERS PARTS-REPLACEMENT PLAN--A seven-man task group, composed of members of the Radio-TV-Household Wholesale Industry Advisory Committee, appointed by NPA to help obtain equitable division and allocation of materials for parts among distributors, recently forwarded a resolution to Washington describing how parts distribution could be maintained. The task force recommended that every wholesale or retail distributor of maintenance and repair parts be required to certify to his supplier that the material delivered will be used only for necessary repairs and replacements, and that the replaced parts, including specified critical materials, will be delivered into normal local scrap channels, or upon a manufacturer's request, returned to the plant for salvage. The plan also stipulates that the delivery of the parts ordered must not result in an inventory in excess of that provided in the order.

EPEM SUBMITS MRO COMPONENT PLAN TO WASHINGTON--Committees of the Association of Electronic Parts and Equipment Manufacturers and the Sales Managers Club, Eastern Group, have also submitted a parts-supply resolution to NPA which they believe will facilitate the acquisition of critical raw materials for replacement parts. In a nine-point program, the EPEM group recommended that distributors who purchase MRO supplies (maintenance, repair and operating supplies) from a manufacturer shall be restricted to a 180-day inventory, distributors to sell such MRO supplies only to customers who certify in writing that the material will be used for repair and replacement. Like the task committee plan, provision for the control of inventory was also noted, and in addition, provision for a manufacturer's priority rating on purchase orders has also been suggested.

OLD LIGHT BULBS CALLED PICTURE-TUBE TROUBLE MAKERS--The straight-wire filaments used in light bulbs made around 25 years ago have been found to be a source of horizontal-pattern interference, according to John H. Campbell, a G.E. illuminating engineer. In an investigation he found that these lamps, usually located in hallway, attic or basement fixtures, and used intermittently, caused enough radiation to interfere with a strong TV signal. Most of these quarter-century veterans will be found to have a clear-glass envelope. If there are horizontal patterns, in one to three spots of your screen, start searching for those clear-glass radiators.

METAL SHELL FEARS FOLD--The jitters, which many had when the metal picture tubes became available, have completely disappeared, according to a recent market survey. When the metal tube was introduced, there was general concern for such problems as the brush or electrostatic charge, the ability of the tube to stand up in extremes of heat and cold, refocusing caused by gassy conditions, dust collection affecting the face of the tube, and shell corrosion. While some of these problems did occur in the early stages, they were rapidly corrected and today millions of receivers are providing excellent performance with the metal-housing type tubes.

---

*N. U.

SERVICE...The National Scene

ANOTHER VIDEO ANTENNA FEE PLAN--It costs two dollars now to install an antenna in Havertown, Penna. A few weeks ago the township commissioners approved an ordinance requiring a fee for a permit before any installation could be made. The regulation, it was learned, was enacted so that it would be possible to control not only the type of antenna installed, but the application of safety precautions for the installation. In an adjoining township, a similar ordinance exists. However, here the permit fee is only one dollar.

SERVICE MEN TO RECEIVE NATIONAL PROMOTION--One of the most colorful programs, recommending Mr. Service Man to the American public, by way of telecasting, broadcasting, magazine advertising, direct-mail and motion-picture star endorsements, has been announced by a tube manufacturer. The program, calling for a nation-wide weekly television show, extensive spot announcements, ads in national weeklies featuring endorsements by Hollywood stars, color displays, reminder stickers and monthly mailing pieces, is scheduled to run throughout '51.

NEW DATES FOR NEDA SHOW--The annual exhibition-conference of NEDA, originally scheduled for the last week in August, will now be held in September from the 10th to the 13th. The change was made to avoid interference with the show dates of the West Coast Electronic Manufacturers Association who will hold their affair in August, 22nd to 24th.

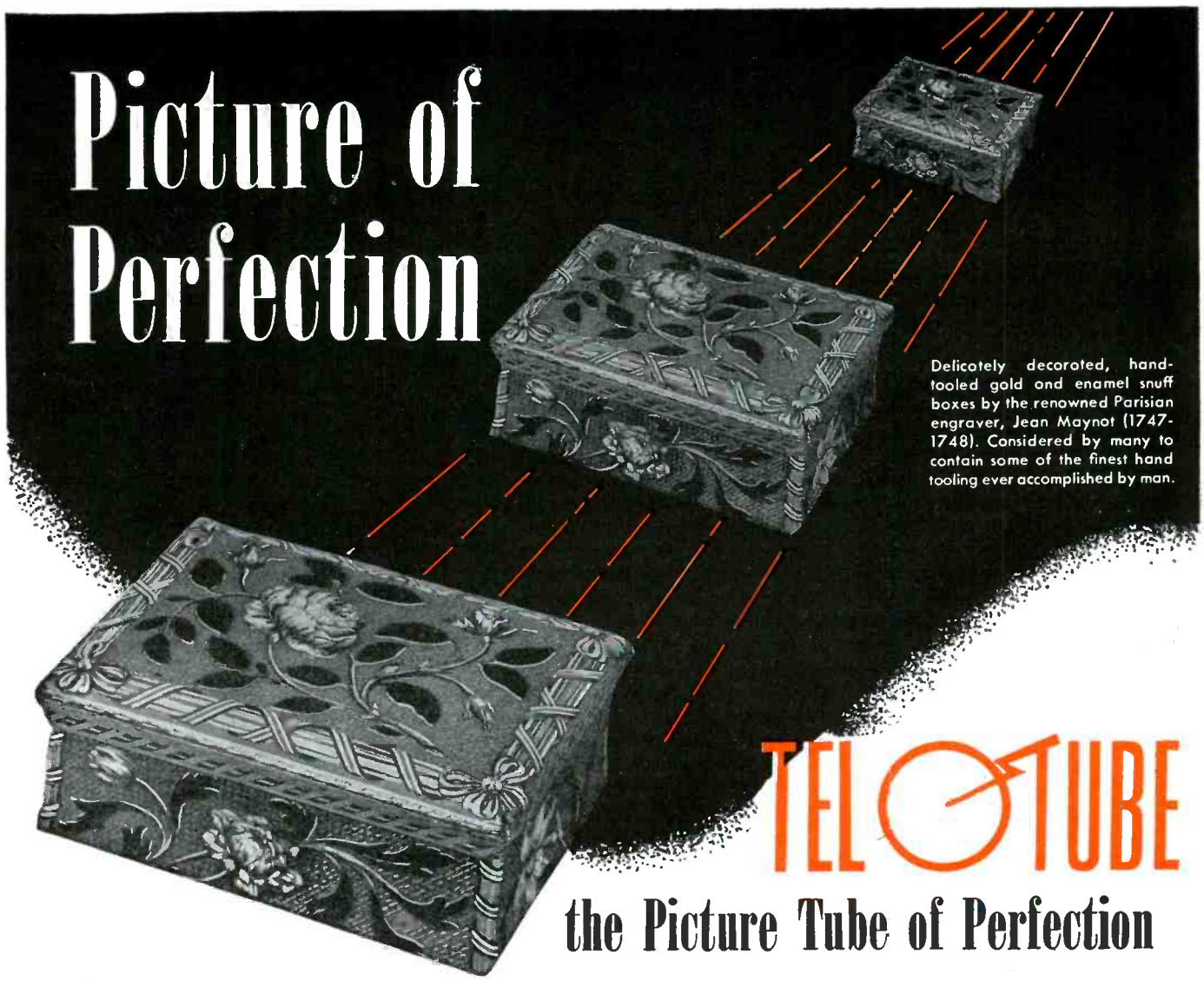
ADDED LIFE FOR PICTURE TUBES--High voltage surges, always a trouble creater particularly insofar as picture tubes are concerned, can be controlled and many hours of life added, according to a report by J. G. Sola. Control units, such as constant voltage transformers, are said to be the answer. In many areas voltage has been found to fluctate up to 30%, although it doesn't take that much to cause trouble. Increases of only six to seven volts, quite common, can cause many premature tube deaths.

CONTRAST MEASUREMENTS NOW IMPORTANT FACTOR IN TUBE PRODUCTION--With the advent of colored filters, gray filters, polarizing filters, gray-face plate glass and sanded face plates, contrast has become quite a factor. Labs have instituted intensive probes to evaluate the potentialities of these and other possible techniques, employing a variety of measurement instruments. Commenting on this aspect of tube production, in a recent IRE presentation, A. E. Martin, R. Q. Vogel and F. W. Harjes of Sylvania revealed that some of the equipment used includes such novel gear as a Macbeth illuminometer, flicker photometer, Luckiesch-Taylor brightness meter, photoelectric setup with a microammeter, etc.

MIDDLETON NOW ASSOCIATION PREXY--Thomas M. Middleton has been elected '51 president of PRSMA, and Jack P. Dickstein and James T. Daly have been named vice president and recording secretary, respectively. Congratulations.

GRATEFUL APPLAUSE--To the desk of ye editor have come a few comments on SERVICE which have certainly made the days quite pleasant. R. E. Greenwood, Seattle, Wash., reported to ye editor that . . . "Your magazine is the most welcome from the service standpoint and the most complete reference on TV, audio, phono, AM, FM and car radio I've ever seen. Hope to be on your list for many years to come. Thanks for a swell magazine." According to Paul V. Forte, executive secretary of the TCA: "SERVICE is a magazine that has always been an excellent source of information for us." Good news, indeed.--L. W.

Picture of Perfection



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RF and IF Amplifiers in

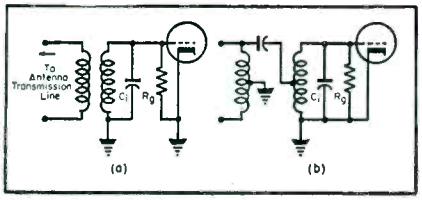
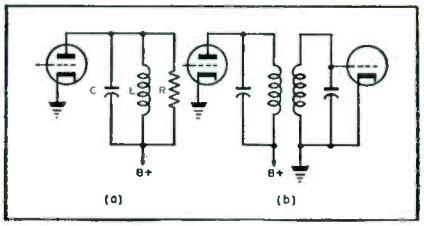


Fig. 1 (*a*) and (*b*). In (*a*) appears a typical tuning input, the capacity shown being that of the input capacity of the tube plus any stray and switch capacity. In (*b*) appears another matching system where the grid coil and tap are changed for each channel. In the system shown in (*a*), both primary and secondary are switched for channel coverage.

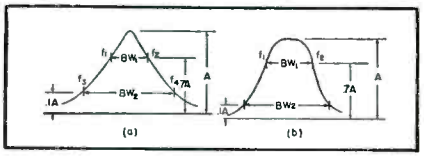
(*Right*)

Fig. 2 (*a*) and (*b*). Plate load of an *rf* amplifier is illustrated at (*a*), while in (*b*) appears a double-tuned critically-coupled amplifier arrangement.



(*Right*)

Fig. 3 (*a*) and (*b*). The response or selectivity curve of the single-tuned circuit illustrated in Fig. 2 (*a*) appears at (*a*), here. In (*b*), we have the selectivity curve of a double-tuned critically-coupled amplifier.



Input Matching Problems . . . Properties of RF Amplifiers . . . Oscillator Arrangements . . . Traps . . . The Sound IF, Discriminator or Ratio Detector Stages . . . Intercarrier Sound Variables.

SINCE THE ANTENNA feeds the received signal to the *rf* tuner, the methods of coupling the antenna to the input grid of the tuner represents a key factor in a chassis, particularly a TV model whose requirements are quite critical. It must be remembered that the antenna has internal resistance; therefore, to transfer maximum energy to the input grid, the grid resistance must match that of the antenna. In addition, the transmission line must be terminated properly to prevent reflections which produce ghosts. This input grid resistance results from transit time effects and cathode lead inductance, the resistance decreasing with increase in frequency. For a tube type such as the 6AG5, it can be as low as 600 ohms at around 200 mc, and as high as 15,000 ohms at 50 mc.

Tuned Inputs

The input circuit is usually tuned to achieve selectivity; hence, to match the antenna impedance an input transformer can be used as shown in Fig. 1(*a*). The capacity shown is the input capacity of the tube plus any stray and switch capacity.

Another matching system is that shown in Fig. 1 (*b*). In this arrangement, the input tuned circuit is tapped at 75 ohms impedance and then coupled to a 300-ohm transmission line through a center-tapped coil which acts as an autotransformer and steps the impedance up by a factor of 4 to 300 ohms. The channel switch provides the correct coil for each channel. In the circuit shown at (*a*) both primary and secondary are switched, whereas in (*b*) only the grid coil and the tap are changed for each channel. The change of tap position is required, because as mentioned previously, the grid resistance decreases as the frequency increases requiring the tap to move toward the top of the coil as the frequency increases. The stepup in input voltage obtained by matching is expressed by the formula

$$N = \sqrt{\frac{R_g}{R_A}}$$

For a 6AG5 operating at about 200 mc, the stepup would be

$$N = \sqrt{\frac{600}{300}} = \sqrt{2} = 1.4$$

The RF Amplifier

To obtain the necessary gain to operate the picture tube a number of tuned *rf* stages could be used; however, it is impractical because of the switching and tracking problems presented. The superheterodyne circuit lends itself to this task because of the simplicity resulting from the use of fixed tuned *if* amplifiers. The antenna could be connected directly to the mixer tube without the use of an *rf* stage; however, oscillator radiation would be increased. The interference to other receivers resulting from oscillator radiation is a problem even with the use of an *rf* stage; hence, an *rf* stage is always used to act as an isolating amplifier and prevent the oscillator power injected into the mixer from entering the antenna. Another important *rf* stage advantage appears in the reduction in inherent receiver noise. The use of an *rf* stage also provides another tuned circuit which adds to the selectivity of the receiver.

Stage Gain

The gain of a stage in any amplifier is determined by the plate load. In the *rf* amplifier the load is usually a tuned circuit such as shown in Fig. 2(*a*). In such a circuit, the load R is expressed by the formula

$$R = Q X$$

where Q is the circuit Q and X is the inductive or capacitive reactance of the circuit. This also can be expressed in terms of the circuit C, as

$$R = \frac{Q}{2\pi f c}$$

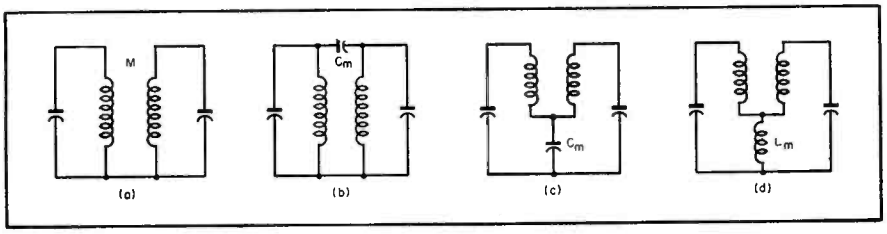
It can be seen from this equation that the load increases with a decrease of

The TV Chassis

by SAM GOLDFUS

Television Engineering Laboratory
Motorola, Inc.

Fig. 4 (*a*), (*b*), (*c*) and (*d*). Four different arrangements for double-tuned critically-coupled circuits. At (*a*), we have an inductive-coupled capacitive setup; (*b*) represents a top-coupled capacitive method; (*c*) in a bottom-coupled capacitive method, and (*d*) in a bottom-coupled inductive method.



C. Since the gain is proportional to the load, which is larger for a smaller *C*, it is desirable to keep the *C* as small as possible. That is why the circuit *C* is usually made up only of the output capacity of the *rf* tube, the input capacity of the mixer, the stray wiring capacity, and the switch capacity.

The response or selectivity curve of the Fig. 2(*a*) single-tuned circuit is shown in Fig. 3(*a*). The frequencies f_1 and f_2 represent the two frequencies 3 db down or .7 of the amplitude at the resonant frequency. The 3-db bandwidth is the difference between these two frequencies. The ratio of the bandwith 10 times down to that at 3 db down is *ten*. This ratio is a measure of the skirt selectivity; the smaller the ratio the greater the selectivity.

Critically-Coupled Amplifier

By using a double-tuned critically-coupled amplifier, such as shown in Fig. 2(*b*), the selectivity curve shown in Fig. 3(*b*) can be obtained. The double-tuned circuit has two major advantages over the single tuned circuit; one is a 40 per cent increase in gain for the same 3-db bandwidth, and the second is greater skirt selectivity. The ratio of the bandwidth at 10 times down to that at 3 db down is 3.2, which shows an improvement in skirt selectivity of about three times.

Double-Tuned Circuits

The double-tuned critically-coupled circuit can be obtained by four different arrangements. The one in Fig. 4 (*a*) is the inductive coupled arrangement; (*b*) is the top-coupled capacitive method; (*c*) is the bottom-coupled capacitive method, and (*d*) the bottom-coupled inductive method. The coupling element is C_m in (*b*) and (*c*), and L_m in (d). The bottom-coupled capacitive method is preferable to the top-coupled capacitive method, because at high frequencies, the top-coupling capacitor must be extremely small.

The Oscillator

A typical oscillator arrangement, frequently found in television receivers, is the Colpitts circuit shown in Fig. 5(*a*). The capacities shown represent the capacities of the oscillator tube: C_{gp} is the plate-to-grid capacity; C_i is the input capacity, and C_o the output capacity. Additional external capacities are often found and usually consist of a trimmer for the fine tuning and a temperature compensating capacitor. Sometimes a capacitor is added to the grid side to adjust the grid drive to a more efficient value.

Fig. 5 (*a*) and (*b*). Typical Colpitts oscillator arrangement appears at (*a*). The circuit in (*b*), also a Colpitts' system, differs from (*a*) in that one side of the oscillator coil is grounded permitting the elimination of one set of switch contacts.

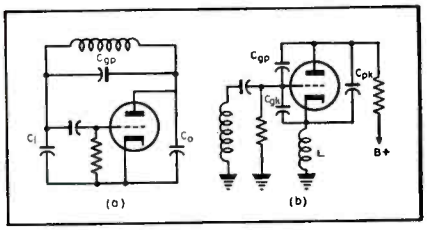
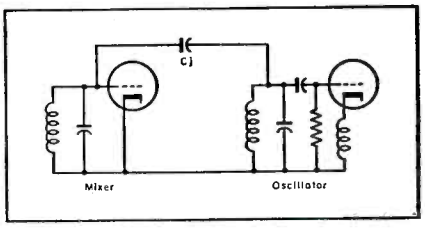


Fig. 6. Circuit of a mixer illustrating how the oscillator voltage is injected by means of a capacitor.



Grounded-Coil Setup

Another oscillator used is that shown in Fig. 5(*b*). This permits grounding one side of the oscillator coil and eliminates one set of switch contacts. This, too, is a Colpitts system with the cathode raised above ground by means of the inductance, *L*.

The oscillator voltage is injected into the mixer circuit, as shown in Fig. 6, by means of the capacitor, C_j. This capacitor is usually of a value of 1 to 3 mmfd. The value is so small because it reduces the pulling effect of

(*Continued on page* 65)

Fig. 7 (*a*) and (*b*). Selectivity curve of single-tuned staggered circuit is shown at (*a*), while at (*b*) appears the overall response of the two stages shown in (*a*).

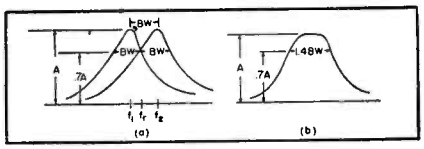
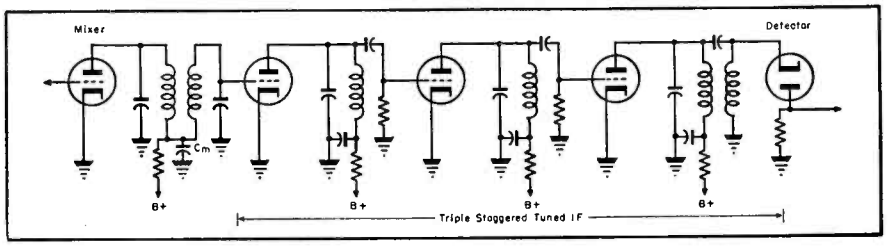
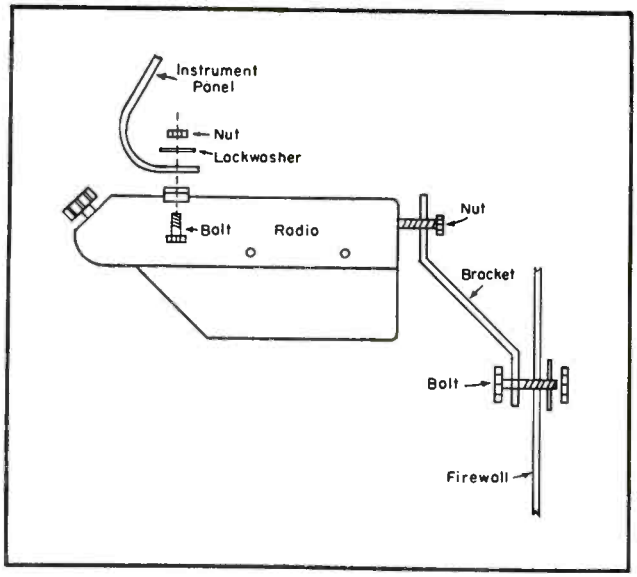


Fig. 8. A staggered-tuned triple-*if* amplifier circuit.





Auto

Fig. 1. Mount arrangement for single-unit receiver under dashboard in car.

Methods Which Can be Used to Mount Chassis . . . Selecting and Installing Antennas . . . Eliminating Noise . . . Rear and Front Speaker Setups Long-Haul Trailer-Truck Installation Precautions.

IN INSTALLING receivers in pickup or heavier trucks, there are several important procedures which must be followed.

Key Requirement

There's one precaution which *must* be carefully observed, particularly when making installations in any truck. They must be made strong and tight! Trucks are designed to haul cargo, not to ride like a feather, and the radio installation must be consequently sturdier to hold up under the extra jarring and vibration. For instance, if there's any doubt as to what size bolt to use, the heavier one should be used; make them too big rather than too small!

Chassis Mounting

Most trucks and pickups will have sufficient empty space on the firewall for a conventional mounting of the set itself. If one of the little *under-dash* sets is to be installed, mounting is usually quite simple. The other types can hang on the firewall, with *J* bolts. A word of caution about hole-drilling. In most trucks will be found voltage regulators that are much heavier than those found on passenger cars, and often positioned right where it's necessary to drill mounting holes. Usually, the regulators stand off from the firewall quite a bit. Thus, if it's absolutely necessary, the bolts on the regulator can be loosened, set mounted and the bolts cut short enough to permit the regulator to be remounted over them. This is recommended only as a last resort, however, since this type of mounting is a difficult one to disassemble should servicing become necessary.

If there is no spot on the firewall to hang the chassis, the area under the dash should be investigated. Most trucks have a heavy brace, or even two, running from the underside of the instrument panel to the firewall. These are flat, heavy straps, and the set may be mounted on top of one of them. A flat, heavy strap should be secured. Its length can be about three inches more than the radio chassis, and it can be placed across under the brace. Two holes should be marked and drilled to fit the mounting bolts of the set. Then the set can be placed on top of the brace, with the strap underneath. The bolts can then be fastened and run up finger-tight. The set then can be shifted into the proper

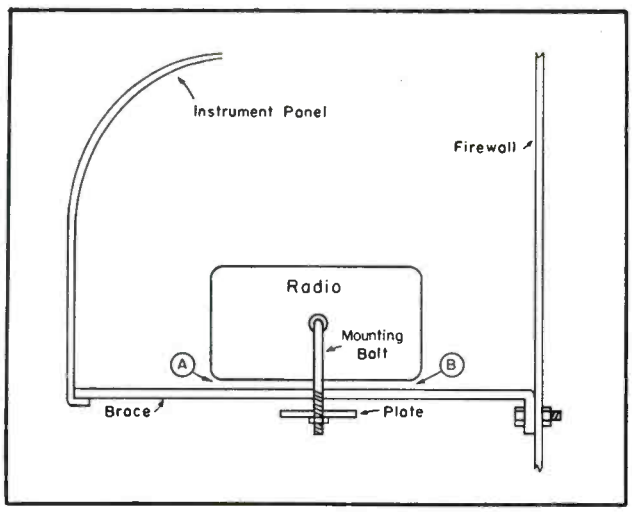


Fig. 2. Setup for the mounting of receiver on brace under the dash. Small pads of wood may be inserted at *A* or *B* to provide *mount rigidity.*

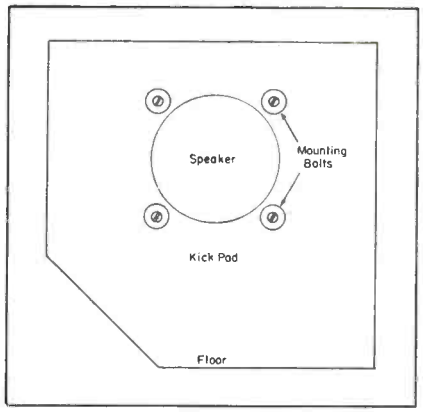


Fig. 3. How the speaker can be mounted in the kick pad.

Radio Installation in Pickup or Heavy Trucks

by JACK DARR
Ouachita Radio Service

position, and the bolts tightened; Fig. 2. You may have to use a couple of pads of wood, to take up any slack. The set should be held very firmly, so that it won't be loosened by the pounding of the truck. If the set fits atop one of the braces, the speaker can be mounted on the other, or in a cabinet on the firewall. If there's no room for even the speaker, it can be mounted above the windshield, or behind the driver's head, in the upper corner of the body. The wiring is then extended to the speaker, running it over the door, and staking down with small cable clamps. In the case of the speaker mounted behind the driver's head, there should be a soft rubber ring on the front, in addition to the screen-wire grille, to avoid head bumps.

If neither of these mountings are suitable, it may be possible to mount the speaker on the right-side kick-pad. These are usually heavy fiber-board, and the speaker can be mounted there, by cutting out a hole of the proper size, and punching holes to take the bolts. *Cup-washers* should be used under the screws to hold the speaker. It is important to use a heavy grille here, as it's within reach of the passenger's feet, and will probably be kicked several times each day; Fig. 3.

The remote control heads may give a little trouble, if there's an assortment of equipment mounted under the dash, such as heater or fog-light switches, etc. Some trucks have an opening in the dash itself to fit the control-head of the custom-built set. If the particular head you have to use won't fit that opening, a dummy control head escutcheon plate should be made out of heavy sheet aluminum, the holes being cut out for the dial, controls, etc., and the control head mounted on it. The new plate may be fastened to the dash with sheet-metal screws, or the original fasteners used. Occasionally, the cover-plate, which was on the opening, can be used as a base for a cutout for the control-head; see Fig. 4.

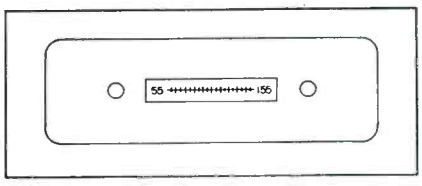
Truck Antenna Installation

Installation of antennas for truck service must be well done, if they are expected to stay there. It's particularly important to be certain that the antenna on a truck is a good one, the best available! It will very definitely pay off. You'll be assured that the rod, coupling plate, contacts, etc., will not fall to pieces in a short time from the jolting and jarring.

It has been found that a two-post side-cowl mount antenna is perfect for all-around truck duty. A medium-length antenna, 66″-72″, should be used. The very short ones won't provide enough signal strength; the trucks are usually operated on the highways, away from the broadcasting stations, and gain is important. The 99″ jobs can be used, but they have quite a bit of weight, whip and bounce. Of course, if these long ones are properly mounted, with the insulators at least 9″ apart or more, and then run with the middle section down, to reduce the strain, they're fine.

The leadin should be tied up out of the way, after installing. This same precaution goes for all control shafts, speaker-cables, etc. No part of the chassis should be left dangling, where it might interfere with the operation of the truck! It can cause a serious accident. All loose wires, cables, etc., should be tied to bars, braces, etc., with friction tape, so that they'll stay out of the way.

Fig. 4. Cutout of cover plate, removed from dash, to fit control head which may be around.



Noise Elimination in Trucks

Motor noise sometimes becomes quite a serious problem in trucks, especially in the larger units using heavy-duty ignition systems. A suppressor must be used in the distributor lead, and a capacitor on the battery side of the coil, as a minimum. All parts of the hood and front fenders should be well-bonded to the chassis. It will occasionally be necessary to run extra ground-straps from the engine-block to the body or frame.

When testing, the antenna lead should be pulled and chassis pickup checked first. If a fairly new chassis is being installed, the noise will be found to be very low, even before the installation of any noise suppression devices. A bypass can be placed across the ignition switch or ammeter, wherever the hot wire is connected. Then the antenna can be replaced and tested for noise pickup. If the rod itself is found to be the source of the noise, bonding of hood and fenders should be checked. Even the radiator grille may have to be bonded. All accessory wiring should be checked under the hood. There's usually plenty of this wiring on a truck, with special horns, fog-lights, air or electric brakes, etc., around. All these wires should be dressed as far away from ignition wiring as possible, tying them to hood-braces or radiator brace rods with tape. Battery wiring will pick

(*Continued on page* 41)

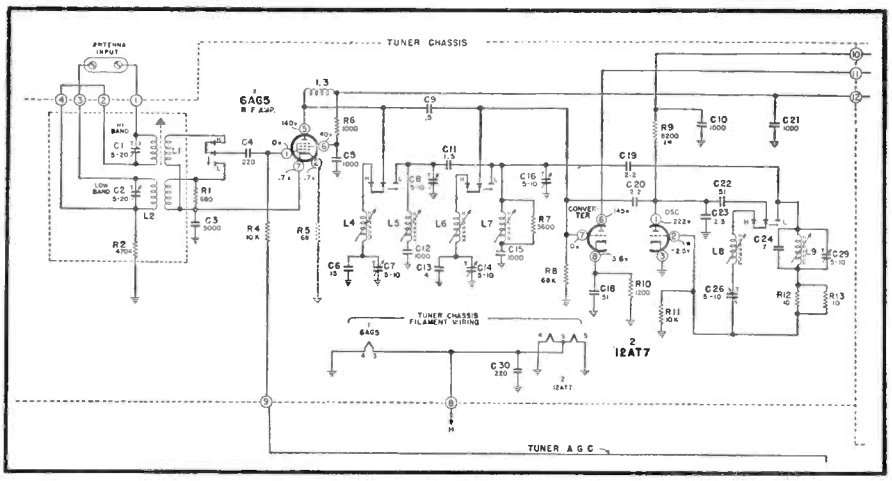


Fig. 1. Modified Raytheon 12AX27 chassis tuner with a 12AT7 which has replaced a 6J6

Servicing Helps

by M. A. MARWELL

Replacement of 12AT7 for 6J6 in Tuner of Raytheon TV Chassis . . . Motorola Service Suggestions: Removing Speaker Hum; Improving Fringe Reception by Adding More Positive Vertical Sync and Minimizing Vertical Collapse; Eliminating Sound Beat Interference in Picture; Avoiding Compression at Top and Bottom of Picture . . . Admiral Modifications: AGC Improvement for Weak Signal Areas; Eliminating Vertical Foldover.

TUBE SUBSTITUTIONS, prompted by procurement problems, have made it necessary to introduce many revisions to assure circuitry efficiency. In many instances substantial improvements have been noted, with the change, because of the increased gain afforded by the new tube. An interesting illustration of this modification trend, providing better results, appears in the tuner circuit of Fig. 1; Raytheon 12AX27 chassis. Here the 6J6 (oscillator-converter) in the tuner was replaced by a 12AT7, a change incorporated in chassis stamped with RMA date code 124034 and up.

Although the revised circuit shown provided more gain, it was found that a further increase in output could be achieved by additional changes. The value of C_9 was changed to .68 mmfd (ceramic); C_{18}, 1000 mmfd (ceramic); C_{28}, 1 mmfd (ceramic); R_9, 6800 ohms (1 watt); and R_{10}, 2200 ohms, (½ watt). This change was incorporated in chassis stamped with RMA date code 124036 and up.

Motorola TV Service Notes

In some of the '51 Motorola television combination models such as 17F1, 17F2, 17F3, etc., a speaker hum may be noticed even with the *ac* power switches in both the TV and radio chassis turned off. This has been traced to incorrect polarization of the leads from the AM-FM radio chassis to the speaker. The remedy is to reverse these leads at the speaker pin jacks. In reinstalling the AM-FM receiver chassis, if it becomes necessary to remove it for service, care should be taken to plug the speaker leads in so that the ground wire from the radio chassis plugs into the pin jack tied to the number 2 terminal on the receptacle which receives the speaker plug from the TV chassis. This number 2 terminal is the ground connection from the TV chassis.

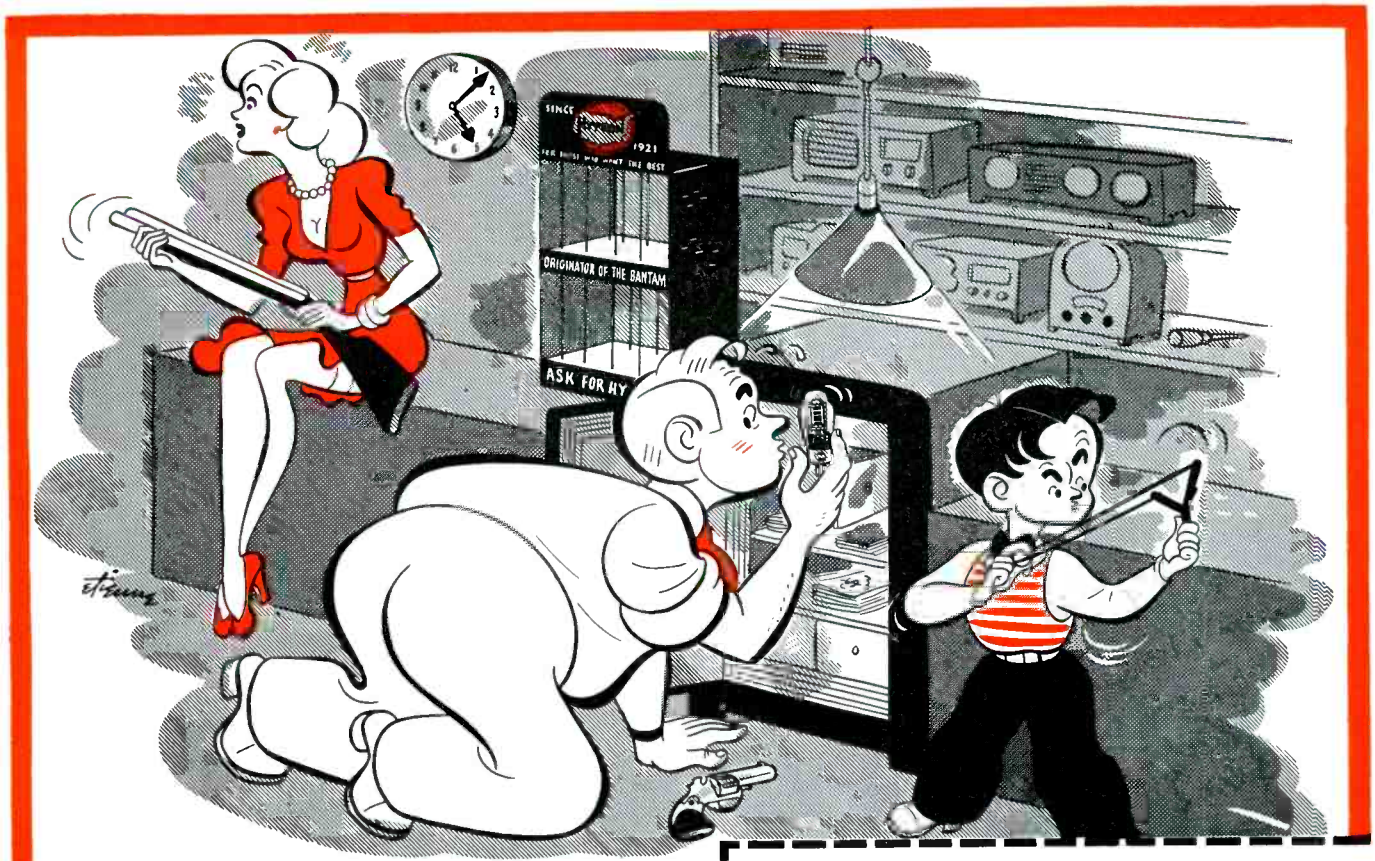
In the early '50 Motorola TV chassis, such as TS-14, TS-23, TS-52, TS-53, TS-60 and TS-74, when used in fringe and weak-signal areas, vertical collapse with certain settings of the size and linearity controls has been encountered. This can be minimized and more positive vertical sync can be secured by making the following alteration; Fig. 2, p. 28.

(*a*) First a differentiating circuit must be added at the input of the first clipper. This helps to prevent noise from reaching the clipper grid. It consists of a 100-mmfd mica capacitor[1] and a 470,000-ohm ½-watt resistor connected in parallel and inserted between the 10,000-ohm series resistor and the coupling capacitor to the first clipper grid. The first clipper grid resistor must be changed from 1 to 2.2 megohms.[3]

(*b*) Then the coupling capacitor to the first clipper grid should be changed from .001 to .005 mfd.[4]

(*c*) The sync-pulse amplitude out of the second clipper can be increased by applying a small positive voltage to its grid. This can be done by connecting a 390,000-ohm ½-watt resistor[5] from the plate supply to the

[1]Motorola 21R6554. [2]Motorola 6R6032. [3]Motorola 6R3927. [4]Motorola 8R9869.



THE TENSION'S TERRIFIC

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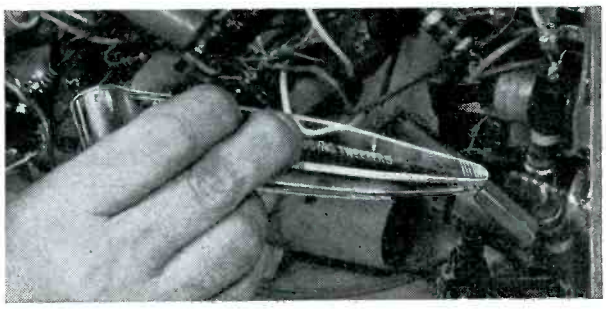

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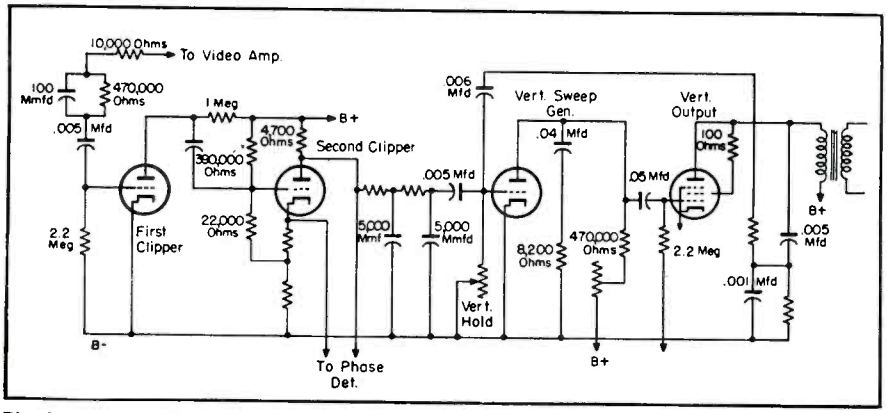


Fig. 2. Revamped Motorola clipper, vertical sweep and vertical output circuit which prevents vertical collapse and assures more positive vertical sync, features necessary in fringe or weak-signal areas.

grid of the tube. To keep the pulses to the phase detector balanced in amplitude, the plate load of the second clipper must be changed from a 5600 to a 4700-ohm ½-watt resistor.[6]

(*d*) The coupling capacitor from the integrator to the vertical sweep generator grid then must be changed from .002 to .005 mfd.[4]

(*e*) In the next alteration, the feedback capacitor from the vertical-sweep output-tube plate circuit to the vertical sweep generator tube grid circuit must be changed from .005 to .006 mfd.[7]

(*f*) Then, the screen grid of the vertical output tube must be isolated by inserting a 100-ohm ½-watt resistor[8] between it and the plate at the socket.

(*g*) In the final modification, the saw-forming capacitor should be changed from .05 to .04-mfd, 600-volts.[9]

There have been a few cases of a short or high resistance leakage to core, developing in the damping diode heater winding in the TS-101 and TS-119 power transformers. To repair the damping diode heater leads should be clipped off short at the power transformer and a separate isolation transformer[10] installed. This is the same transformer used in the TS-89 etc., series chassis.

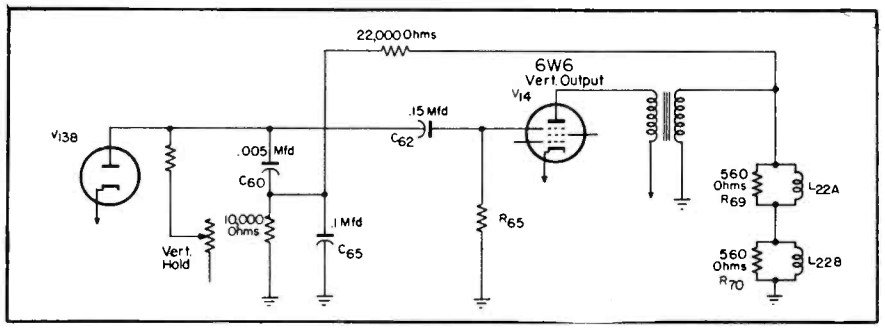
On some TS-101 and TS-119 chassis, there have been complaints of sound beat interference in the picture, caused by pickup from the discriminator circuit. If careful lead dress around the discriminator does not cure this condition, the discriminator transformer secondary tuning capacitor, C_{44}, should be checked. It should be connected so that the outside plate goes to the low side of the coil. In good signal areas the easiest way to cure the trouble is to slightly detune the primary of the discriminator transformer. However, this should not be done in fringe areas. Inserting suppressor resistors at the 6AL5 discriminator tube socket (Fig. 3) will also remedy the condition. All connections from pins *1* and *2* of the socket (V_9) should be removed and a 220-ohm resistor [11] connected to each of these pins. The leads that were originally removed from pins *1* and *2* are then connected to the other ends of the resistors respectively.

Some TS-101 and TS-119 chassis have been found to exhibit a compression at the top, and sometimes also at the bottom of the picture, which is difficult to remove with settings of the vertical linearity and vertical size controls. In these cases the addition of a 22,000-ohm ½ watt resistor[12] from the high side of the vertical yoke winding

[5]Motorola 6R5646. [6]Motorola 6R6080. [7]Motorola 8K790026. [8]Motorola 6R6018.

[9]Motorola 8K400028. [10]Motorola 25B790140. [11]Motorola 6R3933. [12]Motorola 6R6397.

Fig. 4. Altered Motorola vertical-blocking oscillator and vertical output circuit of TS-101 and TS-119 chassis, which eliminates compression at top and bottom of picture.



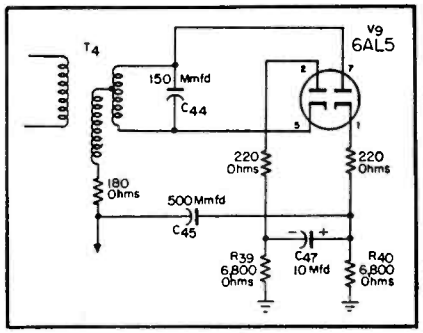


Fig. 3. Motorola circuit with a pair of 220-ohm resistors inserted to remove sound-beat interference in the picture.

to the high side of the peaking resistor R_{64} will remedy the condition; Fig. 4. In installing this resistor it will be found best to use the terminal strip which serves to effect the junction between the green yoke lead and the yellow transformer lead. The resistor can be connected between this lug and the adjacent lug on the same strip which is at present unused. Then a wire can be run from this point to the terminal strip lug which forms the junction for R_{64}, C_{60} and C_{61}. Care should be taken in making this connection not to break the terminal on the 4.5-mc trap coil, L_{19}, by careless movement of C_{64}, the .1-mfd coupling capacitor to the picture-tube cathode.

Improving Reception in Weak-Signal Areas

In the Admiral 20T1, 20V1, 21B1, 21C1, 21D1, 21E1, 21H1, and 21J1 chassis, used in weak-signal areas, where the noise level is high, it has been found that the *agc* diode, V_{304} develops an *agc* voltage which is proportional to the peak-to-peak noise voltage. Thus, when the high *agc* voltage is applied to the controlled stages, the gain of the receiver is controlled by the noise level and not the sync pulse level. This may result in loss of sync, poor contrast or low sound level.

When this situation is encountered, it may be corrected by using the voltage developed across the video detector load for the *agc* voltage, instead of the normal *agc* voltage developed by the *agc* diode.

This change should not be made where strong signals may be received, or overloading will result.

For the 20T1 and 20V1 chassis, the changes shown in Fig. 5 (*a*, *p.* 46) should be followed: First V_{304} (6AL5) should be located. Then resistor R_{314} (680,000 ohms) from pin *7* of V_{304} should be disconnected and connected as shown in Fig. 5. The tuner *agc* lead (white) should be removed from the *agc* lug and the wire grounded to the chassis.

For the 21B1, 21C1, 21D1, 21E1, 21H1, 21J1 chassis the changes shown

(*Continued on page* 45)

BUILT TO TAKE IT

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AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

Design and Application Notes on Wire and Tape Recorders and Players . . . New Developments In Audio Systems for the Public-Address, Custom-Installation and General Service Man.

by KENNETH STEWART

MAGNETIC RECORDING, which a few years ago found favor mostly with hobbyists and experimenters, has tossed off its amateur's cloak and become a professional favorite on many fronts . . . in the home, at the office, at recording studios and even at broadcast stations.

Three years ago magnetic recorder manufacturers were turning out only a few hundred units monthly, almost all of them wire. Today, approximately 11,000 wire and tape recorders are being manufactured each month, according to Jay Sterling Kemp, director of the magnetic recorder division of the Armour Research Foundation.

Commenting on the wire and tape acceptance, W. S. Hartford of Webster-Chicago said recently that both systems now have their enthusiastic supporters, both having their individual advantages, depending on what use they are put to. In his opinion both types have a definite place and use and the future will find them both in widespread use.

Magnetic recording began to win a bit of audio glory when musicians and entertainers found that they could use the system to check themselves on rough spots that showed up during their rehearsals. Music teachers found the method would speed up a music student's progress, since the student could record his lesson and take the spool home to play back on his own machine as a guide for his practice sessions. Language and speech teachers also found the magnetic idea an excellent aid in their fields. Church administrators devised a wide variety of uses for wire. Lectures and politicians found that they could study their speech delivery and content with magnetic recordings.

For police, doctors and lawyers, magnetic recorders have proved to be ideal. And in the business field the magnetic wire dictation machine has become a popular item.

Recently, there was introduced a model* which features a foot control that permits the operator to rewind by simply pressing it. The foot control also is used to start and stop the machine instantly. Thus a dictator is left free to use his hands for making notes, referring to correspondence and answering the telephone, making the stenographer's transcription job easier. In addition, a hand-control microphone provides forward and stop controls.

The model has simple two-button controls, one for dictation and the other for transcribing.

An elapsed-time indicator records quarter-minutes up to 15-minute periods, permitting accurate recording of the length of a letter. Recordings of up to one hour can be made without changing spools.

The unit permits automatic switching from reproduction through the speaker to reproduction through headphones when the headphones are plugged in.

Featured, too, is a wire transport mechanism that is said to make it virtually impossible to snare and spill the wire. The equipment can be used for recording meetings, conferences and important interviews and for rehearsing talks, as well as for dictating. It can also be used for stock inventory.

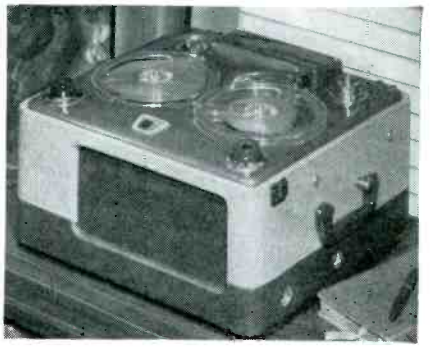
Tape Recorder Developments

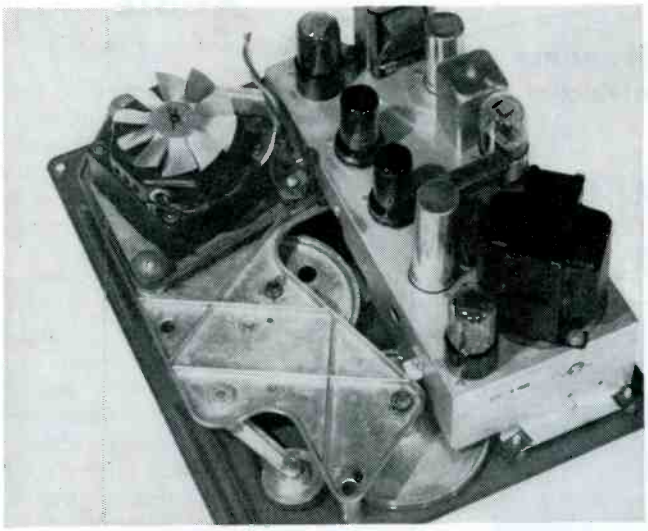
New tape recorders featuring interchangeability of tape spools are now

*Webster-Chicago 228.

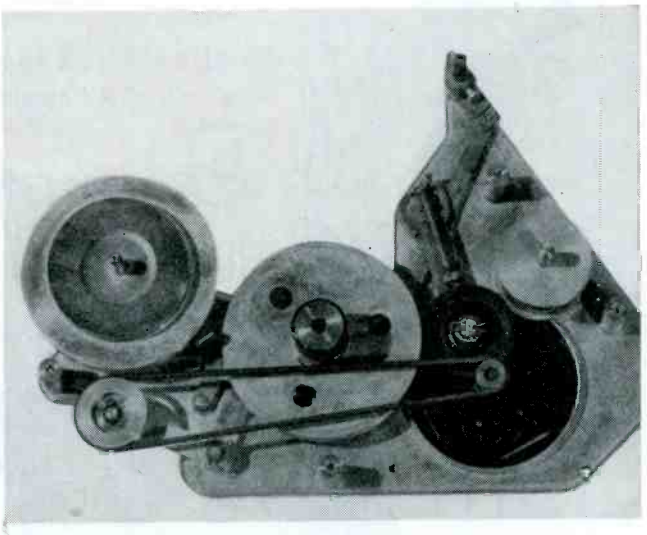
(*Right*)
Webster-Chicago tape recorder.

(*Left*)
Webster-Chicago magnetic-wire dictation machine.





Bottom view of the Eicor tape unit, showing the amplifier and motor.



Motor and pulley mechanism of the Eicor magnetic-tape system.

available. One model[1] records at both 3¾ and 7½ inches per second permitting a spool recorded on it to be played on other tape recorders. The machine utilizes a double track tape that provides two hours of uninterrupted recording at the slow speed.

It has a fast forward and fast reverse speeds. A 1,200-foot reel of tape runs through in three minutes at the fast speed.

A new development in tape reels, loop leaders that drop over the reel, is another feature of the machine. This is said to guarantee an automatic stop at the end of the reel without danger of the leader slipping from its moorings.

Model uses five tubes and a rectifier in a straight *ac* circuit. Three of the tubes are dual purpose types. Has a six-inch speaker.

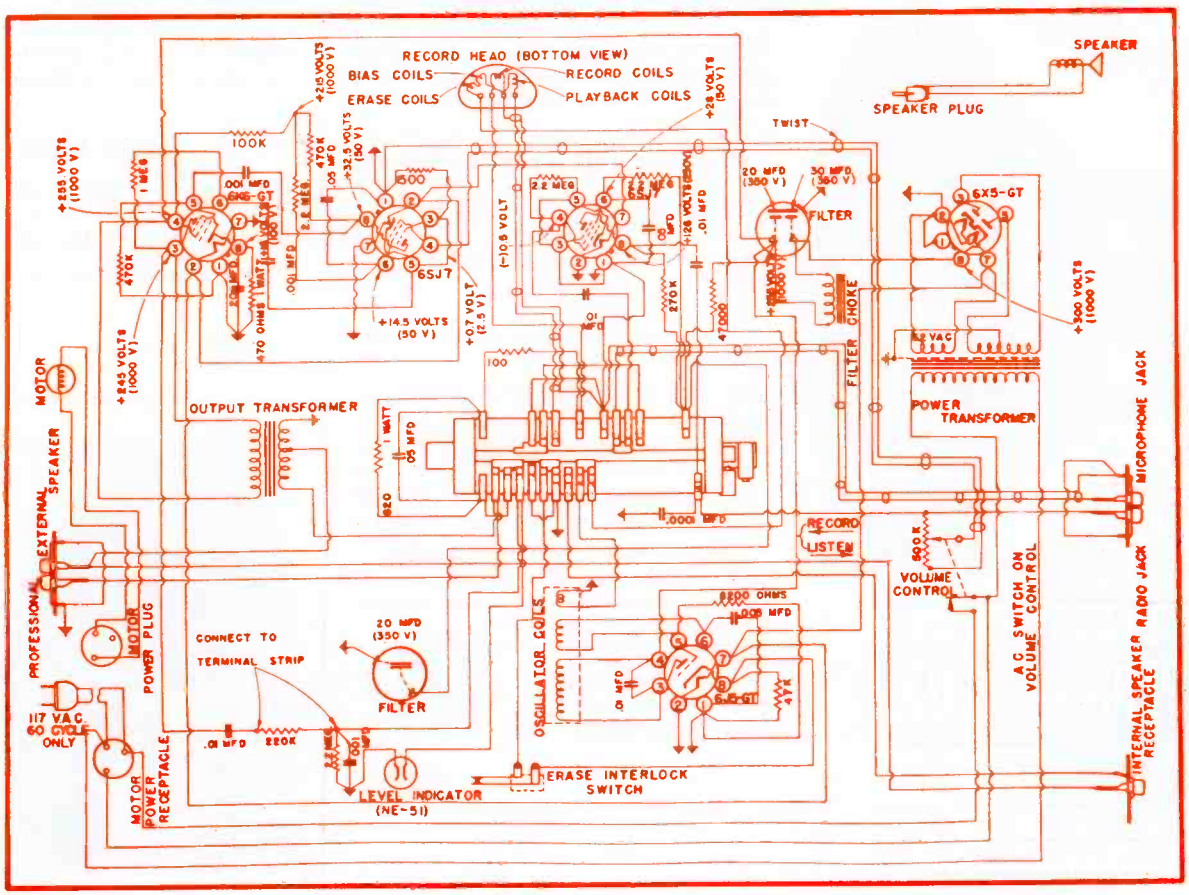
Standard equipment included are a microphone, a power cord, an empty reel and one spool of tape measuring 1,200 feet. Incidentally, nine hours of recording tape can be carried in the case.

In Fig. 1 appears the circuit of another type of tape-recorder and player.[2] In this model four magnetic coils are all in one head. Either playback coil or microphone can be switched to the grid of the 6SJ7. The *radio* input is paralleled with the plate of this tube across the volume control. A 6K6GT

[1]Webster-Chicago Web-Cor 210.

[2]Eicor 15.

Fig. 1. Circuit of the Eicor model 15 tape recorder and player.



Audio

(*Continued from page* 31)

serves as the power amplifier, feeding speakers and the record coil, which is through an equalizer network. Provisions are made for attaching external 3.2- or 500-ohm speakers or lines. A 6J5GT oscillator provides erase and bias signals.

There are four frequency-compensation networks in the amplifier. A series 1-megohm resistor and .001 mfd capacitor between the plate of the 6K6GT and the cathode of the previous tube feed back (and therefore roll off) highs, beginning at about 250 cycles. The apparent effect is a bass boost from 250 down. This is, of course, a high-boost circuit. A parallel 820-ohm resistor and .05-mfd capacitor, in series with the record coil, boosts highs beginning at about 4,000 cycles. This is the only one of the compensators not in the circuit at all times.

The operation of the *forward-stop-rewind* control is quite interesting. With the cathode of the 6J5GT grounded only through its cathode resistor and capacitor, the bias prevents oscillation. This control is a leaf-type interlock switch, which closes only when the mechanical clutch arrangement is in the *forward* position. This prevents erasure when the tape is being rewound, even though the switch, S_1 may be on *erase-record*. When the *forward-stop-rewind* control is closed and the *record-listen* control on *erase-record*, the 6J5GT cathode is grounded directly and the oscillator operates.

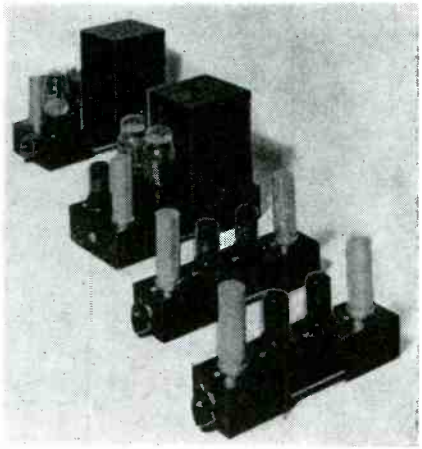
Unitized Amplifiers

A line of unitized amplifiers,[3] designed in the form of block units (modular units) that can be assem-

(*Continued on page* 47)

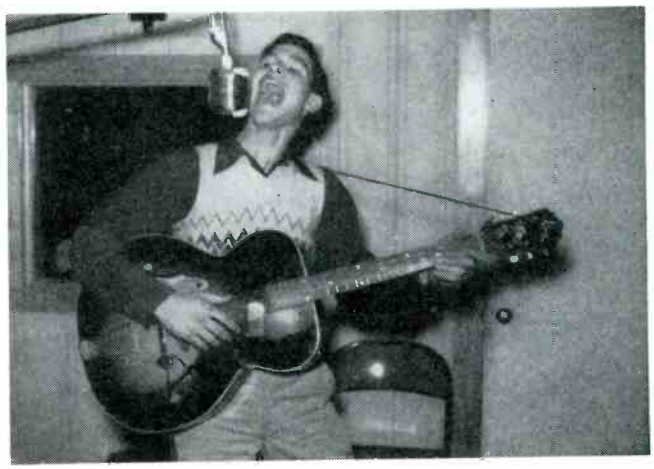
[3]ModulaR Audio Corp., 1546 Second Ave., New York 28, N. Y.

Modular Audio series of amplifiers and preamps.



Professional announcer addressing mike properly. Notice the distance between announcer and the microphone, which avoids pickup of lip and breath noises, and unpleasant hissing and puffing. (*Courtesy KENA, Mena, Ark,; photo by Anthony Grove*)

Misuse of mike, entertainer being too close to microphone, and singing too loudly. This approach causes distortion and overloads microphone. (*Courtesy Raymond Holland; photo by Anthony Grove*)



MICROPHONE TECHNIQUES For PA Men*

by WYN MARTIN

Procedures Which Have Been Found to Provide Best Results in Indoor and Outdoor Activities, Involving Mike and Speaker Relationship, General Positions of the Mike and Mike Addressing.

THE PROPER USE of the microphone, normally assumed to be a procedure well known to all, is, it is sad to report, a complete baffling mystery to many. It is only necessary to listen to the garbled announcements usually heard at railroad stations, carnivals, dance halls, lecture halls, etc., to realize that this irritating situation still exists.

There are several principles which must be followed to assure crisp, understandable reproduction, and none are actually too complex. The first rule, for instance, involves nothing more than mike addressing or learning how to speak into the mike correctly. No microphone ever built can provide that clear reproduction of speech if it is jammed against the mouth and shouted at! For the best results, most microphones must be held at least twelve inches from the lips. When the voice is raised above its normal conversational level, quite a lot more is lost in *readability* than is gained in volume. Nothing is gained if a thousand people *hear* you, but they don't know what you're talking about! Let the amplifier do the work; that's its job!

The fact that you can't hear yourself, when speaking into a *pa* system mike, is actually a tribute to the sound system. For, if the system has been set up correctly, and the gain properly adjusted, you should not be able to hear any sound from the speakers, when standing at the microphone. If you do, you're getting sound where it should *not* be. And if the sound is being heard, there's trouble ahead in the form of feedback. Quite a bit of distortion can be introduced into the sound, due to differing phase relationships in the *direct* and reproduced sound from the speakers, both reaching the microphone simultaneously.

Incipient feedback may be recognized by a little ringing *tail* on each word or sound. This calls for a reduction in gain.

Far more important than the volume in any sound installation, especially in the setups intended for reproduction of speech, is the quality we might call *intelligibility* or *readability*. In other words, we should be interested in the percentage of words spoken which can be clearly understood. A perfect score can only be obtained by the most careful attention to details, when making an installation.

The speakers must be carefully phased, if more than one is used. To check this, a flashlight battery can be connected across the voice coil of each speaker, if cone speakers are being used, marking the polarity which makes the cone go outward. The marking should be applied on the terminals, all terminals with identical markings being connected together. Thus, all cones will travel in and out together, and *out-of-phase* spots can be eliminated. Speakers out of phase will cause fuzzy and even dead spots, due to cancellation of the sound waves. If you are using trumpet speakers. with *pm* driver units, the terminals of these will be marked L_1, L_2, for identification. Like symbols should be connected together.

Speaker Location

Speakers must be located so that their sound will cover the parts of the audience not reached by the direct

*Based, in part, on data prepared by Jack Darr.

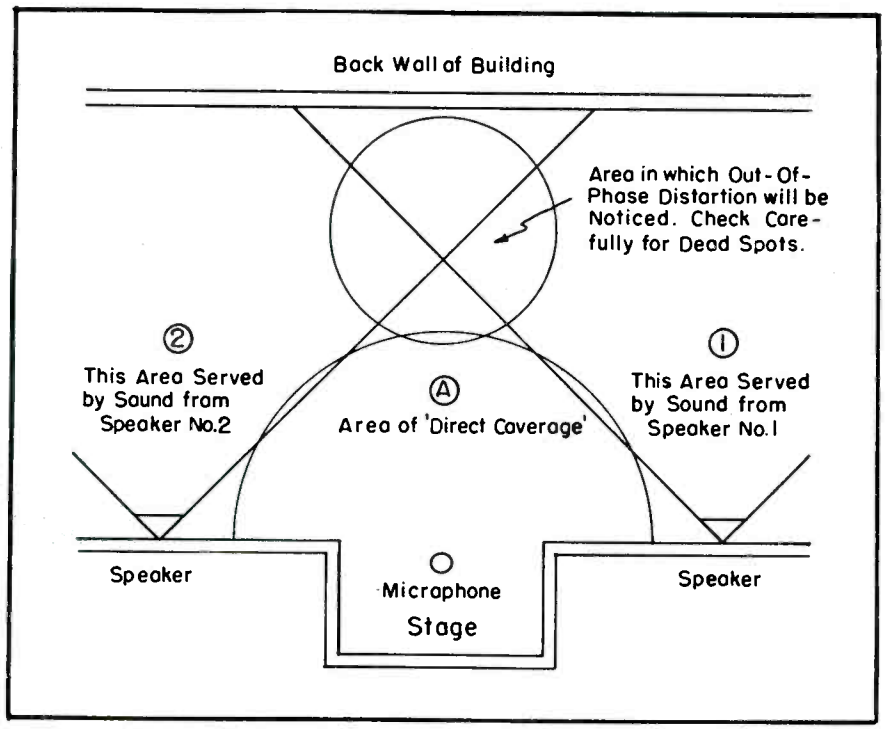


Fig. 1. Floor plan of typical auditorium with stage, showing speaker placement and coverage which can be expected.

sound from the stage itself, as illustrated in Fig. 1. As cited earlier, speakers should not be placed so that their sound will reach the microphone. If the setup is outdoors, there's usually no problem with reverberations, echoes from walls, and so on. Indoor jobs, however, can cause plenty of trouble, unless the speaker angles and volume levels are carefully watched.

In setting up speakers, they should be placed on the sides, directed into the back corners of the building. In addition, they should be placed as high as possible, so that the *beam* of sound may be directed downward, into the crowd, which is one of the best sound-absorbing materials known. Hitting the corners will also force the sound to make as many *bounces* as possible, before it gets back to the microphone. Each bounce loses a little of its original intensity, so that by the time it gets to the microphone, it is usually so weak that it can cause no damage.

Mike Positioning

As we mentioned earlier, it is important to stay at least a foot away from the mike. Any closer approach than this will cause pickup of objectionable *hissing* and *puffing* sounds from the lips and breath. In addressing the mike, natural medium-loud conversational tones should be used. No attention should be paid to the microphone. The stand of the microphone should be set so that it is about level with the chin; then you can speak over the top of it.

Setting up microphones for personalities who insist they know how to speak into them can present problems. There's always the orator who is a mike swallower. He'll have to be briefed, politely, of course. He can be told that you've gotten a very extra special microphone, just for him, and that it's very sensitive. Thus, he must stay at least two feet away from it and the folks will be able to hear him much better. Then, when the stand is adjusted, it can be set just below his chin, and tightened down. You'll be surprised at the difference. Also, he might be told that if he keeps the microphone below his chin, his constituents will be able to see his face much better. If that doesn't please him, nothing will!

The Quiet Speaker

There's also the legislator who's afraid to clear his throat in public, and makes most of his speeches about ten feet from the microphone, speaking in a bashful mumble. About all that can be done for this character is to hang a lapel microphone on him and ride the gain constantly, to keep him audible.

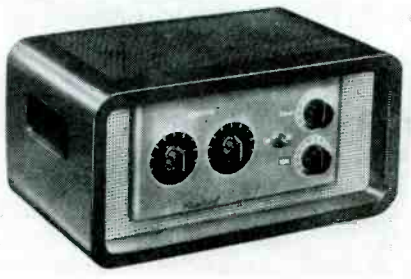
The lapel microphone idea will also work with the *gallopers,* who wave their arms and dash madly about, blissfully ignoring the fact that the microphone is located in the center of the stage. These boys will need plenty of cord. In fact, some of the prancing-talkers almost require a reel, like a deep-sea fisherman, to keep 'em from being hung by the mike-cable!

Coverage and Background Noise

One of the most embarrassing after-the-talk phrases to a sound-man is: "Couldn't hear it!" After you have made what you proudly consider a good installation, and painstakingly *rode gain* on the program all through the evening, this comment is riling. You'll get a certain amount of this normally, for there are characters who take pride in locating spots immediately in back of your speakers, or in a dead spot, and spending the evening there, just so they can gripe at you about the sound.

However, the condition can be avoided, by using an assistant during the installation, who can serve as a mike tester. While he speaks you can walk around the area to be covered and see that there are no dead or fuzzy spots in the room. This test will also reveal the amount of gain required to get coverage. It is important to remember, when making this test, to take into account the background noise that will be present during the actual presentation of the program. An outdoor church service, for instance, will have practically no background noise at all, while, at the other extreme, a football game will have a terrific amount of background, with bands, cheering, etc. The amplifier used must have sufficient power to override the background noise. Church services with fairly large crowds have been covered with only ten watts, while football games have been found to require as much as fifty watts.

Self-contained remote mixer and preamp, which is designed to mix four inputs (high or low impedance mikes and crystal pickups) and to feed the program over remote line to main amplifying equipment located at any required distance away (up to several miles, if desired). Output measured at 100, 400 and 5000 cps said to be 300 mw, 2% at 600 ohms. Frequency response: 1 db, 40 to 20,000 cps. Tubes: 4-6SQ7, 2-6SC7, 2-6SN7GTA, 1-6XGT. (*Model 1904: Rauland-Borg Corp., 3515 Addison St., Chicago 18, Ill.*)



We're Doing Our Best to Keep Up With the Demand

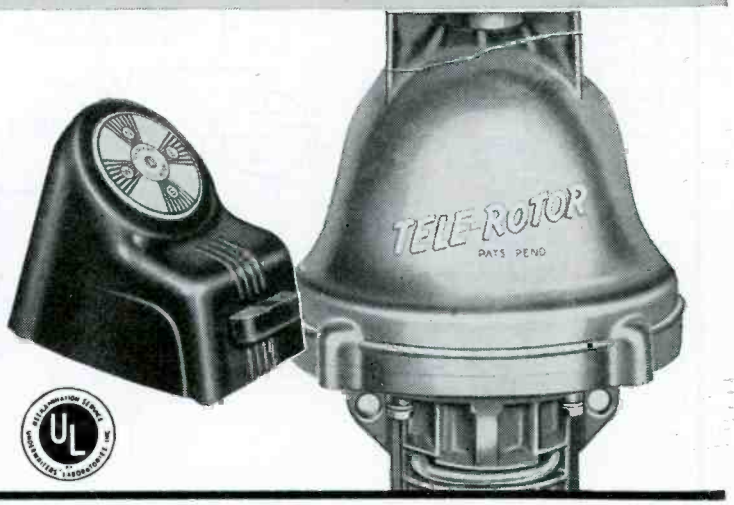
***AND THE DEMAND IS PHENOMENAL — far beyond our material limitations . . . but be patient and your order will be delivered. We are distributing TELE-ROTORS uniformly throughout all TV areas . . . so wait . . . don't compromise with quality.* YOU CAN'T BEAT A TELE-ROTOR!**

CONSISTENTLY DEPENDABLE ROTATORS

TELE-ROTOR

This heavy-duty TELE-ROTOR has no match! It's more powerful . . . will turn any TV antenna array under any weather conditions. Easily installed . . . it is trouble-free in performance. Easiest of all to operate!

MODEL TR-2 . . . . . rotator with "compass control" cabinet having illuminated "perfect pattern" dial . . . (uses 8 wire cable) **$49.95**



CONSISTENTLY DEPENDABLE ROTATORS

TELE-ROTOR CUB

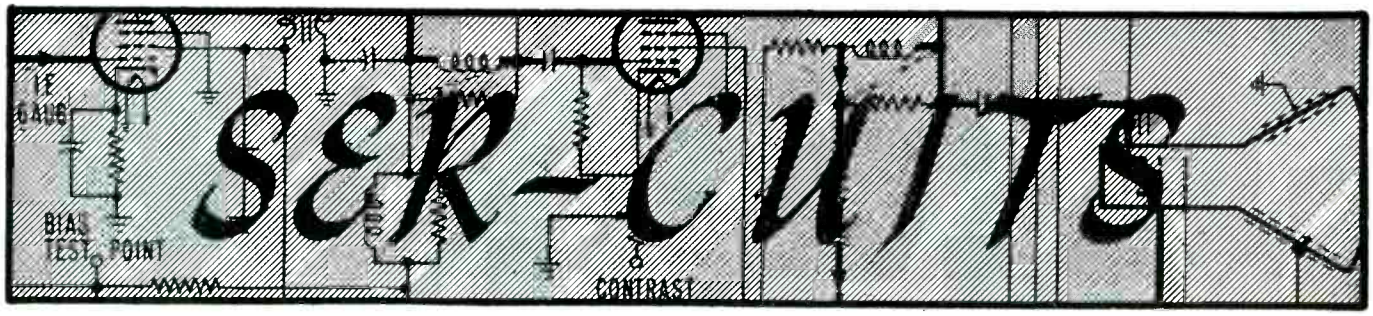
The new TELE-ROTOR "CUB" is ideal for average installations. The same husky motor as the Heavy-Duty model . . . the "CUB" is the fastest and easiest of all rotators to install. All-In-Line design . . . with true in-line thrust between antenna and mast. The ¾" STEEL shaft rotates on a case hardened steel ball . . . with inline reamed oiless bearings.

MODEL 502A . . . . . rotator with plastic control cabinet having indicating meter for "hairline" tuning. (Uses 5 wire cable) **$44.95**

MODEL 501A . . . . . rotator with control cabinet having end-of-rotation signal. Light flashes every 7.2° showing antenna is turning. (Uses 5 wire cable) **$34.95**

CORNELL-DUBILIER SOUTH PLAINFIELD, N. J.

THE RADIART CORPORATION CLEVELAND 2, OHIO



The Keyed AGC System in the G.E. TV Chassis . . . Characteristics of Boosters Developed for Master Antenna Systems.

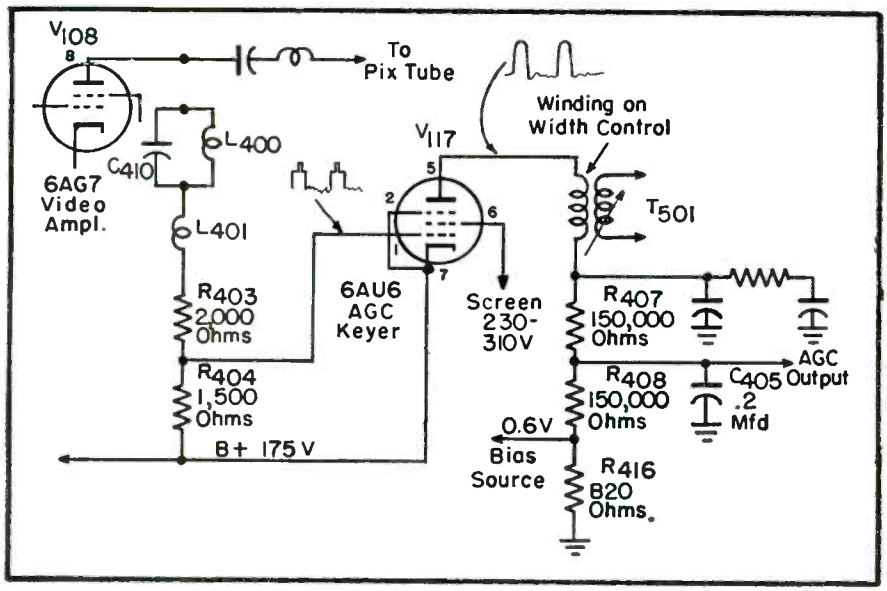


Fig. 1. The keyed *agc* system employed in the G. E. 19C105 chassis.

FAST-ACTING AGC, relatively free from noise influence, particularly important in TV pickup, is now a feature of quite a few chassis, in the form of *keyed-agc* circuitry. This system differs essentially from others in that the *agc* rectifier is made to conduct only for a short duration of a keying pulse supplied at the horizontal sweep frequency of 15,750 cps. Since the rectifier does not conduct between pulses its susceptibility to noise is reduced in proportion to its shortened conduction time which provides an improvement of approximately six to one. Also, in standard *agc* systems, the 60-cps vertical sync pulses to a large measure determine the *agc* output voltage and the *agc* filtering requirements of the system. In designing the *agc* filter for 60 cycles, the action of the *agc* is relatively slow, so that when a rapid fading condition is experienced, such as airplane flutter, the *agc* cannot follow the change. In *keyed agc* the action can be made relatively fast since the filtering requirement is that necessary to maintain the output *dc* voltage at its peak value at a repetition rate of the 15,750-cps horizontal sweep frequency.

Shortcomings of Most AGC Circuits

Airplane flutter, a successive build-up and reduction of the picture signal caused by a beat between the direct signal and that signal reflected from the airplane whose flight is in the signal path, is one of the major annoyances *keyed agc* can overcome. This variation of signal intensity may be at any frequency up to and over 100 times per second, so that unless the *agc* can respond fast enough, it will not prevent successive overload and fading of the signal presented to the picture screen.

The conventional system of *agc* is basically slow as it depends upon the rectification of the video *if* signal and the filtering of it to obtain a *dc* which is equivalent to the peak value of the rectified component. Since more output from this rectifier is provided during the vertical sync interval than during the remainder of the field, the filter must be designed to smooth out the 60-cycle component. Such a filter may have a time constant from 1/10 to 1 second which obviously is not short enough to react to rapid variations in signal strength.

In the keyed-*agc* circuit where the filter is designed to filter a minimum frequency of 15,750-cps pulses, the time constant may be decreased several fold with adequate filtering action still obtainable.

Noise, which accompanies weak or medium signals upsets the conventional *agc* circuits to such an extent, that it would be more desirable to operate without *agc* in many cases. This condition exists because the noise pulses are rectified along with the signal, producing a composite negative bias which lowers the gain of the signal amplifiers to such an extent that the already weak signal does not receive sufficient amplification to give adequate contrast.

Obviously all noise does not have the same effect on conventional *agc* systems. An occasional or single burst of noise will be absorbed by the filter with no noticeable change in bias, while on the other hand where the noise is continuous and of high amplitude, in comparison to the signal, then the bias will in a large part be the result of the noise component.

In the keyed-*agc* system, since the bias rectifier is cutoff between the successive horizontal sync pulses, the resultant noise passed during the sync pulse interval is relatively small, compared to conventional *agc* rectifier circuits, where rectification takes place

over the complete blanking and signal interval. This advantage, in combination with noise limiting afforded by the video amplifier, results in very little effect of the noise on the resultant *agc*, even under poor signal-to-noise ratio reception.

Keyed AGC Circuit Operation‡

In Fig. 1 appears the circuit of a typical keyed-*agc* system, as used in the G.E. model 19C105 receiver. A 6AU6 pentode is used as a keyer tube, with the applied *dc* voltages and grid and plate waveforms as shown. The grid is supplied with a part of the video signal fed into the picture tube. It must have a positive going polarity and be directly coupled to the video amplifier plate circuit so as to maintain the *dc* component. The cathode of the tube is connected to the *B*+ voltage which supplies the video amplifier stage, so that in effect the grid and cathode are connected across a portion of the plate load resistance (R_{404}) of the 6AG7 video amplifier. With a signal, the voltage drop across this resistor is such that the grid of the keyer tube is operated beyond cutoff, except during the application of the positive sync pulses to the grid.

The plate of the keyer tube is essentially at ground potential, as far as *dc* voltage is concerned. However, a positive-going keying pulse derived from the horizontal sweep output circuit is used to provide plate conduction. This pulse of approximately 300 volts peak is obtained from a winding on the horizontal size control. During the peak of this pulse, the tube conducts, since the plate is more positive than the cathode; the cathode potential is represented as a dashed line in *B* of Fig. 2. The plate current flow through the keyer tube develops a voltage drop across three resistors, R_{407}, R_{408} *and* R_{416} (150,000, 150,000 and 820 ohms), which has a polarity that is negative in respect to ground. Since the *agc* bias is taken off at the junction of R_{407} and R_{408}, its magnitude is the result of the plate current through resistors R_{408} and R_{416}. The .2-mfd filter capacitor, C_{405}, was chosen to filter adequately the 15,570-cycle rectified pulse and still maintain a sufficiently short time constant of about 1/30 second. The fact that the filtering can be accomplished at such a high frequency provides the keyed *agc* with its fast action, so that it can follow and compensate for rapid changes in the carrier signal level.

Fig. 2 shows the grid synchronizing pulse as applied to the grid *A* and the keying pulse at the plate *B* of the keyer tube. They have been drawn to

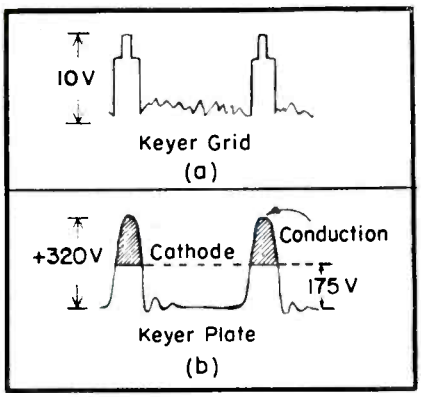


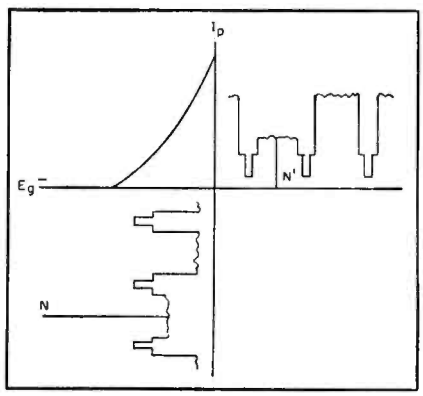
Fig. 2. Grid and plate waveshapes generated by keyer tube.

show the amplitude and phase relation under normal operating conditions. From this illustration it will be seen that the tube will only conduct during the peaks of the keying pulse. Obviously, when the horizontal sweep is not synced with the incoming signal the *agc* bias will be completely upset.

Since the plate current of a pentode is independent of plate voltage, the keying pulse amplitude has negligible effect in establishing the *agc* bias. The *agc* bias is controlled entirely by the peak amplitude of the signal applied to the grid circuit of the keyer tube. With the positive-going sync-pulse polarity, the grid is made less negative in respect to the cathode which causes a plate current flow, which is dependent upon the signal amplitude during the sync-pulse duration. In view of this, it is essential that the video signal applied to the keyer tube retain its *dc* component; otherwise, the *agc* would vary with picture content. In the model 19C105, this is accomplished by coupling the grid of the *agc* keyer tube directly to the video amplifier stage, which in turn is direct coupled to the detector.

The operation of the keyer tube, in the presence of signal, resolves itself as follows: On a medium signal, a medium amplitude of sync pulse (positive going) on the grid of the keyer tube reduces the bias on this tube instantaneously during the sync-pulse duration, so that plate-current conduction takes place. The plate current through the plate resistors produces an *agc* bias which is supplied to signal-amplifier tubes in the *rf* and video *if* amplifiers. If, suddenly, the station signal should increase, the sync-pulse amplitude at the grid of the keyer tube would increase, resulting in a decrease in bias between grid and cathode of the keyer tube. This would cause greater current, resulting in a high *agc* voltage development. This biases the signal amplifier tubes, so that the gain is reduced sufficiently to compensate for the sudden increase in signal from the station.

Fig. 3. Characteristics of the video amplifier $E_g - I_p$.



Circuit Refinements

To realize the maximum noise immunity, it is important to operate the video amplifier stage as a noise limiter. The inherent flatness of the keyed *agc* system used, makes this operation possible over a wide signal range. To fulfill the condition of noise limiting, the signal applied to the grid of the video amplifier should be of such an amplitude that plate current cutoff is almost reached on the peaks of the sync pulses. This condition is shown in Fig. 3. The input signal is shown with a noise pulse, *N*, which is very large compared with the signal. By plate current cutoff, this noise is clipped so that it extends only slightly beyond the tips of the sync pulses. This results in improved performance of the sync clipper and the sync circuits. This operation is maintained effectively only over a narrow range of signal amplitudes, as for strong signal reception a high *agc* bias voltage has to be developed, while for weak-signal reception a lower *agc* bias has to be developed. Therefore, on a strong received signal the peaks of the sync pulses have to reach further into the conduction region of the keyer tube than on weak signals, resulting in poor noise limiting on weaker signals.

To extend the noise clipping to a weaker signal level, the screen of the *agc* keyer tube is varied with signal strength so that for a weak signal a low screen voltage is applied and it is made to increase as the signal strength increases. This is accomplished by obtaining the screen voltage for the keyer tube through a dropping resistor in the *B*+ supply to the third video *if* amplifier, as shown in Fig. 4. Thus, when the third video *if* plate

‡Based on notes prepared by the G.E. receiver division.

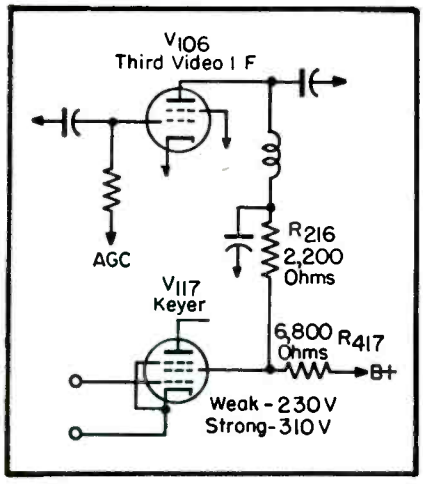


Fig. 4. Screen supply for the keyer.

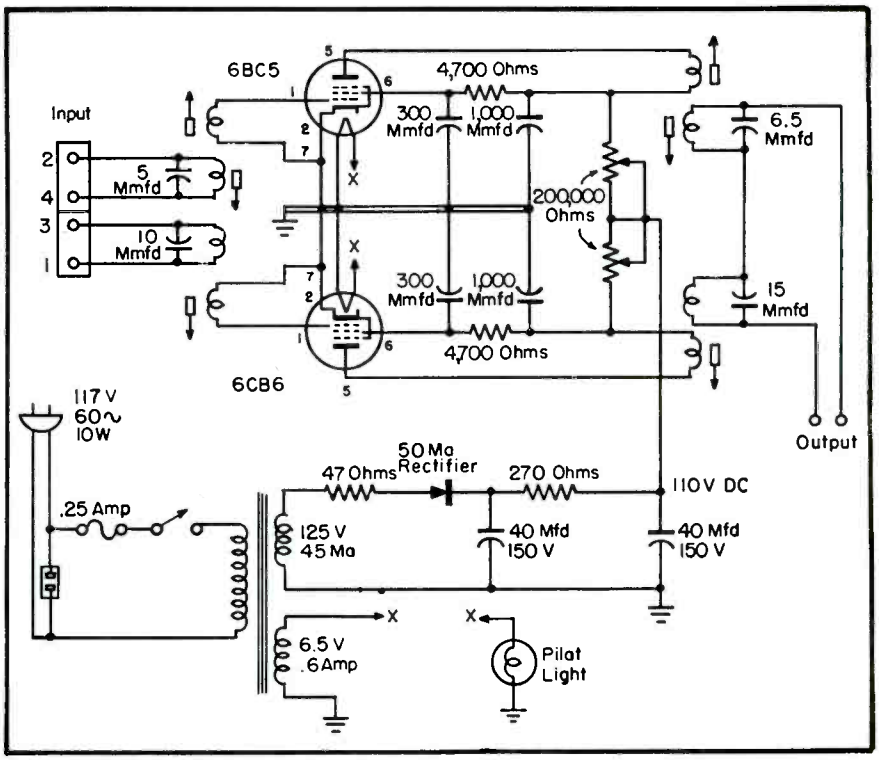


Fig. 5. Circuit of the IT-77A multibooster. (*See p. 43 for analysis.*)

current is high, the screen voltage will be low, and vice versa.

Basically, a change in screen voltage in a pentode such as type 6AU6, has approximately the same effect as a change in grid bias produces, except that a much greater change in voltage in the screen circuit is required. In other words, when the screen voltage is lowered the plate current is reduced as would be the case when the bias voltage is increased.

In Fig. 4, assuming that the signal suddenly becomes weak, the third video *if* tube, V_{106}, will receive less *agc* bias voltage. This results in an increase in plate current of the tube, which causes the voltage drop across a 6800-ohm resistor, R_{417}, to increase. Less screen voltage appears on the keyer tube. The low screen voltage on the keyer causes less keying pulse plate current to flow in the keyer tube, which in turn produces a lower *agc* bias. (This compares to a higher bias voltage which would have been produced if the screen had been supplied by a fixed voltage source, and which would have reduced the noise limiting of the video amplifier.) The lower *agc* bias increases the gain of the signal amplifier tubes to either partially or fully compensate for the loss in signal strength. Thus, with the resultant higher level of signal that the video amplifier grid receives (as compared to a fixed screen supply), better noise clipping will result.

To provide an initial bias to the *agc*-controlled signal amplifier tubes, a fixed bias of approximately 0.6 volt, derived from the power supply, is applied across resistor R_{416}. Thus, when no signal is received the *rf* and *if* amplifier tubes supplied with *agc* will have this minimum bias applied to them, so that their plate current will not be excessive.

The picture contrast in the 19C105 is controlled by changing the screen

(*Continued on page* 43)

Fig. 6. Layout for master antenna system using ITI autobooster (*AB*) and multiboosters (*MB*) Booster designers state that a maximum of twelve receivers* can be tapped off the line before additional amplification is necessary. Incidentally, shielded cable must be used in noisy locations.**

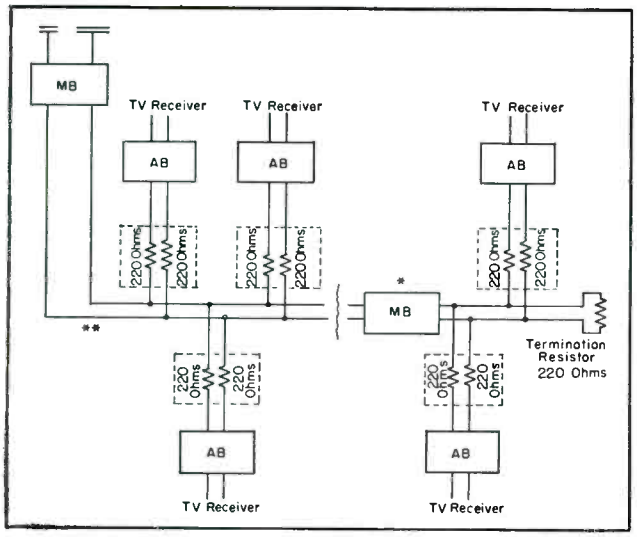
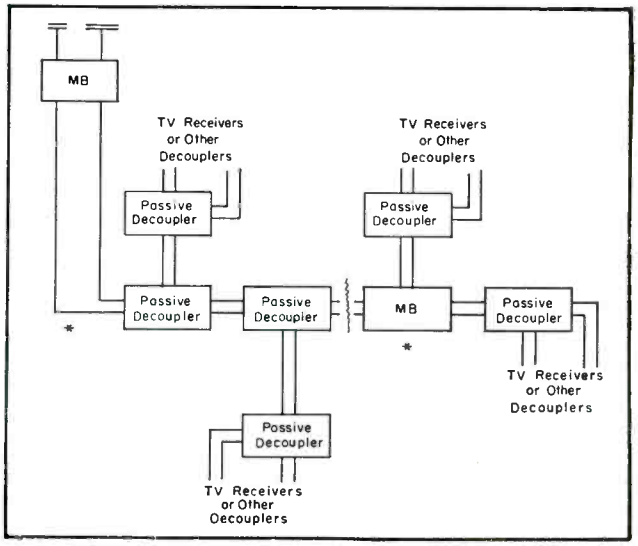
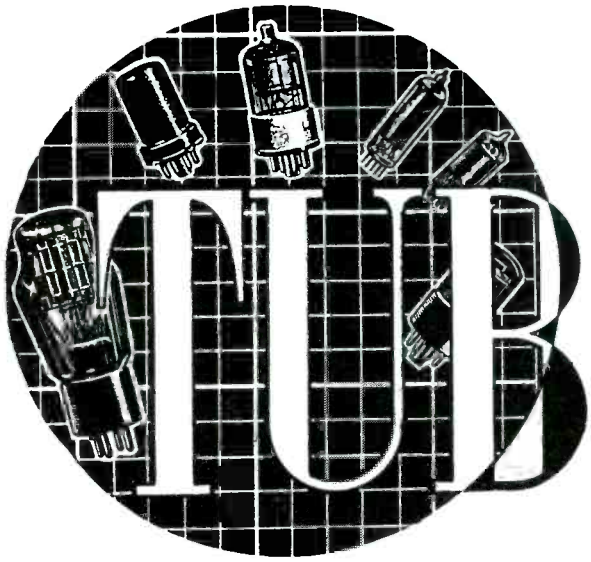


Fig. 7. Master antenna system setup using multiboosters (*MB*) and passive decouplers.





TUBE News

by L. M. ALLEN

Metal Shell 17-Inch Rectangular Tube Features . . . Electrostatically-Focused Picture Tube Developments.

METAL SHELLS, which in '49 became a popular housing for many types of round picture tubes, have found their way to the rectangular tube scene and with interesting results. Developed for a 17-inch type tube, the 17CPA*, the rectangular shape is said to permit use of a cabinet having about 20 per cent less height than is required for a round-face tube having the same picture width. The tube has a picture area 14⅝" x 11", with slightly curved sides and rounded corners.

Frosted-Filterglass Screen Used

The metal shell is said to permit use of a high-efficiency, white fluorescent screen on a relatively flat high-quality face made of frosted Filterglass which prevents specular reflection and provides increased picture contrast. The frosted Filterglass face plate incorporates a neutral light-absorbing material which is said to reduce ambient-light reflections from the phosphor and reflections within the face plate itself in a very much higher ratio than it reduces the directly viewed light of the picture. As a result, improved contrast is obtained. In addition, frosting of the face diffuses reflections of bright objects in the room which might otherwise be objectionable.

Employing magnetic focus and magnetic deflection, the tube is claimed to feature an improved design of funnel-to-neck section which facilitates centering of the yoke on the neck and, in combination with better centering of the beam inside the neck, contributes to uniformity of focus over the entire picture area.

A deflecting yoke, consistsing of four electromagnetic coils, is used for deflecting the electron beam. These coils are used in pairs; the coils for each pair, located diametrically opposite each other, produce a field of essentially uniform flux density. The axes of the two fields ordinarily intersect at right angles to each other and to the tube axis. The deflection of the electron beam is at right angles to

(*Continued on page* 44)

*RCA.

Fig. 1. Dimensional outline of RCA 17CP4 rectangular picture tube.

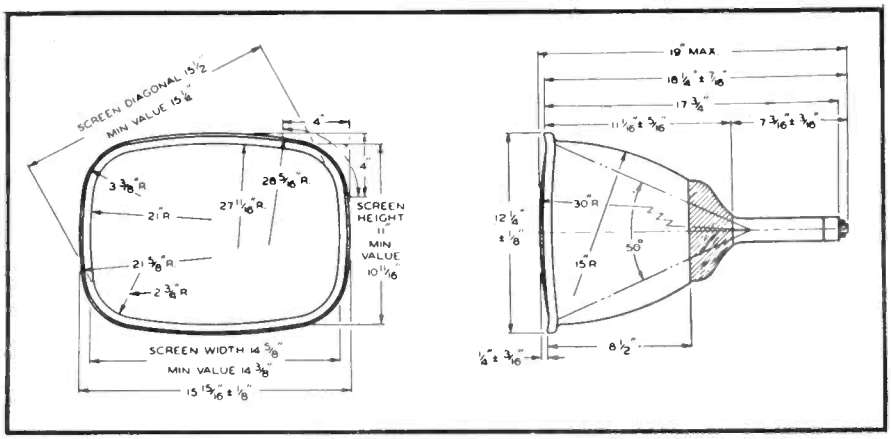
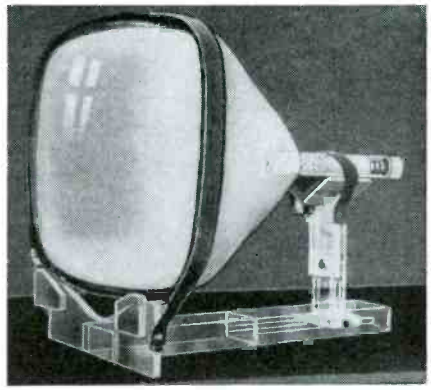


Fig. 2. Television picture tube holder, which it is said will hold any size tube. Plastic frame is adjustable, web straps supporting tube at front and rear. (*Tube Vise; Precision Plastic Products, Inc., 628 W. Lake St., Chicago.*)



Rectangular Wide-Angle Deflection Conversion Trouble Shooting

by WALTER H. BUCHSBAUM*

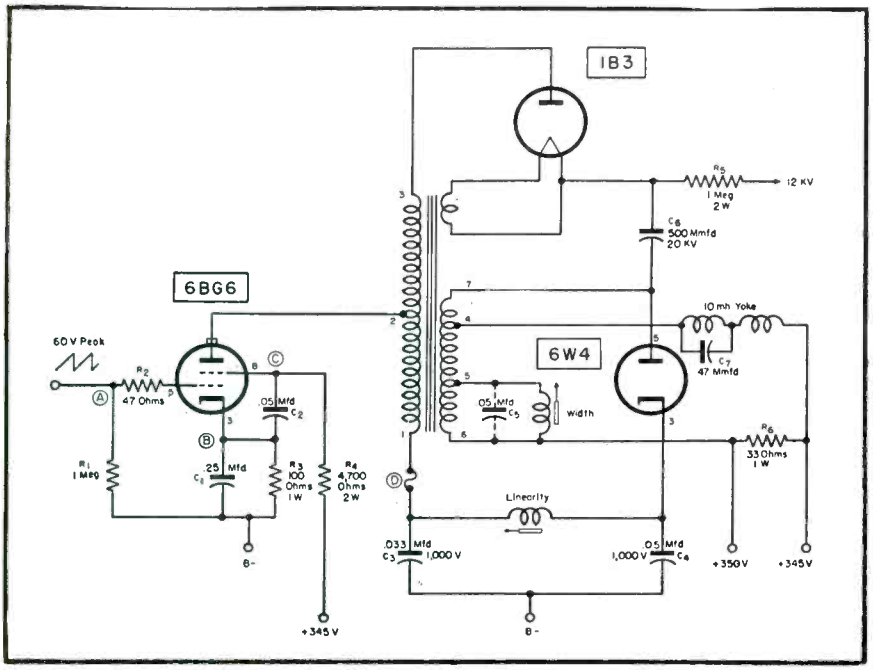
THE MOST FREQUENT SOURCE of difficulty after conversions are completed, particularly where rectangulars have been inserted, is arcing or corona in the high-voltage compartment. With the old circuit the anode voltage probably never exceeded 8500 volts and now that 12 to 14 kv are used, all the sources of corona and arcing show up. The best way to avoid this type of trouble is to leave all solder joints on the socket of the 1B3 smooth and round when the filaments are rewired to the new transformer. If unused socket pins remain in the 1B3 socket and no corona ring is used, it is often helpful to wire all these unused pins together with large diameter bare wire and smooth solder connections. This makes the total surface larger and a static charge is less likely to give off corona from a large surface. The entire high voltage assembly should be cleaned with a small paint brush and all leads should be kept properly dressed.

Another common conversion trouble is insufficient height or width. The latter can be remedied by adjusting the circuit and operating voltages, as outlined for Fig. 3**; Fig. 1, below. To obtain more vertical sweep several steps are posible: First, the height and vertical linearity control should be adjusted for maximum height. If the range of the control is insufficient, the resistor in series with the control should be changed. The quickest way is to connect another resistor of equal value in parallel. If this results in poor vertical linearity instead of greater height, it may be possible to connect the plate circuit of either or both the oscillator and the output tube to a higher voltage source. The oscillator draws very little current and its plate voltage can be obtained from the boost voltage point (*D* in Figs. 3 and 4**) through a 56,000-ohm decoupling resistor and a .25-mfd bypass. If the vertical output transformer is connected to the boost voltage, a 6 to 10,000-ohm, 2-watt resistor and 10-mfd capacitor are required. This latter connection draws more current through the 6W4 and therefore will reduce the boost voltage somewhat. Since this gives less plate voltage for the horizontal output amplifier, less high voltage and less horizontal sweep will result. From this fact, it becomes obvious that the vertical-output transformer should be connected to the boost point only when more than enough high voltage and width are available. Where a 6K6 vertical output tube is used, a 6V6 or a 6W6 often gives more height. For a single 6SN7 in the vertical circuit, a 6BL7 may be substituted for more height. In both cases the socket connections are the same and direct substitutions are possible.

Another frequent source of trouble is horizontal fold-over. This is due to a longer retrace time in the flyback transformer than in the horizontal oscillator and is most frequently found in receivers using the *synchroguide* circuit. Since this is due to a charac-

Overcoming Common Conversion Problems Involving Arcing or Corona in HV Compartment; Insufficient Height or Width; Horizontal Foldover, etc.

Fig. 1. Flyback circuit using a transformer which has a grounded ceramic core.



*Author of Television Servicing; Prentice, Hall, 1950.

**Part I, SERVICE; January, 1951.

teristic of circuit components, no easy cure is available. The simplest way to overcome fold-over is to blank it out. Only a narrow portion of the picture is lost through this apparent folding over and when this is blanked out, the loss is not apparent. A simple way of blanking this out is by means of the first anode of the picture tube. Usually this is connected to a high $B+$ point or else to a boost voltage point. To use the anode for blanking, a 100,000-ohm resistor should be connected from the cathode of the damper tube to a 390,000-ohm resistor going to the plate of the damper tube. The lead to the first anode of the picture tube is connected to the junction of these two resistors. Should the fold-over still be visible, the 390,000-ohm resistor should be reduced to a 330,000-ohm value. If the fold-over has disappeared, but a dark shading covers one side of the picture, the 390,000-ohm resistor should be changed to a 470,000-ohm value.

Auto Radio

(*Continued from page 25*)

up ignition noise by induction, if too close to another wire carrying noise. Bypass capacitors may be necessary on horns or other gadgets.

Trucks ordinarily have heavy-duty generators, and may require bypassing both at the generator and the voltage regulator. If the generator noise doesn't respond to this treatment, the generator should be checked for excessive brush-sparking. If it's present, the armature should be cleaned with a piece of fine sandpaper on a small flat stick.

Wheel-noise is just as prevalent on trucks as on cars. It will respond to the same treatment. Grounding springs should be installed in the grease-caps of both front wheels, being sure that the tip or button is resting in the dimple (lathe-center) of the spindle when the cap is replaced.

Special care must be taken when adjusting trimmers or aligning these sets, as they are usually required to operate at much higher volume than a passenger car radio. The roar of the engine, the multitudinous noises from the body, etc., will demand a lot more volume from the set than the comparative dead stillness of a car. Therefore, the sets must be in top condition at all times, and able to deliver the volume. Whenever possible, the installation of small car-radios for large trucks should never be recommended, as they usually won't deliver the needed wallop, when away from a sta-

(*Continued on page 42*)

Auto Radio

(*Continued from page* 41)

tion. If the speaker can be mounted above the windshield or behind the driver's head as mentioned before, the volume requirements will be quite a bit less.

Special Installations

Now and then, there will appear a truck, usually the very large ones, with a twelve-volt ignition system, lights, etc., and there'll be the problem of installing an ordinary six-volt car-radio in the vehicle. Actually, this isn't as hard as it sounds. The installation can be made in the regular way, with a special *A* or hot lead run from the set down to the mid point of the twelve-volt battery, so that the set can operate on the required six volts, above ground. If the truck has two standard six-volt batteries, as some do, it is only necessary to tap on to one of the ends of the jumper-cable. If it has a twelve-volt, single-unit battery, a small hole should be drilled in one of the cell-jumpers at the proper point, and a soldering lug installed, holding it with a self-tapping screw. It is important to be sure that this connection is large and strong enough to hold out and carry the necessary current. It should be covered with heavy grease when the job is finished, to avoid corrosion. Then the lead wiring should be tied carefully down to avoid damage and short circuits.

Concluding, if you do a good job on one truck, you'll find more and more of them coming your way. Truckers are even more clannish than motorists. Word of a good job spreads fast!

A MODEL COMPARISON

J. K. McDonough (left), general sales manager, Radio and Television Division, Sylvania Electric, and M. F. Balcom, chairman of the board, comparing Alice Wallace, with the floor display piece for which she posed, at the television distributors convention held at Buffalo.

NEW PACKAGING FOR MILLER REPLACEMENT NEEDLES

Two new methods of packaging needles have been announced by M. A. Miller Manufacturing Co., 1165-1169 East 43d St., Chicago 15, Ill.

In one of the packages each replacement needle is covered with acetate to protect the needle from dust. Installation diagrams with instructions are included on the back of a mount card with each packaged needle. All necessary information for identification of the cartridge and replacement is on the face of the card.

The second packaging device is a dispenser box, which permits individual cards to fit into the box; index cards indicate the type of needle.

Ser-Cuits

(*Continued from page* 38)

voltage of the video amplifier tube, V_{108}. Since the keyer tube effectively maintains the sync pulse tips at the plate circuit of the video amplifier near to plate current cutoff over its flat portion of operation, we find that as the screen voltage is increased, more signal amplitude is required at the grid of the video amplifier. A greater drive voltage on the video amplifier will produce a greater signal amplitude at the video amplifier plate, and thus at the picture-tube input. This results in greater picture contrast. As the screen voltage is lowered, the opposite action takes place which results in a lower contrast ratio to the picture. Assuming that the input signal to the receiver remains the same, an increase or decrease in signal at the grid of the video amplifier must be derived through a change in *agc* voltage. In other words, an increase in contrast results in a lower *agc* bias on the controlled tubes and vice versa.

Multiple TV Antenna Systems

In installing master-antenna systems, one of the basic items is the *rf* amplifier. For this purpose, ITI has developed a multibooster* which can be used as the main amplifier in a system with passive decouplers. This system is applicable where signal levels are high and radiation from receivers using the system is not a problem.

Booster Features

The *multibooster* is said to be a wide-band TV and FM amplifier providing a gain of 19 db (nine times) on the low band and 14 db on the high band. The amplifier requires no tuning and is claimed to be operative for continuous 24 hour a day duty. Has separate high- and low-band gain controls, with provisions for separate high- and low-band inputs, or a single combined input by a reconnection of the antenna input terminal board.

The booster can be used as the main amplifier in installations where a simple high-low band antenna system is satisfactory, or as a repeater amplifier in conjunction with individual channel amplifier units, or other boosters, where additional gain is found necessary.

The booster uses one 6CB6 low-band amplifier and one 6BC5 or 6CB6 high-band amplifier.

*ITI-77A.

Tube News

(*Continued from page 39*)

the magnetic field of each pair of coils; hence, by the use of two pairs of coils at right angles, the beam may be deflected to any part of the screen.

Because of the short length of the tube, the electron beam must be deflected through a wide angle. To scan the screen area, it is necessary to deflect the beam through a diagonal deflection angle of 70°, a horizontal deflection angle of 66°, and a vertical deflection angle of 50°.

A focusing field supplied by an electromagnetic coil, permanent magnet, or a combination of the two, concentrates the electron beam into a focused spot at the screen.

The focusing field should be spaced at least ½ inch from the end of the deflecting-coil windings to reduce interaction between the focusing and deflecting fields. If the focusing field is placed too close to the deflecting fields, interaction between them may reduce deflection sensitivity and corner resolution, as well as cause objectionable rotation of the fluorescent pattern as the focus is varied. On the other hand, if the focusing field is too close to the electron gun, resolution will be reduced and pattern distortion may occur as a result of interaction with the ion-trap-magnet field.

As the air gap of the focusing device is moved away from the deflecting yoke, the corner resolution can be improved at the expense of slight loss in center resolution. The strength of the focusing field required increases appreciably as the distance between the deflecting-yoke windings and the air gap of the focusing device is increased.

The ion-trap magnet, required to recenter the electron beam in the gun structure, is of the single-field type. It can be either a permanent magnet or an electromagnet, but must be capable of providing a field strength at its center of 45 gausses for operation at 12000 volts and 50 gausses for operation in the range from 14000 to 16000 volts.

Electrostatically-Focused Picture Tubes

Rectangular picture tubes, in 14, 17 and 20-inch types utilizing electrostatic focus in place of electromagnetic focus have been announced by National Union.

The tubes, developed to effect an economy of copper, which has been placed on the NPA critical list, use a new electron gun having a focusing electrode. This electrode, operating at approximately 20% of the anode potential, is designed to operate with es-

sentially zero current. The focusing potential can be obtained from a conventional flyback-type power supply employing a low cost rectifier operated from the primary of the horizontal-deflection amplifier transformer. Variations in centering due to external conditions can be compensated by the use of electrical centering in the deflection yokes.

Mechanically, the tubes are said to be interchangeable in chassis using either the so-called short or long neck-length tubes. Electrically, the ratings for these tubes are the same as the electromagnetically-focused type tubes which they have been designed to replace.

Servicing Helps

(*Continued from page* 28)

in Fig. 5(b) should be followed. Resistor R_{313} (560,000 ohms) should be disconnected from pin 7 of the 6AL5 and reconnected as shown in the diagram. Then the tuner AGC lead (white) should be removed from the *agc* lug and the wire grounded to the chassis.

Vertical Foldover

Foldover appears as a horizontal white line, at the bottom of the picture, when the height and linearity controls are adjusted for correct picture size and linearity. Line voltage of 105 or lower could often be the cause of foldover in a normal set. However, if foldover occurs at normal line voltage, in the Admiral 20T1, 20V1, 21D1, 21E1, 21H1 and 21J1 chassis one or more of the following changes *in the order shown* can be tried to eliminate the trouble:

Tubes: Some sets use a 6S4 as a vertical output tube. Weak 6S4s frequently cause foldover and a number of new tubes should be tried. Low $B+$ caused by a weak 5U4 rectifier will also cause foldover. (In all chassis *except the 21D1 and 21E1,* replacement of the horizontal output and the damper tubes should be tried.)

Resistor Changes in 20T1 and 20V1 Chassis: The grid resistor R_{408} should be changed from 1 to 3.3 megohms and the decoupling resistor R_{439} changed from 1000 to 500 ohms.

Additional Capacitor Across Width Control in All Chassis: An additional capacitor, .01 to .05 mfd, placed across the width control will decrease the second anode supply by several hundred volts and give more vertical

(*Continued on page* 46)

(Continued from page 45)

sweep without foldover. The decrease in brightness is not noticeable.

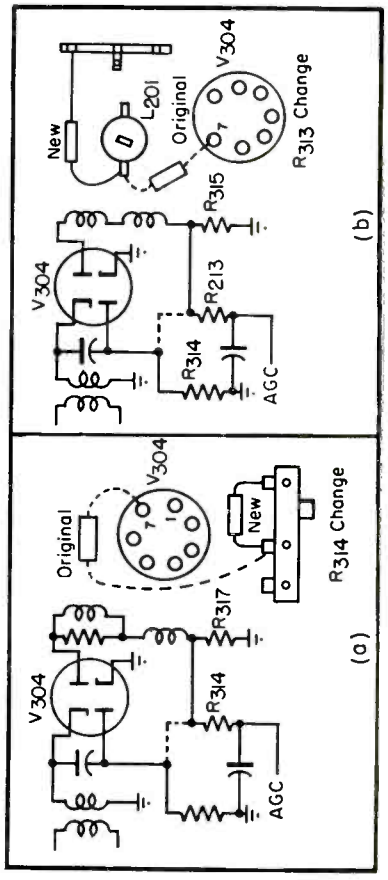
Deflection Yoke—All Chassis: The cores of all the 70° deflection yokes consist of two pieces of iron, each semi-circular in shape. These two core pieces should fit closely together with the air gaps as small as possible.

The yoke should be inspected to see if the air gap is at a minimum. If the air gap is more than 1/32", the collar should be tightened. If this does not reduce the gap, the collar and the iron core should be removed and the insulation smoothed over so that the gap can be closed to minimum.

Previously, the two core halves were of different types of iron, one being powdered iron and the other ceramic iron. The powdered iron has a polished metallic finish, while the ceramic iron is dull. A yoke with both halves of ceramic iron will give increased sweep without a foldover. The additional piece of ceramic iron can be obtained from a defective 70° yoke.

Some yokes are made so that the fiber sleeve must be clipped away with a pair of diagonal cutters before the collar and iron cores can be removed. Present Admiral service yokes use ceramic iron only.

Fig. 5 (*a*) and (*b*). Circuit changes in the *agc* system of Admiral 20T1 and 20V1 (bottom) and 21B1, 21C1, 21D1, 21E1, 21H1 and 21J1 chassis (top) which prevent loss of sync, poor contrast or low sound level.



Audio

(*Continued from page 32*)

bled to form a single piece of equipment, is now available.

For example, a phono amplifier might consist of a unit equalized preamplifier, a unit power amplifier, and a unit power supply. Addition of a unit tone-control chassis providing up to 24 db of bass and treble boost and cut is said to be possible. For use with a radio tuner or television tuner, a unit switching chassis can be interposed between the preamplifier and the main amplifier to provide selection of the desired input.

All chassis are of a standardized length and of widths which are integral multiples of 2⅛". Small tie plates lock units together to form a single structure for cabinet or rack mounting. Connecting terminal strips

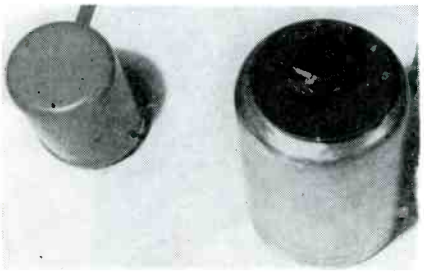
(*Continued on page 48*)

(*Above*)

Magnavox three-speed record changer which not only plays all types of records at 33 1/3, 45 and 78, but automatically plays 10-inch and 12-inch records intermixed and even plays 7-inch records automatically with one control setting. Pickup exerts eight grams of pressure on the needle. The pickup has a dual stylus, one for each type of record groove. An unusual feature is an in-line record brush mounted on the tone arm ahead of the stylus to clean every record groove and prevent *clogging* of the needle. The changer is operated by a four-pole motor and its weighted turntable runs on ball bearings. All controls are centralized at one point. Minimum of wear on records is said to be achieved through the use of a straight spindle and the handling of the records by their center holes only. They rest horizontally on the spindle, and when the bottom record is released for playing, the rest of the stack is supported and then lowered to the *ready* position.

(*Below*)

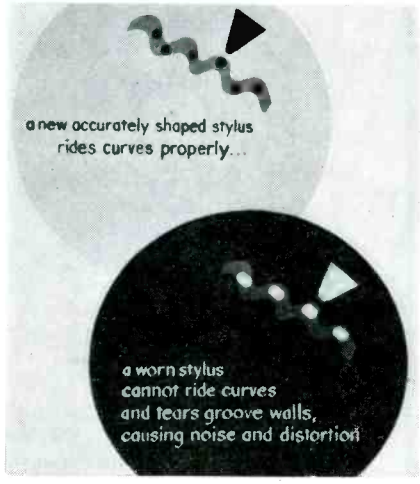
Adjustable 5-range treble filter which operates from the outputs of typical AM/FM tuners or phono preamps and into usual amplifier or tuner input circuits. Original treble-control arrangements of the equipment with which the filter is used retain full usefulness to boost or attenuate within the treble range selected. (*Type OA-1; Berkeley Custom Electronics, 2216½ Grant St., Berkeley 3, Calif.*)



Audio

(*Continued from page 47*)

on the underside of each component are so placed that the output terminals of one unit are always directly adjacent to the input terminals of the next unit. Plate and screen supply and heater power feed directly across, via these terminals, from the power supply through each chassis to the following unit. Connections between chassis can be made by short links of bare wire, or, when desired, units may be placed several feet from each other by use of insulated extension cables. Certain of



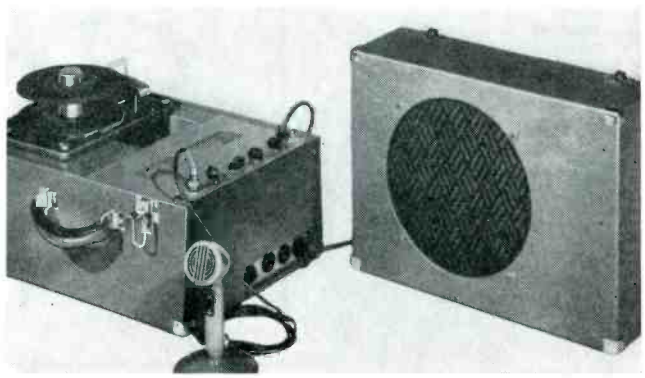
(*Above*)

Shadowgraph views illustrating affects on record when stylus is worn and in perfect condition. Perfect symmetry is said to be retained by the diamond tips even after 1000 record playings, according to Duotone, who are now producing replaceable diamond phono needles.

(*Below*)

A 45-rpm continuous recorded music system equipped with a patented re-stacker which holds twelve 45 rpm records. No manual re-stacking is said to be necessary. All twelve records are played, automatically re-stacked and repeated from the beginning. A dial control allows any number of plays up to eighteen and the machine shuts off automatically, or the control may be set for continuous music. Each unit is equipped with a reject button. The *Emperor* model (illustrated) is designed for dual use as a portable music or public address system. Encased in Hartmann trunk cabinet, it is sold equipped with tubes, a 15-watt Webster amplifier, a 12" Oxford *pm* speaker, microphone and 25' of extension cord. If necessary, as many as 15 additional speakers may be used with the system. (*Ristaucrat, Inc., 1216 East Wisconsin Ave., Appleton, Wis.*)

[4]M. A. Miller Manufacturing Co., 1163 East 43 St., Chicago.

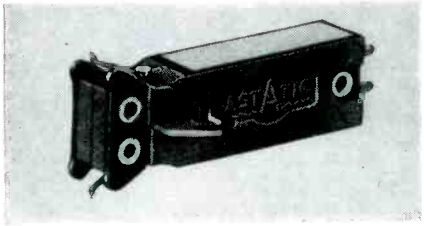


the units have sufficiently low output impedance to permit operation at a considerable distance from the main units.

Needle Cross Reference Guide

A replacement needle cross reference guide[4], which offers the needlemaker's replacement number, the name and number of the manufacturer, the tip material, the radius and the list price, has been announced.

Manufacturers included in the listing are: Astatic, Webster-Chicago, Webster-Electric, Shure, Electro-Voice, Columbia, Seeburg, RCA, Philco and Magnavox.



(Above)

Miniature, lightweight crystal cartridge with double-needle turnover, now available with ceramic elements as well as crystal in all styles. External physical characteristics are the same for all models, as are the minimum needle pressures of approximately five grams. Output of the crystal models, at approximately 1,000 cps, is said to be 1.0 volt, using the Audiotone 78-1 and RCA 12-5-31V test records, while that of the ceramic versions is .4 volt. Frequency range of the single-needle crystal units, with either 3-mil needle for 78 rpm or all-groove needle for all record types, is said to be 50 to 10,000 cps; double-needle 50 to 6,000 cps. The single-needle ceramics are said to have a frequency range of 50 to 6,000 cps; double-needle 50 to 5,000 cps. *(AC series; Astatic Corp.)*

(Below)

Symphonette steel needle display card which holds 50 packages of 30 needles each released by Jensen Industries, Inc., 329 Wood Street, Chicago 12, Illinois.

NEWS

KNOBLOCK NAMED STANDARD TRANSFORMER GSM

Gilbert C. Knoblock has been appointed general sales manager of Standard Transformer Corp., 3580 Elston Ave., Chicago. Knoblock had been advertising and sales promotion manager.

G. C. Knoblock

* * *

CENTRALAB'S ADASHAFT CHART

An *Adashaft* chart showing varied shaft and switch cover combinations used for replacement controls, has been released by Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

Chart enables the Service Man to select the type and size shaft and switch cover needed for the individual replacement job.

* * *

SYLVANIA TUBE SUBSTITUTION MANUAL

A 40-page manual covering substitute types of radio and television tubes has been announced by the radio tube division of Sylvania Electric Products, Inc., Emporium, Penna.

Presented are text and charts on general tube classifications, circuit modifications in which additional resistors are needed, substitute battery type tubes, substitute 150-ma tube types, substitute 300-ma tube types, substitute transformer and auto tube types, substitute TV receiving type tubes, substitute TV picture tube types; and frequently needed changeover diagrams.

Types of tubes classified in the manual include: remote cutoff *rf* amplifiers; sharp cutoff *rf* amplifiers; converters; diode detectors; diode-pentodes; diode triode detector-amplifiers; indicators; multi-purpose tubes; duo-triodes; power amplifiers; general purpose rectifiers including voltage doublers; high voltage rectifiers for TV; gas triode and tetrode relays; horizontal TV scanners; vertical TV scanners; high voltage single and duo-triode oscillators; general purpose triodes; and special purpose tubes.

* * *

MARSHALL NOW AEROVOX AND ELECTRICAL REACTANCE MANUFACTURERS' SALES HEAD

Frank Marshall has been appointed director of manufacturers' sales for Aerovox Corp. and Electrical Reactance Corp.

A. E. Quick will succeed Marshall as sales manager of Aerovox and will make his headquarters in New Bedford.

Charles Golenpaul continues to direct Aerovox jobber sales.

Carl Bretz has been appointed sales manager for Electrical Reactance with headquarters in Olean, N. Y.

SUN RADIO CATALOG

A 132-page catalog, No. 51, has been released by Sun Radio and Electronics Co., Inc., 122-124 Duane St., New York 7, N. Y.

Described are over 200 items including measurement instruments, tools, tubes, meters, wire, components and component cabinets, etc.

Detailed listings of transformers for constant voltage, preamp, plate, filament, filter, isolation and general audio applications are offered.

Featured, too, is a section on switches, relays and tuners. Several pages are devoted to data on racks, cabinets and chassis, which can be used for transmitters, amplifiers and general utility purposes.

In a section on conductors appears detailed listings of wall, cable and box receptacles, as well as straight and angle plugs, plus insert contact arrangements.

* * *

RCA PHOTOTUBE BOOKLET

A 20-page edition covering phototubes, cathode-ray and special tubes, CRPS-102-A, has been published by the tube department of RCA.

Detailed are data on single, twin and multiplier phototubes, picture tubes, camera tubes, monoscopes, low microphonic tubes and *uhf* and other special application tubes. Descriptions, ratings, operating conditions, dimensions, base and envelope connection diagrams, and application data are supplied for all types.

Booklet is available for fifteen cents from RCA tube distributors or from Commercial Engineering, RCA, Harrison, N. J.

HOLLANDER JOINS OAK RIDGE

Jerome Hollander, formerly western regional service manager for DuMont, and design engineer of the test equipment section at G. E., has joined the engineering staff of Oak Ridge Products.

* * *

SHELDON PLANT ADDITION

A two-story addition to the main building of the Sheldon Electric Company is nearing completion.

Building, with half a basement, will add 15,000 square feet to the manufacturing facilities.

* * *

RCA NAMES JACK M. WILLIAMS HOME INSTRUMENT AD MANAGER

Jack M. Williams has been appointed advertising and sales promotion manager of the RCA Victor Home Instrument Department.

Williams, who for the past year has served as special assistant to the company's director of public relations, fills a vacancy created by the appointment of James M. Toney as director of public relations.

* * *

RIDER MANUAL VOLUME XXI NOW AVAILABLE

Rider's Manual Volume XXI has been published by John F. Rider, Inc., 480 Canal St., New York 13, N. Y.

Covered are AM, FM, auto radios, record changers, tuners, disc and tape recorders as of October, '50. Factory-authorized data of 61 manufacturers are offered. Also has a cumulative index for manuals 16 through 21. Has 1,648 pages.

Priced at $18.00.

* * *

WALKER NOW WITH TRIPLETT

V. L. Walker, former sales engineer, radio parts, of United Motors Service, has joined The Triplett Electrical Instrument Co., Bluffton, Ohio, as a sales engineer.

* * *

GHIRARDI-JOHNSON BOOK

A 640-page book, *Radio and Television Receiver Circuit and Operation,* by Alfred A. Ghirardi and J. Richard Johnson, will be published around March 15 by Rinehart Books, Inc., Technical Division, 232 Madison Ave, New York 16.

The first book of a new Ghirardi library titled, *Modern Radio and Television Servicing,* the text contains a discussion of circuits used in modern radio and TV receivers, and how these circuits operate. An analysis of phono pickups, record changers, and disc and magnetic recorders is also included.

Price, $6.00.

* * *

BUYER'S GUIDE DATA APPEARS IN PHOTOFACT INDEX

Photofact Index, cumulative index to Howard W. Sam Photofact Folders, has been expanded to include editorial and buyer's guide material. Publication will be on a bi-monthly basis. First issue of the Index appeared in January.

New material includes articles by manufacturers participating in the Photofact Service.

* * *

RCA RECEIVING TUBE MANUAL

A new edition of the *RCA Receiving Tube Manual* has been announced by the RCA Tube Department.

The manual, RC-16, contains over 300 pages.

Detailed technical information is provided on more than 460 RCA receiving tubes and picture tubes including many discontinued types.

New TV Parts • Accessories • •

DU MONT TV MASK

A TV mask for simplifying the replacement of 12JP4s and 12RP4s with 12QP4As has been announced by the tube division of Allen B. Du Mont Laboratories, Inc., Clifton, N. J.

Greater radius of face curvature of the 12QP4A is compensated for by the mask. When replacing the 12QP4 for the 12JP4 an ion-trap magnet must be added.

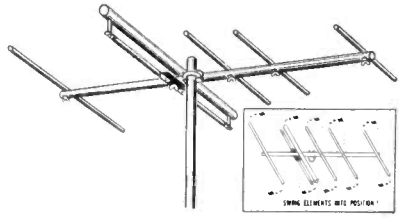
* * *

JFD YAGIS

A line of five element Yagi antennas for fringe and remote areas has been developed by the JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn, New York.

A high impedance driven element is said to assure a terminal impedance matching 300-ohm transmission lines. The five element beam employs triple directors. Uses aircraft aluminum with a 1" o.d. collector element and crossarm.

Said to have high front-to-back ratio. A special jumper harness is available for stacking bays where conditions require. Models are available for low band and high band channels.



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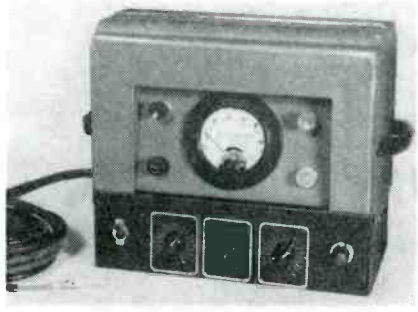
THOMAS PICTURE TUBE CHECKER

A portable *Catho-Chek* unit for testing the picture tube without removing from the chassis has been announced by Thomas Electronics, Inc., 118 Ninth St., Passaic, N. J.

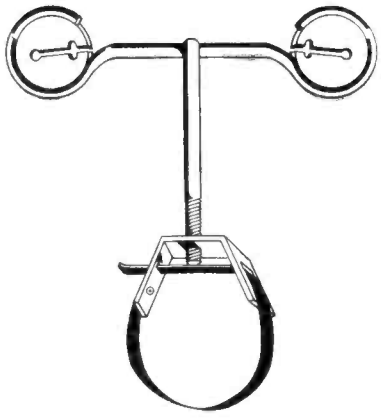
Unit is connected to the terminals at the tube base. Shows condition of the tube in checking emission (reading on a 0-1 *ma* meter scale), gas ratio, shorts, and leakages (reading on a 0-100 microammeter). Lead wires come equipped with standard snap-on test clips. Unit weighs 14 pounds.



TACO DOUBLE-LEAD MAST-STANDOFF INSULATOR

A double-lead mast-standoff insulator, for TV antenna installations where it is necessary to keep the two leads far enough apart to eliminate coupling between them, is now available from Technical Appliance Corp., Sherburne, N. Y.

Available for either ribbon type or R/G transmission line. Standoff is made with two length steel tapes, one for mast 1" to 2" o.d., and the other for masts up to 5" o.d.



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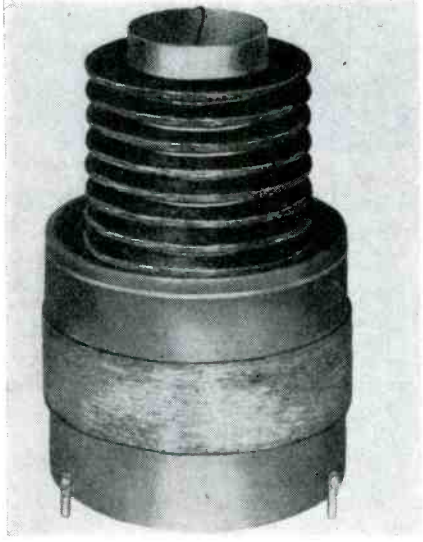
SPELLMAN RF STEP-UP COILS

RF step-up coils, which are said to develop voltages as high as 90 kv, are now available from Spellman Television Corp., 3029 Webster Ave., Bronx 67, N. Y.

Primary is separate from the secondary, which is 7" high and consists of 10 pie windings, 3" in diameter. The primary is 4" high and 4½" in diameter. Secondary voltage output is 35 kv, secondary current is 5 ma, and approximate frequency is 70 kc.



* * *

G-C PICTURE-TUBE COATING

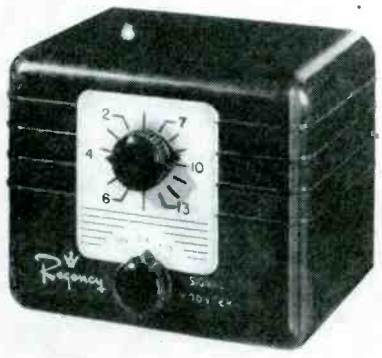
A fast-drying conductive coating, *Tube Koat,* for recoating the outside of picture tubes, has been announced by General Cement Mfg. Co., 919 Taylor Avenue, Rockford, Ill.

Can also be used to coat the inner part of TV cabinets to prevent high-voltage leaks and static discharge.

REGENCY BOOSTER REDESIGNED TO CONSERVE MATERIALS

A redesigned Regency TV signal booster, model DB 410, has been announced by I. D. E. A., Indianapolis, Ind. Has a satin-finish, gold-colored metal panel for the dial face.

Featured are contra-wound bifilar coils with a push-pull triode. Internal impedance matching an input and output accommodates either 300-ohm parallel-line or 73-ohm coaxial cable. Size: 4½"x5½"x3¾".



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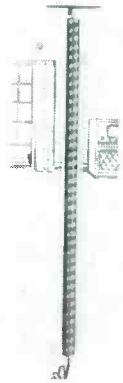
SETCHELL-CARLSON ANTENNA

A drape antenna, model DA 1, has been announced by Setchell-Carlson, Inc., New Brighton, Minn.

Unit is said to be non-directional, requiring no turning. The unit, 4½' high, can be concealed behind a drape or curtain.



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PERFECTION B. O. ELIMINATOR

A device, the B. O. Eliminator, which is said to eliminate the vertical black bars which appear in TV pictures when Barkhausen oscillation occurs in the horizontal sweep output tube, such as the 25BQ6, 6BQ6, 6EV5, 25EV5, 6AU5 or 25AU5, etc., has been announced by Perfection Electric Company, 2635 South Wabash Avenue, Chicago. Barkhausen oscillation is set up near the screen grid of the horizontal sweep output tube, is radiated to the input of the tuner, and sets up vertical black bars that appear on the face of the picture tube. It is especially noticeable with weak signal impulses, as in fringe areas.

The eliminator is installed by slipping it over the tube, as shown.

HI-LO TV SPIRAL ANTENNA

An indoor spiral antenna, model 101, and an outdoor spiral antenna, model 101 R. & W., are now available from Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago 13, Ill.

The indoor model is 20" high and 32" wide.

Outdoor spiral model may be stacked in fringe areas, and can be used with full 360° orientation.

* * *

HICKOK ALL-BAND MICROVOLT SIGNAL GENERATOR

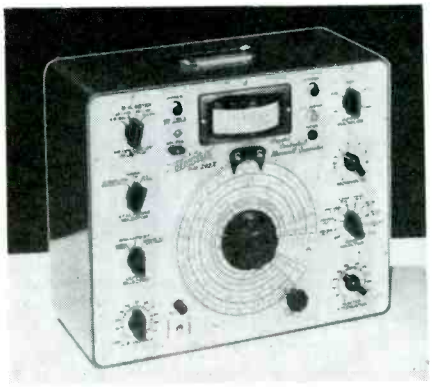
A microvolt signal generator, model 292X, has been announced by the Hickok Electrical Instrument Co., 10528 Dupont Ave., Cleveland 8, Ohio.

Generator covers all AM, FM, TV and mobile frequencies in 7 ranges. Has double range of 125 kc to 110 mc and 150 to 220 mc, all on fundamentals. Crystal accuracy is available to .0025% for mobile bands of 30-50 mc and 152 to 162 mc.

It is said to provide controlled modulated and unmodulated output from .2 to 100,000 microvolts through a 10 to 1 cast aluminum attenuator. May also be externally modulated from 15 to 10,000 cps.

Features temperature compensation. Instrument claimed to have negligible change in frequency due to output, and absolute minimum leakage.

The *af* output is 0-2 volts at 400 cycles. Contains a *db* meter to indicate reference level.



VEE-D-X MILLIONTH ANTENNA

Jerome E. Respess, president of the LaPointe-Plascomold Corp. receiving from plant superintendent, Leo Hein, the one millionth antenna produced by Vee-D-X, a *J* series yagi.

New Parts • • Instruments • Tools • • •

TINNERMAN FASTENERS

Fasteners, that are said to permit replacement of threaded nuts and lock washers on bolts and tap screws, are now available in *Speed Nut Tinker* kits from Tinnerman Products, Inc., Dept. 14, Box 6688, Cleveland 1, Ohio.

Made of heated treated spring steel.

* * *

TRIPLETT PORTABLE VOLT-OHM MIL-AMMETER

A portable volt - ohm - mil - ammeter, model 666-RL, is now available from the Triplett Electrical Instrument Co., Bluffton, Ohio. Provides *ac-dc* voltage ranges from 0 to 5000, 1000 ohms/volt; *dc* to 10 amps; resistance, 0-3000-300,000 ohms and 3 megohms. One selector switch required for all settings. Enclosed, molded switch is said to retain contact alignment permanently. Unit has direct connections, and a precalibrated rectifier.

A strap handle permits hanging the tester during work.

* * *

ANCHOR METAL ROSIN-CORE SOLDER

Cored solder with rosin flux, *Anchor Shurflo*, is now available from Anchor Metal Co., 87 Walker St., N. Y. 13, N. Y.

The activating agent is said to provide a more vigorous action to the rosin flux that speeds up the flow of solder. Said to solder to nickel and cadmium plated surfaces, copper, brass, etc.

WASSCO RESISTANCE SOLDERING TOOL

A resistance soldering tool, the Wassco Glo-Melt panel accessory, model WL-333B2, for attachment to standard Glo-Melts, is now available from Wasserlein Mfg. Co., Inc., PO Box 1421, Joliet, Ill. It is also available assembled with the complete Glo-Melt Unit.

Tool is self contained and no grounding clamp nor fixture is said to be required. Unit is adjustable to twenty-four different heating rates and parts are not overheated nor is there said to be any disturbing visual arc.

* * *

STOCKER AND YALE FLUORESCENT SCREW-IN BULB

A fluorescent *lite-mite bulb,* which can can be used in an ordinary lamp socket, has been announced by Stocker and Yale, Marblehead, Mass.

Bulb contains two 4-watt fluorescent lamps and control components within a 2"x6" shade.

It is said to have illumination of up to 500 footcandles at 3" to 5" working distance. Lamps are rated at 7,500 hours average life.

Supplied for 115-volt, 220-volt *ac* and 110-volt *dc*. End mounting and side outlet socket are available. Size is 1¾" high, 2" wide, 6½" long; weight, 14 ounces.

* * *

ENCO MAGNETIC BASE ELECTRIC LIGHT

A portable, flexible electric light unit the *Miti-Mite,* has been announced by Enco Manufacturing Co., 4522 W. Fullerton Ave., Chicago 39, Ill. Equipped with a magnetic base, it is said to be capable of being attached with a 50 pound pull, to flat or curved metal surfaces.

Has a magnetic base holder 1"x1⅛"x 1½", to which is attached, by means of a ball stem, a bracket assembly having a socket clip. The socket clip holds an electric light socket to accommodate a 25 or a 40-watt bulb.

Comes equipped with 6' of plastic cord with plug-in for *ac* or *dc* outlet. Ball stem swivels in a knurled nut which, by finger tightening, maintains the bracket at the position desired. Magnetic base is concave for mounting on rounded surfaces such as a shaft or pipe.

* * *

OXFORD MINIATURE LAMPS

A line of miniature lamps is now available from Oxford Electric Corp., 3911 South Michigan Ave., Chicago 15, Ill. Included are radio panel, automotive, flashlight, coin machine, and special lamps.

RCA PORTABLE 7-INCH 'SCOPE

A seven-inch 'scope WO-56A, has been announced by the RCA Tube Department.

Features three push-pull stages of direct-coupled amplification.

Instrument is said to permit display of square waves over the frequency range of low *motorboating* rates up to 100 kc. High-frequency response of the 'scope is said to be obtained by the use of frequency-compensated direct-coupled amplifiers without peaking coils.

Scope is equipped with frequency-compensated step and vernier attenuators which it is said do not affect the frequency response, regardless of gain settings.

A low-capacitance probe is also provided with the RCA 'scope which is said to minimize circuit loading.

The 'scope is also claimed to be useful as a peak-to-peak voltmeter. The vertical amplifier can be calibrated so that 10.6 rms millivolts, or 30 p-p millivolts produce one inch of vertical deflection. Step attenuator can be used as a voltmeter range switch, so that peak-to-peak value of the voltage can be read on a calibrated green graph screen.

Unit has pre-set sweep-oscillator positions of 30 cps and 7,875 cps, which are said to permit instantaneous switching between vertical and horizontal television sync and deflection circuits.

The sweep oscillator provides a sawtooth output which is linear over the oscillator range of three to 30,000 cps. These features result from the use of a Potter-type vacuum-tube oscillator and a horizontal amplifier with frequency response that is said to be essentially flat from *dc* to 500 kc.

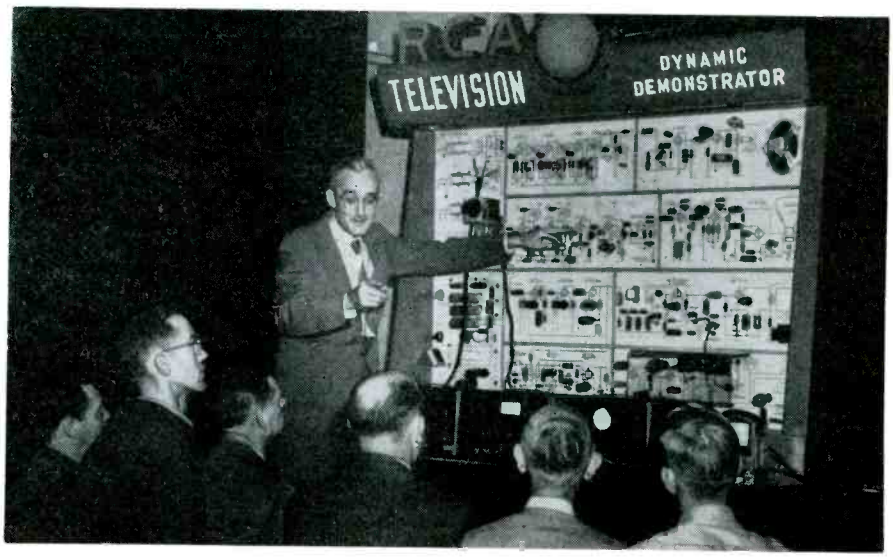
The sweep trace may be expanded to three times the screen diameter. Any portion of the trace can be centered and enlarged for observation of minute waveform detail. The push-pull feature of both vertical and the horizontal amplifier reduces astigmatic distortion.

HELDOR TRANSFORMER CANS

Standard sizes of MIL-T-27 transformer cans are now available from Heldor Metal Products Corp., 85 Academy St., Belleville, N. J.

Supplied with or without brackets, weld studs, blind inserts, etc.

SOUTHERN TV SERVICE CLINIC SESSION

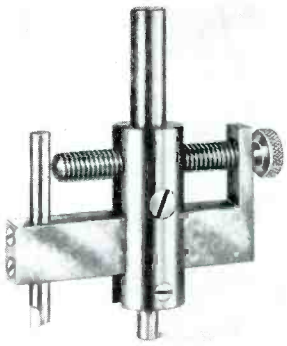


John R. Meagher, television specialist of the RCA tube department, with a dynamic demonstrator at one of the clinic sessions conducted for radio and television Service Men in Birmingham, Ala.; Atlanta, Ga.; and Charlotte, N. C. Sponsors of the Atlantic clinic were Specialty Dstributing Co., Southeastern Radio Parts, and the Yancey Co. The Birmingham clinic was sponsored by R. P. McDavid & Co., and the James W. Clary Co. Charlotte sponsors were Dixie Radio Supply and Southern Radio Corp.

MICRO-CIRCLE CUTTER

A *micro-circle* cutter, that is said to be adjustable in an infinite number of hole diameters within its range has been announced by Precise Measurements Co., 942 Kings Highway, Brooklyn 23, N. Y. A micrometer type adjusting screw assures precise settings.

Two types are available: round shank for drill presses or hand drills and square tapered shanks for hand braces. Maximum hole diameter is 4" for model *1* and 6" for the model *6* cutter. All are equipped with a ¼" high-speed steel cutting bit.



* * *

C-D RF INTERFERENCE BYPASS CAPACITORS

Bypass and feed-through vehicular capacitors, MC and NF series, for the suppression of radio-frequency interference have been announced by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Capacitors are hermetically sealed and said to be built to withstand extremes of vibration, shock and for operation over temperature range from —55° to +85°*C*. Non-inductively wound with short internal connections results in low-impeddance over wide frequency range.

The MC series for bypass has three bracket styles. The NF 10072 for feedthrough is equipped with a universal mounting bracket. All have terminal studs with fastener screws.

Further details appear in bulletin NB-140.

* * *

HELLER AUTOMATIC TACKER

A pocket-size tacker for stapling braided, rubber-coated, single and double strand wire and hollow tube lines is now available from The Heller Co., 2153-N. Superior Ave., Cleveland 14, Ohio. Front and rear guides circle the wire and permit rapid drawing around difficult angles or corners, along baseboards, plaster walls, window frames, ceilings, door jambs and rafters.

Uses staples, made in several colors, whose driving joints it is claimed can penetrate plaster, composition board, hard and soft woods (with holding power up to 64 pounds.) Said to drive the staple to a desired depth without marring or injuring the wire.

Both tacker and staples designed to A. T. and T. specifications.

* * *

INDUSTRIAL DEVICES TEST LIGHT

A test light, the *Lo-Volt Test Lite*, model 1300, encased in a plastic housing, featuring flexible leads with heavy durable coverings 10" long, terminated in spring clips, is now available from Industrial Devices, Inc., Edgewater, N. J.

Plastic bulb lights up on any voltage from 3 to 25 volts *ac* or *dc*.

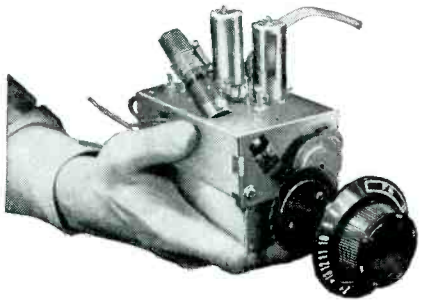
A second model the *Lo-Volt Test Lite*, model 1310, covers a range of from 6 to 50 volts *ac* or *dc*.

DU MONT DETENT-ACTION CONTINOUS INPUTUNER

An input tuner, the series T3C Inputuner, with a dial movement which covers all TV and FM channels in four turns, and occupies the same panel area as indicating devices used on most switch-type tuners, has been announced by the Electronic Parts Division, Allen B. Du Mont Laboratories, Inc., 35 Market St., East Paterson, N. J. One-knob operation clicks into TV channel and then fine-tunes.

Utilizes the Mallory-Ware 3-gang spiral Inductuner plus antenna tuning which provides 4-circuit performance. Has a 6BC5 pentode *rf* stage. The *rf* stage is over-coupled to a 6J6 mixer-oscillator for wide band-pass. A mixer plate network is available to match the *if* system of most TV chassis.

Dimensions: 4 51/64" *l*, 3 3/32" *w*, 5 5/64" *h*. Available in four models; aligned for sound center *if* of 21.25 or 21.75 mc, with or without sound trap.



* * *

FRANKLIN TV TUNER

A television station selector having an *if* output of 41.25 to 45.75 mc, has been announced by Franklin Airloop Corp., 43-20 34 St., Long Island City 1, N. Y.

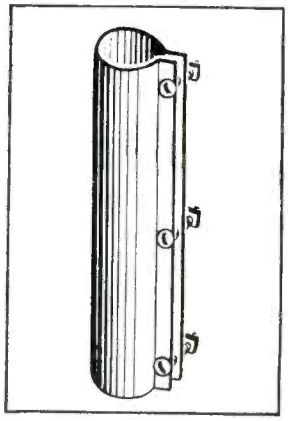
The tuner is of the rotary switch type employing inductances for each of the 12 channels. Inductances and wiring are die stamped on low-loss bakelite wafers. Tuned circuits are employed in the input, *rf*, oscillator and mixer circuits. The *rf* stage uses a 6BC5, while the mixer and oscillator use a 6J6.

* * *

TACO MAST COUPLING

A mast coupling, No. 189 that will couple wood and metal mast sections, has been announced by Technical Appliance Corp., Sherburne, N. Y.

Coupling will accept mast of 1¼" to 1 5/16". Made of steel and can be clamped to masts by means of three ¼" bolts running through flange. Bottom of clamp acts a guy wire anchor.



Shirt-Pocket FM Set

by M. W. PERCY

[*See Front Cover*]

THE TREND TO SMALLER receivers for portable listening has prompted the development of many novel chassis, the most recent of which has been designed for FM pickup.

The circuit for this unusual set, shown on the cover this month, features a superregenerative detector. Both the plate-grid circuits are tuned. This is claimed to increase the sensitivity substantially. In addition, the plate is tuned by means of a potentiometer, so that the load to the antenna is automatically balanced. The model, known as the *Micronet**, is housed in a plastic case, the overall size of which is 5 x 2¼ x 1".

The unit is equipped with a telescoping antenna that extends out to approximately nine inches from the top of the case.

The tubes used are of the subminiature type. The detector, a CK5676, is a filament type triode with an amplification factor of 15.

In the output stage is a CK522AX, a pentode, whose power output is 1.2 mw.

*Micro-Electronic Products, Inc.

The FM midget set with earpiece, at left.

SIR JOHN AMBROSE FLEMING

Invented the first electron tube, 1904, known as the Fleming Valve, opening the field for present day electronic developments.

NPA TASK GROUP

At a meeting of the NPA radio-electronic-TV task group in Chicago: *Front row* . . . Sam Rosenthal, Hyland Electric Co., Chicago; Lealis L. Hale, Hale and McNeill, Monroe, La., of NEDA; Leslie P. Doidge, government chairman, office of Civilian Requirements, NPA; Benjamin Gross, Gross Distributors, N. Y. C.; Marvin N. Bray, General Appliance Storage Co., Alexandria, Va. *Back row* . . . K. G. Gillespie, Jenkins Wholesale Division, Kansas City, Mo.; W. G. Peirce, Jr., Peirce, Phelps, Inc., Philadelphia, Pa.; Harry E. Williamson, Williamson and Davis Co., Washington, D. C.; James H. Simon, Simon Distributing Corp., Washington, D. C.; and George N. Tobias, Radio Distributing Co., Detroit.

Presence Detector Circuitry

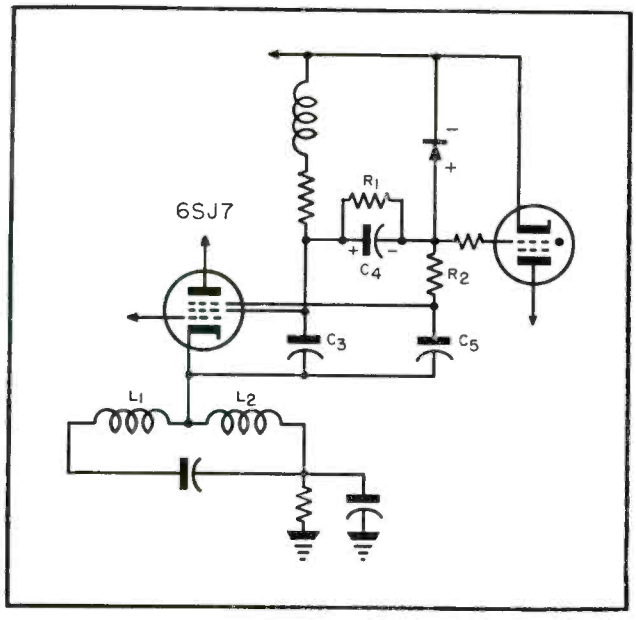
by ALAN SMOLEN

Detailed Analysis of the Operation of the Oscillator and Thyratron System in Capacitive Detecting Setup Used for Alarms, etc.

IN AN ANALYSIS of a presence-detector system*, it was pointed out that the Hartley feedback oscillator is particularly effective for this type of application, since it relies on feedback from the plate to the grid to sustain oscillations. When the voltage fed back from the plate drops below a value necessary to overcome the losses in the oscillating circuit, oscillations will cease. In the circuit shown in Fig. 1*, it will be noted that the voltage fed back from the plate to the grid is inversely proportional to C_2. This is due to the fact that a capacitive voltage divider exists from the grid side of L_1 to ground. In a capacitive divider, the voltage across one of the elements is inversely proportional to its capacitance. If we adjust C_2 so that just

*Page 30, SERVICE; October, 1950.

Fig. 2. How the negative voltage is developed on the grid of the thyratron, a 2D21 in this instance.



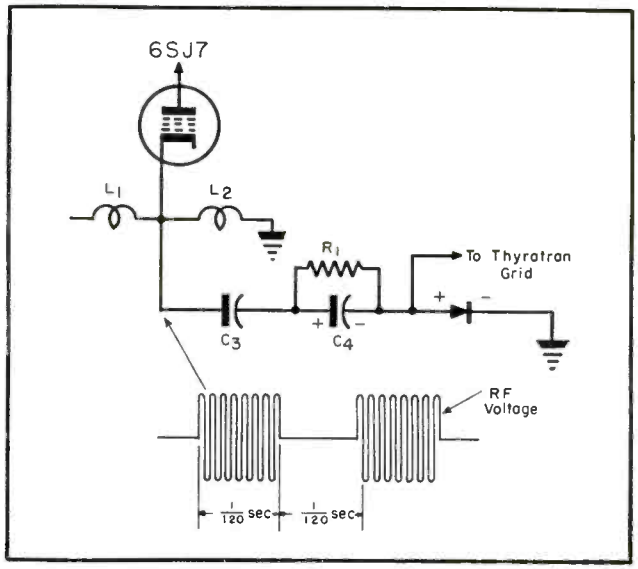


Fig. 3. Equivalent circuit for Fig. 2

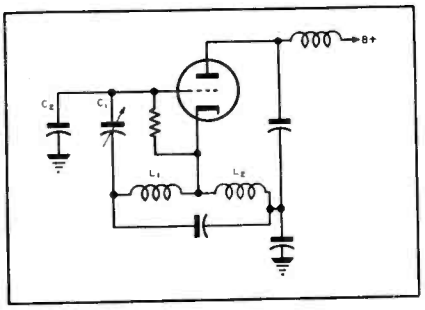


Fig. 1. Basic schematic of the Hartley circuit employed in the presence detector.

enough voltage is fed back to the grid to sustain oscillations, it will be found that a slight increase in C_2 (accomplished by the addition of body capacity to ground) reduces the fed-back voltage and oscillations will stop.

Negative Voltage Importance

Fig. 2 illustrates the manner in which a negative voltage is developed on the grid of the thyratron. This voltage prevents the 2D21 from firing until oscillations cease for at least .2 second. An *rf* voltage exists from the cathode of the 6SJ7 to ground across L_2 during that portion of the 60-cycle *ac* voltage when the plate of the tube is positive. The positive peaks of *rf* voltage cause the crystal to conduct, through C_3 and C_4, and charge up the thyratron grid side of C_4 to a negative potential equal to the peak of the *rf*. This charge cannot leak off very quickly because the discharge path for C_4 is approximately .27 megohm. In Fig. 3 appears an equivalent circuit.

RC Time Constant

During this portion of the *ac* cycle, the plate of the thyratron is negative with respect to its cathode. On the other half of the cycle, when the plate of the 6SJ7 goes negative with respect to its cathode, oscillations cease for approximately 1/120 of a second. The *rf* voltage across L_2 disappears. The time constant of R_1C_4 is sufficiently large (.027 second) to maintain a negative potential on the grid of the 2D21 and prevent its ionization even though the thyratron plate is positive.

Capacitor as Stabilizer

Capacitor C_5 is also charged through a long time constant R_2C_5 (20 seconds) and serves as a stabilizer to maintain oscillation during slow changes of antenna or pickup capacity. As mentioned previously, an increase in antenna capacity reduces the fed-back voltage, and if the antenna capacity increase is sufficiently high, due to atmospheric changes, the relay may operate. The rectified *dc* voltage on the *plate* of the crystal is proportional to the peak of the *rf* oscillation. If, because of a slow change in antenna capacity the amplitude of oscillation begins to drop, the voltage at that point begins to drop. Since this is a negative voltage on the suppressor of the 6SJ7, a decrease in voltage increases the gain of the tube, which will increase the amplitude of oscillation until a new stable point is reached.

Compensation Effects

This effect will also compensate for tube aging and slow variations in line voltage.

On rapid changes in antenna capacity, the long time constant R_2C_5 prevents a rapid compensation and permits normal relay operation.

Rep Talk

JAMES MILLAR ASSOCIATES, 1019 W. Peachtree Street, N.E., Atlanta, Ga., has been appointed sales rep for the Sola Electric Co., Chicago, for the states of Mississippi, Alabama, Georgia, Tennessee, and Florida. . . . *Leroy W. Beier,* 600 S. Michigan Ave., Chicago 5, Ill., has been appointed Astron Corp. sales rep for Illinois. . . . *William Richter,* 295 Lake Avenue, Rochester, New York, has become CRL sales rep to manufacturing accounts in upper New York State. . . . *A. Sidney Hardy,* 4238 Power's Ferry Road, N. W., Atlanta Ga., will represent Tel-O-Tube Corporation of America in the Southeastern territory. *S. M. Levin,* Main P.O. Box 405, St. Louis, Missouri, has been appointed Tel-O-Tube rep for the St. Louis territory. . . . An announcement by *Dick Morris,* Snyder Manufacturing Co. sales-manager, has disclosed that all Snyder reps have been temporarily taken off sales duties and assigned to the factory expediting division. This step has been taken to aid the expediting division in the procurement of essential materials. . . . *Bert Heuvelman,* of Instrument Sales Company, 3947 W. Lawrence Ave., Chicago, Ill., has become Workshop Associates rep for Indiana, except Richmond. He will continue to cover Chicago, too. C. H. Dolfuss, Jr. & Co., Film Exchange Building, Cleveland, O., will present Workshop in Ohio, Kentucky, Richmond (Indiana) and W. Penna. *J. J. Hagerty Co.,* 1223 Longfellow Ave., Royal Oak, Mich., has been assigned the state of Michigan for Workshop. . . . *Busse & Schroeder,* 1575 Noblestown Rd., Pittsburgh, Pa., have become exclusive reps in the tri-state area for Multenna of New York, 77-15 113th St., Forrest Hills, L. I. . . . *Northwest Sales,* 301 Commerce Bldg., St. Paul 1, Minnesota, has been appointed Circle-X rep for Minnesota, North and South Dakota and Wisconsin. *A. Sidney Hardy & Associates,* Atlanta, Georgia, has been appointed to cover Alabama, Florida, Georgia, North and South Carolina and Tennessee. . . . *Robert Milsk,* 522 Michigan Bldg., Detroit 26, Mich., has become Insuline and Clarostat rep for the state of Michigan. *Ed Schulz,* Indianapolis, Ind., will cover the cities of Cincinnati, Columbus and Dayton, Ohio, for Insuline. . . . *Frank W. Taylor, Harry R. Murray* and *Victor F. Nicholson* are now members of the Empire State chapter of Reps. . . . *Harry Estersohn,* 395 East Cliveden St., Phila. 19, has been elected to senior membership in the Mid-Lantic chapter of the Reps. . . . *Thomas H. Closs,* 17 West Pennsylvania Ave., Towson 4, Md., has been appointed sales rep for Weston Electrical Instrument Corp. for northeastern and eastern Maryland. . . . *Maury Farber,* 157 Hartwell Rd., Buffalo 16, N. Y., will now cover Connecticut, Massachusetts, New Hampshire, Vermont, Maine, and Rhode Island for Radio Merchandise Sales, Inc. . . . *Grady M. Duckett,* 1145 Peachtree St., N.W., Atlanta, Ga., has become southeastern factory rep for James B. Lansing Sound, Inc., Los Angeles. . . . *Stephen J. Welsh* has been named metropolitan New York and northern New Jersey district rep for the G. E. tube divisions. . . . *Jules Bressler* is now Rauland Corp. industrial rep, covering manufacturers and jobbers, in metropolitan New York. . . . *Thomas B. Hunter,* 4554 Broadway, Chicago, Ill., will represent Electrical Reactance

throughout Illinois. . . . *Conrad R. Strassner Co.*, Los Angeles, has been appointed TV mast and tower rep for the Penn Boiler and Burner Mfg. Corp., Lancaster, Pa., for the states of California, Arizona, Nevada and New Mexico. . . . Six reps have been appointed to handle Anchor rosin-core solder: *Henry P. Segal*, 143 Newbury St., Boston, Mass. (New England); *B. B. Taylor* and *Ed Glass*, 150 Broadway, N.Y.C. (metropolitan N.Y.); *Leonard D. Allen*, 2401 S. State St., Syracuse, N. Y. (upper N. Y. State); *Walter J. Brauer*, 15631 Lakewood Hts., Blvd., Cleveland, Ohio (Ohio Kentucky, Indiana); *Howard L. Quick*, 919 N. Michigan Ave., Chicago, Ill. (Wisconsin, Michigan); and *Cartwright Sales Agency*, 4030 Club Dr., N.E., Atlanta, Ga. (southeastern states). . . . *Bert Cole* has rejoined Philco as sales rep for the New York-Newark area. . . . *Don Burcham Associates*, Portland, Oregon, *Fred Rosenwasser*, Cleveland, Ohio, and *Sid H. Gatty*, Philadelphia, Pa., have been appointed reps for M. A. Miller Mfg. Co., 1165 E. 43 St., Chicago 15, Ill. . . . *Harry A. Moore*, 4142 N. 18th St., Phoenix, Arizona, has become a rep for Oxford Electric, Chicago, to cover the Arizona territory. . . . *Forrest Valentine* has been named Oak Ridge rep in Indiana and Kentucky, and *Harry A. Cole* has been assigned Florida, Georgia, and North and South Carolina. . . . *G. G. Willison Co.*, 2030 Harold St., Houston 6, Texas, is now sales rep in Louisiana and Texas for the Crest Transformer Corp., Chicago. . . . Fidelity Tube Corp., 900 Passaic St., East Newark, N. J., has appointed *Matthew A. Camber* as national rep for the manufacturers' division, and *Leon L. Adelman* as metropolitan rep for the jobber division. . . . *Richard Mitchell*, 6132 N. Olney St., Indianapolis, Indiana, is now sales rep for Thomas Electronics, Inc., in Indiana. . . . *Jim F. Smith* has joined the Clarostat jobber division headquarters staff. . . . *H. D. Widdekind*, 9004 W. Shorewood Drive 524, Mercer Island, Washington, has become a rep for the Crest Transformer Corp. He will cover the Northwest territory including Montana, Idaho, Oregon, Washington, British Columbia, and Alaska. . . . *Edward De Nike*, P. O. Box 612, 1620 Temple Drive, Florida, is now a rep for Brach in Florida. He will handle all commercial products and will act as government engineering expeditor in that area.

At recent meeting of Oxford Electric reps (sitting from left to right): H. J. Corey, Oxford's director of purchases; John Proctor, Jr., general sales manager; Hugo Sundberg, Oxford's vice president and general manager; David E. Davis, secretary-treasurer of Oxford, and Angelo Sorice, plant superintendent. Between Corey and Proctor (standing) is S. Rodkin, president of Sander Rodkin ad agency, which handles the Oxford advertising program. Reps at meeting included (second row); John Thompson, Atlanta, Ga.; N. J. Laub, Minneapolis; Paul Nichols, New York City; J. C. Lehner, Cleveland; Orville Smith, Jackson, Michigan. Top row, left to right; Walter C. Hustis, Richfield, Conn.; Jack West, Chicago; Jack Yount, Dallas, Texas; Jerry Koenig, Merriam, Kansas, L. M. DeVoe, Indianapolis, Indiana; R. E. Sargent, New York City; and M. K. Smith, Atlanta, Ga.

TV RF-IF Amplifiers

(*Continued from page 23*)

the mixer on the oscillator and vice versa when the respective circuits are tuned. From a study of the circuit, it can be seen that the injection capacitor, in conjunction with the impedance of the mixer tuned circuit, makes up a voltage divider.

The Video IF Amplifier

The video *if* usually consists of three or four amplifier stages. The passband of this amplifier is from 3.5 to 4 mc, measured 6 db down. The amplifier can be made up of double-tuned circuits all tuned to the same frequency, or of single-tuned circuits all tuned to the same frequency. The single-tuned arrangement, with all coils tuned to the same frequency, however, is not used since considerable overall bandwidth shrinkage occurs. For instance, if three single-tuned stages are placed in cascade all tuned to the same frequency, the overall bandwidth measured at 3 db down is 51 per cent of the individual stage bandwidths. To use such an arrangement would mean that the individual stage bandwidths would

(*Continued on page 66*)

TV RF-IF Amplifiers

(*Continued from page* 65)

have to be much wider, with a resulting loss of gain per stage.

By using single-tuned circuits and staggering the frequencies to which they are tuned, an amplifier of high gain and wide bandwidth can be obtained. This can be seen from a study of the plots in Fig. 7 (*a, p.* 23). Here are shown the selectivity curves of two single-tuned stages having equal bandwidths and tuned to frequencies which are spaced a bandwidth apart. The two selectivity curves cross at their 3-db (.7*A*) point, which is at f_r, the mean frequency of the pass band. The overall response of these two stages is that shown at (*b*), which is seen to be the response of a critically-coupled

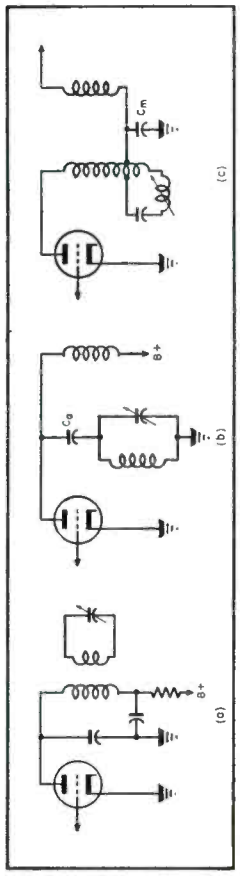
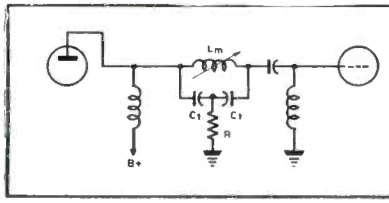


Fig. 9 (*a*), (*b*) and (*c*). Circuits of three typical interference traps of the absorption type.

Fig. 10. Another type of trap in which a negative resistance occurs between ground and the junction of the capacitors, C_1.



double-tuned circuit. It will be noticed that the 3-db bandwidth is 40 per cent larger than the individual stage bandwidths. This compares to an overall bandwidth of only .64 per cent of the individual stage bandwidth, if the two stages were tuned to the same frequency. This increase in bandwidth, obtained by staggered tuning, permits wideband amplifiers to be built, having overall bandwidths wider than that of the individual stages and overall gains that are equal to that of amplifiers, with the same number of stages all tuned to the same frequency.

Staggered-Tuned Response

The staggered-tuned responses, shown in Fig. 7, are for a two-stage amplifier. Amplifiers with more than two stages can be staggered tuned at as many frequencies as there are stages, in pairs, or in combinations of pairs and triples. The use of as many frequencies as there are stages gives more gain.

One arrangement frequently used is the combination of a bottom-coupled double-tuned mixer-plate circuit with a staggered tuned triple *if* amplifier, as shown in Fig. 8 (*p. 23*).

Advantages of Method

An advantage of this arrangement is that the mixer plate coil and first *if* grid coil can be located apart since the coupling occurs through the capacitor, C_m. This permits locating the *if* strip some distance from the *rf* tuner. A second advantage of this arrangement is that due to the increase in skirt selectivity of the double-tuned circuit, much less oscillator voltage in the mixer plate gets to the first *if* grid, than for the case of a single-tuned mixer-plate circuit.

Traps

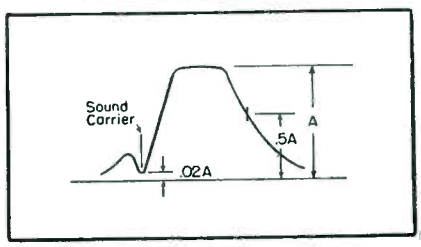
The sound carrier with its sideband frequencies will also be carried through the wide-band video *if* amplifier. If this sound energy reaches the second detector, a 4.5-mc beat between the two carriers and their sidebands will be produced and will interfere with the picture. In mild form, it produces a stipled-looking picture; in strong form, it can completely distort and mask the picture.

Absorption Traps

To prevent such interference, traps are used. These can take several forms. One type is the absorption trap shown in *a*, *b*, and *c* of Fig. 9. In (*a*) and (*c*), the trap is mutually coupled to the circuit while in (*b*), it is directly coupled through C_a.

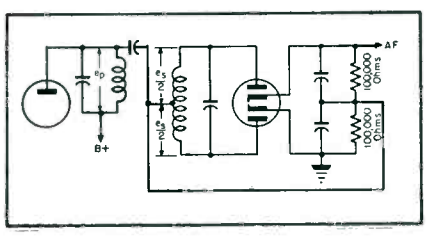
Another form of trap sometimes used is illustrated in Fig. 10. In this

(*Continued on page* 68)



(*Right, top*)

Fig. 11. Overall *if* selectivity curve of a sound trap.



(*Right*)

Fig. 12. Typical discriminator circuit used in TV receiver for detection.

TV RF-IF Amplifiers

(Continued from page 67)

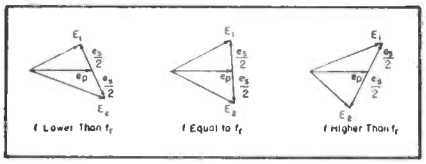


Fig. 13. Vector analysis of discriminator operation.

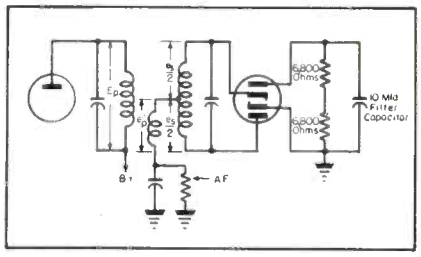


Fig. 14. A ratio-detector TV system.

arrangement, a negative resistance occurs between ground and the junction of the C_t. By balancing out this negative resistance with a positive resistance, R, very high attenuation is obtained at the sound frequencies. The effect on the overall *if* selectivity curve of a sound trap is shown in Fig. 11.

The Sound IF, Discriminator and Ratio Detector

The sound *if* is normally conventional, consisting of several double-tuned critically-coupled stages, operating at frequencies in the region of 21.25 to 21.9 mc. The input to the *if* amplifier is often obtained from the voltage developed across the sound trap.

Since TV sound is frequency modulated, a FM type of detector is used. There are two types in general use; the *discriminator* and the *ratio detector*. The discriminator, shown in Fig. 12, operates on the phase difference between the primary and secondary voltages which is a function of the frequency of the signal applied. The circuit is so connected that the primary voltage, E_p, plus one-half of the secondary voltage is applied to each diode. Because the two voltages are out of phase, they do not add up algebraically but vectorially; hence, the effective voltage on each diode is a function of the phase angle and they are equal only for the case where the input signal is at the frequency of resonance of the tuned circuits (both primary and secondary are tuned to the same frequency); Fig. 13. For the resonant frequency, the rectified voltages across the respective diode loads are equal, and being opposite in polarity the net voltage across the whole load is zero. For frequencies below and above resonance, the voltages on the two diodes are unequal and a net *dc* voltage of negative or positive voltage is developed across the whole load. This *dc* voltage changes at the rate of the frequency modulation, thus producing an audio signal.

At the resonant frequency, the discriminator inherently rejects any AM on the FM signal; however, at frequencies off resonance, any AM present gets through. To eliminate the AM at all frequencies, the discriminator is preceded by a limiter stage. Limiting is accomplished by operating the limiter tube in a saturated condition, so that only a constant amplitude signal is passed on to the discriminator.

Ratio-Detector Circuit

The ratio detector circuit (Fig. 14) is somewhat similar to the discriminator, but differs in its principle of operation. The diodes are connected in series instead of opposing as in the discriminator, a very large capacitor is across the diode load, and the load itself is small compared to that of the discriminator. The acting voltage on the two diodes is the vector sum of the primary and secondary voltages and these voltages vary with frequency, as in the case of the discriminator. In addition, the audio voltage is obtained from a different point in the circuit.

The Intercarrier Sound System

In the discussion of the video *if* amplifier, it was shown that a sound trap

was necessary to eliminate the 4.5-mc beat produced by the video and sound carriers beating in the second detector. Since the sound carrier has side band frequencies, the 4.5-mc beat also has them. It is easy to see then that here is the source of a 4.5-mc sound *if* signal which can eliminate the need for a separate sound *if* amplifier operating at 21.25 or 21.9 mc. Several advantages immediately result; *one* is the reduction in number of sound *if* stages required; *two*, tuning is easier because the local oscillator need not be tuned for narrow band sound; *three*, the set can be tuned for best picture; and *four*, oscillator drift with temperature is made less critical because it has little effect on sound.

Sound-Trap Attenuation

In a set using the intercarrier sound system, the video *if* amplifier response is similar to that of a receiver using a separate sound *if*; however, the sound trap attenuation need not be much more than 20 times since additional attenuation of the 4.5-mc beat occurs in the video amplifier, where the 4.5-mc sound *if* is removed and applied to the 4.5-mc sound system. Methods of removing the 4.5-mc *if* signal from the video amplifier are shown in Fig. 15.

To convert the 4.5-mc *if* signal into audio, a discriminator or ratio detector is used.

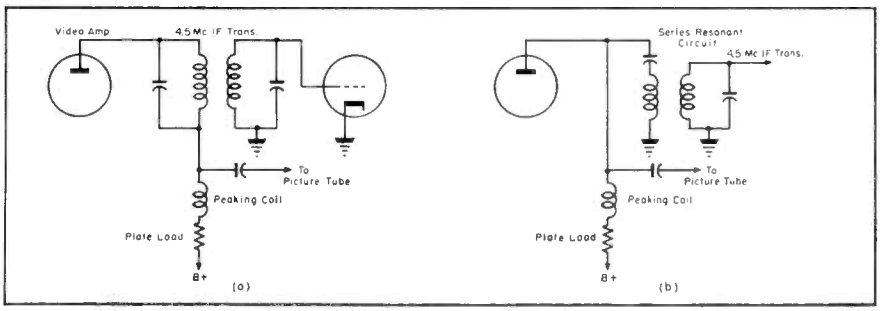
60-Cycle Buzz

One of the major problems of the intercarrier system is the 60-cycle buzz which can occur. This buzz can result from a number of causes. One cause is at the transmitter. Buzz will occur when the white part of the picture is permitted to modulate the carrier less than 15 per cent of the peak amplitude which occurs during the sync-pulse period. This results in a 4.5-mc carrier at the receiver which is turned on and off at the 60-cycle field rate. This type of modulation sometimes occurs, though the stations do attempt to minimize it.

Other Sources of Buzz

Other sources of this buzz occur in the receiver itself. If the *if* or the video amplifier is overloaded, compression of the white part of the signal occurs and this acts to reduce the white modulation to less than 15 per cent of the peak amplitude producing the same effect as excessive modulation at the transmitter.

Fig. 15 (*a*) and (*b*). Two methods which can be used to remove the 4.5-mc *if* signal from the video amplifier in an intercarrier-sound system.



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ASSOCIATIONS

NESDA

THE FORMATION of a new national servicing association, the National Electronic and Service Dealers Association, was announced at a recent meeting in the Hamilton Hotel in Washington, D. C. Delegates from over a score of cities in Pennsylvania, New Jersey, New York and the District of Columbia, assembled to form the new group.

Elections were held and Max Liebowitz, president of the Associated Radio-Television Servicemen of New York, was named president. Others elected were: Norman Selinger, Television Associates, Washington, vice-president; Roger Haines, Allied Television Technicians of South Jersey, recording secretary; Richard Devaney, Philadelphia Radio Service Men's Association, corresponding secretary; Vance Beachley, Midstate Radio Service Men's Association, treasurer.

Temporary headquarters of the association are at 1615 Kalorama Rd. N.W., Washington, D. C.

The association proposes to assist in the promotion of the welfare of Service Men, provide a better understanding between Service Men and manufacturers and promote better public relations and improved cooperation with federal, state and municipal agencies.

The registration fee for admission has been announced as $20. According to present plans, meetings will be held on the first Sunday of each month, with the next one scheduled for March 4, in Philadelphia.

FRSAP

AT A RECENT MEETING of the Federation of Radio Service Men's Associations of Pennsylvania, Dave Krantz was reelected chairman.

Miland Krupa was named vice chairman; Leo Helk was appointed treasurer and William Grimme became secretary. Krupa represents the Luzerne group, while Helk is from the Lakawanna section.

ARTSNY

AT RECENT TV lectures, presented before the Associated Radio-Television Servicemen of New York, TV receivers and sync circuits and 'scopes were covered by representatives of Bendix Radio and Hickok Electrical Instrument Co. At the conclusion of the Hickok talk, a model 195B 'scope was awarded as a door prize.

A new licensing bill, proposed in the N. Y. City Council, was bitterly criticised by ARTSNY prexy Liebowitz and Noel Paine during a mass meeting. They charged that the bill was even more objectionable than earlier versions, the present proposal offering broad powers to a commissioner, which were not defined.

TEN YEARS AGO
From the Association News Page of SERVICE, February, 1941

OVER A HUNDRED members of the Lehigh Valley Radio Service Association, Allentown, Pa., attended the third annual banquet at the Hotel Allen. Joe Marty, Jr., and George Duval were honored guests and speakers. At an earlier meeting, Bruce Burlingame appeared and described the Supreme Vedolyzer. . . . William Pedro was named president of the Whaling City chapter of the Radio Technicians Guild, New Bedford, Mass. Others elected included George Cadorette, vice president; Walter England, treasurer; James L. Shepley, secretary. Louis Senra, Ernest Doyon and George Millette were appointed advisory board members. . . . George C. Connor, commercial engineer of Hygrade Sylvania, appeared at meetings of the Sylvania west coast *Service School* to discuss circuitry developments of '40 and trends in '41. . . . Bill Bohlke, director of test equipment merchandising for RCA, appeared before salesmen and Service Men of jobbers and before Service groups in N. Y., Chicago, Cleveland and Kansas City and discussed the dynamic demonstrator.

TV SERVICING BOOK

A 340-page book, *Television Servicing*, by Walter H. Buchsbaum, has been published by Prentice-Hall, Inc., New York.

Contains an outline of the basic functions and components of the TV chassis, picture tube, its associated circuits, deflection, synchronizing systems, different stages of amplification, *rf* tuners, and antenna theory and application. Circuits used in recent TV receivers, including the intercarrier system, gated beam FM detector, keyed *agc* and wide-angle deflection systems, are described.

Also discussed are *rf*, picture and sound *if* alignment both by the *vtvm* and visual method, installations with special emphasis on weak signal areas and practical solutions, *if* regeneration, intercarrier hum and the many types of interference.

Listed are defects and repair procedures for inoperative receivers, loss of synchronization, defective deflection, poor picture quality, poor sound quality, and poor *crt* performance.

The book has 170 illustrations, and an appendix with 15 complete manufacturer's diagrams of popular TV receivers.

INDUSTRY COMMITTEE PARTS SHOW CONFERENCE

(Right)

At a meeting of the members of the industry committee for the 1951 Parts Distributors Conference-Show which included Jack Berman, Herb Clough, Ken Prince, Walter Jablon, Jerry Kahn, J. Cashman, Lou Calamaras and Sam Spector. Show will be held at the Stevens Hotel, May 21-23.

JOTS AND FLASHES

TV's GROWTH, which in the past has been described in terms of receivers made, is now being mirrored in the number of picture tubes produced. For instance, several manufacturers have celebrated the processing of their one-millionth picture tube. Such events have been announced at Rauland, Eimac, and many others. . . . The Brach Mfg. Corp., 200 Central Ave., Newark, N. J., has released a catalog describing their line of TV antennas and accessories. . . . Lifetime Electronics are now located in their new building at 1501-05 Adams St., Toledo 1, Ohio. . . . Oxford Electric Corp., 3911 S. Michigan Ave., Chicago 15, Ill., recently announced that in '50 they produced over three-million speakers. . . . S. H. Coombs has become head of the electronic sales engineering department of H. E. Ramsford Co., who represent DuMont in western Pennsylvania and West Virginia. . . . H. I. Danziger has become vice president of Henry L. Crowley and Co., Inc., 1 Central Ave., West Orange, N. J. . . . A new department for the reshaping of Alnico magnets for experimental purposes has been established by the Leotone Radio Co., 65 Dey St., New York 6, N. Y. . . . The recent roaring fire in Chicago which burned out a warehouse, fired the entire showroom inventory and a large stock of tubes of Wells Sales. Fortunately, the greater portion of their inventory was stored in three other warehouses and business has been resumed at a new location at 833 W. Chicago Ave., Chicago 22, Ill. . . . The Chicago conflagration also destroyed most of the plant of Condenser Products Co. New headquarters have been established at 7517 N. Clark St., Chicago 11, Ill. . . . Key Service Men from G. E. radio and TV distributors throughout this country and Canada, recently attended a week-long series of conferences at Electronics Park in Syracuse, N. Y. W. L. Parkinson, manager of product service for G. E.'s receiver division, was general chairman for the conferences. . . . Minnesota Mining & Manufacturing Co., St. Paul, Minn., are planning a new plant occupying 114 acres on the west side of Harlem Ave. between 67 and 71 Streets. . . . A new plant with over 25,000 square feet of space has been announced by Channel Master Corp., Ellenville, N. Y. . . . A comprehensive discussion of solder and soldering techniques, covered in an article entitled *Modern Soft-Soldering Technique* by R. W. Hallows, is now available from Multicore Sales Corp., 164 Duane St., New York 13, N. Y. . . . A 48-page *Notebook on Color TV* prepared by Ed Noll, has been published by Paul H. Wendel Publishing Co., Inc., P. O. Box 1321, Indianapolis, Ind. . . . A revised edition of the book *Vacuum-Tube Voltmeters* will soon be published by John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y. The book, with approximately 370 pages, will be priced at $4.50.

ADVERTISERS IN SERVICE—FEBRUARY, 1951

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