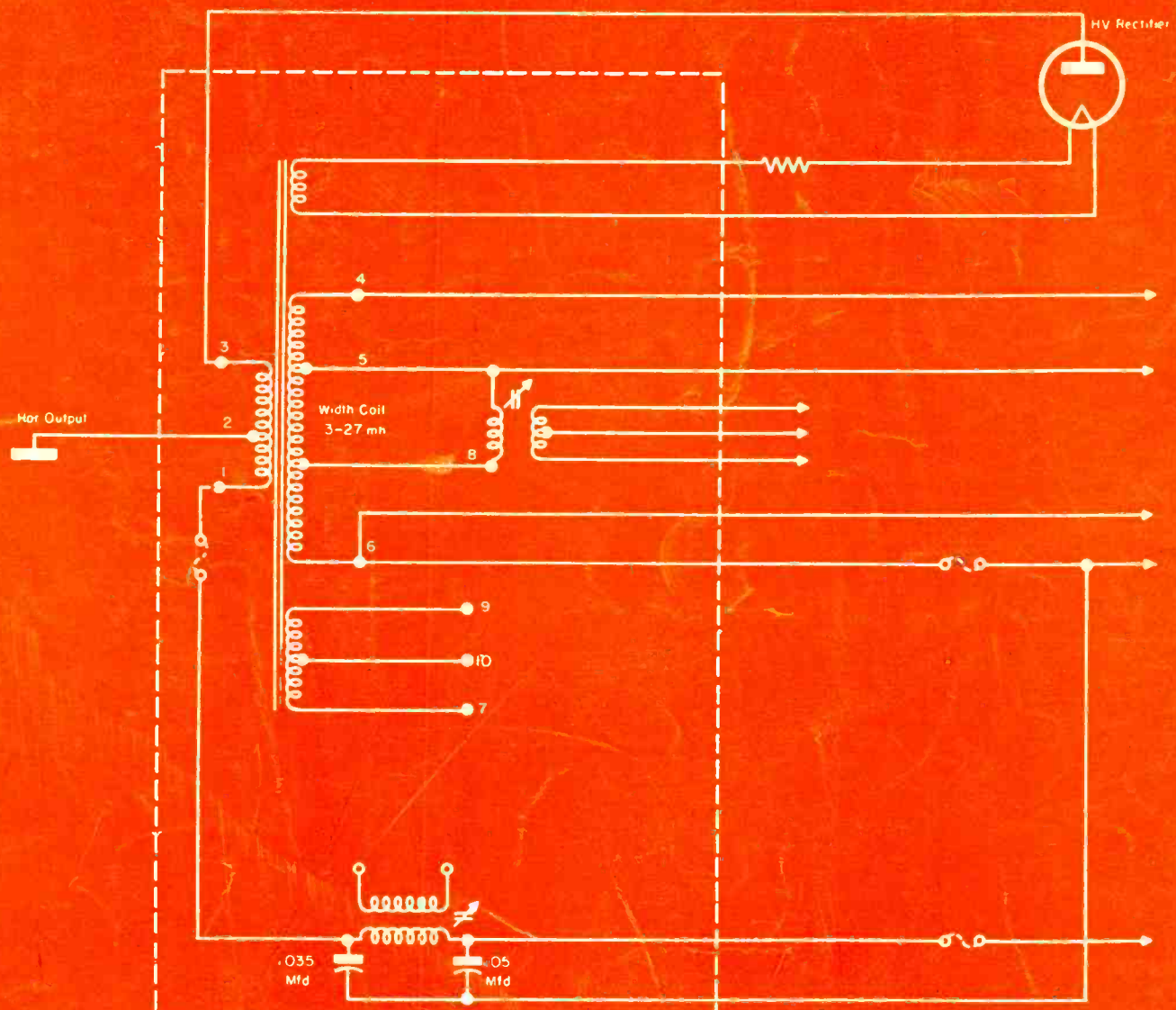
RADIO • TELEVISION • ELECTRONIC

SERVICE

VOL. 22

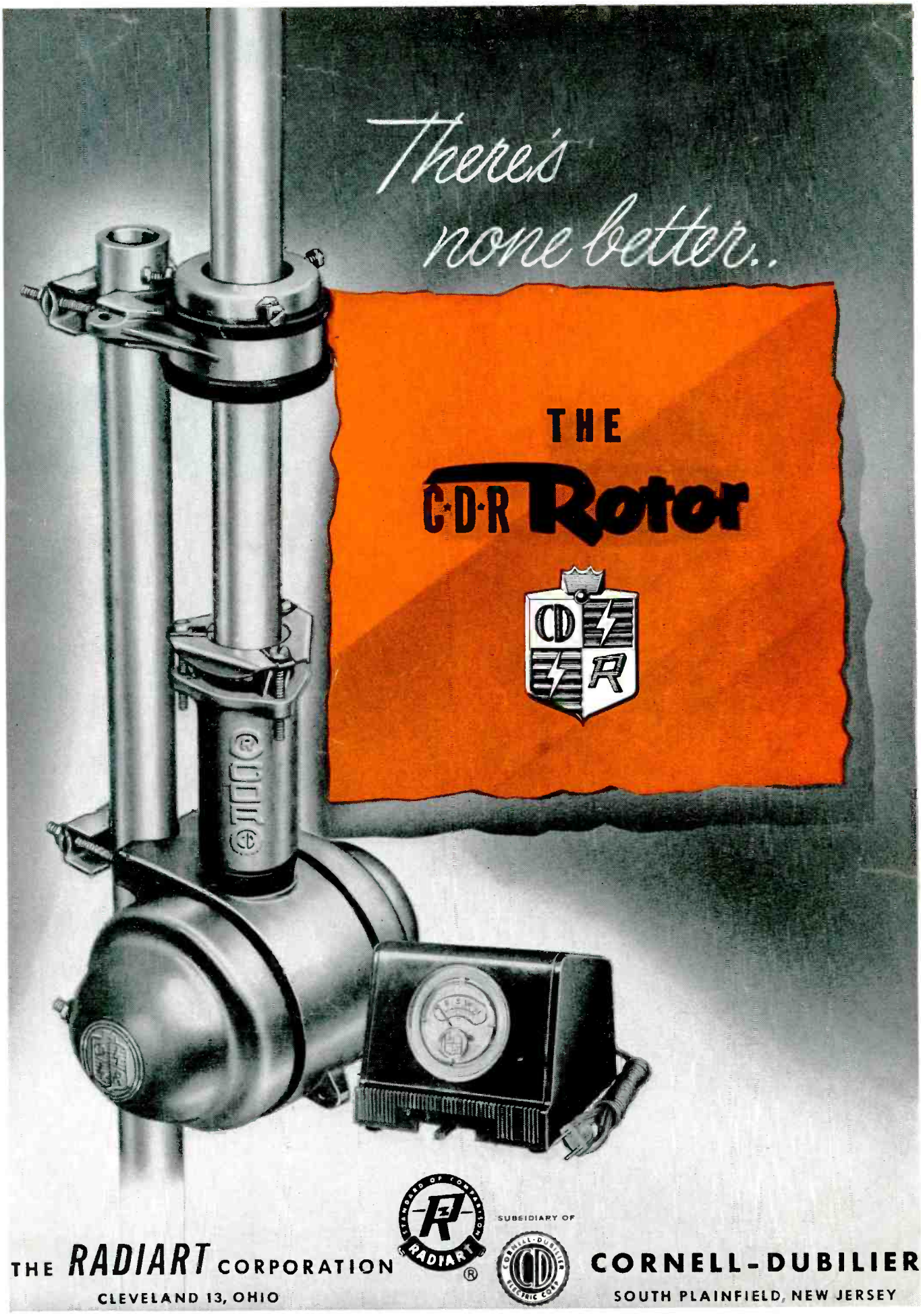
MARCH
1953



Horizontal-deflection circuit, using horizontal linearity coil, for replacement-transformer installation.

[See page 3]

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

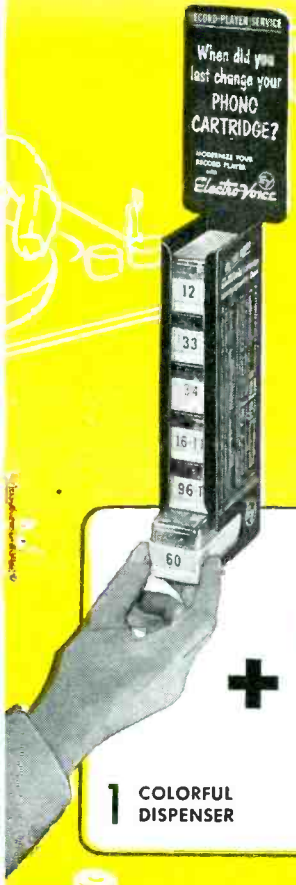


NEW! FREE!

CARTRIDGE DISPENSER

PLUS

THESE E-V SALES AIDS



1 COLORFUL DISPENSER

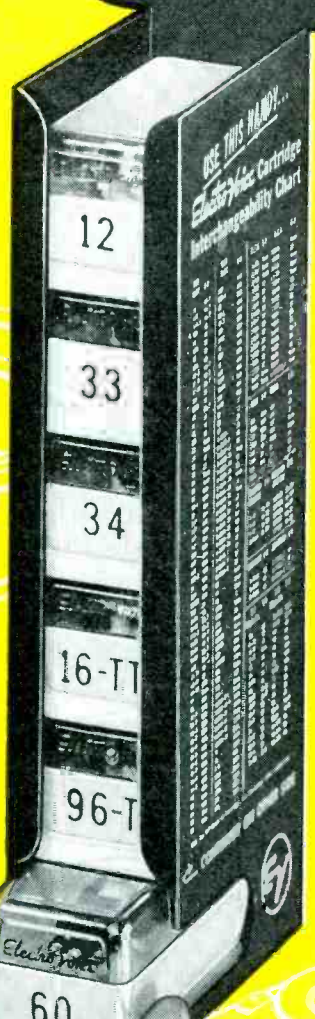
+

PROFESSIONAL PHONOGRAPH SERVICE
WE USE Electro-Voice PRODUCTS

2 UNIQUE DECAL

+

3 SET MODEL REPLACEMENT GUIDE



USE this handsome, all-metal dispenser in your store or shop. It catches the eye and makes your customers want to buy!

This modern merchandiser is the *new way*, the *positive way* to cash in on the $70,000,000.00 phono-cartridge modernization-replacement market.

Not only does it sell cartridges, but the handy Cartridge Interchangeability Chart on each side makes your replacement service quick and easy.

In addition, the unique colorful, transparent Decal and the complete Manufacturers Set Model Replacement Guide make *you* the authority on Phono Service in your community.

All three are Free, without extra cost, from your E-V Distributor with *every* purchase of *any* 6 E-V Phono Cartridges. (The 6 basic Preferred E-V Models shown here, of course, enable you to make over 92% of all replacements.)

Use this profit key to '53! Open up the treasure that holds 10,000,000 Phonograph Modernization Sales. *Make money selling Cartridge replacements now the E-V way.*

Handsome All-Metal Maroon, Yellow and White Dispenser. Holds any 6 E-V Cartridges in their New Jewel-Like Golden Yellow Plastic Boxes.

Hang it on a Wall or Shelf. Cartridge Boxes Easily Removed from Bottom or Top.

Complete Cartridge Interchangeability Chart on Both Sides of Dispenser

Electro-Voice

Send Now For
FREE BOOKLET SCP 1-2
"YOUR PROFIT KEY TO '53"

ELECTRO-VOICE, INC.
411 Carroll St., Buchanan, Mich.
Send Free Booklet SCP 1-2
"YOUR PROFIT KEY TO '53!"

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

Export: 13 E. 40th St., N. Y. 16, U. S. A. Cables: Arlab

When there are new worlds to conquer, JFD will do it!
Now our engineers have combined the famous JFD VHF Jetenna and UHF bowtie antenna into a miracle performer that pulls in all channels—from 2 to 83. Use it with the especially developed filter network* for perfect reception, completely free of inter-spectrum interference. Pre-assembled construction, all aluminum, even to solid aluminum dowels.

Write for the new 1953 JFD dealer almanac on your letterhead—36 pages of the widest TV antenna and accessory line in the industry.

*optional

JFD
UHF - VHF

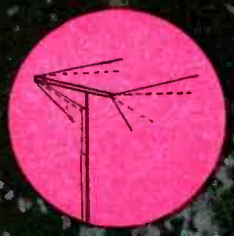
it's out of this world!

new, VHF-UHF All-Channel Antenna
—the Jet 283

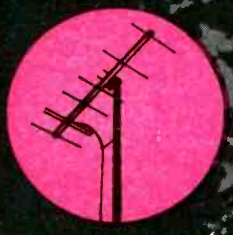
one antenna—one transmission line for all channels from 2 to 83

Corner Reflector No. UHF400

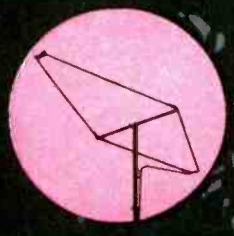
"Bowtie-Flector" No. UHF600



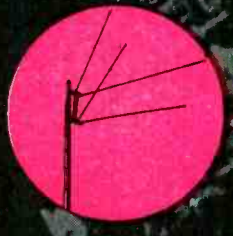
Ultra V-Beam No. UHF500



YAGIS No. UHF300 Series for Channels 14 to 83



Rhombic No. UHF200



"Double-Vee" No. UHF100

JFD MFG. CO., Brooklyn 4, N. Y., Bensonhurst 6-9200
world's largest manufacturer of tv antennas and accessories

Burton browne advertising

Vol. 22, No. 3

RADIO · TELEVISION · ELECTRONIC
SERVICE

March, 1953

LEWIS WINNER
Editor

B. BLOCK
F. WALEN
Assistant Editors

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

 5

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use Teletrons from 12" to 30"

The complete line of Teletrons in the most popular types from 12" to 30", reflects the prominent role Du Mont has played in the advancement of big-picture television. Each time you use a Teletron for replacement, Du Mont's reputation for quality stands behind the reliability of your service.

FREE! *Du Mont data chart lists complete specs on all picture tube types. Attach card or letterhead to this ad for your free copy.*

DU MONT

*Teletrons**

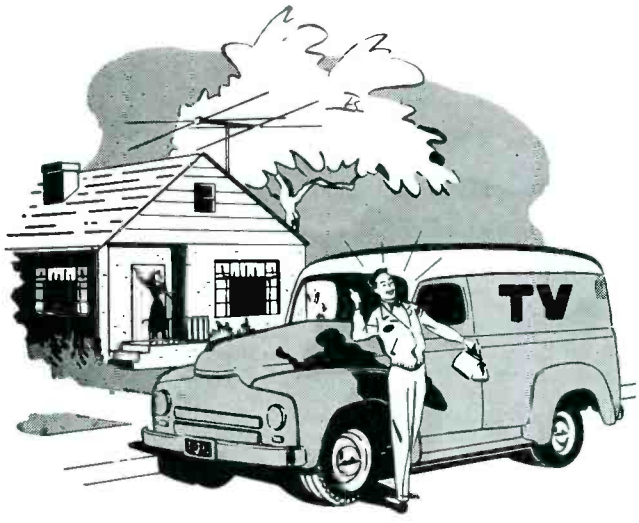
*TRADE MARK

ALLEN B. DU MONT LABORATORIES, INC.
Replacement Sales • 750 Bloomfield Avenue • Clifton, N. J.

ASTRON

SAFETY MARGIN

CAPACITORS



Depend On—*Insist On*

ASTRON CORPORATION

Write for Catalog AC-3 and Name of Jobber Nearest You

Cut Callbacks!

When you install ASTRON Capacitors, you're insuring against call-backs, building your reputation for *reliable* service.

Through the use of an improved electrolyte, and an exceptionally high-purity anode foil—plus rigid quality control and exhaustive multiple testing techniques—ASTRON electrolytic SAFETY-MARGIN capacitors mean longer life and maximum performance under every condition. Unexpected surges of voltage, undue heat or moisture—conditions that might spell failure in an ordinary capacitor—rarely affect an ASTRON.

So next time ask for ASTRON—the capacitor with the "safety margin" that protects your service reputation. And ask for Astron Type AM molded paper tubular capacitors to complete your service job. *Individually tested — individually guaranteed.*

Visit Astron at the I.R.E. Show, Booth 4-707
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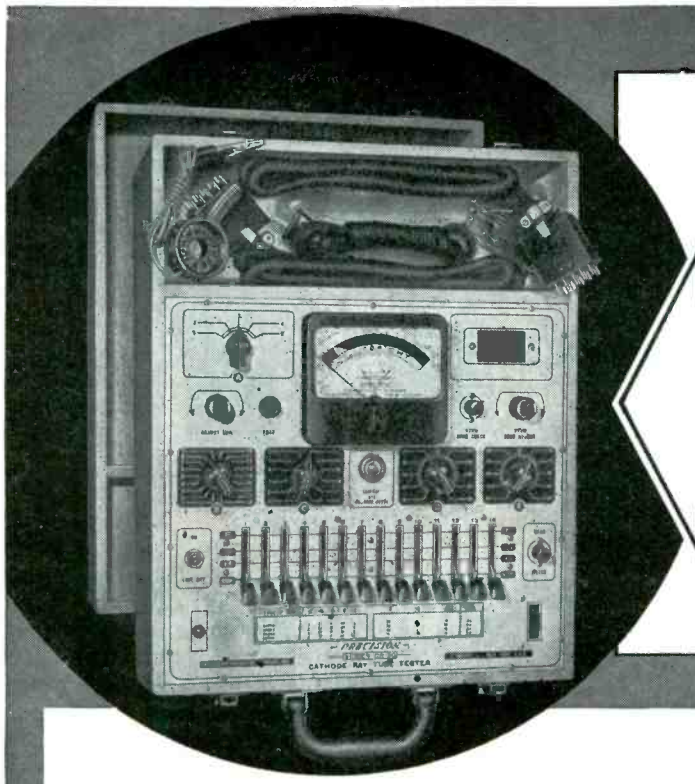
ASTRON
CORPORATION

255 Grant Avenue, E. Newark, N. J.



PRECISION CR-30 CATHODE RAY TUBE TESTER

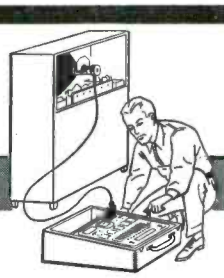
TESTS ALL TV PICTURE TUBES

(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 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

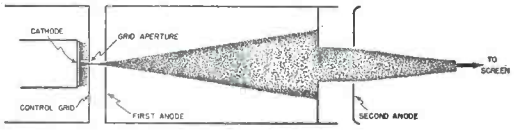
★ **Tests All Modern Cathode Ray Tubes:**—Magnetic and Electrostatic, 'Scope Tubes and Industrial Types.

★ **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

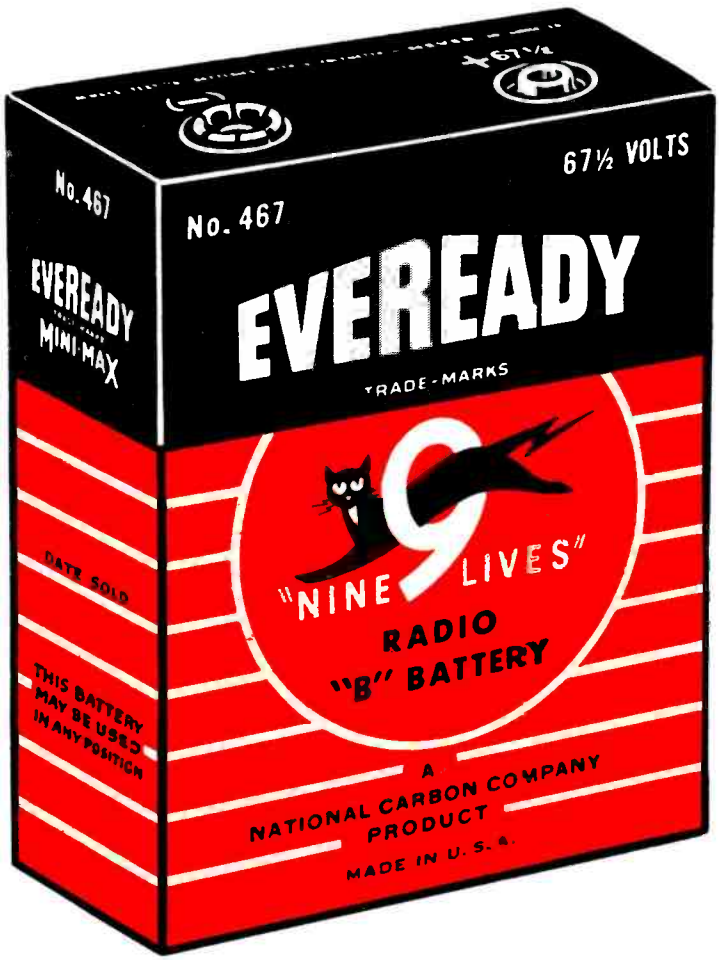
***See the CR-30** on display at leading electronic equipment distributors. Place your orders now to assure earliest possible delivery.*

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



BIG Bonus Offer with your Best Battery Brand!

GOOD NEWS AGAIN!... for "Eveready" Portable Radio Battery Dealers.

Last year's "Bonus-in-Batteries" sales plan was a big success. This year's extra-profit program is even better!

See your "Eveready" radio-battery supplier *today* for full details of the 1953 plan. Don't miss this chance to *add* profit dollars to your fast-turnover, portable-radio battery business.

ORDER NOW . . . Make "Eveready" brand *your* battery brand this year . . . *all* year!

The terms "Eveready", "Mini-Max", "Nine Lives" and the Cat Symbol are trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

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Also . . .

COLORFUL DISPLAY KIT

INCLUDED IN

1953 "EVEREADY"

BATTERY PROMOTION

Jumbo No. 467 battery, nearly 30" high, and many other sales helps. Get this big kit . . .

USE IT NOW!

GRANCO
COAXIAL TUNED

UHF CONVERTER

Completely Automatic

No Electrical Installation

Adjustments Required

Simple to install
Easy to tune

SUPERIOR TO ANY UHF CONVERTER YET PRODUCED

A New Television Era Required A New Engineering Approach . . .

Coaxial resonant cavity tuning has been proven the most satisfactory method of receiving signals in the microwave and UHF spectrum. The Granco Model CTU, based upon coaxial tuned circuitry has proven superior to existing units in side by side laboratory and field tests.

GRANCO Model CTU

Better — Because It's Proven Best

- Continuously variable 465 to 900 Mc.
- No wiping electrical contacts
- Extremely low noise figure
- Excellent Frequency Stability
- Broad Bandwidth Combined with high selectivity
- Three Point Tracking
- High conversion sensitivity
- Cascode i-f amplifier
- Completely shielded construction
- Two stage preselector utilizing Hi-Q coaxial tuned elements

Granco Products, Inc. was formed to provide the answer to the problem of UHF conversion . . . to develop and manufacture a converter which would effectively convert the millions of VHF sets to receive UHF telecasts.
The answer was to be found only through Engineering Specialists. Granco has been fortunate in assembling an organization with years of accumulated experience in the ultra high frequency communications and military electronics field. For some time now the efforts of this skilled group have been devoted solely to the problems of ultra high frequency television reception. As a direct result of these efforts, advanced features, found only in the most costly military radar and communications equipment, have been successfully adapted to economical mass production techniques, and are now incorporated in the Granco UHF Television Converter.

Write for free descriptive catalog sheet

GRANCO COAXIAL TUNED 36-17 20th AVENUE • LONG ISLAND CITY • N. Y.

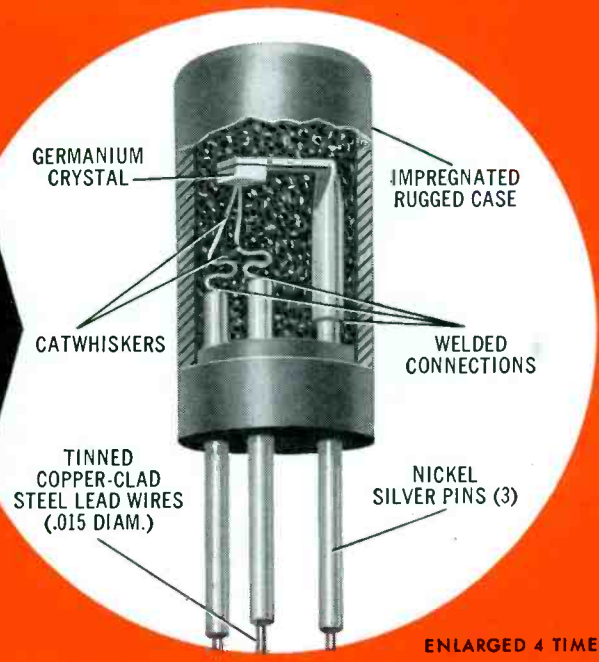
CBS-HYTRON TRANSISTORS

CBS-HYTRON
PT-2A

ACTUAL SIZE

CBS-HYTRON
PT-2S

- Moisture-resistant
- Plug-in or solder-in
- Sturdy triangular basing
- Polarized base connections
- Auto-electronically formed
- Thoroughly stabilized
- Operate up to 55° C



AND YOU CAN BUY THEM NOW!

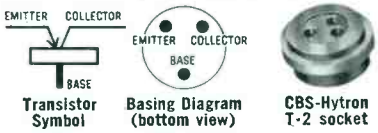
Already a major producer of germanium diodes, CBS-Hytron now offers you prompt delivery of transistors: Point-contact CBS-Hytron PT-2A (for amplifying) and PT-2S (for switching). Both have stable characteristics and are guaranteed moisture-resistant. Note flexible leads welded to base pins. You may solder flexible leads into circuit. Or snip them to use stiff base pins in CBS-Hytron type T-2 socket.

Triangular arrangement of base pins is stronger . . . avoids bent pins. Easy-to-remember basing layout simulates basing symbol (see diagram). Polarization makes socket connections foolproof. You are assured of uniformly optimum characteristics by electronic control of pulse forming. Thorough aging achieves maximum stability. You may operate these transistors up to 55°C. And you can order both CBS-Hytron PT-2A and PT-2S for immediate delivery.

MECHANICAL FEATURES

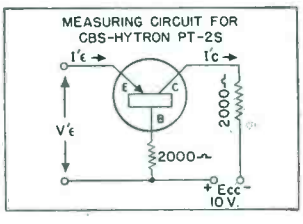
1. Single-ended construction gives maximum mechanical stability.
2. Rugged triangular basing design resists shock and vibration.
3. Dual-purpose connections permit use of flexible leads or stiff plug-in base pins.
4. Direct soldering of germanium wafer to base support guarantees positive contact, avoids flaking.
5. Glass-filled plastic case and high-temperature impregnating wax assure moisture-resistant, trouble-free operation.

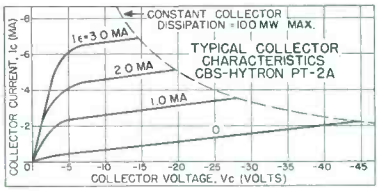
BASING AND SOCKET

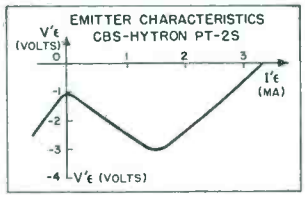


Transistor Symbol | Basing Diagram (bottom view) | CBS-Hytron T-2 socket

Note similarity of pin layout to that of transistor symbol. CBS-Hytron type T-2 transistor socket features groove to guide pins into socket. Also anti-burn-out design to insure that base connection of transistor will always be made first.







CBS HYTRON

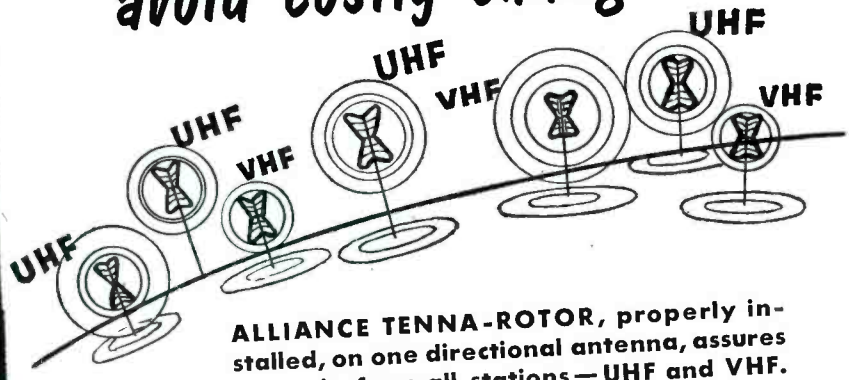
MANUFACTURERS OF RECEIVING TUBES SINCE 1921
HYTRON RADIO AND ELECTRONICS CO.
A Division of Columbia Broadcasting System, Inc.
Main Office: Danvers, Massachusetts

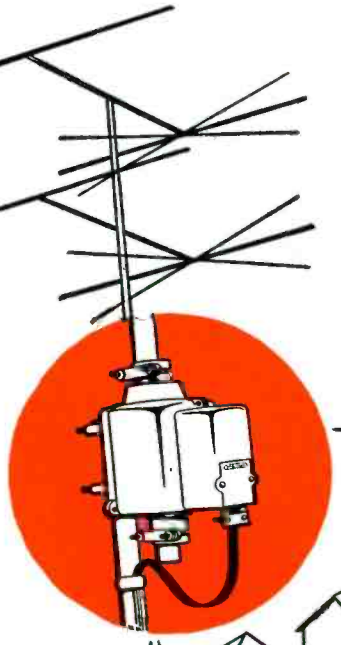
WRITE FOR DATA. Complete free data on CBS-Hytron PT-2A and PT-2S . . . and the T-2 socket . . . are yours for the asking.

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

HERE'S WHY
ALLIANCE TENNA·ROTOR
IS THE ANSWER TO
UHF RECEPTION!

TURN THE ANTENNA TO ANY STATION... *avoid costly changes!*



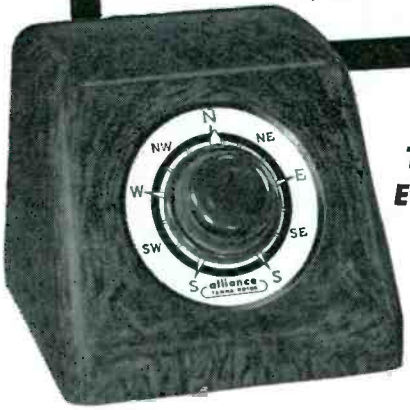


Weather-sealed rotator unit

ALLIANCE TENNA-ROTOR, properly installed, on one directional antenna, assures top gain from all stations—UHF and VHF.

- **UHF is more critical—highly directional!** Tenna-Rotor is accurate—pin-points the antenna—puts it right on the beam!
- **Many channels are changing!*** Tenna-Rotor gives directional *all-channel* reception—stops costly antenna alterations and re-alignments.
- **Make ONE antenna installation the final installation!**
- **Hundreds of thousands of Alliance Tenna-Rotors are in use!**

It pays to insist on Alliance Tenna-Rotor!



Automatic HIR with direction indicator control. Price $44.95

Sold by TV Dealers Everywhere

IMPORTANT NOTICE!

***Changes in television demand changes in present antennas! New UHF and VHF stations mean more channels!** Current FCC rulings have assigned channel changes to nearly one-third of all VHF stations. This makes single-channel antennas and other fixed position antennas obsolete! Prepare now. Meet the coming changes in television with ALLIANCE TENNA-ROTOR.

For nearly 4 years—Eye-compelling Alliance TV spots continue to increase the number of viewers—extend the fringe around every major TV area.

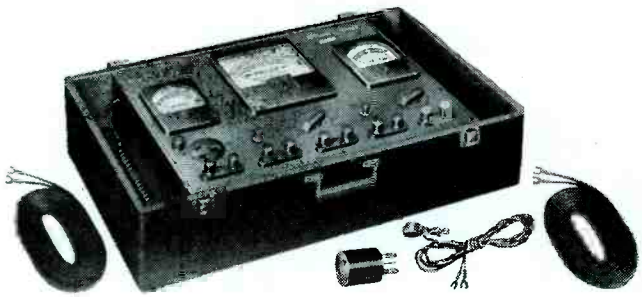
alliance
TENNA·ROTOR
(TV ANTENNA ROTATOR)

PHILCO TESTERS

Now Yours on

NEW SPECIAL PAYMENT PLAN

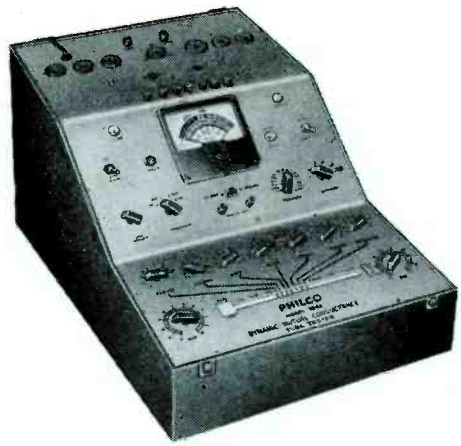
Finest, Most Up-to-Date Testing Instruments Ever Produced!



APPLIANCE TESTER • MODEL 5007

This new Philco Appliance Tester Model 5007 permits complete analysis of over-all performance of refrigerators, air conditioners, ranges and household appliances. It provides accurate temperature measurements in degrees Fahrenheit from —30° to 600° on a large 6″ meter. Ascertains power requirements of appliances up to 6 kilowatts, and includes an AC voltmeter for measuring voltages up to 260 volts. Gives positive check for shorts or open circuits on appliances. Equipped with all necessary "pick-up" elements for temperature determination.

Size: 12″ W. x 8″ H. x 6″ D. Weight: 9 lbs.



MUTUAL CONDUCTANCE DYNAMIC TUBE CHECKER

MODEL 7052. A companion piece to Philco Model 7051 Emission Type Tube Checker. This model 7052 checks all tubes from sub-miniature to low power transmitting tubes. Checks shorts and leakages between elements of tubes. Determines noise characteristics. Ascertains gas content. Gives mutual Conductance readings directly in microhms. Permits forecasting remaining tube life. A portable or counter type tester with a beautiful blue leatherette finish. Operating Voltage: 105-130 Volts AC.

Size: 17″ W. x 15″ L. x 12″ D. Weight: 22 lbs. (Shipping Wt. 34 lbs.)

VISUAL ALIGNMENT GENERATOR • MODEL 7008

FEATURES: AM Generator (and Marker): 3.2-250 mc. • FM Generator: 4-120 mc., and 145-260 mc. • Sweep-frequency width to 15 mc. (Flat to within .2db/mc.) • Audio Generator: 400 cycles • Only one input and output connection • Special oscilloscope circuits • Vertical-deflection Sensitivity: 25 millivolts/inch (with amplifier) • Swiveled cathode-ray-tube housing for compact carrying size • Telescoping light shield • High-frequency probe for signal tracing • Crystal calibrator to provide check points for marker generator.

FILL OUT AND MAIL THIS COUPON . . . OR SEE YOUR PHILCO DISTRIBUTOR TODAY!

PHILCO CORPORATION, Accessory Division
Allegheny & "A" Sts., Philadelphia, Pa.

☐ I am interested in the Philco Test Equipment shown here. Please send me details of your SPECIAL PURCHASE PLAN for obtaining these units.

☐ Please send FREE copy of your new booklet on Philco Test Equipment.

NAME.....

ADDRESS.....

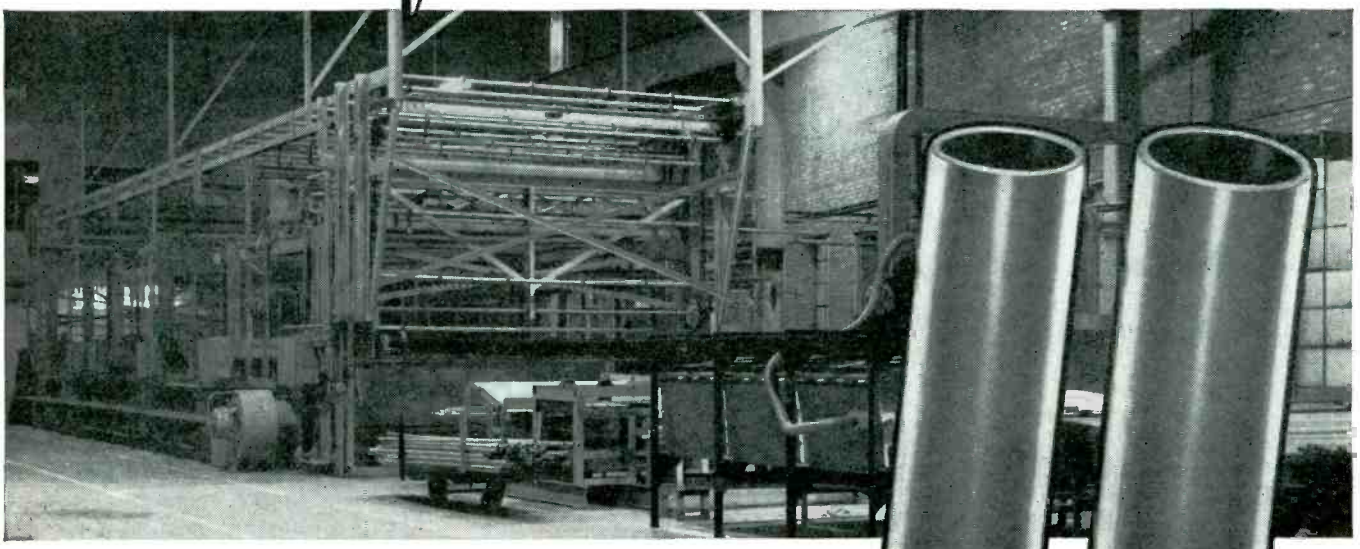
CITY..... STATE.....

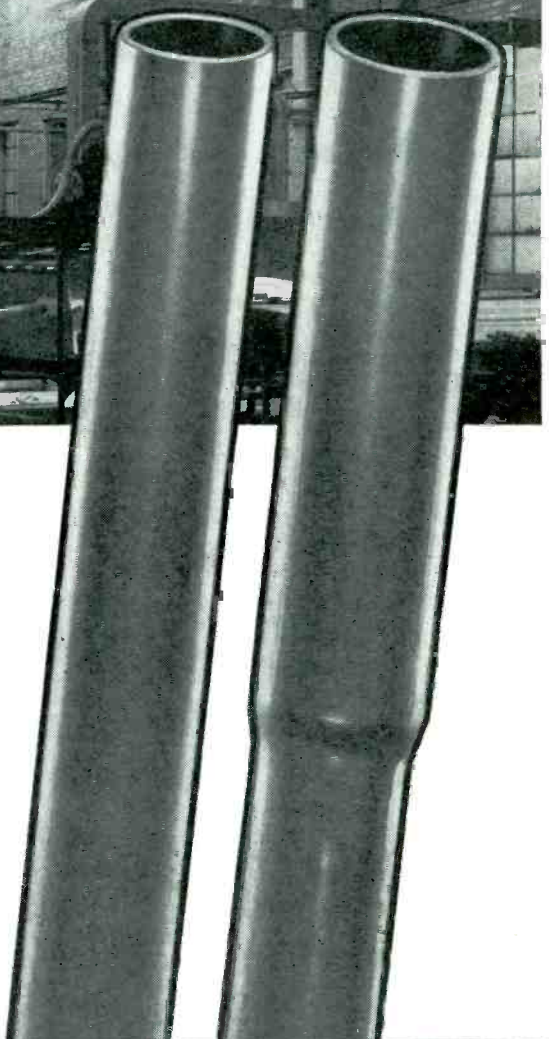
5 ft. and 10 ft. self-coupling

immediate delivery from your Admiral distributor

MASTS

Television





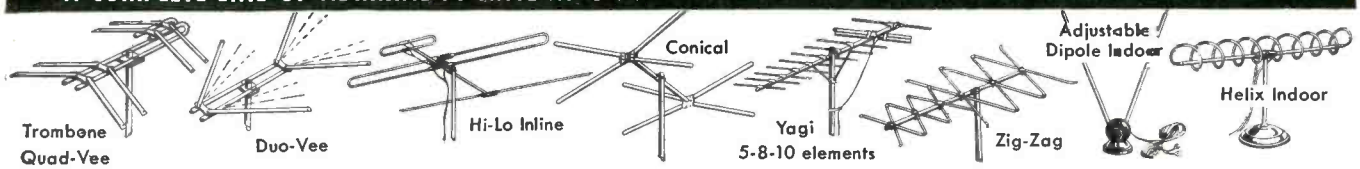
The greatly increased need for outside antennas in new station areas has just about soaked up the supply of masts. Now Admiral is ready to help you meet the demand with these new 5 and 10 foot masts . . . *available at once* from your Admiral Distributor.

Admiral's huge production brings you these masts at the industry's lowest prices. Finest quality, too . . . made of cold-rolled seamless steel tubing, heavily electrogalvanized for utmost rust resistance. Both 5 and 10 foot masts are available with one end flared to take extensions . . . eliminates the need for separate mast couplers. Order from your Admiral Distributor by part number:

	20 gauge	*18 gauge*	*16 gauge*
5 ft. plain end	M 40		
5 ft. flared end	M 40A		
10 ft. plain end	M 41	M 42	M 43
10 ft. flared end	M 41A	M 42A	M 43A

Admiral Corporation, Accessories and Equipment Division, Chicago 47, Ill.

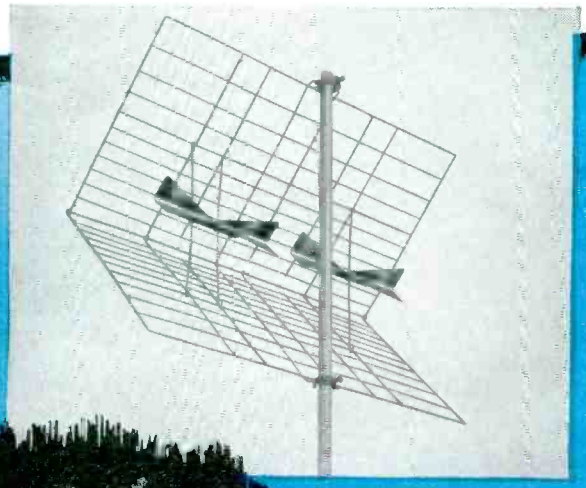
A COMPLETE LINE OF ADMIRAL TV ANTENNAS . . . NOW AVAILABLE FROM YOUR ADMIRAL DISTRIBUTOR



94-5523

New! another Channel Master development!

beats 'em all on UHF!



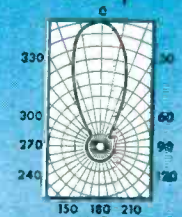
CHANNEL MASTER'S TWIN CORNER REFLECTOR

Model No. 406

Gives the brilliant performance of **2** antennas!

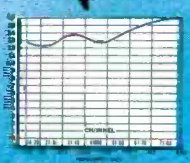
up to **16** db gain

THE MOST SENSITIVE UHF ANTENNA EVER DEVELOPED!



Twice the gain of the BEST standard UHF Corner Reflector

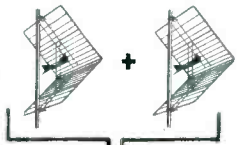
Extremely narrow forward lobe, with no side lobes and negligible rear lobe



Excellent 300 ohm impedance match over the entire UHF range, provided by built-in, pre-cut matching harness

because Channel Master's Twin Corner Reflector really is **2** antennas . . .

stacked side by side into one simple structure



exclusive **DUBL-DIPOLE** design

- 2 antennas, electrically
- 1 antenna, mechanically
- One simple structure . . . one simple installation . . . highest gain, all-channel UHF coverage!

In any area you pick, the Twin Corner Reflector will out-perform any other antenna available today!

Ties together all 3 TV reception bands!

"Free space" terminals. Impossible for dirt or rainwater to accumulate between the terminals, which can short out the picture. Assures you of brilliant, steady reception in ANY KIND OF WEATHER!

SINGLE LEAD • NO SWITCHING

ELIMINATES INTER-ACTION • NO SIGNAL LOSS ON VHF OR UHF

CHANNEL MASTER'S New!

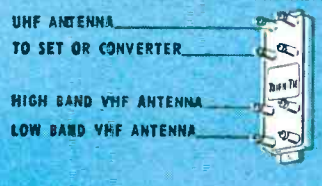
TRIPLE-TIE model no. 9035

electronic inter-action filter

Combines up to 3 antennas with only 1 lead to the set.

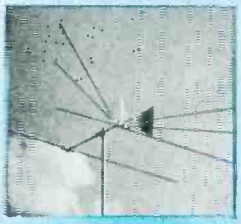
1. Low Band VHF
2. High Band VHF
3. All UHF (Broad Band or Yagi)

Eliminates inter-action between all 3 antennas.

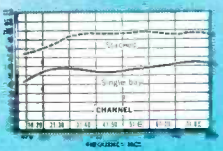


Designed to adapt all HI-LO VHF installations to UHF — quickly and economically

ULTRA FAN series — Complete VHF-UHF coverage



single bay — model no. 413

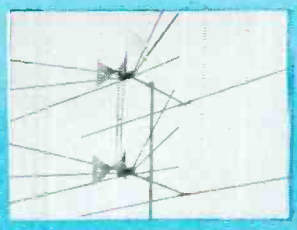


Today's most sensitive All-VU* antennas! The Ultra Fans actually operate on three separate electronic principles — automatically:

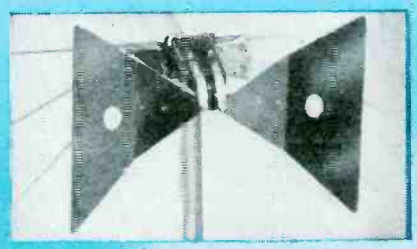
1. Low Band VHF (Channels 2-6) . . . *Conical antenna with parasitic reflector*
2. High Band VHF (Channels 7-13) . . . *Large diameter V antenna*
3. UHF (Channels 14-83) . . . *Triangular dipole with sheet reflector*

One set of All-VU* stacking rods provides highest VHF and UHF gain. Each Ultra Fan has its own 2-stage inter-action filter, so that only one transmission line to the set is required.

*All VHF, all UHF



stacked — model no. 4132



ULTRA DAPTER

model no. 414

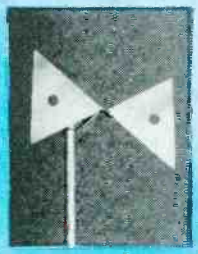
Instantly converts all Channel Master Super Fans into high gain, all-channel, VHF-UHF antennas. Features a *built-in inter-action filter.*

Your best bet for UHF!

CHANNEL MASTER Ultra-Tennas

America's most complete — most effective — UHF antenna line.

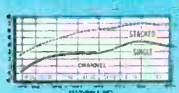
Channel Master's advanced engineering pays off again! While rain caused hundreds of UHF antennas to FAIL recently in Portland, *not one Channel Master antenna dimmed or shorted out a picture!* The facts speak for themselves: Rain or shine, Channel Master antennas outperform all others.



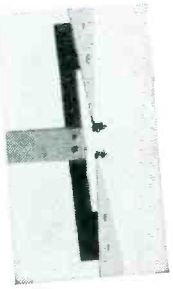
ULTRA BOW

model no. 401

The basic UHF antenna for primary signal areas, and the outstanding member of the bow-type antenna family.



Only Channel Master Antennas are designed to eliminate the "TWIN TERRORS" OF UHF RECEPTION:



- **Vibration, which causes picture flicker.**

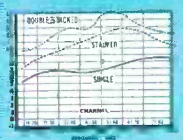
  Eliminated by Channel Master's Ultra-Rigid construction and advanced mechanical design.

- **The accumulation of dirt or moisture around the antenna terminals, which dims and eventually shorts out the TV picture.**

  Eliminated by Channel Master's sensational "free-space" terminals which prevent the accumulation of foreign deposits at the feed points.

ULTRA BOW with SCREEN REFLECTOR

model no. 403

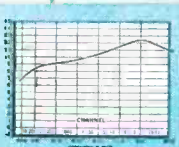


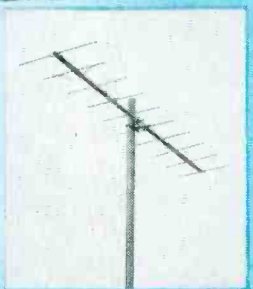
Can be stacked in 1, 2, and 4 bays. High, all-channel UHF gain, excellent front-to-back ratio.

ULTRA VEE

model no. 404

- Good UHF gain
- Low VHF gain
- The most rigid UHF antenna of its type and size.



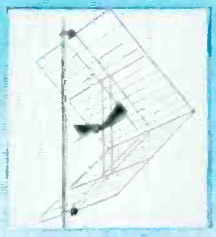


Gain: 11 DB, single
14 DB, stacked

DELTA WELD

Wide Band 10 Element UHF Yagi

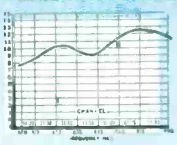
Custom-designed for full coverage of your specific area! Brilliant high gain performance across as many as *23 different channels*



CORNER REFLECTOR

model no. 405

The outstanding all-channel UHF FRINGE antenna.



MEMBER ANTENNA MANUFACTURERS ASSOCIATION

CUSTOM PREASSEMBLED ANTENNAS

Sold through the nation's leading distributors

CHANNEL MASTER CORP.

ELLENVILLE, N. Y.

Write for complete technical literature

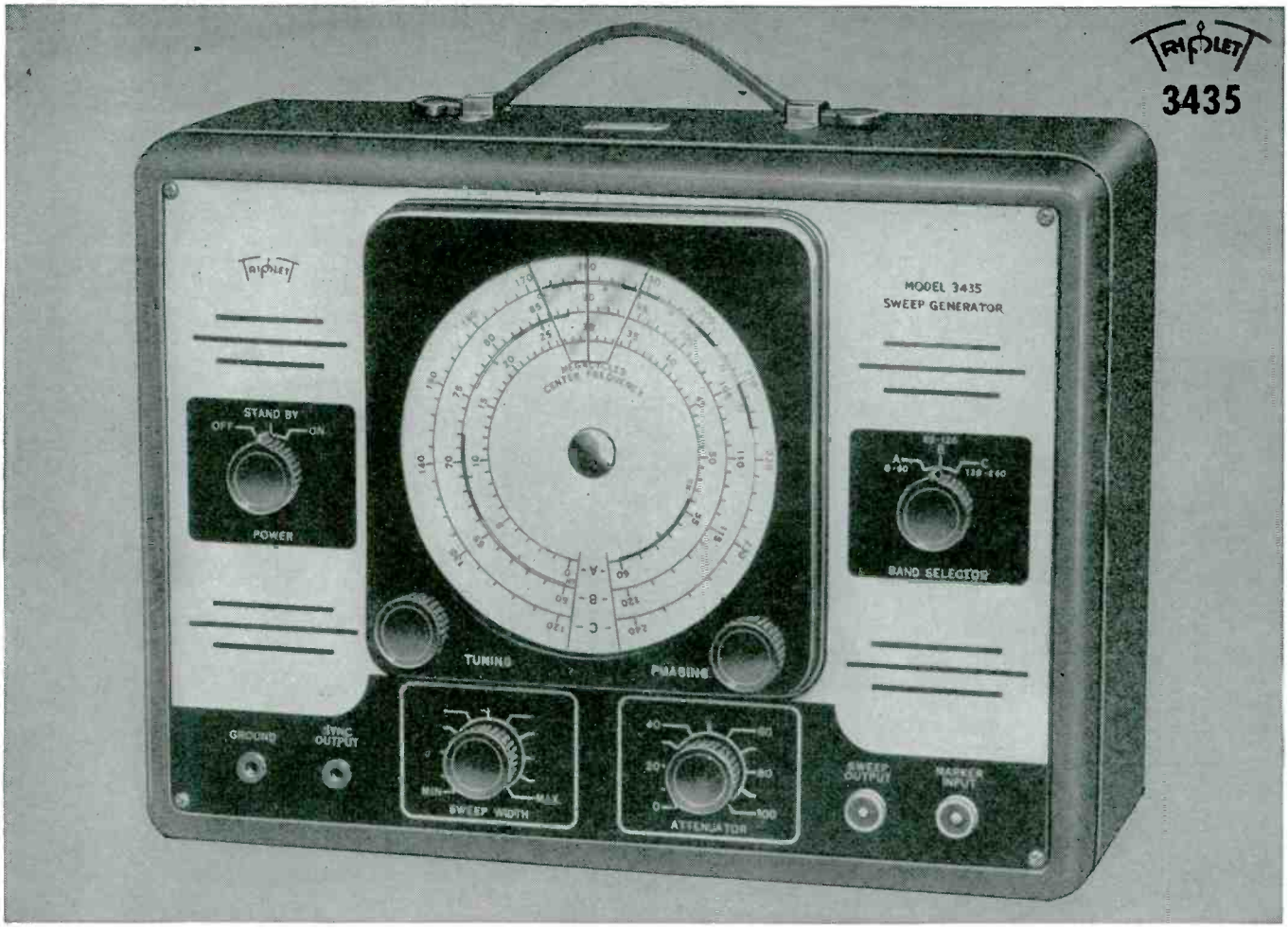
ULTRA-TIE model no. 9034

Electronic Inter-Action Filter

JOINS separate antennas into a single VHF-UHF antenna system, for use with a single transmission line.

SEPARATES VHF and UHF signals at the set or converter where separate inputs are provided.

The only filter with "free-space" terminals.

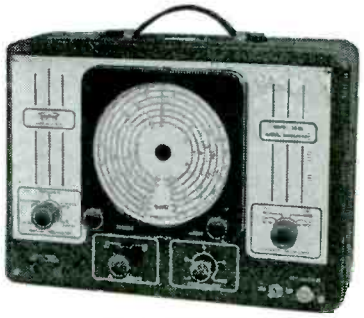


Only $114.50 and you're in Profitable TV Testing

Value-wise you can't make a smarter buy. For if you have a good Signal Generator to use as a marker with 3435, this new Triplett Sweep saves you real money! Performance-wise it's Triplett Engineering at its best. There are no complications in use. Continuous range coverage to 240 MC for all TV carrier and IF frequencies. There are no gaps in frequency, and continuous tuning is provided over all TV and FM bands. Note MAIN frequency dial, marked with channels as well as frequencies; continuously variable sweep width, effective from 500 KC to 12 MC; the PHASE controlled sweep voltage for scope horizontal input; the STAND-BY switch for temporary silencing of generator during other testing. These and many other features make Triplett 3435 an outstanding "buy." See it today at your distributor's.

YOU CAN USE ANY A.M. SIGNAL GENERATOR

. . . but if you are critical you'll appreciate this Wide Range Test Oscillator — Triplett 3432. Five fundamental ranges—165 KC to 40 MC. Two Harmonic ranges 36-120 MC, directly calibrated. Completely Shielded. Seven directly calibrated 330° scales. Illuminated Dial. Try it today.



Triplett 3432

TRIPLETT ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO

TRIPLETT

Triplett

FOR THE MAN WHO TAKES PRIDE IN HIS WORK

These RCA Radio Batteries

Provide balanced service life in new "Personal" sets

This new portable-radio battery combination is radio-engineered for longer service life, less frequent change of batteries.

YES, this is the famous battery combination that provides *balanced* service life . . . greatly increases the playing time of "personal"-type portable radios. These RCA Batteries are opening up a tremendous new radio-battery replacement market that's expanding every day—a *new* profit-maker for you.

LOOK AT THESE FEATURES

FIRST RADIO BATTERY (RCA VS216) **WITH ALKALINE DRY CELLS**

More power per cell from active ingredients more effectively used . . . RCA VS216 "B" Battery is nearly 25 per cent smaller in size than previous types, yet provides almost twice the service life.

FIRST WITH "BALANCED POWER" FOR "PERSONALS"

The new VS216 "B" Battery is used with two of the new "A" batteries, VS236, to give balanced life in a "personal"-type portable that provides virtually the same playing hours as a larger portable set equipped with the RCA VS050 portable "AB" radio pack.

LEAK-RESISTANT "A" AND "B" BATTERIES

Encased-in-steel construction . . . leak-resistant. This construction helps protect portable radios from battery swelling and corrosion.

LOWER COST PER OPERATING HOUR

A 25 per cent saving in battery operating cost over that of old-style "personal"-type portable radios. These new RCA types play new "personal"-type portable radios many times longer without change of batteries.

REMEMBER . . . RCA Radio Batteries are sold principally through Radio Service Dealers. RCA Battery advertising sends customers to you for battery replacements.

GET SET for 1953's big radio-battery replacement business and a big list of satisfied customers. Call your RCA Battery Distributor *today*.

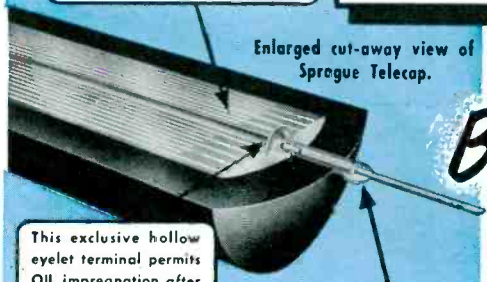
RADIO CORPORATION of AMERICA

RADIO BATTERIES — **HARRISON, N. J.**

SPRAGUE

A **LOOK** INSIDE PROVES ***WHY***

Sprague *dry* molding keeps the high purity paper and foil windings uncontaminated during manufacture.



Enlarged cut-away view of Sprague Telecap.

This exclusive hollow eyelet terminal permits OIL impregnation *after* the capacitor is molded.

Solder-seal construction formerly used only in costly, large metal-encased capacitors.

SERVICEMAN'S DIARY....by Ben Grim

BLACK BEAUTY TELECAPS® ARE TOPS!

★ Molded *dry* into their tough non-flammable Bakelite phenolic cases, Sprague Black Beauty Telecaps are mineral-oil* impregnated through a tiny metal eyelet under high vacuum *after* molding—the same as expensive metal-encased oil-filled jobs! No dust or moisture can contaminate the capacitor sections. This exclusive Sprague *dry assembly process* assures maximum insulation resistance, superior capacitance stability and capacitance retrace†, plus l-o-n-g life under high heat (185°F) and humidity.

★ More than 250 million Black Beauties are on the job today! Used in the most critical TV and radio circuits, they have an unprecedented failure-free service record.

★ Ask for these Black Beauty Capacitors by name and accept no substitute. *There is no other capacitor "just as good."*

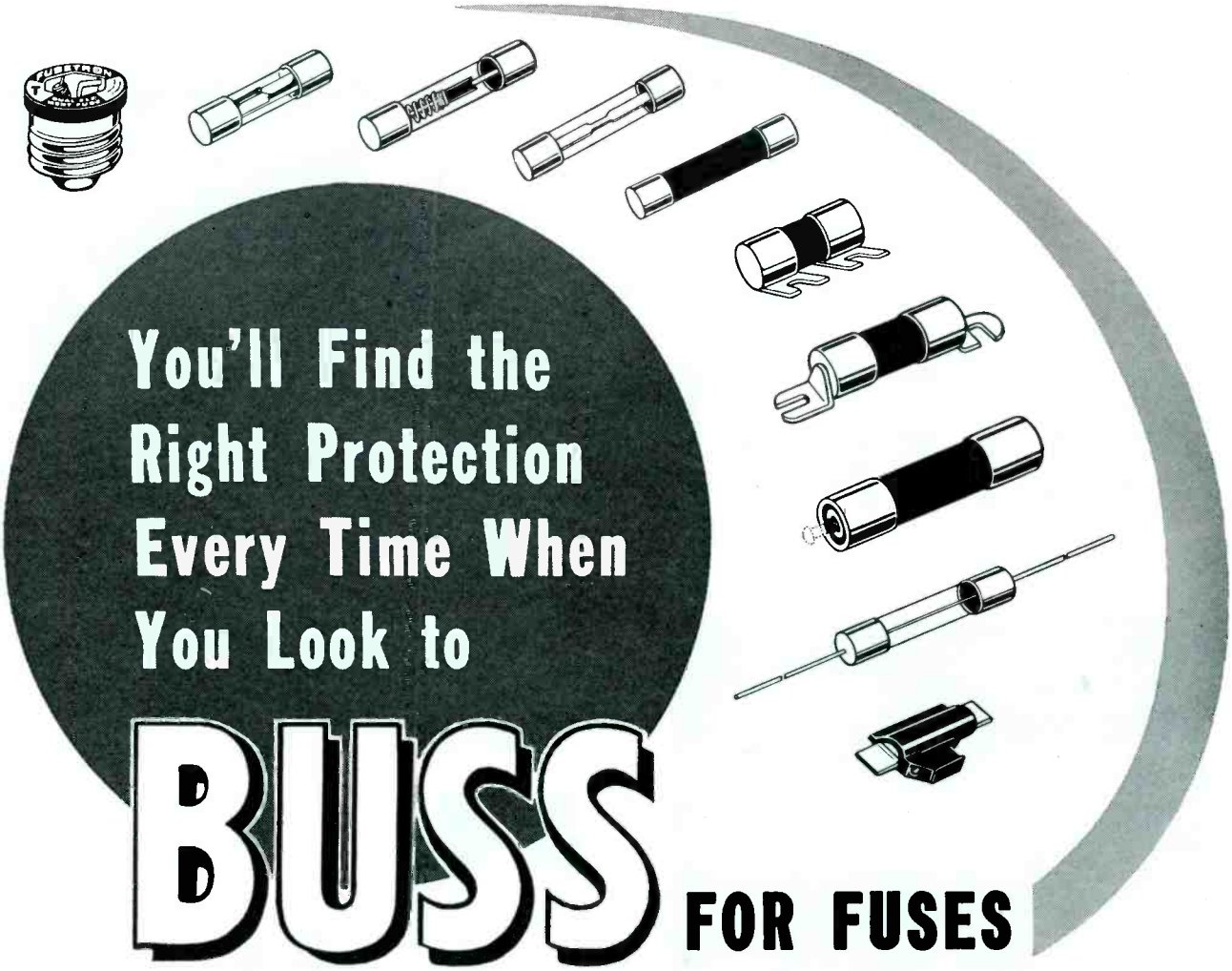
★ Do you have the new Sprague TV Replacement Capacitor Manual? If not, write today to: Sprague Products Company, 61 Marshall Street, North Adams, Massachusetts.

*All units from 600 to 12,500 volts are mineral-oil impregnated.
†Only Sprague Black Beauties consistently return to the same capacitance at the same temperature time after time.

SPRAGUE

WORLD'S LARGEST CAPACITOR MANUFACTURER

SPRAGUE PRODUCTS COMPANY IS THE DISTRIBUTORS' DIVISION OF SPRAGUE ELECTRIC COMPANY



You'll Find the Right Protection Every Time When You Look to BUSS FOR FUSES

A COMPLETE LINE FOR TELEVISION • RADIO • RADAR • INSTRUMENTS • CONTROLS • AVIONICS

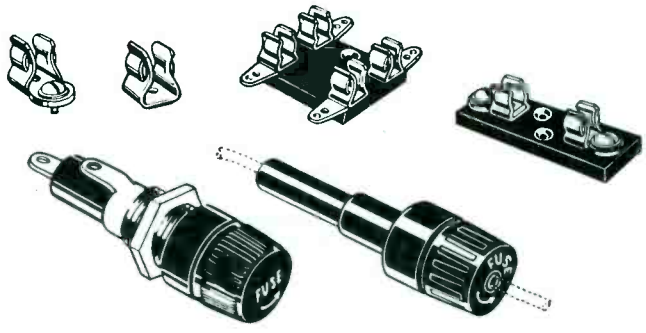
For almost four decades, BUSS has specialized in the production of fuses that are unexcelled for dependability and quality. Today, this experience and forward-looking BUSS research combine to give you the most complete line of fuses for modern needs.

Your added assurance of BUSS dependability is the rigid testing every fuse must undergo. Sensitive electronic testing devices check BUSS fuses for proper construction, correct calibration and accurate physical demensions.

BUSS fuses help you build sales and service. When you install BUSS fuses, you can forget about troublesome "callbacks" caused by unnecessary blowing... and yet you can be certain of positive protection. In addition, your customers have confidence in the BUSS name ...famous in home, farm and industry for 39 years. They'll know you've used the best.

BUSSMANN Mfg. CO., *Division McGraw Electric Company*
University at Jefferson, St. Louis 7, Missouri

***and* A COMPLETE LINE OF FUSE CLIPS, BLOCKS AND HOLDERS**



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

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

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____

S-353

SERVICE...The National Scene

30 NEW TELECASTERS ON AIR SINCE FREEZE LIFT--The post-thaw era, born in the summer of '52 amid hurrahs and huzzahs, has won its first set of gleaming silver spurs, having brought 30 more TV broadcasters to the scene, and a healthy new audience to its fold. Now TVcasting, in addition to those reported earlier are: KTBC-TV, Austin, Tex. (channel 7); WABI-TV, Bangor, Me. (5); WAFB-TV, Baton Rouge, La. (28); KKTV, Colorado Springs, Colo. (11); KROD-TV and KTSM-TV, El Paso, Tex. (4 and 9, respectively); WJTV, Jackson, Miss. (25); KOLN-TV, Lincoln, Neb. (12); WLVA-TV, Lynchburg, Va. (13); WALA-TV and WKAB-TV, Mobile, Ala. (10 and 48); WKNB-TV, New Britain, Conn. (30); WEEK-TV, Peoria, Ill. (43); KXLY-TV, Spokane, Wash. (4), and KOPO-TV, Tucson, Ariz. (13).

NEW ENGLAND STATES WIN UHF CHANNELS--Ultrahigh broadcasting will be introduced in Maine and Massachusetts late this year and in early '54, according to the FCC timetable. In North Adams, Mass., Leon Podolsky, a capacitor design and application specialist and president of WBRK in Pittsfield, has been awarded channel 74, and expects to begin operation in the spring of '54. It is expected that the antenna will be located atop Mt. Greylock, said to be the highest mountain in the state, which should provide a substantial signal to both Pittsfield and North Adams. An application is also on file for a channel in Pittsfield to provide greater coverage through linking of the Pittsfield and North Adams facilities. . . . The Portland Telecasting Corp., has received official approval for channel 53 in Portland, Me., and operation is expected to begin in the early fall of this year.

OVER 125,000 IN FIVE CITIES NOW RECEIVING UHF--According to a leading broadcast network, uhf stations in Portland, Wilkes Barre, South Bend, Atlantic City and Jackson, now have an audience of over 125,000. Portland is first, with over 60,000, and Wilkes Barre next with close to 30,000. Since the report was compiled, uhf stations in Baton Rouge, New Britain, Peoria, Reading, and Youngstown have come on the air, and the audience is believed to have more than doubled.

COLOR-TV PROBLEMS RAPIDLY BEING SOLVED--Exhaustive color-TV system tests have disclosed that many of the stubborn problems which defied solution for quite awhile have now been substantially overcome. It has now become possible, for instance, to transmit color successfully on narrow-band coax. NTSC color specs provide for band sharing of luminance and chrominance components in the normal band, by adding to the luminance information a subcarrier modulated by chrominance information. The subcarrier frequency is an odd multiple of half the line frequency, and thus an odd multiple of half the frame frequency, providing frequency interleaving. . . .Retention of much of the chrominance information has been accomplished through the use of special terminal equipment which at the transmitter divides the composite color signal into two bands of frequencies; the first containing frequency components of the signal extending from 0-2 mc, and the second containing components whose frequencies extend .3 mc on each side of the subcarrier frequency. It is this second band which is moved down in frequency by heterodyning so that it is adjacent to the 0-2 mc band thus limiting the signal to 2.7 mc for transmission over coax cable. Special receiving terminal equipment separates the two bands and moves the upper band back to its original position by heterodyning. In altering the color signal for narrow-band transmission, a linear phase-shift low-pass filter is used to select the luminance components extending out to 2 mc, and an m-derived bandpass filter then selects the components, which extends .3 mc on each side of the subcarrier frequency. Lowering of this band by heterodyning is accomplished in a mixer with a sine-wave voltage whose frequency is 5/3 times the color subcarrier frequency. Following the mixer is a second m-derived bandpass filter, which selects only the difference frequency components which extend .3 mc on each side of 2/3 of the subcarrier frequency. This band is then added to the low-pass band, so that in effect the subcarrier has been lowered, and it becomes possible to transmit over a system limited to about 2.7 mc.

DISTRIBUTOR CHAMPIONS BOLD LIST-PRICE POLICY--At the request of many Service Men, who would like to show new product bulletins to customers without disclosing wholesale prices, one of the largest distributors in the eastern portion of Pennsylvania, has decided to publish monthly supply releases showing list prices only. Here's a pioneer who deserves an award, cheers, and a blessing.

SERVICE...The National Scene

HIGH WINDS WRECK ELKHART FRINGE INSTALLATIONS--Recent windstorms in Elkhart, Ind., played havoc with about 70% of the fringe-antenna installations, causing nearly $40,000 worth of damage. The swirling winds toppled many of the towers and bent and tangled antennas, leadins, guys and supports. Since Elkhart is often beset by such windstorms, the problem has miffed not only the TV set owners, but the insurance companies who will have to eventually pay for damage claims. A series of installation rules and regulations, designed to eliminate these costly mishaps, is now under consideration.

HAINES AND KRUPA WIN ASSOCIATION PREXY POSTS--Milan Krupa, of the Radio Servicemens Association of Luzerne County (Pennsylvania), is now president of FRSAP, succeeding Dave Krantz, who as reported earlier in SERVICE, declined to continue as headman of the association. Krantz, however, will head a state-charter advisory group. Others elected for 1-year terms are: Bertram Benzinger, RSMA (Pittsburgh), vice president; Fred Schmidt, MRSMA (Harrisburg), treasurer; and Leon Helk, RSMA (Lackawanna County), secretary. . . . Roger Haines has succeeded Max Liebowitz as president of NETSDA. David van Nest is now vice president; John Wheaton, corresponding secretary; O. Capitelli, recording secretary; D. L. Clarkson, treasurer, and Milan Krupa, sergeant-at-arms.

FTC SCORES TVI WAVETRAP ADVERTISING--A blazing charge of misrepresentation was hurled recently at manufacturers of TV wavetraps by the Federal Trade Commission. The government's complaint charged that the claims citing that the traps would immediately and permanently eliminate all forms of TV interference and insure picture-clear reception at all times, were false, misleading and deceptive. It is reported that these trap makers have already discontinued production and advertising of these items.

NARDA SERVICE PR PROGRAM SETUP IN CHICAGO--A public relations and advertising plan, developed by the National Appliance Radio-TV Dealers Association and featured as a part of a Certified TV and Installation program, has been introduced in Chicago. According to present plans, those who subscribe to the new approach will follow an 8-point code which will define advertising, charges, insurance, safety, materials, equipment, home repairs and Service Men qualifications. All CTIS members, for instance, will be obliged to issue a standard statement and an itemized bill for charges for every job, and render service in exactly the manner and at the price represented in advertising, such advertising to be free from false and misleading statements. They will also be required to use materials of established and recognized quality and provide adequate tests. The plan, it is said, may serve as a nucleus of a national drive, inviting service groups to join NARDA's fold.

¼-MILLION TV SETS NOW IN CANADA--There are 250,000 TV sets now in service in Canada, according to the chairman of the board of CBC. It was his belief that within three years over a million sets would be in operation. . . . During the fall of '53, three stations will be in operation; the outlets in Montreal and Toronto will be supplemented by another transmitter in Ottawa, carrying programs from Canada and the U.S.

BOUQUETS FOR SERVICE--In a letter to ye editor, W. A. Richards, Renfrew, Pa., noted that . . . . "SERVICE is the best technical magazine I get." And, according to Robert Russell, Louisville, Ky., . . . "SERVICE is the most useful magazine I know of. . . . Compliments to your staff." . . . Harry Lorenson, Newman, Calif., has written in to say that he enjoyed reading the phono-needle and cartridge editorial, exclaiming . . . "You told the truth." . . . In another note to ye editorial desk, B. P. Barthelmy, Derby, N.Y., said. . . . "I was very happy to see the frank editorial describing conditions in Atlantic City . . . Congratulations . . . This article will be displayed in a very conspicuous place in my store.". . . We're proud and gratified to learn that SERVICE has earned such praise. Thanks, gentlemen.--L. W.

At the I.R.E.* be sure to see...

PYRAMID

In capacitors, your best bet, your best buy, is Pyramid!

*Institute of Radio Engineers Annual Convention, Grand Central Palace, New York City, March 23rd through March 26th, 1953.

*Provocative Hi-Fi**

AUDIO has always been a particularly challenging science, charged with many baffling problems. With the mounting interest in *full-dimensional* reproduction, the desire to find solutions to these thorny questions has become more and more intense. As a result, some have discovered unusual facts, and found it necessary to redefine a number of the basic tenets evolved in the early days of the art. And, as in any dynamic art, there are many who feel that even these new interpretations will be changed, and very soon.

In any event, at present some of the new concepts revolve about permissible distortion, actual range requirements, and triode-pentode application possibilities.

In one recent report[1] on permissible distortion levels, and methods available to measure the effect of harmonic and intermodulation distortion, it was noted that when a comparison is made between different sound systems, it is not only important to measure frequency characteristics, but all the harmonics up to and including the 13th. And, in measuring intermodulation distortion, one must remember that the results can only be compared with harmonic distortion measurements on a basis of weighting of the harmonics. In other words, an amplifier which develops, let us say, a 5 per cent second harmonic would produce identical intermodulation distortion as a .77 per cent 13th harmonic.

It has always been assumed that the wider the frequency range the more objectionable distortion can become. Now, intriguing facts concerning this concept have appeared. Studies have shown, for example, that only perceptible distortion at an upper limit of 15,000 cps is represented by .75 per cent total harmonic distortion, and for a top limit of 7500 cps, .95 per cent distortion becomes just perceptible. And, for tolerable distortion, it is said, 1.8 per cent can be considered as a representative figure for a system with a 15,000-cps ceiling, and 4.4 per cent for a 7500-cps range limit. Actually, it was noted, for distortion to be barely perceptible there is little variation in the amount for systems with widely different ceiling frequencies; for a limit of but 3750 cps, perceptible distortion is only 1.2 per cent, or not even twice as much as for a 15,000-cps system.

The triode-pentode debate, on for many years, still continues, although the trend to triodes appears to be stronger than ever before. In the opinion of some specialists, in a class *A* triode harmonics higher than the fourth can be neglected; yet with pentodes, the 13th harmonic has been found to produce observable effects. And, negative feedback does not appear to change the relative amounts of the harmonics produced by any amplifier, affecting them all to the same extent; thus a substantial amount of negative feedback must be used in a pentode system to equal the results of a triode amplifier without any feedback at all. And, it is said, if the same amount of feedback were to be applied to a pentode and triode, the latter would offer superior results. In push-pull triode or pentode systems, if class-*A* conditions obtain, push-pull triodes also retain a superiority over the pentodes.

While these views will satisfy many, countless others will challenge them, and continue the search and drive for even more complete, comprehensive and more acceptable basic concepts which might improve further all of the elements used in the hi-fi system.

[1]F. Langford-Smith, *Radiotron Designers Handbook*.

*With apologies to W. D. Foster, Radio and Electronics, New Zealand.

Winning Friends and Customers

FOR MANY YEARS, associations have used broadcast facilities to tell the true story of the Service Man. The results have always been very gratifying, with consumers showing a deep respect for the views offered.

To combat the recent downpour of adverse criticism appearing in some magazines and newspapers, one group in Philadelphia[2] went on the air with a unique question and answer program, and provided one of the most informative air features ever heard. Representatives of the group offered a series of bold, yet sincere and direct replies, to a variety of questions puzzling the consumer today.

Of particular concern to every set owner are the ability and qualifications of the man making the repair. In a review of these qualifications, on this program, it was noted that the average Service Man is a hard-working, straight-shooting individual, who is far more likely to spend more time on a job than he knows he will be paid for, simply as a matter of personal pride in doing things right.

In response to a question on the need for a charge when a Service Man comes to the house, an association rep declared that a charge is necessary because the rendering of honest and efficient diagnosis in the home or shop, requires the services of only highly trained and skilled men. And with the present shortage of skilled Service Men and the increasing cost of expenses for equipment needed to perform tests to establish the cost of repairs, it is necessary to make a fair charge for such efforts. No reliable service company can offer this service, without fair compensation, it was emphasized.

The important subject of repair charges was also discussed, charges being described as based on an hourly rate of time and material; quoting a rate survey, the breakdown was noted as 40% for labor; 26% for materials; 28% for operational expense, *and only 6% for profit.*

In a commentary on the dangers involved in consumer removal of tubes for test, it was said that set manufacturers do not recommend that unskilled persons tamper or remove parts or tubes from the receiver. It was pointed out that not all defective tubes can be accurately tested for failure to operate in certain circuits, and can only be checked by substitution of a new tube; in many cases, because of critical circuit design, it may be necessary to reset adjustment in the receiver, with the danger of shock and personal injuries. Nine out of ten times, it was said, Service Men have reported that many jobs which would probably have involved minimum service charges, plus perhaps a minor tube, have been so disturbed in alignment, tube harmony and focus, because of consumer tube shifts, that repair bills have totaled two or three times greater than necessary.

This group truly deserves a thumping vote of thanks for this progressive public-relations effort.—L.W.

[2]TV Service Dealers Association; see *page 66* this issue.

Steelton VHF/UHF Community TV

by MARK L. HOUTZ
Better TV Company

IN HILLY COUNTRY, TV reception is quite a problem, particularly for those who are somewhat remote from stations and live between rising shafts of stone, and are thus completely below a receiving horizon. Only through the installation of special masts on hill-top points is it possible to provide usable signals here. Because of the expense of such structures and the difficulty of installation, comparatively few have ventured to set up such receiving points.

With the advent of high-gain master-antenna systems, a solution appeared in the form of *community TV*, involving the use of a single properly-located tower, a series of amplifiers and branch outlets, and coax cables to feed reliable signals to many homes.

When TV came to the rural walled zones of Pennsylvania, it became apparent that only through the use of a community TV system, would anyone be able to enjoy any form of reception. Service Men in several peaky areas began to explore the *cas* idea, found it to be as practical as described and installations began. All worked out well, and when reception possibilities appeared in our town, Steelton, it was decided to adopt a similar plan. Although ours is a small steel town, with a population of 13,000 and but 2,400 homes, it was felt that sufficient interest would obtain if reception could be insured.

Planning of the system began late in '51. I was very fortunate in having an ideal site for the antenna, a family-owned plot of ground on Cottage Hill, 400′ above the main street, one of the highest points in Steelton. Preliminary tests proved this location to be excellent and provide good signal levels to many points in the town.

Before installing the system, many problems concerning zoning, right-of-way access, and utility permits for pole use, had to be resolved. It was necessary, for instance, to secure first a building permit from the Steelton Borough Council, since the tower was to be located in a residential area. Then permission had to be granted for a right-of-way across the streets and alleys. It was also necessary to negotiate with the telephone company and the power and light folks, too, for the use of their poles to mount amplifiers, distribution boxes and coax feeds.

Agreements had to be signed indicating full compliance with many rules and regulations. To illustrate, it was necessary to declare that we would erect and maintain antenna cables, wires and associated appliances throughout the area to be served and in doing so would not interfere with the telephone company's own service requirements, nor affect the economy and safety of the telephone system.

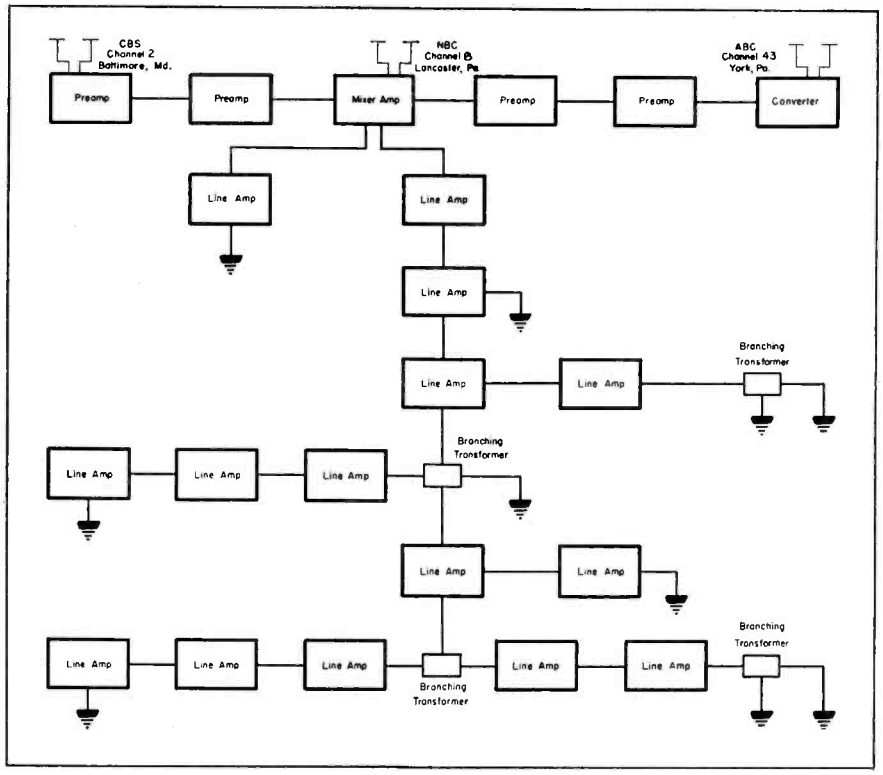
Before making attachment to any pole or poles a permit had to be secured.

In the agreement it was also noted that our cables, wires and appliances, in each and every location, would be erected and maintained in accordance with the requirements and specifications of the national electrical safety code (fifth edition) and Bell System practices, and in compliance with any rules or orders now in effect or that hereafter would be issued by the Pennsylvania Public Utility Commission or other authority having jurisdiction. A series of exhibits described required construction under some typical conditions, where span lengths were not over 175′ and voltage between conductors of power facilities did not exceed 8,700 volts. These exhibits are illustrated below and at right.

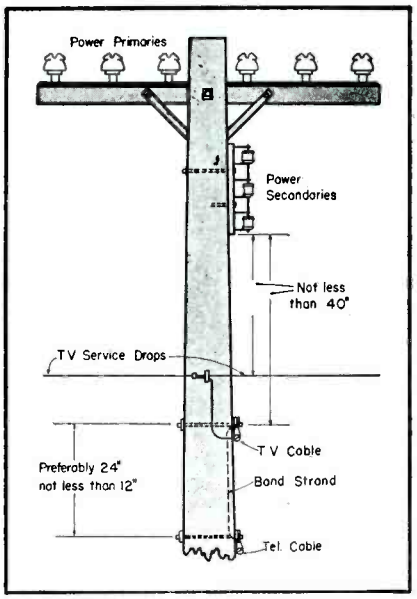
The agreement also stipulated that the telephone company was to receive $1.50 per pole per year on a rental basis to be paid semi-annually.

We were also obliged to declare that one would exercise special precautions to avoid damage to telephone facilities and other gear supported on said poles; and assume all responsibility

Block diagram of community TV system for picking up channels *2, 8* and *43*.



View of pole showing installation of TV distribution system, with no amplifier or meter. The bond strands appear at the first and last pole and every tenth pole.



(All sketches of poles based on exhibits prepared by the Bell Telephone Co. of Pa.)

A Report on the First Veryhigh/Ultrahigh Community-TV Installation, With Complete Data on Zoning, Right-of-Way Access and Telephone/Power Company Requirements, and Features of Antennas and Allied Equipment Used on Tower, Poles and in Subscribers' Homes

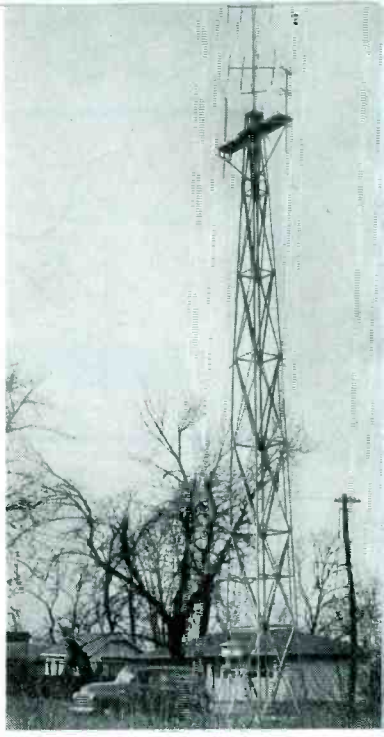
for any and all loss for such damage.

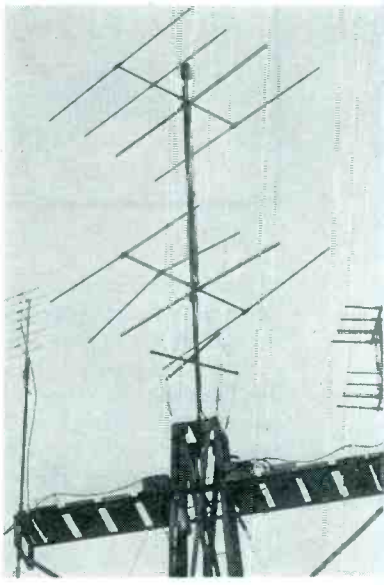
To protect the telephone company from and against any and all claims, demands, actions, judgments, costs, expenses and liabilities of every name and nature which may arise or result, directly or indirectly, from or by reason of loss, injury or damage by gear on the poles, an assortment of substantial insurance policies had to be taken out. Against liability due to damage to property, the policy called for not less than $50,000 for any one accident and, subject to this limit per accident, an aggregate of $200,000 during the policy year, and against liability due to injury to or death of persons, $100,000 to any one person and $300,000 for any one accident. Such insurance as will protect the telephone company from all claims under any Workmen's Compensation Laws in effect also had to be bought.

We also had to furnish a bond to guarantee the payment of all sums which may at any time become due.

With the rule and permit technicalities out of the way the installation could now proceed. And tower plans were first on this agenda. To assist in this project steel company‡ engineers were called in and asked to design a tower that would withstand wind pressure and ice loading. Space had to be provided for three low-band yagi antennas. After the plans were drawn up, the actual erection of the tower began; all fabrication of steel work was done at the tower. Since the height of the tower was 91′, and the site was near the Harrisburg Airport, the tower had to be lighted with warning beams. Thus power (*ac*) had to be provided for this purpose, and for preamps, mixers and converters located on the top of the tower. It was also necessary to provide flood lights for night maintenance. All amplifier equipment was placed on the tower to reduce signal loss. ‡Bethlehem Steel Co.

[*To Be Continued*]

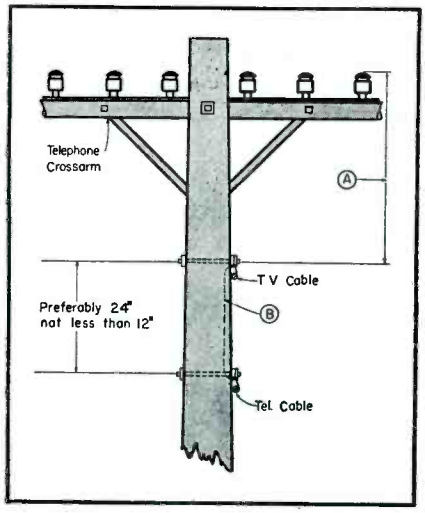




(Right, top)
Overall view of Steelton community TV site and tower. Service truck appears at base.

(Right, center)
Closeup of antennas on tower, left to right; *uhf* (channel 43) antenna, and antennas for channels *2* and *8*. On the platform are, left to right, converter (*43* to *6*), mixer-amplifier preamps and preamps.

(Right, bottom)
Author checking line amplifier. Also shown here are switch box, wooden molding covering and *ac* power cable.



Telephone pole carrying open wire, or cable or both, plus TV cable, but no TV amplifier. No minimum separation is required at point *A*. However, if separation is less than 40″, and the line carries more than one telephone crossarm, climbing space must be provided to reach telephone wires. *R* = bond strand.

Community TV installation and service contract used in Steelton installation.

BETTER T. V.
MARK ROUTZ
249 SWATARA STREET
STEELTON, PENNSYLVANIA
Telephone 9-2725

RESIDENTIAL INSTALLATION AND SERVICE CONTRACT

Name of Applicant _____

Address (mailing) _____

Place of installation _____
Street City and State

AGREEMENT OF INSTALLATION:

1. Better T. V., will furnish and install equipment to provide a television signal on a standard commercial television receiver at the place of installation above specified. Said equipment shall at all times remain the property of Better T. V.
2. Better T. V., agrees to furnish said installation and signal at the earliest possible date after the signing of this agreement and the payment of the sums herein required.
3. Applicant agrees to pay Better T. V., an installation fee of One Hundred Twenty ($120.00) Dollars as follows:
   $_____ upon the signing of this agreement, receipt whereof is hereby acknowledged, and the remainder upon completion of the installation.
4. Better T. V., will connect additional outlets to the initial installation upon the payment of an additional installation fee of $25.00 for each additional outlet.
5. Better T. V., hereby guarantees the best possible television signals available under the circumstances of installation during regular broadcast periods over the channels beamed to its antennae, but in no way assumes responsibility for the failure of a signal due to acts of God, such as hurricanes, floods, ice, wind, lightning, etc., power failures and other causes beyond its control.

SERVICE AND REPAIRS:

1. Better T. V., agrees to maintain service and at all times keep in repair its tower, cable, antennae, amplifiers, and all other equipment necessary for the production of the above-described television signals.
2. Better T. V., assumes no responsibility whatsoever for the operation, maintenance, service or repairs of the Applicant's television receiver.
3. Applicant will in no way disturb, alter, interfere with or move the signal wire of Better T. V., nor will he attach or attempt to attach or permit the attachment of any additional television sets to said wire. Any breach of this clause shall give Better T. V., the right to forthwith remove its equipment from the premises and cancel this agreement. Any fees and charges paid to date will be forfeited.
4. Cost of relocation of Applicant's television receiver or receivers shall be based upon time plus materials.
5. Better T. V., shall at all reasonable times have the right to go upon Applicant's premises for the purpose of inspection and repair of its cables and connections.
6. No additional Television sets shall be attached or connected with Better T. V., system upon Applicant's premises without the consent of Better T. V., and in such case only under the supervision of said Company.
7. Applicant will not assign or sublet the television signal with out the written consent of Company.
8. This contract may be terminated by either party hereto upon the giving of thirty (30) days written notice thereof.

SERVICE AND MAINTENANCE CHARGES:

1. In addition to all other fees and charges Applicant agrees to pay as a service and maintenance charge the sum of Three and 50/100 ($3.50) Dollars per month, payable monthly in advance at 249 Swatara Street, Steelton, Pa. All charges are due and payable not later than the tenth day of month in which due. Better T. V., reserves the right to disconnect all installations and to terminate this contract upon failure to pay all charges on the due date thereof.
2. In addition to the installation charge specified in Clause I, Applicant agrees to pay the sum of $_____ per month for each additional connection made upon the premises of Applicant.

OTHER CONDITIONS:

1. Applicant hereby agrees that it will not permit any person to perform any work or service upon the lines, cables, connections and installations of Better T. V., except by a proper accredited representative of said Company.
2. It is specifically agreed that the facilities contracted for herein apply to a single family residence and that all original or additional outlets shall be used only at the residence described herein.

Signed _____
Applicant

Accepted: BETTER T. V.

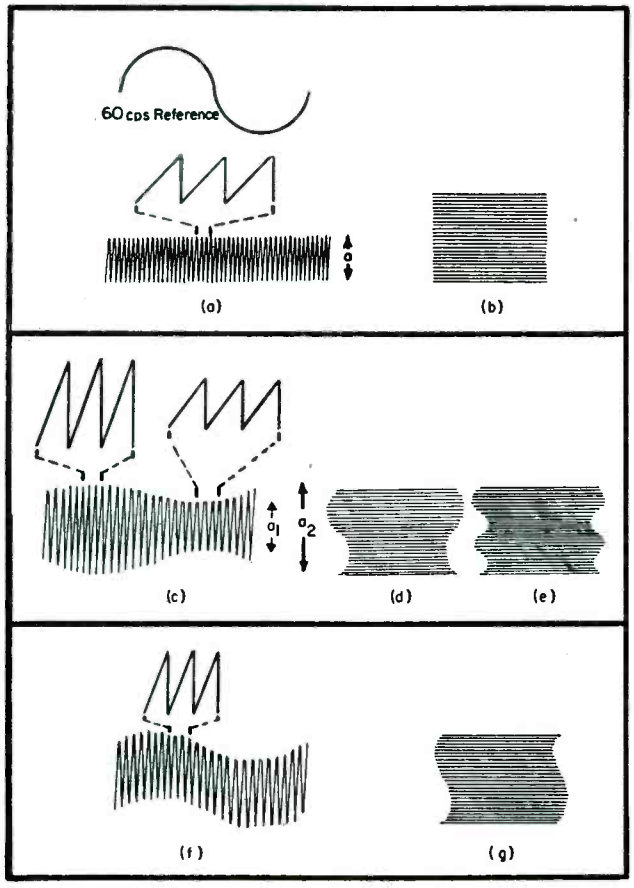
By _____
Authorized Signature

Dated: _____

SUMMARY:

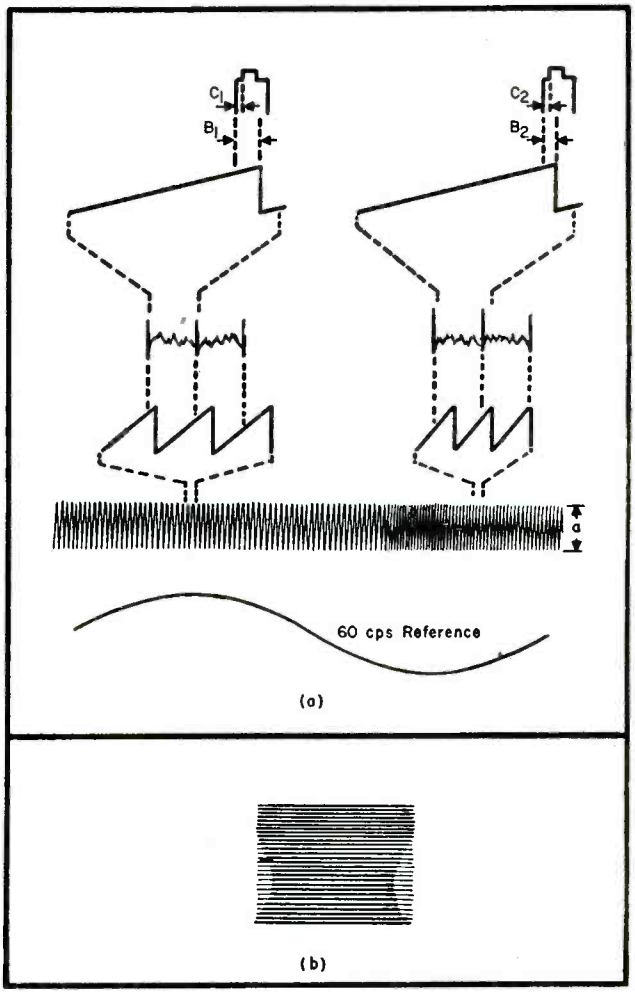
Amount received as down payment _____

Unpaid balance (due when installation is completed) _____



(Left)
Fig. 1. Waveforms illustrating how hum modulation results in bending of the raster edges: *A* represents horizontal sawtooth deflection current waveform of constant amplitude which would produce a straight-edged raster represented by *B*. Portion of wave is enlarged in upper part of *A*. *C* shows a horizontal deflection-current waveform modulated by a 60-cps signal. Raster resulting from 60-cps modulated deflection current appears in *D*. If deflection current were modulated with a 120-cps ripple one complete cycle would cover only half the height of raster as shown in *E*. *F* represents horizontal deflection current which has superimposed on it a 60-cps current. Resulting raster is shown in *G*.

HORIZONTAL



(Right)
Fig. 2. How horizontal bending occurs: *A* shows horizontal-deflection current waveform phase modulated with a 60-cps frequency. Expanded view of the waveform with relation to sync-pulse position appears at two different positions of the modulation frequency; also indicated is detailed relationship of single cycle at these two positions. Effect of this variation on raster is shown at *B*.

IN TROUBLESHOOTING, it is important to know how a particular malperformance is caused to save time in arriving at an accurate diagnosis. Horizontal pulling, bending or stretching can result from operational defects in several different portions of the receiver, but an understanding of the subtle differences in the manifestation of the trouble can be helpful in determining its origin. This type of pulling can be broadly divided into three categories: picture pulling, horizontal-afc pulling and raster bending.

Raster Bending

Raster bending is different from picture pulling or horizontal-*afc* pulling since bending or curvature of the vertical edges of the raster appears even with no signal being received. This bending is caused by hum modulation in the horizontal deflection circuits. How this modulation results in bending of the raster edges is illustrated in Fig. 1; *A* of this drawing represents a horizontal yoke sawtooth deflection current waveform of constant amplitude which would produce a straight edged raster represented by *B*. A portion of the wave is enlarged in the upper part of *A* to show the detailed waveshape of the signal. The horizontal lines represent the horizontal raster-scanning lines; the width of the raster being dependent on the amplitude, *a*, of the deflection current.

A horizontal deflection-current waveform which is modulated by a 60-cps signal, such as could result from heater-cathode leakage in the horizontal oscillator or output tube or from excessive ripple in a half-wave rectifier power supply, is shown in *C*. Detailed waveshape is again shown in the upper part of the figure. Ripple from a full-wave rectifier power supply would of course be at a 120-cps frequency. The raster resulting from the 60-cps modulated deflection current appears in *D*. It will be noted that the width of the raster lines varies in accordance with the variations in amplitude of the deflection wave from the maximum a_1 to the minimum a_2, resulting in a curved-edge raster with the edges corresponding to the envelope of the modulated wave. If the deflection current were being modulated with a 120-cps ripple one complete cycle would cover only half the height of the raster as shown in *E*.

Although not commonly encountered, *F* represents a horizontal deflection current which has had superimposed on it a 60-cps current. This situation would result if a 60-cps voltage were impressed across the horizontal yoke; the resulting raster is

Critical Review of Differences in Three Types of Pulling, Bending or Stretching (Picture Pulling, Horizontal-AFC Pulling and Raster Bending) That Can Be Used to Determine Origin of Trouble and Establish Necessary Cures

PULLING In TV Receivers

by J. C. GEIST

shown in *G*. Power-supply ripple in a receiver which has *B* current flowing in the horizontal yoke could cause this trouble. This type of bending is distinguishable from that caused by modulation in that the amplitude, *a*, of the deflection current does not vary, but the mid-point of each successive sawtooth wave varies in accordance with the superimposed 60-cps voltage. Hence all the raster scanning lines are the same width, but each succeeding one is displaced horizontally, thus causing the edges to be bent as shown in *G*.

AFC Pulling

This type of horizontal distortion manifests itself in bent vertical lines in the picture with the raster edges remaining straight.

An analysis of the sequence causing this bending is illustrated in Fig. 2. At *A* is represented a horizontal deflection current waveform which is phase modulated (essentially the same as a small amount of frequency modulation) with a 60-cps frequency. An expanded view of the deflection-current waveform, with relation to sync-pulse position, is shown at two different positions of the modulation frequency, as well as the detailed relationship of a single cycle at these two positions. It will be noted that although the amplitude, *a*, is constant, the distance between the leading edge of the blanking pulse and the top of the sawtooth varies. This variation is shown at b_1 and b_2. The effect of this variation on the raster is shown in *B*. The heavy portion of the lines represents the picture, and the light lines extending beyond to the straight raster edge represent the portion of the raster covered by the received blanking pulses. The varying length of the lines, extending beyond the unblanked portion of the raster and hence the horizontal pulling of picture elements, is the result of the variation in the position of the blanking pulse in relation to the sawtooth deflection wave, which is in turn the result of the variation in time required for each scanning line to traverse the width of the raster due to the phase modulation of the deflection wave. The difference in raster bending and *afc pulling* is, then, due to the different manifestation of amplitude and phase modulation of the horizontal deflection current.

Picture Pulling

Picture pulling is distinguished from the two types of difficulties discussed, in that it originates in the *rf, if,* video or sync-amplifying circuits. Difficulties originating in these circuits which change the proper shape and relationship of the horizontal sync pulses can upset the operation, so as to allow horizontal sync to be maintained, but cause horizontal bending or picture stretching. Fig. 3 shows one way in which the horizontal sync pulse can be distorted; *A* represents a portion of a horizontal line of the composite video signal showing the proper blanking level and sync-pulse level. In *B* we see the change in signal which can result if limiting takes place in a video amplifier; for instance, by the application of a saturating (too large) signal to the input. The sync pulses can get no higher and the lower-level portions of the signal are raised so that portions of the picture signal are up to the sync level. If as sometimes happens under these conditions, horizontal sync is maintained, it will be unstable; the oscillator will attempt to lock on the leading edge of the blanking pedestal or even some part of the picture signal, and horizontal bending will result. Bending from this origin will often take the form of severe side-ways stretching in a rubbery manner.

Figure 4 (p. 71) illustrates another way in which sync pulse shape can be destroyed: *A* represents a single horizontal blanking pedestal and sync pulse, and *B* shows the shape of the horizontal blanking and sync signal after passing through an amplifier with poor low frequency response. The sync pulse is completely lost and the oscillator will again attempt to lock on the leading edge of the blanking pedestal. Sync instability and bending may result. This type of fault will usually cause improper vertical sync since the loss of low-frequency response would also severely distort the vertical sync pulses.

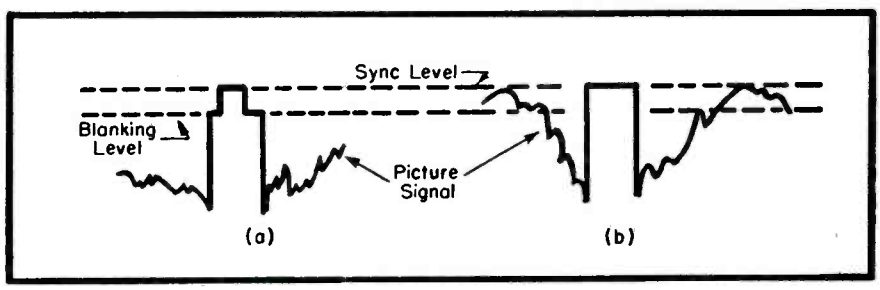
To summarize, any trouble which compresses the sync pulse by amplitude limiting or changes the sync pulse shape by improper frequency response can cause picture pulling.

Troubleshooting

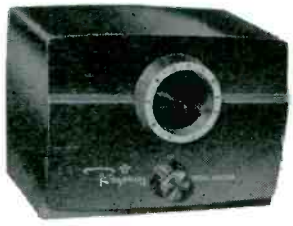
With a background of the origin and manifestations of horizontal bend-

(*Continued on page* 70)

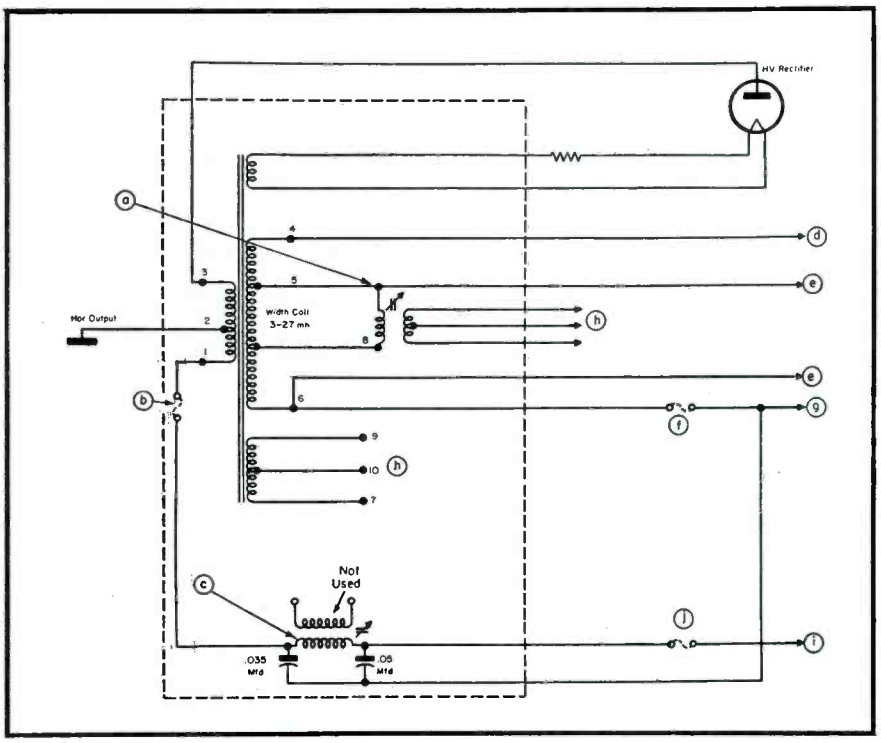
Fig. 3. One way in which horizontal sync pulse can be distorted. *A* represents portion of horizontal line of composite video signal with proper blanking and sync-pulse levels. In *B* appears the change in signal which can result if limiting takes place in a video amplifier.



Thomas A. White
president: Jensen Manufacturing Company, Chicago, Illinois
says: "In every field there's one leader
---- in boosters it's Regency"
the largest selling booster at any price



Burton browne advertising



Circuit of horizontal deflection circuit appearing on the *cover*, designed for replacement transformer. In this schematic, a horizontal-linearity coil is involved, as indicated at *c*. If the original circuit employed such a coil, it should be connected as shown. If the coil has a tap, the tap must be left unconnected. Other connections are similar to those shown in Fig. 1, with *a* in that drawing appearing as *a* here; $b = b$, j and f; $c = i$, $d = d$; $e = e$ and e_1; $f = g$ and $g = h$.

Installation of Replacement Horizontal-Output Transformers‡

by WYN MARTIN

[*See Front Cover*]

WITH THE GROWTH of TV and chassis design improvements the *hv* deflection circuits have undergone considerable change and variation. It has been estimated that although the number of *flybacks* in use by the many set manufacturers probably exceeds three hundred easily, there are only four basic types in use: (*1*) transformer, (*2*) autoformer (modified autoformer), (*3*) direct drive (air core and iron core), and (*4*) adjustable air gap.

Types *3* and *4*, which require exact replacements or extensive circuit modification, appear in about 5 per cent of all sets in use. Type *2* also requires exact replacement[1] and is used in approximately 10 per cent of the present total of sets in use. Type *1* which is the most popular and employed in approximately 85 per cent of the total units in use, has been produced with only minor physical and electrical differences. Basically, all are design modifications of the original powdered iron core flyback[2] and the original ferrite core unit.[3] Replacement units have been developed for these types. In one,[4] the iron-core flyback pattern has been followed and now includes a ferrite core for *fast retrace* requirements and in circuits using low-inductance width coils. These two units,[5] equipped with universal mounting, can be adapted, it is said, for roughly 80 per cent of the sets using transformers. The balance must be exact replacements because of special design.[7]

To facilitate installation of the replacement transformers[6] which follow

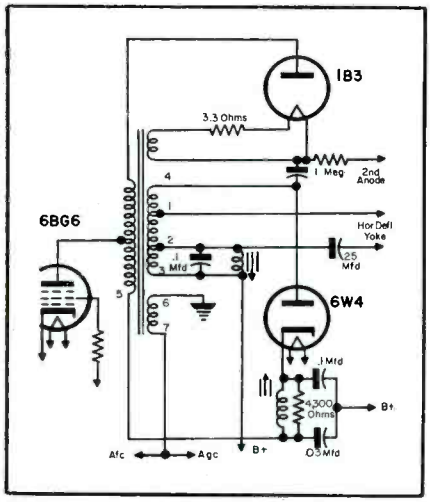
(*Continued on page 83*)

‡Based on notes prepared by engineering department of Merit Coil and Transformer Corp., and supplementary data submitted by *Chet Jur*, Merit Coil sales engineer.

[1]Such as Merit HVO-9. [2]RCA 211T1. [3]G.E. 77J1. [4]Merit HVO-10. [5]Merit HVO-10 and [6]HVO-7 (replacement for G.E. 77J1). [7]Such as Merit HVO-11 *under chassis* mounting for Zenith.

Fig. 1. Horizontal-deflection circuit illustrating changes required when using a replacement for original transformer. When horizontal oscillator-control feedback, not phase detector, or retrace blanking voltages are required, connections are made to point *a*. If fuses are employed, as indicated at *b*, they should not be removed when making change. Point *c* goes to damper-tube cathode or linearity coil, if used. When boost voltage for other circuits is required, this point is connected to damper-tube cathode. At *d* is the direct connection to damper tube plate; if original circuit has damper plate connected to *B*+, the *B*+ lead must be removed. At *e* and e_1 are connections to deflection yoke; if original circuit employs a capacitor in series with yoke, it must be left in circuit. If picture is reversed, the yoke leads should be interchanged. Dashed contacts at e_2 go to fixed or variable-centering voltage, and should be left in circuit as in original. Point *f* is the *B*+ supply lead, as in the original. Horizontal phase detector or *agc* winding is connected at point *g*; if signal for these circuits is not required, these contacts should be left unconnected.

Fig. 2. Original Truetone 2D1089B horizontal deflection circuit, for which circuit shown in Fig. 1 can be followed when replacing transformer.



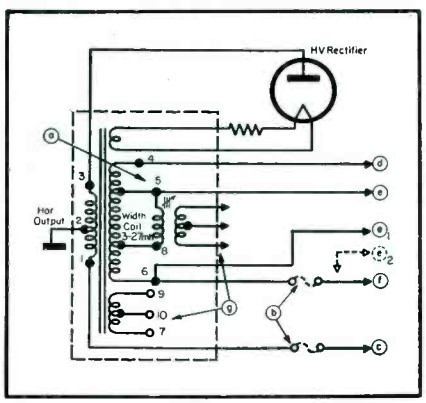
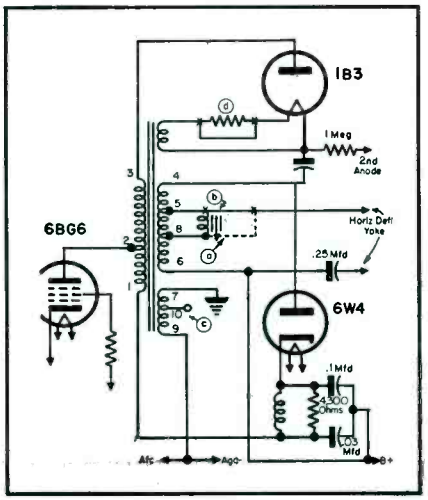


Fig. 3. Modified horizontal-deflection circuit, illustrating points which should be checked or altered to provide best results. To illustrate, if the *hv* rectifier filament burns too brightly, or if tube emission is too low, and the brightness of the picture tube is deficient, change indicated at *d* can be included.



Modifying 'Scope for Field

Part I of a Three-Part Discussion of a 'Scope Modernization Plan and Its Role in Service Engineering for the Repair and Maintenance of Industrial and Public Service Electronic and Communications Equipment Systems

Fig. 1. Handle and label* mounted on a 'scope case.

SERVICING OF INDUSTRIAL and emergency radio-electronic equipment involves a unique basic practice; most of the repairs must be made on the customer's premises, rather than in the shop. Many types of industrial or commercial gear are not readily portable, and some of the units are designed to operate at voltages not readily available in retail or residential areas: 660 volts, 60 cycles, 3 phase; 220 volts, 25 cycles; or 110 volts *dc*. Aeronautical equipment, in the main, now operates on either 24 volts *dc* or 110 volts, 400-cycle *ac*.

Because of these somewhat stringent conditions, it is usually desirable to take the test equipment to the device needing repair, instead of *pulling the chassis*.

There are portable instruments, such as tube checkers, volt-ohmmeters, vacuum-tube voltmeters and test oscillators that are ideal for this type of servicing. However, 'scopes pose a problem, for many are shop-instruments, principally. Fortunately, they can be modified for field work. Interestingly enough, each change evolved to increase the utility of 'scope in the field has been found to improve also its performance in the shop.

Operational Requirements

For most types of electronic equipment, a 'scope that has a sweep range of from 50 to 50,000 cycles, and a vertical amplifier that will give recognizable sine waves from about 30 cycles to 500 kc will be adequate. If timing, sequencing, or programming equipment is to be serviced, a *Z*-axis input is very useful.

Almost as important as the range of electrical characteristics are the mechanical requirements. The 'scope must perform its functions dependably under a wide variety of operating conditions, and must perform them immediately on arrival at the work location. In consequence, its mechanical construction must be rugged enough to stand the ordinary vicissitudes of transportation. A chief cause of 'scope failures in transit is usually vibration, although droppage is the most expensive cause of failures.

Case Considerations

As indicated, portable instruments must be rugged enough so that they will not be damaged by vibrations and shocks incident to transportation. This requires that the instruments have a good case or that a separate carrying case be provided, that the case be equipped with a suitable handle, and that some sort of shock-absorbent feet are provided.

The carrying handles supplied normally are not adequate for field transportation. A proper handle should be quite strong and large enough to accommodate any ordinary hand (up to glove size 8, for example), and free of any sharp edges and burrs on the under side. Such handles are available at most hardware stores, and are known as door pulls.‡ Some of them are drilled and countersunk to take standard 10-32 rack screws, and are ideal as instrument handles.

The carrying handle should be firmly bolted to the top of the 'scope case,

Fig. 2. Lower front view of 'scope showing hollow rubber shock-absorbing feet, modified terminals, and switching changes.

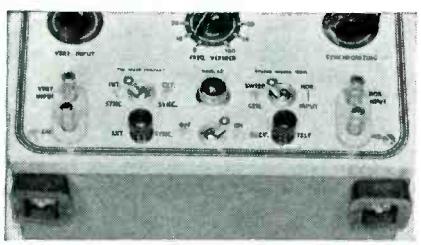
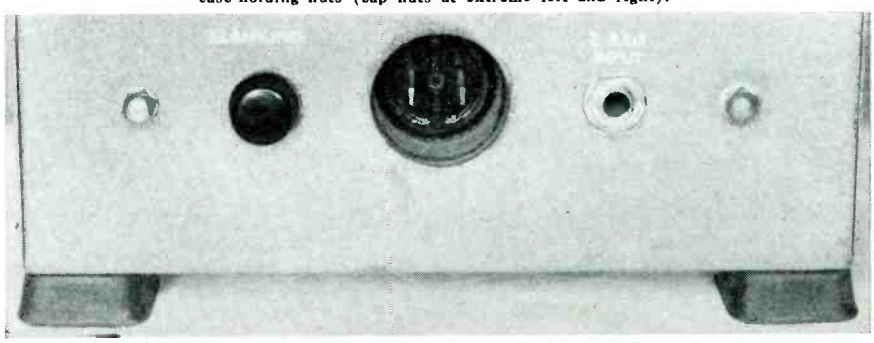


Fig. 3. Lower rear view of 'scope, showing rubber feet, *ac* input (center), *Z*-axis controls, and case-holding nuts (cap nuts at extreme left and right).



*Label is mounted and protected by a standard chart frame; National CFA.

SERVICE ENGINEERING Applications

by RONALD L. IVES

vertically over the center of gravity of the instrument, so that it will carry conveniently. In many 'scopes, the center of gravity is not the geometrical center, due to the weight of the power transformer. A handle of this type, mounted on a 'scope case, is shown in Fig. 1.

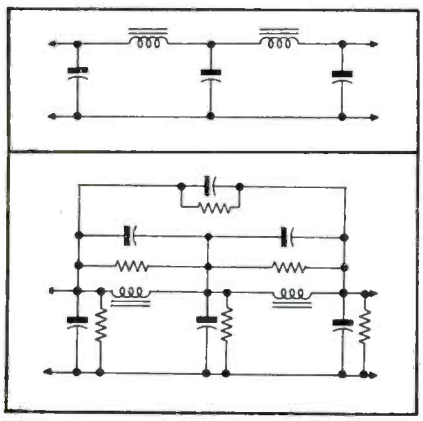
If the case metal is thin, so that the handle mounting bolts may pull out after a short time, it may be reenforced by an internal fish plate made of any convenient nonmagnetic material. Sheet dural, about 1/8" thick, is ideal for this purpose, having the requisite strength with a minimum of weight. Brass and masonite are both useable for reenforcement, but pure aluminium sheet is not very satisfactory.

Before the instrument is taken out of the shop, a clear label, stating what the instrument is, and the name and address of the owner, should be bolted or riveted to the case. This not only discourages theft, but simplifies pass procedures at military and defense installations, and simplifies inspection and customs procedures at state and national boundaries.

To protect the 'scope case, and the surface upon which it rests, from scuffing, and to absorb the bumps and shocks incident to transportation, some sort of nonskid shock-absorbing feet are desirable. Many 'scopes are supplied with either inverted dimples on the bottom of the case, or with small rubber bumpers. Neither of these give adequate protection in field work. Shock-absorbing mounts are quite effective here, but difficult to obtain. As a substitute, the rectangular hollow rubber feet used on some portable typewriters will be found very effective. They are provided with a large central washer, and can be mounted conveniently with a standard rack screw. Feet of this type are shown in Figs. 2 and 3.

‡Such as Stanley No. 3 door pull.

Fig. 4. At top appears a schematic of a filter, while below we have the actual filter circuit as determined by test. The added elements appeared due to leakage and intercoupling in the multi-unit electrolytic.



Terminals, Controls and Indicators

In some instances, it will be found that the terminals are not suited for use with shielded leads or plug-in rejection filters. For some forms of servicing it will be necessary to replace these 'scope terminals with types[1] which fit special attachments or with *A* and *N* coax fittings, used on a wide variety of communications equipment. Where shielded leads are not likely to be needed, any convenient binding post can be used. Connector arrangements permitting use of shielded leads are shown in Fig. 2.

Power connections to most 'scopes are by means of a line cord, which, as supplied, may not be too sturdy for field work. Because dangling line cords have a predilection for catching on things and being stepped on, it is usually advisable to remove the cord entirely from the 'scope, and use a recessed male plug for power input.[2] The connecting cord, preferably a rubber-covered industrial cord, such as is used for electric drills, can then be equipped with a male connector on one end, and a female receptacle on the other. Clamp type connectors[3] perform well in this service. Use of a recessed input plug is shown in Fig. 3.

Controls having rough spots, noisy sectors, undesired nonlinearities and wobbling shafts should be replaced with electrical equivalents of good manufacture.[4]

Switches are a frequent cause of trouble in 'scopes. Perhaps the most satisfactory switch for instruments is the bat-handled toggle type. This has definite positions, does not creep under vibration, and usually indicates malfunction by a characteristic change in the sound of operation. Switches of this general type are shown in Fig. 2.

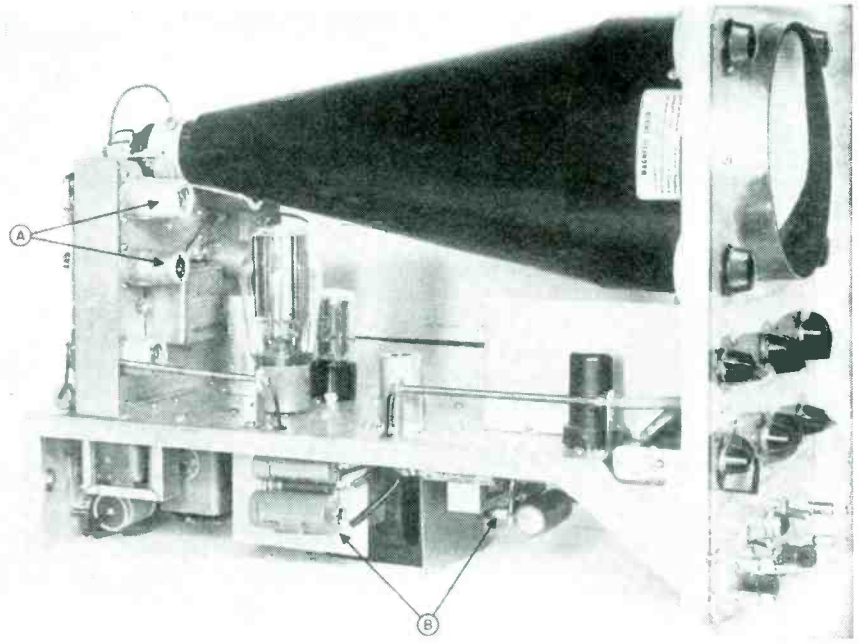
Utility of the 'scope will be increased if some definite coordinates are sup-

(*Continued on page 36*)

[1]Such as National FWJ.

[2]Such as Amphenol 61-M10. [3]Amphenol 61M11 and 61-F11. [4]Such as Ohmite AB or Mallory MP types.

Fig. 5. Side view of modified 'scope, showing constructional features. At *A* appears a view of the miniature tube shields serving as *hold downs*, while at *B* are terminal strips used to mount resistors and capacitors.



Modifying 'Scope

(*Continued from page 35*)

plied, so that nonsimultaneous comparisons can be made. Transparent grid screens[5] are ideal for this purpose.

Power Supply Considerations

Power supplies for 'scopes usually give little trouble, and are adequate for their purpose throughout the life of the components. Chief causes of trouble are the rectifier tubes, and aging of the electrolytics used in the low-voltage supply.

Many 'scopes use a 5Y3 with plates in parallel as the high voltage rectifier. This works quite well, even though the tube may be a trifle overvolted, but tube life may be short. When tube trouble recurs, the 5Y3 should be replaced with a 5R4GY, which has an unusually long life.

In a number of older 'scopes, the filter becomes less effective with age, yet the capacitors still appear to be good. This trouble is particularly common when multiple unit filters are used, and is caused by leakage and intercoupling between the units. In several instances, where the filter schematic was as shown in Fig. 4 (top, p. 35) the true filter circuit, as determined by tests, actually looked like that shown at bottom of the figure. This trouble is common enough so that replacement of multitple unit electrolytics by single units appears prudent.

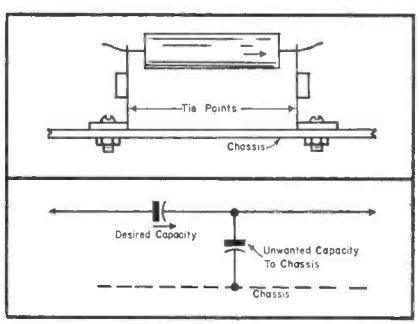
Output voltage of the B supply may usually be increased by installing a larger input capacitor, and regulation of rc filters may be improved by replacing one or more of the filter resistors by chokes. This will only result in a real gain if the dc resistance of the choke is considerably lower than that of the filter resistor which it replaces, and the reactance of the choke, in ohms, is considerably greater than the ohmic value of the resistor; $2\pi FL$ must exceed R. Care must be taken, when replacing resistors by chokes, that the leakage field of the choke does not impinge upon a signal circuit, and cause hum injection. Obviously, nothing is gained if hum is removed from one part of the circuit, and then injected elsewhere.

Constant-Voltage Transformer Use

Overall stability and consistency of a 'scope will be increased if all input voltages are regulated. In particularly bad locations, use of a small constant-voltage transformer between line and 'scope may be found desirable, care being taken to separate the two devices by several feet, to avoid leakage field difficulties. The low-voltage B supply may be regulated by use of conventional VR tubes, at a cost of approximately 30 milliamperes additional current drain; and the high voltage can be held within approximately one per cent by use of high-voltage regulators at a cost of about 30 microamperes additional current drain.

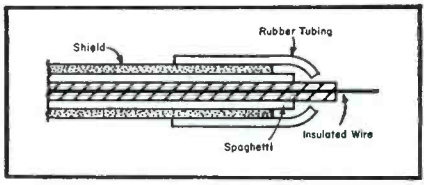
As a general rule, a constant-voltage transformer will protect against the effects of voltage drifts spread over several cycles; while regulator tubes

Fig. 6. Mounting of coupling capacitors, and effect of mounting.



[5]Such as DuMont 216-C, 5" diameter type.

Fig. 7. Insulation of shielded wiring.



are most effective against transients lasting less than one cycle.

Where line voltages are consistently abnormally high or low, they may be brought to within operating limits by use of a small autotransformer and monitored with a small voltmeter.

To keep miniature tubes from vibrating out of their sockets, a standard tube shield should be installed over each. These shields act as very effective *hold downs,* and increase circuit stability slightly at the higher frequencies. Although some military and industrial specifications require that octal tubes be equipped with *hold downs,* it appears that they will stay in good sockets under almost any expectable field conditions. The use of miniature tube shields as *hold downs* is illustrated in Fig. 5*A*; p. 35.

Resistors and capacitors should be firmly mounted to resist vibration. Terminal strips are useful here; Fig. 5*B*. Turret-type sockets are very satisfactory in new construction, or in extensive remodeling jobs. Bypass capacitors, having one side grounded, can be held firmly to the chassis by use of a cable clamp and bolt, but interstage coupling capacitors should not be so mounted, as unwanted capacity to ground will be introduced, with resultant lowering of high-frequency response. Mounting away from the chassis, as in Fig. 6, is preferable in this instance.

Wherever a wire passes through a hole in the chassis or any supporting member, it should be protected by a grommet or piece of spaghetti, to prevent insulation wear ultimately resulting in a short circuit. Shielded leads should likewise be protected by use of insulating tubing, as in Fig. 7, to prevent wear and short circuits.

Internal wiring should be made as vibration resistant as practicable. In general, power connections should be cabled and anchored in place with cable clamps, and signal leads run as nearly *point-to-point* as possible.

Because the total cost of a component failure is many times the cost of the component, it is wise to use components of the better grades, and to allow a large margin of safety in their ratings.

In the next instalment (*April*) an analysis of the circuitry modifications required for field work will be presented.

Service Engineering — field and shop notes

First of a Monthly Series of Reports on the Installation and Maintenance Procedures Developed to Improve Results and Insure Top Performance from Industrial Electronic, Commercial 2-Way, Aircraft and Marine Communications, and Sound Systems. Covered this Month are Design and Application Characteristics of Tubes Used in Mobile Gear and Methods Available for Test‡ . . . Receiver Noise Reduction Suggestions‡ . . . Dynamotor Relay Checker‡ . . . Dust-Proofing Techniques . . . Instrument Developments

by THOMAS K. BEAMER

MODERN 2-WAY SYSTEMS employ multitudes of vacuum tubes, and the number of types may vary from less than ten to over 100. The tubes' life characteristics vary according to the type of installation, application, tube type and the individual tube. A complete familiarity with these factors is essential to proper maintenance, economical operation and optimum equipment performance.

The cathode emission of a new tube is normally considerably higher than necessary for proper operation. Only a small portion of the total emission capability is used. Emission will remain essentially constant over the greater portion of the tube's useful life, first decreasing slowly, and then with increasing rapidity. It is only after the total emission decreases to the point where gain and other tube characteristics are affected that replacement is necessary.

A *hot* tube, (one with high initial emission), is generally the result of a high, built-in cathode temperature. Hot tubes will decrease in emission more rapidly than cold tubes and have shorter expected lives. Thus, cold tubes, even though they may be lower than average in emission, are desirable for minimum maintenance and maximum reliability.

It has been found that tube life is increased in circuits with high negative grid bias and small plate loads. A class *A* amplifier tube will have a longer expected life than a class *C* amplifier or oscillator tube.

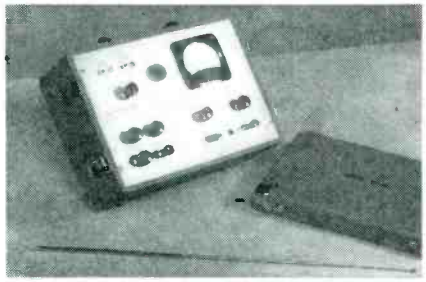
When a tube is plugged into its socket, an electro-chemical balance is initiated in the cathode, which stabilizes after a few hundred hours. Unnecessary switching of tubes to different circuits requires establishment of a new balance at the expense of tube life.

Constant rated filament and $B+$ voltages can contribute to extended life. Wide variations in line voltage at a base station can be countered by a voltage regulating transformer to achieve greater tube life in addition to stabilized performance.

While *ruggedized* versions of some tubes may provide extended life under conditions of vibration, it has been found that usually they offer no great advantages for use in fixed stations.

Tubes at 50 hours still have a failure of more than 2½ times that of tubes in operation at 500 hours. Thus, new tubes are much more susceptible to failure and therefore new tubes should specifically be watched for symptoms of deterioration during the first month of operation through checks of stage meter readings.

Frequency and modulation meter for use in the maintenance of two-way radio systems on assigned frequencies. The meter measures modulation swing and carrier frequency of FM transmitters, and features both high and low *rf* output for receiver alignment. Available with either one or two crystals, for servicing single or two-frequency systems, in both the low (25-50 mc), medium (72-76 mc) and high (152-174 mc) bands. Meter is available with or without a crystal oven, and with crystal tolerances ranging from .0005 to .0025 per cent. Oven is available in two ratings, 38° and 75° C, and is powered from any external six-volt power supply. (*ST-13-A; Dept. N-14, G.E., Syracuse, N. Y.*)



Testing

The preferred method of testing tubes revolves about a measurement of performance of the tube in its asso-

(*Continued on page* 74)

‡Based on data prepared by the technical information department of *Motorola*.

No fuss No cuss

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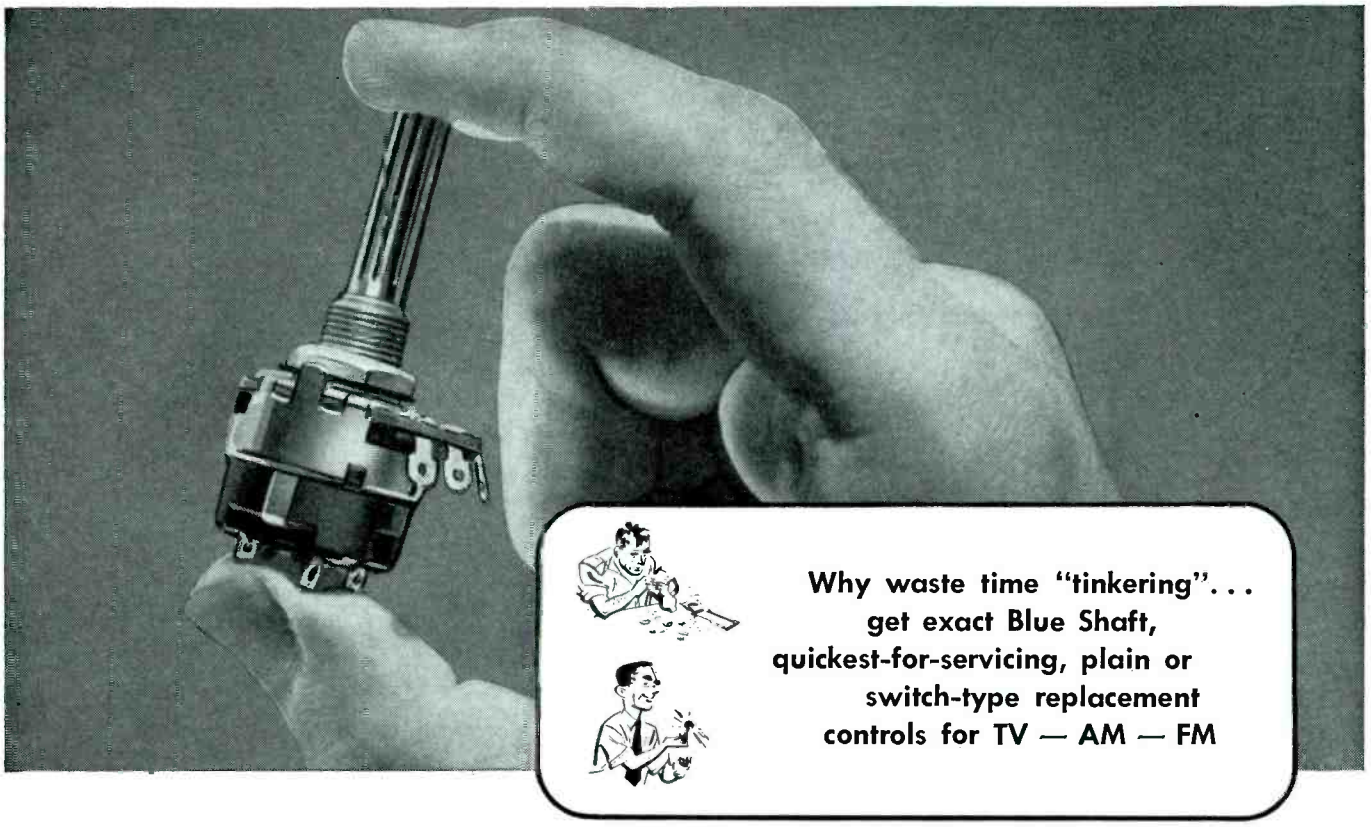

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Cat. No.	Ohms Max. Resistance	Taper	Circuit Location	List Price
B-60	500,000	C-2 (audio)	Volume or Tone	$1.00
B-60-S*	500,000	C-2 (audio)	Volume or Tone	$1.50
B-70	1 megohm	C-2 (audio)	Volume or Tone	$1.00
B-70-S*	1 megohm	C-2 (audio)	Volume or Tone	$1.50

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Flexible "Fastatch,"† type KB, converts any plain type control with blue and white label on back cover to switch type . . . in seconds.

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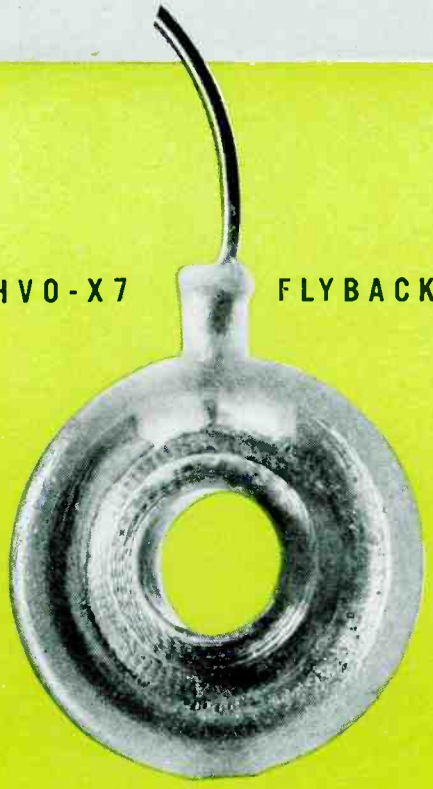

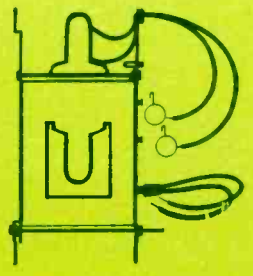

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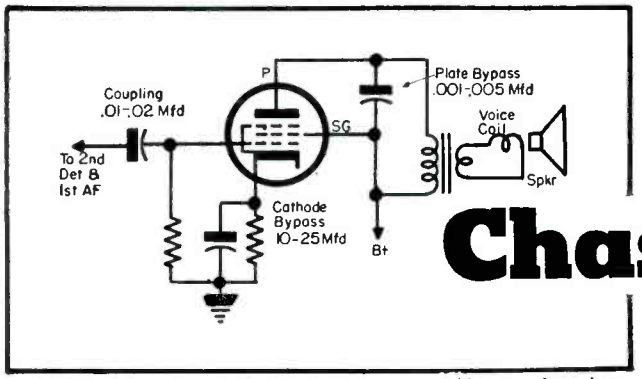


Fig. 1. Typical output stage used in most *ac/dc* sets, featuring bypass, from plate to screen of power tube, which can cause trouble if it develops leakage.

Those WEAK Chassis Complaints

by JACK DARR
Ouachita Radio Service

Causes and Solutions to Assortment of Odd Loss-of-Sensitivity Troubles In Broadcast Receivers Which Stubbornly Defy Normal Check Procedures

SOME OF THE MOST puzzling problems encountered by Service Men appear in sets which come in with one complaint: "It's just weak." If the chassis should be entirely dead when repairs are needed, diagnosis and repair are truly much easier. But, when the problem revolves about a loss of sensitivity, there's usually a real job ahead!

Some of the units found in this condition can of course be repaired by routine methods: replacement of weak tubes, filter capacitors, etc., which cause plate voltages to drop; leakages in bypasses causing low screen voltage, and so on. These fall in the *obvious-trouble* class, and can generally be cleaned up in a hurry.

Equipment Needed

One of the basic weapons in the battle against *weak sets* is good test gear and plenty of it. A minimum is an accurate *ac-dc* vacuum-tube voltmeter; signal generator; preferably one which can furnish an FM signal for alignment; a 'scope; signal tracer, with tuned channels for *rf, if,* oscillator and *af* voltages; a reliable capacitor-tester; and an audio oscillator. The *af* unit may be eliminated if the *rf* signal generator has provisions for a separate *af* output. Provision for external modulation of the *rf* signal generator will often come in handy.

A second essential is a thorough grounding in conventional circuitry. Service Men should have an everyday acquaintance with the exact means employed by the various design engineers to obtain their results; *rf* amplification, local oscillators, audio amplication, volume and tone control circuits, power supplies of all types, etc.

When one is familiar with the basic circuits of each different application, *if* amplification, for example, it is simple to recognize the purpose and capabilities of any modification that might be encountered. Since there are really only a few basic circuits, amplifiers, oscillators, etc., normally the only difference lies in the modifications made by the design engineers. Each has his own particular way of achieving his purpose, and experienced Service Men can often recognize the work of some engineer, by just looking at the schematic of a set. One puzzler often found is that old bugaboo, no volume, even after all routine tracing has been made, and everything checks all right; then the alternative remaining is to conduct a detailed stage-by-stage test of the receiver.

Power Supply Troubleshooting

The power supply is possibly the cause of some of the headache, although this is presumed to have been checked. Recently, in the course of repairing one *low-volume ac/dc* set, an odd circuit was uncovered. The receiver used a 25Z6, and an electrodynamic speaker. An entirely unwarranted assumption was made; it had been felt that this was a conventional half-wave supply. After checking to see if it was a doubler, it was found that plates were tied together, but the rectifier had a split output; one cathode fed the plates and screens, the other furnished current for the field coil of the speaker. The input capacitor for this half was open; thus there was no field current, and no volume, although plate voltages were normal. If the schematic had been checked, this circuit would have been immediately

(*Continued on page* 80)

Fig. 2. A pentode second detector-first *af* stage, showing combination trimmer capacitor-tweet filter (*A*), which can introduce replacement problems.

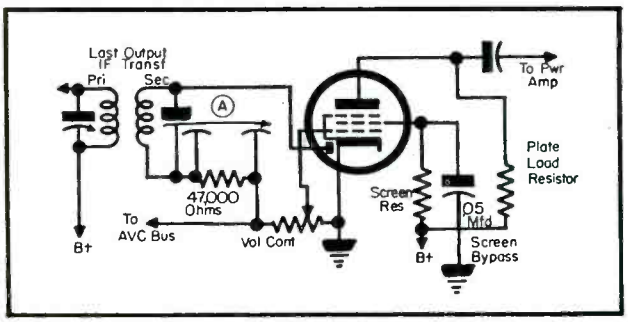
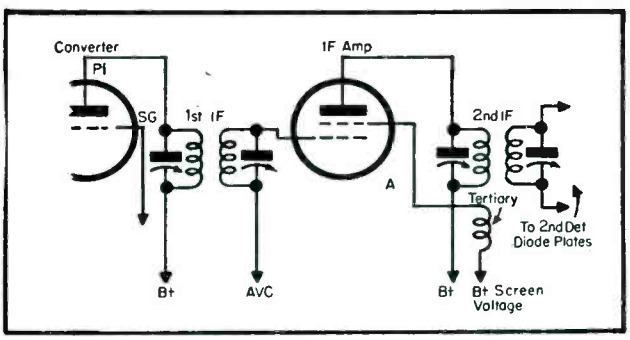
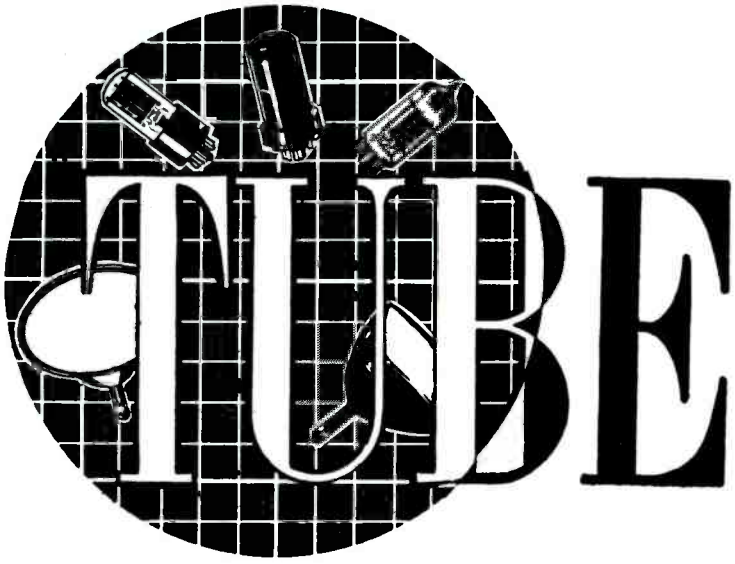


Fig. 3. An *if* amplifier stage using tertiary winding to feed screen voltage. This introduces small regenerative voltage into transformer aiding gain. In a conventional amplifier stage, the tertiary winding and screen bypass are omitted.





News — by L. M. ALLEN

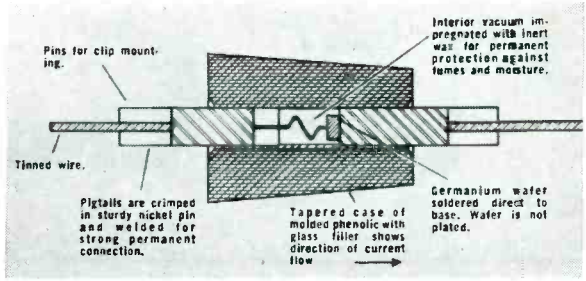


Fig. 1. Cross-sectional view of a *IN81 germanium diode.* (*Courtesy Radio Receptor*)

Features of Germanium and Silicon Diodes Now Available as Rectifiers, Detectors and Frequency Converters

CRYSTALS, which in the pioneering days of radio, served as the key to the signal, and then were completely replaced by vacuum tubes, have returned to the scene and with quite a flourish. Today crystals, in the form of germanium and silicon in diodes and transistors, are once more a vital element in the receiving system, with diodes occupying an extremely important post in TV circuitry.

Applications

There are a wide variety of diodes available for general purpose and special applications; the diodes have been included as rectifiers, detectors and frequency converters in most instances, with germanium being used at the lower TV frequencies, and silicon at higher frequencies and as detectors and converters.

Types Available

In the general-purpose classification will be found the 1N34, 1N34A, 1N43, 1N44, 1N45, 1N46, 1N66, 1N69 and 1N70. Ceramic, glass and plastic bodies are featured in these types. In the 1N69 and 1N70, for instance, plastic construction is used. For video detection, there is the 1N64, also with plastic construction. In the *uhf* mixer classification will be found the 1N72. There is also a 1N35 with a ceramic body which is normally used as a matched duo diode. There are also diodes for 100 and 200-volt applications; 1N38, 1N38A and 1N39. For mixer and detector use at the microwave frequencies there are 1N21, 1N21A, 1N21B, and 1N21C (3,000-mc mixers); 1N25 (1,000-mc mixer); 1N23, 1N23A, and 1N23B (10,000-mc mixers); 1N26 (24,000-mc mixer); 1N78 (16,000-mc mixer); 1N32 (3,000-mc detector); 1N76 (9,000-

(*Continued on page 73*)

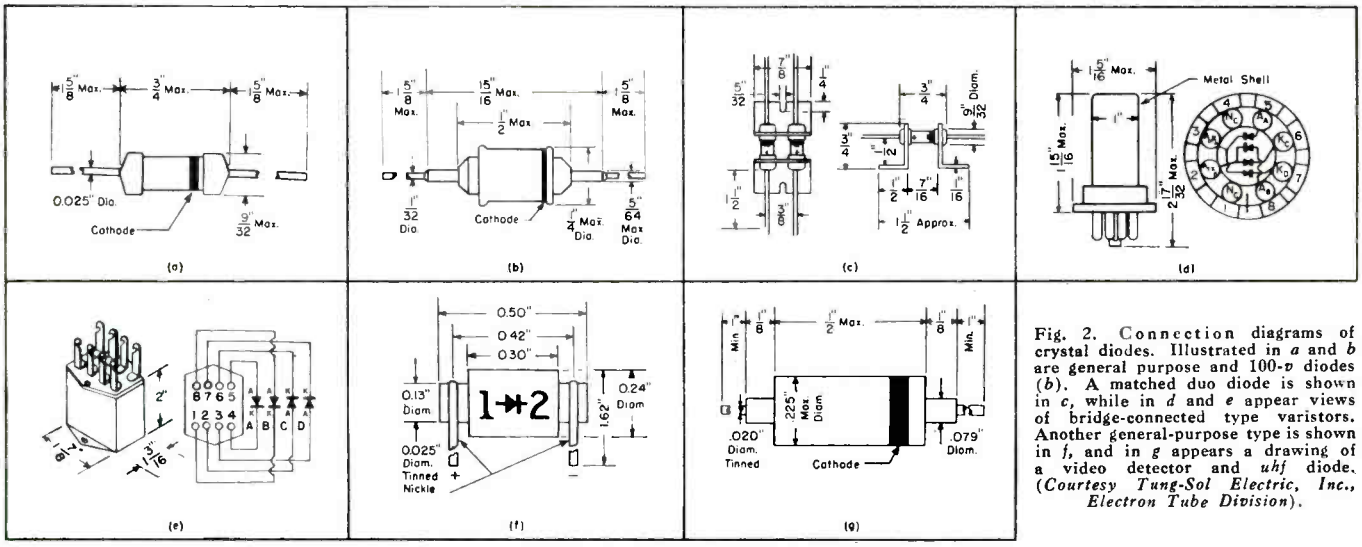


Fig. 2. Connection diagrams of crystal diodes. Illustrated in *a* and *b* are general purpose and 100-*v* diodes (*b*). A matched duo diode is shown in *c*, while in *d* and *e* appear views of bridge-connected type varistors. Another general-purpose type is shown in *f*, and in *g* appears a drawing of a video detector and *uhf* diode. (*Courtesy Tung-Sol Electric, Inc., Electron Tube Division*).

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RADIO CORPORATION of AMERICA

ELECTRONIC COMPONENTS **HARRISON, N. J.**

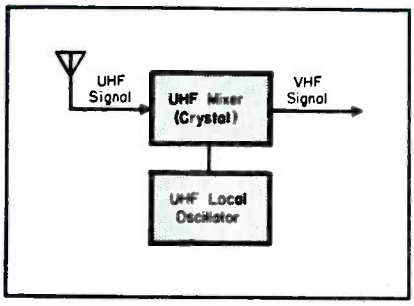
Design, Application and Service Features of Three Types of UHF Converters Now Available: Single/Dual-Channel Adapters, Tuner Strips in Turret Tuners and Separate Tunable Self-Powered Units

UHF CONVERTERS

by HENRY R. HESSE

Senior Engineer, TV Receiver Division

Allen B. DuMont Labs



(*Left*)

Fig. 1. Essentials of a *uhf* converter.

(*Below*)

Fig. 2. Double-conversion superhet operation.

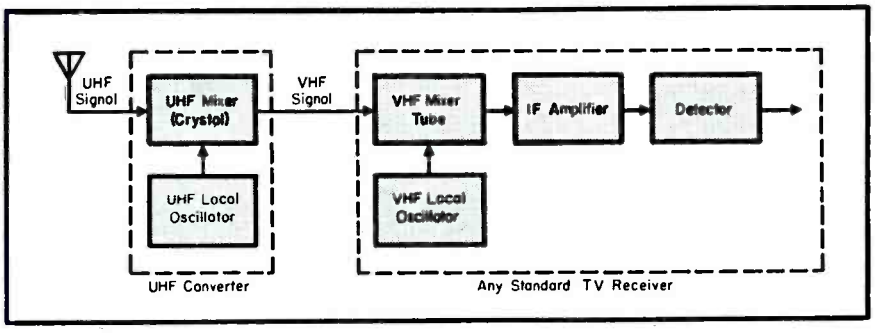


Fig. 3 (below). Block diagram illustrating single-channel converter setup.

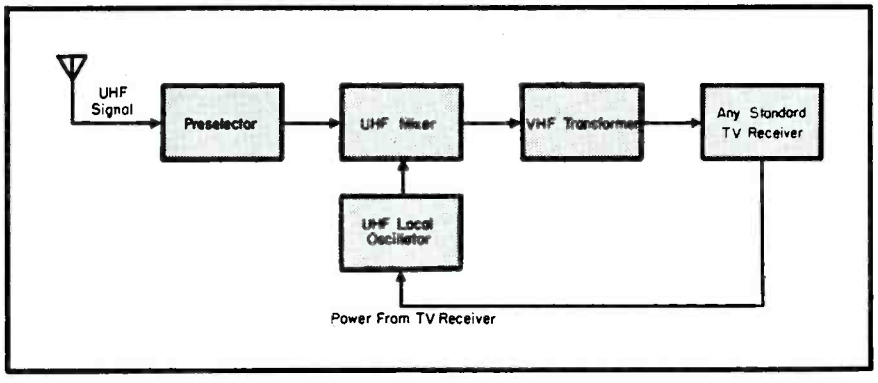
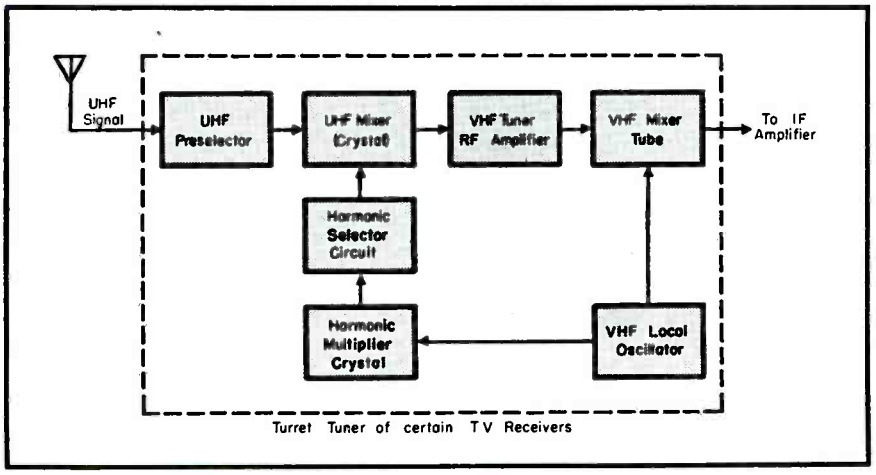


Fig. 4. Explanation of operation of turret tuner equipped with *uhf* channel strip.



A UHF CONVERTER is a device which converts the ultrahigh frequency to a lower or *vhf* level for reception by a standard *vhf* receiver. Such a converter utilizes the superhet principle to change one frequency to another frequency using a mixer and a local oscillator. Expressed another way, a converter attached to a TV receiver may be considered as a double-conversion superhet, the *uhf* signal being first converted to *vhf* and the *vhf* output then being converted to the required *if*.

There are three kinds of *uhf* converters available; single-dual channel unit, tuner strips in turrets tuners, and separate tunable self-powered unit.

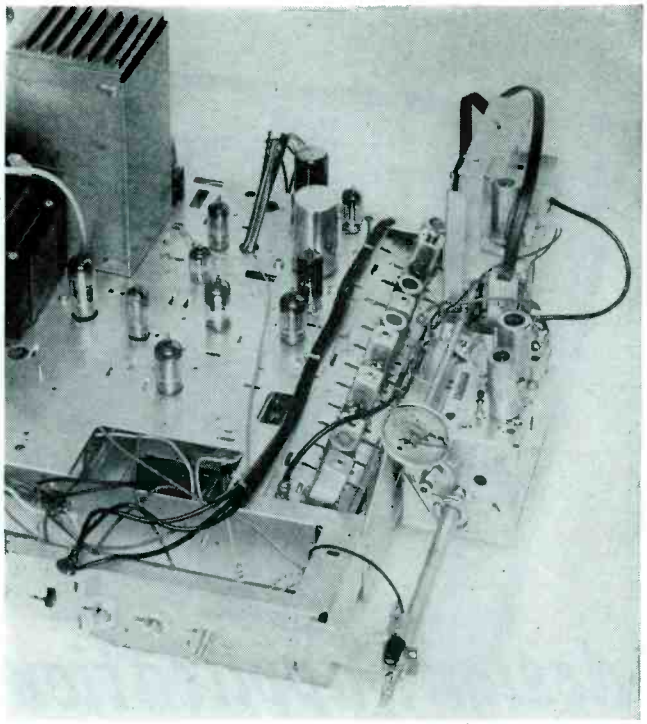
The simplest converter will only convert one *uhf* channel to *vhf* and is usually a fixed tuned unit placed on the rear or inside the TV receiver. In locations where only one *uhf* station is receivable the single-channel converter[1] is satisfactory. In locations where possibly two *uhf* stations are contemplated or receivable,[2] it is possible to use two single-channel converters tuned to each of the stations and provided with a changeover switch for selection of either station. Single-channel converter oscillators are usually powered from the TV receiver by means of an adapter placed in a power tube socket. The circuitry of these converters usually has a *uhf* tuned circuit, crystal mixer, local oscillator and an output transformer. All circuits must be fixed tuned by the Service Man before or during installation. Since the circuits may be tuned to any frequency it is necessary to select one of the unused *vhf* channels and set the oscillator frequency accordingly. One of the *vhf* channels is selected to obtain high-image selectivity. There are two possible oscillator frequencies which will produce the desired *if*; the lowest oscillator frequency is the correct one and the

[1,2]Martin, Wyn, *UHF Selectors*, SERVICE; November, 1952.

higher one is the incorrect frequency. The correct oscillator frequency may be obtained from the following equation: *uhf* pix carrier – *vhf* pix carrier of channel chosen on tuner for the *uhf* station = the oscillator frequency. The channel limits, pix and sound carrier, and the oscillator frequencies required to convert to standard *if*, and to convert to either channel *5* or *6* or for all channels from *2* to *83* appear in *table 1*; p. 78. Adjustment of the converter to an incorrect oscillator frequency results in a negative picture (portions of the picture which should appear dark will appear light and vice versa); on receivers having separate sound *if* channels, there will be *no* sound since the sound *if* will not be correct even though the pix *if* is correct. Single-channel converters often suffer from poor noise figure, inadequate match, limited selectivity and inefficient conversion.

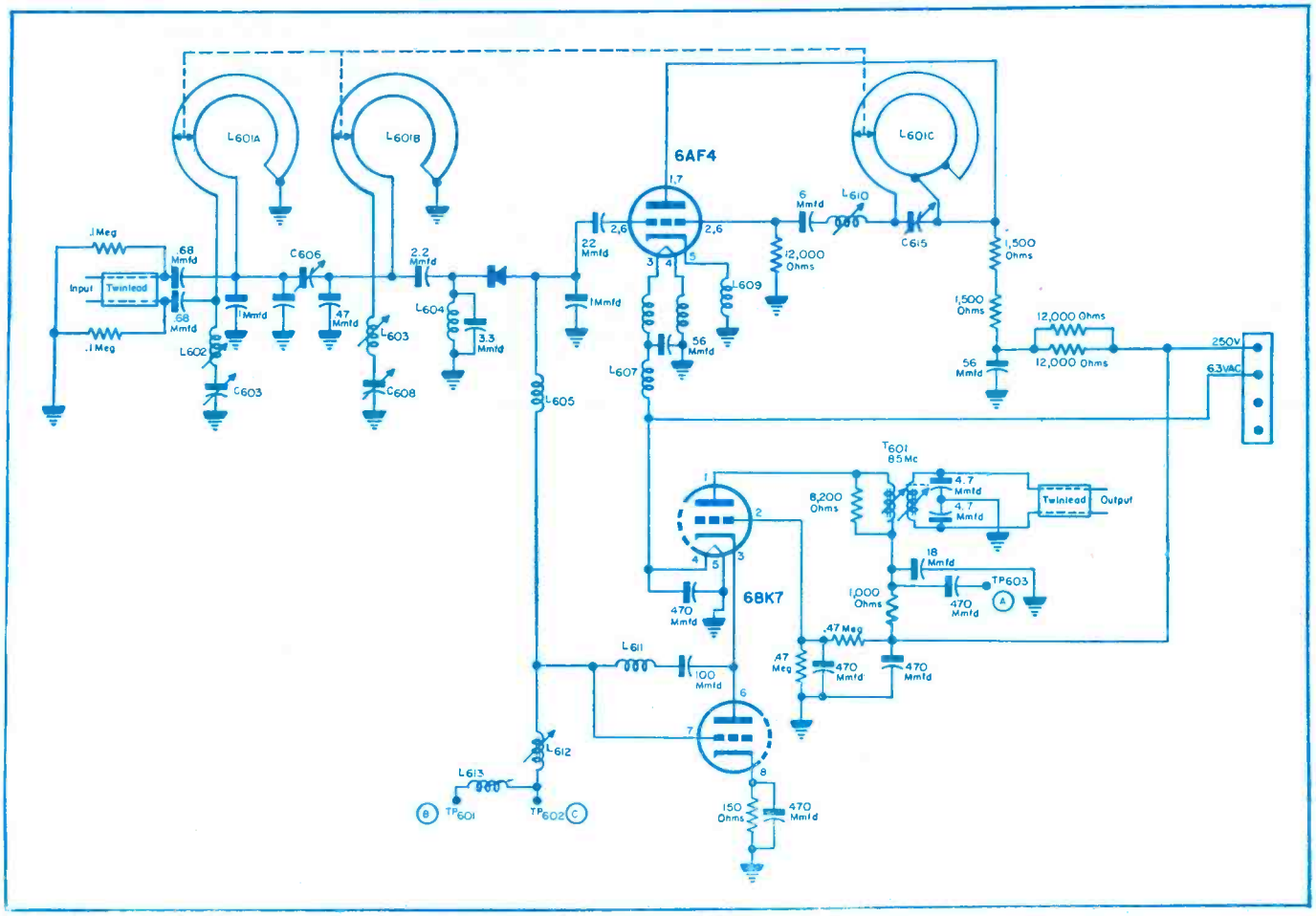
Certain TV receivers equipped with turret tuners may be modified for *uhf* pickup by removing a *vhf* turret strip and replacing with a *uhf* turret strip. The *uhf* turret strips are actually compact converters. The circuits mounted on the strips convert the *uhf* signal to a first *if* between 100 and 174 mc in the *rf* portion of the tuner, and again convert to the regular *if* amplifier in the receiver. In these strip setups only one local oscillator is used in this circuit. This oscillator must operate at such a frequency that it will convert

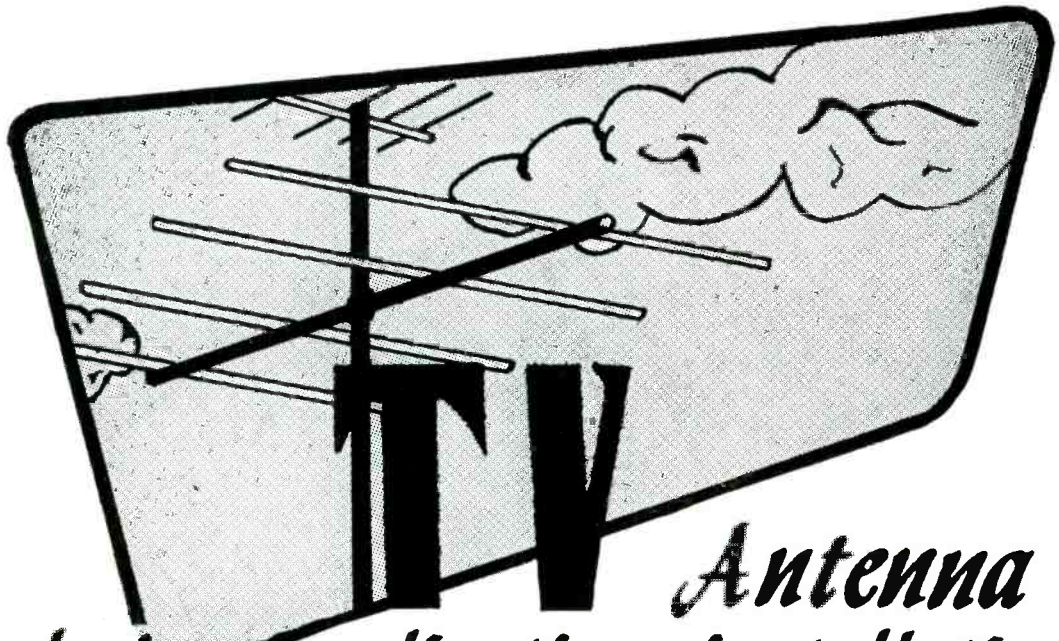
(*Continued on page 79*)



View of TV receiver with built-in tunable *uhf* converter; at right. (*Courtesy DuMont*)

Schematic of continuous *uhf* tuner which has a preselector, crystal mixer, oscillator and *if* preamp. Mixer uses a G7 germanium or 1N82 silicon crystal. In the oscillator a 6AF4 triode is used, and the *if* amp uses a 6BK7 dual triode in a cascode circuit. For channel *5*, TP_{601} (*B*) and TP_{603} (*A*) are grounded. and TP_{602} (*C*) is open. For channel *6*, TP_{601} and TP_{603} are open, while TP_{602} is grounded. (*Magnavox model 700-359*)





TV Antenna Digest

design.. application.. installation.. service

by RALPH G. PETERS

Features of Diamond-Grid Element Dipole Antennas . . . Adjustable End-Fire Array Conicals . . . Single-Channel UHF Converters . . . UHF/VHF Lead-Antenna Couplers . . . Continuous-Tuning Coax-Cavity UHF Tuners, and UHF Antennas

IN THE DEVELOPMENT OF TV antennas, particularly for fringe applications, many novel element designs have been evolved. As a result of one study of the problem, a diamond-grid element type of antenna[1] has been produced for near fringe, deep fringe and extremely remote applications in single, dual and four-bay assemblies.

The diamond-grid element, it is said, provides a multi-frequency dipole with automatic phasing at the apexes of the diamonds.

Each leg of each unit in this diamond-grid system is designed to resonate at a definite frequency; the combination of four legs in the diamond-shaped unit also has a resonant frequency. Each two legs taken together have a resonant frequency and the distance between opposite points, that is the vertical and horizontal diagonal distances, provide still other resonant frequencies.

The closed diamond structure is *self-phasing*. That is, the voltages in the two adjacent legs at any corner are in phase. Hence, it is claimed a plurality of such units can be coupled at adjacent corners without the use of stubs, capacitors, transformers, resistors, coils, or other coupling devices.

A series of such diamond-shaped units can be joined in colinear relationship to form a dipole which is fed from a pair of unconnected adjacent

(*Continued on page* 48)

Fig. 1. Illustration of a conventional dipole element which resonates at one fundamental frequency appears at *a*. In *b*, we have two dipole elements combined in a *V*. Each leg equals a resonant frequency, and the combination of the two has a resonant frequency equal to one-half the frequency of each leg.

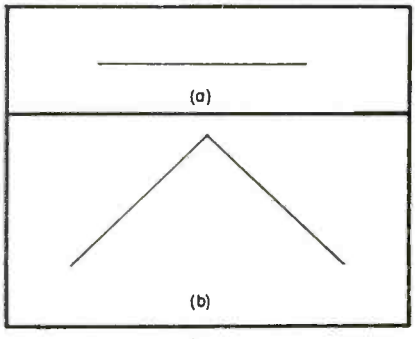
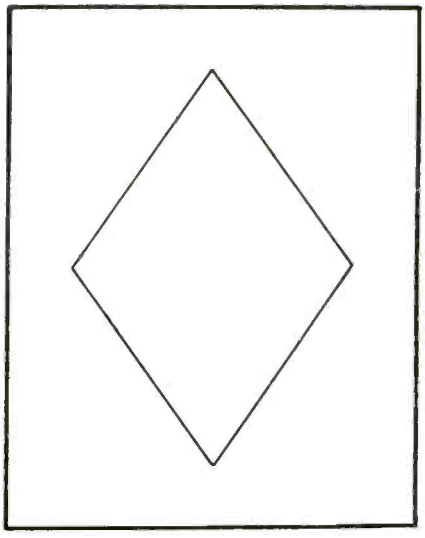
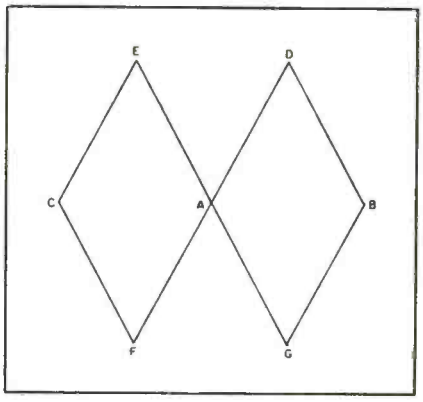


Fig. 2. Diamond-grid dipole with four dipole elements combined. Resonant frequency here is equal to one-fourth that of the individual legs around the conductors. It also has a resonant frequency for the length between the horizontal apexes and another resonant frequency between vertical apexes, where the vertical and horizontal distances are different, as shown.



[1]Pixmaster UHG model 99 (patent pending); invented by Harry M. Pomeroy and William H. DePean.

Fig. 3. Two diamond-grid dipoles hooked in series along their horizontal axis.



HIGH-FIDELITY starts in the Diskchanger

by CHARLES DWYER

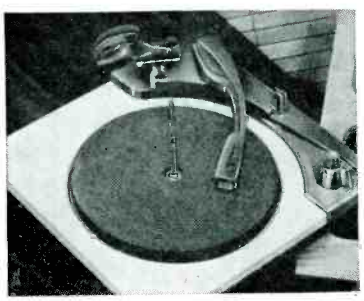
High-Fidelity enthusiasts are interested in more than just the sound their system reproduces. "What's behind" the component parts is a frequent source of conversation. Some of the information your customers seek is contained in this advertisement.

"HIGH-FIDELITY" means many different things to different people. In the main, however, it means reproducing recorded music with all the depth of tone and realism of a live performance. To accomplish this, engineers and hobbyists spend long hours and much money on amplifiers and speakers capable of delivering the ultimate 20,000 cps. Then, when sound reproduction is poor, as is often the case, they ask—"why?"

Why High-Fidelity Installations Fall Short

In high-fidelity phonograph installations, the sound system no matter how good, can only reproduce what is fed into it by the Diskchanger. The Diskchanger then is the *heart* of a high-fidelity installation—it is in the Diskchanger that true, faithful fidelity starts.

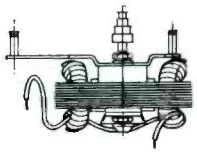
Here's What Makes a High-Fidelity Diskchanger



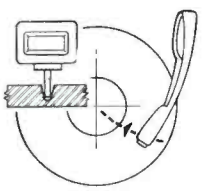
Webcor "HF" Diskchanger—also available mounted on handsome base pan. Comes equipped with crystal cartridge, G. E. Triple Play or for plug-in of standard magnetic cartridges. Wide range of decorator colors.

To be worthy of a high-fidelity installation, a Diskchanger *must* perform three important functions: (1) accurate speeds with low "wow," "hum" and "rumble"; (2) superior tracking for sensitive signal pick-up and, (3) change records gently and quickly with a minimum of mechanical noise.

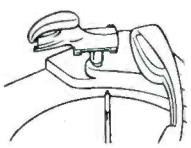
Webster-Chicago recognized the need for a true high-fidelity Diskchanger and developed the Webcor "HF" Diskchanger. The Webcor "HF" provides features that insure a superior signal from the recording—a signal that is free from all disturbance and distortion—and Webcor excels in the Diskchanger's three important functions:



1. Accurate Turntable Speeds—*Webcor uses a powerful motor for constant speeds and low "hum!" A finely machined "Step Drive" translates motor power into accurate record speeds—eliminating "wow!" The turntable is extra-heavy and ball-bearing mounted to act as a balancing flywheel for the motor. The result is constant, accurate turntable speeds with a minimum of "wow," "hum" or "rumble."*



2. Superior Tracking—*Because of Webcor's Velocity Trip, the Balanced Tone Arm is guided by the record grooves—not by mechanical drives or gears. This allows the pick-up to float in the record grooves without pressure of any kind—to track every hill and valley—to pick-up the sound exactly as it was recorded.*



3. Fast, Gentle Changing—*Incorporated in the Webcor "HF" Diskchanger is the famed, gentle "Push-Off" change system. Triggered into action by the Velocity Trip, the Balanced Tone Arm swings up and away—the record is pushed off the spindle step and cushioned by the thick resilient turntable carpet formed by Webcor's exclusive electrostatic flocking. The Webcor plays up to 4 hours of all 3-speed, 3-size records, then shuts off automatically after the last record has been played. Truly the ultimate in convenience.*

Capitalize on the national advertising and promotion behind the new Webcor "HF" series of Diskchangers. You'll find your customers asking for Webcor by name—be stocked to make these profitable high-fidelity sales.

Webster-Chicago Corporation, Chicago 39, Illinois

4125

TV Antennas

(*Continued from page* 46)

points of the center diamond elements. As illustrated in Fig. 3 (p. 46) two diamond-shaped dipoles can be hooked up in series along their horizontal axis. At point *A* the diamond grids are electrically and mechanically connected. Point *B* indicates where the dipole may be fed or tapped. Dipole will resonate at one fundamental frequency between points *B* and *C*, and half the same frequency around points *B, D, A, E* and *C*. Possible vertical frequency action is not utilized in this simple combination. Vertical frequency resonance between points *D* and *G* will be different from that obtained between *A* and *B*, or between *B, A* and *C*. There is also a definite resonant frequency for the distance between points *A* and *B*.

In Fig. 4, four-diamond-shaped dipoles are shown connected to form a simple multiple frequency (broadband) antenna. Feed points are at *B* and *I*. Phasing or coupling takes place at points *A* on the left series and at *H* on the right series. This particular illustration shows diamond grids with equalateral distances between apexes of the individual diamonds. However, in practice, these would not, ordinarily, be equilateral distances, to secure a better broadband effect. By compressing the sides of each grid, or expanding them, different resonant characteristics can be obtained. The addition of a suitable reflector properly spaced behind the array, it is said, will result in unidirectional characteristics. Small diameter conductors are used in making up the antenna to minimize *end* effects on each end of the dipole legs, and to reduce weight. The use of large diameter conductors in the legs serves to increase the *end effect* on each leg, and in such a case it becomes necessary to shorten the length of each leg somewhat, depending on the diameter of the conductor being used. *End effect* takes place when large diameter conductors are used in making up the grid legs due to the capacitive action across the apexes of the diamonds.

In Fig. 5 (p. 88) appears the make-up of an 8-element system employing diamond-grid dipoles in a colinear array.

Phasing between inner and outer grids and upper and lower grids is said to take place automatically at the points or apexes. Hence, the grids can be joined directly, as shown, without coupling devices.

The assembly is mounted vertically and is directional in the normal to the plane of the assembly. The maximum radiation is broadside to the plane of the elements, and is also bi-directional.

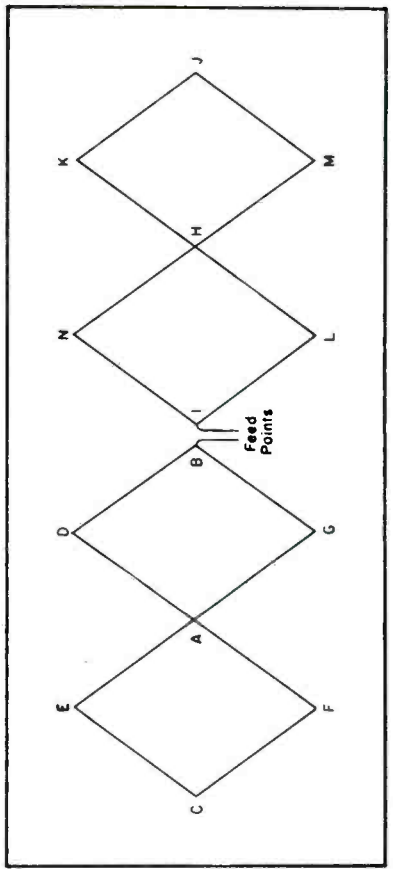
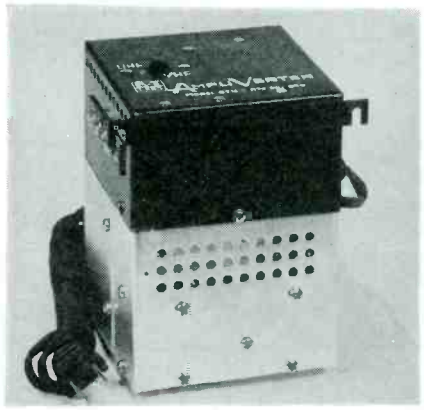


Fig. 4. Four diamond-grid dipoles connected to form a simple multiple frequency (broad-band) antenna.

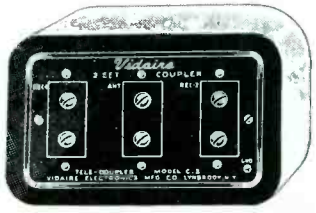


Single-channel *uhf* converter which is said to operate automatically with the *TV* set. Can be used in tandem to handle two or more *uhf* channels. Model features three tubes, (*6AF4*, *6BK7A*, and *6CB6*), a germanium mixer and a self-contained power supply. All three sections are shielded to minimize oscillator radiation. Double-tuned *rf* circuits are said to reject spurious signals and provide correct bandpass and flat response. Has input terminals for both *uhf* and *vhf* antennas. For *uhf* reception in master *tv* systems, there is available a single-channels. Model features three tubes, (*6AF4*, amplifier. (*Models BTU-1 Ampliverter and UC-1; Blonder-Tongue Laboratories, Inc.*)

The legs may be one-fourth or one-half wavelength, or a sub-multiple, such as one-eighth wavelength, depending upon the available space and the frequency band with which the antenna is designed to operate.

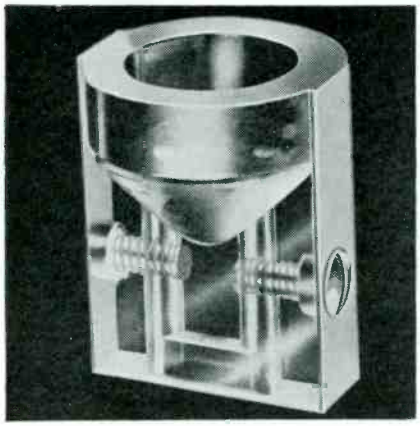
The sensitivity to horizontally or vertically polarized waves can be accentuated as desired by properly com-

(*Continued on page* 88)



Tele-Coupler which permits use of one antenna with two TV receivers. Engineered for most TV receivers with either 72 or 300 ohm input. Coupler is said to reduce reflections. (*Model C-2; Vidaire Electronics Manufacturing Co.*)

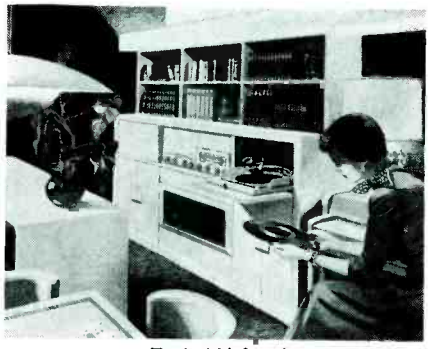
Solderless transmission line splicer designed to provide a constant-impedance splice of tubular types 300-ohm line to flat types. Molded of polystyrene. Ends of polyethylene transmission line insulation are completely covered. (*Type 29-S; Mosley.*)



AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART



Typical hi-fi package installation.

Hi-Fi Package Designs . . . Speaker Enclosure Structures

THE SELECTION of *hi-fi* units for a complete system often presents a complex problem. Although each of the items features sound and thorough engineering it is not always possible to achieve maximum efficiency because the separate components are not expressly designed to match each other. Several solutions have been proposed: It has been suggested that certain mechanical and electrical characteristics be standardized; system design be considered as a base factor; and units be selected for matched qualities by specialists to provide a package.

Recently the package approach has appealed to many and there has appeared an interesting series of matched *hi-fi* packages. At left and on p. 52 is illustrated one such group with four selected items: tuner, amplifier, changer and speaker.[1] According to the supplier of this *hi-fi* assortment, everything necessary for a custom installation, including all hardware, plugs, jacks and matching connecting cables of correct impedances, are furnished.

The amplifier used in this system, diagrammed in Fig. 1, is said to have an undistorted power output of 10 watts with a frequency response flat within 1 db throughout a 20-20,000-cps range. Featured is a separate, switchable preamp-equalizer stage for use with a variable-reluctance phono pickup. Separate bass and treble tone controls provide boost or attenuation. Hum level is claimed to be −70 db down. Output transformer can be used for multiple speaker installations when desired.

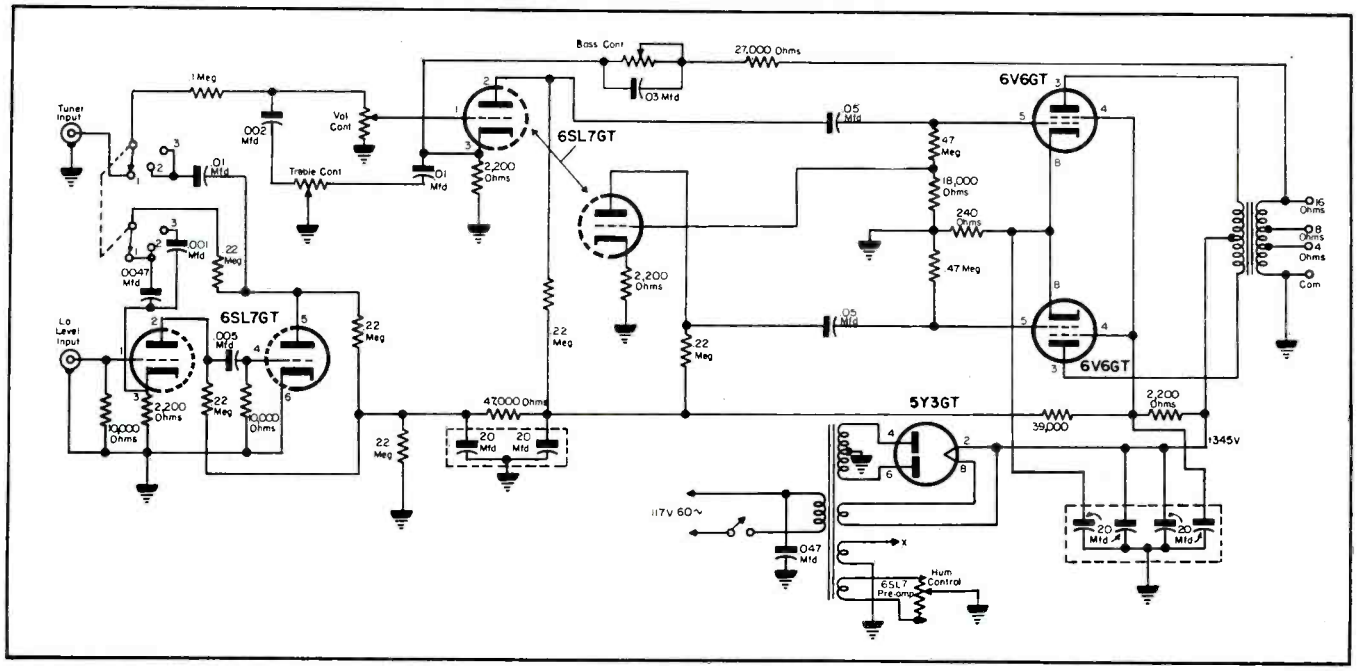
A 6SL7GT serves as the preamp tube, and another 6SL7GT is used for phase inversion. In the power output are two 6V6s.

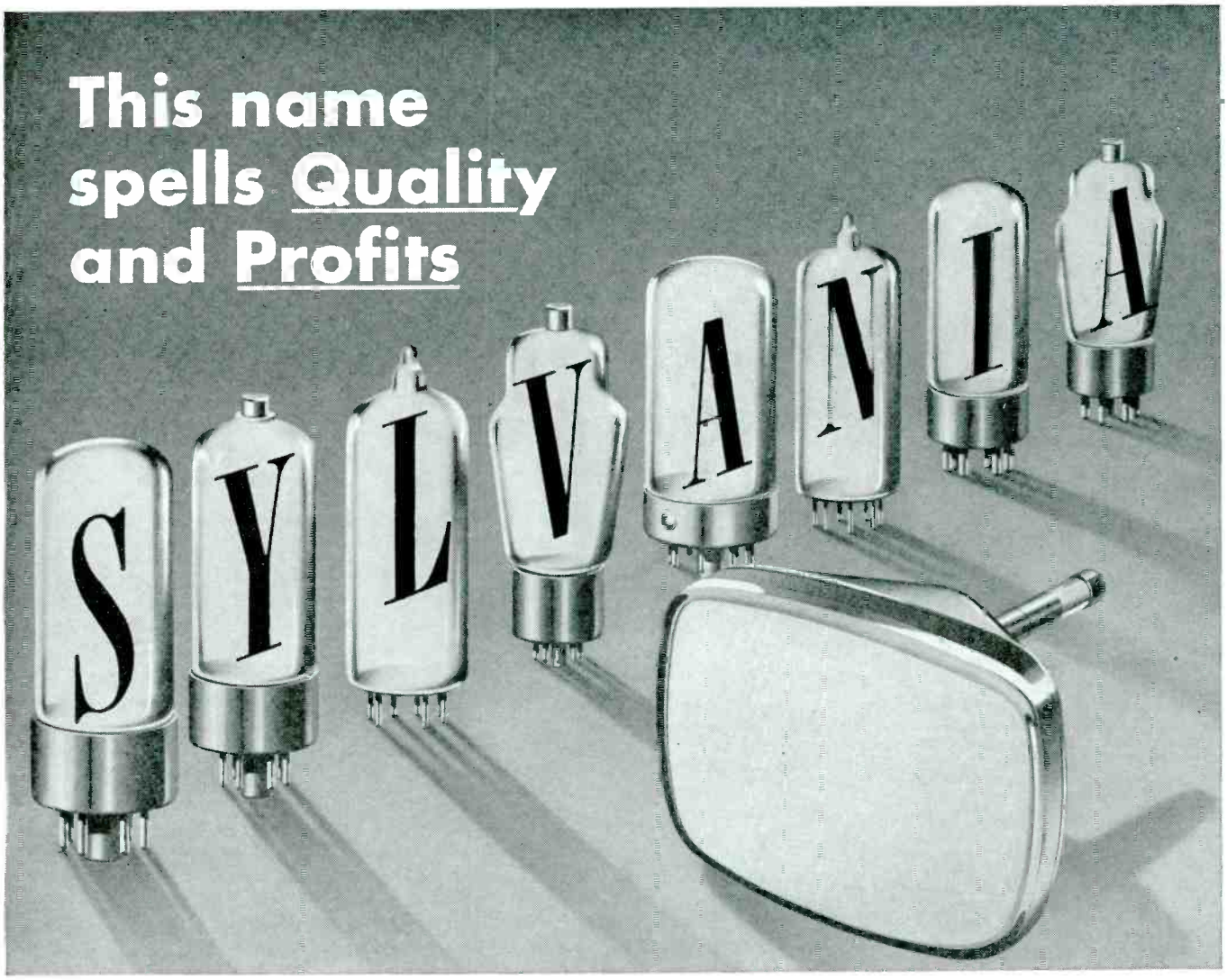
The changer is a 3-speed *push-off* type with a velocity trip mechanism. To silence amplifier during change

(*Continued on page* 52)

[1] Meissner.

Fig. 1. Circuit of Meissner 9-1160 10-watt amplifier which features a preamp stage.





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Audio

(*Continued from page* 50)

cycle, a muting is provided. Pickup is a triple-play variable reluctance cartridge.[2]

The tuner, for AM or FM, is said to have a frequency response of ±2 db from 50 to 15,000 cps.

Speaker is a coax type, combining tweeter and woofer principles, with two separate cones driven from a common voice coil. A built-in mechanical *crossover* at 4500 cps divides the audio spectrum properly between the two separate cones. Frequency response is claimed to be nearly flat throughout the 20-15,000 cps range. Power handling capacity is 15-20 watts. Overall dimensions are 12⅛″ diameter and 6⅜″ depth. Requires an 11″ baffle opening.

Cabinet Requirements[3]

In installing speakers, of the type selected for this system, four basic conditions[4] must obtain.

The cabinet must be rigid enough to insure a minimum of housing vibration caused by the speaker. Undesired vibrations can cause not only unnatural reproduction due to rattle and resonances, but can also introduce a severe case of michrophonics. Where cabinet design will not permit the elimination of vibration in the cabinet itself, it may be necessary to shock mount the phono mechanism and also the amplifier chassis. Standard parts are available for shock mounting and in most cases are supplied with the phono's mechanism.

The location of the speaker or speakers should be such that directly radiated sound waves will not strike the amplifier chassis or the record player mechanism. If, for instance, it is necessary to mount the speaker directly below the record player mechanism, a barrier (not less than ⅜″ plywood) should be built under the record player mechanism.

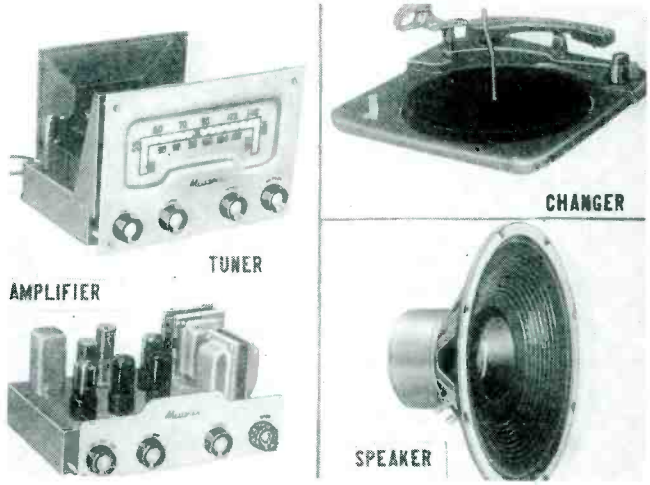
Adequate ventilation should be provided for the amplifier chassis. As a *minimum* space, an open backed cabinet having a depth not greater than 18″ and an amplifier compartment not less than 13″ wide and 8½″ high is recommended. Under no conditions should the amplifier chassis be built into a closed compartment.

The baffle board on which the speaker is mounted should be as heavy as practical. Not less than ½″ thick

(*Continued on page* 86)

[2]G. E. [3]See Mark Vino discussion, this issue; p. 54. [4]From Meissner service notes.

Fig. 2. Four key units in a packaged hi-fi assembly. (*Courtesy Meissner*)



A Chassis Merchandising Plan for TV Service Men

by C. K. STERLING

On Many Occasions, it has been noted that Service Men are in an enviable position to promote the sale of accessories, and even complete radio and TV receivers.

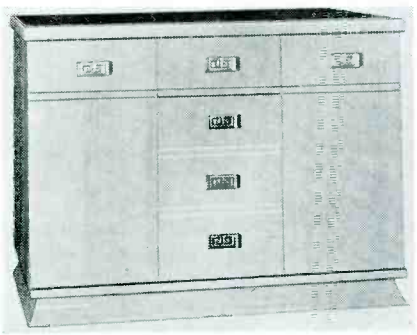
Since most consumers are aware of the Service Man's working knowledge of chassis of all types, expert advice is sought from these men. They are asked to offer not only unbiased technical opinions on the efficiency of the chassis or accessory, but their relative dollar values.

Many Service Men have capitalized on this interest through various merchandising ties. As an example, selecting chassis felt to warrant sincere recommendation, dealer-distributor cooperative plans have been set up and consumers have been directed to these sales establishments for closings.

Noting the significant success many of the boys have had in developing such sales, one manufacturer[1] has evolved a program which makes it possible to sell chassis and cabinets, too, on a direct basis, yet without an inventory, if so desired.

The plan features the use of a three-dimensional electrically-illuminated viewer, which illustrates in life-like perspective, a variety of cabinets available for the chassis, which, in this instance, is the 630 type with many improvements. To assist further, a complete price and additional data catalog are supplied. Included in the modified chassis are a link-coupled cascode tuner, a retrace-blanking circuit, cosine yoke, provision for phono connection and switch, 12-inch *pm* speaker, 17 or 20-inch picture tubes, plus a 10-watt audio system.

[1] Transvision.



(Right) Modern cabinet, included in merchandising plan, with provision for TV, phono, radio, record compartment or bar.

(Left) Another type of cabinet available for TV, radio and phono.

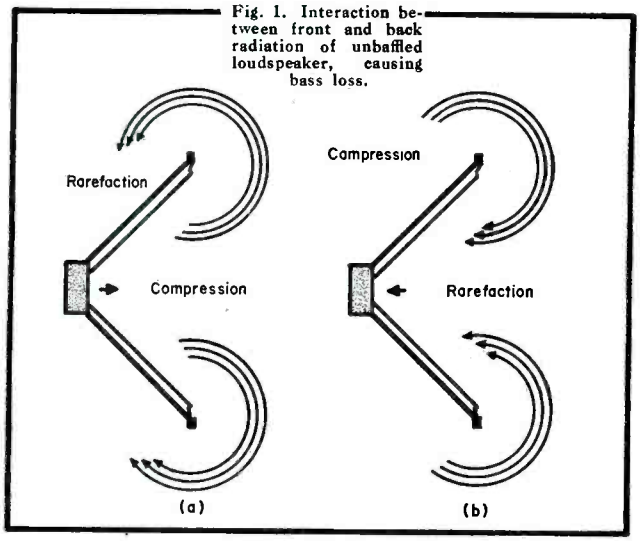


Fig. 1. Interaction between front and back radiation of unbaffled loudspeaker, causing bass loss.

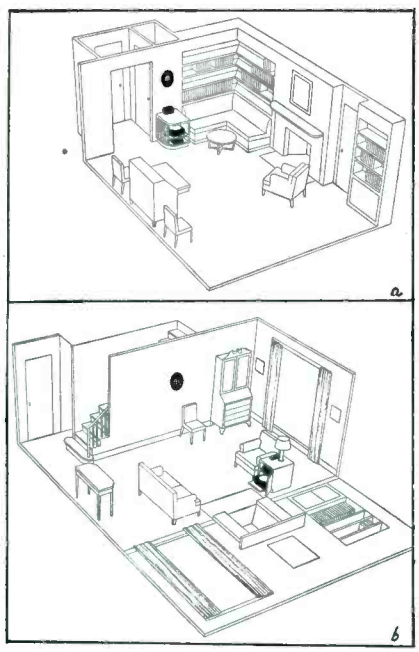
MOUNTING

Evaluating Efficiency of Baffles, and Open and Closed Enclosures Which Can be Used to Mount Speakers . . . Mounting Precautions . . . Measuring Effectiveness of Bass-Reflex Cabinets . . . Horn Properties . . . Mount Locations

THE PURPOSE of all loudspeaker mounting devices is the same; to enable the speaker to get a better *bite* of the air, particularly at the lower frequencies, so that speaker-to-room coupling is improved. A speaker may have a very even response to a wide range of frequencies in terms of voice-coil motion, but if it is improperly mounted performance will be quite poor. The bass will be thin *acoustically*, and will probably have a higher percentage of distortion.

The effects of efficient acoustical coupling for the speaker are all good. The effective mass of the air load lowers the speaker's resonant frequency, bass response is improved and extended downwards while bass distortion is decreased, and the tendency of the speaker system to *hang over*, or continue to vibrate after the signal has stopped, is decreased.

A *baffle* is a separator between the area faced by the front of the speaker cone and that faced by the back. The cone itself acts as a separator at high frequencies, but in the bass the pressures and rarefactions produced by the two sides of the cone tend to cancel each other out. When the cone moves forward the air merely slips around the speaker edges to fill in the vacuum that has been created simultaneously at the back, instead of carrying acoustical energy into the room;; see Fig. 1. When this interplay is prevented by a separating wall, however, the pressures and rarefactions created by the speaker must be radiated into the room, and the loss of bass is prevented.



The term *infinite baffle* does not mean that the separating wall is limitless in size, but that two requirements have been met:

(*1*) The baffle is large enough so that no significant interplay between front and back can occur at the lowest frequency produced by the speaker. With an open flat baffle this would mean a diameter of almost 9′ for a low frequency limit of 60 cycles.

(2) The enclosure into which the rear of the speaker faces, if such exists, is large enough so that the elastic suspension system of the speaker is not appreciably stiffened. When speaker motion has to compress and rarefy a small volume of air at the back, the resonant frequency of the speaker's mechanical system, which determines the low frequency cut-off of the speaker, is raised. Thus bass response is degraded, and the effect of the speaker resonance peak is made more annoying.

One excellent way to achieve infinite baffling is to mount the speaker in a wall, closet, stairwell, etc., as in Fig. 2. In this way all interaction between the front and back of the cone is prevented, while the rear of the speaker faces into a very large space. When closets are used the presence of the normal coats and dresses do no harm, and possibly some good.

Several precautions must be taken, however, with this type of mounting. The speaker should be screwed or bolted securely to architectural members, or if a separate baffle is used it must be thick, sturdy, and as small as possible to prevent vibration. Quarter-inch or half-inch plywood should never be used for a baffle.

A second necessary precaution is to see that the speaker does not face, either forward or backward, into a long enclosure that effectively forms a resonating air column. When the shape of the rear space unavoidably has pipe-like characteristics, the adverse effect may be at least partially counteracted by lining this space with sound-absorbent material.

Although wall or stairwell mounting is excellent acoustically, landlords

Fig. 2 (*left*). Two types of speaker mounts. In *a* we have a closet door used as a loudspeaker mount, while in *b*, the speaker is mounted in space under stairway. (*Courtesy Altec Lansing*)

Fig. 2*c*. Duplex speaker and associated hi-fi units installed on back of a closet door. (*Courtesy Altec Lansing*)

The LOUDSPEAKER

by MARK VINO

tend to lack enthusiasm for this sort of architectural improvement. The effect of the infinite baffle is therefore more popularly achieved by the use of speaker cabinets. A totally-enclosed cabinet will, of course, prevent bass loss caused by front-to-back interaction, and if it is big enough the speaker suspension will not be stiffened. The necessary size of a cabinet-type infinite baffle depends upon the speaker used; not directly on its size but mainly on the stiffness of the cone suspensions. The closest available index to this stiffness is the resonant frequency. A speaker with a 40-cycle resonant frequency (this is unusually low) normally requires a minimum cabinet volume of the order of 16 cubic feet for infinite baffle performance; a speaker with a 60-cycle resonant frequency requires a minimum cabinet volume of about 10 cubic feet; and a speaker with resonance at 80 cycles requires a cabinet volume of about 6 cubic feet. In general, the larger the speaker the lower the resonant frequency, but this is not always true.

All totally-enclosed cabinets, whether of the infinite baffle or other type, must be constructed with a maximum of rigidity and solidity. Joints should be glued and reinforced, large flat areas should be braced with cross-bars to break up possible resonant vibrations, and material thinner than ¾" should not be used anywhere. This is especially important with cabinets which are totally enclosed, because the internal acoustical pressures become very great.

In addition to the foregoing measures, speaker cabinets must be lined with sound-absorbent material to absorb the higher frequencies and avoid standing-wave resonances of the type that occur in organ pipes. Special lining materials may be purchased, or ordinary *rug-silencer,* tacked to all inside surfaces, may be used satisfactorily. The same effect is achieved by filling the entire cabinet with a very soft, light, and cottony substance.

An open-backed cabinet usually exhibits an annoying acoustical resonance somewhere below 200 cycles. The upper bass is made heavy and the sound is boomy and unnatural. However, when the volume requirements of the infinite baffle enclosure cannot be met, the use of a few openings at the back of the cabinet will relieve some of the acoustical pressure on the speaker suspensions, and will not normally affect the performance in other respects to any significant degree.

A grille cloth is almost always tacked onto the baffle to protect the speaker from dust and to improve appearance. It is important that this cloth be of a lightly woven material. A simple check will test the suitability of any material. It should be stretched, held close to one's mouth and then blown through. If the cloth creates an appreciable resistance to the passage of air it should not be used.

Further speaker protection from possible damage by feet, children's toys, or probing screwdrivers may be furnished by a metal grille, which will do no harm acoustically if it does not rattle or sing.

The Bass-Reflex Enclosure

One of the very popular speaker cabinets is the bass-reflex or tuned port enclosure (Fig. 3), an enclosure which has been both praised and maligned in audio literature. When improperly used its performance may be quite poor, and in such a case stopping up the port has often improved the overall results. Properly used, however, the bass reflex cabinet makes possible the use of smaller cabinets than are required by the infinite baffle. In addition, the bass resonance of the speaker may be counteracted by the anti-resonance of the enclosure, which is called, in acoustics, a *Helmholtz resonator.* Reducing the *excursion* of the speaker cone at resonance improves the eveness of frequency response, improves damping (that factor which tends to oppose sharp resonance and hangover), and decreases harmonic distortion.

A cabinet of smaller volume may be used because the stiffness of the air in the enclosure, which at low frequencies is compressed and stretched unformly like a spring, is balanced by the acoustical mass of the air in the port, in the same way that inductance may balance out capacitance in a resonant electrical circuit. The air in the port moves back and forth, and has the same effect on the outside air as a diaphragm or piston would. At acoustical resonance, output from the port, in the same way that inductance simultaneously impeded to a maximum degree by the enclosure anti-resonance. Thus, if the acoustical resonant system is tuned to the same frequency as that of the speaker, cone excursion is reduced without acoustical

(*Continued on page* 56)

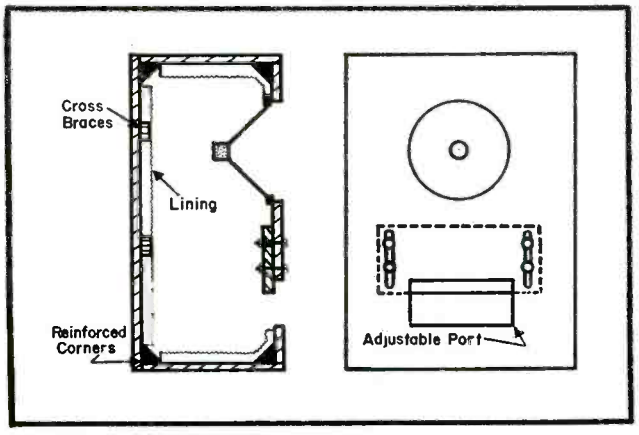
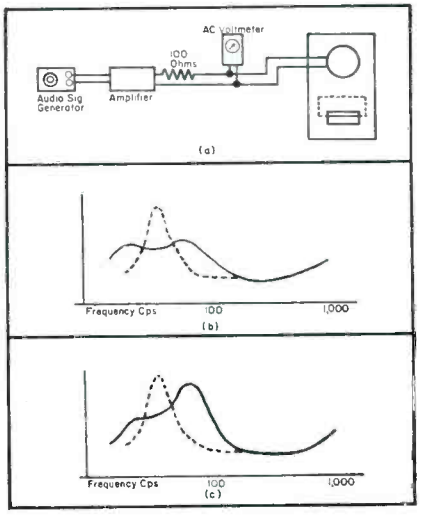


Fig. 3. Bass-reflex cabinet with adjustable port. Dimensions are normally less than those listed for infinite baffle enclosure. Typical values for an average 12" speaker are: volume, 5 cubic feet, and port opening (before adjustment), 125 square inches. Shape of port and relative dimensions of enclosure (as long as pipe-like shape is avoided) is a matter of taste. The port area may be divided between two or more openings if preferred. If a separate tweeter is used it may be mounted above the woofer or on top of the cabinet.

Fig. 4. Method of tuning bass-reflex cabinet, and results achieved. Dashed lines in *b* indicate shape of voltage versus frequency curve (representing speaker impedance) with port closed, while solid line shows shape of curve when port opening is optimum size. Shape of curve with port closed is noted in dashed lines of *c;* shape of curve with incorrect port opening appears in solid line curve. Performance would be better with the port closed.



Loudspeaker Mounting

(*Continued from page* 55)

output suffering, and the adverse effects of a smaller enclosure for the back of the speaker are cancelled.

Bass-reflex cabinets must, therefore, be tuned to the particular speaker which is mounted in them. An accurate job requires an audio signal generator and an *ac voltmeter* with a scale at least as low as 0—5 volts. The procedure is illustrated in Fig. 4*a*. The speaker is connected to its amplifier—either the one in the assembly, or the output stage of the signal generator, if this unit has a power amplifier incorporated in it—through a carbon resistor of one or two-hundred ohms, and the *ac* voltmeter leads are clipped across the speaker terminals. The audio signal is then varied over the range of speaker resonance, which will ordinarily be somewhere between 40 and 100 cycles. With the port completely closed there will be a pronounced voltage peak at speaker resonance, as shown by the dotted line in Fig. 4*b*. When the size of the port is adjusted to its optimum dimensions this peak is severely reduced, as shown in Fig. 4*b* by the solid line, and two new, smaller peaks appear on each side of the original. These peaks are of the same nature as the double-humped response peaks of over-coupled electrical tank circuits.

A port size which is slightly off will create a curve whose two peaks are unequal in height; a port size which is very much off will create either the original high peak or two widely separated, pronounced peaks, one for the speaker and one for the enclosure. The port dimensions can be adjusted by any simple mechanical method (such as blocking off portions of the opening) to achieve the correct curve, and then fixed permanently. Decreasing the port area for a given cabinet volume lowers the resonant frequency of the enclosure. The acoustical resonant frequency may also be lowered by extending the port inwards, like a pipe.

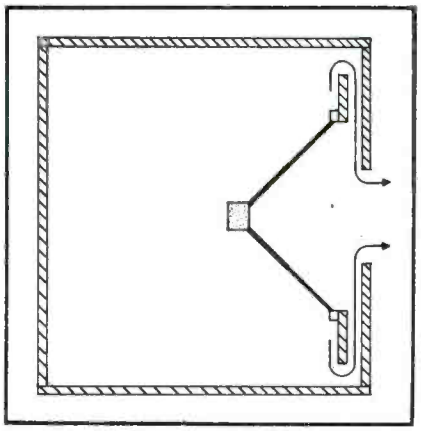
Once the interior of the cabinet is properly lined to prevent air column resonance, and if the cabinet is not pipe-shaped, the resonant frequency of an enclosure with given volume and reflex opening will not be affected by the relative cabinet dimensions. The length of the path from speaker to port has nothing to do with the operation of the Helmholtz resonator. As a matter of fact, the port is often placed as close as possible to the speaker to form a unified acoustical driving source.

A further refinement of the above tuning procedure may be introduced by tacking pieces of cloth across the final port opening, layer after layer, until the two new resonant peaks are themselves reduced by the *damping* effect of the cloth. Too heavy or too much cloth will cause a return to the single, high amplitude peak.

The R—J Enclosure

An extension of the principles of the bass-reflex cabinet has been incorporated in a recent development, known

Fig. 5. R—J speaker enclosure.



as the R—J enclosure‡; Fig. 5. This design is also based upon the principle of the Helmholtz resonator, but the values of the stiffness and acoustical mass are made so great as to overshadow the equivalent elements of mechanical stiffness and mass of the speaker. The air enclosing the back of the speaker is so stiff by reason of its small volume, and the counter-balancing acoustical mass of the two ports is so great by reason of the port dimensions, that the resonant frequency of the complete system is formed primarily by the acoustical enclosure rather than by the mechanical mass-elasticity system of the speaker. Therefore, tuning is not necessary, and baffling may be achieved in an enclosure not much bigger than the speaker unit itself, without having to worry about raising the resonant frequency of the speaker. Cabinets are made in convenient shapes for unobtrusive mounting in bookshelves or similar small spaces.

Horns

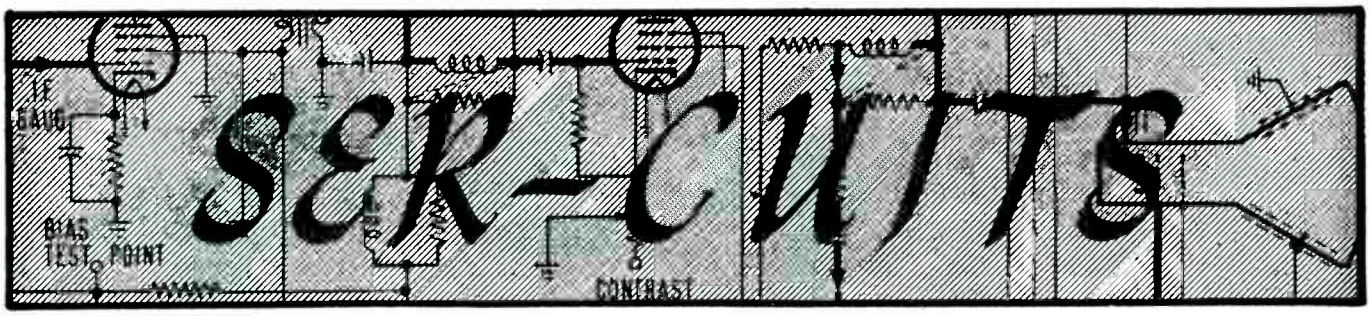
The most efficient acoustical coupling device for a loudspeaker is the horn. A source of sound at the narrow throat of the horn moves the layer of air immediately ahead of it, which in turn moves the slightly larger layer of air ahead of *it*. Each successive adjacent layer of air, which is only slightly larger than the one preceding it, is moved in its entirety, so that by the time the sound has reached the mouth of the horn the vibrating source at the throat (a speaker diaphragm or cone) has engaged all of the air in the horn, and the effective radiating area of the throat is increased towards that of the mouth.

Horns may be incorporated into the design of the original speaker, as in the case of certain tweeters or public-address speakers, or a conventional cone-type loudspeaker may be used for the driving unit of a separately constructed horn, usually of wood. The horn system provides the best possible mounting from the point of view of full, undistorted bass, but requires very large structures, even when folded. For good bass reproduction the mouth area must be large, yet the rate of flare must be gradual. The disadvantages of horns are therefore size and expense.

When different speakers are used to cover different portions of the frequency spectrum, and if some of the speakers use horn coupling while others do not, care must be taken to

(*Continued on page 90*)

‡Named after inventors, Robbins and Joseph.



by M. W. PERCY

27-Inch 90° Picture-Tube Chassis Circuitry‡

ABOUT A YEAR AGO, it was noted in these columns that the demand for larger and larger picture tubes was growing, and it would eventually be necessary to produce more and more chassis with tubes of the 24 to 27-inch variety, particularly the latter type.

During the past few months, there have appeared quite a few lines featuring 27-inchers, with many noteworthy circuitry developments evolved to provide higher contrast and better definition so necesary with enlarged images. An interesting example of this type of design appears in Fig. 1, which illustrates partially the circuit used by Magnavox in their 27-tube model CT-358, 107 series, using a 27-inch 90° picture tube.

The chassis also has a cascode *rf* tuner and an increased sensitivity full-bandwidth video *if* amp. A wide-band video amp has been included to provide the improved contrast and definition. A high-gain intercarrier-sound *if* amp with limiter and ratio detector, and a 10-watt push-pull audio amp are also featured. In addition, there are direct provisions for a *uhf* tuner.

Cascode RF Tuner

The cascode *rf* tuner consists of a 6BQ7 *rf* amplifier and 6U8 mixer-oscillator.

The secondary of the antenna transformer is tuned for each channel by shunts with the proper value of inductance to make it resonate with the 6BQ7 input capacity. The circuit also has an *if* trap, which is tuned to 44.5 mc for best average *if* rejection on all channels. To further minimize *if* interference an external *if* trap assembly is incorporated for those few areas where the overall *if* interference is severe. These traps are series-connected in the receiver antenna leadin to be tuned to give maximum rejection at the undesired *if* frequency.

Tuning of the *rf* plate and mixer grid is accomplished by wafers which are identical to *rf* grid wafer. Coupling capacitors connected between appropriate points provide the necessary coupling for the proper bandpass on all channels. The *rf* 6BQ7 is used in a cascode circuit (triode *1* grounded cathode, triode *2* grounded grid) to minimize triode feedback and provide a good signal-to-noise ratio with good stability. In the mixer ½ of a 6U8 pentode is used because of its low feedback characteristic with 41 mc *if*.

To reduce high-band radiation from the main TV chassis, common low-side capacity coupling is used to the first *if* tube grid circuit, and the tuner chassis is connected to the main chassis only at the tuner's rear apron.

Video IF

The video *if* amplifier operates at a picture carrier frequency of 45.75 mc, with a design bandwidth of 4 mc at −6 db, and consists of a double-tuned circuit (low-side capacity coupled), followed by a staggered quadruple. This double-tuned circuit consists of two similar coils that are physically separated, one in the tuner (converter plate coil), and one in the grid circuit of the first *if*.

The remainder of the *if* amps consist of four stagger-tuned stages, using 6CB6s for maximum stable gain. Inductively coupled to the first, second and third *if* plate coils are three traps, similar to that on the *if* input coil. Two of these traps are tuned to 47.25 mc (adjacent channel sound) and one to 39.75 mc (adjacent channel picture). An additional 41.25-mc trap is capacity-coupled to the plate of the second *if* tube to provide additional co-channel sound rejection.

The first and second *if* stages are in series; this was found to reduce the drain on the low-voltage supply and at the same time provide a relatively *stiff* effective *B* voltage for better *agc* action. Similarly, the fourth *if* tube is in series with the sound *if* amp.

To provide stability, all *if* coils and traps, with the exception of the capacity-coupled 41.25-mc trap, are shielded; a 1N64 detector is enclosed in the fourth *if* can. Two *rf* chokes with a self-resonant frequency of 43 mc provide isolation of the *if* amp and prevent stray coupling of the *rf* component.

Video Detector and Sound IF

As indicated, the chassis employs intercarrier sound *if* (4.5 mc), produced by the video detector, a 1N64 crystal diode, located within a shield can also containing the final *if* bifilar coil, bypass capacitor and *if* stabilizing filter choke.

The 4.5-mc intercarrier sound *if* signal is amplified by a single tuned first sound *if* amp, 6AU6, and in turn fed to a 6AU6 limiter stage. The limiter stage drives a conventional ratio-detector circuit which provides additional AM rejection, and affording improved FM performance in the recovered audio. Both grid and plate limiting occur in the limiter stage.

In the audio amp a resistance-coupled voltage amplifier phase inverter stage, 12AX7, drives a pair of 6V6GT push-pull output tubes, to provide 10 watts audio output.

The video amplifier employs two stages to provide full bandwidth and up to 130 *v* p-p drive voltage; the first stage is a 6CB6 direct coupled to the video detector for noise clippling. Sync and *agc* takeoff is from the plate side of the 6CB6, the 6AU6 *agc* tube, V_{206}, being *dc* coupled to this point.

The video signal is *ac* coupled to the grid of the 6K6GT video output tube. By means of grid current, *dc* restora-

(*Continued on page 87*)

‡From notes prepared by service department of Magnavox.

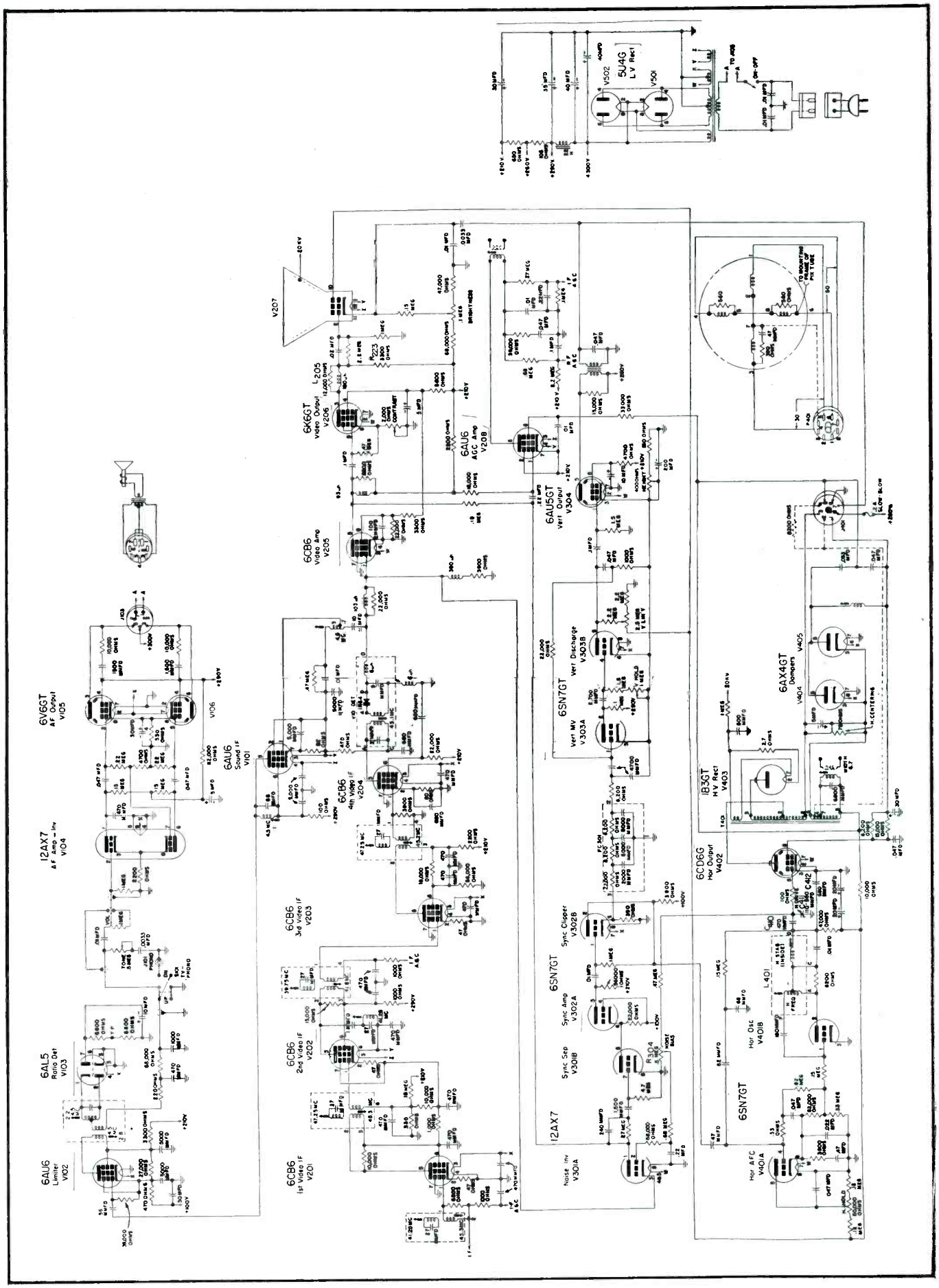


Fig. 1. Partial circuit of the 27-inch picture-tube chassis; *Magnavox CT-358*.

Servicing Helps

Horizontal-AFC Adjustment Procedures Video-IF Alignment . . . Width-Coil Adjustments . . . Improving Stability with Filament Chokes

by M. A. MARWELL

DUE TO THE DIFFERENCE in the horizontal circuits of the Capehart CX-36 and CX-37 chassis, different alignment procedures must be used for the horizontal oscillators.

There is no horizontal hold front panel control on the CX-36. To correct any misalignment of the horizontal circuit, the 6AL5 horizontal *afc* detector must be removed and the horizontal frequency slug on the rear of the chassis adjusted until one slowly rolling picture and one vertical blanking bar appear. Then the 6AL5 can be reinserted and, after the tube warms up, the picture should be perfectly synchronized. To check adjustment of horizontal phasing after the horizontal hold adjustment has been completed, the picture should be decentered so that the right hand edge of the raster is visible. Adjustment for maximum brilliance should follow and contrast control should be reduced until the raster edge can be plainly seen. There should then be visible 3/16" between the edge of the raster on 17" tubes and ¼" on 21 tubes. If the picture is out of phase, the horizontal phasing slug on the rear of the chassis should be adjusted until the picture is properly phased. If a considerable amount of change is required it may be necessary to readjust the horizontal frequency as described. If phasing is too far out of adjustment, it will be difficult to center picture.

On the CX-37 chassis the front horizontal hold control should first be turned from one extreme to the other and the amount of picture shift noted. When adjusted to both extremes, the control should vary the picture phasing by an equal amount. The picture should be properly phased when the front horizontal hold control is in the approximate center of its range. If these conditions do not exist, two adjustments will have to be made.

The cover from the rear of the *hv* compartment should be removed and with a jumper, the two terminals provided on the lug strip just inside the high-voltage compartment should be shorted. This will short out the horizontal ringing coil.

Then, the rear horizontal hold control should be adjusted so that when the front horizontal hold control is on center, the picture will be properly phased. Then the jumper can be removed. The slug of the ringing coil should be adjusted so that the front horizontal control will properly phase the picture at the middle of its range, and equally misadjust the phase or frequency at the extremes of rotation.

Misalignment of the high bandpass video *if* in the Capehart CX-36 chassis can cause extreme loss of definition and various troubles such as ringing and what appears to be a lagging reflection. Reduction in bandpass width can be caused by misalignment of the 41.25 and 47.25-mc *if* traps. These are the top slugs of transformers T_{202}, T_{203} and T_{204}.

Width Coil Adjustment

If it becomes necessary to move the slug in the width coil of the Magnavox 107 series chassis to within ¼" of its maximum outward position to obtain proper width, the .0068-mfd capacitor should be removed and readjusted.

With the width coil slug in the outward position the minimum inductance will be well below specified minimum resulting in overheating and burning of the width and keyer coils.

This procedure will be necessary only on chassis now in the field, as the coil specifications have been changed and the value of the capacitor (C_{417}) changed to .0022 mfd.

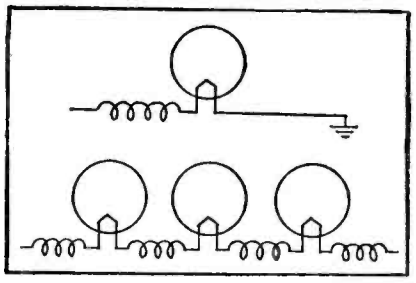
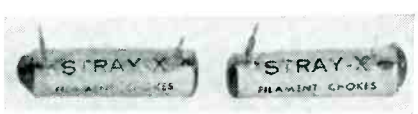


Fig. 1. Parallel (*top*) and series (*bottom*) hookups for TV chassis filament chokes, illustrated below.



6U8 Replacements

It has been found that some 6U8 tube types are better than others as replacements in the Admiral 19 series chassis in the vertical oscillator and third *if* amplifier. This is a critical circuit and some tubes may not work satisfactorily in this application. A weak 6U8 may often be the cause of insufficient height.

Variations of 1B3GT HV Rectifiers

In all makes of 1B3GTs except one‡ pin *5* is an open pin. In the exception pins *5* and *7* have been internally connected. If the latter type tube is used in Sentinel models 462 and 463 (with pins *5* and *7* internally connected) the 8.7-ohm current limiting resistor connected between these terminals on the socket will be bypassed resulting in excessive filament voltage, and therefore short tube life.

Accordingly if this tube type is used as a replacement, pin *5* should be clipped off the tube base. In Sentinel models 454, 455, 456, and 457 the 1B3GT filament current limiting resistor is only 2.2 ohms. While the life of the 1B3GTs with the internally-connected pin would not be seriously affected in these models, it will be wise to clip pin *5* off the tube base.

Improving Stability

In some TV chassis, oscillations or *strays* are frequent. Fed through to the filament circuit, they can upset the stability of the sync and in intercarrier models cause hum. To eliminate this problem filament chokes** can be used to isolate the *hot* circuits; they can be installed in series with the filament of the sync tubes, as illustrated in Fig. 1. The chokes have also been found to improve video and picture circuits, where sync pulse is taken from the video output tube; in this instance the chokes can be installed in the video and picture-tube filament circuits.

****Gemco StrayX;* Great Eastern Manufacturing Co., Brooklyn 12, N. Y. ‡G.E.; models with pin *5* open will soon be available.

H. D. Suesholtz,
General Manager,
Transvision, Inc.

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YOU CARRY NO STOCK: With my Sales Kit you sell from our million-dollar inventory. We ship either to you, or direct to your customer, as you wish. **YOU MAKE 2 INCOMES FROM EACH SALE** — *profit on the set,* and a fee for the *installation* (we expect all of our Factory Agents to be *competent installation-and-service men*).

YOU CAN BEAT COMPETITION: Our prices on giant screen TV sets will enable you to meet and best competition at a *good profit.*

YOU SELL THE FINEST SETS: You sell sets with the incomparable **RCA-licensed 630 Chassis** — the finest on the market — or the famous fine-quality **Transvision A4 Chassis.** You have a wider sales range — a greater choice of *Table Models, Consoles, Combinations,* in screen sizes from 17" to 21". *You have a set and a price for every prospect.*

SECURE YOUR FUTURE: Don't lose time. Get started making more money now. *Fill out and mail the coupon to me — TODAY!*

CLINCH SALES
In prospect's home with my 3-Dimensional Illuminated Viewer, Natural Color Slides, and Salesman's Catalog.

We offer the LATEST, 31-tube

630 TYPE RCA licensed CHASSIS with High-Fidelity Sound

This famous Chassis offers many exclusive features, including . . . high-fidelity sound . . . flat response, 60-12,000 cycles . . . push-pull amplifier . . . 31 tubes (27 tubes, pic tube, 3 rectifier tubes) . . . designed for optimum UHF performance . . . handles all picture tubes up to 24" . . . made with only the finest parts . . . carries standard RMA Guarantee.

Buy this great Chassis direct from my factory.

BEAUTIFUL, IRRESISTIBLE CABINETRY: **This illustration is only suggestive of our vast line of gorgeous TV Sets. *Get the SALES KIT. See the Natural-Color Slides.* You'll agree that Transvision offers the hottest TV deal in the entire industry!**

SEAL OF APPROVAL — ASSOCIATED RADIO-TELEVISION SERVICEMEN — A RTS — NON-PROFIT ORGANIZATION — DEDICATED TO *Integrity* IN TELEVISION SERVICING

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TRANSVISION, INC., NEW ROCHELLE, N. Y. Dept. S-3A

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Determining if Scope is Operating Properly . . . Checking for HF Voltage Feeds . . . Locating Grid-Current Flow Which Can Cause Response Curve Distortion . . . Residual Voltage Pattern Types . . . Birdies . . . Vertical Sweep Crosstalk and TV Station Signal Pips

In The Field‡

IN ADJUSTING VIDEO amplifiers, and sweeping, often no indication except a sort of marker, appears on the 'scope, unless a very low bias is used on the amplifier; then a pattern that is apparently meaningless appears. What is wrong?

Some 'scopes will not respond to a video sweep satisfactorily unless a suitable crystal probe is used between the output of the amplifier and the input of the 'scope. When the bias is greatly reduced, the amplifier becomes non-linear and begins to rectify partially the sweep signal. This, of course, represents abnormal operating conditions. Not only is it necessary to use a crystal probe *which has the same input impedance as the grid of the picture tube,* and which has a satisfactory response to 60-cycle square-wave modulation, but it is also *essential to include the picture detector* in the test arrangement; otherwise the video response curve will appear to have an abnormal high-frequency peak. The preferred test setup is shown in Fig. 1. A suitable crystal probe for this test appears in Fig. 2.

Fig. 1. Equipment arrangement for video amp adjustment and sweep. The *if* sweep signal and the *if* marker signal beat together in the picture detector to develop a 0 to 4-mc video sweep into the video amplifier. A true response curve is obtained because the input resistance to the video amplifier is normal. It is also essential to remove the socket from the base of the picture tube and utilize a crystal probe which has the same input impedance as the grid of the picture tube. The time constant of the probe must be suitable for satisfactory demodulation of 60-cps square-wave envelopes.

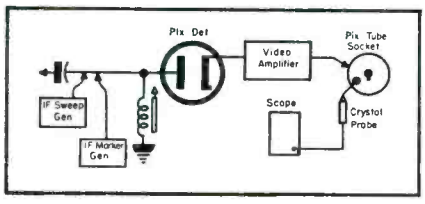
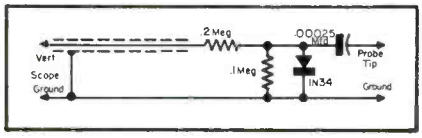


Fig. 2. A crystal probe suitable for developing the response curve of a video amplifier. The constructor must guard against the use of close-fitting shields over the components which seriously increase the stray capacitance to ground of the *rf* network in the probe.



IT HAS BEEN STATED that heater lines may carry *hf* voltages from one section of the receiver to another, thereby causing trouble. Is there any way of checking this situation?

Yes. A crystal demodulator probe is best adapted for a check of the presence of modulated high-frequency voltages on the heater line. If the spurious voltages are in the form of pips, better display can be obtained by using a very small capacitor, and feeding the voltage directly into the 'scope. Fig. 4 shows a 'scope display for the test.

CAN RECEIVER *take* off be due to feedback loops in sync or sync-sweep circuits?

Receiver *take-off* is occasionally caused by lack of neutralization in the sync circuit; in those receivers which require neutralization. Sync-amplifier leads must be properly spaced for neutralization. The procedure requires a number of steps, for which reference should be made to the receiver manufacturer's service data. In other types of receivers, feedback loops are provided between the horizontal-sweep circuit and the horizontal-oscillator circuit to develop a negative pulse on the output waveform from the horizontal oscillator; when components associated with the feedback loop become defective, the receiver frequently is thrown into oscillation.

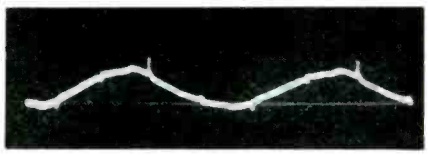
WHAT IS THE best way to determine whether a 'scope is operating correctly?

A square-wave generator should be used to check. Patterns illustrated in Fig. 3 will appear for 50, 1000, 10,000 and 100,000 pps.

WHAT IS MEANT by a birdie?

A birdie is a beat-frequency marker used in visual-alignment work. The structure of the marker is that of a low-frequency FM wave, as shown in Figs. 5 and 6. The birdie appears to revolve because the phases of the beating waves are continually changing slightly with respect to each other; this is equivalent to saying that the two frequencies are not completely stable.

Fig. 4. A small series capacitor in a crystal probe serves to attenuate 60-cycle heater voltage to a very small value, and provide this display; at the same time, if there are harmonics in the heater voltage, these harmonics will be relatively enhanced. Here is a case where the harmonics of the heater voltage are feeding through a crystal probe. Service Men must avoid confusing such harmonics with demodulated spurious *rf* voltages. In case of doubt, the *rf* and *if* tubes should be removed to determine whether the display is changed.



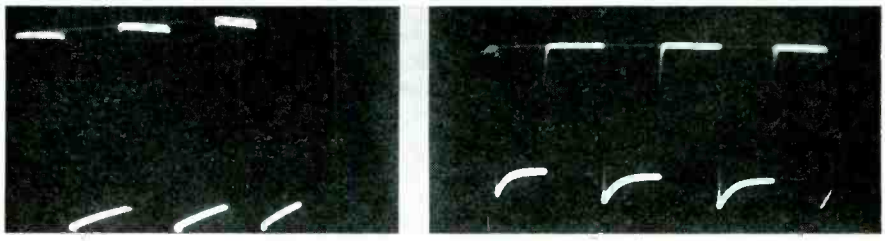
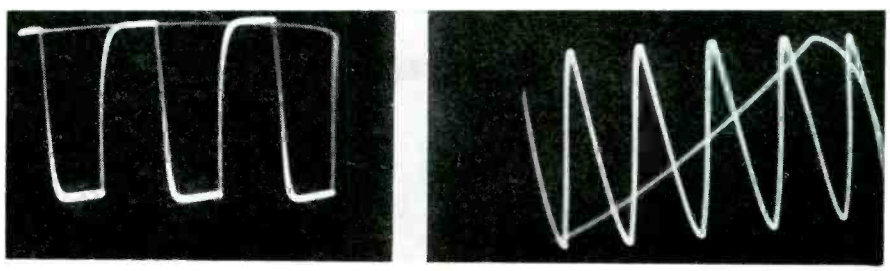


Fig. 3. Square-wave response of average shop 'scope: *A* (above left) = 50 pps; *B* (above right) = 1000 pps; *C* (below left) = 10,000 pps; *D* (below right) = 100,000 pps.



(*Right*)

Fig. 5. A beat marker, as seen on an *if* response curve, using 10 or 15-mc sweep width. The large sweep width has the effect of compressing the marker, as seen on a section of the curve.

GRID-CURRENT FLOW has been mentioned as one of the causes of distortion of the response curve during visual alignment. What is the best way to determine if such distortion is present?

A zero-volt reference line should be used from the sweep generator, and the 'scope display inspected for undershoot, as indicated in Fig. 7.

WHAT IS MEANT by the statement that it is possible to run down difficult troubles in a receiver by checking the amount of *ac* present in the *dc* circuits?

Every receiver has residual voltages present in the $B+$, $B-$, *agc*, and other supply lines. Faulty bypass capacitors, in particular, permit these residual voltages to rise, and impair the normal circuit operation. Fig. 8 illustrates typical waveforms and peak-to-peak residual voltages found in a good quality TV receiver, when operating properly.

WHAT IS MEANT by non-standard sync transmission?

Non-standard sync will be present at times during technical difficulties at the transmitter, when long cable hauls must be contended with, and also occasionally during tune-up at test-pattern time. Many defects in the sync can cause the signal to be non-standard. For example, a reasonably good receiver reproduction of standard sync appears in Fig. 9*a*, while in *b* a case of non-standard sync is shown. Poor interlace is another type of non-standard sync, which appears when the video signal is viewed on 60-cycle sweep; the odd pulses interleave with the even pulses, and when the interlace is poor, the observer will often see the odds *weave* back and forth with respect to evens, or, in some cases, successive odd and even pulses will be unequally spaced.

HOW CAN ONE tell whether a pip is caused by vertical-sweep crosstalk or by a TV station signal?

A crosstalk pip will disappear when the sweep-output tube is removed. The two pips also have different shapes, as shown in Fig. 10.

---

‡*Based on questions posed during meetings conducted by* **R. G. Middleton,** *senior engineer at Precision Apparatus Co., Inc., and author of TV Trouble-shooting and Repair Guide Book, published by John F. Rider.*

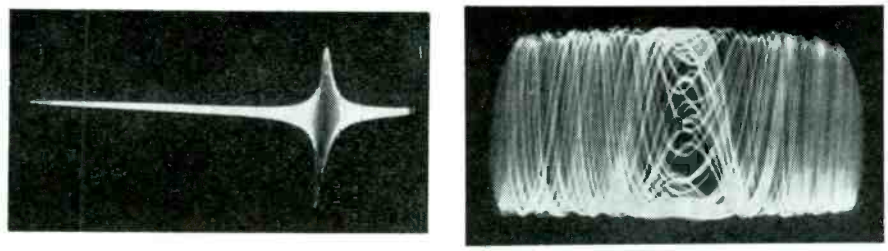


Fig. 6 (top right). The same beat marker (Fig. 5) becomes greatly expanded when the sweep width is reduced almost to zero. The structure of the marker is seen to be that of a low-frequency FM wave, the phase of which is continually shifting, causing the marker to appear to revolve around its axis.

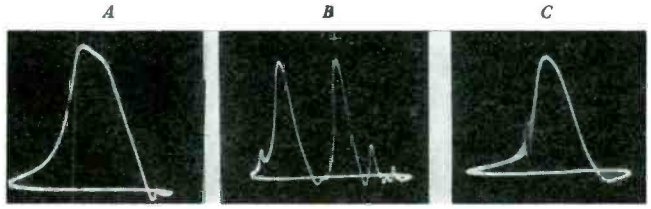


Fig. 7 (left). Displays indicating typical instances of grid-current flow in first video-amplifier stage due to overload during alignment: *A* — moderate overload due to application of excessive sweep voltage; *B* — severe overload due to excessive sweep voltage; *C* — overload due to excessive marker voltage. In each case, the grid-current flow shows up as undershoot of the curve below the zero-volt reference line.

Fig. 8 (below). Typical waveforms revealing residual voltages in a TV chassis: *A*—residual voltage across input to power supply (14 p-p volts); *B*—residual voltages across output of power supply (.1 p-p volt); *C*—residual voltage across sweep-decoupling capacitor (.05 p-p volt); *D*—residual voltage across 225-volt power-supply bus (.03 p-p volt); *E*—residual voltages across 135-volt power-supply bus (.01 p-p volt); *F*—residual voltage at grid of picture tube (1.25 p-p volt); *G*—residual voltage across *rf/if* grid-bias bus (.01 p-p volt).

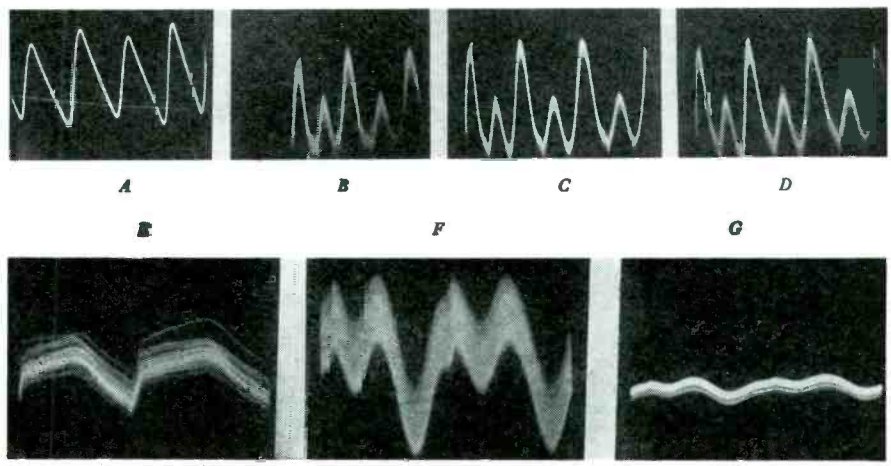
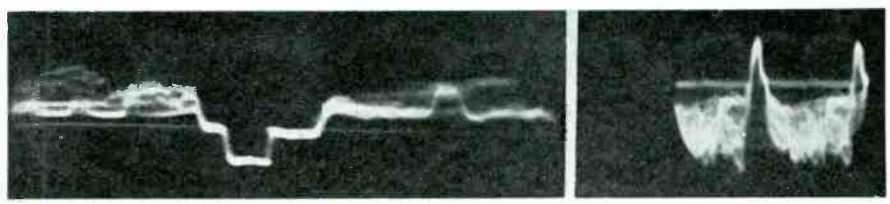
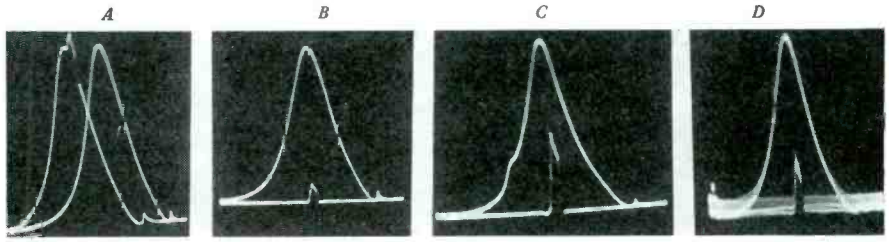


Fig. 9 (below). At left (*a*) is a standard sync waveform. Non-standard sync is shown in *b* (right).



(*Below*)

Fig. 10. Traces illustrating examples of vertical-sweep crosstalk in *if* circuits: *A*—appearance of crosstalk pulse when return trace is not blanked (pulse appears on one curve only); *B*—appearance of crosstalk pulse when return trace is blanked (pulse appears on zero-reference line); *C*—a more severe case of vertical-sweep crosstalk; *D*—distinction between vertical-sweep crosstalk and vertical sync pulse, when station signal is used as a marker (the vertical sync pulse appears at the left end of the zero-volt reference line, while the crosstalk pulse appears in the center of the zero-volt reference line).



IRE National Convention

THE YEAR'S FOREMOST technical event —the national convention of the Institute of Radio Engineers—will not only feature a striking exhibition of over $10-million worth of equipment at the Grand Central Palace in New York City, as noted last month, but a four-day program of outstanding sessions, highlighting such subjects as color, *uhf*-TV, audio, transistors, mobile, marine and aircraft communication systems and broadcast receivers. So many papers (over 200) have been scheduled that they will be presented at two hotels, the Waldorf-Astoria and the Belmont Plaza, as well as the Grand Central Palace.

On Monday, *March 23*, the opening day of the conclave, *color-TV* will be covered extensively by specialists from Hazeltine and G.E., and on Tuesday, additional papers on the subject will also be presented by experts from Sylvania and leading universities. The much-discussed *transistor* will also be thoroughly surveyed in a series of papers offered on Tuesday, in the morning and in the afternoon.

On Wednesday, *audio* will be in the limelight with two seminars, during which microphones, loudspeakers, phono reproducers, tape recording and studio acoustics will be analyzed by such experts as Leo L. Beranek, MIT; Harry F. Olson, RCA; Hugh S. Knowles; Benjamin B. Bauer, Shure Bros; Marvin Camaras, Armour Research; and J. Sabine, Celotex.

On Thursday, *audio* will again be headlined. Dr. Beranek will lecture on the unusual sound-reinforcing system now in use in the General Assembly building of the United Nations. Broadcast and TV receivers will also have a special session. Among those who will appear here are: E. H. Boden, Sylvania, who will discuss factors affecting the design of *vhf/uhf* tuners; Wolf J. Gruen, G.E., reviewing the theory of *afc* sync; and Kenneth E. Farr, Westinghouse, describing a color-TV receiver for the NTSC system.

A number of radically-new instruments for color, the ultrahighs, and service-engineering applications, will also be unveiled and described at the convention.

Papers will be presented between the hours of 10 A.M. and 5 P.M. daily, and exhibits at the Palace will be open for inspection from 11 A.M. to 9 P.M. on Monday, March 23; 9:30 A.M. to 9:00 P.M. on Tuesday and Thursday, March 24 and March 26, respectively; and 9:30 A.M. to 6 P.M. on Wednesday, March 25.

SERVICE will be on the second floor at the Palace; *booth 2-201*.

PHILCO INSTRUMENT CAMPAIGN

A campaign planned to acquaint Service Men with a new line of test equipment, and provide advance information on each model shortly before it is made available for sale, has been inaugurated by Philco, according to J. C. Courtney, Jr., accessory division sales manager.

The initial advertisement in the program features three testers currently available: *appliance tester,* model *5007, mutual-conductance dynamic tube checker,* model *7052,* and a *visual alignment generator,* model *7008.*

Included in the visual alignment generator are: an AM generator (and marker), 3.2 – 250 mc; an FM generator, 4 – 120 mc, and 145 – 260 mc; sweep frequency width to 15 mc; an audio generator, 400 cycles; special 'scope circuits; a telescoping light shield; and a *hf* probe for signal tracing.

PERSONNEL

J. H. Robinson, formerly a parts jobber and earlier with National Union as sales manager, has been appointed sales manager of Aerolite Electronics Corp., 507 26th St., Union City, N. J.

*

Jay J. Greengard, formerly sales and advertising manager of Talk-A-Phone Co., has been appointed general manager of Waldom Electronics, Inc., 911 N. Larrabee, Chicago, Ill.

Jay J. Greengard

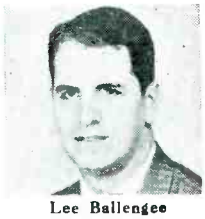
S. F. Myers

Sheldon F. Myers has been named advertising and sales promotion manager of the TV-radio division of Westinghouse Electric Corp., Sunbury, Pa.

*

Monte Cohen has been elected president of General Instrument Corp., 829 Newark Ave., Elizabeth, N. J. Cohen will also continue as president of the F. W. Sickles Division. . . . **Lee Ballengee,** manager of the Chicago office, has been named assistant sales manager, with headquarters at the home plant. . . . **Benjamin V. K. French** replaces Ballengee in the Chicago post.

Monte Cohen



Lee Ballengee

*

Harold P. Gilpin has been appointed general sales manager of the radio tube and TV picture-tube division of Sylvania Electric, headquartering at 1740 Broadway, New York City.

Harold P. Gilpin

Henry G. Mohring

Henry G. Mohring, formerly treasurer, is now vice president in charge of finance, and **Samuel E. Scott,** formerly comptroller, is now treasurer of the American Electrical Heater Co., Detroit, Mich.

*

John J. Doyle, formerly manager of power tube sales, has been appointed manager of renewal tube sales of the electronic tube division of Westinghouse. . . . **James L. Brown** is now manager of equipment tube sales.

L. W. Teegarden, formerly vice president in charge of technical products, has been elected executive vice president of RCA.

*

B. Harold Miller has joined the staff of Conti Advertising Agency, as assistant to the president, and will headquarter at 170 E. Ridgewood Ave., Ridgewood, N. J.

*

Stewart E. Wright has been appointed vice president in charge of sales in all divisions of the Schauer Manufacturing Corp., Cincinnati, Ohio.

*

John H. Craft, Jr., has been appointed national service manager of Stromberg-Carlson Co., Rochester 3, N. Y., taking the place of **F. Leo Granger** who is now the company's distributor manager.

NEEDLE CONTEST WINNER

Henry A. Taleske of Harper Music Shop, Detroit, overjoyed at winning $1,000 first prize in contest sponsored by makers of Jensen phono needles. Looking on, left to right: Karl Jensen, vice president of Jensen Industries, Inc.; Frank G. Kehrer, salesman for Ferguson Radio Supply Company, and C. J. Ferguson, head of the firm which distributes Jensen needles in the Detroit area.

Associations

TSDA

SEVERAL WEEKS ago the Television Servicing Dealers Association in Philadelphia inaugurated a public relations program with a half-hour broadcast over WIP which featured a question and answer forum covering problems posed by the public.

The program, arranged by Louis J. Smith, the Association's vp, and WIP's program director and announcing department, offered answers to queries covering type of members in TSDA, reasons for service charges, variations in charges, guarantees, and so on.

In reply to a question on the membership makeup of TSDA, the association's representative said that the Television Servicing Dealers Association is a group of radio and TV service shop owners who are geared to provide the best and the maximum in service to the consumer; they are owners of established service shops with qualified personnel, and with the necessary electronic test equipment to operate efficiently.

NATESA

ON APRIL 11-12, the National Association of Television and Electronics Service Association will hold its annual convention in Kansas City, Missouri.

Television Service Engineers of Greater Kansas City will serve as hosts.

According to Walt Niswonger, chairman of the ad committee, 1½ floors of the Continental Hotel have been reserved for the convention. Manufacturers are expected to display TV equipment and parts at the affair.

Convention will begin Friday afternoon with registration and cocktail hour.

Talks will follow on Saturday and a banquet will be held at night. On Sunday morning there'll be an optional ranch style breakfast followed by round table discussions, and farewells.

For registration blanks write TSE, Box 8424, Kansas City, Missouri.

RTTG

THE RADIO TELEVISION Technicians Guild, Boston Chapter, offered a sound-film recently describing practical troubleshooting on Philco TV-90, the use of test equipment in TV service, and design and servicing of *agc* and noise inverter circuits.

TEN YEARS AGO

A V LINE OF replacement parts, including paper and electrolytic capacitors, volume controls, power and audio transformers, and reactors, that could be used in servicing the majority of home radio receivers, were approved for release by Washington. . . . *Dr. Joseph Slepian*, who was associate director of research at Westinghouse, reviewed the field of electronics and electronic engineering in an article entitled "*Electronics and Ionics*". . . . *E. H. Fritschel* was placed in charge of sales of industrial electronic tubes at G.E. . . . *Robert L. Russell* joined the Hallicrafters Co. as an administrative assistant. . . . *J. A. Clancey* was named plant manager of the National Union factory at 57 State St., Newark, N. J. . . . *Terry P. Cunningham* was appointed radio advertising manager of Sylvania. . . . Army-Navy *E* award winners for the month included: Solar Manufacturing Corp.; Sprague Specialties Co.; Wincharger Corp.; and Truscon Steel Co. . . . *Frank H. McIntosh* was appointed assistant director of the radio division of WPB.

NEWS

NAME CHANGE FOR LA POINTE

The company name of The LaPointe Plascomold Corp., has been changed to La Pointe Electronics Inc., Rockville, Conn.

William A. Damerel has been appointed vice president and *Milby M. Hancock*, formally general manager, has been promoted to the position of assistant to the president.

* * *

ASTRON EXPANDING

An expansion of plant capacity and manufacturing facilities at 255 Grant Avenue, East Newark, N. J., has been announced by the Astron Corp.

* * *

DELCO INAUGURATES AUTO-RADIO SERVICE SCHOOLS

A series of auto-radio service schools, to be held in 19 cities, has been announced by the United Motors Service Division of General Motors Corp., Detroit, Mich.

Schools will offer service information on the '53 Delco auto-radio favorite-station-signal-seeker tuner. Part of the presentation will consist of a film. Literature on serving of auto radios will also be given to all those attending.

Cities to be covered include: Indianapolis, March 23; Buffalo, April 6; Cleveland, Chicago, Minneapolis, April 13; Detroit, Kansas City, Seattle, April 20; Denver, Omaha, April 27; Philadelphia, May 4; New York, May 11; and Boston, May 18.

* * *

G-C OPENS STANDOFF PLANT

A plant, devoted exclusively to the manufacture of standoffs with a capacity of 250,000 per day, was opened recently by General Cement Manuufacturing Co., 919 Taylor Ave, Rockford, Ill.

* * *

100-MILLIONTH TUBE CELEBRATION

At Weatherly, Pa., plant of Tung-Sol Electric Inc., which recently produced the 100-millionth miniature tube, a 6U8 triode-pentode. Tube, received by Universal International Picture starlet, Ruth Hampton, as it left the quality control section of assembly line, was presented to Louis Rieben, president of Tung-Sol. At ceremonies were (left to right): Harry Van Twistern, Weatherly plant manager; Ruth Hampton; Louis Rieben (holding 100-millionth 6U8); and Milton Schulte, vice president of Tung-Sol electron tube manufacturing. Behind Rieben is John R. Williamson, Weatherly plant personnel director.

TACO PLANT ADDITION

Work has been started on an addition to the existing Technical Appliance Corp. plant in Sherburne, N. Y. New addition will house facilities for manufacture of all metal parts, as well as plating and finishing operations which are required.

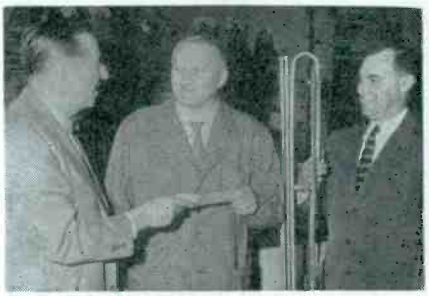
* * *

DI-CO PLANS EXPANSION

Plans for an additional two-story, 5,000 square-foot building, have been announced by the Di-Co TV and Plastic Co., Milford, Conn.

New plant, which will also be located in Milford, will house production facilities, and offices on the second floor.

TV ANTENNA PRIZE WINNER



Walt Read, of Lou Johnson Co., Salem, Oregon, national grand prize winner in the recent Ward *slush pump parade* sales contest, designed to popularize the *trombone* antenna, receiving a check from Bill Earl, Ward rep. Looking on is Bernie Wallig, store manager.

CATALOGS, BULLETINS ETC.

Allied Radio Corp., 833 W. Jackson Blvd., Chicago 7, Ill., is now publishing a 4-page quarterly, *Allied High-Fidelity Auditioner,* describing new audio products and developments. Featured is a question and answer column reviewing typical problems encountered with hi-fi equipment.

* * *

Hewlett-Packard Co., 395 Page Mill Rd., Palo Alto, Calif., has released another issue of their *H-P Journal,* describing two audio oscillators. One oscillator operates from 20 cps to 40 kc, and the other from 5 cps to 600 kc.

* * *

Clarostat Manufacturing Co., Inc., Dover, N. H., has published a 262-page second edition of its *TV Control Replacement Manual,* listing replacement controls by set model and chassis designation, set manufacturer's part number, Clarostat catalog number, function and description. Manual priced at $1.00.

* * *

David Bogen Co., 29 Ninth Ave., New York 14, N. Y., has released a 24-page booklet, *Electronics for Audio-Radio-TV,* detailing design features and indoor and outdoor specifications of amplifiers, *pa* systems, TV boosters, etc.

* * *

Jensen Manufacturing Co., 6601 Laramie, Chicago, Ill., has issued technical bulletin *4,* analyzing a four-channel ultra-fidelity system. Information covers bass-reflex transmission unit and associated 45-cycle crossover network for frequency range adjacent to the lower limits of audibility.

* * *

Cornell-Dubilier Electric Corp., South Plainfield, N. J., has prepared an engineering bulletin, *NB-147,* describing a series of miniaturized tubular metal-cased paper capacitors, *Demicon,* in seven basic styles for 100, 200, 300, 400, 600 and 1000 *v dc,* with capacity ranges from .001 to 1 mfd.

* * *

Pioneer Electronics Corp., Dept. J, 2232 Broadway, Santa Monica, Calif., has published a 32-page booklet, *Something You Should Know,* that explains in non-technical language how big picture tubes are made.

* * *

General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass., has released an issue of the *Experimenter,* describing a 50-250 mc oscillator.

* * *

Aerovox Corp., New Bedford, Mass., has made available a bulletin, *Aerovox Miniature Metal-Cased Capacitors,* containing listings, specifications, drawings on miniature capacitors that operate in temperature ranges from —40° to +85° *C,* and from —55° to +125° *C.*

* * *

CORRECTION

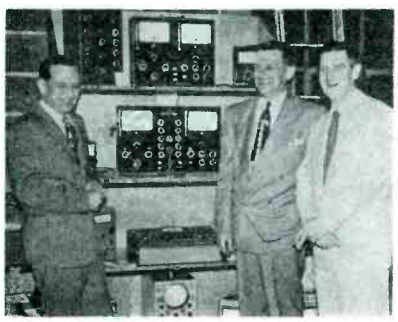
THE 1220-PAGE Radio's Master buying guide described in the February issue as being available on request from United Catalog Publishers, 110 Lafayette St., New York 13, N. Y., is priced at $1.95 and available from either local electronic parts distributors or UCP.

Rep Talk

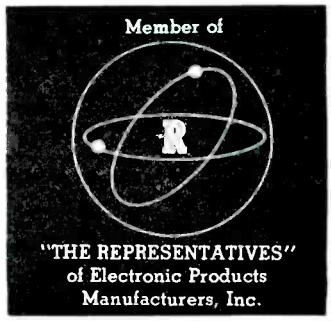
THE REPS of Electronic Products Manufacturers, Inc., have authorized the purchase of electros of the organization's new emblem, so that senior members may use the insignia on stationary and business cards. Membership pins and wall plaques were also approved. . . . Rep members will convene at the '53 Electronic Parts Show at the Conrad Hilton Hotel, Chicago, May 18-21. . . . *Marshall Ball* has been elected president of the Empire State chapter, succeeding Wilson Zimmerman. *Wally B. Swank* was re-elected vice president; *Frank W. Taylor,* secretary, and *Arnold R. Andrews,* treasurer, were also named. *Gordon C. LeRoy* was advanced from associate to senior member in the chapter. . . . *Walter T. Hannigan* has been unanimously elected president of the New England chapter of The Reps. Others elected included Jack Goss, *vice president,* and Stanley *Harris,* secretary-treasurer. Four new associate members have been named to the local chapter: *William Wright, Robert Nelms, Frank Harrington* and *Ray Bridge.* The *Directory and Buyers Guide* of the New England chapter is now available. . . . *William B. Pray,* 18 Brewster Rd., Wellesley Hills, Mass., has been named rep for C-B-C Electronics Co., Inc., in New England. . . . *Mike Meyers* has been appointed rep for Radio Merchandise Sales, Inc., in northern and western New Jersey. . . . *Lowry Dietrich Co.,* 1404 Swantek St., Pittsburgh 4, Pa., a newly formed organization, has been appointed rep for Clarostat Manufacturing Co., Inc., in western Pennsylvania and West Virginia. . . . *W. J. Doyle,* formerly sales manager for Astatic, has been appointed rep for Erie Resistor Corp., in Illinois and Wisconsin. . . . *Jack Berman Co.* is now in new headquarters at 1141 S. La Cienega Blvd., Los Angeles 35, Calif. . . . *Arthur T. Koyce* has joined the Morris F. Taylor Co., Silver Spring, Md., as a sales engineer for Virginia and the District of Columbia. Company has enlarged their facilities and obtained another warehouse at 8933 Brookville Rd., Silver Springs, Md. . . . *Clark R. Gibb Co.,* 312 16th Ave., SE, Minneapolis, Minn., has been appointed rep for Condenser Products Co., in Minnesota, and North and South Dakota. . . . *Mike Roth Sales Co.,* 4397 Groveland Rd., Cleveland 18, Ohio, has been named rep for Crown Controls Co., Inc., in Ohio. . . . *Stan Cluphf,* 4265 S. Santa Fe Dr., Littleton, Colo., has been appointed rep for the Baker Manufacturing Co., in the Rocky Mountain area. . . . *Paul Hayden,* who heads the Southeastern Sales Company, Savannah, Georgia, will cover North and South Carolina, Georgia, Florida, Tennessee, Mississippi and Alabama, for Halldorson Transformer Co., Chicago.

Paul Hayden

At opening of branch of Roberts & O'Brien, parts jobbers, at Auburn, New York, who carry line of Simpson instruments. Left to right: *Les O'Brien, Willis Wink* (Simpson New York rep) and *Jim Roberts.*



New insignia for *the Reps* conceived by *Burton Browne.* Insignia will appear on lapel pins, on letterheads and in advertising sponsored by the organization and its members.



Horizontal Pulling

(*Continued from page* 31)

ing it is now possible to establish a straightforward method of pinpointing faults. No claim is made as to the originality of these procedures; rather, there is offered a logical order to those procedures which have been found effective, to provide a systematic method of rapidly diagnosing trouble.

Assuming the set exhibiting horizontal bending is still in the cabinet, a number of tests can be made to determine which section of the receiver is at fault:

(*1*) One should observe the edge of the raster with no signal being received. If no bending is evident, the trouble is not due to raster bending. If raster bending is evident, horizontal oscillator and horizontal output tubes should be replaced one at a time. If the trouble is not due to heater-cathode leakage in either of these tubes, it will be necessary to remove the chassis to determine the origin of ripple voltage causing the bending.

(*2*) If the trouble is not raster bending, a signal exhibiting horizontal bending, should be tuned in. The contrast control setting should be reduced, and the picture studied to see if bending has been eliminated. If so, trouble may be due to defective tubes in the video or sync channel somewhere beyond the contrast control. Depending on which part of the circuit contains the contrast control, one tube at a time should be replaced until the bending is eliminated.

(*3*) If the foregoing procedure is not effective and particularly if the vertical sync is also unstable, the overall receiver low-frequency response should be checked. This check may be made simply by turning up the brightness and adjusting the vertical hold control until the blanking signal is visible on the raster and then observing the blanking and sync signal.

In one view the low-frequency response may be good and the dark portions of the blanking signal representing the vertical sync pulse will be darker than the darkest portion of the picture. In another the vertical sync pulse will be little or no darker than the darkest portions of the picture, indicating that the sync-pulse level is too low and that the low-frequency re-

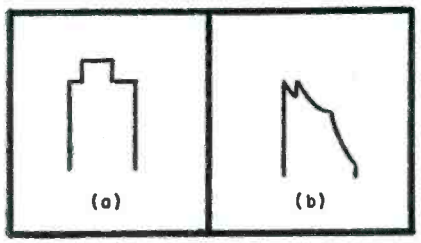


Fig. 4. Another way in which sync pulse shape can be destroyed. *A* represents single horizontal blanking pedestal and sync pulse. *B* shows shape of horizontal blanking and sync signal after passing through an amplifier with poor low-frequency response.

sponse is probably poor. If the latter condition exists, the adjustment of the tuner local-oscillator should be checked to insure that the transmitted picture carrier is properly situated on the video *if* pass band. If the tuner is correctly adjusted the receiver will have to be removed from the cabinet to determine the cause of the poor low-frequency response.

(*4*) If the low-frequency response appears satisfactory, the tube which feeds sync information to the horizontal *afc* circuits should be removed. It may be necessary to select a tube further back in the sync channel if the tube feeding the *afc* is a dual triode in combination with the horizontal oscillator. (Of course, this procedure will be impossible in a receiver using a series-heater arrangement.) While adjusting the vertical and horizontal hold controls manually to momentarily hold sync, one should determine whether or not horizontal bending has disappeared. If it has, the trouble will be somewhere before the *afc* circuits and may be due to a leaking or gassy tube in the tuner or video *if* stages, causing the bias on the *agc* bus to be decreased and allowing the video amplifier to be overloaded, resulting in sync pulse limiting. The trouble could also be caused by sync pulse limiting due to a defective tube in the video and sync amplifier stages. Tubes should be replaced one at a time until horizontal bending is eliminated.

(*5*) If the bending is still evident with the sync amplifier removed, the trouble is in the *afc* circuits. One tube, at a time, should be replaced in these circuits until the bending is eliminated.

If replacing tubes does not cure the trouble, it will of course be necessary to remove the chassis from the cabinet so that more detailed trouble-shooting can be accomplished. If the chassis is out of the cabinet at the start of the troubleshooting operation, time can usually be saved by determining the direct cause of the trouble with test equipment rather than replacing each *rf*, *if*, video and sync amplifier as in step *4*.

When the chassis is on the test bench, the following test procedure is suggested:

(*1*) If raster bending is evident and tube replacement is ineffective power supply filters and other bypass and decoupling capacitors should be substituted in the horizontal oscillator and output stage.

(*2*) It will be necessary to determine whether trouble is in or ahead of *afc* circuits. If the trouble is in the *afc* circuits, voltages should be checked and tests made for defective parts throughout these circuits. It will also be necessary to be sure that excessive ripple is not

(*Continued on page 72*)

(*Continued from page 71*)

present by substituting bypass and decoupling capacitors.

Slight bending at the top of the picture only can be caused by interaction of the vertical and horizontal sync circuits, resulting in phase-modulation of the horizontal oscillator at the start of each vertical scanning cycle. This type of bending is in some receivers in the nature of a design defect. However, tests can be made to verify the source of trouble and in some cases improvements can be made. To check for the existence of vertical-sync interaction the sync input should be disconnected from the vertical oscillator and see if bending disappears. If so, the trouble is due to coupling from the vertical oscillator. Additional isolation in the vertical oscillator input circuit may decrease bending.

A more searching analysis of the trouble can be made by using a 'scope with the external sync terminal connected to an appropriate point in the receiver under test, so as to sync on the received horizontal sync-pulses. In this way the horizontal sweep oscillator will be locked in phase with the constant horizontal pulses and will not follow the phase modulation of the receiver waveform to be observed. Top-of-picture bending will show up on the horizontal circuit waveforms as a *following haze* on the 'scope pattern, caused by the first few cycles of each frame falling at a slightly different place on the face of the 'scope. If this haze is present and disappears when the vertical oscillator is disabled, the phase modulation will be due to coupling in the deflection yoke or through the power supply. Additional *B+ filtering* or a new yoke may correct the trouble. If disabling the vertical oscillator does not remove the phase modulation, one should observe the sync signal being fed to the horizontal *afc* input for any trace of vertical sync pulse. Removing this unwanted signal by proper high-pass filtering should decrease the phase shift.

(*3*) If trouble is ahead of *afc* circuits, voltage on *agc* bus should be checked, and on the grid of each *rf* and *if* tube. Too low an *agc* voltage may allow sync pulse limiting by overloading the video amplifier. A check of the voltage on the grid of each tube may indicate that one of them is leaky or gassy and developing a positive voltage on the grid. The trouble may, of course, be due to a fault in the actual *agc* circuit.

(*4*) If the trouble is not originating from improper *agc* operation,

sync pulse waveforms throughout the video and sync amplifier stages should be checked to locate the origin of sync-pulse limiting or other pulse-shape distortion. Once a point of distortion is found, voltages should be checked and tested for defective parts in this circuit.

(*5*) Wave-shape tests in step *4* will have indicated sync pulse distortion due to poor low-frequency response. If the pulse shape is poor at the video detector output, and if the tuner oscillator is properly adjusted to the pass band of the *if* amplifier, it will be necessary to realign the video channel, preferably with the aid of a sweep generator.

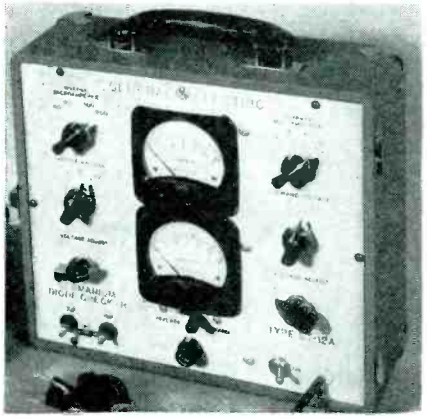
In attempting to locate the source of horizontal bending it should be kept in mind that an excessively strong signal at the input to the receiver can cause overloading, resulting in pulling. Also, it is possible for antenna location or orientation to cause freak reception of the direct and reflected signals so as to cause picture distortion resembling horizontal pulling. Particularly, in the case of a new installation or reception of a new station, it is well to be sure of an adequate antenna by checking other stations, or if the signal appears excessively strong, to reduce it with a resistive attenuator at the antenna terminals before attempting more extensive troubleshooting.

Tube News

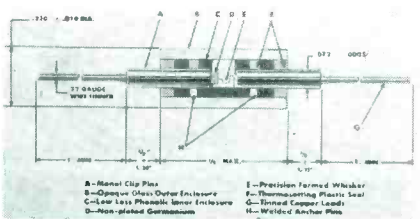
(*Continued from page* 42)

mc detector); and 1N31 (10,000-mc detector). For mixing and detector use at these higher frequencies (9,000-24,000-mc), coax construction is normally employed.

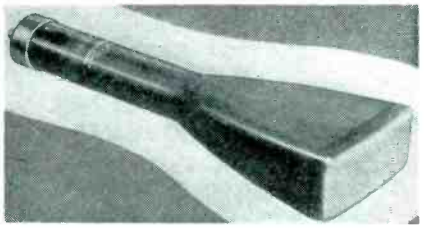
G.E. germanium diode checker designed for use in laboratories, quality control groups and Service Shops. The unit, type *ST-12-A*, has test clips for diodes having leads, and for those with pins on each end. Diode resistance is checked by placing a variable, accurately metered *dc* voltage across the diode. The resulting current appears on a second meter. The forward and inverse circuits are entirely separate.



Constructional view of germanium diode, that consists of an inner housing of low-loss phenolic material over which an outer housing of glass is assembled. Diodes are said to feature moisture-resistant characteristics, electrical isolation from adjacent circuitry, and shock and vibration resistance obtained by the use of a non-skid germanium crystal surface. (*International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.*)



Rectangular *crt* designed for miniaturized 'scopes. For high frequency video work as well as low repetitive operation. (*3XP Rayonic; Waterman Products Company, Inc.*)



Service Engineering

(*Continued from page 38*)

ciated circuitry. Logged readings at periodic intervals help in detecting impending tube failures. Stage gain readings, volume or gain control settings, limiter current readings and overall sensitivity are good indications of tube performance. Replacement should not be based on the actual measured performance, but rather on the rate of decrease of performance and the extent of degradation from the standard acceptable performance.

Tube testers provide an acceptable method of checking high frequency tubes only when performance tests are not feasible. In *if* and *rf* amplifiers and oscillators, tubes that are performing satisfactorily may not register as acceptable on tube testers. The converse is also true.

In no case is it wise to change a tube because of age alone. Life characteristics vary considerably even between tubes of the same type operating in the same circuit. Replacing tubes unnecessarily jeopardizes reliability and incurs excessive maintenance cost.

Mobile Receiver Noise Reduction

Noise, in mobile communications receivers, is more than a nuisance problem. If not kept in check, excessive noise can seriously reduce ranges and hamper effective communications at any range.

The noise generated within the equipment, such as dynamotor and vibrator hash, can be effectively suppressed in any well designed unit. A vehicle can move out of a weak signal area that has a high ambient noise level. But the only method of countering vehicle noises, such as ignition

Mobile transmitter for 9 frequencies: 27 to 30 mc, 30 to 40 mc*, 40 to 50 mc*, 50 to 54 mc, 72 to 76 mc*, 108 to 132 mc, 143.8 to 149 mc, and 152 to 163 mc*. Uses 6J6 oscillator and tripler, 6J6 doubler, 6J6s in push-pull parallel, final, 12AU7 speech amplifier, and 6AQ5 modulator. Power input, 12 watts; power output 6 watts. Has an automatic noise limiter.

*FM or AM, *MB-26:* Sonar Radio Corp., Brooklyn, N. Y.

interference, is to attack the problem at its source. It will be found that these problems are most severe at the lower frequencies (25-50 mc). At the present state of design, it has been found that narrow bandwidth steep sided selectivity characteristics make the receiver susceptible to impulse noise, *regardless of how the selectivity is obtained.* However, noise can be held to a level consistent with good reception if the proper countermeasures are taken.

Source

The first step in noise reduction centers about the location of the noise source and the point of entry of noise into the radio system. Countermeasures are only effective if they prevent the noise from entering the radio equipment.

In locating the noise source, the receiver must, in general, be receiving a weak signal, i.e., a signal which quiets the receiver not more than 20 db. Stronger signals may mask noise by limiter action; absence of signals masks noise with inherent receiver thermal noise.

Ignition noise can be detected by regular *popping* or *snapping,* following the speed of the vehicle engine. Erratic *popping,* which increases when lights or electrical accessories are turned on, can be the result of inadequate bonding of various portions of the vehicle body. A whining noise will probably be due to generator interference and rasping sounds will probably be caused by gauges, particularly the temperature gauge. Crackling or popping, while the vehicle is in motion, can be the result of static electricity charges on moving insulated parts such as wheels and hubcaps.

Ignition

The ignition system represents the primary source of radio interference problems. Virtually all radio equipment manufacturers supply shielded bypass capacitors and distributor noise suppressors as standard installation accessories. One of the capacitors should be connected to the ignition coil primary terminal. The suppressor is to be connected in the lead between the ignition coil and the distributor.

It is also advantageous to keep the distributor breaker points and the ignition system capacitor in good condition. Periodically, it is important to check for good connections and circuit continuity in the ignition system. Capacitive coupling of ignition noise from high voltage to low voltage leads can be minimized by separating the leads or, in extreme cases, by shielding the ignition coil and running the ignition wiring in a conduit or shield braid.

Standard noise suppressing auto parts are now available for most cars. Resistor-type spark plugs contain built-in suppressors and, according to the manufacturer, also provide superior engine performance over conventional spark plugs. Distributors with built-in resistors are available to suppress noise at its source. The complete ignition wiring harness can be replaced with a high resistance cable assembly now being manufactured for most cars.

It will be found that generator noise can normally be adequately reduced with a bypass capacitor across the output terminals, if the brushes and commutator are kept in good condition. A hand-wound choke in series with the generator field may also aid in noise reduction. Unless specifically approved by the vehicle manufacturer, bypass capacitors must not be used in the generator field circuit, or damage to the voltage regulator may result.

Gauge noise can be detected by jarring the individual gauges with the

(*Continued on page 76*)

(*Continued from page 75*)

ignition switch on. The effect of each individual gauge will be made more pronounced by disconnecting the *hot* lead from all gauges other than the one being checked. If the noise continues, a shielded bypass capacitor should also be connected at the gauge. One of the most frequent offenders is the temperature gauge. When a significant change in receiver noise level is detected, the noisy gauge should be bypassed with a capacitor at the gauge source.

Bonding

In most modern cars and trucks, the vehicle body and frame forms the ground return for the electrical circuit. Differences in conductivity, inadequate electrical bonds between adjacent conductors, and unequal current distributions result in potential differences throughout the vehicle. The miniature arcs which create radio interference can be minimized by effective use of copper bonding braid and brass contact wipers. Points to check include, in particular, the exhaust pipe, muffler, and hood. The accelerator and choke rods or cables, brake and speedometer cables, gearshift linkages, motor block, rear axle assembly, doors, and fenders must also be checked for sources of interference because of inadequate bonding.

Static Charges Problems

Any insulated moving part is likely to build up a static charge which discharges to produce noise. The worst offender is likely to be the front wheels and hubcaps insulated from the rest of the vehicle by a film of grease. Standard grounding brushes or springs, such as front wheel static eliminators, will satisfactorily kill this interference in most cases where it is present.

Alignment can also be used to minimize impulse noises.

In general, the procedure consists of detuning one of the first *if* stage coils slightly until an impulse noise balance null point is reached. The detuning, however, should not decrease the limiter meter reading by more than ½ microampere. This practice also serves to reduce ignition noise from passing vehicles and other ambient *rf* impulse noise.

Dynamotor Relay

A simple test can be used to make a quick check of the primary power circuits in a mobile transmitter-receiver unit, disclosing a commonly

overlooked cause of shortened life of dynamotor, vibrator and relays.

A voltmeter, set to a low voltage *dc* scale, should be connected across the contacts of the *A* power relay. The normal voltage drop across the contacts will be only a few millivolts. The push-to-talk button should then be pressed. A noticeable deflection of the meter needle on the 10 *vdc* scale indicates improper operation.

Dynamotor starting current surges will normally exceed 100 amperes. The voltage drop through the common cables, terminals and battery may lower the primary voltage sufficiently to cause *A* relay drop-out. This, in turn, releases the dynamotor relay initiating a relay *chatter* cycle while high current is flowing through the dynamotor relay. This, of course, shortens the relay contact life.

Low resistance primary and relay control leads, a battery of adequate size sufficiently charged, and good contact at all terminals coupled with periodic checks will not only alleviate this problem but also prevent it from occurring.

Dust Proofing

From a servicing standpoint dust presents two problems. First, a chassis covered with dust is not conducive to best repair procedures and secondly, dust inside coils, in relays and around components may actually cause the equipment performance to degenerate. Mobile housings are usually built without louvers and vents to achieve maximum protection from both dust and splashing water. However, with anything less than a hermetic seal, it is virtually impossible to keep fine dust out of the equipment in dry areas.

One solution,[1] features the use of a plastic (polyethylene or equivalent) bag placed entirely around a transmitter-receiver. Scotch type polyethylene tape seals the openings. The installation is thus both dustproof and moisture proof.

General Purpose Test Meter

In the installation and servicing of two-way systems, it is often necessary to check and measure current, voltage, and comparative radiated power. Now available for this purpose is an instrument[2] with test leads for equipment with built-in metering sockets or proper point-to-point checking facilities.

A typical application is the checking of the power amplifier loading of a mobile transmitter. This operation requires the measurement of grid drive, plate current, plate voltage, and *rf* output. In this case, one lead is connected to each of these circuits, and by operating *function and circuit* switches, all the readings and adjustments can be obtained to insure maximum transmitter output at the rated plate power input.

By a similar arrangement of test leads, it is possible to adjust the receiver output for maximum quieting sensitivity. This is accomplished by listening to a self-contained speaker in the meter and observing the noise voltage indication on a calibrated scale for signal quieting.

The equipment is provided with a short *sniffer* antenna to enable the meter to measure relative radiated power in the immediate field of a transmitting antenna. A large meter face contains a meter movement with a sensitivity of 50 microamperes for full-scale deflection. The accuracy of unit is said to ± 4 per cent of full scale on all voltage and current scales.

[1]Evolved by *W. A. Kellogg*, Radio-Telephone Service Co., Stockton, Calif.

[2]RCA CX-7A.

Channel	Channel Limits (mc)	Picture Carrier (mc)	Sound Carrier (mc)	Oscillator Frequencies for Standard if: Pix = 45.75 mc Sound = 41.25 mc	Oscillator Frequencies (mc) to Convert to Channels 5 — 6	
2	54- 60	55.25	59.75	101		
3	60- 66	61.25	65.75	107		
4	66- 72	67.25	71.75	113		
5	76- 82	77.25	81.75	123		
6	82- 88	83.25	87.75	129		
7	174-180	175.25	179.75	221		
8	180-186	181.25	185.75	227		
9	186-192	187.25	191.75	233		
10	192-198	193.25	197.75	239		
11	198-204	199.25	203.75	245		
12	204-210	205.25	209.75	251		
13	210-216	211.25	215.75	257		
14	470-476	471.25	475.75	517	394	388
15	476-482	477.25	481.75	523	400	394
16	482-488	483.25	487.75	529	406	400
17	488-494	489.25	493.75	535	412	406
18	494-500	495.25	499.75	541	418	412
19	500-506	501.25	505.75	547	424	418
20	506-512	507.25	511.75	553	430	424
21	512-518	513.25	517.75	559	436	430
22	518-524	519.25	523.75	565	442	436
23	524-530	525.25	529.75	571	448	442
24	530-536	531.25	535.75	577	454	448
25	536-542	537.25	541.75	583	460	454
26	542-548	543.25	547.75	589	466	460
27	548-554	549.25	553.75	595	472	466
28	554-560	555.25	559.75	601	478	472
29	560-566	561.25	565.75	607	484	478
30	566-572	567.25	571.75	613	490	484
31	572-578	573.25	577.75	619	496	490
32	578-584	579.25	583.75	625	502	496
33	584-590	585.25	589.75	631	508	502
34	590-596	591.25	595.75	637	514	508
35	596-602	597.25	601.75	643	520	514
36	602-608	603.25	607.75	649	526	520
37	608-614	609.25	613.75	655	532	526
38	614-620	615.25	619.75	661	538	532
39	620-626	621.25	625.75	667	544	538
40	626-632	627.25	631.75	673	550	544
41	632-638	633.25	637.75	679	556	550
42	638-644	639.25	643.75	685	562	556
43	644-650	645.25	649.75	691	568	562
44	650-656	651.25	655.75	697	574	568
45	656-662	657.25	661.75	703	580	574
46	662-668	663.25	667.75	709	586	580
47	668-674	669.25	673.75	715	592	586
48	674-680	675.25	679.75	721	598	592
49	680-686	681.25	685.75	727	604	598
50	686-692	687.25	691.75	733	610	604
51	692-698	693.25	697.75	739	616	610
52	698-704	699.25	703.75	745	622	616
53	704-710	705.25	709.75	751	628	622
54	710-716	711.25	715.75	757	634	628
55	716-722	717.25	721.75	763	640	634
56	722-728	723.25	727.75	769	646	640
57	728-734	729.25	733.75	775	652	646
58	734-740	735.25	739.75	781	658	652
59	740-746	741.25	745.75	787	664	658
60	746-752	747.25	751.75	793	670	664
61	752-758	753.25	757.75	799	676	670
62	758-764	759.25	763.75	805	682	676
63	764-770	765.25	769.75	811	688	682
64	770-776	771.25	775.75	817	694	688
65	776-782	777.25	781.75	823	700	694
66	782-788	783.25	787.75	829	706	700
67	788-794	789.25	793.75	835	712	706
68	794-800	795.25	799.75	841	718	712
69	800-806	801.25	805.75	847	724	718
70	806-812	807.25	811.75	853	730	724
71	812-818	813.25	817.75	859	736	730
72	818-824	819.25	823.75	865	742	736
73	824-830	825.25	829.75	871	748	742
74	830-836	831.25	835.75	877	754	748
75	836-842	837.25	841.75	883	760	754
76	842-848	843.25	847.75	889	766	760
77	848-854	849.25	853.75	895	772	766
78	854-860	855.25	859.75	901	778	772
79	860-866	861.25	865.75	907	784	778
80	866-872	867.25	871.75	913	790	784
81	872-878	873.25	877.75	919	796	790
82	878-884	879.25	883.75	925	802	796
83	884-890	885.25	889.75	931	808	802

Table 1

Channels, frequencies, picture and sound carriers, and oscillator frequencies for standard *if* and channel 5—6 conversion. (*Prepared by C. Dale Nestlerode, Section Head, TV Receiver Division, DuMont*)

UHF Converters

(*Continued from page* 45)

from *vhf* in the range between 100 and 174 mc to an *if* of 41.25 mc, and also be correct to convert, using one of its harmonics, the second, third or fourth, from the *uhf* carrier to the same *vhf* frequency as noted. To calculate the required oscillator frequency and also the *vhf* frequency needed, the formulas shown in *appendix 1* (p. 80) can be used[3].

Receivers equipped with turret-type tuners have been quite popular for a number of years and are being used with *uhf* strips in some areas. Strip systems do have a limitation; the maximum number of channels such a converted receiver is capable of receiving. This is becoming increasingly important since there soon will be localities in which more than 12 combined *vhf* and *uhf* channels will be receivable.

The third and most elaborate converter is self-powered and continuously tunable over the complete *uhf* band. Such units are available in separate cabinets for placement beside the TV receiver; they are also currently being incorporated in '53 model TV receivers. In the new receivers equipped with turret tuners a 13th position for *uhf* will be provided, with the normal *uhf* vernier dial being used for *uhf* tuning a separate *uhf* converter in the receiver cabinet. Continuously tunable converters have a high-pass filter, *uhf* preselector, *uhf* crystal mixer, local oscillator, *vhf* cascode low-noise amplifier and power supply, if it is a separate unit. The high-pass filter attenuates all *vhf* signals, preventing overloading of the *uhf* converter and the resultant picture distortion.

Special problems arise when a converter is used with a separate sound *if* type of TV receiver. These problems are: More critical tuning; more frequent retuning of the converter due to oscillator frequency warm-up drift; and greater possibility of microphonic howl due to sound from the speaker vibrating the *uhf* oscillator tube or components. To achieve the lowest possible noise figure, regardless of the TV receiver with which the converter is to be used, a low-noise amplifier of cascode design is incorporated. This amplifier usually operates between 76 and 88 mc covering both channels *5* and *6*. The wide-band amplifier covering two channels permits the user to select the channel having the least interference from a local *vhf* channel.

The cascode amplifier, first described by H. Wallman was originally developed for use in radar equipment. It was designed to provide a maximum gain, while introducing a minimum amount of noise from electrons flowing through the tubes. The circuit consists of a grounded-cathode triode followed by a grounded-grid triode. Triode tubes are used because they introduce less noise than multigrid tubes. The use of triodes as *rf* amplifiers usually requires neutralization to prevent self oscillation. In the case of the cascode amplifier the first grounded-cathode stage is prevented from oscillating by the low cathode impedance of the second stage. The second grounded-grid stage will not oscillate because the grounded grid acts as a shield between the plate and cathode circuits. The overall gain of a cascode amplifier is equivalent to the gain of a pentode stage, with the same mutual conductance, but the noise factor of the cascode amplifier is much lower than that of a pentode amplifier. (Noise factor is a measure of how closely a receiver approaches a theoretically perfect receiver in its ability to receive

(*Continued on page* 80)

[3]Hesse, Henry, *Theory and Operation of Crystal Mixers and Multipliers*, SERVICE; Dec. 1952 and Jan. 1953.

(*Continued from page 79*)

weak signals.) Since crystal mixers have a conversion loss, it is extremely important to use a low-noise cascode amplifier to pick up the normally weak *uhf* signals.

Appendix 1

Calculation of frequencies in double conversion superhet using a single local oscillator and its harmonics, such as in *uhf* turret strips.

f_o = *vhf* oscillator frequency
f_i = *if* pix carrier frequency
f_s = *uhf* pix carrier frequency
n = oscillator harmonic number (use *2* for low *uhf*, *3* for mid *uhf*, and *4* for high *uhf*)
f_r = *vhf* pix carrier frequency

(*1*) Set *vhf* oscillator to $\frac{f_o = f_s - f_i}{n + 1}$

(*2*) Set harmonic selector circuit to $(n \times f_o)$

(*3*) Set *vhf* circuits for $f_r = f_s - (n \times f_o)$. Must be within 100 to 174 or recalculate using different harmonic number n.

Obtain the *uhf* pix carrier for the channel desired from table 1 (p. 78) and the *if* pix frequency from the service manual of receiver.

[Another comprehensive report on *uhf* tuners and converters will appear in the April issue.]

Weak Chassis

(*Continued from page 41*)

apparent. Moral: don't take anything for granted!

Let us trace a typical set, and see what might be found to cause similar trouble.

Common practice with sets using pentode outputs, such as 50L6, is to use a small bypass (.002 to .005 mfd) shunted across the output transformer primary, from plate to screen grid, to bypass an unpleasant high-frequency tone. If this capacitor develops any leakage, part of the signal will be shunted to *ground*, through the filters, and lost. A simple test is to feel the capacitor; if it is too warm, it may be leaking. It should be disconnected and checked for a positive test.

In one peculiar case, it was found that this capacitor had opened up. Sound output was low and a peculiar distortion appeared at high levels. Voltages were satisfactory, but the grid bias was high; bias resistor and supply voltages were normal. Finally, 'scope was connected to the voice-coil, and the output stage was found to be in violent oscillation, in the supersonic range. This was upsetting the bias, driving the tube too high on the curve, with consequent overloading and distortion. Replacement of the capacitor stopped the oscillation.

If the set incorporates inverse feed-

back, the feedback resistor, transformer-tap, or capacitor should be checked for proper size and polarity. A change in the value of a feedback resistor could cause too much voltage to be fed back into the preceding stage, with a loss of gain. Reversal will usually cause oscillation and be easily located.

Electrolytics used as cathode bypasses will often be found open, especially in the older sets. This will cause an impairment of the tone and a loss of volume. Once in a while a shorted capacitor will be found, causing a loss of bias voltage.

On the input of this stage, the coupling capacitor will cause trouble, if open or leaky. It is important to measure the voltage drop across the grid resistor with a *vtvm*; a difference of over one volt usually spells trouble. Some of the resistors used in the lower-priced sets have caused trouble because of value shifting. This seems to be more prevalent in the higher value resistors; 2.2, 3.3 megohms, and so on. Although the resistors used for plate load and screen dropping in the first audio stages, with such tubes as 1U5, 12AT6, 12SQ7, are high-values, the resistance changes can be sufficient to give trouble. Plate load resistors can increase quite a bit without being too noticeable, but screen resistors are somewhat more critical. They should be checked carefully against the rated value, as shown by the coding. One should never assume that a resistor is good, simply because it is not burned or discolored; many a perfectly good-looking resistor has had to be replaced because of a shift in value. Some recent production sets have used very small resistors, known as *matchsticks*. These have been found to be quite troublesome, especially in the 1 and 3.3-megohm sizes.

In some late-model sets the output *if* transformer has a *tweet-filter* in the transformer itself. This is usually in the form of two small capacitors, about 100 mmfd, which are an integral part of the secondary trimmer assembly, or a *resonating capacitor,* used with the permeability-tuned types. The latter consists of several small plates, interleaved with the plates of the secondary trimmer, insulated by mica sheets. Intermittent troubles have been located in several of these units, especially in chassis produced just after the war; '45 and '46. If an exact replacement is not available, a standard transformer should be used, and the tweet filter installed externally. Such a filter can be made up from two 100-mmfd ceramics or micas and a 47,000-ohm resistor, or one of the *printed circuit* filters, can be used instead.

The *if* amplifier is a source of much trouble in the *weakness* department. If there is a high-resistance joint in any one of the windings, a severe loss in gain and selectivity will result. Fortunately, this is usually easy to locate; any *if* trimmer which does not show a definite peak indicates a defect in the winding. These can be further checked by measuring the *dc* resistance of the winding. Though there is a certain variation between the products of the different manufacturers, an average 456-kc *if* will measure about 11-25 ohms; 262-kc *if*'s about 50-65 ohms, and the 175-kc coils will go as high as 100 ohms. A positive check is to compare the resistance of the suspected coil with other windings in the set.

In some receivers the 47,000-ohm resistor used in the tweet-filter will be inside of the output *if* can. One should not assume this winding to be open only if the resistance is around 50,000 ohms. The schematic should be checked to be certain.

In some sets made several years ago, a special input *if*, incorporating a small winding which fed the *if* screen grid, was used. This was connected so that

(*Continued on page* 82)

(*Continued from page* 81)

its polarity introduced a controlled amount of regeneration into the *if* amplifier, increasing the gain. Voltages applied to this stage will be found to be critical, due to this feature. It is important to watch out for the possibility of a reversal of this winding by an inexperienced servicer. This can lead to trouble, if unsuspected.

The local oscillator can be the cause of much weakness and loss of selectivity grief. If the oscillator stage does not generate enough voltage to give a strong *if* beat-note, the set will be quite weak. This trouble is normally caused by weak tubes; a new tube should always be substituted into the stage before trying any more drastic remedies. The remainder of the difficulties can be found in the oscillator coil, usually in the plate or tickler winding, and rarely in the grid capacitor or grid leak. If the grid leak changes in value, especially if it goes down (less resistance), voltage will be low at the low-frequency end of the band.

One of the best checks for oscillator performance is developed grid voltage. This must be measured with a *vtvm*, and should be at least 10 or 15 volts, at the low end of the band. This is an average value, of course, and will vary with different tube types but a reading of less than 5-7 volts at 550 kc should be viewed with suspicion. If a signal-tracer is available, it can be used to very good advantage in this circuit, not only as a measurement of voltages, but of the frequency as well.

If the oscillator voltage remains low, after trying a new tube, the coil windings should be checked. On tickler-feedback oscillators in which tubes like 6A7, 6A8, 1A7, with separate oscillator plate elements are used, the grid winding will measure about 5 to 7 ohms and the tickler coil will run 3 to 5 ohms. Corrosion seems to attack the plate windings the most, possibly due to the high voltage applied to them As exact duplicates for oscillator coils in the older sets are usually quite difficult to find, it is recommended that this coil be rewound. First a sketch of the connections should be made and then the coil disconnected. The defective coil should be unwound, counting the turns, and noting direction of winding. The open will be found at a small bright green spot. All traces of this green corrosion should be scraped off, and the coil washed with carbon-tet. If the original wax is badly scratched, or gone, one turn of cellophane tape should be wound around the coil and the new coil wound over this.

[To Be Continued]

H-O-T Replacement

(*Continued from page* 33)

the original ferrite-core design, a set of basic schematics have been developed, and are illustrated in Figs. 1, 2, 3 (p. 33), and on the *front cover.*

An interesting application of these basics appears in Fig. 2, which is the horizontal-deflection circuit of Truetone's model 2D1089B. In this set there are three unusual design problems. Gated *agc* and an *afc* are operated from an additional winding on the horizontal output transformer. There's also a low-inductance width coil shunted by a capacitor and the terminal numbering system is the reverse of that used on the replacement.[6]

Surveys have shown that these factors are the greatest stumbling blocks encountered in replacing a horizontal output transformer.

In replacement work it is first necessary to select the circuit closest to the one under repair. Using the Truetone as a model we find that the damper tube is not inverted (modified autoformer application) and thus the circuit shown on the cover can be eliminated. Further study reveals that the Fig. 1 circuit is closest to Truetone arrangement.

Continuing, it then becomes necessary to check the numbering systems of the original and the replacement, which are entirely different. For example, terminal *3* on the Truetone unit is the end of the secondary where B+ is connected, while on the replacement,[6] it is the end of the high-voltage winding where connection is made to the 1B3 plate. Thus, normal operation could not be expected if it were assumed that these were the same points on both transformers.

In Fig. 1, it will be found that the horizontal output transformer and the width coil must be changed. This means that the Truetone units *53X315* and *9A1976* must be discarded and the replacement transformer[6] and width coil[7] installed in their place. In addition the .1-mfd capacitor in parallel with the width coil must also be deleted.

Special care must also be taken to identify the feedback loops (*afc,* peaking networks), and in this set there is a separate winding for *agc-afc* which can be left disconnected until a raster is obtained on the picture tube.

After the physical installation has been completed, where no difficulty should be encountered because the replacement has the same mounting centers as the original, the unit must be wired in. By comparing the two diagrams, it will be noted that the connection to the plate of the horizontal output 6BG6, plate of the *hv* rectifier 1B3, and the start of the primary to the linearity coil or boosted *B+* are exactly alike for both transformers. The filament winding for the 1B3 rectifier is wired exactly the same for both units. As mentioned, the *afc-agc* winding must be left disconnected until a raster is obtained.

The wiring of the secondary is a bit involved because the greatest number of variations appear here.

Beginning with terminal *4* of the replacement (Fig. 1) a direct connection to damper tube plate should be made. This is identical to that in the original circuit and even the terminal number on the transformer will be found to be the same. If the original circuit has the damper plate connected to *B+*, the *B+* lead must be removed. An examination will show that no *B+* lead was connected at this point on the Truetone; thus this represents no problem here. Connected at this point is the other end of the *hv* capac-

(*Continued on page* 84)

[7]Merit MWC-1.

(*Continued from page* 83)

itor and since the Fig. 1 circuit indicates no change, no alteration need be made.

Below terminal *4*, we come to *5* which as indicated in Fig. 1 is connected to the deflection yoke and corresponds to terminal *1* of the Truetone flyback transformer. In addition, connected at this point is one side of the primary of the width coil. This represents the first point of difference. Moving down to terminal *8* of the replacement, it will be found that the other end of the primary of the width coil is connected, *but nothing else.* Here is the second point of difference between the two circuits. Finally, the end of the replacement's secondary terminal *6* is connected to *B+* exactly the same as the original Truetone unit terminal *3*. Here also is connected the return from the deflection yoke, leaving the .25-mfd capacitor in the circuit as indicated on Fig. 1. Formerly this lead, in the original circuit, was connected to terminal *2* of the secondary.

Wiring now completed, the set can be turned on and raster size and brightness checked. Should there be insufficient width or poor linearity the yoke connection can be shifted to terminal *8* or *4* as noted in *a* of Fig. 3. This may be necessary to match the inductance of the yoke because the exact value of *inductance* of the horizontal deflection coils is rarely given by the manufacturer in his service notes. Then the set should be allowed to run for five minutes, checking for breakdown, overheating, and other undesirable reactions.

Passing this *shakedown* the set can be turned off and *afc-agc* connections made. Referring again to Fig. 1, we find an arrow pointing to an extra winding on the replacement. When this part of the circuit is examined, the similarity between *5A* and the original circuit will be apparent. Terminal *7* is grounded the same as *6* was on the original Truetone unit, and terminal *9* connected to the same circuit as *7* was connected on the Truetone horizontal output transformer. As a concluding check, point *a* (picture width) can be probed. The *width* referred to in the replacement instructions and *b* in Fig. *3* can be checked with an ohmmeter; the approximate *dc* resistance of the width coil needed to match the replacement will be noted.

The *afc-agc* point in Fig. 3 at *c* is important because no *afc* control will be possible if the connections are reversed. In other words, it will be impossible to *sync* the horizontal oscillator with the station synchronization pulse. Reversing the connections on the transformer will correct this condition. Here again, no set manufacturer indicates the start and finish of this winding; therefore, it is impossible to give specific instructions for each set.

Hi-voltage referred to at *d* in Fig. 3 indicates changes available if the *hv* rectifier filament burns too brightly, or if the tube emission is too low and the brightness of the cathode-ray tube is deficient.

ANTENNA MAKER AWARDS REP

Piet Rollandet, Brach rep in Oregon and Washington, receiving inscribed gold wrist watch for being the outstanding Brach salesman in '52, from Ira Kamen, Brach vice president, sales, while Jay Saphier looks on.

Audio

(*Continued from page* 52)

material should be used. Material thickness up to 1″ can be employed.

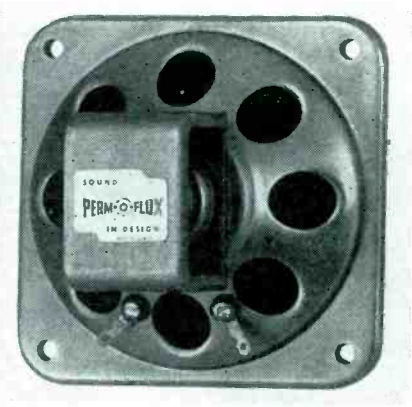
Changer Connections[4]

To prevent hum pickup, the record player frame must be connected to the amplifier chassis. In some record players the connecting lead from the phono pickup cartridge to the amplifier chassis is a shielded lead with the shield connected to the pickup cartridge *and* to the record player frame. In the changer used in this package the record player frame is automatically connected to the amplifier chassis; in record players which do not have this connection, a separate connecting lead between the record player frame and the amplifier can be used.

[4]From Meissner service notes.

Model of single cabinet *hi-fi* reproducing unit which contains a tuner and amplifier (left), tape recorder (center) and a record changer, player and speaker, which may soon be available. (*The Hallicrafters Co., 4401 Fifth Ave., Chicago 24, Ill.*)

Outdoor theatre speaker which is said to be free from rubbing voice coils, due to warping of the voice coil or corrosion of the voice-coil gap. To insure absence of rubbing, gap is larger than normal and to restore sensitivity to the larger gap, a 1.47 ounce magnet is used. In addition, all metal parts, including the voice coil gap, features a dichromate treatment, which is claimed to prevent corrosion even in tropical climates. Cork gasket is used to prevent warping of the cone, due to swelling and buckling of the gasket. Models for 4″ and 5¼″ speakers are available. Illustrated in a 4″ type; 4C-DI. (*Permoflux Corp.*)



Ser-Cuits

(*Continued from page* 58)

tion takes place at this point. The combined tube characteristics of the two stages are such that good contrast in the vicinity of *white* is achieved and *dc* restoration on the output tube grid maintains this condition with relative black/white content changes in the signal. Partial *ac* coupling from the output peaking circuit, L_{205} and R_{223}, to the picture tube grid is employed to render less critical the variation in background (*dc*) component when switching between channels. The load resistor, R_{223}, is wire wound and has an amount of inductance which is a part of the compensation employed and must not be replaced by a non-inductive resistor.

Noise Inverter

To remove noise bursts that exceed the sync pulse level from the signal that is fed to the *agc* and sync circuits, ½ 12AX7 is used as a noise inverter. It is a grounded-grid amplifier that forms a parallel signal path around the video amp tube. Since it is cathode driven, the signal output of the invertor is in phase with the detector signal, while the video amp output is 180° out of phase.

The noise inverter is biased beyond cutoff, enabling it to conduct only on noise signals which exceed the sync tips at the detector. Bias for the noise inverter is obtained from the grid-bias voltage of the horizontal output tube by means of a voltage divider in the output tube grid return. A pot, R_{304}, provides independent adjustment of noise inverter bias and horizontal drive. The noise inverter bias usually is between 9 and 13 volts.

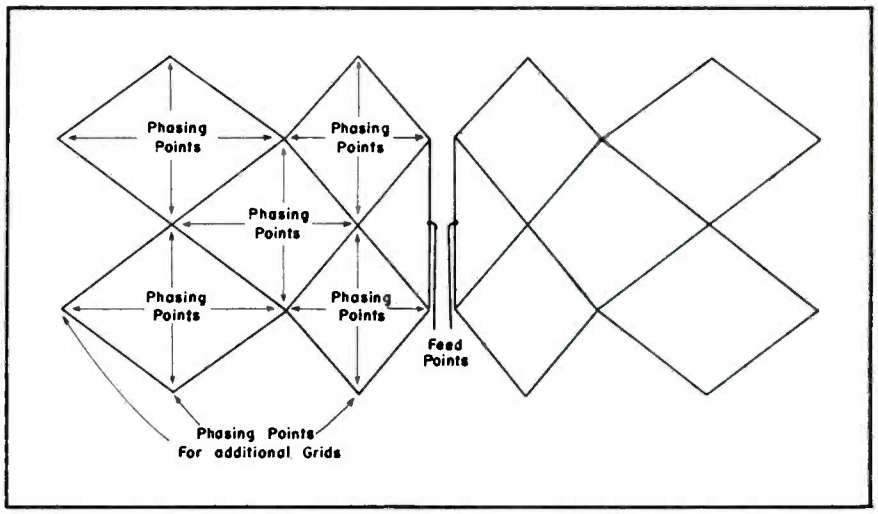
In this model, which uses keyed *agc*, a series-fed pulse to the *agc* amp was selected because of the ease of filtering the derived *agc* voltage. The *rf agc* voltage is considerably delayed to reduce the medium signal-to-noise content of the picture. The *rf* amplifier grid-to-cathode conduction is used as a clamp for *rf* bias delay in the *agc* system.

In the sync separator are three triode sections, ½ 12AX7 and a 6SN7GT, $V_{301B, 302A, 302B}$, which are, respectively, the sync separator, sync amplifier and sync clipper. The sync separator is direct coupled to the sync amplifier operating in its positive grid region. The sync clipper is *ac* coupled to the sync amplifier and levels off sync tips at a uniform level. The sync clipper also serves as a phase-splitter and supplies a negative sync signal at the cathode for the vertical system, and a positive sync signal at the plate for the horizontal system.

TV Antennas

(*Continued from page 49*)

Fig. 5. An eight-element antenna employing the diamond-grid dipoles in a colinear array.



bining the grids. For example, if a plurality of grids are combined colinearly in a horizontal plane, the overall assembly would be most sensitive to horizontally polarized waves resonating to a dipole of the same overall length. However, each grid will have its own resonant frequency in addition to contributing to the overall length of the longer dipole.

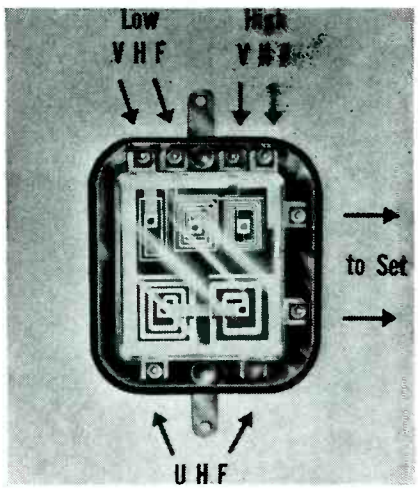
The picking off, or feeding, of the dipole at closed points, instead of opening the grid at such points, is claimed to take advantage of the automatic phasing of a closed grid and eliminates the coupling elements which would otherwise be required.

The electrical characteristics as previously noted, can be altered by making the legs of unequal length, i.e., by making the top legs longer or shorter than the bottom legs, or by making the right-hand legs longer or shorter than the left-hand legs, or by making the four legs of unequal length.

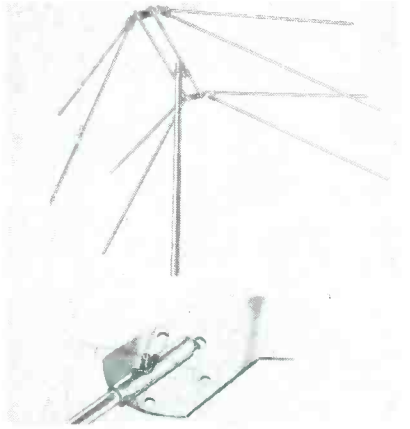
A reflector, to increase further directivity, can constitute the tubing used to support the assembly, or a curtain type or diamond-shaped reflector can be used. If diamond shapes are used, they would correspond in dimension to the front antenna and would be insulated at all points except the center, which may be grounded to the pole.

Smaller grids can be employed (as illustrated) on the inside (center) of the dipole. They can, however, be disposed on the outside and a plurality of small grids may be connected in series. The small grids may be of the same or of different sizes. Furthermore, although the smaller grid resonates at a higher frequency than the larger grid, it has been found that it does not reduce appreciably the pickup efficiency of the larger grids. The inside grids serve as transmission lines for the adjacent outside grids.

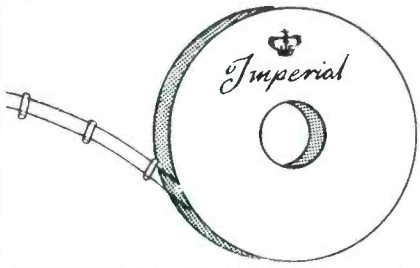
Antenna is said to be applicable for *vhf* and *uhf* pickup.



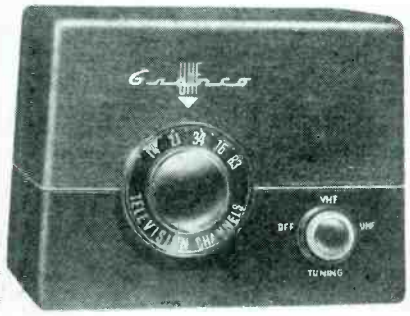
Coupler for *uhf* and *vhf* antenna installations. Unit employes a silver-printed circuit enclosed in an hermetically sealed butyrate case. Coupler has four sets of terminals: One pair is for *vhf* antennas covering channels 2-6; another is for *vhf* antennas for channels 7-13; third is for *uhf* antenna, and last set is for the leadin wire to the set. Can be attached to mast by use of the stand-offs which are packaged with coupler. (*JeTie; JFD.*)



Adjustable end-fire array conical *V* antenna. Has an adjustable bracket arrangement which permits positioning of any one or all of 8 elements to any of following angles: 45° (for *uhf*); 60° (for *uhf-vhf*); 90° (for *vhf*), and 180° (for *vhf* where stations come from widely separated points, but are in same general direction). Pin bracket which retains the elements can be rotated so that the pin snaps into the hole positions, giving the desired angle. Tightening of the assembly is accomplished by a few turns on wing nut. Preassembled unit. Has a double u-bolt assembly. *Q* bars are dowel-reinforced at u-bolt. Elements, which are ⅝" aluminum with pinched ends, are also dowel-reinforced. Two and four bay models are also available. Tube of Tenna-Tek corrosion proofing compound is furnished with each unit. (*Model AAV-100; RMS.*)



Open lead for *uhf* and *vhf* installations. Has a nominal impedance of 250-275 ohms. The narrower spacing for 250-275 ohms is said to be more desirable at *uhf*. Has a .35 db dry line loss in 100' at 500 mc. Line consists of two No. 20 copper wires supported by polystyrene spacers placed 4½" apart, and is coated with a triple layer of Formvar. Available in 100', 250' and 500' spools. (*Imperial Radar and Wire Corp.*)



Uhf converter with a coax tuner which consists of three coax cavities, two functioning as a band-pass preselector; the third, controlling the local oscillator frequency; a cascode amplifier, and a power supply. Preselector is essentially an overcoupled double-tuned transformer with a balanced 300-ohm antenna input and unbalanced output to the mixer. Local oscillator, a Colpitts type, tunes below the signal frequency for double superhet or converter applications. Mixing takes place in a low-noise diode, with an *if* appearing at *vhf* channels 5-6. This is amplified in a cascode *if* amplifier terminating in a balanced 300-ohm output. Tuning is controlled by a single knob which functions as both a channel selector and fine tuning selector. Complete *uh* band is covered by five turns of tuning knob. A circular dial, calibrated directly in channel numbers, rotates approximately 140° for all 70 *uh* channels. (*Model CTU; Granco Products, Inc.*)

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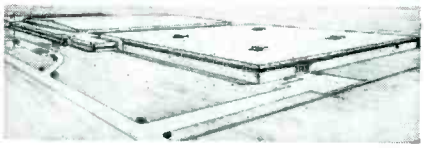
Loudspeaker Mounting

(*Continued from page 57*)

see that the increased efficiency of the horn couplers does not overbalance the tonal structure. Conventionally-mounted bass speakers used in conjunction with horn-type tweeters, for example, ordinarily call for an attenuating network in the tweeter circuit, while horn coupling for the bass normally precludes the use of cone-type tweeters. The increased efficiency of horn coupling may also bring out hum voltages that would ordinarily go unnoticed.

Speakers should be mounted in such a way as to command as large a part of the room, or of that part of it which is to be used for listening, as possible. Corner mounting is therefore excellent when feasible, and has the additional advantage of improving bass reproduction. The smaller the solid angle into which the speaker faces the better the coupling to the air of the room at lower frequencies. A speaker near the floor, ceiling, or juncture of two walls is therefore in a better position from this point of view than one mounted in the middle of a wall. However, wall mounting often does not give the designer much choice, and he must take what he can get. Good results have been produced from many different types of speaker location in practice.

NEW PICTURE TUBE PLANT

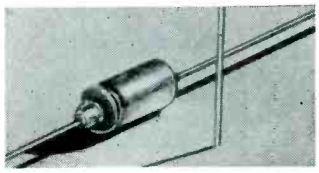


Drawing of proposed 235,000-square-foot picture-tube plant and warehouse to be built in Kalamazoo, Michigan for Hytron Radio & Electronics Co. Plant is scheduled for occupancy in June '54.

Micamold Miniature Electrolytics

Miniature electrolytic capacitors, *Microlytics*, available from 3-.05 mfd, in working voltages of from 3-50 *vdc*, have been announced by Micamold Radio Corp., 1087 Flushing Ave., Brooklyn 37, N. Y.

Smallest unit is .175" outside diameter and 11/32" long. Maximum temperature rating is 65° *C*.



Tools . . . Instruments Parts . . .

Equipto Small-Parts Storage Cabinet

A steel storage cabinet, *Little Gem*, which, it is claimed will provide quicker access to a wider variety of tiny parts, has been introduced by Equipto Div., Aurora Equipment Co., 422 Cleveland Ave., Aurora, Ill.

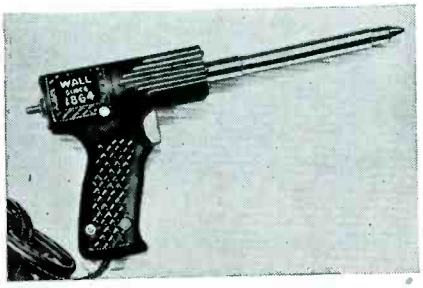
Cabinet is designed for use either individually, in stacks, under counters, or on shelving. Drawer measures 11" x 11" x 1¼", and accommodates up to 28 adjustable compartments enclosed on all four sides and bottom. Front of compartments is curved and overhang at rear is said to prevent shuffling of items when drawer is jerked open or slammed shut. Label holder identifies each compartment.

* * *

Wall Instant-Heat Soldering Iron

An instant-heat gun-type soldering iron, *Trig-R-Heat* that does not use a transformer, has been announced by Wall Manufacturing Co., Grove City, Pa.

Soldering iron has a plastic gun-grip, and heat-control thermostatic action, that is said to prevent iron from getting too cool for efficient soldering, or too hot for tip safety. A switch-controlled spotlight is featured for interior soldering. Wattage starts at approximately 400 and idles at about 100.



Oelrich Master-Service Card File

A business control system, *700, master-service card file,* that consists of a metal file box, 500 5" x 8" master service cards and one set of alphabetical index cards, has been introduced by Oelrich Publications, 4135 N. Lawler Ave., Chicago, Ill.

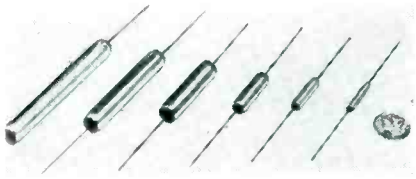
Card system functions as a customer account card, on which customer information, service details, sales details, warranty and service contract expiration dates are entered. Spaces are available for details of 15 service jobs per customer.

* * *

C-D Electrolytics With Tantalum Foil

Tantalum electrolytic capacitors, *TAN,* that are said to have a lower leakage current, long shelf life, a lower power factor at room temperature and a good power factor at temperatures as low as 55° *C.* have been developed by the industrial division of Cornell-Dubilier Electric Corp., S. Plainfield, N. J.

Capacitors are available in a variety of capacity and voltage ratings. Both polarized and non-polarized types are made with voltages up to 150 *wv.*

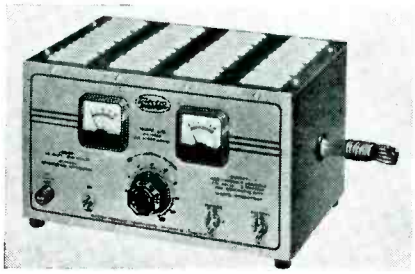


* * *

Electro 12-Volt DC Power Supply

A filtered *dc* power supply, model *C-12,* that provides adjustable 0-16 *v dc* voltage from an *ac* source, for all current loads from 1-8 amps continuous output, has been announced by Electro Products Laboratories, Inc., 4501 N. Ravenswood Ave., Chicago 40, Ill.

Special filtered circuit is claimed to reduce *ac* hum to less than 3% at 8 amps. Equipped with fuse and terminal connecting clips.



Mallory Vibrator For Communications Equipment

A vibrator, *4548,* specifically designed for two-way communications equipment, has been announced by P. R. Mallory and Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.

Designed especially for use in 6-volt applications, vibrator will replace the presently recommended 248 in servicing various models of Federal, Motorola and RCA sets.

* * *

Erie HV Disc Capacitors

A line of high-voltage disc ceramicon capacitors, with 3/8", 19/32" and 3/4" maximum diameters, are now available from the Erie Resistor Corp., 644 W. 12 St., Erie, Pa.

Standard *dc* working voltage ratings are 1000, 1500, 2000, 3000, 5000 and 6000, with a dielectric strength test of twice the rated working voltage.

* * *

Primax Instant Solderer

A German-made soldering iron, *Primax-Solderer,* that is said to reach soldering heat within six seconds, is now available from S. Barnett, P.O. Box 54, Bowling Green Station, New York 4.

Unit has a balanced grip with trigger control, and has a special alloy tip that is said to stay tinned indefinitely under normal usage. Available for 110 or 220 *v,* 50/60 cycles.

TV Parts . . . Accessories

American Research HV Portable Voltmeter

A portable 10" long high-voltage voltmeter, *TV Voltprobe,* has been developed by the American Research Corp., 1504 11 St., Santa Monica, Calif.

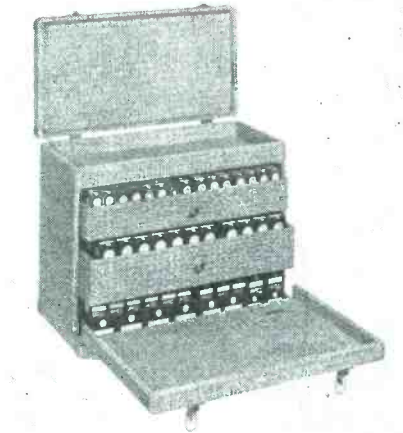
Unit measures accelerating *dc* voltages from 4000 to 25,000. Measurements can be made without removing the tube or chassis from the cabinet. Instrument can also be used as an *rf* indicating device for checking high-voltage oscillator circuits.

* * *

Argos Deluxe Tube Caddy

A *deluxe* tube caddy, with a tool tray for TV Service Men, has been announced by Argos Products Co., Genoa, Ill.

Other features include heavier draw type clasps, standup support for the cover, and black-and-white pebble-grain leatheroid covering. Size is 18" x 14½" x 9¼".



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Eby UHF-VHF Crossover Network

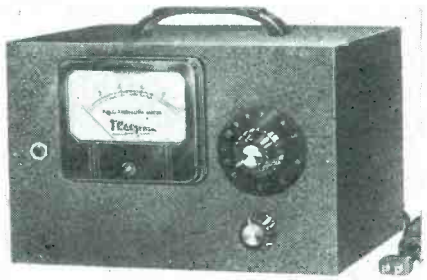
A crossover network which combines *uhf* and *vhf* into a single antenna system for one-line feed is now available from Eby Sales Co., Dept. E, 130 Lafayette St., New York 13, N. Y.

Network, an electronic filter, employs high and low-pass resonant circuit, designed, it is said, to isolate the *vhf* antenna from the *uhf* antenna, and to eliminate interference. Installed on the mast or crossarm of the antenna by a clamp.

Transvision Field Strength Meter

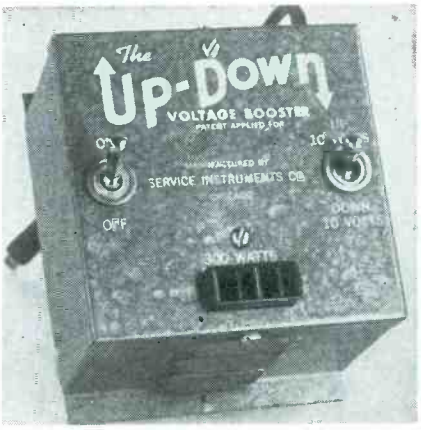
A field strength meter, *FSM-2* and *FSM-3B,* that measures signal strength from 10-50,000 microvolts, is now available from Transvision, Inc., New Rochelle, N. Y.

Meter can also measure TVI on all channels and check receiver radiation. Unit, which is adaptable for *uhf,* is available for *ac* or battery 110-volt line operation.



Service Instrument Voltage Booster

A line-voltage booster, *Up-Down,* whose output is said to maintain a 10-*v* boost or drop when correcting high or low-line voltage, has been announced by Service Instruments Co., 422 S. Dearborn St., Chicago 5, Ill.

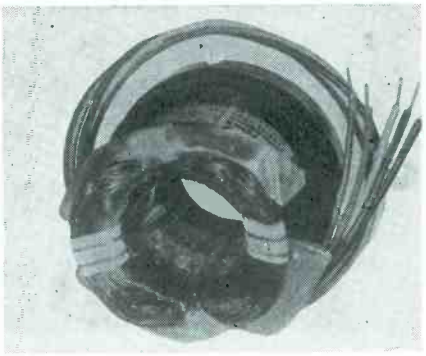


* * *

Halldorson Deflection Yokes With External Network Control

Two deflection yokes, *DF601* and *DF602,* incorporating a fifth lead for external control of network, has been announced by Halldorson Transformer Co., 4500 N. Ravenswood Ave., Chicago 40, Ill.

Fifth lead (four are conventional) is interconnected with components in the yoke to provide external rearrangement of the network to suit different TV set requirements. Yokes cover all 8.5 to 14-mh applications.



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Holub Masonry Drill

A masonry drill, *Hi-Twist* that, it is claimed, can be used for continuous drilling of concrete, stone, brick, as well as copper, brass and other soft metals, has been announced by Holub Industries, Inc., Sycamore, Ill. Dust packing, which usually causes stalling, is said to be overcome by a combination of oval flutes, narrow lands and fast spiral which carries the dust up and out of the hole as fast as it forms.

Drill is made of alloy steel and has a carboloy tip. Sizes range from 11/64" to 1" for spiral-fluted drills and 1⅛" to 1½" for straight-fluted drills.

* * *

CORRECTION

THE movable table (type *2602*) announced by *DuMont* and described last month as designed for picture tubes, was developed for mounting of complete 'scopes, which can be placed at varying depths on a tilted top, by means of an adjustable bar which supports the instrument.

JOTS AND FLASHES

TRANSISTORS now have a friendly neighbor, *Fieldistors,* which feature the use of certain types of pure germanium, whose peculiar properties provide a change of conductivity with a change in the strength of the electrical field around them. These new members of the semiconductor family, said to produce a substantial amplifying action, are now undergoing an extensive study by the Air Force. . . . Over 7.6-million picture tubes and 368.5-million receiving type tubes were sold by manufacturers in '52, according to RTMA. . . . *Matthew Mandl's* book on *Hearing Aids, Their Use, Care and Repair* has been published by The Macmillan Co. . . . *Gail S. Carter,* of Permo, Inc., and *Joseph Dworkin,* of the Dynavox Corp., and president of the Phonograph Manufacturers Association, were elected chairman and vice chairman, respectively, of the RTMA Phonograph Industry Committee. Group will institute plans to encourage the use of records and playback equipment. . . . The Audio Engineering Society, P.O. Box 12, Old Chelsea Station, New York 11, N. Y., will publish its own *Journal of the Audio Engineering Society,* edited by *Lewis S. Goodfriend,* four times a year. First issue to appear in March 53, will include the thirty papers presented at the annual meeting of the society held in October '52. . . . *Dr. Harold Pender,* founder of IRC, was admitted as an Eminent Member into Eta Kappa Nu Association recently, in recognition of his technical attainments and contributions to society through outstanding leadership in the profession of electrical engineering. . . . For his pioneering work in the field of radio and TV, *Brig. General David Sarnoff,* chairman of the board of RCA, received recently the annual engineering and science award of the Federation of Engineering Societies of the Drexel Institute of Technology, Philadelphia, Pa. . . . National Carbon and Burgess Battery now include the battery numbers of NEDA in their interchangeability charts. . . . *Peter H. Cousins,* who has been information director of RTMA for several years, has been appointed special assistant to executive vice president *James D. Secrest,* and staff assistant to the technical products division. . . American Phenolic Corp. has licensed the U. S. Wire and Cable Co., Union, N J, to manufacture, package and sell tubular twin-lead under Amphenol's Krueger patent 2,543,696. . . . Taco has received a contract from the U. S. Navy for special antennas.

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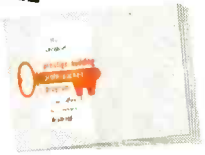

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