Formerly TELEVISION RETAILING

CALDWELL-CLEMENTS'

TECHNICIAN

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

October • 1953
In 2 Sections • Section 1

Hi-Spots in This Issue—

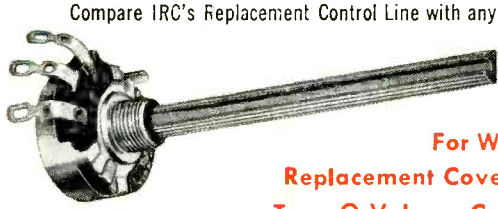
Hi-Fi Service & Installation • "Intermittent" TV-Radio Defects • Diagnosing CRT Troubles • Color TV • Circuit Digests

FOR ALL OF TODAY'S REPLACEMENT CONTROL NEEDS

IRC Volume Control Plant, Asheville, North Carolina.

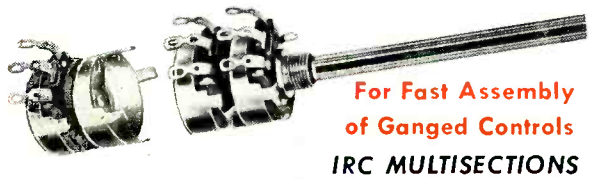
Name your requirement; it's in full production *now* at IRC's new volume control manufacturing plant. From no other single source can you get such wide replacement coverage. And no other replacement control gives you the IRC combination of easy installation and trouble-free performance.

Compare IRC's Replacement Control Line with any other:



For Widest Replacement Coverage Type Q Volume Control

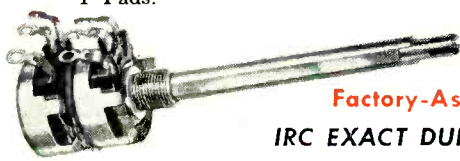
82 values—7 tapers—give greatest TV, AM, FM coverage with least stock. Flatted, knurled and slotted Knobmaster Fixed Shaft fits most knobs without alteration. 13 Interchangeable Fixed Shafts give fast conversion to "specials" with fixed shaft security. Small ¼" long bushing and compact 15/16" design ideal for small sets—yet handle large set needs as well. Cushioned-turn rotation. Quiet element. Handsome appearance.



For Fast Assembly of Ganged Controls

IRC MULTISECTIONS

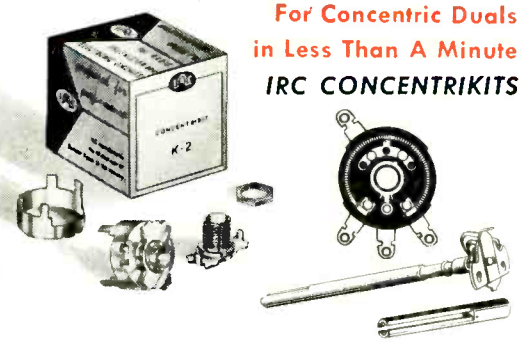
In just a few minutes you can assemble standard duals, triples, even quadruples—with IRC Multisections and Q Controls. Simply remove control cover and attach Multisection. Over 15,000,000 combinations. 20 resistance values. Switches can be added. Use to provide low-cost L Pads and T Pads.



Factory-Assembled

IRC EXACT DUPLICATES

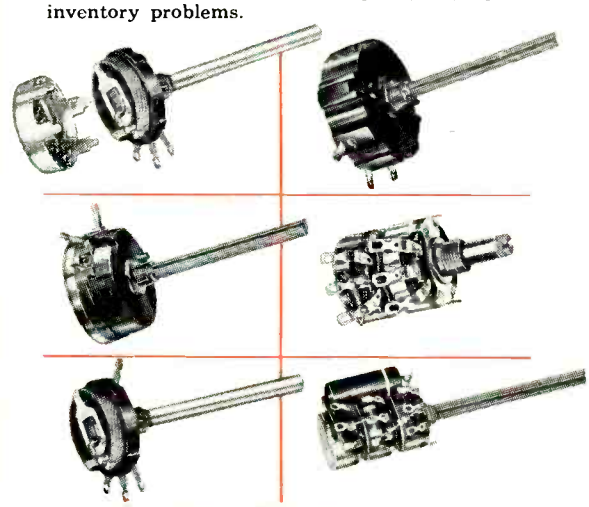
IRC's complete line includes 492 Factory-Assembled Exact Duplicate Concentric Duals. Mechanical fit and electrical operation double-money-back guaranteed—specifications are based on set manufacturers' procurement prints. Resistance values are matched; tapers are closely followed; shaft lengths are never less than manufacturers' nominal—never more than 1/32" longer. Cover more than 5,000 TV sets. Carbon and wire wound.



For Concentric Duals in Less Than A Minute

IRC CONCENTRIKITS

Here's coverage of more than 5,000 TV models. Revolutionary 4-piece Universal Concentrikits assemble with shafts and elements in less than a minute to give you the exact duplicate replacement control you want. Mechanical fit and electrical operation double-money-back guaranteed. Assemble both carbons and wire wounds. Fewer inventory problems.



For Special Purpose Controls IRC's Complete Line

2-Watt Wire Wounds—2 styles, full rounded shaft and Knobmaster shaft. *High Voltage Controls*—2-watt carbon-element control with Knobmaster shaft. *4-Watt Wire Wounds*—2 styles, short, knurled and slotted shaft or Knobmaster shaft. *TV Attenuators*—Carbon-element control for adjustment of signal input. *TV Centering Controls*—2-Watt Wire Wound Control with centering tap. *Loudness Controls*—Continuously variable, bring higher fidelity to ordinary audio.

No other brand of replacement controls offers you wider variety — greater efficiency. Send for New IRC Control Catalog DC1D.

For one-source-service on all your control requirements, order from your IRC Distributor.

IRC

INTERNATIONAL RESISTANCE COMPANY

425 N. Broad Street, Philadelphia 8, Pa.

In Canada: International Resistance Co., Ltd., Toronto, Licensee

Wherever the Circuit Says

TECHNICIAN*

(Formerly the TECHNICIAN SECTION of "TELEVISION RETAILING")

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

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—serving the industry's largest group of service technicians, service managers and installation specialists.

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OCTOBER, 1953

TECHNICIAN'S CHART OF ANTENNA SYSTEM TROUBLES—A pictorial tabulation to help you show the customer the seven points at which his antenna and down-lead system may fail, as weathering and atmospheric disintegration take their toll after a couple of years exposure. Demonstrating why a Fall antenna check-up is desirable, if the customer's reception is to be maintained in first-class condition for important TV shows on the air this winter. Handsome chart in two colors "Now is the Time for an Antenna Checkup". ***Section 2 of this Issue.***

***CIRCUIT DIGESTS** (See page 81 and the following sheets)*

EMERSON: Chassis 120174-B, 120198-D
HOFFMAN: Chassis 403-24
MONTGOMERY WARD: Auto Radio, Model 35BR-6796A
PHILCO: R-F Chassis R-201, Deflection Chassis D-201
RAYTHEON: Chassis 21T8
RCA VICTOR: Chassis KCS83C, KCS83D

DEPARTMENTS

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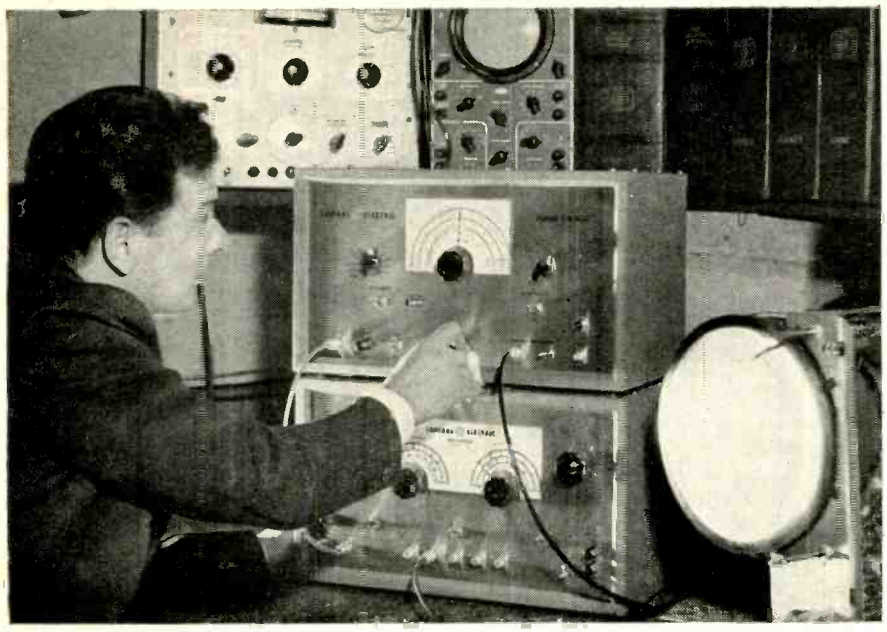
*Reg. U. S. Patent Office



"OUR CUSTOMERS TELL US THAT THE PICTURES ARE BETTER THAN WHEN THEIR SETS WERE BRAND-NEW."

Says W. T. Gerlach
Roselle Radio and TV Service
1027 Chestnut St., Roselle, N. J.

"Since the first TV sets were delivered in this area, we've installed almost every type and brand of picture tube, but we've yet to find any that gives a picture like the G-E Aluminized Tube.

"Our tube customers are not only satisfied—they are downright pleased! As a result, **more than two out of every three tubes we are installing are G-E Aluminized Picture Tubes."**

"2 OUT OF EVERY 3 TUBES ARE G-E ALUMINIZED

Give your customers TV's finest picture—and make more money!

"65% OF OUR PICTURE TUBES SOLD ARE G-E ALUMINIZED. ONE OWNER TELLS ANOTHER."

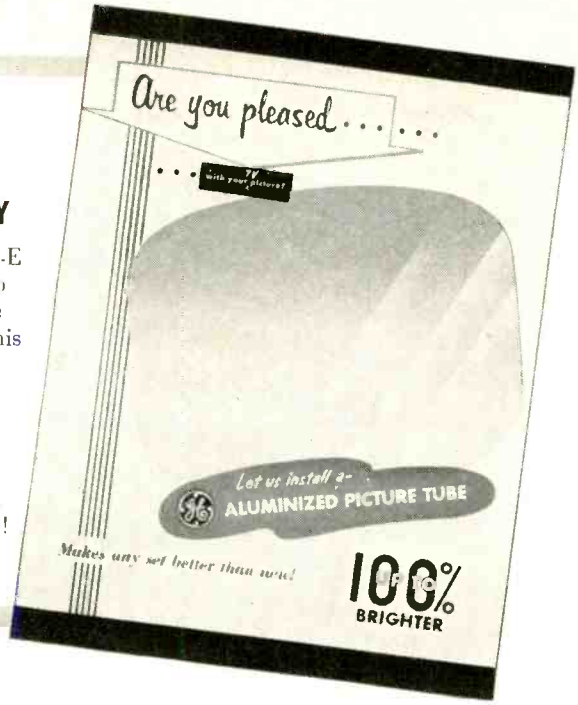
Says Kenneth L. Middleton . . . HILLENS
740 N. Garey Ave., Pomona, Cal.

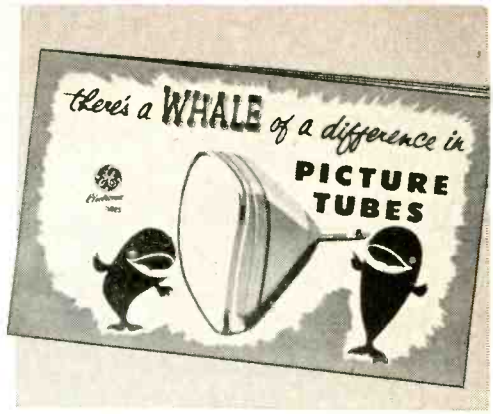
"GENERAL ELECTRIC ALUMINIZED PICTURE TUBES ARE ONE OF MY REAL BIG MONEY-MAKERS!"

Says Norman Foster . . . Foster Television
2922 Milwaukee Ave., Chicago, Ill.

BRAND-NEW MIRROR DISPLAY

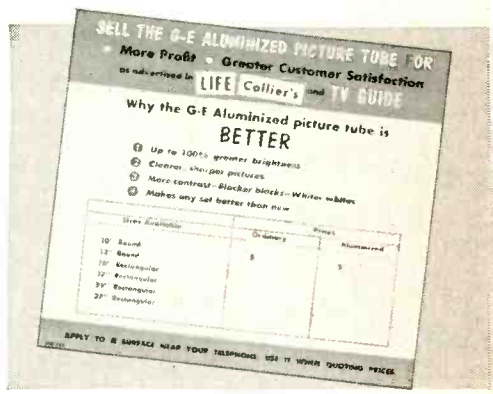
Eye-evidence why a G-E Aluminized Tube is up to 100% brighter. The mirror does it! . . . This 3-color display with polished, gleaming mirror sticks front or back to any flat surface—your store-window, door, or wall. A real attention-getter!



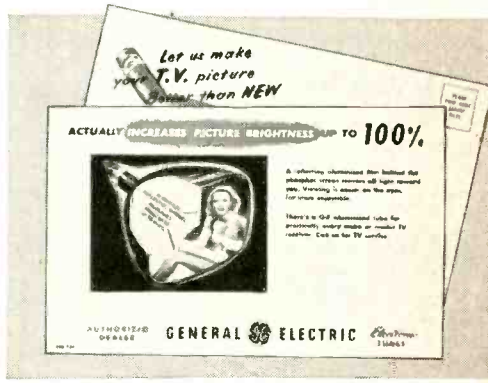


FACT-CRAMMED BOOKLET FOR TV OWNERS

COLORFUL STREAMERS



PHONE-SELLING PRICE GUIDE



MAIL CARD THAT BUILDS INQUIRIES

NEWSPAPER AD MAT

WE INSTALL PICTURE TUBES!"

Ask for new 6-piece promotion kit!

All these helps are waiting for you at your G-E tube distributor!

GET the full kit of G-E Aluminized Tube sales aids! Use them to sell better-than-new TV! It's a sure-fire way to lick competition from inferior picture tubes offered to your customers.

This mirror, booklet, and other helps will work hard for you, developing *profitable* tube sales. General Electric further supports your efforts by a strong coast-to-coast advertising campaign to TV owners. Ads in LIFE, COLLIER'S, and TV GUIDE, reaching some 40,000,000 readers, tell why the G-E Aluminized Tube is brighter, better, the finest tube any set can have!

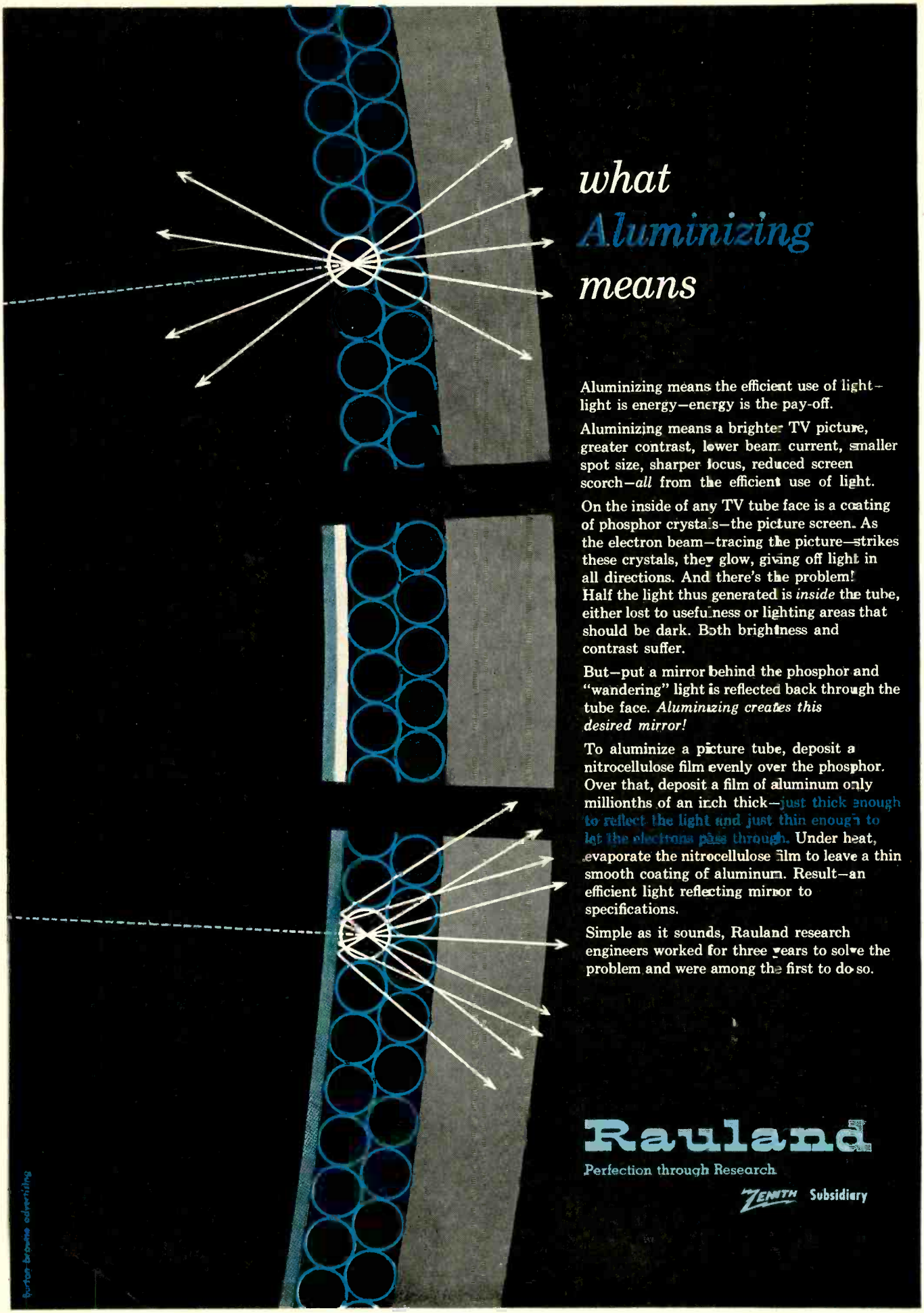
Today many leading TV builders are featuring new-model receivers with General Electric Aluminized Tubes. Demand for replacement tubes will skyrocket as the finer performance of the aluminized tube is made known by enthusiastic set owners.

Take a tip from successful service dealers everywhere! Sell TV's finest picture *profitably! Tube Department, General Electric Co., Schenectady 5, New York.*

1878 75 1953
YEARS OF ELECTRICAL PROGRESS
Diamond Anniversary

GENERAL ELECTRIC

161-1A7



what Aluminizing means

Aluminizing means the efficient use of light—light is energy—energy is the pay-off.

Aluminizing means a brighter TV picture, greater contrast, lower beam current, smaller spot size, sharper focus, reduced screen scorch—*all* from the efficient use of light.

On the inside of any TV tube face is a coating of phosphor crystals—the picture screen. As the electron beam—tracing the picture—strikes these crystals, they glow, giving off light in all directions. And there's the problem! Half the light thus generated is *inside* the tube, either lost to usefulness or lighting areas that should be dark. Both brightness and contrast suffer.

But—put a mirror behind the phosphor and "wandering" light is reflected back through the tube face. *Aluminizing creates this desired mirror!*

To aluminize a picture tube, deposit a nitrocellulose film evenly over the phosphor. Over that, deposit a film of aluminum only millionths of an inch thick—just thick enough to reflect the light and just thin enough to let the electrons pass through. Under heat, evaporate the nitrocellulose film to leave a thin smooth coating of aluminum. Result—an efficient light reflecting mirror to specifications.

Simple as it sounds, Rauland research engineers worked for three years to solve the problem and were among the first to do so.

Rauland

Perfection through Research

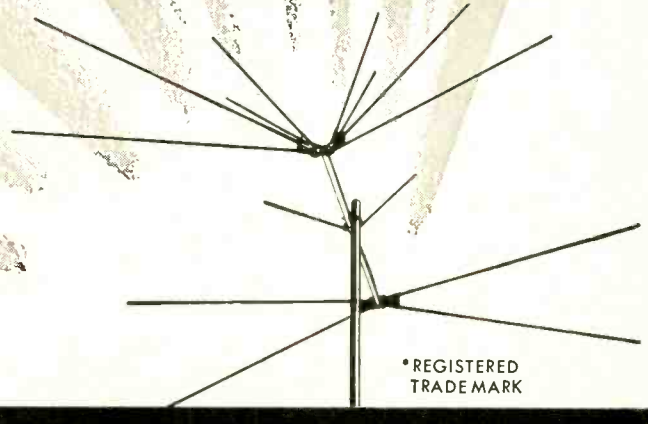
ZENITH Subsidiary

Your *BEST* antenna buy for channels 2 to 83!

telrex "DUO-BAND"

"CONICAL-V-BEAM"*

★ UNIFORMLY HIGH GAIN
★ EXCELLENT DIRECTIVITY
★ AUTOMATIC TRANSITION FROM UHF TO VHF
★ HIGH SIGNAL-TO-NOISE RATIO
★ ALL ALUMINUM RUGGED CONSTRUCTION



*REGISTERED TRADEMARK

INSTALL ONE ANTENNA, ONE TRANSMISSION LINE—Full UHF and VHF reception. The Telrex Duo-Band extends the famous "CONICAL-V-BEAM" principle. The addition of two supplementary V splines compacts and adds in-phase the higher frequency signals.

AUTOMATIC, PERFECT TRANSITION FROM VHF TO UHF—No "lossy" filters or isolation networks are employed in the Telrex design. Both UHF and VHF signals are picked up at the same cone apex.

ONLY A SINGLE TRANSMISSION LINE IS REQUIRED — Duo-Band provides uniformly high gain with one major lobe, channels 2 to 83 and actually improves reception on channels 7 to 13.

ASSURES HIGH SIGNAL-TO-NOISE RATIO . . . FREE FROM GHOSTS — Excellent directivity on VHF and UHF. A clear, un directional pattern makes Duo-Band the perfect array for reception near or far.

DUO-BAND features include all aluminum rugged design, light weight. Practical design can be used single bay or stacked for increased sensitivity.

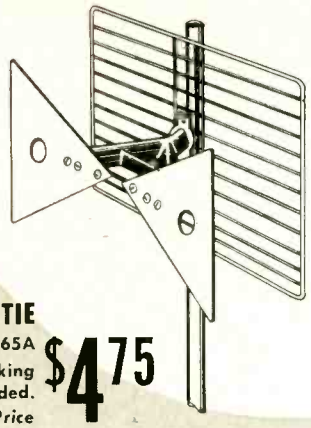
60 Models Available to meet every Antenna Requirement. Write for Illustrated Catalog on the Complete TELREX Line.

"CONICAL-V-BEAMS" are produced under Re-issue Patent No. 23,346. Canadian and Foreign Patents Pending.

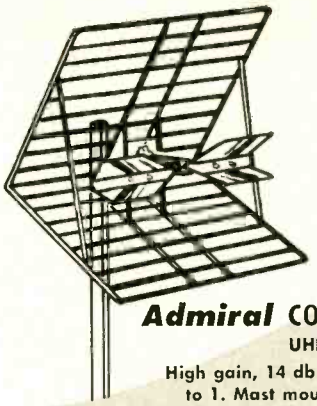
telrex INC. BETTER BY DESIGN
"CONICAL-V-BEAMS"
ASBURY PARK 2, N. J.

SERVICE MEN! Modify existing "CONICAL-V-BEAMS" with DUO-BAND! Existing antennas can be modified to operate efficiently on channels 2 to 83 by means of the new Telrex Modification Kit.

Originators and Manufacturers of "CONICAL-V-BEAMS" — insist on the Original! Look for the Telrex Trademark.



Admiral BOW TIE
UHF Antenna, No. AN65A
Each antenna furnished with stacking bar. Mast mounting bracket included. Mast not included. *Suggested List Price* **$4.75**



Admiral CORNER REFLECTOR
UHF Antenna No. AN56A
High gain, 14 db. Front to back ratio 15 to 1. Mast mounting bracket included. Mast not included. *Suggested List Price* **$9.95**

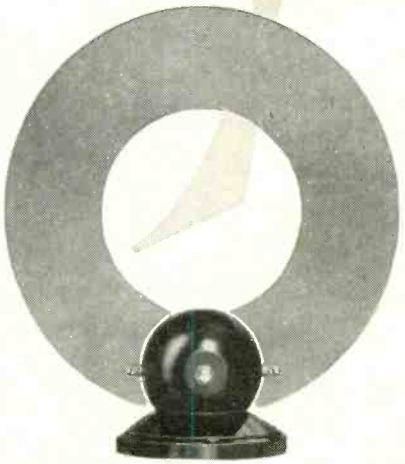
Admiral all-channel UHF antennas

HIGH GAIN
LOW COST

Now you can make an extra profit on installations using these high gain UHF antennas. In good signal areas, the Admiral Bow-Tie No. AN65A gets excellent reception on any of the 70 UHF channels...*and lists for only $4.75!* For troublesome locations, where ghosts, reflections and interference are encountered, install the Admiral Corner Reflector Antenna No. AN56A. It lists for only $9.95.

Both these antennas are made with aircraft aluminum antenna elements and vibration-proof reflectors. Both come completely assembled, ready to mount. "A-frame" insulators provide plenty of free air space around elements. The units have high mechanical strength, low wind resistance, and are treated to resist weathering. They can be easily fastened to existing masts and towers.

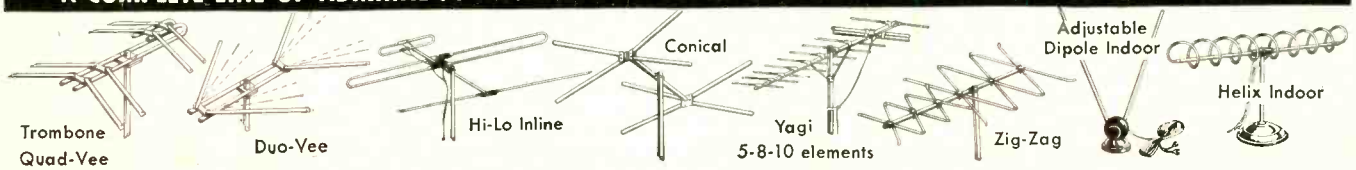
Where an indoor UHF antenna is needed, give your customer the Admiral Target No. 94A10-7. Smartly styled in rose-gold colored anodized aluminum with mahogany phenolic base, it stands only 10 inches high. The base is weighted and felt padded...can be placed on top of receiver...picks up all UHF channels. Order by part number from your Admiral distributor.



Admiral TARGET
Indoor Antenna No. 94A10-7
Complete with lead-in
Suggested List Price **$4.95**

Admiral Corporation
Accessories and Equipment Division • Chicago 47, Illinois

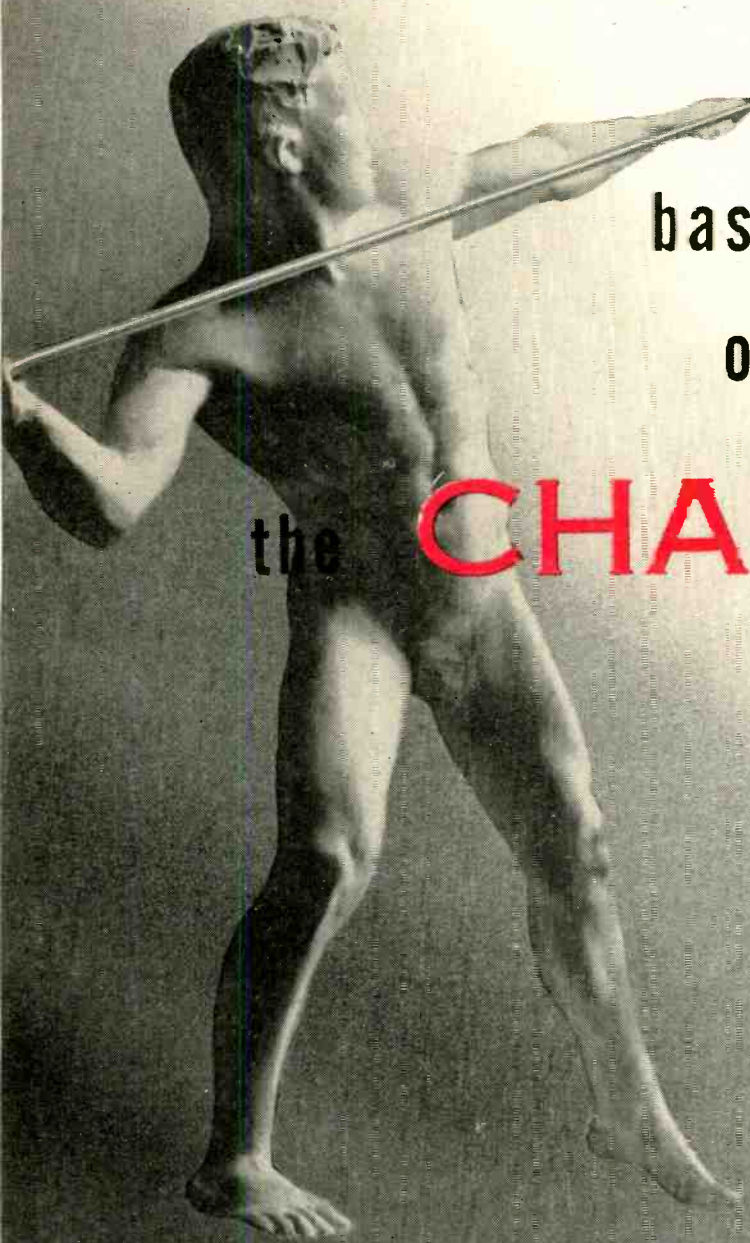
A COMPLETE LINE OF ADMIRAL TV ANTENNAS . . . NOW AVAILABLE FROM YOUR ADMIRAL DISTRIBUTOR



CHANNEL MASTER

introduces a

basically *new type* of VHF antenna



the CHAMPION*

the highest gain all-channel VHF antenna ever developed!

Featuring the unique new "Tri-Pole"

TRIPLE-POWERED DIPOLE

The "Tri-Pole" is a new antenna system in which the Low Band folded dipole also functions as three folded dipoles tied together in phase on the High Band. This is the heart of the Champion, the secret of its phenomenal performance on all 12 VHF channels.

The **CHAMPION** is another great development of the world famous Channel Master laboratories.

*Pat. Pending

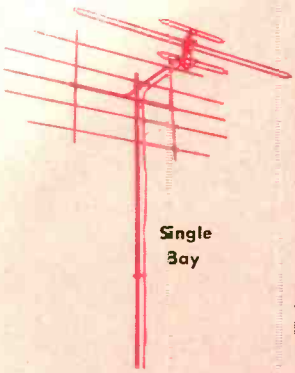
the CHAMPION is the most sensitive all-channel VHF antenna ever designed!

Stacked *CHAMPION* provides:
11-13 D B High Band gain
6½-7½ D B Low Band gain

Here is a totally NEW kind of antenna, completely different — in principal and performance — from any VHF antenna you've ever seen! Since the lifting of the TV freeze means a gradual disappearance of the single-channel VHF area, the VHF antenna of the future will be a *multi-channel* antenna. Prepare now for outstanding reception on *all* VHF channels — present and future — with Channel Master's super-sensitive CHAMPION! Outperforms every all-channel VHF antenna made today — and many Yagis, too!

COMPARE these features with the antenna you are now using:

- Folded dipoles throughout — give close to 300 ohms impedance across the entire band.
- Screen-type reflector provides high uniform gain on every channel, 2 through 13. *Not* frequency sensitive — this reflector provides more than twice as much extra gain as straight bar reflectors.
- Phase-correcting harness is built-in and fully assembled; the only wiring you do is to attach the lead-in.
- All-aluminum construction . . . lightweight, durable, non-corrosive.



MARVEL OF PRE-ASSEMBLY

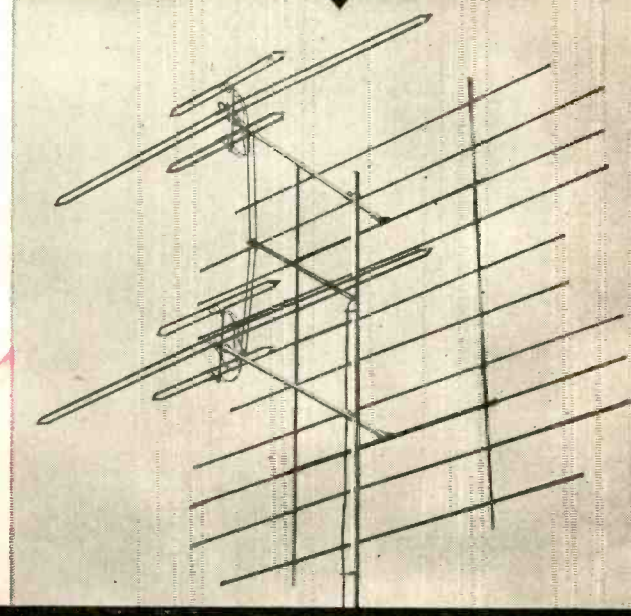
assembles faster than a 5-element yagi!

Collapsed "Pap-Up" screen opens instantly — no loose rods, elements or hardware. "Tri-Pole" assembly features automatic Spring Lock Action — all dipoles snap permanently into place without wing nuts or any other hardware.

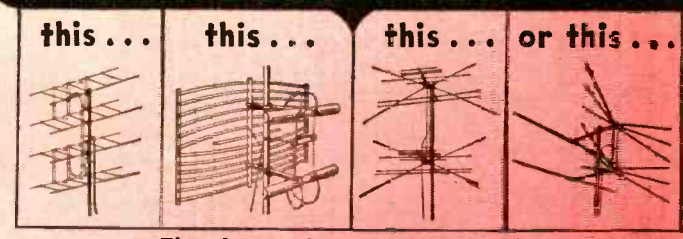
It's a *CHAMPION* in any area!

1-bay—*local areas*
2-bay—*secondary and fringe areas*
4-bay—*super-fringe areas*

THIS ANTENNA...

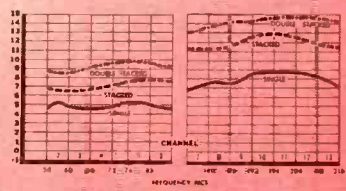


OUT-PERFORMS:



The 2-Bay CHAMPION actually gives you the performance of:

- Separate 5-element Yagis for every Low Band channel!
- Separate 10-element Yagis for every High Band channel!



Model No.		List Price
325	Single Bay	$20.83
325-2	2-Bay	$42.36
325-4	4-Bay	$88.89
Separate Stacking Harness		
325-3	2-Bay Harness	$ 2.08
325-5	4-Bay Harness	$ 4.15

Send for complete technical literature.

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

The TARZIAN UTP1 (Single Channel) Translator for UHF

Works on ANY TV Receiver

- Self-powered.
- Two units may be attached to receiver to receive two UHF channels.
- Input alignable to any UHF station (470-890 mc)
- Output into balanced 300 ohms, channels 2-6 inclusive
- Requires NO internal wiring changes.
- Easily attached.

COMPLETE RANGE OF FREQUENCIES AND ANTENNA SWITCHING POSSIBILITIES MAKE THE RECEPTOR

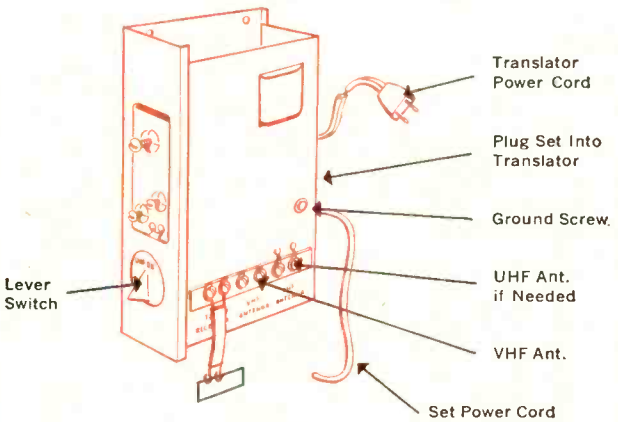
Completely Universal in Application

The UTP1 is the answer to set owners anywhere within the range of one or two UHF stations.

Adaptable to any type receiver, the UTP1 brings in the UHF station through one of the unused low channels, 2 to 6. None of the 12 VHF channels is sacrificed.

The same high standards of engineering quality . . . design . . . and development which have made the TARZIAN Tuners famous—are embodied in the UTP1 Receptor.

Moderately-priced to appeal to millions of present-day set owners. See your set dealer or service man or write for detailed information.



SARKES TARZIAN, INC., TUNER DIVISION
BLOOMINGTON, INDIANA

over 99%* hit the bull's-eye for quality!

that's why we call

Federal PICTURE TUBES "BEST-IN-SIGHT"

Thousands of famous-name picture tubes were quality-tested by a famous-name TV set manufacturer.* When the scoring was over, Federal led all the brands tested . . . with an "OK" on over 99% of its tubes!

Here's proof, Mr. Serviceman, that it pays to replace with *Federal* . . . here's assurance of top performance . . . of less time wasted on call-backs . . . of more profit per tube replaced!

Federal quality brings to servicemen a tremendous opportunity to create customer-goodwill . . . to build steady replacement business.

Federal quality *stands by* servicemen, because it *stands up* in service . . . backs up their years of experience and know-how . . . their *trained* judgment. That's one of many big reasons why more and more servicemen are specifying Federal "Best-in-Sight" picture tubes.

Join the trend today . . . ask your Federal Distributor about the popular-size line that takes care of over 90% of all TV replacements . . . ! For information, write to Dept. N-354.

"Federal always has made better tubes"

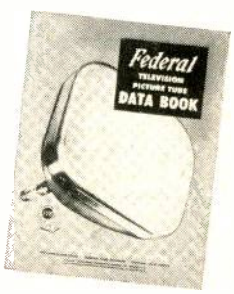
Federal *Telephone and Radio Company*

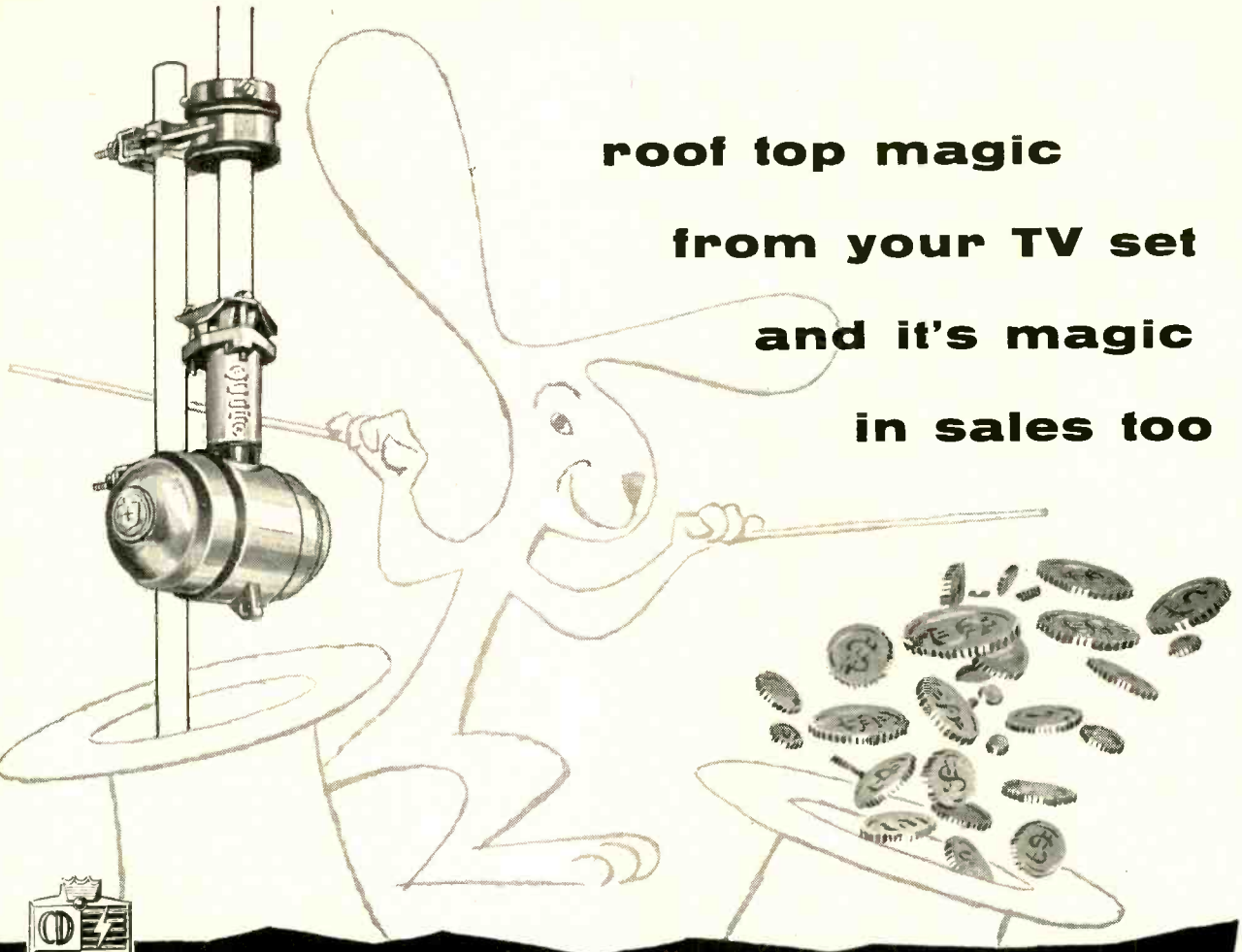
100 KINGSLAND ROAD, CLIFTON, N. J.

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

Get Your Copy of Federal's TV Picture Tube DATA BOOK

12-page booklet with information on interchangeability, basing diagrams, bulb outlines, dimensions, characteristics. Address your inquiry to Dept. listed above.





roof top magic from your TV set and it's magic in sales too

the C•D•R Rotors

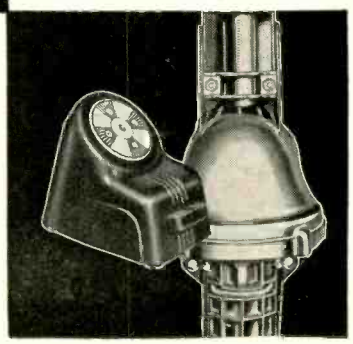
NATIONALLY PROMOTED IN TELEVISION

★ There's real MAGIC to the CDR ROTOR! The way it IMPROVES any TV picture is magic ... the way it sells ... is magic! BUT ... the real answer is quality manufacture of a proven design! That adds up to continued dependable performance ... CDR ROTORS ARE BUILT TO LAST ... built to perform under any conditions!

NOW ... MORE IN DEMAND THAN EVER BEFORE with the BIG consumer advertising campaign in full swing ... if you don't have your BIG CDR PROMOTION KIT with selling and advertising aids ... write us for your kit ... to help you sell EVEN MORE!

TR-12 ... a special combination value consisting of complete rotor including thrust bearing ... handsome modern design cabinet with meter control dial **$47.95**

TR-11 ... same as TR-12 without thrust bearing **$44.95**



TR-2 ... the HEAVY DUTY rotor especially suited for special TV antenna installations. Complete rotor with "Compass Control" cabinet having illuminated "perfect pattern" dial. **$49.95**

THE RADIART CORPORATION
CLEVELAND 13, OHIO

THE CORNELL-DUBILIER ELECTRIC CORP.
SOUTH PLAINFIELD, N.J.

We shot for the moon ...on a clear night

We set our sights on developing a new electron gun . . . one whose finer beam would establish an all-time high in resolution for electrostatic-focus picture tubes.

We shot for a gun that would produce a smaller, sharper spot . . . a spot free from the effects of excessive "starring" which causes an outline blur similar to the haze around the moon on a cloudy night.

Smaller spot size, and cleaner, more uniform spot shape are the secrets of the Du Mont Hi-R Teletron. These are the features which have made possible a more vivid presentation of the television picture.

They are the reasons why, in just a few months, the Hi-R Teletron has become the performance standard of the television industry.

DU MONT®
*Teletrons**

Hi-R—A new high in resolution—now being incorporated in all DuMont Electrostatic Focus Teletrons

*TRADE MARK

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

MOST AMAZING TV TROUBLE SHOOTER

HICKOK

Does in Minutes...Many Jobs that Normally Take Hours by Usual TV Service Methods

- Crystal controlled all-purpose TV service instrument.
- Provides TV Pulses of 60; 900; 15,750 cycles and 315 KC.
- The only instrument to provide Horizontal and Vertical framing frequencies for fast servicing of deflection circuits. As well as provide drive for a monoscope or camera.
- RF output covers all channels and is calibrated in microvolts for sensitivity measurement.
- Can be used as a wire-connected TV transmitter to simultaneously transfer program to any number of TV receivers on any channel.
- Permits approximate field intensity measurement.
- Substitute video amplifier.
- Vertical, Horizontal sawtooth can be substituted for vert., horiz. oscillator in TV set.
- In addition to all these features the 650 also generates a bar and dot pattern.

MODEL 650

WHAT USERS SAY:

√ "Hickok Model 650 Generator is the most practical single piece of television test equipment offered to the TV serviceman. I like every feature about it, and have seen it used in every possible way."

Jack P. Moore, Service Mgr.
Commonwealth Television Installation & Service Company

√ "The Hickok Model 650 is, without a doubt, one of the most useful instruments yet developed for the Television Servicing Technician."

Ray S. Guichard, Mgr. Svr. Trg.
Capehart-Farnsworth Corporation

√ "My Hickok Model 650 Television Video Generator is the most time saving instrument I have ever used. Television Service companies who don't have this instrument should get one, and they could turn out three times as much work."

F. W. Gibbons, Oxford, Mississippi

√ "In my opinion, no self-respecting TV service organization should be without a 650. Hickok has again pioneered a quality piece of equipment at a price anyone can afford."

Donald T. Birch, Radio-TV Instr.
The Lively Technical School

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
Dupont Avenue • Cleveland 8, Ohio

LETTERS
To the Editors

Customer Appreciation

EDITORS, TECHNICIAN:

TV service customers do not realize how much time and energy a good serviceman puts into a job; they have no idea of all the work he does when he is out of their sight. Ways should be found to call attention to these matters in order to improve customer relations.

Barclay Hill Rd.
Beaver, Pa. WM. WALLACE MILLIGAN

Favors Licensing

EDITORS, TECHNICIAN:

I'm in favor of licensing service technicians to push the screwdriver maniacs out of the business. If those fellows were out, we'd all be able to make a good living in a respected occupation.

5 Perkins Ave. M. E. BLAISDELL
Brockton, Mass.

Serviceman Is Goat

EDITORS, TECHNICIAN:

Most TV manufacturers are forgetting the serviceman when they design and build sets. I've been in the service game since the beginning and I can see now that receiver builders are making the serviceman the goat of poor design and low-grade components.

126 York Ave. T. R. MORRIS
Weatherford, Texas

Poor Cooperation

EDITORS, TECHNICIAN:

Why are radio-TV manufacturers so uncooperative when it comes to furnishing service data on their products? They should realize that it is in their interest, as well as ours, to supply complete technical dope promptly.

148 N. 85th BILL CARON
Seattle 3, Wash.

Better Tubes And Components

EDITORS, TECHNICIAN:

It seems to me that TV manufacturers would do themselves, their customers, and servicemen a great big favor if they would take some steps to obtain better tube and component reliability in their products. Such a progrom is long overdue.

167 Frank Ave. SAM MESSIN
Oxnard, Calif.

Standard Service Rates

EDITORS, TECHNICIAN:

I hope that technicians and service organizations will get together and establish standard service-call rates. It seems to me that this is the only method by which we can put a stop to those bait ads in newspapers, offering two and three dollar service calls.

5925 Cooper Ave. R. N. MANSFIELD
Detroit 13, Mich.

Collection Difficulties

EDITORS, TECHNICIAN:

We have trouble collecting bills for service on sets which incompetent butchers have messed up; customers protest that they are being forced to pay twice for the same repair. We would like to know how other service shops solve this problem.

274 Eastern Ave. SAMUEL BRUNO
Springfield, Mass.

Poor Quality Parts

EDITORS, TECHNICIAN:

Parts jobbers who sell poor-quality "cheap" parts and tubes to servicers should realize that they are thereby causing customer dissatisfaction and giving the entire trade a bad name. They ought to stop doing it.

871 N.E. 128 St. A. E. PELOQUIN
No. Miami, Fla.

Indiscriminate Wholesaling

EDITORS, TECHNICIAN:

I think something should be done about the indiscriminate wholesaling of radios, TV sets, parts and antennas. The suppliers of the "wholesalers" advertise in national magazines offering their products at my wholesale prices; then they expect legitimate shops like mine to display, sell and service their wares. I'd like to have the comments of others on this subject.

Ontonagon, Mich. JACK WATT

Fix-It Books

EDITORS, TECHNICIAN:

I hate TV announcers who condemn servicemen on the air in order to sell their fix-it-yourself books to gullible TV owners. Let's figure out some way to slap back at those oily-tongued characters.

1303 8th St. HENRY PERKOWSKI
No. Bergen, N. J.

Mail Order Merchants

EDITORS, TECHNICIAN:

The main evil that plagues me is the selling to my customers, at or below my wholesale cost, by the big mail-order outfits. Apparently we need much stronger servicemen's associations to stop this practice.

140 Main St. A. L. ABELL
Shelby, Mont.

An Old Story

EDITORS, TECHNICIAN:

The TV service business is going through the same stages that radio servicing did in the late twenties and early thirties. The dollar service call, the promise to perform repairs in the customer's home—it's an old story to anyone who remembers. The big difference is that TV is more complicated and service must necessarily cost more.

4927 E. 20th St. R. V. HILL
Kansas City, Mo.

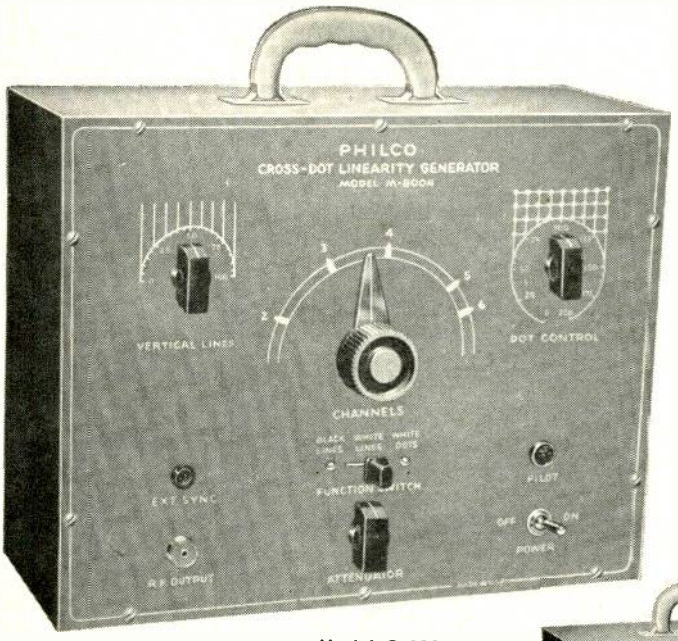
NEW! Versatile! Exclusive!

PHILCO®
Cross Dot
TV Linearity Pattern
Generator

More Stable Operation at
1/3 the Cost
of Comparable Generators

Again . . . Philco leads the field! For the finest possible linearity adjustments without station pattern, here is the all new *cross dot* linearity pattern generator. This unit not only lets you make TV linearity adjustments more quickly and accurately but also permits precise routine adjustments and trouble shooting with amazing economy of operation . . . Light, rugged, portable, heavy gauge steel case . . . finished in durable gray hammertone . . . See your Philco distributor now or write Philco, Accessory Division, "A" & Allegheny, Philadelphia, Pa.

Now Yours on New Special Payment Plan



Model G-8004

Specifications: —Self stabilized oscillator • Variable output frequencies • Power consumption approximately 10 watts • Power supply—105-125 Volts, 60 cycles • large easy-to-tune dial • high level output controllable with variable attenuator.

Model M-8104—TV Field Strength Meter • Offers more features than any unit at this popular price . . . Super Colorado Tuner for low noise and high gain . . . May be used to check TV boosters, antenna combinations, interfering signals and picture signal strength.

Model 7008—Visual alignment Generator • Combines in one economical unit functions ordinarily found only in a cumbersome collection of costly devices . . . Includes extra sensitive built-in oscilloscope . . . AM, FM, and audio generators. Sweep output flat to within .2 DB/MC.

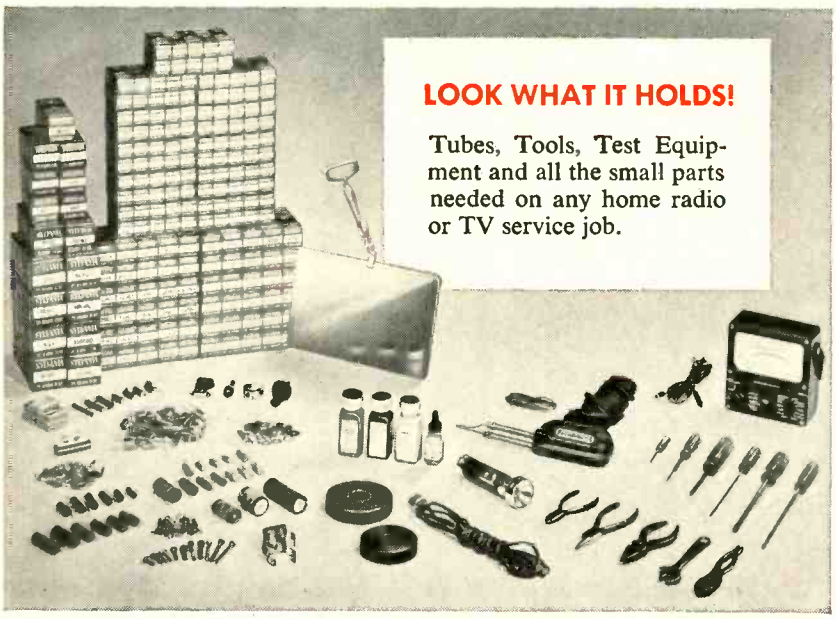
PHILCO
Test Equipment
Specifically Designed for the Serviceman

Servicemen! Here's Your Sylvania

T-N-T CHEST

(TUBE AND TOOL)

The Most Valuable Service Aid You've Ever Seen!



Talk about a useful servicing aid . . . this Sylvania T-N-T (Tube and Tool) Chest is really it! Carries more tubes, tools and parts than any chest on the market!

LOOK AT THESE FEATURES:

- Bass and fir plywood case
- Waterproof Du Pont Fabrikoid cover
- Holds 187 receiving tubes
- Lightweight folding aluminum tool and parts tray
- Unbreakable plastic handle
- Brass-plated hardware
- Room for mirror and ohmmeter
- It's a complete, portable service shop!

ACT NOW . . . Offer Limited!

This chest is now yours for only $5.00 and 30 Sylvania Premium Tokens. Offer good only between August 1st and November 15th. See your Sylvania Distributor who has these kits now.

Remember, you get 1 Sylvania Premium Token with every 25 receiving tubes or with every picture tube you buy.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

LIGHTING · RADIO · ELECTRONICS · TELEVISION

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

Depend on Mallory
for
Approved Precision Quality

The MALLORY UHF Converter can mean EXTRA PROFITS when UHF television comes to your area

Where UHF television has already gone on the air, the Mallory Converter has proven to be one of the fastest moving items in the new UHF market. And for good reason too.

- **The Mallory Converter will equip any TV set to receive *all* channels—old and new.**
- **Picture definition is excellent . . . tuning is easy.**

Another outstanding feature of the Mallory Converter is that it tunes in *all* channels in *any* area. The customer who has one has nothing more to buy, no adjustments to make . . . even if he moves to another broadcast area.

YOUR MALLORY DISTRIBUTOR will be glad to show you the Mallory Converter . . . tell you how successful it has been for dealers in other areas. Get complete information today, so you can make the most of the new UHF market tomorrow.

Installation is FAST and EASY

. . . and it can be done right in your customers' homes in a matter of minutes. Simply connect the antenna leads and power lines from the Converter to the set. That's all there is to it.

P. R. MALLORY & CO. Inc.

MALLORY

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

APPROVED PRECISION PRODUCTS

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

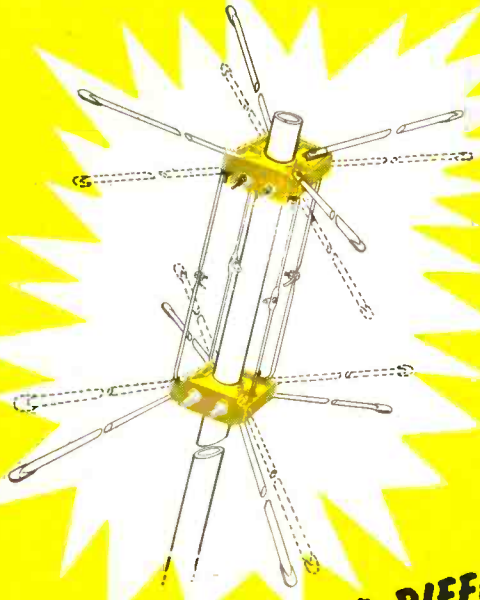
MONEY BACK GUARANTEED

TO RECEIVE *All* UHF and *All* VHF STATIONS IN *All* DIRECTIONS FOR 60 MILES

WITHOUT A ROTORMOTOR OF ANY KIND!!

WORLD'S MOST POWERFUL UHF—VHF TELEVISION ANTENNA

While antenna reception is guaranteed for 60 miles, perfect pictures have been consistently received as far as 160 miles from stations.



MODEL

SUPER 60

All NEW DESIGN FOR '54

- LOW-LOSS SWITCH
- LOW-LOSS PHENOLIC INSULATORS
- USES NEW 4-CONDUCTOR MATCHED IMPEDANCE LINE
- ONLY 10 INCH SPACING BETWEEN ANTENNA BAYS

ONE INSTALLATION ONE ANTENNA
ONE TRANSMISSION LINE

SO NEW! SO DIFFERENT! IT'S PATENTED!

#2,585,670
#2,609,503
#2,625,655
#2,644,091

Money Back Guarantee

IN ALL LOCATIONS IN EVERY AREA
WITH STATIONS IN ALL DIRECTIONS

The new All Channel Model Super 60 is guaranteed to bring in, immediately on installation, every UHF and every VHF station within 60 miles in any direction, giving clearer and sharper pictures than any antenna or combination of antennas with or without rotor motors.

If, immediately on installation, it fails to do this, we agree to refund to the jobber to whom we sold and shipped it, his full purchase price.

The 9 position selector switch electronically rotates the antenna in a stationary position.

LIST PRICE $36.75

SEE YOUR LOCAL JOBBER.

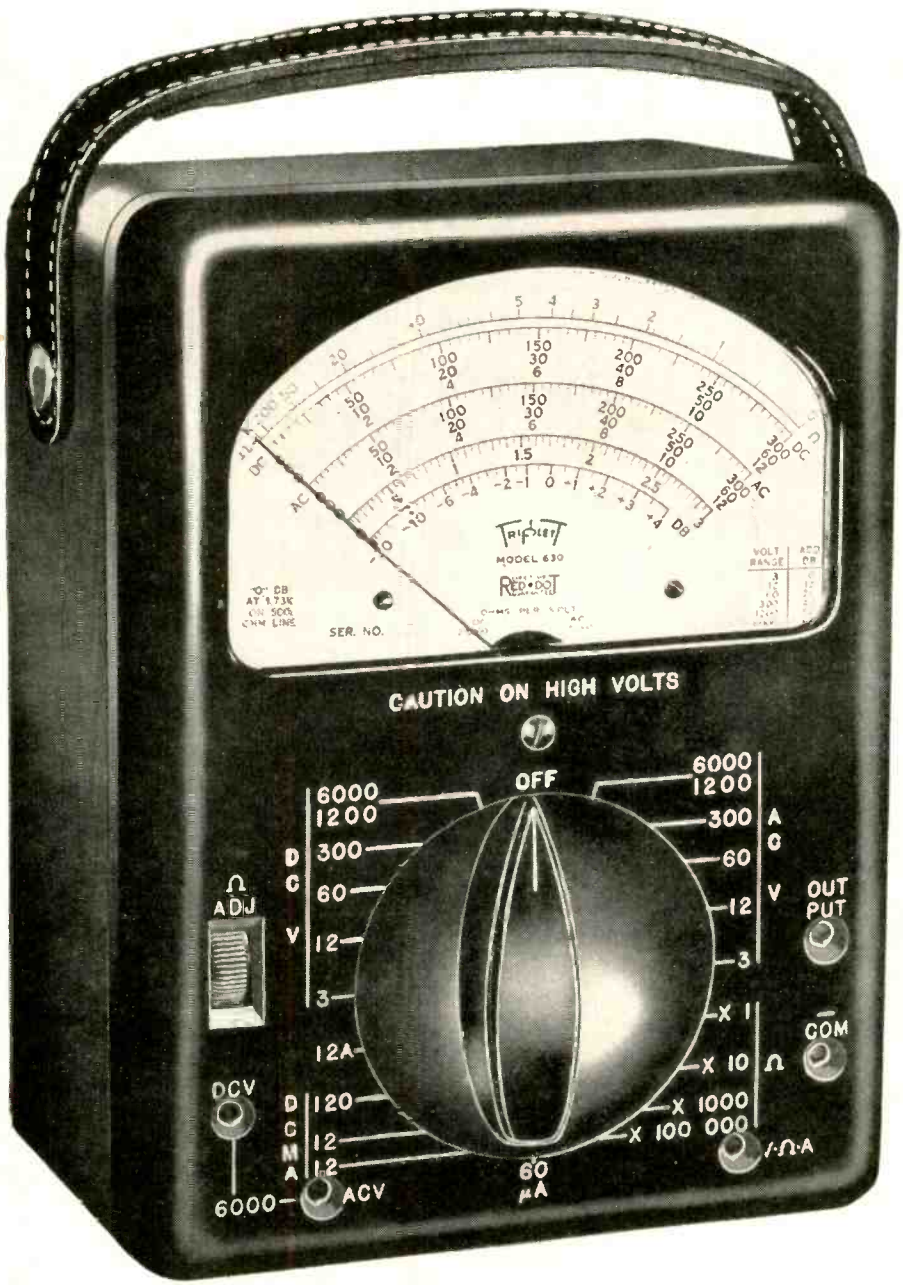
PRICE INCLUDES

Complete stacked array • 4 stacking bars • 9 position switch • Switch-to-set coupler • 3 - 7½" stand offs • Individually boxed in mailable carton

BE READY NOW — FOR THE FUTURE

ALL CHANNEL ANTENNA CORP., 70-07 QUEENS BLVD. WOODSIDE 77, NEW YORK

TRIPLETT 630 Volt-Ohm-Mil-Ammeter "speaks" for itself in any company



TRIPLETT 630 Volt - Ohm - Mil - Ammeter has many significant advantages and features that make it stand distinctly apart from similar instruments in its price class. Actually in components, in engineering, in minutely accurate performance, Triplett 630 closely approaches laboratory standards.

Since the scales of any VOM comprise the means by which it makes its multiple services most valuable, the legibility and easy-read-ability are of prime importance. Triplett engineers have created in Triplett 630 the longest scales available in this size tester. (The upper arc by actual measurement is four and three-eighth inches.)

This long-scale factor accounts for the ease with which precise readings are easily made. Further legibility is gained by use of black and red scale markings. D.C. and D.B. are black and white. A.C. and Ohm markings are red on white. Ohms from one hundred million to one-tenth ohm mark the range of this amazing scale. On low ohms, center scale reading is 4.5 ohms.

The Single Switch

Futher indication of the practical skill and engineering "know-how" behind Triplett 630 is the Single Switch. Its simplicity of operation assures no burn-outs thru momentary memory lapses. There is instant switching to desired circuit thru a single 2½" knob flush with the face panel. The molded switch itself embodies the most advanced engineering practices. Fully enclosed, the silvered contacts are kept permanently clean. Its rugged construction means stronger performance and longer life.

These two factors are but samples of the many ways in which on-the-job needs have been anticipated and provided for in a beautiful streamlined tester. It provides A.C.-D.C. Volts, D.C. Micro-amperes, Milliamperes, Amperes, Ohms, Megohms, Decibel and Out Put readings in a no-short design embodying interior construction with all direct connections; no harness cabling. Its fool-proof unit switch construction houses precision resistors in insulated recesses in direct connection with switch contacts.

Study the following Ranges and descriptions and compare them point by point with *any* similar instrument for conclusive proof that Triplett 630 "speaks" for itself in *any* company.

Ranges

D.C. Volts: 0-3-12-60-300-1200—at 20,000 Ohms/Volt (For Greater Accuracy on TV and other High Resistance Circuits.)
A.C. Volts: 0-3-12-60-300-1200-6000—at 5,000 Ohms/Volt (For Greater Accuracy in Audio and other High Impedance A.C. Circuits.)
Decibels: —30, +4, +16, +30, +44, +56, +70. (For Direct Reading of Output Levels.)
D.C. Microamperes: 0-60—at 250 Millivolts.
D.C. Milliamperes: 0-1.2-12-120—at 250 Millivolts.
D.C. Amperes: 0-12—at 250 Millivolts.
***Ohms:** 0-1,000-10,000—(4,4-44 at center scale).
***Megohms:** 0-1-100—(4,400-440,000 center scale).
Output: Condenser in series with A.C. Volt ranges.

**Resistance ranges are compensated for greatest accuracy over wide battery voltage variations. Series Ohmmeter circuits for all ranges to eliminate possibility of battery drain when leaving switch in Ohms position.*

Get a Triplett 630 into your own hands at your distributor.
U.S.A. Dealer Net $3950

TRIPLETT ELECTRICAL INSTRUMENT COMPANY
BLUFFTON, OHIO

FREE—your Choice of

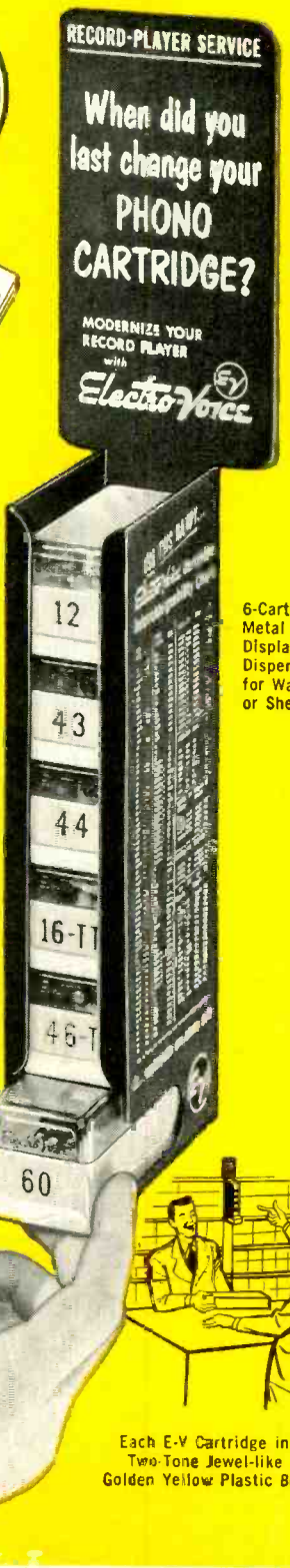
NEW PHONO-CARTRIDGE CARRY-KIT *or* DISPLAY-DISPENSER

Handy All-Metal Carry-Kit Holds 6 E-V Cartridges

Complete E-V Interchangeability Chart on both sides makes servicing positive and easy

PLUS
WINDOW or DOOR DECAL

PLUS
REVISED SET-MODEL REPLACEMENT GUIDE



6-Cartridge Metal Display Dispenser for Wall or Shelf

10,000,000
PHONOGRAPHS ARE WAITING TO BE SERVICED

Get your share with these E-V aids to sales!

Again E-V gives you a positive profit-maker—and helps make *you* the authority on Phono-Service in your community!

Free of extra cost, from your E-V Distributor, you can get your choice of new Cartridge Carry-Kit or Display Dispenser *plus* professional Decal and up-to-date set-model Replacement Guide, with *every* purchase of *any* 6 E-V Phono Cartridges.

Furthermore, the new E-V high output, high compliance, permanent Ceramic Cartridges revolutionize servicing. They are *not* affected by moisture or heat—can be carried in your service kit or kept on display without fear of deterioration. *And they are directly interchangeable with silent-needle type crystal cartridges that do not use a thumb screw*—yet cost no more than crystal. They are part of the famous E-V Basic 6 Preferred Types that make over 92% of all cartridge replacements.

Take advantage of this offer now! Make money selling cartridge replacements. Cash in on the $70,000,000 phono-cartridge modernization replacement market.

For a limited time only.

SEE YOUR E-V DISTRIBUTOR TODAY

Each E-V Cartridge in Two-Tone Jewel-like Golden Yellow Plastic Box

Electro-Voice

BUCHANAN, MICHIGAN

Export: 13 E. 40th St., New York 16, U.S.A., Cable: Arlab

TECHNICIAN

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

A Code for TV Service

Here are the fifteen basic planks in a platform for sound service business. A New England group of technicians has outlined this "code of ethics" for use in its letters to customers, in newspaper ads, and in cards for its windows and trucks. And as reminders of the firm's aims, copies of these "fifteen commandments" are kept before every member of its staff—outside men, bench technicians, office girls, and management.

To All It May Concern, —

WE PLEDGE OURSELVES TO —

1. Maintain sufficient personnel to render quick service.
2. Employ only thoroughly competent television technicians.
3. Render service at a reasonable charge.
4. Conduct an honest business.
5. Advertise our business truthfully and honestly.
6. Give the customer an accurate estimate of his job in advance, and then adhere to the estimate quoted.
7. Itemize and identify any and all charges on our bills.
8. Keep an adequate file of circuit diagrams and technical data on every make of set, to enable us to do a better job.
9. Co-operate with all manufacturers, and bring to their attention any errors we discover, in set design, construction and manufacture.
10. Repair sets in the customer's home when possible.
11. Make no charges for home calls if we fail to fix the set in the house.
12. See that our men are pleasant in demeanor, clean in appearance, and respect the customer's personal property.
13. Make no charge for call-backs, if they occur within two days of the initial visit.
14. Warrant for one year all parts replaced in accomplishing the repair.
15. Co-operate with all chambers of commerce, Better Business Bureaus, city officials, and organizations, private, city and state, on any matter pertaining to the television business.

Tuning In the

GOOD BUSINESS GENERALLY is assured throughout the last quarter of 1953, despite the dark forebodings we heard earlier in the year. Purchases are running $11 billions ahead of '52. Employment is at an all-time high of 63.2 million jobs. Corporate profits have been healthy during the first half of '53 and are expected to continue good. TV and appliance sales are expected to come back strong with the approaching Christmas season. And many new TV stations will go on the air before January 1 (both VHF and UHF). Compared with the 115 stations in operation last year when FCC lifted the "freeze," 255 TV stations are now on the air, with more than 300 others under construction and expected to be ready before '53 closes.

AT NILES, MICH., TV interference became a major issue in the last local mayoralty election. Mayor Russ Thomas, who finally won the majority of votes, early in his campaign equipped a truck with a rotating antenna and sent this outfit all over town hunting out interference sources, such as faulty neon signs, industrial machinery and household troublemakers. Unexpected culprits turned out to be old-fashioned loop-filament incandescent lamps (83 of them in Niles homes) which were promptly replaced free as a new municipal service. Now TV reception is good from Chicago, 90 miles away, and a thousand new TV sets have been sold in Niles since election.

BAD YOKES—A number of technicians tell us of troubles with deflection yoke coils becoming so tightly stuck to pic tube necks that when either tube or yoke requires removal, there is danger of cracking the tube neck. Some shops have printed forms explaining this hazard and they ask customers to sign a release which absolves the servicer in case of kinescope breakage incident to yoke coil replacement. If the set owner refuses a signature, the job is rejected and he is told to take it somewhere else. Shop operators say the risk involved is too great to chance the ill-will and wrangling which might result if the matter isn't handled this way.

"Success in business," said Confucius, 2,000 years ago, "requireth 3 things: 1. Patience; 2. Patience; and 3. PATIENCE!"

COLOR-TV WILL BRING BIGGER WOES to the average serviceman, many dealers and distributors believe. "If the present-day black-and-white receivers are such headaches to today's servicemen, what will the color receiver present in new service problems?" Training for color TV servicing should begin now, not when the sets are on the market, they insist. But too few are preparing for the advent of color. (See page 42.)

PROSPECTS BRIGHT NEXT 9 MONTHS—"The economic climate in which you and your customers will do business during the next two or three quarters will be essentially favorable," Dr. Howard T. Hovde told members of the National Electronic Distributors Association September 13. "Personal income will continue high through the first three months of 1954. This will serve to offset some of the less favorable factors that will influence the demand for radios and television sets through the first half of next year. Distributors' demands from business and from the military for electronic equipment will continue strong, though not at the current high rates."

CRT IMPLOSIONS are now worrying a number of manufacturers' service managers. They have had enough reports of troubles from collapsing picture tubes, to feel that this trouble may grow into a real hazard. For our part we have asked a number of servicemen we know, and we can't find a single instance in which any of our technician friends has experienced an implosion without cause. Plenty of cases where somebody dropped a tube or let fall a heavy object on it, with complete destruction resulting. But tube just go bang all by itself—no reports!

"Look here, Wilson—during this UHF campaign we expect all our men to wear ties appropriate to the occasion!"

WELL-KNOWN TV MANUFACTURER claims that he is not making any big-screen (24 to 30 in.) sets because there are still too many bugs in those CR tubes. Says he will wait until pic tube makers have licked the problem of leaks in big tube envelopes.

BONDED TV SERVICE—Since 1945, Raytheon's receiving-tube division has been bonding the repair work of radio-TV servicers through several large surety companies. Out of millions of service jobs performed by 30,000 servicers thus bonded, less than 50 complaints are reported. In connection with its bonded electronic technicians, Raytheon has drafted the following servicemen's code designed to reassure the public:

CODE OF ETHICS FOR TECHNICIANS

1. *Guarantee all radio and television repair work for 90 days.*
2. *Use only parts of recognized quality.*
3. *Charge not more than list price for parts installed.*
4. *Test customers' tubes as accurately as possible.*
5. *Keep labor charges at a reasonable level.*
6. *Perform only such work as is necessary.*
7. *Maintain proper equipment for good repair work.*
8. *Maintain the highest quality service.*

Picture .....

LIFE-IS-GETTING-BETTER DEPT.—A few big parts distributors in the NY area are now putting on their bills and packages notices that they sell to bona-fide servicemen only. They really mean it, too. Looks like those beefs about distributor-to-consumer sales are finally producing some good results.

AUTO COSTS ARE UP 5 to 6% over 1951, according to AAA records. A serviceman who runs his car 10,000 miles in 1953 will fork out $908, as compared with $861 in '51. Insurance, license fees and depreciation are up from $533 to $560. And tires, oil, gasoline and maintenance have risen from $328 in '51, to $348 this year. Are you figuring in this increased factor in your costs of making service calls and pick-ups?

Mrs. Gotrox: "Really, I can't understand why it should suddenly go bad. It's been playing fine for 20 years!"

DEBUNKING THE FAMILIAR CRY "All servicemen are gyps," a recent nation-wide, house-to-house survey indicates that 70% of the TV-owners interviewed actually had no gripes at all! *Compared to a similar survey taken in 1952, the serviceman had even slightly increased his prestige in some cases. Below are the comparative answers (percentage-wise) to a survey question asked in 1952 and 1953: "Would you say your service company (the one used last) does a really good job of repairing TV sets, a fairly good job, or a rather poor job?" The answers:*

	1952	1953
Really Good	70%	70%
Fairly Good	18%	19%
Rather Poor	6%	6%
Don't Know	6%	5%

Several other informative questions served to further bear out the survey findings that TV servicemen are not the "gyps" they're pictured. As is usually the case, a few isolated malpractices are blown-up out of proportion. Unfortunately, these cases tend to smear the whole industry.

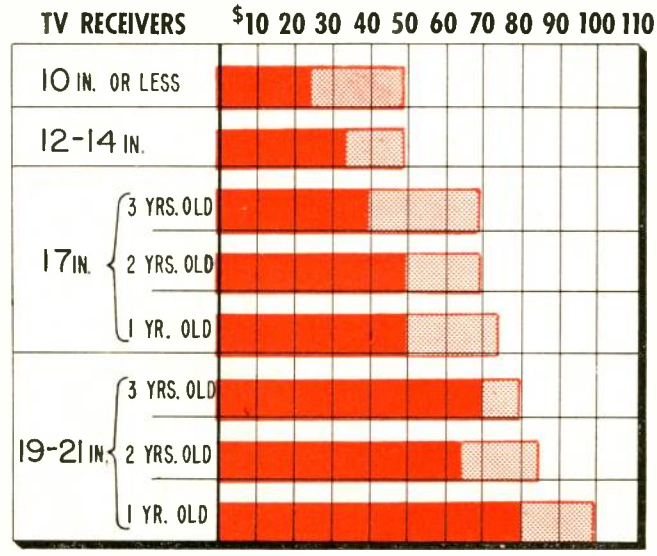
PART OF THE SCENERY—Television servicemen are becoming so much a part of the scenery these days that New York City police are making use of the fact. Two cops went through the motions of repairing antennas on an apartment house roof while dressed as TV servicemen, but in reality they were observing the movements of a fugitive murderer through an opposite window. When they were sure he was their man, they worked their way down his fire escape, stringing twin-lead as they went, and then pounced on him. Caught him in his shorts watching TV before he could reach for his gun.

Serviceman Joe starts out for a day's fishing!

BRAND-NEW CONTROLS AND DIAL SET-UPS on some of the newly-introduced TV receivers and phonographs require careful study on the part of the servicer in order that he may become thoroughly familiar with them. Consumers are being sold heavily on the gimmicks on the front of the new receivers, and the technician must be ready to answer questions, make efficient repairs.

HI-FI LOOT—It looks like the hi-fi idea has caught on among all kinds of people. A burglar invaded the home of a prominent symphonic conductor and took an expensive AM-FM tuner and three classical record albums. Passed up valuable jewelry, furs and silver which were nearby and worth much more than the records.

TEST PATTERNS—In Japan, TV stations interrupt the programs every half hour to transmit a test pattern for five minutes. They do it as a service to permit technicians to adjust sets on which they are working. Idea here for new UHF stations?



TRADE-IN VALUES FOR TV SETS

Allowances for trade-ins must depend largely on individual judgment, condition of set, and current market conditions. Minimum values are shown by solid-color bars; maximum allowances by tinted extensions—with actual allowances to be granted ranging somewhere in between. In general, trade-in allowances will be smaller as Christmas season nears.

Servicing Intermittent Receivers

A Logical System, Using Oscilloscopes and Voltmeters,

By Edward W. Kesgen

• The problem of servicing intermittent radio and television receivers, although difficult, can become far less time-consuming when approached in a logical and systematic manner. Time-honored methods of attacking the problem, such as heating or refrigerating the chassis, wiggling and tapping components at random and raising or lowering the line voltage, while occasionally effective, cannot produce consistent results. A more effective technique consists of monitoring suspected stages or the entire receiver, if necessary. This is another version of the familiar technique of dynamic signal tracing.

With respect to instrumentation requirements: a scope, signal generator, vacuum-tube voltmeter and two other voltmeters will take care of practically any intermittent; in many cases, one voltmeter alone may prove adequate. When grid circuits in sync, RF or video IF stages are being monitored for DC voltage changes, a VTVM will be needed.

Discontinuous Signal Paths

Before developing the technique of dynamic signal monitoring, let us consider what actually happens when a receiver becomes intermittent. A receiver consists of a number of signal paths, each of which channels intelligence to its ultimate destination. These paths may be common to more than one type of intelligence, or signal, as in the case of television receivers.

When the receiver is operating normally, the signal paths are *continuous*. Defects in tubes and other components, or cold-soldered connections, however, may cause a signal path to become intermittently *discontinuous*. Dynamic signal monitoring may be defined as the technique of monitoring a signal, or intelligence, at strategic points throughout its path, to locate such discontinuities, as well as intermittent short-circuits or high impedances that may develop in signal routes.

Minimizing Time Waste

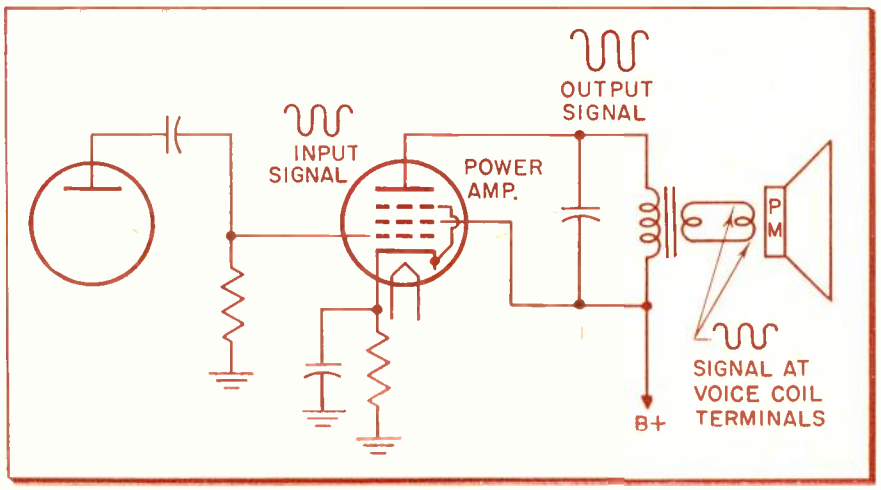
It has been stated that the ability to measure marks the beginning of understanding. It will be seen that it is this ability to measure the changed conditions in a signal path that minimizes the drudgery and waste of time generally associated with the servicing of intermittent receivers. It should be noted that while a change in a signal path may or may not manifest itself as a DC voltage change, as measured at appropriate tube sockets, it will ALWAYS manifest itself as a *signal voltage* change in the defective stage.

An illustration may make this point somewhat clearer. A completely inoperative receiver is checked in a conventional manner by measuring DC electrode potentials at the tube sockets. These potentials appear to be normal. The trouble is actually an open speaker voice coil. A dynamic check would have immediately indicated a discontinuous signal path between the plate of the final audio amplifier and the speaker voice coil (see Fig. 1).

Let us now develop the technique of dynamic signal monitoring by applying it to a typical intermittent radio and then to a television receiver. We shall begin with the amplitude-modulated radio receiver. In this instance we are concerned with only one form of intelligence, i.e., that contained in the amplitude-modulated RF carrier.

We cannot monitor this kind of a transmitted signal, since its amplitude is subject to continuous variation. We are, however, able to monitor the path taken by such a signal by substituting an amplitude-modulated signal generator as the signal source.

Fig. 1—Signal distribution in audio output stage when voice coil is open. Note that signal voltage will be measured at all the proper points, and will even appear across the voice coil. Sound, however, will be absent, pointing to the voice coil as the source of the fault.



Test Equipment Set-Up

The receiver to be monitored is set up on the service bench. The signal generator is connected or coupled to its input, as appropriate. The generator output is modulated. The scope input is connected between the second detector load resistor and B-minus (point A and ground, respectively, in Fig. 2); the AC input of the first voltmeter is connected between the first audio amplifier plate and B-minus, and the AC input of the second voltmeter is connected across the speaker voice coil. (A blocking condenser (.1 MFD) may be used in series with one lead of each voltmeter, to keep DC out of the meter.) The volume control is now adjusted until the audio output of the receiver is at a normal level. A china pencil marking should be made around the scope wave-form, to make future changes in its amplitude more noticeable.

The range switch of the voltmeter at the plate of the first audio amplifier is set at the highest possible volt-

by Dynamic Signal Monitoring

for Dealing with the Most Difficult of Repair Problems.

age range, to minimize the meter's loading effect on the circuit. The same precaution is recommended whenever a meter with a relatively low input impedance (1,000 ohms-per-volt) is connected across a high-impedance circuit.

Once monitoring has been started, the receiver requires no further attention until a change of audio level is noted. It is suggested that the technician attend to other duties, keeping within earshot of the receiver, however, as monitoring progresses.

When a change of audio level is noted, a check of the instruments will indicate the vicinity of the trouble. If, for example, all readings show a substantial reduction, we may conclude that the trouble lies either ahead of the second detector load resistor, or possibly in the power supply. If, on the other hand, the voltages across the demodulator load resistor, and between the first audio plate to ground, remain substantially unchanged, but a pronounced decrease is noted across the voice coil, we know that a source of signal discontinuity exists between the first audio plate and the voice coil.

In either case, the area to be investigated has been narrowed down considerably. Dynamic signal *tracing* (not *monitoring*) may now be advantageously employed to pin-point the source of the trouble. If the receiver begins to function normally before these signal-tracing tests have been concluded, as so often happens, monitoring is resumed, but at different points.

Taking the last case as an example, we know that there is no signal discontinuity up to the first amplifier plate. Following the basic procedure previously outlined, we might now connect our scope between grid and ground of the audio output tube, a voltmeter between plate and ground of the audio output tube, and another voltmeter across the voice coil.

It should be noted that monitoring is merely a watch-and-wait procedure. When the monitor instruments indicate that the intermittent is in its active phase, monitoring is abandoned, and signal tracing via a signal generator and scope or voltmeter is resorted to. When the set operation becomes normal, signal tracing is abandoned, and monitoring is resumed.

While the time consumed during monitoring may be considerable, this does not represent wasted manpower, as other work is being done while the receiver is being monitored. The time actually spent on trouble shooting is negligible when compared to other less systematic methods. Results are also positive—i.e., definite—when dynamic signal monitoring techniques are employed.

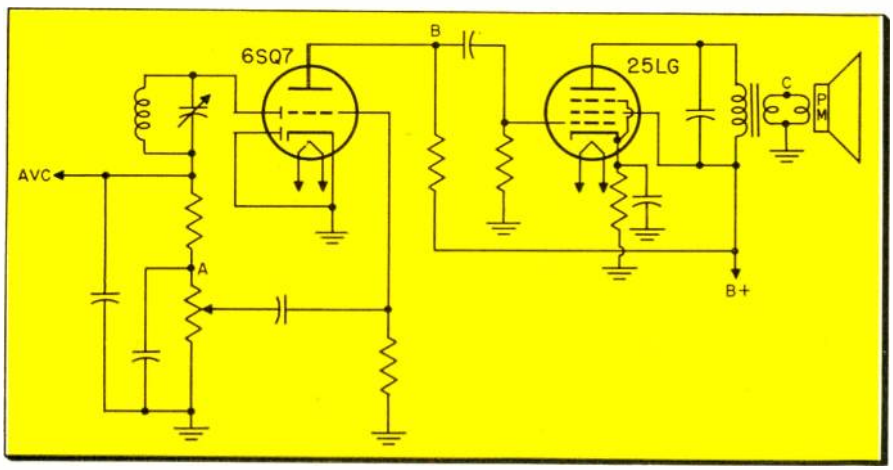


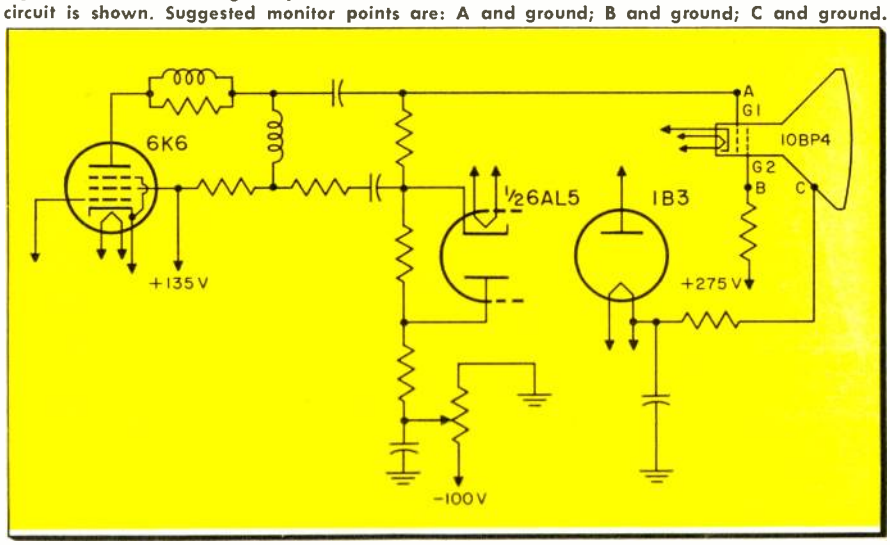
Fig. 2—Initial monitoring setup for intermittent AC-DC broadcast radio receiver. Suggested monitor points are: A and ground; B and ground; C and ground.

Monitoring CRT Socket

Let's now consider a common television receiver complaint. An intermittent TV receiver may operate normally for a long period of time, then the screen will suddenly go dark. Audio output remains unaffected; this would indicate that the low-voltage power supply is probably functioning normally.

The CRT socket would appear to be a likely place to begin monitoring. The common leads from all the voltmeters are connected to the cathode of the CRT; the positive DC voltage leads are connected to points A, B and C respectively (see Fig. 3). A

Fig. 3—Initial monitoring setup for TV receiver with intermittent raster. Part of an RCA 630TS circuit is shown. Suggested monitor points are: A and ground; B and ground; C and ground.



meter with a suitable high-voltage probe should be used to measure the voltage between C and ground.

In this case we shall use the transmitted composite video signal instead of a signal generator. Connect the receiver input to an antenna, then adjust the controls until a normal picture is displayed on the screen. Adjust the voltmeters for one-third or half-scale deflection.

If the monitored electrode voltages remain substantially unchanged when the screen becomes dark, the CRT is probably at fault. If the high voltage should fail, a good point at which to start checking is the control grid of the horizontal output tube. (This point can be considered a line of demarcation between horizontal oscillator and horizontal output tube malfunctioning.) A scope should be used for the check. If the amplitude and waveform of the observed sweep signal are normal, the trouble probably lies in the horizontal output stage; if abnormal, the horizontal oscillator stage becomes suspect.

Further Tests

If the receiver should begin to function normally before further localization tests have been concluded (but after a monitoring test has shown the signal at the input to the horizontal output stage to be normal) it is suggested that the second anode be monitored as before, and that the control grid and plate of the horizontal output tube be monitored as well. A capacitative voltage divider will be required at the plate, as this voltage is beyond the range of the average VTVM. (A VTVM, incidentally, is needed for this last check.) If still another voltmeter is available, the DC voltage at the screen grid of the horizontal output tube may be monitored as well.

Our exposition of dynamic signal monitoring thus far has been confined to basic techniques. It is expected that the technician will elaborate on these basic techniques to suit his needs. The remainder of this article will concern itself with general information which, it is hoped, will be helpful in diagnosing intermittent troubles.

Choosing Monitor Equipment

The nature of the signal to be monitored will dictate the choice of monitoring equipment to be used. DC voltages may be monitored with a voltmeter. AC signals up to about half a volt or so may be monitored with a scope; higher AC voltages may be monitored with a scope or voltmeter; if the circuit's impedance is much higher than the input resistance of the meter (on the voltage range at which it is to be used) the scope should be used instead of the voltmeter. The use of a demodulator probe is indicated if the frequencies to be monitored are beyond the range of the monitoring instrument.

The stage of the receiver being monitored will determine whether the output of a signal generator or the composite video signal should be used as a signal source. It should be noted that if the RF or IF stages of an FM receiver are being monitored, an AM signal should be injected into the receiver. The use of a demodulator probe is indicated at these frequencies. Such probes will not demodulate an FM signal. If the audio stages of the same receiver are to be monitored, a frequency-modulated signal should be injected at the receiver's antenna input.

Monitoring intermittent sync stages suggests the use of the commercially - transmitted composite video signal. It is a convenient signal source, and is far more stable, in our opinion, than most test equipment found outside the laboratory.

It has been assumed that three voltmeters are available in the technician's shop. If this is not the case, two voltmeters, or a scope and a volt meter, may be used, at the expense of the amount of intelligence that may be simultaneously obtained. When a scope is used, the outline of the intelligence being displayed should be indicated with a china pencil, for future comparison purposes.

The home servicing of intermittent receivers is not recommended, as it is not practical, economically, to wait for a receiver to become intermittent in the customer's house.

Clues from Set Owner

Information obtained from the owner of the intermittent receiver is often of material value in diagnosing trouble. If, for example, a receiver of the intercarrier sound type has intermittent sound, information as to whether the picture is simultaneously affected would be helpful. If the picture is not affected, we may conclude that the source of trouble is between the sound take-off point and the speaker. We now have two definite points between which to monitor the sound signal.

Thus far, we have considered cases where only the amplitude of the signal has changed. Signal monitoring need not be confined to this type of intermittent. Waveform distortion, frequency changes, etc. may also be monitored. Such monitoring involves only a minor extension of the techniques previously discussed. A minimum of two scopes and two voltmeters are required for this type of monitoring. A VTVM with a properly isolated DC probe should, of course, be used when a tuned circuit—the RF oscillator tuned grid circuit, for instance—is monitored. The scopes are connected between the points where it is suspected that the signal modification is taking place. The signal waveform originally displayed should be outlined with a china pencil. Appropriate electrode voltages should be simultaneously

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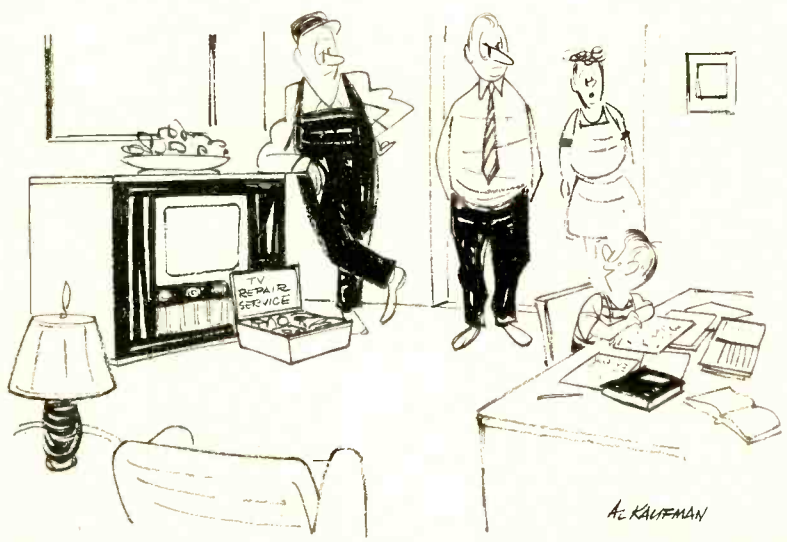

"Oh, yes, I did take a tube out. Our finals are tomorrow and I had to get some work done."

Transmission Lines For UHF

Choosing Down-Lead; Matching and Lightning Arrestor Problems

• Use of a suitable transmission line is very important in assuring satisfactory UHF reception. VHF twin-lead is not recommended for UHF. Experiences of service people in Portland, Oregon, reveal that during bad weather (when it rained or snowed) as much as 90% of the incoming signal was dissipated in such a line.

A number of transmission lines are on the market that have been expressly designed for UHF. Among them are tubular (see Fig. 1), rectangular and open-wire lines. When a tubular line is used, the open end of the line at the antenna should be sealed. A drain hole should also be cut through the insulation at the

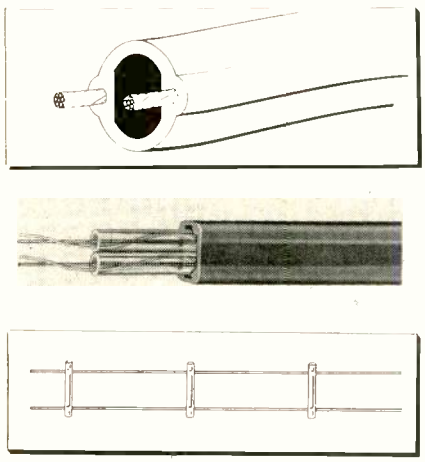

Fig. 1—(Top) Tubular line. (Center) Rectangular line. (Bottom) Open-wire line.

point where the line enters the house, to permit the water that has condensed in the line to leak out. The drain hole in the line should, of course, be cut in a section lying outside the house (see Fig. 2).

In Portland installations where these precautions were not taken, not only was the efficiency of the line reduced during bad weather, causing reception to deteriorate—appreciable amounts of water also leaked onto the living room floor of the house involved, filling the heart of the housewife with emotions other than pure joy.

The very low signal losses of open-wire line, even in bad weather, is a strong point in its favor when lines are being considered for UHF use, particularly in fringe locations. No insulating material that collects dust

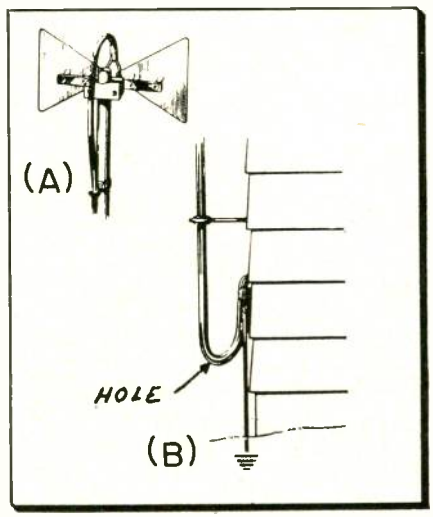

Fig. 2—A) Downward loop is made at antenna when tubular line is employed. B) "Drip loop" is also provided at a point near the one where the tubular line enters the house. A small hole is cut at the point indicated, for drainage.

or moisture is present, as in conventional flat twin-lead. On the other hand, the line requires very careful installation, since a slight bend or kink can have serious results at ultra-high frequencies. A wind blowing a kink in the line can create standing waves in it, impairing reception; or the line may be bent by careless handling during the installation. The moral is, install open-wire line with great care; and check the line closely when trouble in the antenna is indicated.

The rectangular line's losses per hundred feet are slightly higher than conventional 300-ohm twin lead. In wet weather, however, the rectangular line's losses do not increase appreciably, whereas the losses of the twin-lead do. Another advantage claimed for rectangular line over twin lead is its greater stiffness, which makes it less apt to oscillate, bend or break under wind stresses.

Matching Open-Wire

Housewives generally don't like open-wire line in the house, for esthetic reasons. The problem may be solved by running a short section of 300-ohm twin lead from the TV receiver to the window where the open-wire line is being brought in. The small piece of twin-lead will not attenuate the signal significantly; since it is inside the house, it will be unaffected by bad weather. When the open-wire line has an impedance of 450 ohms, it may be matched to the 300-ohm twin-lead section by use of a matching transformer. Other methods of matching the two sections of line are shown in Fig. 3.

Lightning Arrestor Problem

The loading effect of arrestors designed for VHF make the latter unsuitable for use on UHF. The capacitance present in such a type of arrestor tends to bypass excessive signal from the line, impairing reception.

Capehart engineers suggest that the arrestor may be dispensed with,

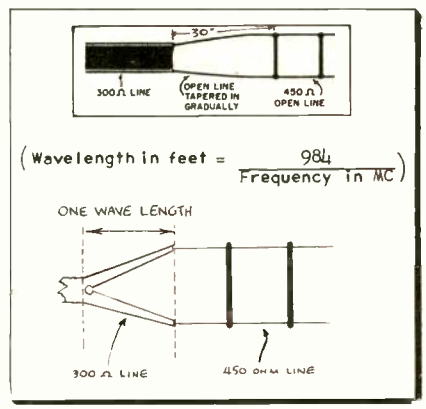

Fig. 3—Methods of matching 450-ohm open-wire line to 300-ohm twin lead. Top sketch: the open wire is tapered down to the twin lead over a distance of 30 inches from the first "spreader," as shown. Bottom sketch: 300-ohm line is split over one wave length, and fanned out to the connecting points on the open-wire line.

without violating fire regulations, by bringing the transmission line down into the ground, where it is *earthed* or embedded into the soil. The conductors of the line are short-circuited at the ground end. At a distance of one-quarter wavelength—or any wavelength that is a multiple of one-quarter wavelength—above the earthed point, the lead-in from the receiver is tapped into the line, as shown in Fig. 4. The wavelength referred to is that of the UHF channel being received (single-channel reception is assumed). It may be determined by using the formula wavelength (in feet) = 984/frequency (in MC), where the frequency re-

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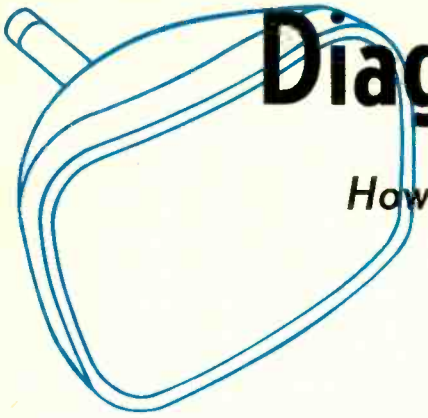


Diagnosing Cathode-Ray

How to Determine Quickly Whether the CRT or Its

By M. G. Goldberg

• Every TV serviceman has no doubt been greeted at a customer's door with the complaint "The screen doesn't even light—I hope it isn't the picture tube!" or something very similar. Statements such as these point up the importance of correct diagnosis when checking on a customer's complaint of no picture or no raster, as the CRT replacement cost is a big item in most people's budget, and in some homes may amount to a minor financial calamity.

The writer has found from personal experience that fully 25% of picture tube troubles do not necessitate replacement of the CRT with a new tube, even though the heater may not light, or some other so-called conclusive bit of evidence exists that the tube has breathed its last. Certain CRT defects may be readily repaired. To live in peace with one's conscience, a minimum number of checks must be made on the CRT to determine not only whether it is really bad, but whether the trouble is beyond repair.

A fairly common trouble—intermittent CRT filament lighting—is often due to oxidized contacts in the CRT socket. A number of such cases turned up in RCA receivers manufactured during 1950. A slight movement on the socket or wiring during receiver tests would cause the tube to light and stay that way for hours, sometimes days. Then the trouble would start all over again. Pinching the socket contacts to increase the pressure on the pins had only a temporary effect, as did scraping the fine white oxide from the contact surfaces. Only a new socket solved the trouble permanently. To minimize callbacks on these jobs, use only the best socket that can be bought; a difference of a few cents will make for a more satisfied customer, one who is more than happy to pay the extra trifle requested, instead of a $50 to $80 bill for a new picture tube.

Another intermittent filament case which the author encountered recently occurred in a 1606 Philco table model which worked fine for over two years and then suddenly lost picture and raster. A visual check showed that the CRT filament was

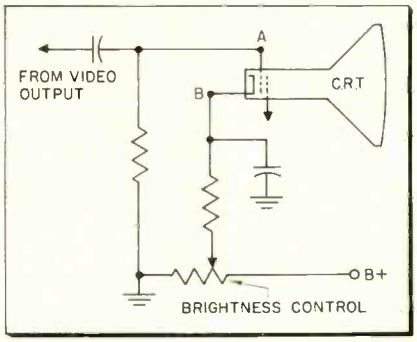


Fig. 2—A cathode-to-grid short in this CRT circuit would reduce the picture tube bias, and also attenuate or eliminate the video signal.

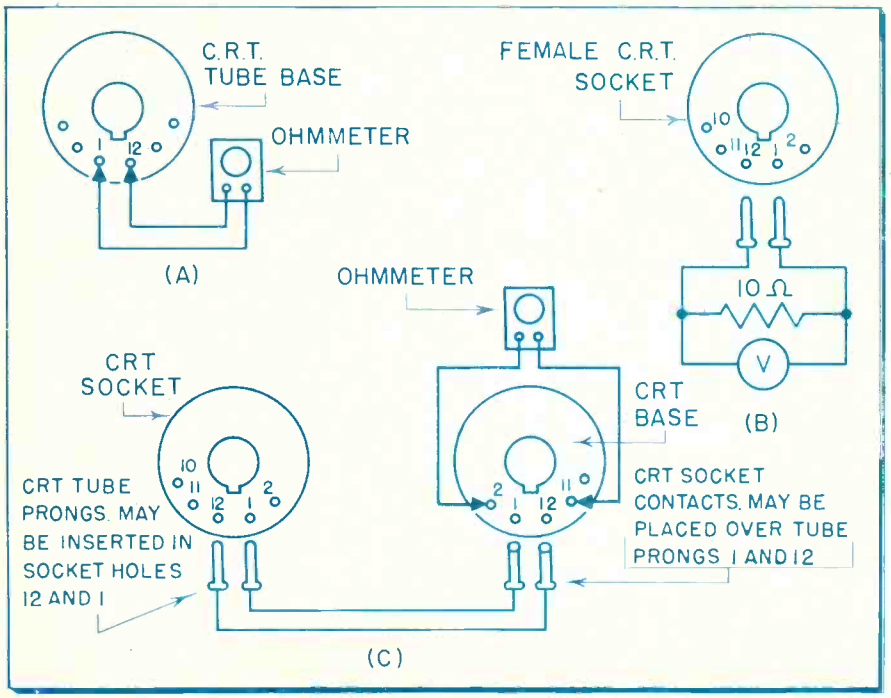
unlit; further testing disclosed that no AC voltage was present either at the heater pins or the CRT socket connections.

Pulling on one of the heater leads (the one usually connected to the chassis) caused the tube heater to light intermittently. The trouble was finally traced to a poorly-soldered joint at the chassis kick-out where three other wires were fastened and soldered. The heater wire from the CRT was the first inner lead around the kickout, and the solder had never penetrated down that far, contact being made only through pressure of metal against metal. The resistance of the contact caused slight heating at this point, and the resultant oxidation finally caused an open to develop.

Test Procedure

It is good practice to follow a certain procedure in checking for a bad picture tube. The first test should be for open heater connections. A visual check will indicate in most cases whether or not the tube is lit. Feeling the neck of the CRT to see if it is becoming warm is another way to test for CRT filament lighting, when a visual check cannot readily be made. Note that in a number of CRT's the heater is so well covered that it takes several minutes for heat

Fig. 1A—"Cold" resistance check of CRT filament. B—Voltage test for intermittent in CRT socket. C—Resistance check for "hot" short between grid and cathode of the cathode-ray tube. Care should be taken not to let the ohm meter leads touch the "live" pins.



Tube Troubles CORRECTLY

Circuit Is Defective. Remedies for Some Picture Tube Defects.

to be felt on the neck of the glass. Note also that the presence of heat here only tells you that the CRT filament is not open; it may, however, be partially shorted, or in imperfect contact with the base pins—a resistance check will reveal the trouble in such cases.

The writer has no prejudice against CRT tube checkers but uses the tests and remedies described in this article because many times the cause of the tube burning out will show up

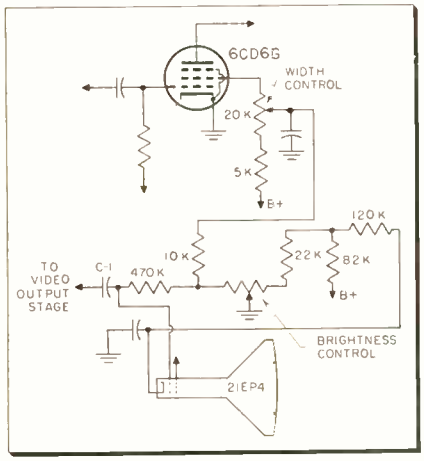


Fig. 3—An increase in the 22K resistor connecting to the brightness control caused an excessive CRT bias, dimming picture and raster greatly. This bias could not be reduced below –30V by manipulation of the brightness control.

during such an investigation.

To test the CRT filament, turn off the receiver and allow the CRT to cool off for a couple of minutes. Now remove the socket from the tube base and check the heater resistance on the low scale of an ohmmeter (see Fig. 1A). The resistance of the heater varies inversely with temperature, and when cold will normally be much less than might be expected. For instance, a 17BP4 draws .6 ampere at 6.3 volts during normal operation. By Ohm's law (R=E/I), the resistance when hot would be app. 10.5 ohms. Since we cannot resistance-test the CRT filament during set operation, we let it cool off and check it when cold, finding that the reading is less than 2 ohms—which is normal.

Keeping the ohmmeter connected across the tube heater pins and tapping the base lightly with a pencil, or squeezing the tube pins slightly with a pair of long-nose pliers, may cause the meter to jump "all over the lot." If the meter reading varies as much as 25% or more, place a soldering iron at the ends of the pins, applying a small amount of fresh solder at the same time, then wipe the contacts clean. When the CRT has cooled off, try another resistance check while tapping the base; if a definite improvement is noticed, you may have corrected the cause of the trouble. The writer still finds tubes operating 15 months from the time this cure was attempted.

Tests Under Load

If, in the resistance check above, the heater checked ok, our next move would be to test the heater supply circuit *under load*. To do this, remove two heater pins from an old tube base and solder a 10-ohm, 5-watt resistor between them. Plug these units into the No. 12 and No. 1 holes in the CRT socket, and attach an AC voltmeter set to its 10-volt range across them, as shown in Fig. 1B.

Now try wiggling the leads and the pins slightly, watching the meter for indications of imperfect contact. With the receiver on, the meter should, of course, register app. 6.3 volts; any appreciable deviation from this reading would indicate a bad connection in the heater circuit. If wiggling the pins causes the meter reading to change more than one-tenth of a volt

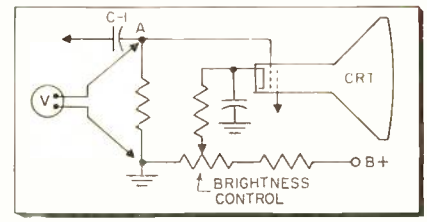


Fig. 4—Conventional brightness control circuit. A check for leakage in C-1 is made by connecting the voltmeter between point A and ground.

or so, the socket should be replaced. It might be advisable to remove the damper tube during this test, to remove all high voltage from the receiver; the voltage rises to maximum with the CRT inoperative, and thus becomes more dangerous.

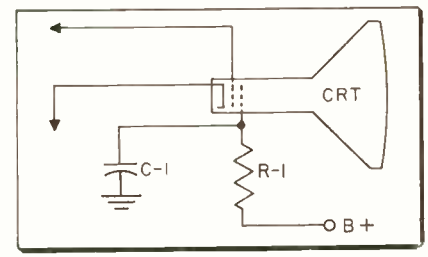
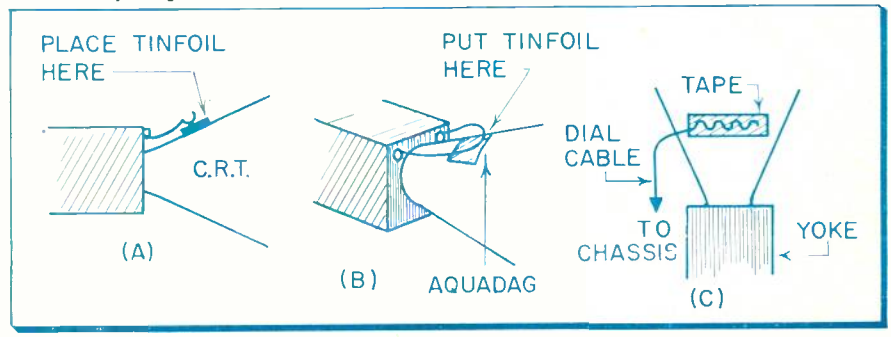


Fig. 5—If R-1 in this circuit open-circuited intermittently, a slow fade-out but rapid reappearance of the picture would tend to take place.

It need hardly be emphasized that the above tests do not have to be made if the heater appears normal on visual inspection, and has no tendency to cut in and out periodically. The tests are mentioned here because a relatively high percentage of CRT troubles are due to socket

Figs. 6A, B—Contact between the outer aquadag coating of the CRT and the spring finger or wire loop that grounds this coating to chassis may be improved by inserting a strip of tinfoil as shown. The tinfoil is folded back on itself once. C—For stubborn cases of poor contact, a piece of metal-stranded dial cable, held in place by 3M tape, is used to connect the outer aquadag to chassis.



or circuit defects, and red would be the serviceman's face if he replaced a picture tube, collected for it, and then had the same trouble start up almost immediately afterward. Relations with the owner would be strained, to put it mildly!

In the case of cathode and grid defects, many long-time cures can be effected. Due to the extremely close spacing between the cathode and the grid in the tube structure, a slight flaking of the cathode may cause a short to develop between them. An annoying condition is sometimes found where a short is present only while the tube is hot; in a "cold" resistance check, no short can be found. This is due to the fact that the cathode-grid spacing, which may be only two-thousands of an inch when the tube is hot, may double after contraction takes place upon cooling, thus preventing the shorting particle from touching the grid.

Test for "Hot" Short

A simple test for the condition just described can be made as shown in Fig. 1C. Connect the high range of an ohmmeter between the cathode and grid pins of the CRT (No. 11 and No. 2). Now run a pair of extension wires with connectors and pins between the socket and the tube as shown. These leads can be made up and kept in the service kit along with the 10-ohm resistor mentioned previously. The tube filament is now at its normal temperature. The short check is made by tapping the CRT base lightly with the side of a pencil, and noting whether any reading is indicated on the ohmmeter.

A short between cathode and grid may be suspected when the brightness control has very little or no effect on picture and raster brilliance, and when even with the contrast control full on, little or no picture appears. Any leak or short between A and B in Fig. 2 would shunt both the brightness control and the video input signal; the screen would stay bright because of the absence of CRT bias.

CRT vs HV Trouble

Sometimes the technician is uncertain whether trouble is present in the CRT or the high-voltage section. The writer has found the following a helpful clue in differentiating between the two possible sources of trouble: If turning up the brightness control causes the picture to "blow" off the screen, increasing greatly in size and decreasing in brightness, the trouble is almost invariably in the high-voltage supply circuit.

If a poorly-soldered joint exists in the tube pins to either the CRT grid or cathode, the remedy is obvious. Nothing can be done, however, if the tube develops an open in either of these elements internally. On the other hand, if a short exists between the two which can be momentarily cleared when the CRT base is tapped, the following procedure may effect a temporary, and in many cases a permanent, cure.

Momentarily connect a .25 MFD 400-volt capacitor between pin 10 (anode No. 1) of the tube and ground, charging up the condenser from this anode voltage. (The frame or mounting of the CRT is usually grounded, providing a convenient point of attachment for the condenser's negative lead; otherwise use a short lead from the chassis to the capacitor.) Now shunt the capacitor across the shorted grid and cathode elements. Do this with the receiver on, repeating the operation until either a cure is effected, or the conclusion reached that the tube is beyond help. The advantage of using a charged capacitor rather than the B+ supply as the voltage source lies in the fact that the likelihood of damaging the cathode or grid is minimized, since only a limited amount of current can flow, and most of this is dissipated in the first instant of contact, if a leak or short exists.

Trouble in the brightness control circuit may falsely lead one to believe that the picture tube is defective, unless a voltage check is made between the grid and cathode terminals at the socket of the CRT. A case in point involved a Philco RF41 chassis using a 21EP4 tube. The complaint was that the picture remained dim even with the brightness control full on. Turning up the contrast control brought out the blacks very strongly, and the picture otherwise appeared clear and in focus.

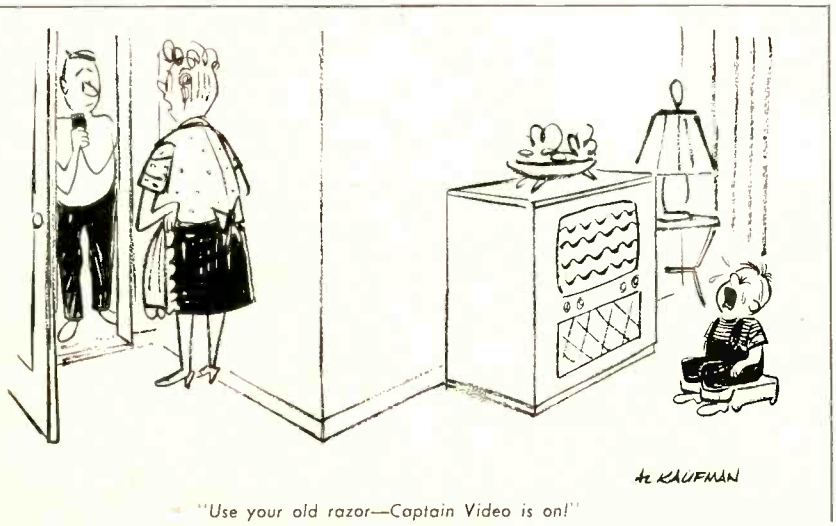
Here was the answer tailor-made! *A poor picture tube would not have good blacks if the brightness was way below normal.* Turning up the contrast control with a poor CRT present would have caused picture highlights to appear somewhat silvery, and might even make the picture turn negative in places. Therefore the trouble had to be in the circuit, as turned out to be the case. A 22K resistor (see Fig. 3) had increased in value, preventing the bias from being reduced below 30 volts. A new twenty-five cent resistor corrected the trouble.

Unusual Feature

A special feature of this circuit is worth noting (aside from the fact that only a grid-to-cathode reading would indicate the true bias voltage —a reading taken from grid to ground or cathode to ground might be misleading). This is, that the CRT grid is returned (through a 470K resistor) to one end of the brightness control, while the CRT cathode goes (through a 120K resistor) to the opposite end. As the brightness control is advanced, the positive cathode bias is reduced and the grid voltage *increases* in the positive direction, both changes lowering the net bias, and causing an increased voltage drop across the 120K resistor.

This feature points up the necessity for becoming familiar with as many circuit variations as possible; what may be a normal reading in one

(*Continued on page 75*)



"Use your old razor—Captain Video is on!"

Vertical Circuit Troubles

Peaking Resistor Defects. Mismatched Vertical Output Transformer.

• A number of troubles in vertical peaking circuits can be quickly localized by raster and waveform checks. Idealized waveforms shown in Fig. 1 illustrate conditions of correct and incorrect peaking. In Fig. 2, actual waveform voltages that appear at the plate of a vertical amplifier under the conditions cited in Fig. 1 are shown. The appearance of the raster in each case is illustrated in Fig. 3.

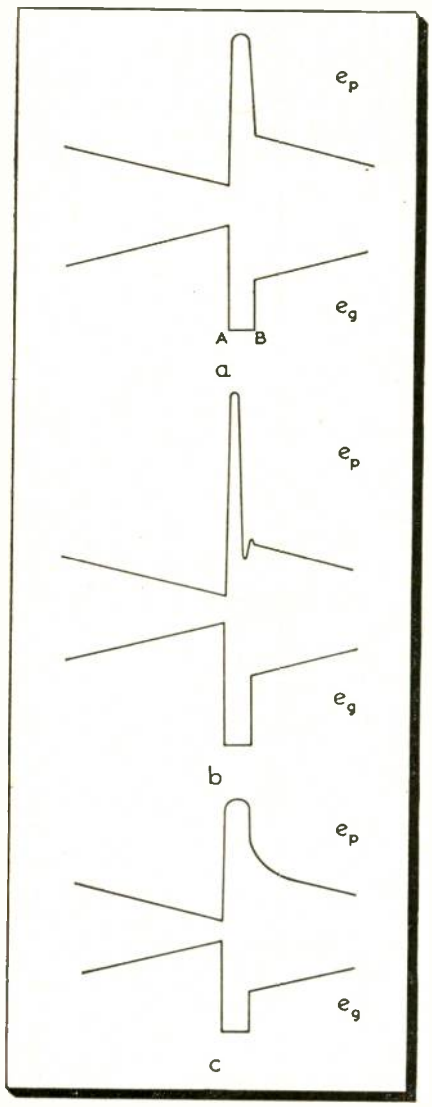


Fig. 1—Vertical output tube voltages. A—Correct peaking; B—Too much; C—Too little.

In Fig. 1B, where too large a peaking pulse (e_g) is present, the negative grid voltage present during retrace is too large. There is, consequently, little damping by the vertical amplifier. (The vertical amplifier is effectively in parallel with its load impedance during vertical retrace, and damps or loads down the load impedance at this time. Too large a bias will reduce its damping effect.) Retrace is completed rapidly and the current in the "underdamped" circuit continues to oscillate while the tube is cut off. When the peaking pulse has passed, the conduction of the tube quickly damps out the oscillations.

Tell-Tale Waveforms

This condition tends to produce a linearity disturbance at the top of the raster (Fig. 3B). The tell-tale waveforms associated with this trouble are shown in Figs. 1B and 2B. The likeliest cause of such a defect is an increase in the value of the peaking resistor (R-1, Fig. 4).

When the peaking pulse is too small (Fig. 1C) the relatively small negative grid voltage present during retrace causes the tube to damp the circuit excessively. The peaking pulse at the grid ends, in fact, before retrace has been completed. The excessive damping increases retrace time. Foldover at the top of the picture tends to result (Fig. 3C). The characteristic waveforms associated with this condition are shown in Fig. 1C and 2C. The likeliest source of such a trouble is a decrease in the size of the peaking resistor.

The waveforms shown in Fig. 1 have been "idealized" in that the retrace time has been shown disproportionately large. This was done for the sake of clarity. The correct dimensions of this portion of the waveforms are indicated in Fig. 2.

In order to better note the raster imperfections indicated in Fig. 3, the raster should be decentered verti-

(*Continued on page 74*)

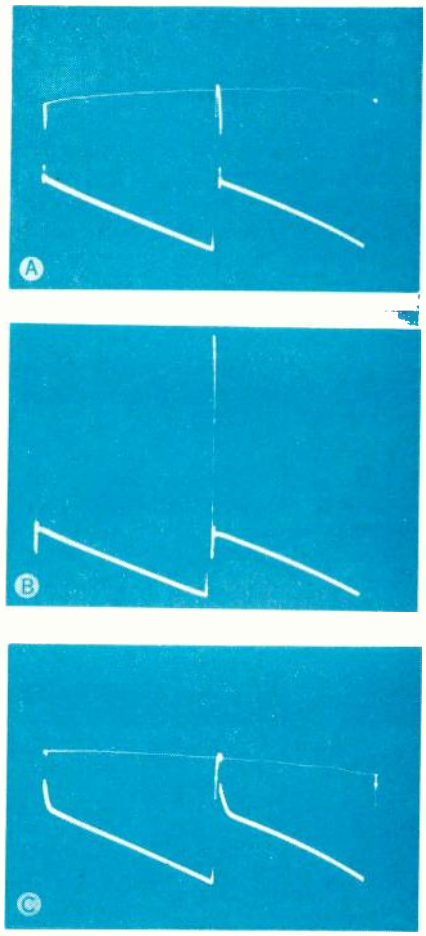
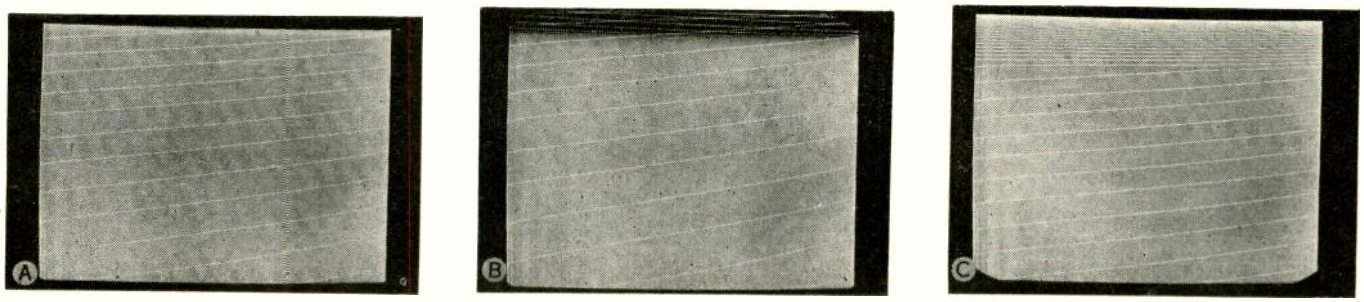


Fig. 2—Actual plate voltage waveforms for the vertical output tube, under the conditions of Fig. 1.

Fig. 3—Peaking effect on raster retrace. A—Correct peaking; B—Too much, linearity disturbance at top; C—Too little, excessive retrace time.



Introducing You to

Review of Basic Theory for Servicemen

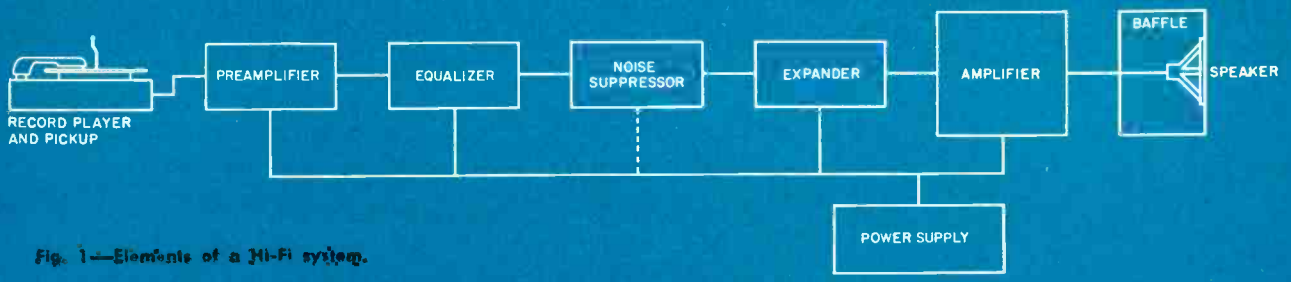


Fig. 1—Elements of a Hi-Fi system.

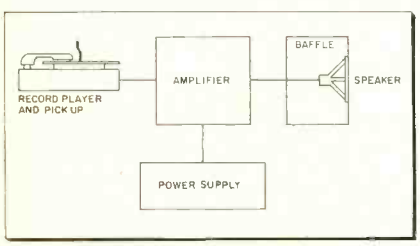
By Harry Mileaf

(The current boom in the Hi-Fi business has been arousing increasing interest among servicemen unfamiliar with this field. This article will provide such technicians with a sound technical introduction to high-fidelity systems. In articles to follow, more detailed information on Hi-Fi components, custom installations and service will be presented.)

• The high-fidelity audio business is a very controversial one. Various Hi-Fi authorities have been in frequent disagreement with one another about important Hi-Fi considerations. There are, for this reason, many different Hi-Fi units available on the market, and the Hi-Fi salesman has also become a Hi-Fi consultant to the potential customer who is looking for advice on how to set up a good system.

Because of the disagreement on what makes up a "good" system, few systems are offered for sale in complete form. Hi-Fi installations are generally made up of a combination of separate units. Fig. 1 shows an overall Hi-Fi system for recorded music. This sketch contains optional units that are not always used in a Hi-Fi system, but are added to improve the latter's fidelity. Fig. 2 shows the basic requirements for a Hi-Fi set-up; usually what the ordinary enthusiast starts out with, perhaps periodically adding optional units to expand the system to that shown in Fig. 1.

Fig. 2—Simple Hi-Fi system.



Some optional units are incorporated in the basic system provided by a number of manufacturers. For example: some amplifiers are made with built-in preamplifiers; some preamplifiers have a built-in equalizer network; some amplifiers have a built-in expander circuit. The best way to sell high-fidelity audio systems, in our opinion, is to offer separate units. In that way, the initial cost for the basic system is considerably lower and more appetizing to the customer; besides, optional units can always be added at a later date, at a comparatively low cost.

Hi-Fi Requirements.

What makes a good Hi-Fi system? In what respects can you compare one manufacturer's unit with another's? What should you advise the Hi-Fi enthusiast? These are important questions that the Hi-Fi dealer and technician frequently face.

A good audio system (we will confine our discussion to a recorded music system in this piece) should have the following:

1. A record player that will revolve at a correct and at a constant (LP or standard) speed, and not impair the quality of the records.

2. A reproducing pickup that will have as wide a frequency response as possible and deliver an appreciable pickup voltage; one that will reproduce on long-playing records as well as it does on standard ones, without causing unnecessary wear on the records' grooves. (Separate pickups for LP and standard records are provided in some systems.)

3. A method of equalizing the overall frequency response to make up for the response changes introduced during recording. This is generally known as tone balance.

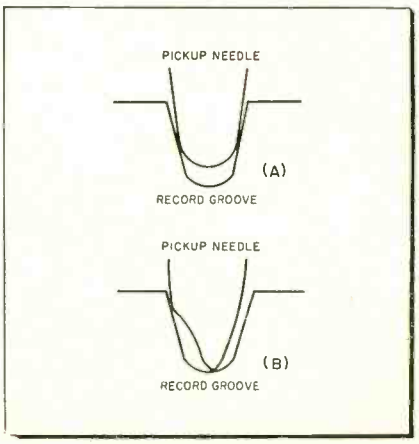
4. A method of suppressing scratch-noise frequencies. These noises are markedly present in older records.

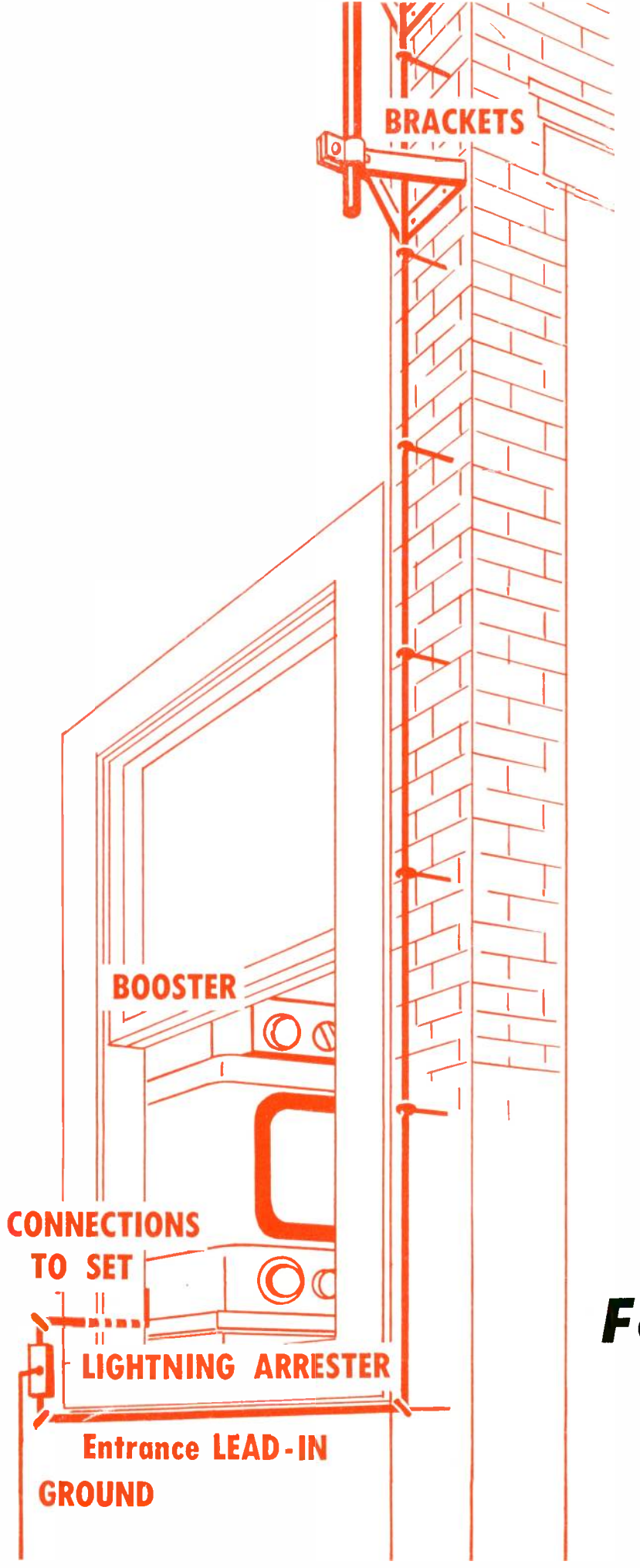
5. An audio amplifier that will uniformly reproduce (i.e., provide a flat response for) the entire range of audio frequencies; one that will introduce a minimum of distortion and background hum, and have an adequate power output.

6. An output transformer that will provide for a uniform, efficient transfer of power over a wide range of frequencies; and a loudspeaker system that will not discriminate against the frequency or amplitude of audio signals.

7. A baffle and baffle location that will compensate and accentuate the proper frequencies without introducing undue reverberation, phase

Fig. 3A—Good needle, properly seated. B—Worn needle, improperly seated.





arrestor, or receiver, may be using up valuable signal strength.

4 DEFECTS IN THE TRANSMISSION LINE MAY BE WEAKENING RECEPTION. The insulation may be defective; or the conductors may be open-circuited or shorted.

5 ANTENNA ACCESSORIES MAY BE THE WORSE FOR WEAR. Stand-off insulators may have pulled out; brackets and clamps may be rusty and loose. These defects may be causing the antenna or its downlead to sway excessively, making the picture jittery.

6 TROUBLE IN THE ROTATOR SYSTEM (if one is used) may keep you from getting the clear pictures your antenna is capable of providing.

7 A NEIGHBOR MAY HAVE PUT UP AN ANTENNA TOO CLOSE TO YOURS, impairing the stability or detail of your pictures. Re-positioning of your antenna will be necessary in such a case.

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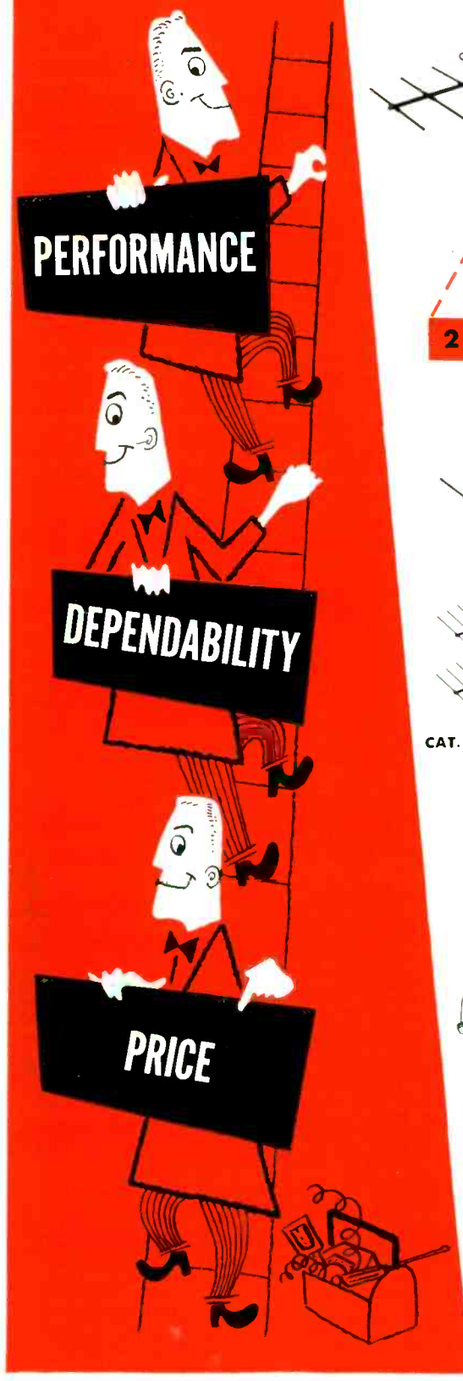
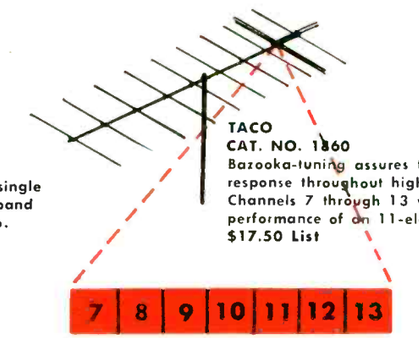


TACO
CAT. NO. 1840
Triple-Driven. Yagi performance with a single antenna for all low-band Channels 2 through 6.
$35.00 List



TACO
CAT. NO. 1860
Bazooka-tuning assures flat response throughout high-band Channels 7 through 13 with performance of an 11-element yagi.
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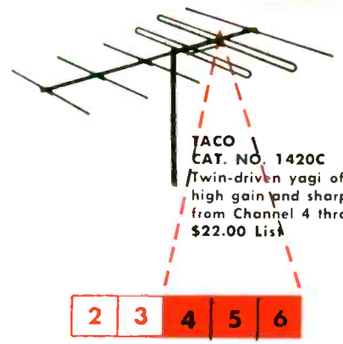

TACO
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Twin-driven yagi offering high gain and sharp directivity from Channel 4 through 6.
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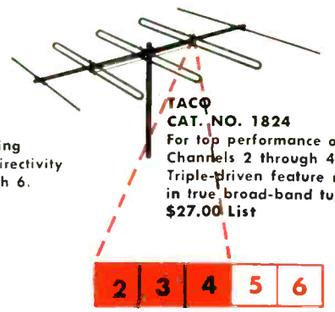

TACO
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For top performance on Channels 2 through 4. Triple-driven feature results in true broad-band tuning.
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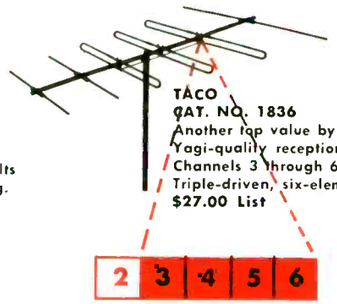

TACO
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Another top value by Taco. Yagi-quality reception on Channels 3 through 6. Triple-driven, six-element design.
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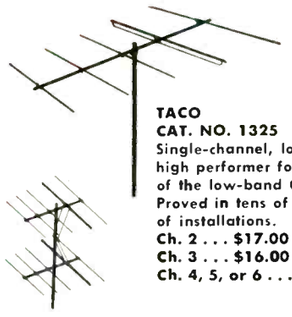

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Single-channel, low-cost, high performer for any one of the low-band Channels. Proved in tens of thousands of installations.
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Ch. 3 . . . $16.00 List
Ch. 4, 5, or 6 . . . $14.75 List

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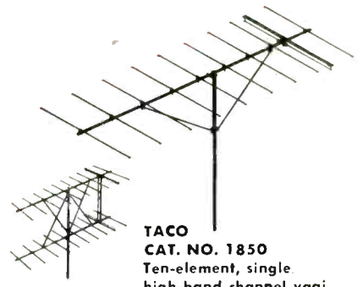

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Ten-element, single high-band channel yagi. Also available as stacked antenna. Sparkling performance in toughest locations.
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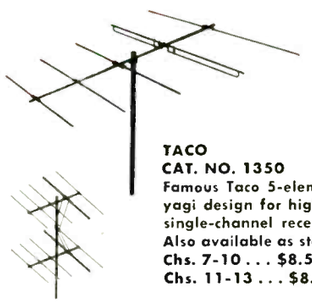

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Famous Taco 5-element yagi design for high-band single-channel reception. Also available as stacked antenna.
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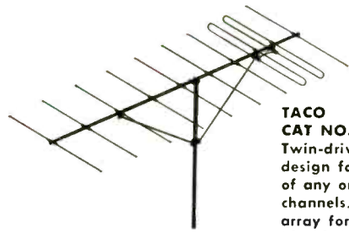

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Twin-driven, ten-element design for finest reception of any one of the low-band channels. Also available as a stacked array for additional gain.
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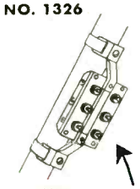
Ch. 6 . . . $31.00 List



HOT A PRINTED CIRCUIT

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Where the installation calls for both a low-band and a high-band antenna . . . mix the signals with this unit and feed through a single transmission line to receiver.
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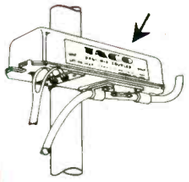

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For combination UHF/VHF installations—combines signals for both antennas to feed the receiver through a single transmission line.
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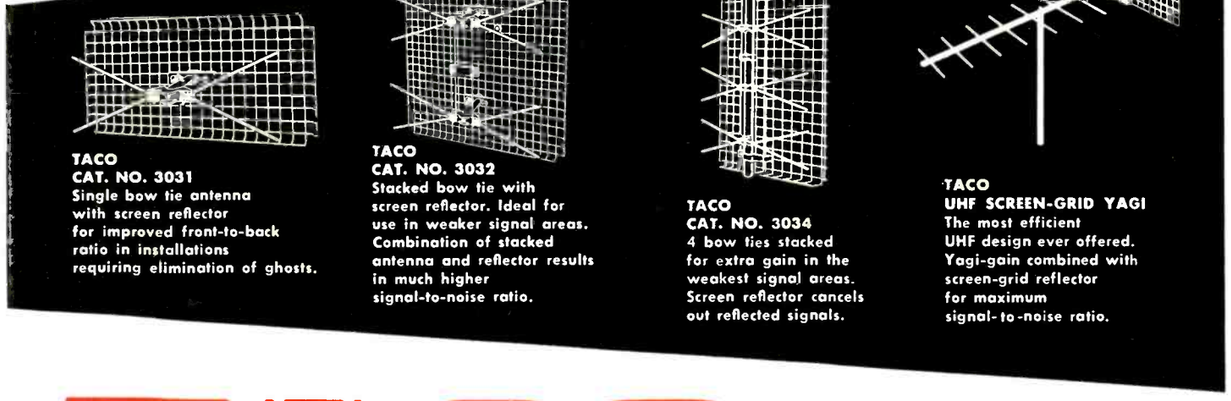
UHF



TACO
CAT. NO. 3031
Single bow tie antenna with screen reflector for improved front-to-back ratio in installations requiring elimination of ghosts.

TACO
CAT. NO. 3032
Stacked bow tie with screen reflector. Ideal for use in weaker signal areas. Combination of stacked antenna and reflector results in much higher signal-to-noise ratio.

TACO
CAT. NO. 3034
4 bow ties stacked for extra gain in the weakest signal areas. Screen reflector cancels out reflected signals.

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UHF SCREEN-GRID YAGI
The most efficient UHF design ever offered. Yagi-gain combined with screen-grid reflector for maximum signal-to-noise ratio.

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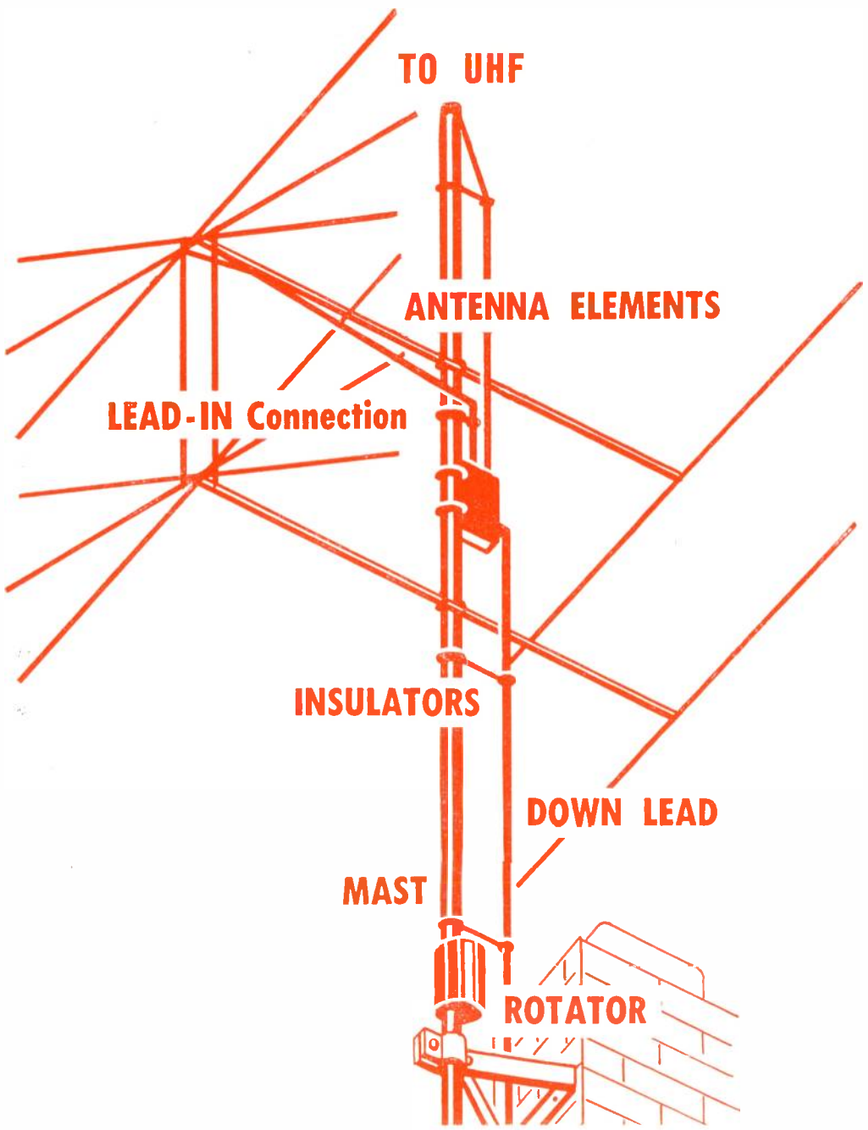


One of Seven or More Troubles in Your Antenna System May Prevent Good Reception of the Fine TV Programs Coming This Winter:

1 YOUR ANTENNA'S POSITION MAY HAVE SHIFTED, causing weaker reception or "ghosts" on one or more channels.

2 THE ANTENNA'S ELEMENTS MAY BE IN POOR SHAPE. Rusty, loose or broken units may be present, impairing reception.

3 POOR CONNECTIONS at the antenna, lightning

In 2 Sections • Section 2

October • 1953

With Chart of Common Troubles in Antenna Systems, Compiled by the Editors

TECHNICIAN

What to Tell TV-Set Owners About The Importance of Regular Antenna Check-ups. See Inside

(Formerly the TECHNICIAN SECTION of "TELEVISION RETAILING")

AN URGENT MESSAGE TO SERVICE TECHNICIANS

13 million antennas . . . half of all the outside antennas in use today . . . NEED SERVICE!

This is your opportunity for undreamed-of profits, plus all the goodwill that comes from a host of greatly satisfied customers.

The evidence is not only obvious; it is VISIBLE—in every direction. For service or replacement, you have a sales potential equal to one half of all that has been done to date in TV antenna installation.

For your own sake, weigh these facts carefully:

26 to 27 million TV sets will be in use by Christmas.
18 million, at least, will be *outside* antennas—many outmoded; others bent, broken, corroded, rusty, or with poor connections and inferior reception.

You recognize this opportunity, of course. So, make up your mind to START TODAY. Decide WHICH antenna brand gives you the types of antennas best suited to your area.

WHAT TO TELL YOUR CUSTOMERS

√ Outside antennas need checking up at least every two years, and probably need complete replacement every 3 or 4 years. In some cases, this is due to atmospheric destruction, winds, smoke, etc.; in others, snow, sleet and ice.

√ Chimney-mounted antennas suffer rapid corrosion from acid gases and may cut down the replacement period to 2 or 3 years.

√ Point out possible defects in transmission line, conductors, standoff insulators, brackets, clamps, etc.

√ The antenna's orientation may have shifted, causing weaker reception or "ghosts" on one or more channels.

√ A neighbor's antenna, especially on a crowded apartment roof, may be too close, affecting the stability and detail of your customer's picture and requiring repositioning of the customer's antenna.

√ In recent months, the coming of UHF has made antennas of extreme importance. Old masts may be re-equipped with UHF bow ties and other UHF specialties.

√ Stress the limitations of *obsolete* types of antennas. Advances in design have outmoded many old aerials even though they appear to be sturdy. Continued use results in impaired reception far short of that which a modern antenna would provide.

NO TV SET IS BETTER THAN ITS ANTENNA

As a professional, you know that it is folly to spend hundreds of dollars on a fine receiver unless it is to be fed from an A-1 antenna system—meaning: A-1 rods and contacts, accurately matched down-lead, lightning arrestor, etc.; all continuously maintained in A-1 condition.

Teach your customer not to discount or disregard his antenna just because he can't see it to examine it carefully. Let him know that your interest is not confined to set and circuit repairs; that antennas need ceaseless and unforgetting attention.

While YOU realize these things, your customer DOES NOT. Tell him, by all means.

And now, a few points about TACO.

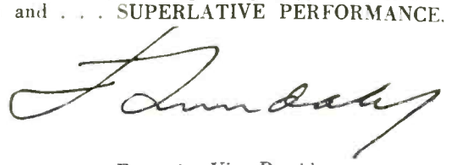
TACO—1931 PIONEER WITH 1953 PRESTIGE

TACO, short for Technical Appliance Company, is also a symbol of BETTER ENGINEERING, dating back to the earliest days of radio.

With the coming of television, TACO was ready with truly efficient antennas and has remained in the forefront of TV antenna engineering to this very day, as shown in the following pages.

TACO's policies have aided and protected the trade (a) by never producing an antenna of unproved design; (b) by never sacrificing quality for price; (c) by never failing to provide a satisfactory margin for serviceman or dealer.

When you install a TACO antenna, you can rest assured that you are giving your customer a product of the soundest engineering, the highest quality, sturdiest construction and . . . SUPERLATIVE PERFORMANCE.



Executive Vice President
TECHNICAL APPLIANCE CORP.

Hi-Fi Installations

Who Want to Enter the High-Fidelity Field

distortion, or varying levels of audibility in different parts of the room.

Record-Player and Pickup Cartridge.

As we previously pointed out, the record player should have a correct, constant speed and should not damage records. Many Hi-Fi enthusiasts prefer a manual (single) record player to a record changer. They feel this way because the dropping of records down the spindle in automatic record changers tends to enlarge the center hole of the record. A slight "wow" is apt to result.

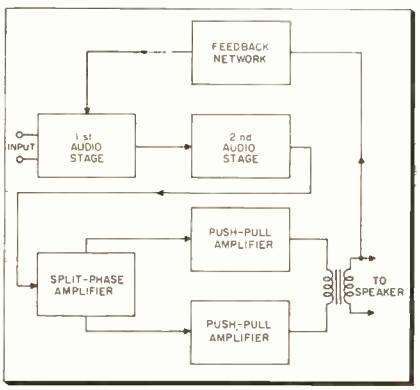


Fig. 4—Block diagram of Hi-Fi Amplifier.

High-fidelity set owners generally buy good records and are interested in making them last as long as possible. A poorly-designed record player can make a record wear prematurely in many ways. The pickup needle has the most effect on the wear of records. The material of which the needle is made, its shape, and the way in which it tracks the record's grooves are the most determining factors in the wearing out of records.

Fig. 3A shows a pickup needle properly seated in a record's groove; Fig. 3B shows a worn needle that is riding the wall of the groove. This causes unnecessary wear on a record and will produce scratch and distortion; the pickup arm will often skip grooves in such cases. Some "permanent" needles should be changed periodically to prevent record wear. A number of Hi-Fi technicians are inclined to avoid the use of a pickup in which the needle is permanently attached, because the latter cannot be changed if and when wear has made its replacement necessary.

The pickup itself will be either a crystal or magnetic type, and should be selected according to the amplifier that will be used. A crystal pickup can supply a higher voltage to the amplifier, but it does not have as good a response as the magnetic type. A preamplifier is necessary when a magnetic pickup is used, due to the low output of the latter.

Hi-Fi Amplifier.

The amplifier is the most important item in the overall Hi-Fi system. It is also the most difficult part of the system to decide on. The amplifier should be able to deliver at least 10 watts of power with a minimum of distortion, over a wide range of frequencies. Its "B" supply must be adequately filtered to prevent an appreciable hum.

Fig. 4 shows a block diagram of an average Hi-Fi amplifier. The feedback network is a very important part of the amplifier. This network determines the range of flat frequency response. A large portion of output signal is fed back to the input, degenerating the input signal. This degenerating action levels off the frequency response of the amplifier. Without this feedback, the response characteristic of the amplifier would be considerably different (see Fig. 5). With feedback, the frequency response improves considerably, but the gain of the amplifier decreases. Because of this, the amplifier must be sensitive to begin with.

The amplifier should have an adequate number of controls so that it can be properly adjusted to suit the customer's requirements for different recordings. Besides the volume control, a treble and bass control are desirable, to produce the desired tonal balance. Another important control, for the serviceman's use, is a screwdriver adjustment to balance the push-pull output stages. Push-pull output stages are used to cancel out the distortion that tends to develop in this section of the amplifier. They are only effective, however, when properly balanced.

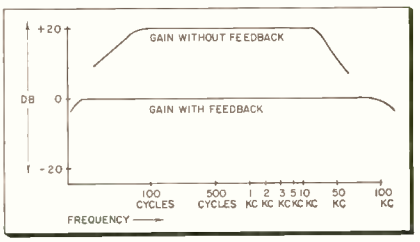
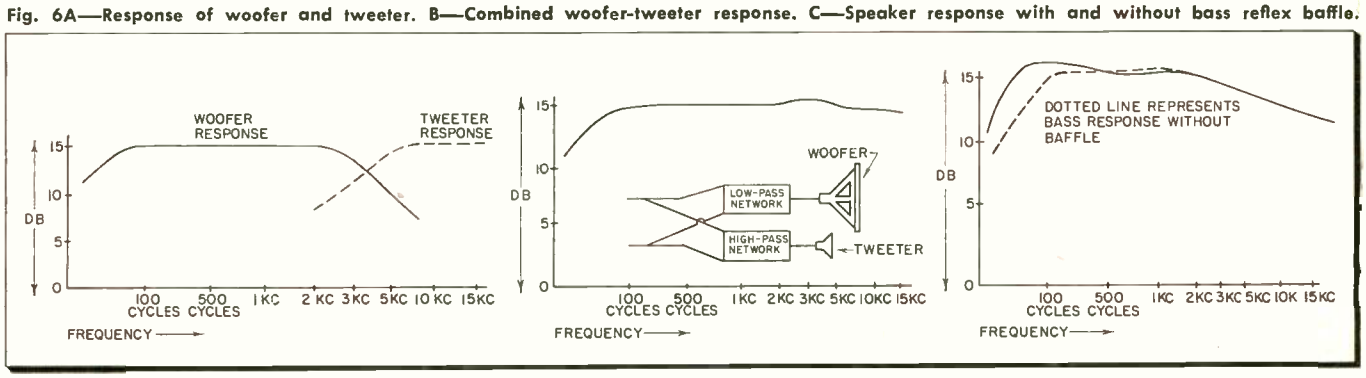


Fig. 5—Response of typical amplifier with and without feedback.

Output Transformer and Speaker.

The output transformer's main function is to transfer energy from the amplifier to the speaker (or speakers). The transformer comes with the amplifier. Its impedance must be taken into consideration when deciding on a choice of speaker(s). The impedance of the speaker system must match the transformer impedance to insure an efficient transfer of energy without distortion or frequency discrimination. One

Fig. 6A—Response of woofer and tweeter. B—Combined woofer-tweeter response. C—Speaker response with and without bass reflex baffle.



simple solution is to select an amplifier with a universal output transformer unit on which a number of output impedances are available.

The speaker requirements to be considered when one is chosen are: 1. Power-handling capacity. 2. Frequency response. 3. Impedance. 4. Efficiency. 5. Type of field (PM or dynamic).

The speaker (or speakers) used in the Hi-Fi system must be able to handle the entire output of the amplifier easily; they should be able to handle at least 5 watts more than the total power output of the amplifier, if distortion is to be minimized.

The frequency response of the speaker system is, of course, a determining factor in the overall response of the entire Hi-Fi installation. Fig. 6A shows the frequency response of a woofer speaker. The dotted line indicates the response of a good tweeter. Due to the physical characteristics of a speaker, it cannot (by itself) cover the entire audio range efficiently. If a good woofer and tweeter, with the response curves shown in Fig. 6A, are combined with a good crossover network, the curve shown in Fig. 6B can be obtained. Some coaxial speakers contain their own crossover systems.

In general the PM (permanent-magnet) type of speaker is preferred because it is self-magnetized and does not have to be matched to the power supply, as does a dynamic speaker. If a dynamic speaker is not properly matched, hum will develop.

BAFFLES. The speaker baffle is almost as important as the speaker itself in providing satisfactory fidelity. The bass reflex speaker cabinet can improve the bass response of the speaker considerably, as indicated in Fig. 6C. The speaker must

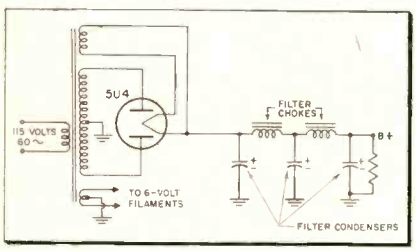
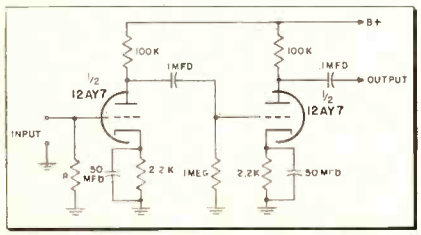


Fig. 7—Schematic of simple but satisfactory power supply.

Fig. 8—Basic two-stage preamplifier circuit.



Basic Principles of

be mounted as securely as possible within the baffle, to prevent audible

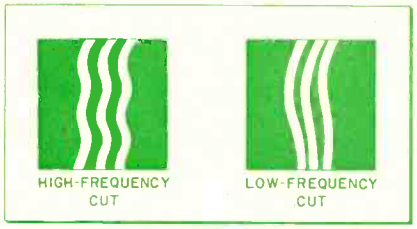


Fig. 9—Comparison of high and low-frequency cuts made by stylus. Grooves shown for both frequencies were made with the same signal amplitude applied to the cutting head. Note the reduced separation between grooves in the low-frequency cut.

rattle. The interior of the baffle should be lined with an absorbent material, to prevent high-frequency resonance of the baffle. A variety of baffles are available, each possessing advantages over the others in the particular locations for which they were designed.

POWER SUPPLY. The power supply delivers the B+ and filament voltages to each section of the Hi-Fi system. The supply must be large enough to feed these sections without being loaded down. When selecting a power supply for the system, a supply with a rating in excess of what is required is preferable; any future additions to the system, thus, will not be too much of a drain on the supply.

The supply should deliver a fairly constant output under varying loads, so as not to affect the characteristics of the amplifier. The most important factor, perhaps, in a good power supply is the residual hum level of its B+ or output voltage. This hum level should be very low. A simple but satisfactory power supply is shown in Fig. 7.

PREAMPLIFIER. A preamplifier became necessary in Hi-Fi systems with the advent of the magnetic cartridge. This unit, along with its desirable characteristics, has a very low signal output voltage; the average amplifier cannot build up this signal output to the proper level without introducing distortion. The preamplifier builds up the signal to the minimum level demanded by amplifier requirements.

Since the magnetic cartridge is a low-impedance device, and most amplifiers have high input impedances, the preamplifier acts as an impedance matching unit as well. Some preamplifiers also incorporate equalizing networks for frequency compensation; we feel it is better to use a separate equalizer for this purpose, so that more complete control can be obtained. Fig. 8 shows a basic two-stage preamplifier.

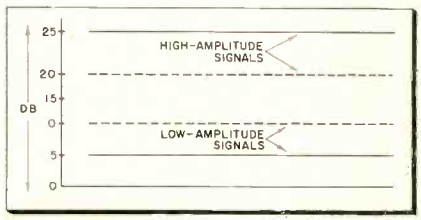
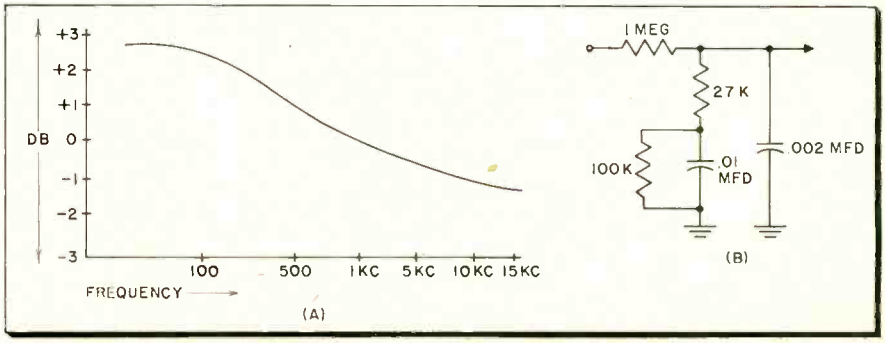


Fig. 11—Graph indicating effects of amplitude compression on high and low-amplitude audio signals. Dotted lines represent high and low-amplitude signals after compression.

EQUALIZER. The primary purpose of the equalizer is to compensate for reduced low-frequency response of records. When a recording is made, the lower frequencies are attenuated. This is done for the following reason: The lateral cut for a low frequency is greater than for a high frequency at the same voltage. This difference in the stylus excursion is shown in Fig. 9. Because of the tendency of the stylus to cut into the next groove at the high-amplitude, low-frequency signals, these low frequencies have to be attenuated. Various recording com-

Fig. 10—One type of RC equalizer and its output curve. Equalizers compensate for the attenuation of low-frequency audio signals during recording.



Hi-Fi

panies use different roll-off characteristics, so the equalizer must be adjustable for various compensation curves. One type of equalizer and its curve is shown in Fig. 10.

EXPANDER. The volume expander circuit is used to compensate for the amplitude discrimination introduced at the recording studio to prevent the overcut of the record's grooves. While making records, the difference between the high-amplitude and low-amplitude signals is sometimes so great, that the recording of the two signals in their correct proportions would result in the high-amplitude signal over-cutting the grooves. To prevent this condition, the recording studios compress the difference in the signals. Fig. 11 shows how the relative amplitudes of the signals are changed after compression.

It is obvious that the correct relationship between the high-amplitude and low-amplitude signals must be restored in the phono amplifier if high-fidelity is to be attained. This is done by the expander circuit (Fig. 12). The expander circuit achieves the effect desired by giving more gain to high-amplitude signals and less gain to low-amplitude ones; its action is opposite that taking place in an AVC circuit.

NOISE SUPPRESSOR. Through experiments it has been found that surface noise, the scratch noise of a worn record, or even the rumble due to turntable rotation, occurs within bands of frequencies. There are a number of noise suppressors on the market that will filter out these noise frequencies and yet not affect the fidelity of the system to any appreciable extent. A good

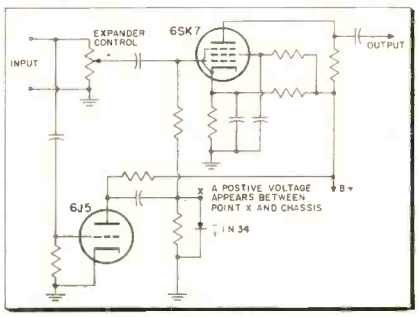


Fig. 12—Volume expander. This circuit compensates for amplitude-compression during recording.

noise suppressor should be adjustable, so that it can be set for optimum performance.

Some suppressors are made up of RC or LC networks; others contain vacuum tubes, to provide amplified action. The system to be used is determined by the budget, as well as the amount of noise to be suppressed. When installing a noise suppressor, a cut-out should be used, so that when a record is being played that has no noticeable noise, the suppressor can be readily removed from the circuit.

When Your Town Gets First TV

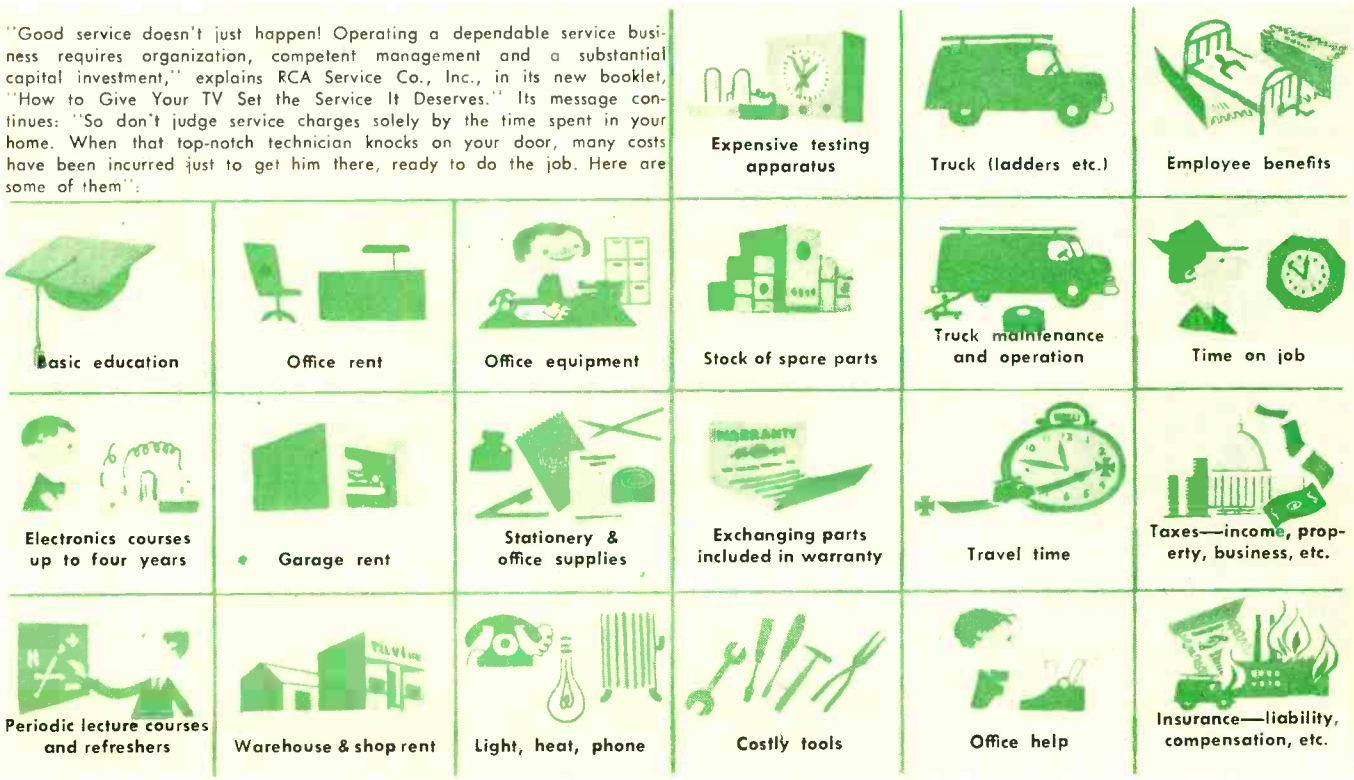
TV servicemen's associations, local Better Business Bureaus, and merchant groups are banding together in those areas which are getting their first TV station, to prevent a repetition of the situation in Denver, Colorado, last year.

Readers will recall the mess that resulted when fly-by-nights moved in to peddle obsolete and broken-down TV sets just before the new transmitter went on the air. People snapped them up at high prices, brought them home and waited for the big day when programs were to begin. Needless to say, all hell broke loose on that day. The fly-by-nights who had sold them the lemons had disappeared from the scene, and Denver servicemen bore the brunt of the wrath of the angry customers when the cost of making extensive and expensive repairs became known.

Let us all hope that the reputable TV merchants and servicemen in new TV areas will be able to prevent a recurrence of this chaotic condition.

If Your Customer Beefs About His Bill, Show Him Your Hidden Expenses

"Good service doesn't just happen! Operating a dependable service business requires organization, competent management and a substantial capital investment," explains RCA Service Co., Inc., in its new booklet, "How to Give Your TV Set the Service It Deserves." Its message continues: "So don't judge service charges solely by the time spent in your home. When that top-notch technician knocks on your door, many costs have been incurred just to get him there, ready to do the job. Here are some of them":



Serviceman's Analysis of

Simplified Outline of the NTSC Standards for

By Irving Shulman

• Servicemen may recall the excitement generated in 1951, when the FCC announced that it had approved a set of "spinning wheel" standards for commercial color-television transmissions. Controversial interest died when the Government issued an order that all color-television manufacturing be stopped, in order to conserve vital materials and manpower needed for defense.

The color-television transmission standards approved at that time were for a *field sequential system,* which was non-compatible with existing monochrome (black and white) transmissions. This meant that color telecasts could not be received on the millions of monochrome receivers already in use. To receive color transmissions in monochrome, the vertical and horizontal deflection circuits of the black-and-white receiver would have had to be altered; other circuit changes would have been necessary as well.

There were various objections to the field sequential system from an engineering viewpoint. Let us briefly review the field sequential system. A little history of this sort will enable us to better understand the system currently up for approval.

Three fields were transmitted in succession in the field sequential system: first red, then green and last blue. These fields represented the light falling on the camera tube from the color scene being televised. Two sets of the above-mentioned three fields were interlaced, producing a complete color picture or frame. Twenty-four frames were transmitted each second.

Defects of Old System

Now, the existing monochrome television channel has a bandwidth of 6 MC. In order to transmit three complete color pictures, with an amount of detail in each color equivalent to that present in the regular monochrome transmissions, much more than 6 MC is needed. Since only 6 MC was available, however, the amount of detail contained in each color picture was reduced, in order to permit the color transmissions to be squeezed into a 6 MC channel. As a result, picture detail was impaired. The low twenty-four frames per second rate introduced objectionable flicker, and color instability was noted in scenes where rapid motion was present.

The radio and television industry's NTSC (National Television Systems Committee) for the past two years has been developing and field testing a color television system. In July, 1953, this committee's proposal was submitted to the FCC for approval. When the FCC approves the NTSC color system, excitement will return to the television industry. It has been predicted that color television receivers will be on sale to the public some time in 1954. Let us see what the NTSC has done to overcome the shortcomings of the field sequential system.

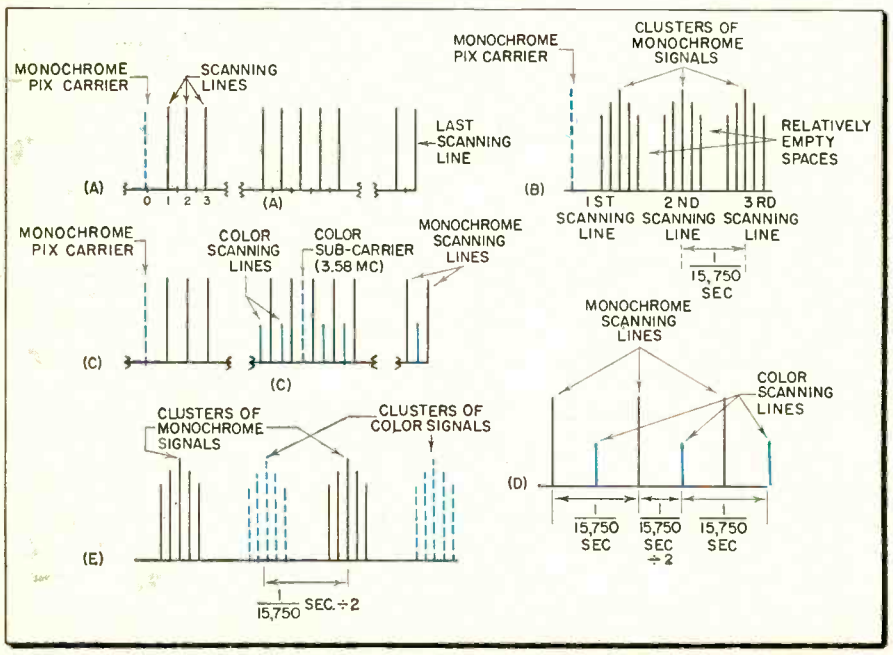
Definition and Compatibility

In the first place, the NTSC color system is a compatible one. A color broadcast can be received in monochrome, on a conventional black-and-white set. No alterations or circuit changes are needed.

Secondly, NTSC color transmissions will provide all the detail present in monochrome transmissions. The NTSC transmission is actually a high-definition monochrome picture with color added; yet it needs only the 6 MC allocated for the regular black-and-white television transmission. How was this miracle accomplished, when only a few years ago it was thought that 12 MC of bandwidth would be required for a color transmission of equivalent fidelity? We'll soon see.

The engineers had a tough nut to crack. These were the problems that confronted them: 1—The color system had to be compatible with monochrome TV. 2—It had to provide pictures containing detail equivalent to that present in black-and-white TV. 3—The colors had to be convincing to the eye. 4—The system had to provide freedom from flicker, and color instability. 5—The

Fig. 1—A) If no video information is being transmitted, the horizontal scanning lines may be represented as a series of pulses, equal in amplitude and separated from each other by 1/15,750 of a second. Only a few lines are shown. B) When video information is being transmitted, a cluster of video signals is associated with each scanning line. Note the empty spaces between clusters. C) If color scanning lines were mixed with monochrome ones, the result could be pictorially indicated as shown above. D) Close-up view of monochrome and color scanning lines. E) Enlarged view showing appearance of modulated scanning lines when color signals are inserted between the monochrome ones.



the New TV Color System

Color Transmission That Are Expected to be Approved Soon

color system had to stay within the existing 6 MC monochrome TV channel.

Investigations disclosed that the human eye had certain characteristics of which advantage could be taken:

1—In the case of large areas, the eye has three-color vision. That is, any color scene can be reproduced by blending in the proper proportions of light from three "primary" colors, usually red, green and blue.

2—With respect to areas containing medium-sized detail, the eye needs only two-color vision. Blues become indistinguishable from greys or yellows of equal brightness in such cases. Browns tend to blend in with crimsons. Light from only two primary colors is needed in these instances to reproduce the color scene.

3—The eye is practically color-blind when viewing small detail.

Adding Color

These findings, abetted by a great deal of experimentation, resulted in the conclusion that if a high-definition monochrome signal were transmitted, only a relatively small amount of coloring information would have to be added to create an acceptable color picture. Tests showed that only 1.5 MC of bandwidth would be required to transmit the necessary color information. The process of superimposing a low-definition color picture on a high-definition black and white one, incidentally, is known as *"mixed highs."*

Now, where can the additional 1.5 MC of radio-frequency spectrum needed to transmit the color information be obtained?

In seeking an answer to this question, engineers mulled over the fact that the normal monochrome system does not utilize the radio-frequency spectrum assigned to it efficiently. Many unused gaps exist in the range of frequencies covered by each channel.

Researchers long ago pointed out that for most scanned subjects, almost all the signal energy present is concentrated at frequencies that are whole multiples of the line-scanning frequency. About mid-way between these heavily-occupied areas are comparatively vacant ones. At odd multiples of half the line frequency, in other words, relatively unused stretches of spectrum are available (see Fig. 1A, B). Color information can be inserted into these gaps.

Band-Width Conservation

If the color carrier frequency is correctly chosen, the color signal sidebands (which contain the color information) will fall between the sidebands that contain the black and white information (see Fig. 1C, D, E). This process, which is known as *band-sharing* or *frequency interleaving,* was the one actually adopted by the NTSC.

In practice, it was discovered that mutual interference is present when band-sharing is practiced—that is, color signals interfere with the monochrome ones, and vice versa. The dot interference pattern created is, however, not objectionable at normal viewing distances (just as the presence of the scanning lines in a black and white picture is not annoying).

The frequency chosen to represent the color carrier is 3.57945 MC. It is referred to more conveniently as 3.58 MC. This frequency is an odd multiple of half the horizontal scanning rate $\left(\frac{15{,}750 \times 455}{2} = 3.58 \text{ MC, app.}\right)$. 3.58 MC is a video frequency; the corresponding radio frequency can be obtained by adding 3.58 MC to the black and white RF carrier.

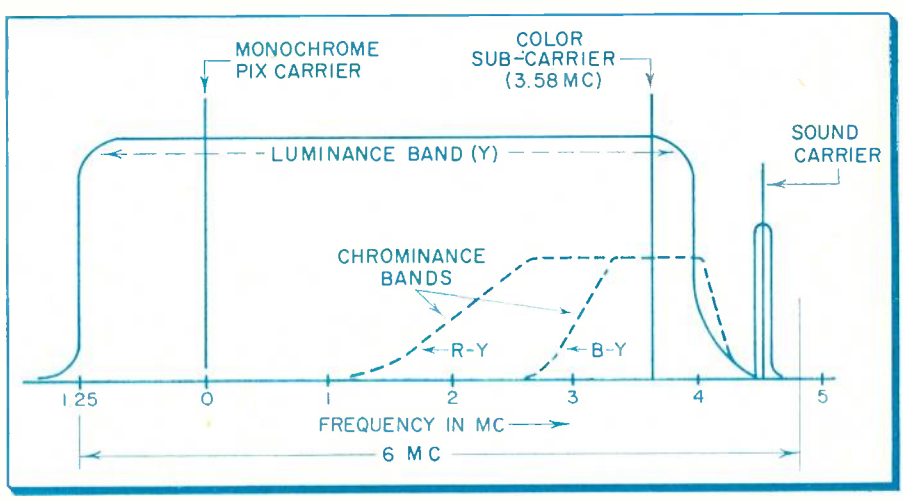
Band-sharing or frequency interleaving does not make the color subcarrier components completely invisible in the black and white spectrum, due to non-linearities that exist in the TV system, as well as insufficient persistencies of vision. These components are visible but not readily apparent at normal viewing distances, when 3.58 MC is used as the sub-carrier frequency. There are reasons why a lower frequency might be more desirable (to minimize cross-talk between color signals at the receiver, for instance); 3.58 MC was, however, determined by tests to be the best compromise frequency.

Band-Width Relationships

The band-width relationships of the NTSC color system to the black and white information are shown in Fig. 2. Note that only 1.5 MC, app., is allotted to the color or *chrominance* signal; 4.2 MC is given to the black and white or *luminance* signal (the latter is also referred to as the monochrome signal).

The information transmitted is limited to the amount that the

Fig. 2—Bandwidth relationships of color and monochrome signals. Approximately 1.5 MC is allotted to color signals; monochrome information gets 4.2 MC.



human eye can readily perceive. The eye distinguishes between three separate, distinct visual sensations; 1—Brightness (relative intensity of light, or *luminance*). 2—Hue (the color or colors present—red, green and/or blue). 3—Saturation (purity of color present. A very deep red would represent a high degree of saturation. White would be equivalent to zero saturation.) The eye is sensitive to changes in brightness, but relatively insensitive to changes in hue.

Blue Band-Width

Coming back to Fig. 2, note the relatively small area allotted to the blue (B-Y) signal. The allotment is small because the eye is relatively insensitive to blue. High-frequency blues (fine detail) can't be detected as blues by the eye—only low-frequency blues (representing large areas) up to about 600 KC are recognized as blue by the eye.

Double sidebands are allotted to the blue signal—each blue frequency is, so to speak, transmitted in duplicate. The red (R-Y) signal, on the other hand, is sent out with one sideband and a vestige of another one (vestigial sideband transmission). Suitable response curves in the receiver's tuned circuits take care of the differences in amplitude of the blue and red signals, and provide compensation, if any is needed, for the mode of transmission used in each case. These signals, incidentally, need not be equal in amplitude (assuming that they were equal in the scene being scanned), since the eye does not respond to them in equal measure.

Before the operation of the color receiver can be understood, some idea of how the transmitter functions is necessary. We will therefore present, in simplified and outline form, a possible transmitting system (see Fig. 3.)

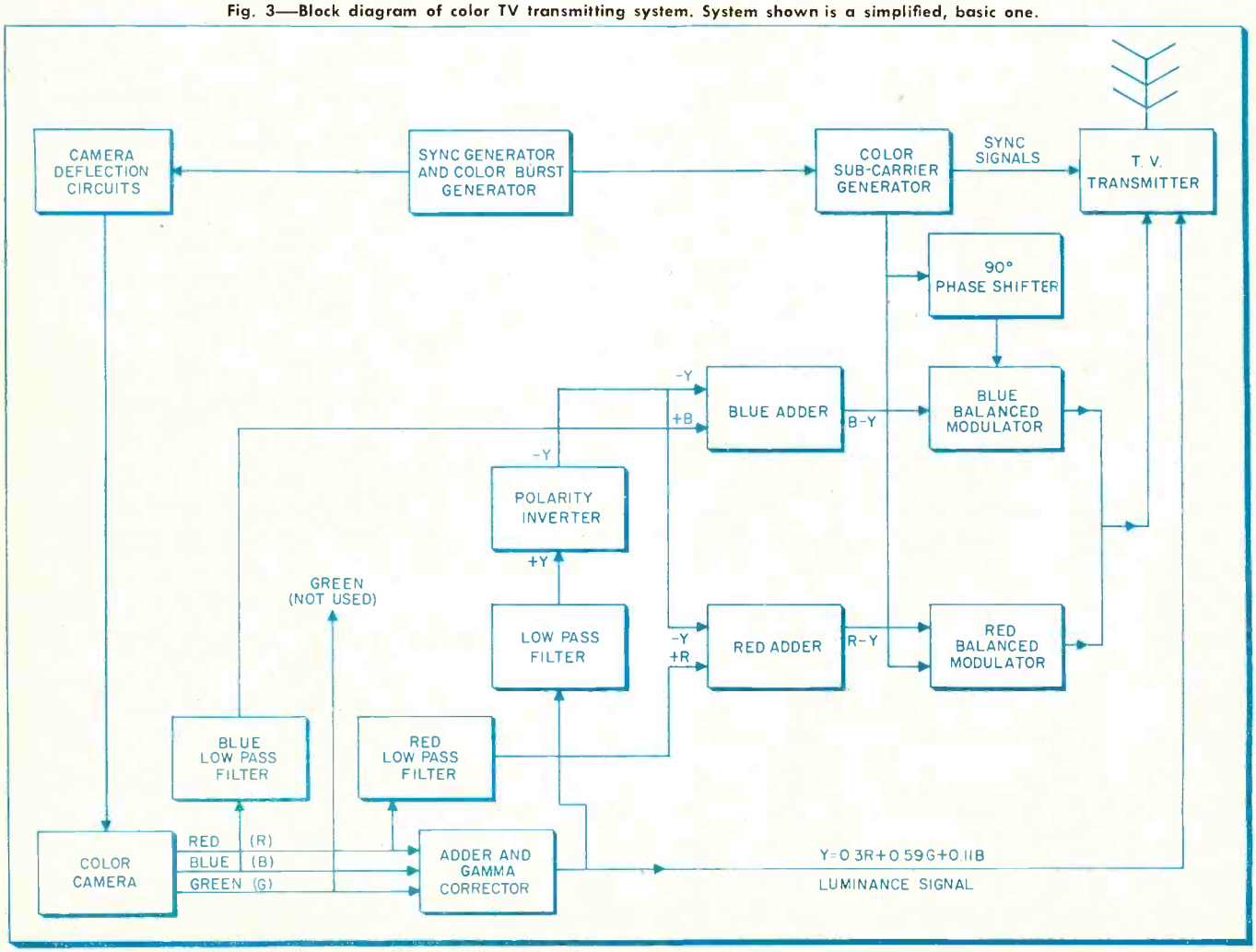
Referring to Fig. 3—the output of the color camera is composed of three electrical signals: red (R), green (G) and blue (B). These signal voltages are counterparts of the colored light being reflected from the televised scene into the camera. The signal components representing the scene contain both brightness and color information. To permit black and white receivers to receive the color signals in monochrome, the brightness information must be transmitted as an AM signal, in the same way that a monochrome transmitter would send out such a signal.

Color Signal Paths

The color signals take two paths when they leave the color camera. One path takes them to an *adder and gamma corrector block,* in which they are suitably processed for transmission as a luminance or monochrome signal. In the second path, they are worked over by appropriate circuits and made into the desired chrominance (color) signals. Let's analyze the first operation a bit.

The adder part of the *adder and gamma corrector block* assigns cor-

Fig. 3—Block diagram of color TV transmitting system. System shown is a simplified, basic one.



System

rect proportions to the red, blue and green signals. Thus blue is assigned to a value of 11% of the total, red to 30% and green to 59%. The assignments are such, that the resultant picture seen at a monochrome receiver looks the same to the viewer, as the original scene would, when viewed by a color-blind man. Application of the individual color signals to suitable taps on voltage dividers permits the percentage assignations just described to be made.

The gamma corrector compensates for distortions introduced in various parts of the television system. One distortion that might be cited is that introduced at the receiver's cathode-ray tube. The CRT is not linear at all levels of operation—i.e., the light output of its screen is not linearly proportional to the input signal at all input signal levels. Compensation is therefore needed, just as compensating filters are required in photography, to counteract the non-linearity of film and printing paper.

The signal output of the *adder and gamma corrector block* is the luminance or Y Signal. This signal contains all the brightness information and detail of the televised scene, as we previously indicated. It goes to the transmitter, and is sent out into space. Monochrome receivers will utilize only this portion of the total transmission.

Color Signal Processing

Let us now analyze how the color signals are processed. The red and blue signals go to the red and blue adder, respectively. The green signal is not separately transmitted—it is, instead, transmitted as a part of the luminance signal (.59G), and recovered at the receiver by subtracting the sum of the red and blue signals from this luminance signal. Green rather than red or blue is sent out with the luminance signal because the separate transmission of green would necessitate the use of a larger bandwidth than is required by the separate transmission of red or blue.

Before the red and blue signals enter their respective adders, they pass through low-pass filters. The function of these filters is to remove undesired color frequencies. The blue filter removes blue information above 600 KC; the red filter removes red information beyond 1.5 MC. The reader will remember that the NTSC system dispenses with the transmission of such frequencies. The unneeded frequencies must be filtered out, to conserve bandwidth; the filters take care of this job, permitting only the desired 1.5 MC range of color signal that the channel has room for, to get through.

The reader will note that the input to the blue and red adders consists not only of the blue and red signals (indicated by +B and +R) but also of the luminance signal. The luminance signal has been inverted 180 degrees in phase in a *polarity inverter*, so that it is opposite in polarity to the blue and red signals; this explains the respective polarity markings in front of the B, R and Y

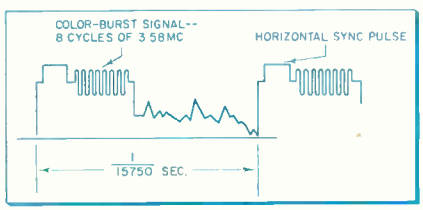


Fig. 4—Color-burst signal used to provide synchronization of chrominance signals at the color receiver.

signals at the input to the blue and red adders.

Why is the luminance or Y signal combined with the red and blue signals in the adder circuits? The reason is, we want to get rid of the brightness information present in these signals. No need exists to transmit this information that is mixed with the red and blue signals, since the black-and-white (luminance) signal already contains this intelligence. By subtracting Y from B, and Y from R, the brightness component of the color signals is removed.

Modulator Functions

The output of the blue and red adders (B-Y and R-Y) is applied to the *blue balanced modulator* and the *red balanced modulator*, respectively. The function of the modulators is to remove the color carrier, or color *sub-carrier*, as it is often called (since it is suppressed—i.e., eliminated), and pass only the sidebands. The question now arises, why is it necessary to eliminate the color carrier?

One of the reasons the color carrier is suppressed is that a better signal-noise ratio is possible with this type of transmission. In an AM transmitter (which is the kind used for sending out the picture signal in TV) a good deal of power is wasted by transmitting the carrier, which carries no intelligence (the intelligence lies in the sidebands). If the carrier can be gotten rid of, the power that went into it can be added to the sideband power, increasing the signal-noise ratio of the desired intelligence.

The color carrier is also suppressed to minimize interference that may be created by the heterodyning of color and sound carriers. The interfering signals created as a result of this condition would fall into the video bandpass and impair picture detail, especially in monochrome receivers, where the sound carrier is not as greatly attenuated as it is in color receivers.

Sideband Generation

From an examination of Fig. 2, the reader will note that the blue and red signals, which are relatively low in frequency to begin with (blue signals go up to 600 KC, red ones to 1.5 MC) fall at the high-frequency end of the channel. To translate these originally low frequencies into the higher ones required by the band-sharing system employed, we beat them against the color subcarrier in the balanced modulators, so that they appear as sidebands above and below the subcarrier frequency (3.58 MC). The process is similar to the one taking place in an AM broadcast transmitter, when audio signals are changed into RF sideband frequencies. The balanced modulators make this process possible; they also suppress the undesired color subcarrier.

The suppressed carrier is restored at the color receiver; it is needed in the color 2nd detector, to beat with the color sideband signals and cause the latter to be demodulated. Restoration of the carrier in the receiver is achieved by having a local oscillator generate a signal of the proper frequency—i.e., that of the suppressed color carrier.

Two kinds of signal are fed to each balanced modulator—the color subcarrier signal (which comes from the color subcarrier generator) and the blue (B-Y) signal to one modulator; the subcarrier and red (R-Y) signal, to the other. The reader will note that, while the color subcarrier is applied *directly* to the red balanced modulator (Fig. 3), it is applied to the blue balanced modulator through a block labeled *90-degree phase-shifter*. The reason for this block may be outlined as follows:

To simultaneously transmit blue and red color information representing *two* separate signals, *two* carriers are needed. Only *one* carrier is, how-

(*Continued on page* 69)

Pricing TV Repairs: by the

Fixed Charges Are Better Than Time Fees, Says A. Maius.

• Should television technicians charge a varying portal-to-portal service charge, or a flat fee? Is it better to base repair charges on an hourly labor rate, or to bill each customer the same amount for the same job, regardless of time variations? These questions, which frequently arise in any discussion of pricing, as well as others pertinent to the problem, were put to Abe Maius, owner of Paramount TV Service Center in Greater Cincinnati.

Operating Methods

Before examining Maius' answers, analyzing the basis of Paramount's price policies, a brief glance at the company's operating methods may be relevant. The Service Center is a large one, employing 23 technicians, all of whom were carefully screened before they were hired. An applicant's know-how, speed and skill is tested for one day in the shop to learn if he is able to maintain the standards Paramount requires of its servicemen.

The company operates on a 24-hour schedule, including Sundays and holidays. Nine service trucks are manned by driver-technicians who handle home service, pickups and deliveries; five benchmen repair sets brought into the shop by outside servicers and customers. Located in Norwood, Ohio, Maius' shop is in the heart of the greater Cincinnati area; its trucks cover calls originating within an approximate 35-mile radius of the city.

Unlike some concerns, Paramount does not charge a portal-to-portal fee for home service calls. "Our charge to the customer is $5, plus parts, if the set does not have to be brought into the shop," Maius says. "And that fee is the same whether we have to go just around the corner, or 20 miles out of town, to take a look at the set."

Unwise Pricing

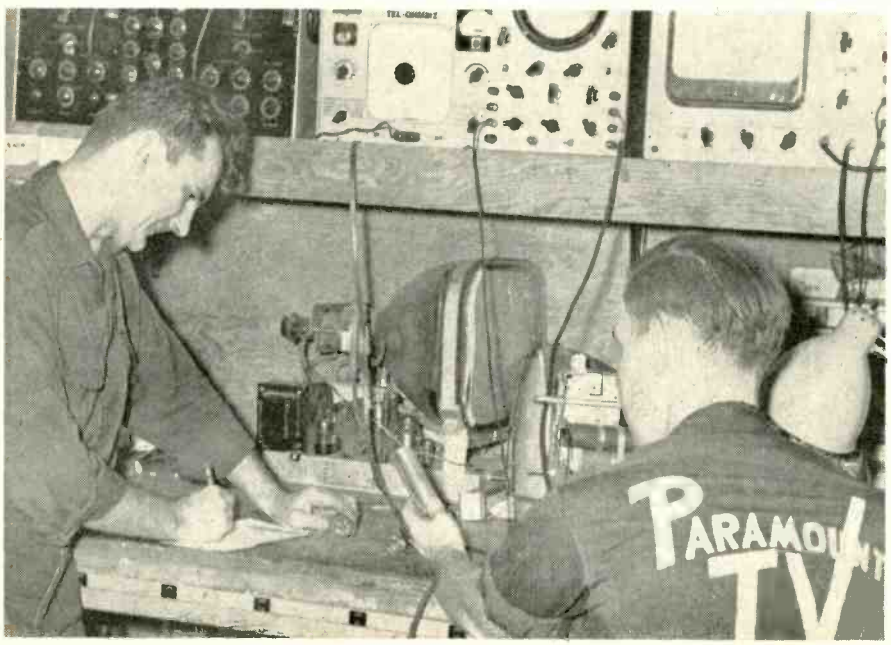
"We are trying to build a volume business, and it is impossible to do this if we limit customer potential by unwise pricing," he continues. "A portal-to-portal charge inhibits growth, in my opinion, and causes the technician to lose business that would bring profit to him once the set was in his store."

How can Maius afford to send his trucks out on those time-and-gas-consuming distant calls? First, Paramount's location is a favorable one. Because the shop is centrally located, the bulk of the business originates in not too far distant areas. Also, the dispatching personnel, who route the technician drivers as customers telephone in, try to schedule each driver's calls so that he remains in the same section of the city where he made his first stop of the day or evening.

Maius explains: "Over a period of time the transportation cost of all the calls will average out. Those that involve extra expense will be balanced by the calls on which the technician has little transportation cost because they originate within a short distance of his operating base. Our flat $5 fee is determined by the *average* transportation cost of making a normal call, plus the *average* time spent on the call."

Technical supervisor Charles Long keeps prices of parts up to date. He checks shipments as they come in and immediately marks new prices on the boxes, also changing listings on the price sheets which are used at the dispatch desk.

Under a fixed rate system, there is no need to record the time involved in repairing a television set. Bench men simply list the work done on the customer's bill, after a job is completed.



Time Allotment

The time allotted the technician for each home service call is 30 minutes, excluding transportation. "In that length of time a competent serviceman should be able either to find out what is wrong with the set and correct any minor trouble, or recognize that it must be brought into the shop," Maius says.

"That's where the high calibre of the men we hire comes in," he continues. "The fact that they can do a job quickly permits us to operate

HOUR or by the JOB?

Technicians Should Find This System Helpful

on a close time schedule for home calls. A further factor that speeds the technicians' work and adds to their efficiency is the help they get from the shop crew. When a driver finds that a set he has been called on to service is a make with which he is not too familiar, a call to the Service Center puts him in touch with one of the benchmen who does know the workings of that particular make. Instead of losing time by experimenting, the efficient outside man gets to the heart of the problem by the quickest, most direct route available —even if it means admitting that he does not know all the answers himself."

If the outside man finds that the set must be taken into the shop, the flat service charge is $7.50 instead of $5. Mr. Maius explains the additional fee this way: "$5 covers the original call—the time, transportation and equipment depreciation involved in having our man go to the customer's home to look at the set. The extra $2.50 is for the diagnosis of the set's trouble, which we make after the set has been brought into the shop. If a customer brings the receiver in himself, however, there is no such service charge. Instead, he pays only a $3 fee for diagnosis.

Charges Never Excessive

"Now, every technician knows that this fee wouldn't begin to cover the time spent in locating the trouble in some of the sets he is called upon to repair. Sometimes it's necessary to put a set on the bench and test it off and on for a couple of days, before the difficulty is spotted. Troubles in other sets can be diagnosed in a matter of minutes, on the other hand.

"The time spent in locating set faults, like our transportation costs, averages out, and for this reason we are safe in charging the flat $2.50 or $3 diagnosis fee. We make a profit and keep our customers happy at the same time, for under this system no one is presented with a bill which he could consider exorbitant, as would sometimes be the case if we made up this portion of the total bill

Chart used by Paramount to determine labor charges on shop repair jobs. Note that prices do not include charge for locating the trouble.

Aerial: repair or orientation, per hour	$ 9.20
minimum	11.50
Aerial: installation or replacement (job price) for standard installation	$17.25 to 23.00
Audio Amplifier: resistor or condenser replacement, wiring repairs	4.05
Audio Transformer: replacement	5.20
Automatic-Frequency-Control System: resistor or condenser replacement, wiring repairs	5.75
Automatic Record Changer: major repair, including cleaning, adjustment and lubrication	$7.75 to 13.80
Automatic Record Changer: minor repairs	2.90
Automatic-Volume-Control System: resistor or condenser replacement, wiring repairs	5.20
Beam Bender (Permanent-Magnet Type): replacement or repairs	1.75
Beam Bender (Electromagnet Type): replacement or repairs	4.30
Condenser: main-filter replacement	5.20
Condenser: trimmer replacement	6.05
Condenser: tuning-gang replacement	7.50
Control: replacement	3.75
Damping Circuit: resistor or condenser replacement, wiring repairs	6.05
D-C Restorer: circuit resistor or condenser replacement, wiring repairs	4.30
Deflection Coil: replacement	6.35
Detector Circuit (Audio): resistor or condenser replacement, wiring repairs	4.30
Detector Circuit (Video): resistor or condenser replacement, wiring repairs	4.90
Dial-Drive Cable: replacement	$2.30 to 3.45
Dial-Drive Mechanism: replacement or repairs	3.15
Dial Lamp: replacement	1.15
Dial Pointer: replacement	$1.75 to 2.30
Dial Scale: replacement	3.15
Discriminator Circuit: resistor or condenser replacement, wiring repairs	6.35
Discriminator Transformer: replacement	7.50
Filter Choke: replacement	4.90
Focus Circuit: resistor or condenser replacement, wiring repairs	4.30
Focus Coil: replacement	6.35
Horizontal Circuit: resistor or condenser replacement, wiring repairs	6.05
Horizontal-Output Transformer (Direct View): replacement	7.20
Horizontal-Output Transformer (Projection): replacement	11.50
Intermediate-Frequency Amplifier (Audio): resistor or condenser replacement, wiring repairs	5.45
Intermediate-Frequency Amplifier (Video): resistor or condenser replacement, wiring repairs	5.45
Optical System: flat- or spherical-mirror replacement	6.60
Optical System: corrector-lens replacement	10.05
Optical System: cleaning and adjustment	4.30
Oscillator Circuit (Horizontal): resistor or condenser replacement, wiring repairs	4.90
Oscillator Circuit (Horizontal): transformer replacement	6.60
Oscillator Circuit (Vertical): resistor or condenser replacement, wiring repairs	4.90
Oscillator Circuit (Vertical): transformer replacement	6.60
Phonograph Motor: cleaning and lubrication	5.20
Phonograph Motor: replacement	4.60
Phonograph Pickup: replacement or adjustment	3.75
Power-Supply Circuit (High-Voltage System): resistor or condenser replacement, wiring repairs	5.45
Power-Supply Circuit (Low-Voltage (B+) System): resistor or condenser replacement, wiring repairs	4.30
Power Transformer: replacement	9.50
Projection Screen: replacement	5.45
Radio-Frequency Amplifier: resistor or condenser replacement, wiring repairs	5.45
Radio-Frequency Transformer: replacement (does not include "clip-in" coils)	6.05
Resistor (Voltage Divider): replacement	4.30
Speaker: replacement	4.30
Speaker Cone: recentering	2.60
Speaker Cone: replacement	5.45
Station-Selector System (Mechanical): repairs	3.45 up
Switch (On-Off): replacement	4.30
Switch (Push Button): cleaning and lubrication	4.05
Switch (Push Button): replacement	7.20
Switch (Radio-Phono) replacement	5.20
Switch (Wave-Band, Single-Section): replacement	7.20
Switch (Wave-Band, Multiple-Section): cleaning and lubrication	5.75
Switch (Wave-Band, Multiple-Section): replacement	$9.20 to 13.80
Tubes (Complete Set, Except Cathode-Ray Tube): replacement	2.90
Tubes (Cathode-Ray, Direct View): replacement	4.30
Tubes (Cathode-Ray, Projection): replacement	6.05
Tube Socket: replacement	7.20
Vertical-Output Transformer: replacement	5.75
Width Coil: replacement	5.20
ALIGNMENT OF TUNED CIRCUITS	
Television Chassis: complete audio and video	5.75
Radio Chassis: complete FM and AM	4.05
Automatic-Frequency-Control Synchronizing Circuit	3.75

Television Repair Charges *(Continued)*

on the basis of an hourly rate."

Maius applies this same reasoning to labor charges (for adjustments, repairs and replacements). He follows a suggested schedule set up by Philco Service several years ago, based on an estimate of time involved in each adjustment, repair or replacement process, when performed by a competent television serviceman. The labor charge for a specific job is, in consequence, always the same. If, for example, the price chart lists $5.20 for the labor in replacing an audio transformer, then that is the amount the customer is charged, regardless of whether it takes a Paramount technician more or less time to do the job than the standard set by the Philco time study.

But doesn't a company risk taking a loss by charging a *fixed* labor fee rather than an *hourly* rate? Maius qualifies his answer to this question with a warning. "If a serviceman is inexperienced or slow, this set-up is not for him. In my opinion, only the most competent technicians can operate profitably on a fixed rate basis."

"Here at Paramount we have serviced some 68 different makes of sets so far, each of which has its own peculiarities. The time it takes to do the same service job varies from brand to brand, but because our men are highly trained and thoroughly experienced, they can handle all makes and their associated problems in a minimum of time. If the chart shows that it should take a competent television serviceman $5.20 worth of time to do a given job, then that's how long it will take our men on the average. The evidence that this system has paid off for us lies in the fact that we have not raised our labor charges since our rates were established three years ago."

Before adopting the fixed-fee system, Mr. Maius based his charges on a $6 per hour labor rate. "It took us just two months to realize that this price procedure would not work out for us," he recalls.

"In some cases we lost customers because they felt their bill was excessive, even though we never charged for more than four hours labor, regardless of how much time over that was spent on a set. In other cases the charge was too low. We realized that labor costs had to be minimized by charging according to average, rather than actual service time. The best way to do this, it seemed to us, was to adopt a standard price for every classification of service performed in repairing a television set.

Typical Case

"To illustrate a typical transaction at Paramount: A customer phones reporting that her TV set is not working. Our outside serviceman calls at her home and discovers that the CRT is defective. So far, she owes us $5 for the home service call. Since it is hazardous to change the picture tube in the home, the set must be taken into the shop. The charge for this service brings the bill to $7.50. The price chart lists the labor cost at $4.30, so the customer's bill will be $11.80, *plus the cost of the CRT.*"

In reference to this last portion of the bill, Maius points out that although the installation of a new cathode-ray tube necessitates a number of adjustments, no additional charge is made for the latter. It is considered part of doing a satisfactory and complete job for the customer. If, however, the set was brought in solely for some adjustment—say, re-alignment—the price would include a $7.50 service charge, plus $5.75, the fee listed on the chart for this adjustment.

Red Tape Cut

As for the actual mechanics of pricing under this set rate system, Maius has found that much red tape has been eliminated, and that the paper work involved is a minimum. The benchman simply lists the work done on the bill when he completes a job. There is no need for him to figure the time involved. The shop supervisor then consults the chart for the labor cost, which he adds to the bill, along with the price of any parts used. As a double check, all bills for outgoing work are reviewed at the dispatch desk. The only part

(*Continued on page* 73)

Little Stories of Servicers' Success

Bonded TV Service, Belmont, Mass.

A Bonded television technician answers his radio-telephone and gets a hurry-up call from Mrs. Consumer. He'll service set 10 minutes later!

From a capital of $9.75 to a yearly gross of $100,000 in only four years is the success story of Bonded Television Service, Belmont, Mass., and its enterprising owners, Julius R. Widisky and Edwin A. Fisher. These two technicians have a service fleet of 12 cars, each equipped with radio-telephones, which cruise the suburban areas of Boston on a two-shift basis daily from 8:30 A.M. to 10 P.M. The firm maintains a service headquarters and an office staff of 13. Two girls, chosen for their patience, courtesy and ability to talk with customers, take calls and then relay the messages to the car nearest the customer's home. The radio-telephones are rented from Mobilphones, of Boston, and an answering service, available 24-hours-a-day, is purchased through the Merrimack Mobile Communications Co. Each car, owned by its driver-technician, is equipped with $400 worth of tubes and a caddy with all the tools likely to be needed. Every driver averages ten house calls a day, about 90% of them resulting in immediate fixing of sets. Only one set in ten has to be brought back to the shop. These "touring technicians" are guaranteed a basic salary of 25% of the gross business they do.

Transmission Lines

(Continued from page 33)

ferred to is that of the UHF channel.

Take ¼, ½, ¾, 1/ 5/4, 6/4, or any other such multiple of the wavelength (determined by formula just cited) and you have the correct distance to use—*for one channel.* When more than one channel is to be received, the problem becomes a little more complicated. The distance above earth in such cases must be a quarter wavelength or multiple thereof *for all the channels to be covered.* Some playing around with numbers will be required, to obtain a distance proper for every channel.

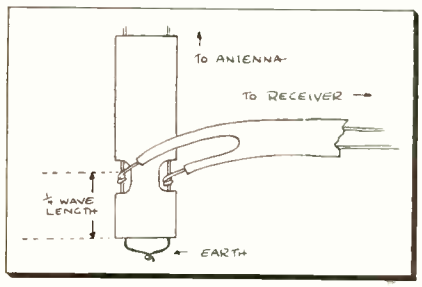


Fig. 4—Using quarter-wavelength of transmission line as a lightning arrester. (Figs. 2, 3, 4 courtesy of Capehart.)

The Du Mont Service Dept. offers the following helpful comments on lightning arrestors: Most antennas and receivers are nominally rated as having an impedance of 300 ohms; this impedance, though, is not present over the entire band. As a result there are usually standing waves present on the transmission line. Under these conditions, the installation of a lightning arrestor can cause considerable attenuation of the signal.

Minimizing Attenuation

This attenuation can be minimized by using the following procedure when installing an arrestor:

1. Place the arrestor as near to the receiver end of the line as possible.
2. In single-station areas, pull the lead-in through the arrestor a quarter of an inch at a time. Each time the arrestor is moved, remove your hand and check the signal. In this way the arrestor position which gives the least attenuation will be found.
3. In areas where two or more stations are received, the arrestor may be positioned to favor the weakest signal, or for the best compromise with respect to two or more signals.

COLOR SHORTS

ALREADY NBC is making elaborate plans to put color-TV programs over its network reaching 55 stations. Leading shows will be prepared for color-presentation as follows:

Oct. 6 Dinah Shore
Oct. 11 Paul Winchell
Oct. 18 TV Playhouse
Oct. 24 Your Show of Shows
Nov. 7 Hit Parade
Nov. 17 Bob Hope

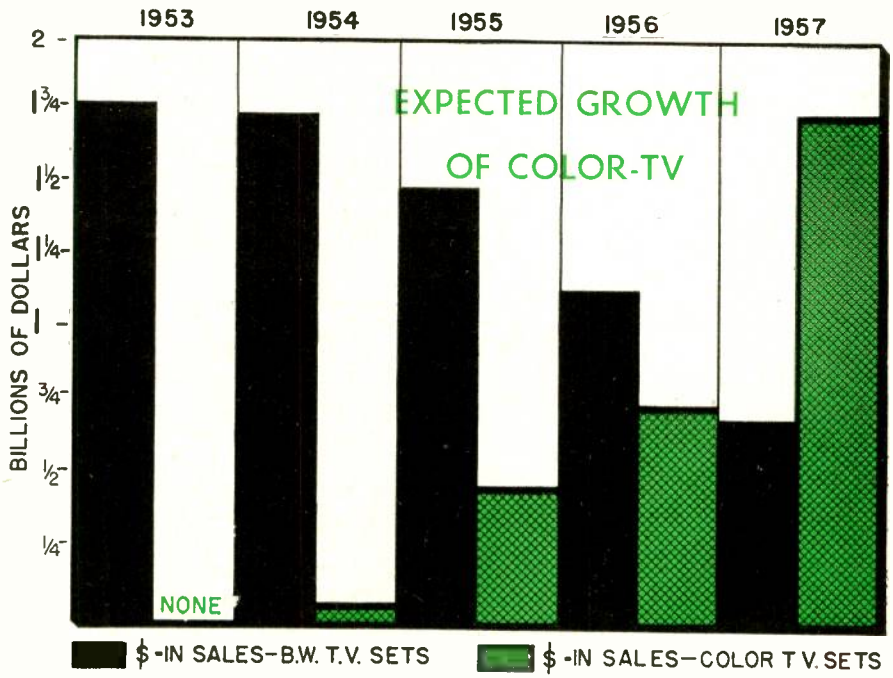
All color-TV shows will be put on from NBC's Colonial Theatre in New York City, which is equipped with four color cameras. Pending FCC color-TV approval, the above commercial shows will be produced and rehearsed in full color techniques, but broadcast in black-and-white. Warner's big sound stage in Brooklyn is also being fitted out for color-TV production.

COLOR RECEIVERS will not be on the market in quantity until sometime in 1954. Meanwhile, at New York, NBC is equipping the 300-seat Bijou Theatre, 209 W. 45th St., with movie-size-screen color facilities. The theatre will be used for public demonstrations of color until mass production of receivers is achieved.

DR. W. R. G. BAKER, NTSC chairman, and GE vice-president, has delivered to Chairman Hyde of the FCC a 16-volume, 52-pound exhibit reporting results of the NTSC's two-and-a-half years of technical studies of the problems involved. The proposed committee system offers color telecasts that could be tuned in by existing sets in black and white. If color reception were desired, a color set would have to be purchased in most cases since the industry generally does not consider "converters" practical, although a few engineers propose methods of "converting" present black-and-white sets.

EMERSON TV sees an early reduction in the high prices of color receivers, and has announced that once color-TV gets the go-ahead signal from FCC, it will produce receivers at prices only 25% above the cost of present black-and-white sets. Benjamin Abrams, Emerson president, said that the company would attempt to turn out such sets within 18 months after FCC approval of the new industry-sponsored compatible color system.

CBS HAS FORMALLY requested FCC to approve the new NTSC compatible color standards, and to cancel further authorization of the CBS "spinning-color-wheel" incompatible system which the FCC had officially adopted in 1950. Meanwhile CBS is carrying on experimental network color broadcasts using the NTSC standards.



Service Hints from Manufacturers

Improving Synchroguide Circuit. Odd Filter Condenser Trouble

Improving Horizontal Stability

Pacific Mercury TV, in one of its service bulletins, proposes an improvement of the "Synchroguide" circuit. The change may possibly prove helpful in receiver makes other than those put out by Pacific Mercury.

In some 150-Series receivers, the company says, there is a tendency for the horizontal deflection circuits to become unstable when slightly out of adjustment. The instability shows up as a severe breaking up of the raster into bright and jagged vertical and horizontal lines, and is usually accompanied by increased squealing or "singing" directly from the horizontal output transformer. This tendency can be eliminated by the following changes:

1. Add a 150 ohm resistor between C-51b and Pin 1 (grid) of the 6AU5 horizontal output tube (V-15), as shown in the diagram below. This prevents parasitic oscillation of the output circuit.

2. When adjusting the inside core of the "Synchroguide" transformer with an oscilloscope, DO NOT ADJUST FOR EQUAL PEAKS, as recommended in "Horizontal Oscillator Alignment Procedure" in previously published service information. Instead, set the broad peak slightly below the sharp peak, as shown in the sketch below. This will generally require resetting the front frequency range control to obtain normal lock-in range.

A thorough investigation of the sine-wave stabilized "Synchroguide" circuit, Pacific Mercury continues, has revealed that the above adjustment is preferable to the usual "equal peak" adjustment. Examination of the waveform at the grid of the blocking oscillator tube, V-14, has indicated that the sine-wave component added to the grid discharge voltage tends to make the grid voltage approach the cutoff bias of the tube after approximately ⅓ of the cycle has been completed, thus tending to cause premature firing of the oscillator. The adjustment indicated above keeps the grid voltage more negative in this region, and insures stable operation over a wide range of deflection circuit adjustments.

Filter Condenser Trouble

The Wells Gardner people discuss an interesting service problem with respect to their TV receivers that can no doubt occur in other set makes as well. Defective B supply filter condensers, it is pointed out, may cause intermittent horizontal jitter and intermittent picture tearing or bending, as well as horizontal foldover. An inoperative horizontal oscillator may also result from such defects. (Partial open-circuits or leaks in a filter condenser are referred to, not capacitor short-circuits.)

It may be very difficult to localize the source of the symptoms just cited, if the serviceman doesn't know what to look for. When any of the above symptoms are encountered whose source cannot be found by conventional test procedures, a check of the B filters for intermittents is advised. Any filter capacitors connecting to the B+ bleeder at or near the tap going to the horizontal sweep section are especially eligible candidates for the fishy eye.

The filters should be checked for intermittents by moving the condenser solder lugs slightly with a non-metallic tool, observing whether symptoms of trouble appear in the picture. In some cases, it may be necessary to operate the set for long periods of time to get the trouble to re-appear, after you have once moved any of the condenser solder lugs. A filter condenser should be replaced if movement of its solder lugs causes any of the conditions cited to appear or disappear.

It is important to remember that intermittent B+ filters may impair the operation of the horizontal sweep section without producing noticeable effects on the audio signal, raster edges, or DC voltage readings.

CRT Substitution

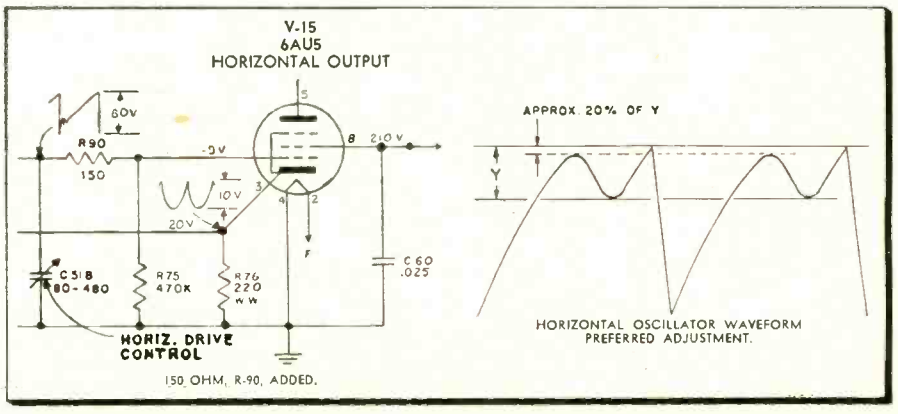
CBS-Hytron offers an important suggestion on cathode-ray tube substitutions in its booklet titled *Substitution Chart for Television Picture Tubes.*

"When a tube having automatic-electrostatic focus is substituted for a magnetically-focused tube, move the focus coil from its position on the neck of the tube and place it as far back as cabinet restrictions permit. Do not remove the focus coil from the circuit unless a resistor of suitable resistance and wattage is inserted in its place. In substituting an automatic - electrostatic - focus tube for an electrostatic-focus tube, it is not necessary to remove the focus-electrode lead from the socket. No change in socket wiring is required."

Checking Ion Magnet Strength

Sylvania points out (in its *Television Picture Tubes* booklet) that an ion magnet of insufficient strength can cause the CRT screen to be damaged. To check whether or not the magnet is too weak, the following procedure is recommended: Gradually approach the ion magnet with first the North, then the South end of a small bar magnet. If an increase in screen brightness is noticed for any position of the magnet, it shows the adjustment is incorrect, or the ion trap magnet too weak.

(Left) Part of "Synchroguide" circuit in Pacific Mercury 150 receivers. (Right) Suggested waveform change.



New Circuit Features

Anti-Noise Network in Latest Emerson Sets Analyzed

• In electrically-noisy fringe areas, it is quite possible for the amplitude of externally-caused electrical noise pulses to be greater than that of the sync pulses. These relatively high-amplitude noise pulses, which are of the same polarity as the sync, cause picture instability, since they upset the operation of the sync separator by causing heavy grid conduction and thus charging the control grid up to an abnormally high negative value. This condition can cause sync pulses (horizontal or vertical) to be lost, until the sync separator grid circuit has discharged through the grid resistor to its normal negative value (which is determined by the peak sync amplitude). If the troublesome noise pulses could be eliminated or reduced to a point below sync level, stability would be greatly improved.

Switching Inverter Off

Reduction in the amplitude of the noise pulse is accomplished by the noise inverter. In extremely strong signal areas, the noise inverter circuit should be made inoperative. This is accomplished by means of the switch mounted on the "fringe compensator control" (see Fig. 2). This switch, when "off" effectively increases the bias on the noise inverter (by inserting an additional 10K resistor, R-91, in its cathode circuit), keeping the inverter well beyond cutoff at all times, and thus effectively eliminating it from the circuit. Failure to keep this circuit beyond cutoff in strong signal areas may result in vertical roll and/or wiggle.

Noise Inverter Operation

A composite video signal of positive polarity is taken from the sync amplifier plate and fed to the grid circuit of the noise inverter tube through C-68 (Fig. 2). The grid bias on this tube is set by adjusting R-89 (fringe compensator) which effectively varies the positive voltage on the cathode of the tube. At the correct setting of R-89, the noise inverter does not conduct (is just below cutoff) on sync or video information.

All positive noise pulses of greater amplitude than the sync pulses will cause the inverter to conduct. The peaks of the sync pulses are clamped (i.e., limited or clipped) just below the cutoff point of the noise inverter tube by the clamper (V-17A), to prevent their causing conduction of the noise inverter, over wide variations in signal amplitude. The operation of the clamp tube is as follows:

Since positive-going noise pulses whose amplitude is greater than the sync pulses undergo an additional stage of amplification in the noise inverter (see Fig. 1), they are greatly amplified and reversed in polarity, so that when they are fed back onto the composite video signal through C-69, they completely cancel out the noise pulse. The amplified negative-going noise pulse is of greater amplitude than the original positive-going one, thus causing a slight dip on the composite video signal.

This system eliminates those noise pulses which tend to adversely affect the operation of the sync separator.

Sync Clamp

In order to keep the tips of the sync pulses below the cutoff point of the noise inverter tube over wide variations in input signal level, the peaks of the horizontal sync pulses are clamped at approximately zero volts by automatically varying the bias across R-90 (2.2 meg. noise inverter grid resistor) in accordance with the strength of the horizontal sync pulse (See Figs. 2 and 3). This is accomplished by the sync clamp tube in the following manner: The first horizontal sync pulse will cause plate current to flow, charging C-68 to the peak of this pulse. (Fig. 2, pulse labeled A). In subsequent cycles, due to the relatively long time constant of C-68 and R-90, the voltage developed across R-90 as a result

(*Continued on page* 55)

Fig. 1—Block diagram of noise inverter circuit.

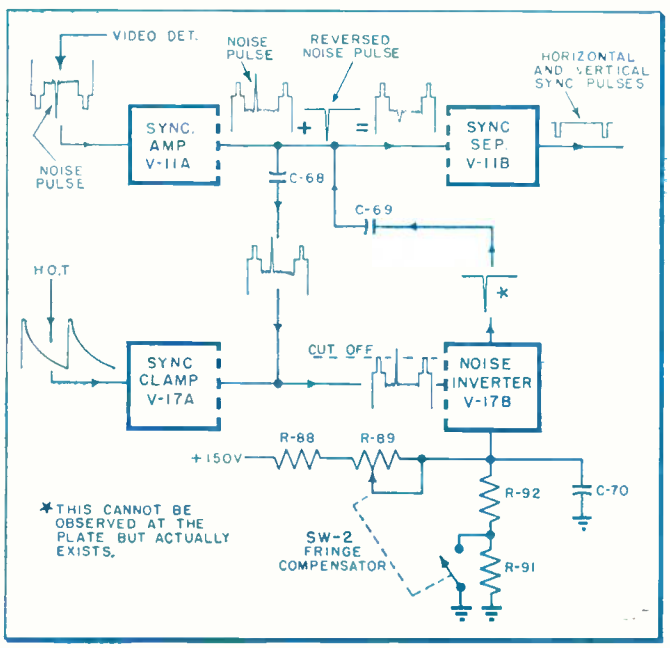
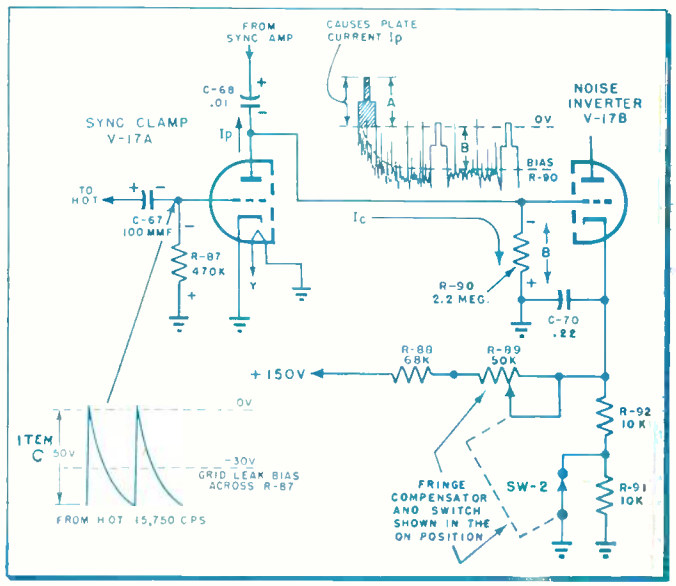


Fig. 2—Noise inverter and associated circuits used in Emerson chassis 120174-B, 120198-D. For complete schematic, refer to Emerson *Circuit Digest* in this issue.



What to Tell Your Customers Who Ask about Color TV—

"BUY THAT BLACK & WHITE TV

Here Is the Inside "Dope" About Color TV Which Tells the Inquirer Why He Should Buy a New

1 ***Should I buy a TV set now or is it likely to become obsolete in a year or two?***

You may buy right now, with the assurance that your investment insures you years of enjoyment, to the full extent of the natural life of the set.

2 ***But I read in the papers that color TV is coming soon. Will my set then be obsolete?***

No! In the first place, it will be some time before we have color TV. In the second place, when color comes, it will be a "compatible" color system. This means that the set you buy now will receive all programs broadcast, in black and white, without any modification.

3 ***You say it will be "some time" before color comes. How long does that mean?***

The "timetable" for color TV is estimated as follows: The industry has field-tested and approved standards. Now the FCC (Federal Communications Commission) is being asked to consider these standards for approval. It is not known how long their consideration will take, but the earliest possible date is considered to be January, 1954. After FCC approval, the industry will tool up for color sets and broadcast equipment. It is expected that the earliest date for commercial production will be January, 1955, although a few sets will be available in 1954.

4 ***You mean that in two years all programs will be in color and all sets will receive it?***

No. The "infiltration" of color broadcasts will be a slow and gradual process. It is not likely that *all* programs will ever be in color. Remember also, that color movies, after 15 years, total less than 40% of the movies made. Color TV sets, in the beginning, will be more expensive than black and white . . . probably from 3 to 4 times as much. Color TV will at first be a luxury item.

5 ***You say that if color is broadcast, this present set will receive it in black and white. Would this be equivalent to present reception quality?***

It will, in fact, be better. Demonstrations of experimental broadcasts of the present industry-wide color system have proven that black-and-white reception of these programs is superior to present black-and-white broadcasts.

An Editorial Service of TECHNICIAN, published by

SET WITH CONFIDENCE TODAY!"

TV Set Now, With Full Confidence That Forthcoming Developments Will Never Make His TV Set Obsolete

6 ***You have referred a couple of times to "industry standards." What does that mean?***

The various manufacturing concerns in the industry have formed a joint committee to study and develop color TV. This is known as the National Television System Committee (NTSC). Its aim is to pool the brain-power and know-how of firms representing about 90% of the manufacturing volume of the industry in order to produce the best solution to the problems of color. This committee has now produced standards which are compatible, successful, and in compliance with the requirements of the FCC.

7 ***Is this the system with the revolving color wheel I used to read about?***

No. This new NTSC system is fully electronic, with "built-in" color. There will be no moving parts and nothing showing outside the television cabinet.

8 ***Is this system perfected? How will prices compare?***

Yes—already the FCC has announced rule-making looking to early official approval of the new NTSC standards. However, additional complication of the color sets will, as we said before, make them more expensive than present sets, and will also require that color picture-size be much smaller than present popular black-white sizes.

Showing the "better buy" you will get in a present-day black-white TV set:

Today's "21-inch" black-white TV with a picture area of 240 sq. inches, averages in price about $240

But the first color-TV sets (ready around mid-1954) will have only 90 sq. inches of picture area (about one-third the above) though priced about $900

9 ***So, if I buy now, my set will not become obsolete, ever?***

RIGHT!

And commercial color TV is at least a year or more away?

RIGHT!

And when color TV comes, sets will be more expensive than they are right now, with smaller pictures?

RIGHT!

10 ***And when color TV comes, commercially, it will still not encompass all programs?***

Right! Buy now and you can be confident that you will not miss anything in the future; that you will get your full money's worth out of your set; and *above all*, you will not be missing many months of wonderful programs which are now on the air, but which would by-pass your home should you wait for the coming of color.

CALDWELL-CLEMENTS, Inc., 480 Lexington Ave., New York 17, N.Y.

"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Adjacent-Channel TVI

A number of sets in the metropolitan (New York City) area displayed this type of station interference. All of the sets were "hot"—i.e., very sensitive. The symptom produced by the interference was a ghost of the interfering station, seen in the background of the desired picture. The ghost rolls slowly vertically, since it is not synchronized in the receiver; it has been observed to move horizontally as well. The rolling blanking bars produce a "venetian blind" similar to the familiar effect of co-channel interference.

The trouble is due to the excessive signal strength of the undesired stations. These interfering signals feed through the front end, when the set is tuned to a desired station on a neighboring channel. For example, Channel 4 may exhibit a ghost of Channel 5, or in some cases Channel 2. When tuned to Channel 5, a ghost of 4 or 2 may be seen. Similarly, Channel 4 or 5 may be the ghost on Channel 2.

Use of an indoor antenna eliminated the interference, but simultaneously eliminated reception of weak high-frequency stations. A commercial trap in the antenna leads (transmission-line units connected at the antenna terminals) would remove two interfering stations, which provided a solution where only two were serious offenders; it could not, however, eliminate *three* offenders. Stubs were similarly tried but did not prove satisfactory for more than two offending stations, due to some unexplained inter-action.

A permanent cure for cases of venetian-blind interference was effected by disconnecting the transmission line from the low-frequency antenna and re-connecting it (after cutting off a piece to suitably reduce its length) to a commercial high-frequency folded dipole (see Fig. 1). The HF dipole was installed about 15 to 36 inches below the original low-frequency unit. This low-frequency unit was left in its original position in most cases (see next paragraph for exceptions) and to its terminals was connected a resistor equal to the characteristic impedance of the line (generally 300 ohms). Removal of the low-frequency unit entirely, or its excessive spacing from the new HF unit, resulted in excessive attenuation of the LF signals in the majority of the cases, as the LF unit acted as a tuned circuit, and transferred some of the energy circulating in it to the nearby HF unit.

Fig. 2 illustrates a set-up for improving signal pick-up on HF channels, while getting rid of venetian-blind TVI. The low-frequency unit is positioned to act like a parasitic reflector for the HF dipole at high frequencies, and yet pick up and transfer some LF energy to the HF unit. The connection of the resistor across the LF antennas terminals provides an improved high-frequency response. The LF unit is horizontally placed to the rear of the HF unit. The distance between them is not too critical; between 12 and 30 inches is generally satisfactory, with the greatest gain (ap-

Fig. 1—HF dipole mounted below LF unit. Note 300-ohm terminating resistor. This would be used only on a folded dipole.

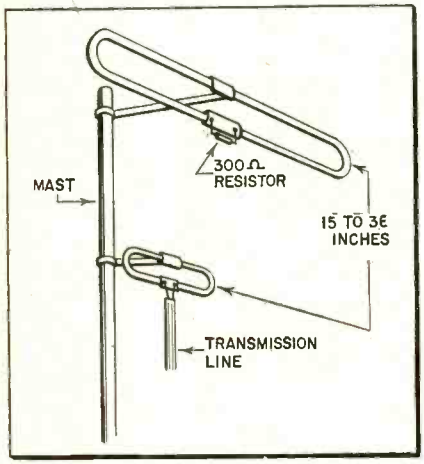


Fig. 2—Alternate method of connecting the HF dipole. The HF unit is positioned *in front of*, instead of *under*, the LF dipole.

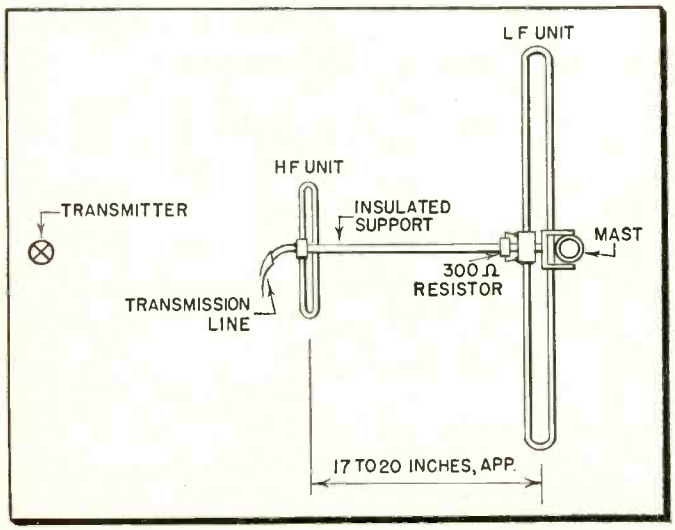
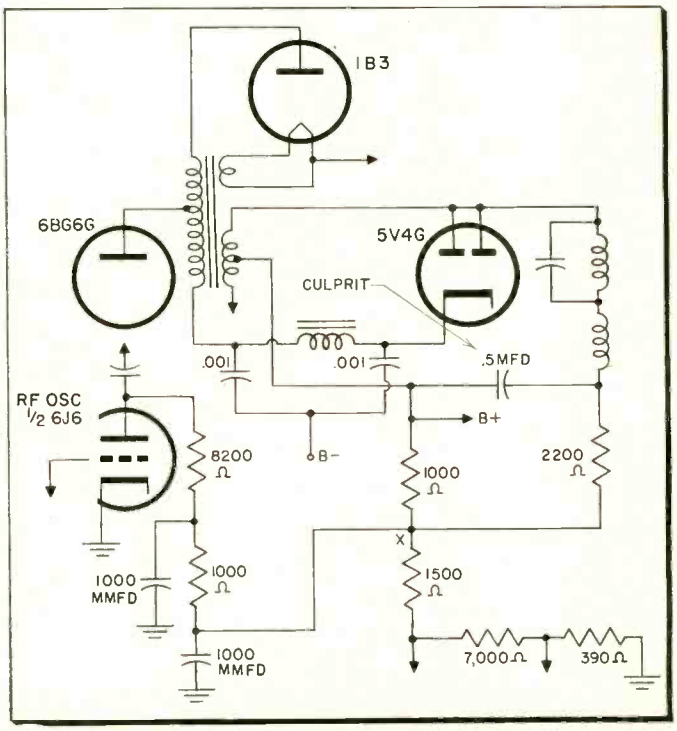


Fig. 3—Part of horizontal and front-end circuits in Motorola receivers VT105, VK106 and VT107.



parently) present at a spacing of about 17-20 inches.—*James A. McRoberts, Brooklyn, N. Y.*

Half-Screen Blackout

It would be difficult to find two points in a TV receiver further apart circuit-wise than the front-end oscillator and the horizontal deflection yoke; in servicing some of the older Motorola receivers, however, I found a trouble in the yoke circuit that affected the front-end oscillator. An open-circuit or considerable decrease in capacitance in the .5 MFD capacitor at the bottom of the yoke (see Fig. 3) would cause the entire left half of the screen to be blanked out, because blanking of the oscillator signal at horizontal line frequency was taking place.

Note in Fig. 3 that there is a common resistor at the high end of the bleeder unit (1000 ohms) through which current flows, that completes the deflection coil circuit. The .5 MFD capacitor bridges the 2200 and 1000-ohm resistors, bypassing the 15,750 KC sweep signal out of them. When this capacitor dries out with age, its reactance goes up and it is no longer as effective in bypassing the two resistors, one of which is common to the plate circuit of the 6J6 oscillator in the front end.

The two .001 MFD capacitors are too small for effective bypassing to ground at line frequency, and have little effect in preventing the horizontal signal from reaching the 6J6 plate, where modulation of the RF oscillator signal by the sweep signal occurs. The IF signal is similarly modulated, and after being detected and passed thru the video amplifier, the polarity of the sweep-modulated video signal is such as to blank out almost half the left side of the screen. The screen illumination gradually comes to normal at about the middle of the raster. A replacement capacitor completely cures the trouble; to prevent a recurrence, however, add a .05 MFD 400-volt capacitor from point X to ground.—*M. G. Goldberg. St. Paul, Minnesota.*

New Circuits

(*Continued from page* 51)

of the discharge of C-68 will be equal to the peak sync pulse amplitude (denoted by B, in Fig. 2). Stronger signals will cause more plate conduction, thereby *increasing* the bias across R-90, while weak signals will cause less plate conduction, *decreasing* the bias across R-90 (see Fig. 3).

As you can see, the clamp tube in conjunction with C-68 automatically

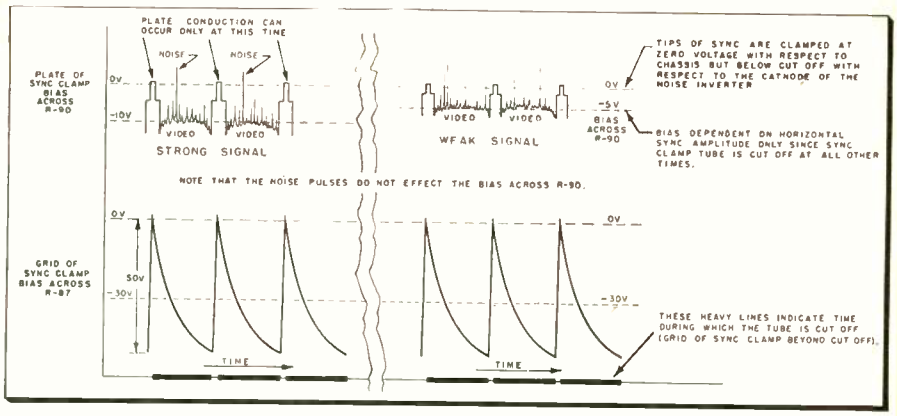


Fig. 3—Waveforms at plate and grid of sync clamper, illustrating why noise pulses do not affect the bias supplied to the noise inverter by the sync clamper.

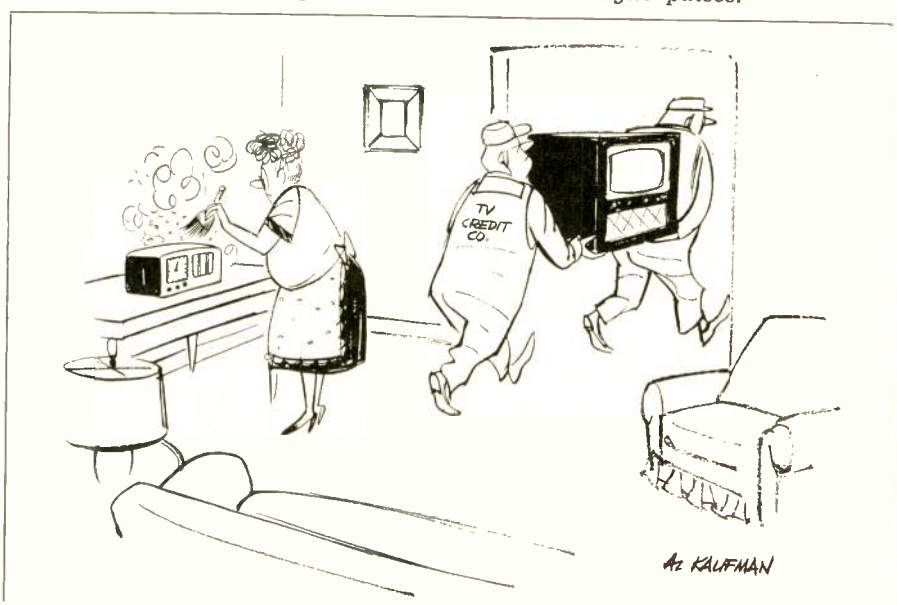
adjusts the bias across R-90 so that the tips of the sync pulses will be clamped or limited at approximately the zero volt level, over wide variations in signal strength. The grid-to-cathode bias of the noise inverter is set by the "fringe compensator" so that the tips of the sync pulses will fall below the cutoff level of the noise inverter. As mentioned previously, this level is always maintained by the sync clamp tube.

Sync Clamp Tube

In order for the bias across R-90 to be dependent on the sync amplitude and not on noise pulses, the sync clamp tube is kept cut off at all times except during horizontal sync pulse time. This is accomplished by triggering the grid of the sync clamp tube at a horizontal rate with a positive pulse from the horizontal output transformer (see Item C, Fig. 3). This pulse (about 50 V peak-to-peak), drives the grid of the sync clamp tube positive, causing grid conduction. This conduction charges grid capacitor C-67 to the peak value of the positive pulse (approx. —30V). Due to the relatively long time constant of C-67 (100 MMF) and R-87 (470K), the voltage across R-87 due to the discharge of C-67 remains at about —30V until the next horizontal pulse comes along, at which time the grid again draws current, charging C-87 once more to —30V. The process outlined is repeated.

As a result, the sync clamp tube remains well below cutoff except during the brief (horizontal sync pulse) interval when its grid is positive (see Fig. 3).

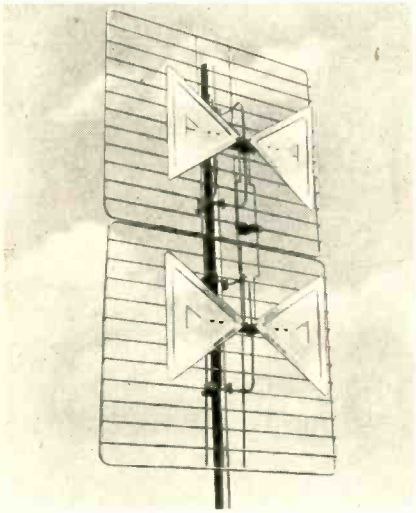
Horizontal sync pulses in the composite video signal fed to the plate of the sync clamp tube (through C-68) appear at the same instant the grid of this tube is driven positive; plate conduction can only occur at this time. Noise pulses which occur between sync pulses cannot possibly cause the tube to conduct, since the grid of the sync clamp tube is well beyond cutoff at such times, and improper triggering of the inverter by these pulses can therefore not occur. *Because of this fact, the negative voltage developed across the noise inverter grid resistor (R-90) is dependent only on the amplitude of the horizontal sync pulses.*



Newest Television ANTENNAS

Channel Master ANTENNA

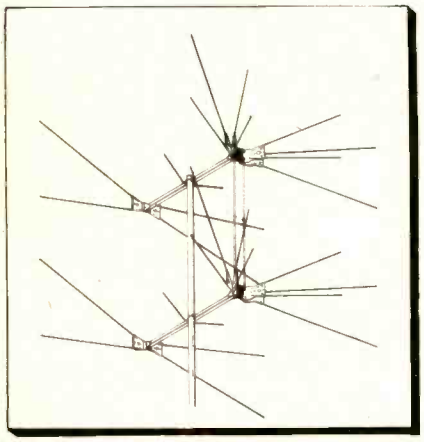
The Bow-Flector model No. 408 is a broad-band UHF antenna with a gain of up to 10 DB unstacked, and 12½ DB stacked, according to the maker. The antenna has free-space



terminals to prevent dirt, ice or rain from collecting between feed points. The stacked unit has full-wave spacing between elements for higher stacking gain. Channel Master Corp., Ellenville, N. Y.—TECHNICIAN.

Telrex UHF-VHF ANTENNA

The Telrex Challenger is an aluminum UHF-VHF conical-V array with one major in-line lobe, high gain and good impedance match throughout the 54 to 890 MC spec-



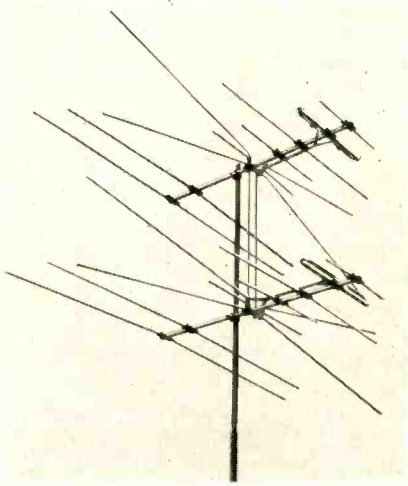
trum, according to the manufacturer. The array can be stacked up to four bays. Only a single transmission line is required for both UHF and VHF operation. Telrex, Inc., Asbury Park, N. J.—TECHNICIAN.

Kay-Townes UHF-VHF ANTENNAS

The Kay-Townes VU-1 is a single, and the VU-2 a two-bay, antenna for UHF and VHF reception of Channels 2 to 83. They are of conical design and require only one down-lead. The mast clamp, cross arms and boom are of heavy gauge aluminum. Kay-Townes Antenna Co., Rome, Ga.—TECHNICIAN.

JFD VHF ANTENNA

This Jet 213 antenna is a broad-band array with high gain which is uniform for signals throughout the VHF band, it is said. The manufacturer also claims good directivity and



absence of side lobes for this antenna. It is pre-assembled, made entirely of aluminum and lists at $21.75. A two-bay array, including matching jumpers, lists at $45. JFD Mfg. Co., Inc., Brooklyn 4, N. Y.—TECHNICIAN.

Hi-Lo INDOOR ANTENNA

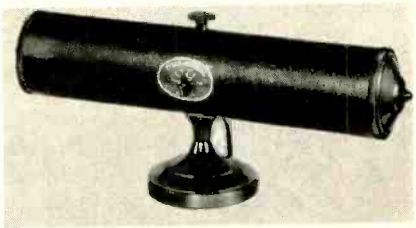
Hi-Lo's model 303 is for indoor reception of all UHF channels. Twin arrows may be adjusted for highest gain on each channel being received. List price is $5.95. Hi-Lo TV Antenna Corp., 3450 No. Ravenswood Ave., Chicago 13, Ill.—TECHNICIAN.

RMS INDOOR BOWTIE

The model IBT-500 is a UHF indoor antenna with bow-tie elements of high-tempered aluminum. The gain of the unit may be raised by the addition of a reflector, model R-500, which plugs into the fitting at the back of the antenna. Radio Merchandise Sales, Inc., 2016 Bronxdale Ave., New York 60, N. Y.—TECHNICIAN.

Tricraft INDOOR ANTENNA

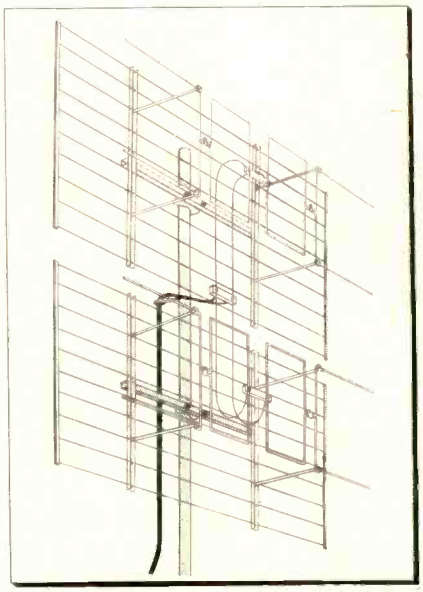
The Tricraft model 600 is a UHF-VHF indoor antenna with a built-in two-wafer, four-pole selector switch to produce a good impedance match



to 300-ohm line on all channels. Tuning and dipole elements are housed in a rotatable radome enclosure. Tricraft Products Co., Chicago 22, Ill.—TECHNICIAN.

Finco UHF ANTENNAS

Finco model 502 is a two-bay, model 504 a four-bay UHF antenna. Both models have narrow patterns and a high front-to-back ratio, according to the manufacturer. They



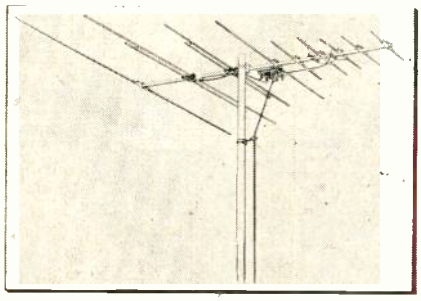
are of aluminum construction throughout, including the screen. Both antennas require only one transmission line. Each model is available in three variations—502 and 504A, B, and C. The A-B-C variations are designed to peak on the following channel range: A, Channel 14 through 32; B, Channel 29 through 55; C, Channel 53 through 83. A stacking arrangement is also available for double stacking the two-bay unit. Finney Co., 4612 St. Clair Ave., Cleveland 3, Ohio.—TECHNICIAN.

for VHF and UHF

For Other New Products See Pages 66, 67, 68

Vee-D-X PRODUCTS

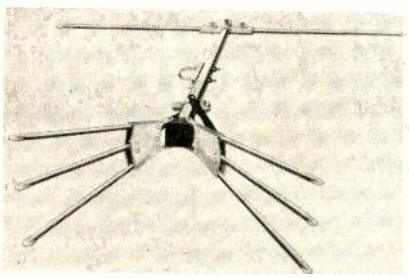
The Vee-D-Xtra Special is a hi-low yagi phased with the company's printed circuit isolation filter. There are five elements for high-channel reception, and four elements for low. Vee-D-X broad-band yagis are available in both 10 and five-element models. The 10-element antennas, identified as the "X" series, are available in the following model numbers: X-26, for Channels 2 to 6; X-46, for Channels 4, 5 and 6; and X-713, for Channels 7 through 13. Isolation fil-



ters MM-40 and MM-40A are available for connecting separate UHF and VHF antennas to a single transmission line; the MM-25 and MM-25A permit the use of a single line between separate high and low VHF antennas assembled on the same mast. A universal lightning arrester has hermetically sealed electrodes and will accommodate flat, tubular, oval, round and open wire lines. It can be mounted on a mast, water pipe or window sill. La Pointe Electronics, Inc., Rockville, Conn.—TECHNICIAN.

Falcon UHF-VHF ANTENNA

This Vari-Con unit is a UHF-VHF array of conical design with element heads coupled to a sliding sleeve on the boom. The sliding sleeve is



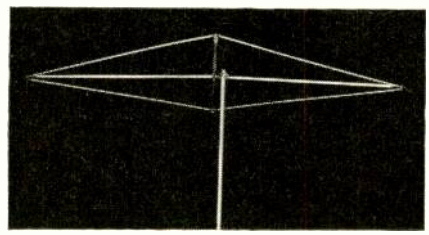
moved to a calibration mark on the boom which corresponds to the channel peaking desired and then secured by tightening a wing nut. Falcon Electronics Co., 2003 Cedar St., Quincy, Ill.—TECHNICIAN.

All Channel TV ANTENNA

The All-Channel Super 60 is a UHF-VHF array for omni-directional reception. It uses a four-conductor matched impedance transmission line; the two bays are spaced ten inches apart. The major front lobe of the antenna is rotated electrically by a nine-position selector switch furnished with the antenna. List price is $36.75. All Channel Antenna Corp., 70-07 Queens Blvd., Woodside 77, N.Y.—TECHNICIAN.

Brach UHF RHOMBIC

Model 496, a broad-band UHF rhombic antenna, has sharp directional characteristics and an average gain of 15 DB, according to the manufacturer. Model 496 is of all-aluminum construction with non-hygro-



scopic insulators, weatherproofed terminals and resistor, and is designed to provide an impedance match to 300-ohm transmission line. Brach Mfg. Corp., Div. of General Bronze Corp., 200 Central Ave., Newark 4, N. J.—TECHNICIAN.

Brooklyn TV ANTENNA

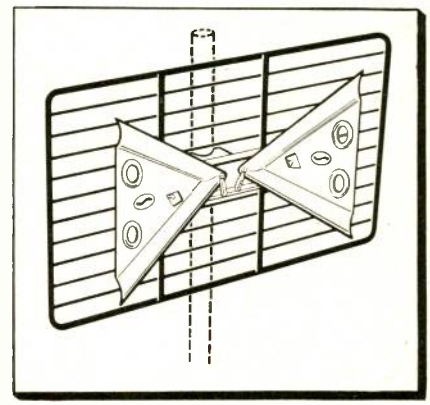
This indoor antenna for FM, VHF or UHF reception is called the Flashbeam. It has adjustable arms which can be set for best results under various conditions. The antenna is mounted on a cut-glass base which is rotatable over 180 degrees. Lists for $9.95. Brooklyn TV Co., Inc., 72 Steuben St., Brooklyn 5, N. Y.—TECHNICIAN.

Neal UHF-VHF ANTENNA

The Paraboray is based on the radar parabolic-type antenna principle and has high average gain on Channels 2 to 83, according to the manufacturer. Only one transmission line is required for UHF and VHF reception. Neal Electronic Co., Box 376, Huntsville, Ala.—TECHNICIAN.

Snyder UHF ANTENNA

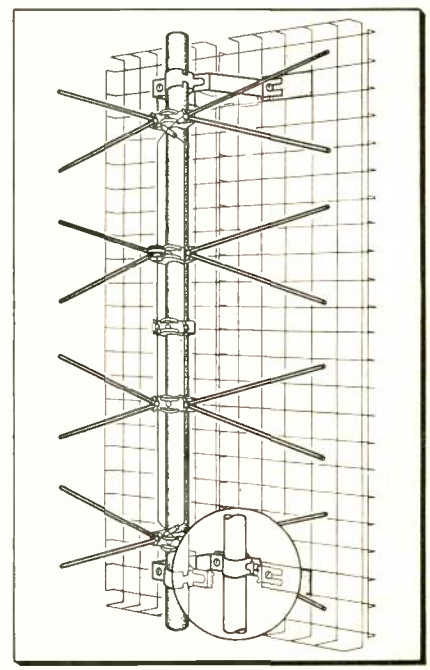
The UHF-5 is a bow-tie with reflector for Channels 14 to 83. The antenna has embossed aluminum elements, an all-welded, heavy-duty



reflector screen and single U-bolt mounting. Snyder Mfg. Co., Philadelphia 40, Pa.—TECHNICIAN.

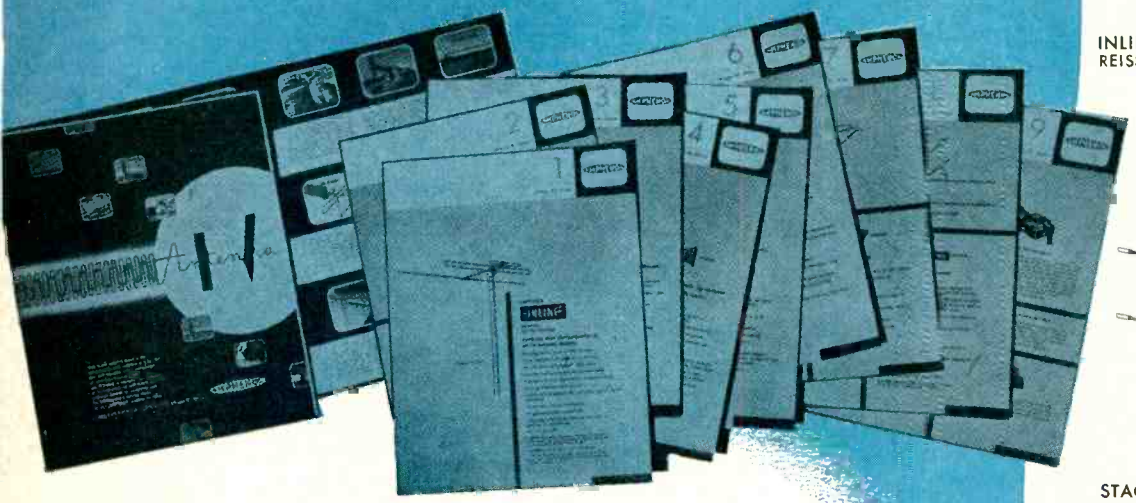
Taco UHF ANTENNA

Uniformly high gain is claimed for the Taco bow-tie antenna with reflector (Cat. no. 3006) across the entire UHF band. High front-to-back ratio and sharp directivity suppress



ghosts. Heavy plating withstands weathering. A simple mounting bracket accommodates a variety of mast sizes. List price, $12.95. Technical Appliance Corp., Sherburne, N. Y.—TECHNICIAN.

TECHNICIANS will read with profit...



the "TVAntenna Folio"

Designed primarily to give installer-technicians a handy reference work on television, the new AMPHENOL "TVAntenna Folio" is a six page folder that gives the complete story of television from the transmitting antenna to the home. Along with its very informative and readable text, the "TVAntenna Folio" has beautiful Kodachrome illustrations that picture everything from television wave transmission to antenna types.

The "TVAntenna Folio" illustrates and discusses the differences between VHF and UHF. It shows how the factors of attenuation, refraction, diffraction, reflection and interference influence UHF and VHF television waves. It points out what the installer can do, where possible, to overcome these factors and emphasizes the importance of the proper installation in UHF. Particularly helpful to the technician is the discussion in the "TVAntenna Folio" of how antenna gain and radiation measurements are made—it will help him in interpreting published antenna data.

The "TVAntenna Folio" is a digest of the fuller information contained in the new AMPHENOL film "The UHF-VHF Television Antenna Story." Now being shown across the nation, this color slide-film is something you will not want to miss. Be sure and contact your AMPHENOL distributor and make arrangements to see "The UHF-VHF Television Antenna Story."

Along with each copy of the "TVAntenna Folio" are enclosed the new AMPHENOL antenna and accessories catalog sheets. These contain complete gain charts and radiation patterns (measured in accordance with current RETMA standards) on each antenna.

For your free copy of the "TVAntenna Folio" fill in the coupon below and mail it to AMPHENOL—*today!*

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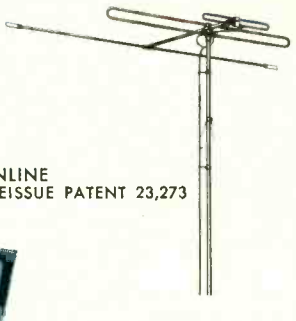

INLINE
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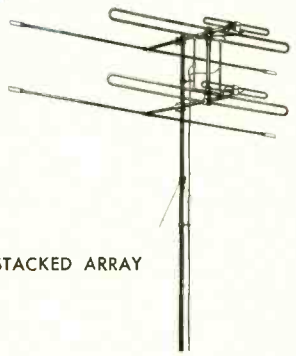
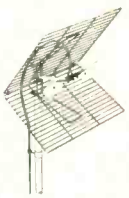
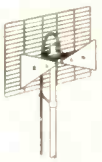


STACKED ARRAY

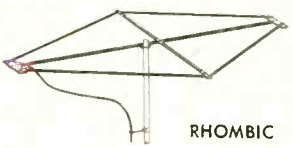
CORNER REFLECTOR



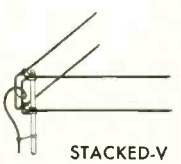
BO-TY



YAGI



RHOMBIC



STACKED-V

AMPHENOL

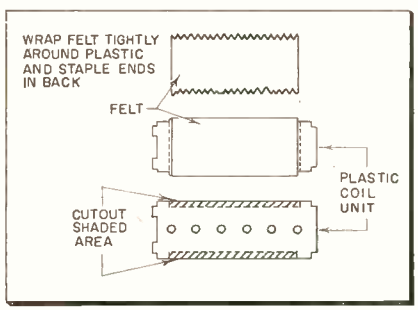
Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Cleaning S-C Tuners

Noisy or intermittent operation of Standard Coil tuners is sometimes caused by loss of tension in the hard copper contact springs. Far more often it is caused by corrosion on the coil unit contacts, and by an accumulation of dirt and grease on the copper contact springs. When the condition is severe, the channel selector may have to be snapped in an out of its channel setting several times, to bring the picture back in. To clear this condition up, the tuner must be disassembled. This is a necessary, but not always easy task. Following is a very rapid method of accomplishing the clean-up.

An RF and an oscillator coil unit are necessary. They can be purchased, or obtained from an old Standard Coil tuner. Clip all wires from the contacts, and remove the coils and forms. Clamp the plastic body of the coil unit in a vise, and file out the shaded areas, within the dotted lines, as shown in the illustration. Cut a piece of hard felt to the width of the filed-out notch. Wrap the felt around the coil unit, fitting it into the filed notches. Pull the ends tight and staple or sew them together. Repeat this job with the second coil unit.



To clean the tuner, simply remove any one set of coil units. Insert the felt-wrapped units into their place. Dab some contact cleaner on the felt, and rotate the drum several times. Replace the original coil units. Using a rag and some cleaner, wipe off the contacts on all the coil units, while rotating the drum slowly. Total time consumed, about 3 minutes. *S. Marsh, New York, N. Y.*

Disabling Oscillator in TV Alignment

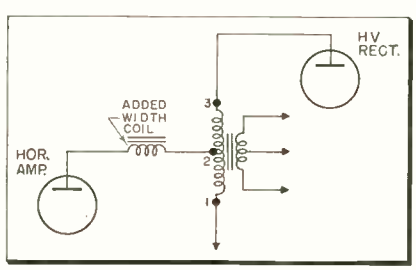
Most TV set manufacturers recommend that the video IF stages be aligned by feeding a signal into the control grid of the mixer tube. Since the mixer is generally in the same envelope as the oscillator, spurious traces tend to interfere with the desired one on the scope, confusing the servicer. The following is a simple but effective method of disabling the oscillator section of a dual purpose mixer-oscillator tube: Cut off prong number 1 on a 6J6 tube, and substitute it for the 6J6 present, when the receiver uses a Standard Coil tuner. In RCA sets using a 6X8 as mixer-oscillator in the front end, the proper pin to cut off is number 3. (Any converter tube can, in fact, be made up with its oscillator section disabled by merely cutting off the oscillator plate prong of the tube—Ed.) *Walter Hohlfield, Holhfield Electric Co., Greenleaf, Kansas.*

SHOP HINTS WANTED

TECHNICIAN will pay $5 for acceptable shop hints. We are particularly interested in hints that tell how a technician located a hard-to-find trouble in a TV set, radio, record-changer or similar unit; or how he traced a conventional defect to its source more rapidly than usual by using a short-cut. Unacceptable items will be returned to the contributor. Send your ideas to "Shop Hints Editor, TECHNICIAN, Caldwell-Clements, Inc., 480 Lexington Ave., New York 17, New York."

Flyback Repair

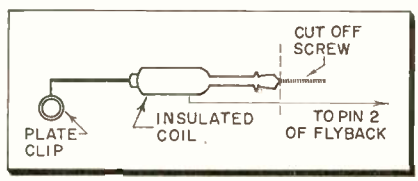
In a TV repair job the other day we found there was no RF voltage on the plate of the horizontal amplifier tube, and consequently no RF voltage at the input to the HV rectifier. When the 6BG6G horizontal amplifier tube was replaced with a new one, the RF voltage (as indicated by the spark drawn) returned to normal at the plate of the amplifier. A test of the original tube, however, indicated that it was good.



It was inserted into another TV set as a further check. Set operation was normal.

Several other new tubes were now tried in turn in the set being serviced. Only a few returned the set to normal operation. Circuit checks seemed advisable. Voltage readings and scope waveform checks revealed no trouble in the horizontal oscillator stage. Trouble in the flyback transformer seemed likely. Subsequent replacement of the flyback transformer verified that this was actually the case. When the original 6BG6G tube was used with the new transformer, the set operated normally.

Before the transformer was replaced, a remedial measure was tried that worked out fine. The information just presented was intended to serve as an introduction to this little trick.



I took an ordinary width coil and inserted it between the primary of the flyback transformer and the plate of the horizontal amplifier, as shown in the sketch. When the receiver was tried after this change, it immediately worked as it should.

I believe that a few turns of the primary winding in the flyback had short-circuited. The loss of resistance was so low that the average ohmmeter could not register it. The loss of inductance, was, of course, the important one. It is this inductance loss that the insertion of the width coil compensates for.

On another set in which this method was tried, and results measured, an originally insufficient CRT 2nd anode voltage was raised 1500 V by the series addition of the width coil to the horizontal amplifier plate circuit.

The method has been used in other cases where small but critical losses in flyback transformer primary inductance impaired circuit operation severely. The technique restored circuit operation to normal in approximately 75% of the cases.

The brass screw should be cut off from the width coil. The coil must also be very well insulated. We were fortunate enough to have some liquid plastic on hand at the shop which we used to dip the coil in. The bottom of the coil winding was connected to the plate lead, and the top layer or the beginning of the coil was attached to the flyback connection (terminal 2 in sketch). *Joseph F. Valenti, New York, N. Y.*

Revolutionary Superotor®

Leader Design gives you FIVE FIRSTS – Five exclusive sales features

Now! — a new name, and a great new standard of quality and performance in antenna rotators! With FIVE major advances, SUPEROTOR overnight has shot years ahead of the entire field! For the consumer, SUPEROTOR means superb new control and reception. For the serviceman — a remarkable new ease in servicing. And for the distributor — the "plus" business that comes from handling a unit that wins cheers **all the way down the line.** SUPEROTOR will be available in your area soon. Don't miss it!

5 DYNAMIC NEW ENGINEERING FEATURES • • •

1

QUICK DETACHABLE DRIVE UNIT

Complete drive unit can be replaced in five minutes — by one man, without dismounting antenna. When necessary antenna can be locked in any desired direction with drive unit removed.

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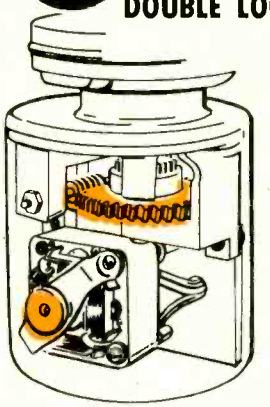
2



DOUBLE LOCK STOP PREVENTS DRIFT AND COAST

Worm gear lock positively maintains antenna in desired position — no drift. Motor brake prevents transfer of motor inertia to antenna — no coast. Permits smallest increment movement of antenna for precision tuning.

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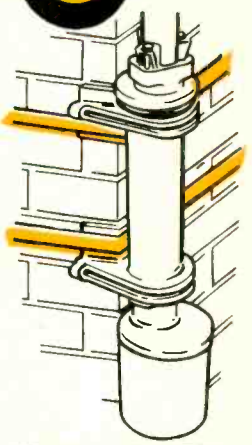
3



Plus *These Other Outstanding Features*

- Antenna position readable without rotating antenna
- Operates at upwards of 350 feet from control point
- Dependable high-torque motor
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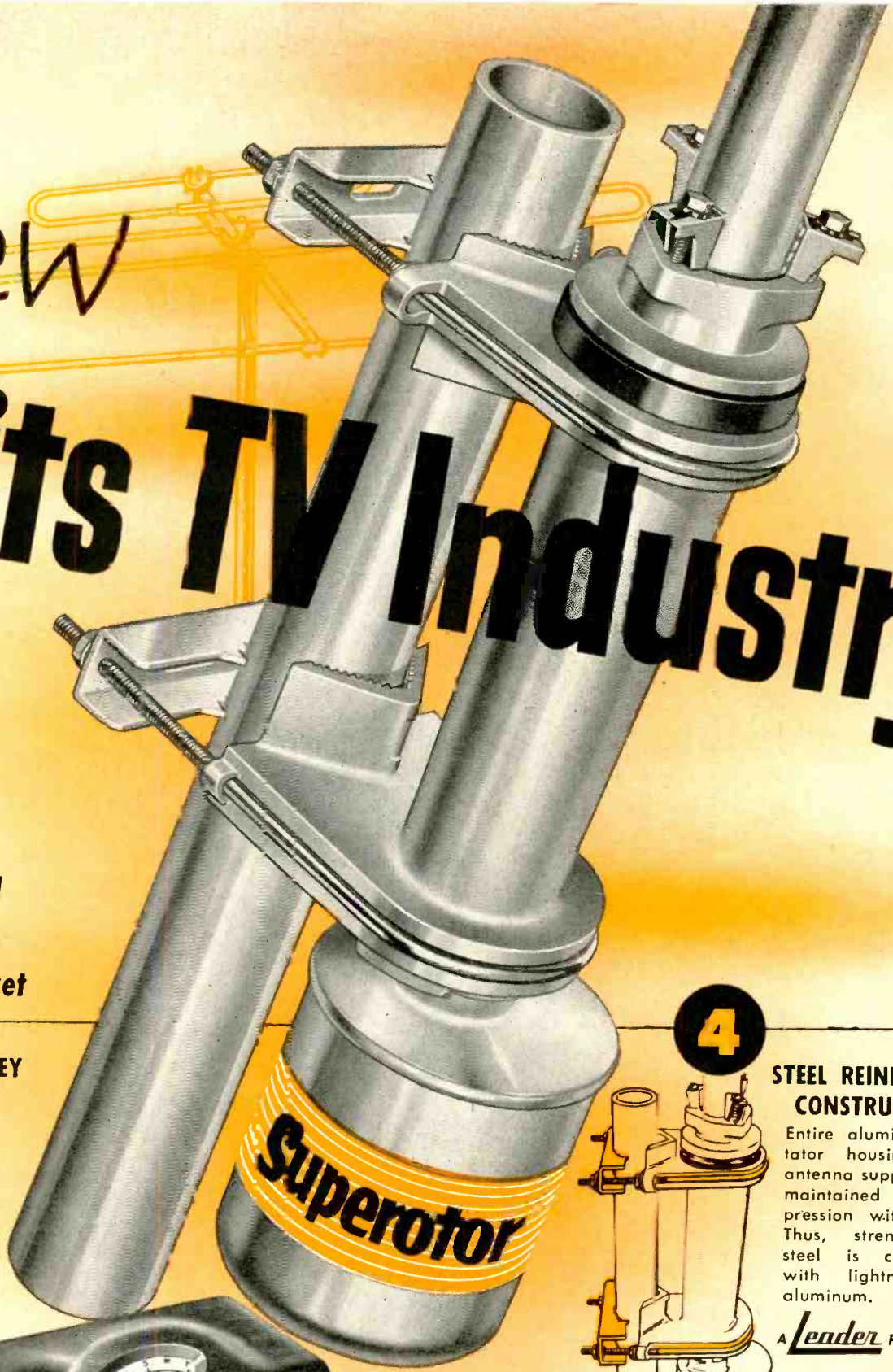
LEADING THE WAY TO BETTER PRODUCTS

New Hits TV Industry

Years ahead of Anything on the market



BUILT-IN CHIMNEY MOUNT DESIGN

Eliminates need for stub mast assembly. Mounts directly on chimney, and below chimney crown, protecting drive unit from soot and corrosive fumes.

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Patent Applied for

4

STEEL REINFORCED CONSTRUCTION

Entire aluminum rotator housing and antenna supports are maintained in compression with steel. Thus, strength of steel is combined with lightness of aluminum.

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5

VP TUNING

Only the Superotor with double lock stop, permits "finger tip" Vernier Precision tuning.

A Leader First!

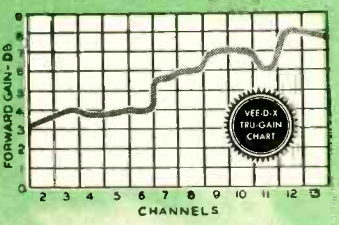
VEE-D-X PROUDLY PRESENTS . . .

THE ONE AND ONLY **ALL-CHANNEL YAGI**

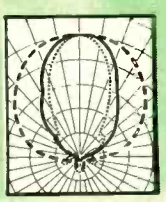
VEE-D-X tra Special

MODEL SP

AT LAST YAGI POWER AND DIRECTIVITY WITH *ALL-CHANNEL PERFORMANCE*



CAUTION: It is the policy of VEE-D-X not to falsify gain charts for advertising purposes. This Tru-Gain Chart is exact and is based on standard specifications using a single dipole as reference.



FEATURES

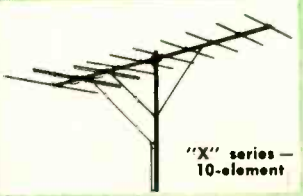
- *Powerful all-channel VHF performance*
- *High forward gain and sharp directivity*
- *Extremely high front-to-back ratio (important toward eliminating interference from unwanted stations)*
- *Rugged, pre-assembled construction*
- *One piece drawn aluminum boom*
- *Better rooftop appearance with clean yagi lines*
- *Ideal for use with VEE-D-X Antenna Rotator* →

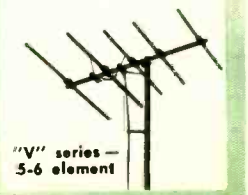
VEE-D-X engineering has produced another truly great antenna – the VEE-D-Xtra Special. Think of it – all the desirable features of a yagi – yet with all-channel performance in a single easy-to-install antenna. Technically, it is a nine-element hi-low yagi (5 elements on high channel – 4 on low) "T" matched. The hi-low sections are phased together with the new isolation filter (MM-25). Here is the ideal all-channel antenna – and especially wherever interference from unwanted stations must be eliminated. A honey for use with the VEE-D-X Rotator.

La Pointe ELECTRONICS INC.
ROCKVILLE, CONNECTICUT

VEE-D-X

VEE-D-X also announces two great new series of Broad Band Yagis. The extra powerful "X" series 10-element, and the "V" series 5 and 6-element. Both in three cuttings, 2-6, 4-6, 7-13.


"X" series – 10-element


"V" series – 5-6 element

Licensing: Yes or No?

Will It Solve the Television Technician's Problems or Add to Them?

The licensing controversy goes on. Licensing measures are still under consideration in various parts of the country. Much heat and some light have been generated by the discussions. We'd like to check on the light, without blowing any fuses.

The pro-licensing people have brought forth a number of arguments in favor of licensing. The most important of these may be summarized as follows:

1—Licensing will give the serviceman professional status, and with it, the recognition he wants and deserves in the community. It will also help him attain higher financial remuneration. Hourly rates of pay for electricians in many areas are considerably higher than those for TV technicians. Even truck drivers make more than many TV technicians. Licensing, by raising technical standards and inspiring customer confidence, will provide higher returns for both shop owners and technicians.

2—Licensing will eliminate the tinkerers and incompetents who bring the service field into disrepute. These would-be servicers will be unable to pass an adequate examination and, receiving no license, will be eliminated.

3—It will eliminate dishonest and unethical servicemen, and thus contribute to the restoration of public confidence in the service business as a whole. Shady practices on the part of a few service companies—phony ads offering service at impossibly low rates, excessive and unjustified service charges, and the use of second-hand parts as replacements—have caused the public to take a dim view of the service profession. Loss of service income (as well as prestige) has resulted. Licensing will eliminate such practices, by denying certificates to phonies.

The opponents of licensing, on the other hand, have brought forward the following important counter-arguments:

1—Honesty and competence cannot be assured by legislation. Licensing may bring politics and graft into the industry, as it has done in other fields, in various U. S. cities. Since many proposed licensing laws provide that all existing TV servicemen automatically qualify for licenses (according to a pamphlet recently put out by the RTMA), licensing may actually foster incompetence, instead of preventing it.

2—Rating TV men justly on their competence will prove very difficult in practice, since good technicians often have only a smattering of theory, while long-hair boys with ample theory at their finger-tips may be poor bench men.

3—The disrepute in which the public allegedly holds the TV serviceman is greatly exaggerated. According to a poll conducted by Elmo Roper, 86% of all TV set owners have high opinions of the service work performed on their receivers by their technicians. Furthermore, the great majority of these set owners consider service charges they have paid fair and reasonable. Licensing is hardly needed to eliminate a disrepute which is largely non-existent.

According to A. Coumont, Service Coordinator of the RTMA, Better Business Bureaus have reported that complaints about TV service abuses are now negligible. Since the evil has receded to such a small amplitude, no step as drastic as licensing is necessary to diminish it.

Proposals for laws to regulate radio and television servicing were introduced in the legislatures of at least four states this year.

A bill introduced in Wisconsin was killed, but is going to be reintroduced, according to its sponsor.

In New York State, a licensing bill was introduced, but not favorably acted on.

Rhode Island lawmakers turned thumbs down on a proposed licensing measure.

An Illinois bill is pending.

The following comments suggest themselves to us:

When a technician thinks of licensing in terms of raising prestige, he almost invariably tends to visualize a doctor or dentist, and considers the great respect in which these professional people are held. We think it should be pointed out that licensing per se does not guarantee an increase in prestige; certainly no such prestige as has attached itself to the practice of medicine, dentistry or law is going to descend on the TV-radio technician just because he receives a slip of paper. Taxi drivers are licensed, yet few of them consider their prestige noteworthy. The acquisition of prestige is a long, cumulative affair; it takes many years for a profession to build up the public's rating of its status, and licensing by itself is certainly not going to shortcircuit this high-impedance path.

Licensing's ability to eliminate incompetent servicers may likewise be questioned. Adequate administration and policing of a licensing law is necessary to make it effective, and such matters require money. How many municipal governments are going to fork over suitable amounts of money for proper enforcement of licensing, when adequate financing is not being made available for hospitals and schools?

Our feeling is, if an incompetent servicer is able to survive the heavy business pressures that force thousands of the unfit out of the business world every year, he will probably find it relatively simple to get around a municipal licensing ordinance, particularly when so much happens in the smoke-filled back rooms of political clubs.

We think the service industry as a whole must get together and work out an effective program for raising competence, prestige and financial returns. The RTMA is already working on a nation-wide training program for increasing the technical competence of TV technicians. Other segments of the industry have been working on advertising and other programs to boost the technician's credit with the public. We feel hope lies in increasing and coordinating such industry-backed plans, rather than relying on inquisitions, police and politicians.

Some Pros and Cons of Licensing

Pro:	Con:
Licensing will increase the prestige and earnings of the technician.	Throwing an industry into the laps of policemen and politicians offers no assurance that increased earnings or prestige will result.
It will eliminate tinkerers and incompetents.	Rating the competence of TV men is apt to prove very difficult.
It will weed out the dishonest and unethical servicemen.	Honesty and competence cannot be legislated into the service business.

New Instruments,

Granco UHF CONVERTER

The Granco Star is an all-channel UHF converter with coaxial-tuned cavity elements. A selector switch on the converter turns the TV set on and off and provides rapid changeover from UHF to VHF reception. The unit is supplied with a 6AF4 oscillator tube, a 6CB6 IF amplifier tube and a crystal mixer. Granco Products, Inc., 36-17 20th Ave., Long Island City 5, N. Y.—TECHNICIAN.

Triplett V-O-M-AMMETER

The Triplett 630 Volt-Ohm-Mil-Ammeter has five DC voltage ranges at 20,000 ohms per volt, five AC voltage ranges at 5,000 ohms-per-volt, six DB ranges, a DC microamp scale, three DC milliamp ranges, and a DC ampere scale. There are also scales for ohms and megohms measurements. Dealer net is $39.50. Triplett Electrical Instrument Co., Bluffton, Ohio—TECHNICIAN.

RCA AUDIO GENERATOR

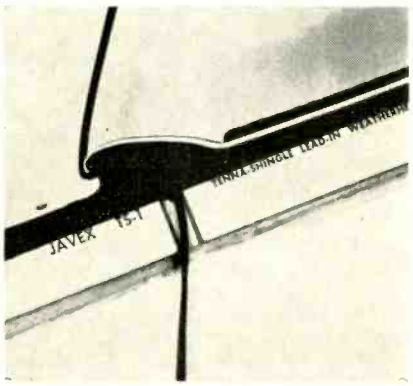
The WA-44A is an audio signal generator with a frequency range of from 11CPS to 100 KC. It has a sinusoidal output which has less than 2% total harmonic distortion over the range from 30 to 1500 CPS, and a maximum hum level of 0.1% of the rated output; output voltage varies less than ±1 DB over the frequency range, according to the manufacturer. The generator is AC-operated and contains both high and low-impedance output circuits. The high and low terminals supply a maximum voltage of 15 and 2.5 volts RMS, respectively. The instrument also incorporates a terminal which supplies up to six volts at line frequency for use in intermodulation tests. RCA Victor Div. of RCA, Camden, N. J.—TECHNICIAN.

Tele-Matic UHF BOOSTER

What is claimed to be the first UHF booster has just been announced by Tele-Matic Industries. The need for a booster is accentuated on UHF frequencies because of low transmitter power, poor propagation properties and high noise figures of present-day receivers. This new booster is said to increase the radius of good UHF reception in all areas throughout the country. Unit is designated as model UH-14-83. Tele-Matic Industries, Inc., 1. Joralemon St., Brooklyn 1, N. Y.—TECHNICIAN.

Javex WEATHERHEAD

Tenna-Shingle is a TV lead-in weatherhead molded of acrylic resin. It fits under shingles on a roof, or under siding; as a shingle, it covers the small hole required for the lead-in. The Tenna-Shingle is transparent, and takes on the color of the surface to which it is attached. It accommodates standard 300-ohm twin-lead line. Javex, Redlands, Calif.—TECHNICIAN.



Hickok OSCILLOSCOPE

Model 665, a five-in. cathode-ray oscilloscope, has a frequency range from 0.5 cycle to 700 KC, down 3 DB. It has good stability, no drift and flat, square-wave response from 60 cycles to 100 KC with less than 1% tilt and less than 2% overshoot, according to the maker. The vertical amplifier has push-pull output and a sensitivity rating of 20 MV RMS per inch; the input impedance is 2.2 meg. 15 MMFD. Horizontal sensitivity is 30 MV RMS per inch, and horizontal input impedance is .1 meg., 52 MMFD. Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland 8, Ohio—TECHNICIAN.

Imperial GROUNDING ROD

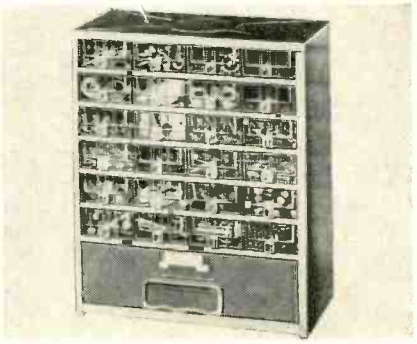
This grounding rod, intended for protection of television antenna installations, is made in both 4-ft. and 6-ft. lengths, and has double-copper plating and a hard-turned point for driving into tough soils. An aluminum-cast connector clip is provided for ground wire connection to the rod. Imperial Radar & Wire Corp., 4342 Bronx Blvd., New York 66, New York.—TECHNICIAN.

UTL TV ACCESSORIES

Five UTL products intended for use by technicians include a TV cross-over network to permit the use of UHF and VHF antennas with a single lead-in; an interference filter of the three-section, high-pass type for use between transmission line and TV receiver; and a two-set coupler, for operation of two TV receivers from a single antenna. Also being produced is a variable inductance kit, consisting of eight permeability tuned coils, calibrated within 5% limits. To assist the technician, a curve sheet indicating inductance values is supplied for each coil. United Technical Laboratories, Morristown, N. J.—TECHNICIAN.

Akro-Mils STORAGE UNITS

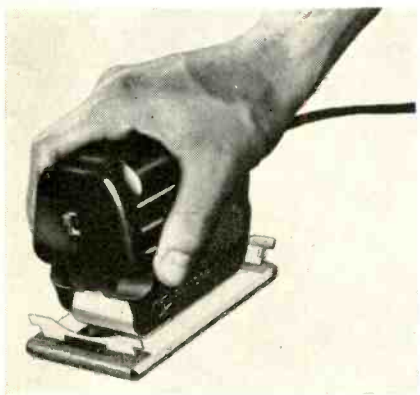
This line of parts storage units, called Haz-Bins, provides single units with 8 to 384 separate compartments. The cabinets are welded steel, with enamel finish. Drawers are of steel or clear plastic; the plastic ones may be divided into two or three compartments with removable separators. Haz-Bin, Jr. cabinets are available in 10 models with 8 to 128 plastic drawers; prices for these range from $4.25 to $55.95. Four portable models are priced at $7.95 to $15.95. Akro-Mils, Inc., Box 989, Akron 9, Ohio.—TECHNICIAN.



Tools and Accessories

Wen SANDER-POLISHER

This sander-polisher is a straight-line vibrator-type hand tool for fine finishing, polishing or waxing. It op-



erates on AC, and produces 240 strokes per second. Retails for $13.95. Wen Products, Inc., 5808 N. W. Highway, Chicago 31, Ill.—TECHNICIAN.

Eico VOLTAGE CALIBRATOR

Model 495 provides a square-wave output at line frequency for scope calibration, or signal input. Output signals are provided in steps of .1 volt, 1 volt, 10 volts, or 100 volts peak-to-peak; amplitude is variable from zero on each range. A regulated power supply compensates for effects of line voltage variation. The calibrator uses an OC3, 6AL5 and a selenium rectifier. In kit form, unit is priced at $12.50; factory-wired, $19.95. Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y.—TECHNICIAN.

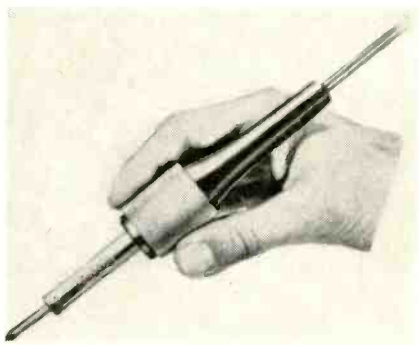
Atlas UNIVERSAL CLAMP

Model SK-1 Sky Hook is a universal clamp designed to solve difficult problems of microphone positioning. The unit can be secured to almost every type of surface ledge, round pipe or irregularly-shaped stanchion.

A microphone can be attached directly to the tube supplied with the clamp. The casting is finished in gun-metal crackle; the chrome tube is 3 in. long. Atlas Sound Corp., 1451-39th St., Brooklyn 18, N. Y.—TECHNICIAN.

Hexacon SOLDERING IRON

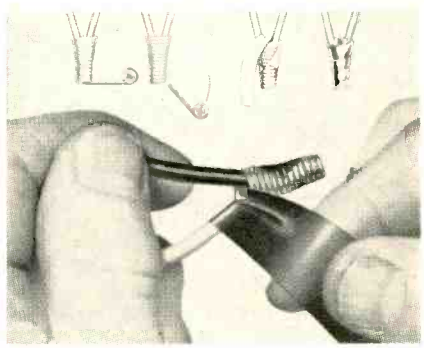
This pencil-type tool weighs only two ounces and has tip and element as separate parts, with both replace-



able independently. Available in 25 watts with ⅛-in. tip, or 30 watts with 3/16-in. tip. Either size lists for $5. Hexacon Electric Co., W. Clay Ave., Roselle Park, N. J.—TECHNICIAN.

MMM WIRE SPLICING AIDS

"Scotchlok" electrical spring connectors and "Scotch" plastic electrical tape No. 33 facilitate the splicing of two wires to produce an insulated, compact connection. The conical, spring-steel, spiral connector is thrust over the two wire ends and twisted by the terminating winding stem. Spring tension then holds the wire ends tight and the winding stem



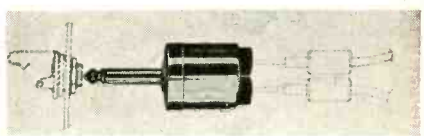
is snapped off. The electrical tape is started on the connector and brought forward to seal its bell end. Then, wrapped around the connector until it extends ½-in. beyond the small end of the connector, the tape is folded back and further wound toward the bell end to complete the splice. Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—TECHNICIAN.

International MULTITESTER

This combination volt-ohmmeter is 4¼ in. by 3 in. by 1½ in. and weighs 12 ounces. It has four DC voltage ranges reading to 300 volts, four AC voltage ranges reading to 600 volts, and four resistance ranges reading to two megohms, all selected from the front by a rotary switch. Sensitivity is 10,000 ohms-per-volt with accuracy of 2% of full-scale deflection for DC voltages; for AC voltages, sensitivity is 8,000 ohms-per-volt, with accuracy of 5% of full-scale deflection. Power for resistance measurements comes from self-contained batteries. The multitester comes with a leather case. International Instruments, Inc., Box 2954, New Haven 15, Conn.—TECHNICIAN.

Switchcraft ADAPTERS

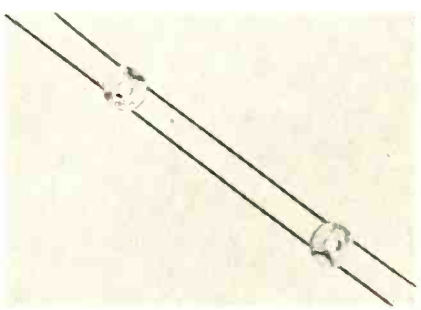
Seven different adapters, designed to simplify the connection of equipment having different types of connectors, are being manufactured by Switchcraft. These adapters elimi-



nate the considerable re-wiring otherwise needed to connect two pieces of equipment on which connectors do not mate. Switchcraft, Inc., 1328 N. Halstead St., Chicago 22, Ill.—TECHNICIAN.

Fretco OPEN-WIRE LINE

Saucerline is the name of a new open-wire transmission line used for UHF and VHF lead-in purposes. The insulator is designed for minimum signal loss and is a type of low-loss

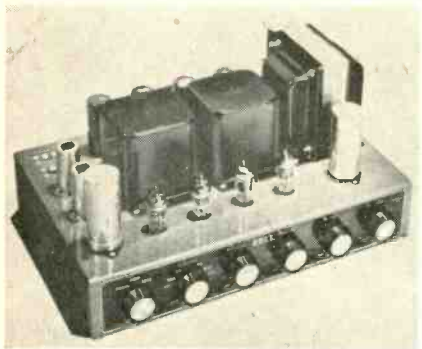


material called polythemalyne. The impedance of the wire is 300 ohms. Line will perform satisfactorily in wet and dry weather, according to the manufacturer. Fretco, Inc., 406 N. Craig St., Pittsburgh 13, Pa.—TECHNICIAN.

New HI-FI Units

Bell BINAURAL AMPLIFIER

This binaural model, 3-D, is a dual-channel, high-fidelity amplifier which includes three sets of inputs. Dual inputs for radio and tape, and a pair of dual inputs for phonograph records are provided. The two sets of phono inputs provide for use of either high or low impedance pick-ups, and are equalized for all existing binaural records. The unit may be used for monaural reproduction of conventional broadcasts, records or tapes through one or both channels. In addition to a three-station input selector, the unit has a six-position function switch to select binaural, monaural, or reverse binaural either with or without loudness control. A



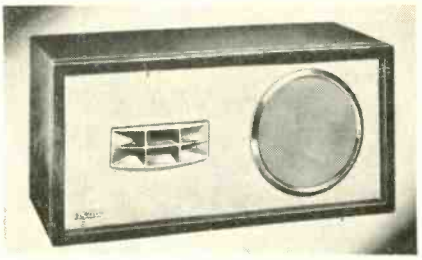
balance control permits the operator to compensate for differences between loudspeakers, pickups and listening areas in order to restore the original binaural balance. Boost and attenuation are incorporated into the design of the bass and treble controls. A master gain control is also used. The power output is 20 watts, 10 from each channel, with less than .5% distortion; frequency response is flat from 20 to 20,000 CPS within .5 DB. Dual output impedances of 4, 8 and 16 ohms for speakers are provided, as well as dual high impedance terminals for output to tape recorders. Bell Sound Systems, Inc., 555 Marion Rd., Columbus 7, Ohio.—TECHNICIAN.

Espey HI-FI COMPONENTS

Espey's line of Hi-Fi units, designed for custom installations, consists of model 100 AM-FM radio chassis, model 101 AM-FM tuner, model 200 AM-FM radio chassis, model 300 AM-FM tuner, model 400 AM-FM deluxe tuner, and model 500 deluxe audio amplifier. Espey Mfg. Co., 528 E. 72nd St., New York, N. Y. —TECHNICIAN.

Jensen HI-FI REPRODUCER

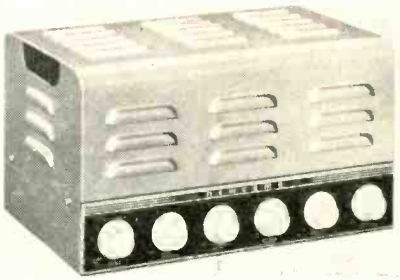
The Duette is 11-in. high, 10-in. deep and 23¼ in. long. It contains an 8-in. woofer in its own acoustical compartment and a multicell horn tweeter. These comprise a Hi-Fi two-



channel speaker system with a 20-watt power rating and output impedances of 4 and 8 ohms. The net price of the Duette is $69.50. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago 38, Ill.—TECHNICIAN.

Newcomb AUDIO AMPLIFIER

Model E-254 has an output rating of 25 watts with less than 5% distortion; frequency response is plus or minus 2 DB from 40 to 15,000 cycles. The amplifier has a four-channel mixer with three mike inputs and a phono input, individual tone controls



for bass and treble, and multi-stage inverse feedback. Model E-504 is similar but provides 50 watts of audio power. Two other models, identical to these 25 and 50-watt amplifiers but with three-speed phonographs, are also available. Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.—TECHNICIAN.

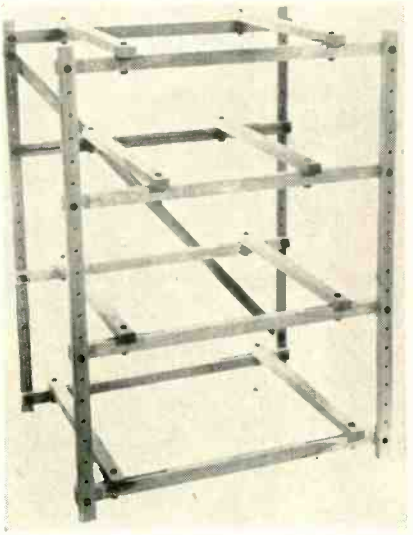
Brociner CONTROL CENTER

The model A100-CA2 audio control center consists of model A100 phonograph preamplifier-equalizer with separate turnover and roll-off controls, and model CA2 control amplifier. The CA2 provides an input selector switch, bass boost and cut control, treble cut and boost control, and volume control. The control amplifier can be used alone for radio reception, or combined with the pre-amplifier-equalizer for record reproduction. The unit is a complete, self-powered front end for use with any good power amplifier. The preampli-

fier-equalizer section is available separately as model A100PV. Brociner Electronics Laboratory, 344 E. 32nd St., New York 16, N. Y.—TECHNICIAN.

River Edge RACK KIT

River Edge model 730 Hi-Fi Flexo-Rack kit is intended to serve as a temporary housing for Hi-Fi equipment in the user's home. Dealers may use it as a mount for displaying Hi-Fi components. The



rack, of wood construction and secured by thumbscrews and bolts, can be adapted to accommodate units requiring different amounts of head room and shelf space. Retails for $9.90. River Edge Industries, River Edge, N. J.—TECHNICIAN.

Gately SPEAKER ENCLOSURE

The Gately super-horn loudspeaker enclosure is available in unfinished form and in golden mahogany finish. This applies to both 12- and 15-in. speaker-size models. Gately Development Laboratory, Barrington, N. J.—TECHNICIAN.

Color-TV System

(*Continued from page* 45)

ever, available. The ingenious solution to this problem worked out by engineers was to shift the phase of the carrier 90 degrees, *effectively creating another carrier*. One carrier signal is modulated by the blue signal, while the second is modulated by the red one.

If a vectorial representation was made of the situation, two vectors at an angle of 90 degrees would be drawn, one for each of the sub-carriers. The *phase angle* of the resultant vector would represent the hue information; the *amplitude* of the resultant would stand for the saturation intelligence.

The output of the blue and red balanced modulators are combined with the luminance and sync signals to make up the composite transmitted signal.

The reader will note (Fig. 3) that the sync generator has a color-burst generator circuit associated with it. The circuit permits a sample of the subcarrier output to be transmitted along with the horizontal sync information. This subcarrier signal sample is transmitted (along with the horizontal sync information) as a short 8-cycle, 3.58 MC signal burst (see Fig. 4). The burst occurs during the time interval occupied by the back porch of the horizontal sync pulse. The receiver uses this color sync information to keep a color oscillator operating at the correct phase and frequency, in a manner somewhat similar to the automatic frequency control of horizontal deflection circuits.

The color oscillator signal is applied to the receiver's red and blue color demodulators, along with the chrominance signals. The blue and red color information is recovered at the output of the color demodulator (just as black and white video signals are extracted from the video IF information in the video detector).

He Liked Color Schematic

EDITORS, TECHNICIAN:

Please notify me immediately when my subscription is due to expire as I want to be sure to have it renewed.

Your TECHNICIAN magazine is certainly well worth the small fee you charge. Why, the "Circuit Digest" section alone is worth that much to me. And the color-television schematic in September really helped me understand the principle of that system. Keep up the good work.

JOHN L. MANCINI
John's Radio & Television Service
122 Shirley St.,
Winthrop, Mass.

NEWS of the TRADE

Executive committee, National Electronic Distributors Association, 1953-54. Upper (l to r) Doc Carpenter, Dick Weatherford and Henry Morrison. Lower (l to r) Tory H. Horne, Aaron Lippman (Chairman) and James Prestwood.

FCC to View Color-TV

The Federal Communications Commission will view an official demonstration of color-television in the New York City area, Oct. 15, replacing its earlier plan to have such a demonstration in Washington. The demonstration will employ the new standards developed by the National Television System Committee, an all-industry group. The commission proposed to adopt the system in August, but has not rendered a final decision.

During the demonstration from noon to 1:45 P.M., color programs will be telecast by the National Broadcasting Company, Columbia Broadcasting System and the Du Mont Laboratories experimental ultra-high-frequency station. Industry representatives have suggested that color receivers for commission members be set up on Long Island, possibly at the Homestead Hotel in New Gardens, Queens.

NEDA'S New Officers

The National Electronic Distributors Association elected the following officers at its St. Louis convention Sept. 16: President, Dahl W. Mack, Scranton Radio & Television Supply Co., Scranton, Pa., succeeding W. D. Jenkins; executive vice-president, L. B. Calamaras, Chicago, re-elected; 1st vice-president, Anthony Dabowski, Dymac Inc., Buffalo, N.Y.; 2nd vice-president, J. V. Tonahill, Scooter's Radio Supply Co., Ft. Worth, Tex.; secretary, Albert Steinberg, Albert Steinberg & Co., Philadelphia, Pa.; treasurer, R. C. Whitehead, Whitehead Radio Co., Columbus, Ohio.

Re-elected chairman was Aaron Lippman, Aaron Lippman & Co., Newark, N.J. with following board members: J. G. Prestwood Jr., Prestwood Electronics Co., Augusta, Ga.; John G. Bowman, J. G. Bowman & Co., Chicago; R. V. Weatherford, R. V. Weatherford Co., Glendale, Calif.; Tory H. Horne, Western Electronic Supply Co., Seattle, Wash.; Henry F. Morrison, Morrison's Radio Supply Co., Ashtabula, Ohio; H. M. Carpenter, Thurow Distributors Inc., Tampa, Fla.

Calendar of Coming Events

Oct. 9-11: National Alliance of Television & Electronic Service Assns., (NATESA) Annual Fall Convention, Morrison Hotel, Chicago, Ill.

Oct. 14-17: Audio Fair and Convention, Hotel New Yorker, New York, N. Y.

Nov. 13-14: IRE Annual Electronics Conference, Hotel President, Kansas City, Mo.

Nov. 17-19: RETMA, Palmer House, Chicago.

NATESA Convention at Chicago

Plans for the fourth annual TV-radio-electronics service industry convention sponsored by the National Alliance of Television and Electronic Service Associations contemplate a three-day event at the Morrison Hotel, Chicago, Oct. 9-11.

Frank Moch, national president of NATESA, announces a three-day educational program with such topics as color-TV servicing; transistors; UHF; antennas; tuners; circuitry; test equipment; insurance; cost-accounting training and "how to handle your competitor."

"Each of these subjects will be handled by a real expert," Moch says. "Such authorities as Lee Allen, Dan Creato, Clint Walters, E. R. Klineman, Professor Jack Hazlehurst and many others will be prominent.

An important feature of the three day event, Moch said, will be discussion of a public-relations program to educate TV-set owners on the problems of TV repairmen, and to "win friends and influence people" in behalf of the nation's legitimate service firms."

The national officers of NATESA have extended an invitation to everyone in the electronic servicing industry and allied trades to attend the convention.

Dahl W. Mack of Scranton Radio & Television Supply Co., Scranton, Penna., new president of National Electronic Distributors Association, and W. D. Jenkins of Radio Supply Co., Richmond, Va., retiring president.

LaPointe Personnel Changes

W. Ward Willett has been named advertising manager of LaPointe Electronics Inc., manufacturers of the Vee-D-X line of TV antennas and accessories. He was formerly sales promotion manager of the Plax Corporation. Also, Lincoln N. Kinnicutt, formerly director of advertising and public relations, was named assistant to the general sales manager. Kinnicutt's new duties will pertain to sales in all divisions of LaPointe, including Vee-D-X and the newly acquired Circuitron Inc., a company manufacturing printed circuits for electronic devices.

Eico Gives Decals

Electronic Instrument Co., Inc., designers and manufacturers of the Eico line of kits and instruments has released a three-color decal for servicemen to attach to their windows and vehicles. This decal is packed free with each kit and instrument: a serviceman may obtain as many as he needs by writing directly to EICO at 84 Withers Street, Brooklyn 11, N. Y.

Channel Master Designer

Sheldon Rutter of Evanston, industrial designer, has been retained by Channel Master Corporation to do all product design. Rutter will also serve as a packaging and art consultant.

K-G Electronics Expands

K-G Electronics Corp., makers of Delta-Beam TV antennas, has moved factory and offices to new quarters at 2738 N. Sheffield Ave., Chicago. The move will provide additional manufacturing facilities for antennas, as well as other projects K-G has under way in the TV field.

Alliance Rotor Promotion

John Bentia, Alliance Mfg. Co. vice-president says the firm will expend more than one-half million dollars this fall to introduce its two new Tenna-Rotor models. The word is being spread by 110 TV stations as well as newspaper, trade journal and general magazine advertising. The appointment of J. O. Reinecke, Chicago industrial designer, to restyle Alliance products was also announced.

New Site for Pennsy Firm

Amil Gumula, of A. G. Radio Parts Co., Elkins Park, Pa., announces that the company's new main store and offices are located at 939 Township Line. Former headquarters were in Philadelphia.

SERVICE ASS'N REPORTS

Pa. Group Changes Name

At the state federation (FRSAP) meeting, held September 20, in the Sheraton Hotel, Pittsburgh, Pa., with Chairman Milan Krupa, presiding, it was decided to have final action taken at the October session to change the present chartered title of the organization to "The Federation of Television Radio Service Associations of Pennsylvania" (FTRSAP).

A panel discussion was held on the effect of Pennsylvania's newly enacted consumers' sales tax and its application to the service industry within the state. It was felt by the delegates, that the tax registration in itself would have a beneficial effect by making a marked and a more clearly defined margin between the wholesaler and the retailer; the latter now requires a state registration number.

It was also decided to promote activity to encourage and uphold the validity of the dealer franchise. The co-operation of parts and set jobbers will be sought in the project. The next federation meeting will be held in Harrisburg, Pa., October 18, at the Hotel Harrisburger.

Pontiac (Mich.) Electronic Association

Another new service Association that has taken root is the Oakland County Electronic Association of Pontiac, Michigan. Organized only last May, it has already signed up 40 dealers engaged in TV servicing. Independent servicemen join as associate members in this organization.

While the summer months have been used predominantly for social gatherings . . . the fall sessions will include outstanding speakers from all over the country speaking on topics in their specialized fields.

The association advertises weekly . . . listing its code of ethics and the names and addresses of members, says James Hampton, secretary.

Transistor Showing for Hicksville, N.Y., Servicers

Members and guests of the Long Island Television and Radio Technicians Guild were scheduled to witness the first Long Island transistor demonstration at the September 30 meeting, one conducted by C. E. Walter, of the RCA Service Co. Those attending were also to receive free copies of a 311-page volume comprising nine TV clinic lectures by RCA Service Co.

Guild offices are at 23 Broadway, Hicksville, N.Y.

Long Island Electronic Technician Officers Inducted

At a recent "Get Acquainted" open house meeting, held at the Williston Park, L. I. Masonic Club, members of the Long Island Electronic Technicians Assn. elected the following officers: William Carey, president; William Paone, vice-president; Earl A. Horton, treasurer; Phil Jannazzo, recording secretary; Harold F. MacFarland, corresponding secretary; and John Duggan, sergeant-at-arms. MacFarland is also executive secretary of the association.

Audio Society Sets NY Meet

The Audio Engineering Society of New York will hold its fifth annual convention and meeting in conjunction with the Audio Fair and Exhibition, at the New Yorker Hotel, New York City, October 14-17.

REP NEWS

Rider Rep Adds Territory

John T. Stinson Co., 219 Sagamore Rd., Havertown, Pa., currently sales representative for John F. Rider Publisher, Inc., in eastern Pennsylvania, Delaware and southern New Jersey, has added Washington, D. C., Maryland and Virginia to its territory.

Joseph Reps Moore Towers

Moore Tower & Equipment Co. of Peoria, Ill., has appointed Ben Joseph, 509 Fifth Ave., New York 17, N. Y., as sales representative for the states of New York, New Jersey, Pennsylvania, Delaware and Maryland. Joseph has been a manufacturer's representative since 1937.

Best Sets Sales Rep

Best Electronics Corp. of Los Angeles announced the appointment of the following as sales representatives for its line of VHF and UHF antennas and associated products: George Davis Sales Co., for southern California, Arizona and southern Nevada; Sherwood P. French for northern California and Nevada; Frank W. Rauer for Ohio, western Pennsylvania and West Virginia; Fred H. Larabee Co., for Iowa, Kansas, Missouri, Nebraska and Oklahoma; Gordon G. Moss for Colorado, Utah, Wyoming and New Mexico. Also named were Mac Peterson for Hawaii; Lewis Slubin for eastern Pennsylvania, southern New Jersey, Delaware, Maryland and the District of Columbia; Walter W. Bieberich for Indiana and Kentucky; Howell Sales Co., for Idaho, Montana, Oregon, Washington and Alaska; Jack Geartner for Florida and Cuba.

UTL Appoints Packards

Jim and Dave Packard of Houston, Texas, have been appointed representatives for the United Technical Laboratories of Morristown, N. J. for Arkansas, Louisiana, Oklahoma and Texas. They will handle Klipzons, Plastik-707, antenna accessories, an inductance kit and other U. T. L. products.

EMC Names Hendrickson

Electronic Measurements Corp., New York, has announced the appointment of William A. Hendrickson as jobber representative for the New England territory; this includes Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont and Maine.

Two Join Akeroyd Staff

The Arthur E. Akeroyd Company, New England electronic sales representative, with headquarters at The John Hancock Building, Boston, Mass., announces the appointment of two additional men to the sales organization. Joseph B. Rembaum and Nelson W. Wells will work with Ray Bridge and Art Akeroyd in New England. Rembaum will cover the distributor accounts in Massachusetts, Maine, New Hampshire, Vermont and Rhode Island, while Wells will call on both distributors and industrial accounts in Connecticut.

Pricing TV Repairs

(*Continued from page 48*)

of the entire pricing process that is at all time-consuming lies in keeping up with changes in the cost of parts.

This phase of the operation is handled by the technical supervisor, who keeps a constant check as shipments come in. He immediately marks any new prices on the boxes, and suitably changes the listing on the price sheets which are used for checking at the dispatch desk.

"Our fixed-rate system is easy and quick to handle," Maius sums up.

Parts Mfrs. Committees

Karl W. Jensen, Jensen Industries, Inc., Chicago, chairman of the Association of Electronic Parts & Equipment Manufacturers, has announced the appointment of EP&EM committees for the year.

P. N. Cook, Chicago-Standard Transformer Co., was named chairman of the social committee, with the following members: I. A. Thayer, Belden Mfg.; Vic Machin, Shure Brothers; Gil Knoblock, Chicago-Standard, and Sid Gracen, IE Mfg.

Credit Committee: E. Van Deveer, Jensen Mfg., chairman; John Kupsco, Shure Brothers, Al Bruning, American Mike; Jay Greengard, Waldon Electronics and D. B. Shaw, Howard W. Sams & Co.

Publicity Committee: O. D. Jester, Standard Coil, chairman; Arnold Litteken, Merit Transf.; J. Wayne Cargile Pernio, Inc.; Leroy Mintz, M. A. Miller; and Charles A. Hansen, Jensen Mfg.

Educational Committee: Roy S. Laird, Ohmite, chairman; Ralph Brengle, Potter-Brumfield; John Cashman, Radio Craftsmen; Ben Farmer, Rauland; Bob Mueller, Centralab; R. M. Gray, Rauland-Borg.

Industry Relations Committee: Theodore Rossman, Pentron, chairman; Ken Hathaway, Ward-Leonard; Mel Buehring, Simpson Elect; Herb Clough, Belden Mfg.; Ted Acherly, Sylvania.

Membership and Attendance Committee: Wilfred Larson, Switchcraft, chairman; H. A. Staniland, Quam-Nichols; Robert Arndt, Crest Trans.; W. A. Hamilton, Hamilton Electron; Max Fink, Fink Antenna Corp.

Merchandising Problem Analysis Committee: Ben Boldt, Amphenol, chairman; W. J. Halligan, Jr., Hallicrafters; P. N. Cook; A. N. Haas, Jr., Bud Radio; W. A. Kuehl, Drake Electric; L. G. Warren, Sola.

Parts Show Group Elects Ehle

Harry A. Ehle, of International Resistance Co., Philadelphia, has been elected president of the Radio Parts & Electronic Equipment Shows, Inc., sponsors of the Electronic Parts Show, H. M. Carpenter, Thorow Distributors, Inc., Tampa, Fla., was chosen vice-president; Francis F. Florsheim, Columbia Wire & Supply Co., Chicago, secretary; and Bernard L. Cahn, Insuline Corporation of America, Inc., Long Island City, N.Y., treasurer.

The 1954 Show will be held at the Conrad Hilton Hotel, Chicago, May 17-20.

Comdr. Mathews in New Post

Commander R. H. G. Mathews has been named executive vice-president of Burton Browne Advertising, Chicago, which serves many clients in the electronic industry. Comdr. Mathews was formerly general sales manager of the Honan-Crane Corp. of Lebanon, Ind., a subsidiary of the Houdaille-Hershey Corp., Detroit.

During the war years, Comdr. Mathews served as Navy Recruiting Officer for Indiana and also as Navy Inspector of Recruiting and Induction for Indiana, Ohio, Kentucky and West Virginia. He later was Captain of the Navy Yard at Hollandia, New Guinea.

A pioneer in the field of radio and electronics, Comdr. Mathews received his first American amateur radio license back in 1912. He was one of the founders and directors of the American Radio Relay League and, with K. E. Hassel, formed the Chicago Radio Laboratories, which subsequently became the Zenith Radio Corp.

". . . Our television set is being repaired, and they sent us this to use in the meantime."

Vertical Circuit Troubles

(*Continued from page 37*)

cally, making its top section visible.

When the vertical output transformer primary has lost inductance, due to shorted turns, or when an improper substitute is inserted in the place of the one originally present, symptoms similar to those shown in Fig. 5 may be noted.

Transformer Matching

For the best deflection linearity, the tube and transformer must be designed to complement each other. Variations in either can be at least partially compensated by adjustment of bias on the vertical output tube. This bias adjustment is usually made

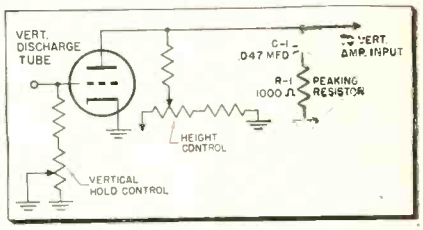


Fig. 4—Vertical discharge tube circuit, showing location of peaking resistor.

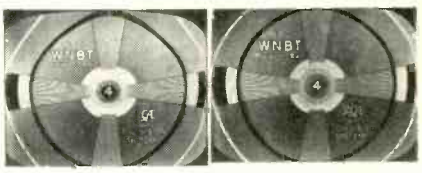


Fig. 5—A—Normal test pattern at left. B—Nonlinear pattern resulting from a reduction in the primary inductance of the vertical output transformer. The Moire effect in the photos is not due to poor interlace—it is the result of the process employed in reproducing the photos.

by means of a variable cathode resistor—the vertical-linearity control. Only a certain amount of compensation is possible, however, and objectionable distortion can result from improper pairing of the tube and transformer.

Fig. 5A is a photograph of a test pattern illustrating the good linearity produced with typical matched commercial deflection components. Fig. 5B shows the impaired linearity which resulted when a transformer with a primary inductance only 55% as great, approximately, as that of the original unit, was improperly substituted. Considerable adjustments of the height and vertical linearity controls were necessary to make the linearity even as good as that of Fig. 5B. No adjustment of the controls, however, could produce satisfactory linearity.

Intermittent Receivers

(*Continued from page 32*)

monitored with the voltmeters to indicate a definite correlation between the signal modification and electrode voltage changes, if any.

It should be noted that while a voltmeter and scope, with or without a demodulator probe, will load a receiver to some degree, this loading is constant, Although the output of the receiver will consequently be attenuated. the attenuation, being a function of the loading, will also be constant and will not interfere with signal monitoring. In rare instances, critical circuits (a horizontal AFC circuit, for instance) may require temporary readjustment to compensate for this loading, but this is ordinarily not necessary.

Although we have discussed only basic monitoring instruments, more elaborate equipment may be used to monitor and record information. An audible alarm to indicate a signal change may be incorporated, if desired. Such equipment has been designed and built by the writer, and can be similarly worked out by technicians, without too much difficulty.

Diagnosing CRT Troubles

(*Continued from page 36*)

receiver can be very abnormal in another. For instance, if we wanted to test for a leaky C-1 coupling capacitor in Fig. 3, it would be necessary to turn the brightness control to minimum, in order to ground the low end of the grid resistor. When measuring with a high-resistance voltmeter from grid pin to chassis, no appreciable positive voltage should be present if the capacitor is ok. A positive voltage *would* be indicated on the meter if the capacitor was defective (unless it was open, in which case there would be no picture on the screen).

In the more conventional circuit shown in Fig. 4, it would make little difference where, when the above test was made for a leaky coupler, the brightness control was set—the contrast control, however, would have to be set at minimum, to prevent rectification from taking place in the grid circuit on strong video input signals.

Some intermittent troubles in CRT circuits which do not affect voltage readings may perhaps lead the technician to a false notion that the tube or its socket is defective. Consider Fig. 5, which illustrates a method often used to supply anode No. 1 with the proper voltage. An open C-1

would have little effect on set operation, but an intermittently open resistor (R-1) could cause a slow fade-out of the picture when the open-circuit takes place, followed by a rapid reappearance of the picture when the resistor cuts back in, or changes to a much smaller value than an open circuit. This anode No. 1 circuit takes so little current that capacitor C-1 will handle enough electron flow to keep the CRT working for 5 to 8 seconds after R-1 opens up. If C-1 shorted to ground, no voltage would, of course, be available for anode No. 1, and the picture would either be very dim or not visible.

Little trouble is experienced in the anode No. 1 circuit in cases where the voltage fed to it is *directly* tapped off from the B-plus supply.

Nothing much can be done about correcting anode No. 1 or No. 2 troubles which originate within the tube. Poor contact where the external aquadag coating contacts the grounding clip or spring in glass picture tubes can generally be spotted by a visual inspection; it will also make itself audibly noticeable, in most cases, if the volume control is turned down. Often a faint sparking can be heard which seems to have no effect on the picture; a mild shock may be received if the outer aquadag coating and a part of the chassis are simultaneously touched.

Two cures, both simple, are suggested. In Figs. 6A and 6B a small strip of lead foil or tinfoil, folded once on itself, is tucked between the contactor and the tube for better contact. In Fig. 6C is shown a method the writer has used in stubborn cases, or in instances where the coating has been rubbed off or worn away from the usual point of contact. An ordinary piece of metal-stranded dial cable is bent as shown and laid over the bell of the tube; a strip of Minnesota Mining Co. electrical (black) Scotch tape is placed over it and pressed firmly in place. The surface is then lightly sprayed with a coat of Krylon.

It is not infrequently difficult to tell at once whether the picture tube or a circuit defect is to blame for a poor or dim picture. If, however, from a cold start, the picture tube takes several minutes to appear on the screen; sound comes in normally; the ion magnet must be moved toward the base of the CRT, away from its normal position on the neck of the tube, for best brightness; and the picture has no blacks or clear whites—you can tell your customer with a clear conscience that he most probably needs a new picture tube.

Complete Index of

ALL "CIRCUIT DIGESTS" TO DATE

Including Current Issue. CIRCUIT DIGEST NOS. 89 to 94 will be found in this issue of TECHNICIAN.

All Units Are TV Receivers Unless Otherwise Noted

HOW TO FIND MONTH in which any CIRCUIT DIGEST APPEARED

Circuit Digest Numbers

1- 8	Sept. 1952
9- 16	Oct. 1952
17- 24	Nov. 1952
25- 30	Dec. 1952
31- 36	Jan. 1953
37- 43	Feb. 1953
44- 49	Mar. 1953
50- 58	Apr. 1953
59- 64	May 1953
65- 70	June 1953
71- 76	July 1953
77- 81	Aug. 1953
82- 88	Sept. 1953
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95-100	Nov. 1953

Note: Months prior to September, 1953, refer to issues of Television Retailing (predecessor of TECHNICIAN)

(Continued on page 78)

Circuit Digest Index

(*Continued from page 77*)

INDEX TO ADVERTISERS

OCTOBER, 1953

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

MFRS' Catalogs & Bulletins

Heathkit Catalog

The *1954 Heathkit Catalog* lists the full Heath line of test equipment kits. Available from The Heath Co., Benton Harbor, Mich.

CBS-Hytron Transistor Manual

This 8-page manual on transistor theory for technicians is available from CBS-Hytron distributors, or CBS-Hytron, Danvers, Mass.

Amphenol Antenna Folio

A colorful folio dealing with characteristics and problems of UHF and VHF television, and illustrating basic antenna types, is available. The folio is also designed as a holder of Amphenol antenna catalog sheets. Folio and sheets may be obtained from Amphenol distributors or by writing to American Phenolic Corp., Chicago 50, Ill.

Moore Tower Catalog

A catalog sheet describing TV antenna towers and accessories is available from Moore Tower and Equipment Co., 1121 First National Bank Bldg., Peoria, Ill.

Shure Sound Catalog

Shure's *General Catalog 44A* describes microphones, microphone parts and accessories, phono cartridges and pickups, and wire and tape recorder heads. It also lists replacement information on phono cartridges, communication mikes and magnetic recording heads. Write to Shure Bros. Inc., 225 W. Huron St., Chicago 10, Ill.

Stancor Replacement Guide

The first edition of the 1953 Stancor TV transformer replacement guide lists transformer replacement information on over 5600 TV models and chassis, including many 1953 models. It covers 101 brands of TV sets, in alphabetical order, by model and chassis number. A separate catalog section lists electrical and physical specifications on 125 Stancor TV replacement components.

A catalog sheet, *Bulletin 467*, gives complete data on various transformers recently added to the Stancor line. Available from any Stancor distributor, or from the Chicago Standard Transformer Corporation, Standard Division, Addison and Elston, Chicago 18, Illinois.

TECHNICIAN
CIRCUIT DIGESTS

Figure 11. Video Detector Output, Pin 2 of J200. 2 volts, 60 c.p.s.

Figure 12. Gate-Pulse Plug, Pin 4. 500 volts, 15,750 c.p.s.

Figure 13. A-G-C Gate Grid, Pin 1. 22 volts, 60 c.p.s.

Figure 14. Gate-Pulse Plate, Pin 3. 10 volts, 15,750 c.p.s.

Figure 15. Gated-Limiter Grid, Pin 7. 2.5 volts, 15,750 c.p.s.

Figure 16. Noise-Inverter Plate, Junction of R605, C602, and C603. 23 volts, 15,750 c.p.s.

Figure 17. Noise-Inverter Cathode, Pin 8. Wave shape and amplitude vary with noise

Figure 18. Sync Separator Plate, Pin 1. 17 volts, 60 c.p.s.

Figure 19. Sync Separator Plate, Pin 1. 17 volts, 15,750 c.p.s.

Figure 20. Phase-Splitter Grid, Pin 7. 14 volts, 60 c.p.s.

Figure 21. Phase-Splitter Plate, Pin 6. 30 volts, 60 c.p.s.

Figure 22. Vertical-Oscillator Grid, Pin 2. 165 volts, 60 c.p.s.

Figure 23. Vertical-Oscillator Plate, Pin 1. 130 volts, 60 c.p.s.

Figure 24. Vertical-Output Grid, Pins 2 and 7. 120 volts, 60 c.p.s.

Figure 25. Vertical-Output Plate, Pin 9. 800 volts, 60 c.p.s.

Figure 26. Phase-Splitter Plate, Junction of R614, R615, and C600. 8 volts, 15,750 c.p.s.

Figure 27. Phase-Splitter Cathode, Pin 8. 8 volts, 15,750 c.p.s.

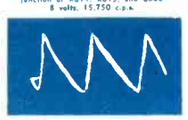


Figure 28. Phase Comparer, Pins 5 and 7. 6 volts 15,750 c.p.s.

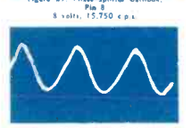


Figure 29. Horizontal Oscillator, Pin 2 of Gate-Pulse Socket J801. 20 volts, 15,750 c.p.s.

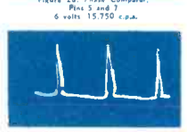


Figure 30. Horizontal-Oscillator Cathode, Pins 8 and 3. 16 volts, 15,750 c.p.s.

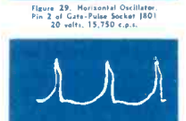


Figure 31. Horizontal-Oscillator Grid, Pin 2. 38 volts, 15,750 c.p.s.

Figure 32. Horizontal-Output Grid, Pin 5. 130 volts, 15,750 c.p.s.

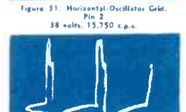


Figure 33. Horizontal-Deflection Yoke, *Pin 7 of J800. 3000 volts, 15,750 c.p.s.

*See CAUTION.

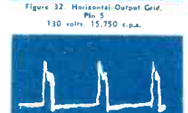


Figure 34. Gate-Pulse Socket, Pin 4 of J801. 500 volts, 15,750 c.p.s.

* CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform shown in figure 33 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip, and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, because of the high voltages present. The peak-to-peak voltage shown for figure 33 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

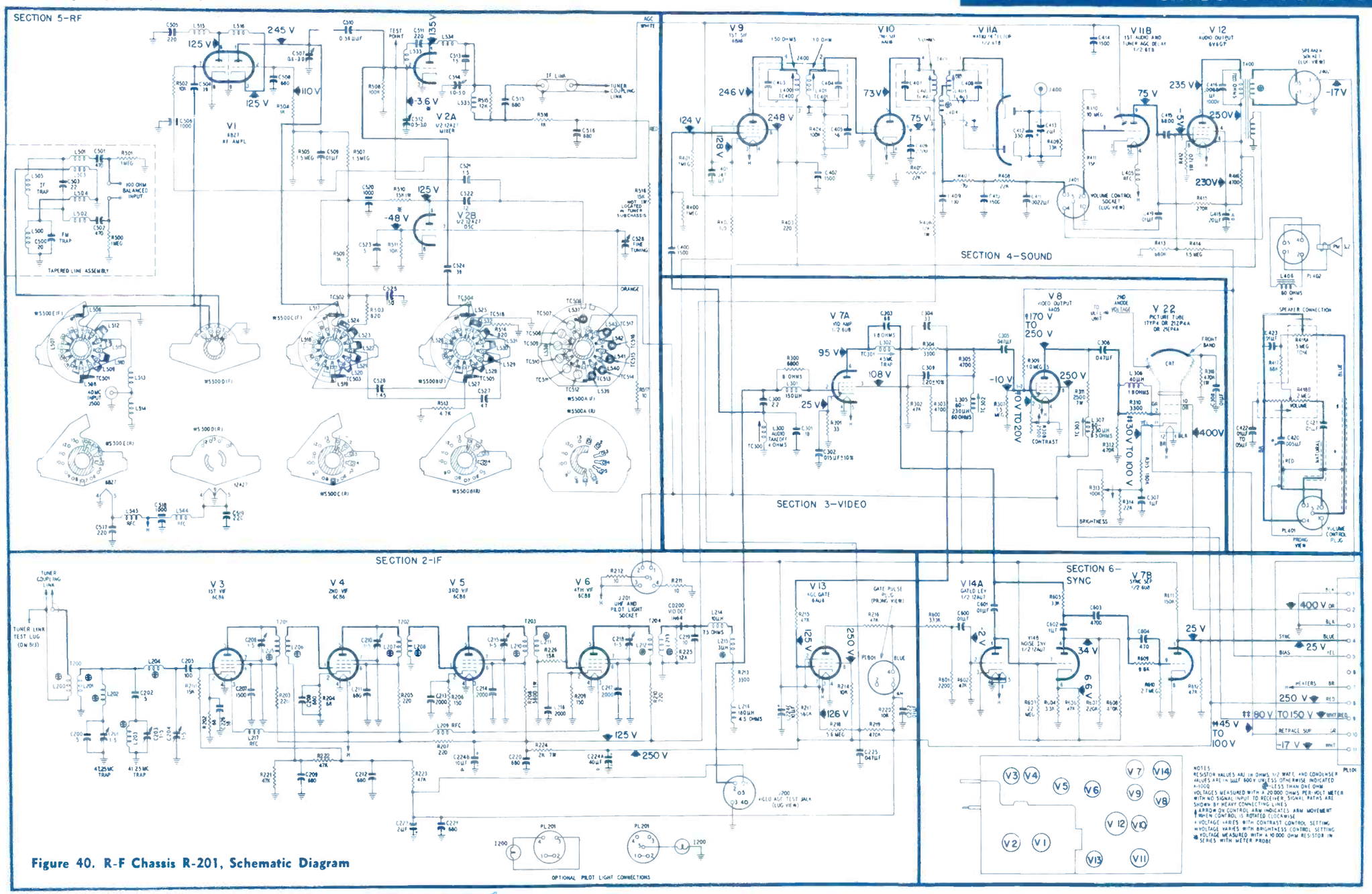
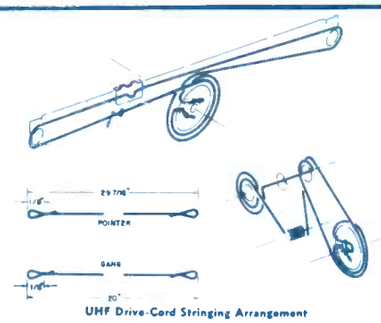


Figure 40. R-F Chassis R-201, Schematic Diagram

CAUTION: One side of the a-c line is connected to the chassis through C101 and L406. The other side of the a-c line is connected to the chassis through F100, R100, CR100, and C103, in series. Grounding the chassis will result in a short circuit across one or the other of these two branches in the voltage-doubler circuit. During servicing and alignment, it is desirable that an a-c line isolation transformer capable of handling at least 225 watts (Philco Part No. 45-9600) be used. Failure to use an isolation transformer will greatly increase the shock hazard, and may result in damage to the equipment.



UHF Drive-Cord Stringing Arrangement

VOLTAGE MEASUREMENTS

The voltages on the schematics were taken with a 20,000-ohms-per-volt voltmeter, with a line voltage of 117 volts, and no signal input to the receiver. Since voltage readings taken in the video i-f stages vary widely with different test equipment setups, voltage measurements for these stages are omitted from the diagrams.

B SUPPLY FUSE REPLACEMENT

The B supply protective fuse, F100, is wired into the low-voltage section, and is in series with the selenium rectifiers. For replacement, use a 1.6-ampere delayed-action-type fuse, Philco Part No. 45-2656-23.

CAUTION: Discharge the circuit before replacing the fuse.

PHILCO
R-F Chassis R-201, Deflection Chassis D-201

R-F Chassis R-201, Deflection Chassis D-201:
models 4308, 4110, 4108, 3104, 4008

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UHF TUNER-ADAPTER UT20B, PART NO. 43-6701

UHF Tuner-Adapter UT20B, Part No. 43-6701, provides for reception of UHF signals on television Channels 14 through 83. UHF Tuner-Adapter UT20B is designed for installation in Philco B line television receiver and is installed on BU models. These receivers use r-f chassis R-201.

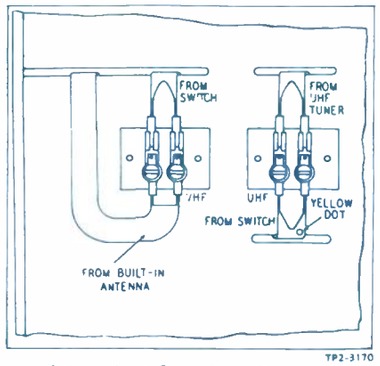
PLANETARY DRIVE

The UHF tuner is tuned by means of a 3-gang tuning condenser, which is driven through a specially designed planetary drive. . . . . The planetary drive is so constructed that fine tuning and coarse tuning can be accomplished with a single control knob. The tuning shaft is coupled to the driving shaft through three balls, which form a planetary drive that produces slow rotation for fine tuning. See figure 2. After rotating 180 degrees with the tuning shaft, a pin engages the driving shaft, and the two shafts are direct-coupled, for coarse tuning. To re-engage the planetary drive for fine tuning, it is only necessary to reverse the direction of rotation. The dial pointer is connected to the tuning gang through a cord drive, and indicates the channel number to which the tuner is tuned.

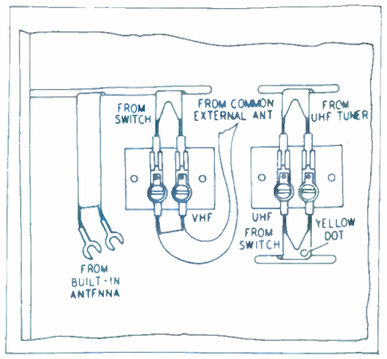
ALIGNMENT AND REPAIRS

The frequencies at which the Tuner-Adapter operates are extremely high; therefore, it is necessary that the utmost care be taken to safeguard against upsetting the delicate adjustments of the tuner. It is recommended that the serviceman make only minor repairs to the tuner, such as replacement of the tube or crystal and the wiring of external leads. The Tuner-Adapter should be returned to the factory for alignment and major repairs, unless the serviceman is properly equipped to perform these jobs. In general, a good rule to follow is not to remove the cover of the Tuner-Adapter.

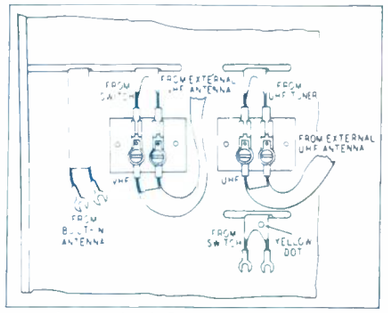
NOTE: Replacing the tube with a new one may detune the tuner. If this occurs, a number of tubes should be tried, until the most satisfactory substitute for the original is found.



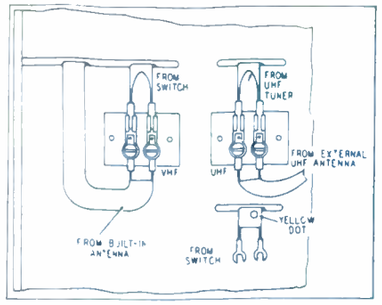
Antenna-Lead Connections, Common Built-In Antenna



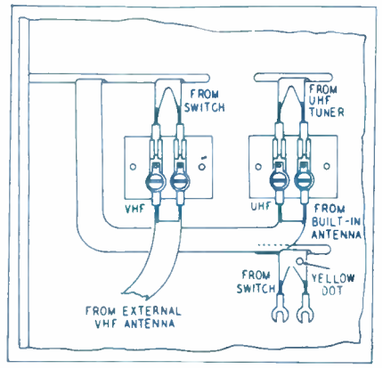
Antenna-Lead Connections, Common External Antenna



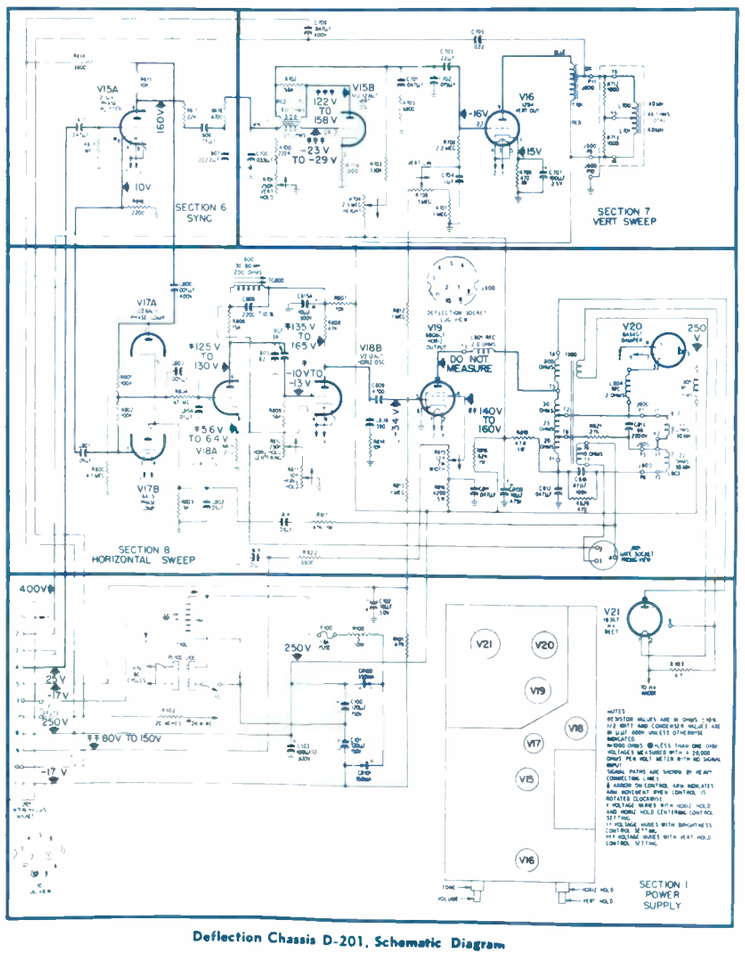
Antenna-Lead Connections, Separate External Antennas



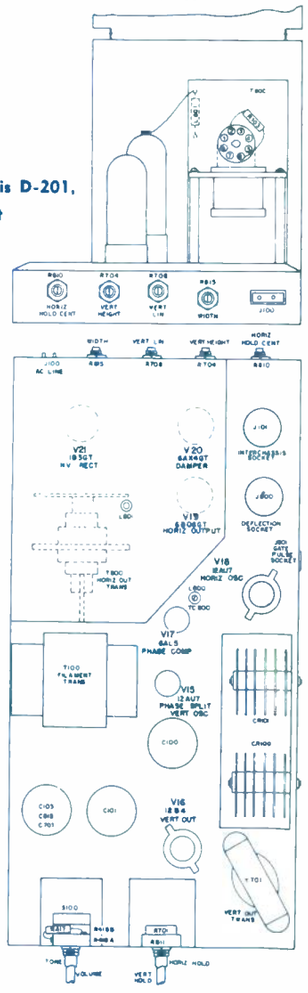
Antenna-Lead Connections, VHF Built-In and UHF External Antennas



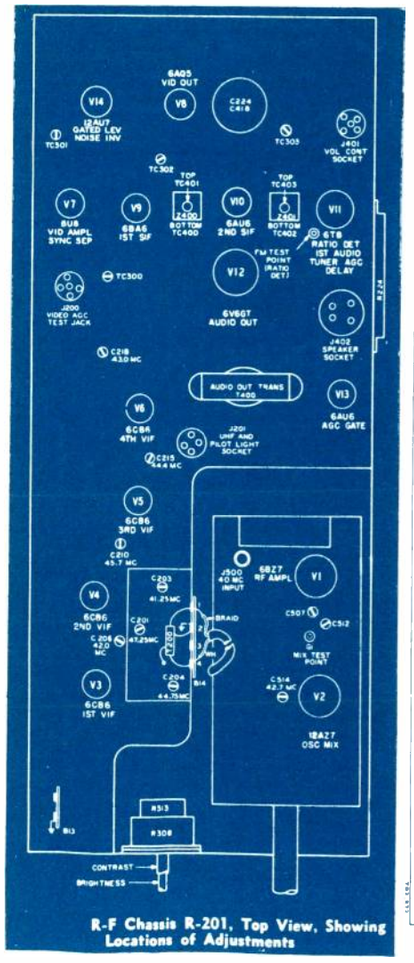
Antenna-Lead Connections, VHF External and UHF Built-In Antennas



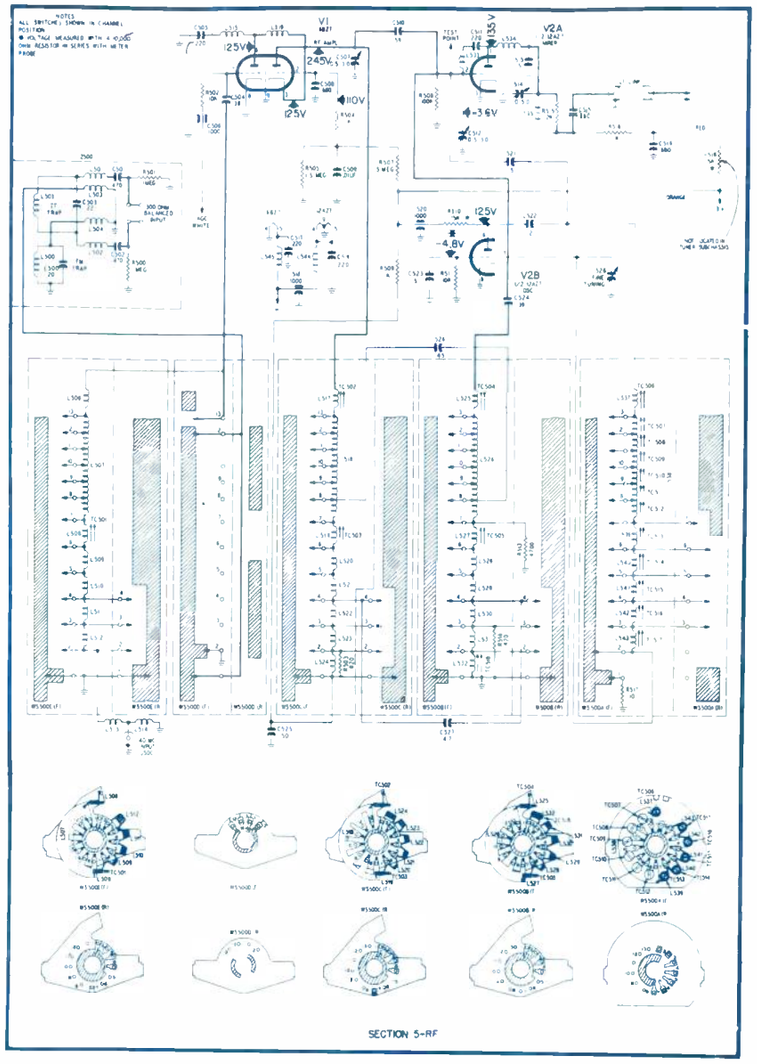
Deflection Chassis D-201, Schematic Diagram



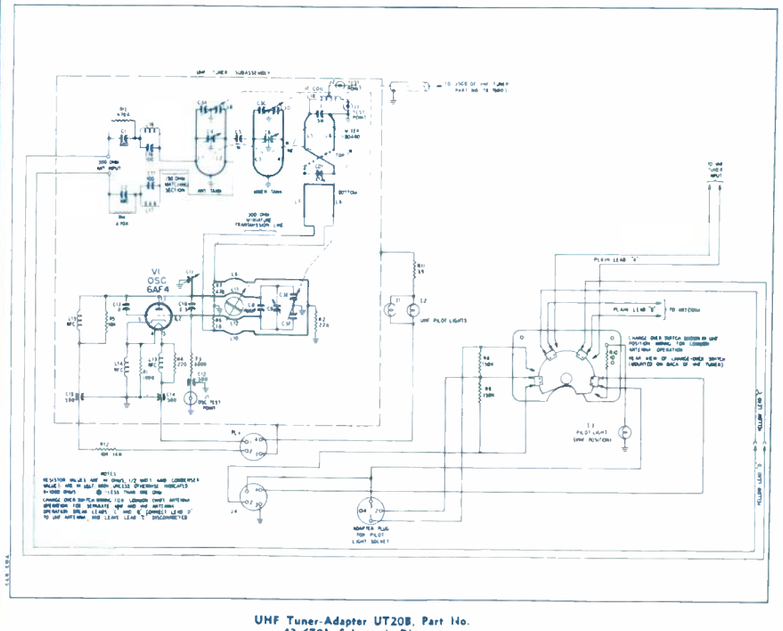
Deflection Chassis D-201, Base Layout



R-F Chassis R-201, Top View, Showing Locations of Adjustments



Television Tuner, Part No. 76-7600-3, Schematic Diagram



UHF Tuner-Adapter UT20B, Part No. 43-6701, Schematic Diagram

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October • 1953

TECHNICIAN CIRCUIT DIGESTS

The schematic is shown in the latest condition at the time of printing.

All resistance values in ohms. K = 1000.

Direction of arrows at controls indicates clockwise rotation.

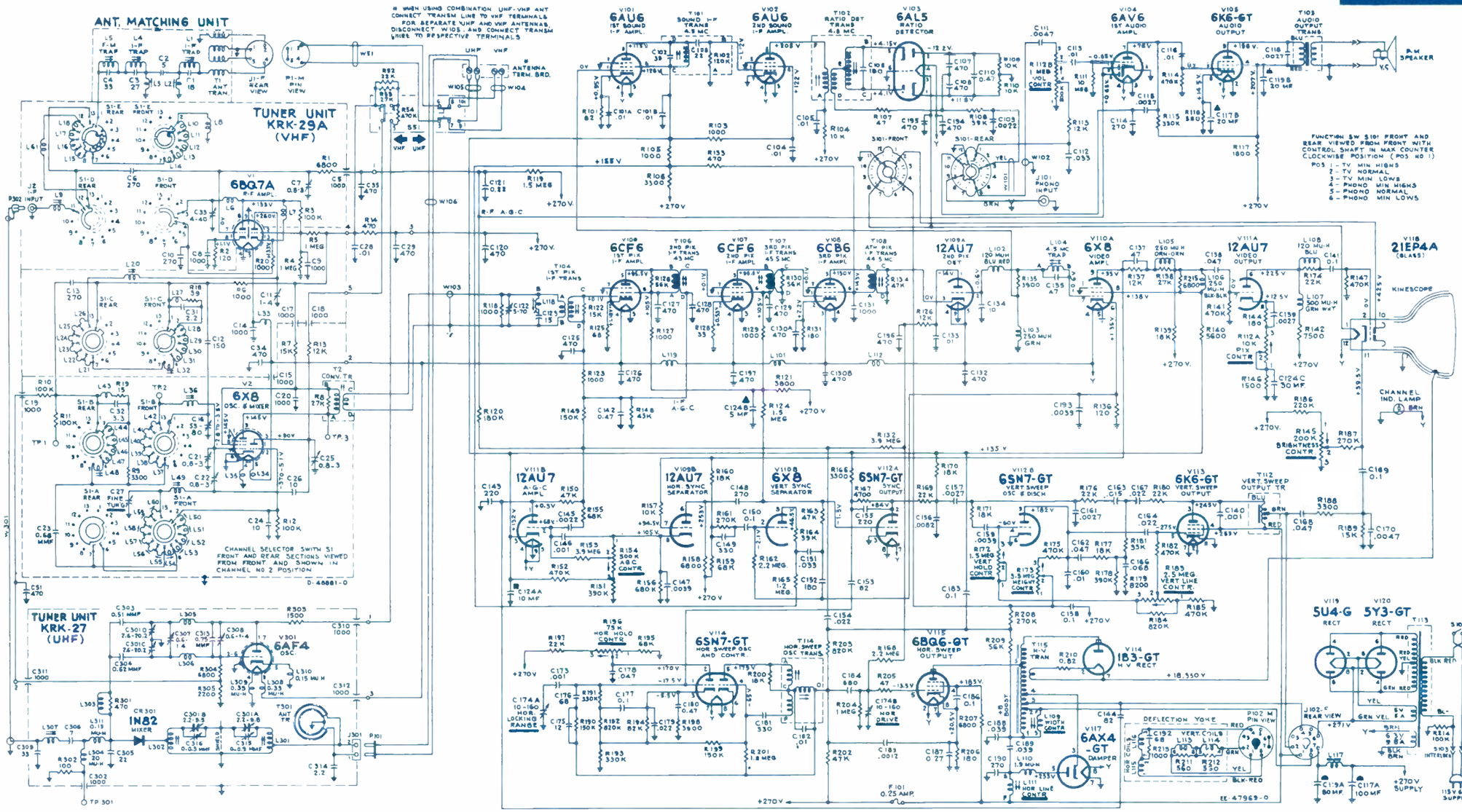
Schematic Diagram KCS83D

All voltages measured with "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

CHASSIS DESIGNATIONS

KCS83C Models 21-S-354 and 21-S-362 employing a KRK29 Tuner.

KCS83D Models 21-S-354U and 21-S-362U employing a KRK29A/27 Tuner



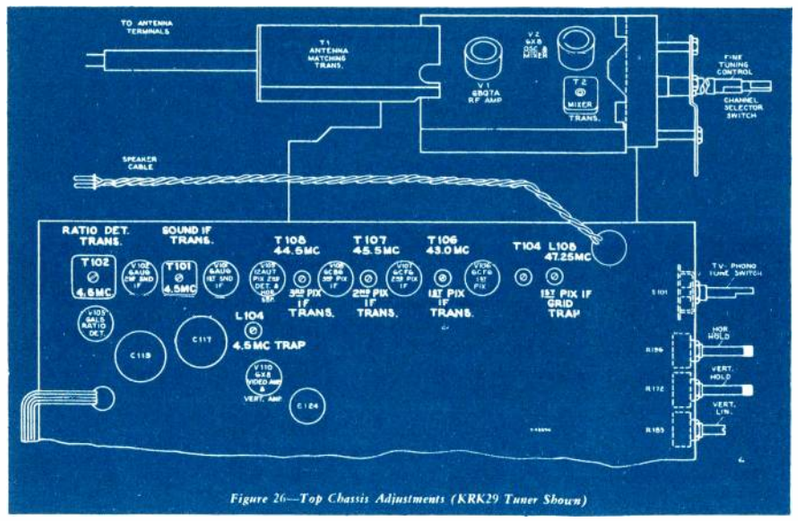


Figure 26—Top Chassis Adjustments (KRK29 Tuner Shown)

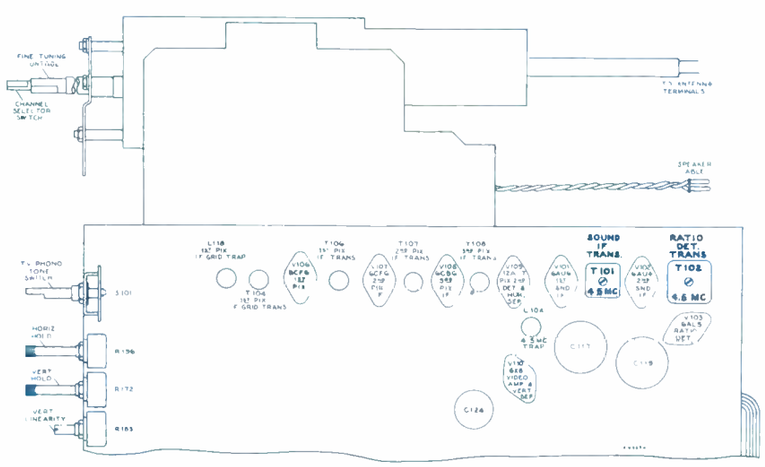


Figure 27—Bottom Chassis Adjustments (KRK29 Tuner Shown)

GENERAL DESCRIPTION

Models 21-S-354, 21-S-354U, 21-S-362 and 21-S-362U are "21 inch" television receivers. Models 21-S-354 and 21-S-362 are identical except for cabinets, and speakers. Models 21-S-354U and 21-S-362U are identical except for cabinets, and speakers. Models 21-S-354 and 21-S-362 have full 12 channel VHF coverage. Models 21-S-354U and 21-S-362U feature full 12 channel VHF coverage plus any UHF channels desired.

Figure 24— Horizontal Oscillator Wave Forms

HORIZONTAL OSCILLATOR ADJUSTMENT. — Normally the adjustment of the horizontal oscillator is not considered to be a part of the alignment procedure, but since the oscillator waveform adjustment may require the use of an oscilloscope, it can not be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require readjustment in the field. However, the waveform adjustment should be checked whenever the receiver is aligned or whenever the horizontal oscillator operation is improper.

Horizontal Frequency Adjustment.—Tune in a station and sync the picture. If the picture cannot be synchronized with the horizontal hold control R196, then adjust the T114 frequency core on the rear apron until the picture will synchronize. If the picture still will not sync, turn the T114 waveform adjustment core (under the chassis) out of the coil several turns from its original position and readjust the T114 frequency core until the picture is synchronized.

Examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive control C174B, the width control L109 and the linearity control L111 until the picture is correct.

Horizontal Oscillator Waveform Adjustment.—The horizontal oscillator waveform may be adjusted by either of two methods. The method outlined in paragraph A below may be employed in the field when an oscilloscope is not available. The service shop method outlined in paragraph B below requires the use of an oscilloscope.

A.—Turn the horizontal hold control completely clockwise. Place adjustment tools on both cores of T114 and be prepared to make simultaneous adjustments while watching the picture on the screen. First, turn the T114 frequency core (on the rear apron) until the picture falls out of sync and three or four diagonal black bars sloping down to the right appear on the screen. Then, turn the waveform adjustment core (under the chassis) into the coil while at the same time adjusting the frequency core so as to maintain three or four diagonal black bars on the screen. Continue this procedure until the oscillator begins to motorboat, then turn the waveform adjustment core out until the motorboating just stops. As a check, turn the T114 frequency core until the picture is synchronized then reverse the direction of rotation of the core until the picture falls out of sync with the diagonal bars sloping down to the right. Continue to turn the frequency core in the same direction. No more than three or four bars should appear on the screen. Instead, the horizontal oscillator should begin the motorboat. Retouch the adjustment of the T114 waveform adjustment core if necessary until this condition is obtained.

B.—Connect the low capacity probe of an oscilloscope to terminal C of T114. Turn the horizontal hold control one-quarter turn from the clockwise position so that the picture is in sync. The pattern on the oscilloscope should be as shown in Figure 24. Adjust the waveform adjustment core of T114 until the two peaks are at the same height. During this adjustment, the picture must be kept in sync by readjusting the hold control if necessary.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious. On the other hand, if the broad peak is higher than the sharp peak, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the hold control approaches the clockwise position.

Remove the oscilloscope upon completion of this adjustment.

Horizontal Locking Range Adjustment.—Set the horizontal control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the T114 frequency core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C174A slightly clockwise. If less than 2 bars are present adjust C174A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. Adjust the T114 frequency core so that the diagonal bar sloping down to the right appears on the screen and then reverse the direction of adjustment so that bar just moves to the left side of the screen leaving the picture in synchronization.

RCA VICTOR
Chassis KCS83C, KCS83D

Technician CIRCUIT DIGEST 90

Chassis KCS83C:
models 21-S-354, 21-S-362

Chassis KCS83D:
models 21-S-354U, 21-S-362U

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RCA VICTOR
Chassis KCS83C, KCS83D
Technician CIRCUIT DIGEST 90

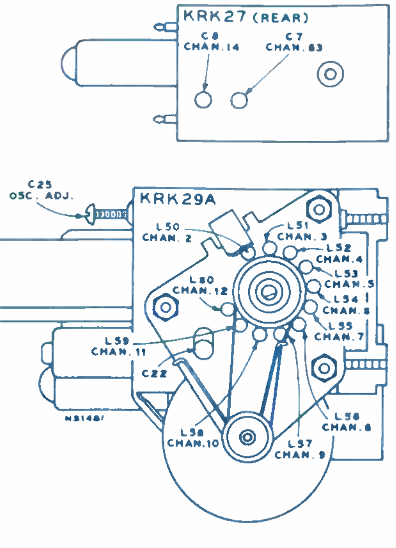


Figure 10—KRK29A/27 Oscillator Adjustments

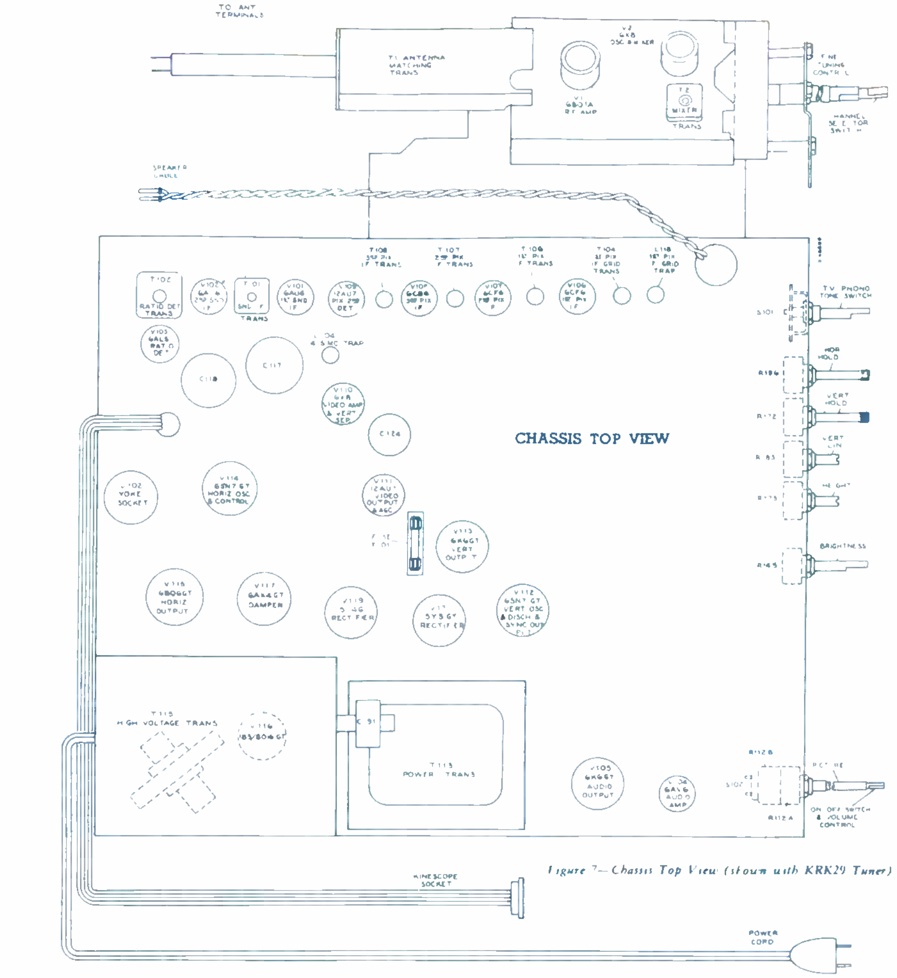


Figure 7—Chassis Top View (shown with KRK29 Tuner)

KRK29A/27 TUNER ALIGNMENT
Models 17-S-354U and 17-S-362U

VHF ALIGNMENT.—A tuner unit which is operative and requires only touch up adjustments, requires no presetting of adjustments. For such units, skip the remainder of this paragraph. For units which are completely out of adjustment, preset C27 all the way out. Set channel 7 to 13 oscillator slugs one turn from tight. Turn T2 slug all the way out. Do not change any of the adjustments in the antenna matching unit.

Disconnect the link from terminals "A" and "B" of T104 and terminate the link with a 39 ohm composition resistor.

Turn the receiver channel selector switch to channel 2.

The 43.5 mc. trap is adjusted with zero bias. To insure that the bias will remain constant, take a clip lead and short circuit the AGC terminal of the tuner at the terminal board to ground.

Connect the oscilloscope to the test point TP2 on top of the tuner unit. Set the oscilloscope to maximum gain.

Connect the output of the VHF signal generator to the output of the antenna matching unit at the junction of L5 and C4 at the bottom of the FM trap L5.

Tune the signal generator to 43.5 mc. and modulate it 30% with a 400 cycle sine wave. Adjust the signal generator for maximum output.

Adjust C33 on top of the tuner, for minimum 400 cycle indication on the oscilloscope. If necessary, this adjustment can be retouched in the field to provide additional rejection to one specific frequency in the i-f band pass. However, in such cases, care should be taken not to tune C33 into channel 2, thereby reducing sensitivity on channel 2.

Connect the potentiometer arm of one of the bias supplies to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it.

Set the channel selector switch to channel 8.

Preset C22 to read —3.0 volts at the test point TP1, as read on the "VoltOhmyst." The limits for oscillator injection voltage are 2 volts minimum and not exceeding a maximum of 5.5 volts.

Turn the fine tuning control fully clockwise.

Adjust C25 for proper oscillator frequency, 227 mc. This may be done in several ways. The easiest way and the way which will be recommended in this procedure will be to use the signal generator as a heterodyne frequency meter and beat the oscillator against the signal generator. To do this, tune the signal generator to 227 mc. with crystal accuracy. Insert one end of a piece of insulated wire into the tuner unit through the hole provided for the adjustment of C16. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the tuner oscillator to shift. Connect the other end of the wire to the "r-f" in terminal of the signal generator. Adjust C25 to obtain an audible beat with the signal generator.

Turn C27 clockwise until the beat note just begins to change, then turn one full turn in the same clockwise direction.

Return the fine tuning control to the mechanical center of its range.

NOTE:—If on some units, it is not possible to reach the proper channel 8 oscillator frequency by adjustment of C25, switch to channel 13 and adjust L49 to obtain proper channel 13 oscillator frequency.

Then, switch to channel 12 and adjust L60 to obtain proper channel 12 oscillator frequency. Continue down to channel 8, adjusting the appropriate oscillator trimmer to obtain the proper frequency on each channel. Then again on channel 8, adjust C25 to obtain proper channel 8 oscillator frequency. Switch back to channel 13 and readjust L49 and back to channel 8 and adjust C25.

Set the T2 core for maximum inductance (core turned counter-clockwise).

Connect the sweep generator through a suitable attenuator, as shown in figure 19 to the input terminals of the antenna matching unit.

Connect the signal generator loosely to the antenna terminals.

Set the sweep generator to cover channel 8.

Set the oscilloscope to maximum gain and use the minimum input signal which will produce a usable pattern on the oscilloscope. Excessive input can change oscillator injection during alignment and produce consequent misalignment even though the response as seen on the oscilloscope may look normal.

Insert markers of channel 8 picture carrier and sound carrier, 181.25 mc. and 185.75 mc.

Adjust C21, C16, C11 and C7 for approximately correct curve shape, frequency, and band width as shown in figure 18.

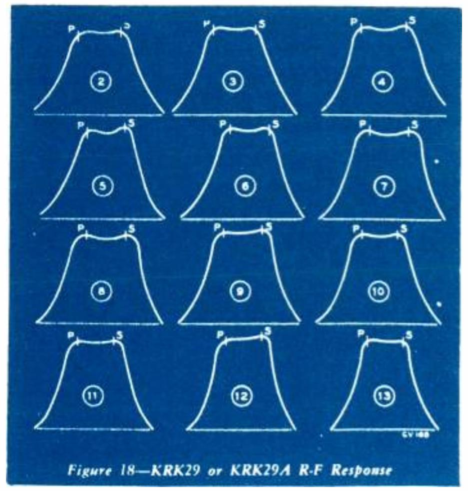


Figure 18—KRK29 or KRK29A R-F Response

The correct adjustment of C7 is indicated by maximum amplitude of the curve midway between the markers. C11 tunes the r-f amplifier plate circuit and affects the frequency of the pass band most noticeably. C21 tunes the mixer grid circuit and affects the tilt of the curve most noticeably (assuming that C7 has been properly adjusted). C16 is the coupling adjustment and hence primarily affects the response band width.

Connect the "VoltOhmyst" to test point TP1. Adjust C22 to read —3.0 volts dc on the "VoltOhmyst" at TP1. Readjust C27, C21, C16 and C11 for proper response. Adjust C7 for maximum gain at midpoint of the curve. Repeat if necessary until the proper response is obtained.

Set the receiver channel switch to channel 13.

Adjust the signal generator to the channel 13 oscillator frequency 257 mc.

Turn the fine tuning control fully clockwise.

Adjust L49 to obtain an audible beat. Slightly overshoot the adjustment of L49 by turning the slug an additional turn in the same direction from the original setting, then reset the oscillator to proper frequency by adjusting C27 to again obtain the beat.

Set the sweep generator to channel 13.

From the signal generator, insert channel 13 sound and picture carrier markers, 211.25 mc. and 215.75 mc.

Adjust L36 and L20 for proper response as shown in figure 18.

Turn off the sweep and signal generators.

Connect the "VoltOhmyst" to the tuner test point TP1.

Check the oscillator injection voltage to be within limits as previously specified. Adjust if necessary to bring within range.

If it was necessary to readjust C22, turn the sweep and signal generators back on and recheck the channel 13 response. Readjust L36 and L20 if necessary.

Set the receiver channel selector switch to channel 8 and readjust C27 for proper oscillator frequency, 227 mc.

Set the sweep generator and signal generator to channel 8.

Readjust C21, C16, C11 and C7 for correct curve shape, frequency and band width.

Turn off the sweep and signal generators, switch back to channel 13 and check the oscillator injection voltage at TP1 if C21 was adjusted in the recheck of channel 8 response.

If the initial setting of the oscillator injection trimmer was far off, it may be necessary to adjust the oscillator frequency and response on channel 8, adjust the oscillator injection on channel 13 and repeat the tracking procedure several times before the proper setting is obtained.

Turn off the sweep generator and switch the receiver to channel 6.

Adjust the signal generator to the channel 6 oscillator frequency 129 mc.

Set the fine tuning control to the center of its mechanical range.

Adjust L54 for an audible beat. Adjust L48 and L32 for proper curve shape as shown in figure 18. Recheck the oscillator injection voltage at TP1, to insure that it is within the limits specified. Readjust C22 if necessary.

If C22 required adjustment, switch the receiver and the signal generator to channel 8. Readjust C21 for correct curve shape and recheck C27 and C25 for proper oscillator frequency.

Check the response of channels 2 through 6 by switching

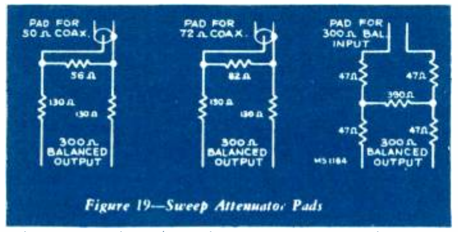


Figure 19—Sweep Attenuator Pads

the receiver channel selector, sweep generator and marker generator to each of these channels and observing the response and oscillator injection voltage obtained. See figure 18 for typical response curves. It should be found that all these channels have the proper response with the markers above 80% response.

If the markers fail to fall within this requirement readjust L48 and L32 in order to obtain curves within the proper limits.

Switch the channel selector, signal generator and marker generator through channels 7 to 13 and observe the response curves, referring to figure 18 for proper wave shape. Check the injection voltage at each channel to be within limits. If necessary readjust C11, C21 or C16 to obtain the proper response.

With the receiver and signal generator on channel 13 adjust L49 for an audible beat with the signal generator.

Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator slug to obtain the audible beat. It should be possible to adjust the oscillator to obtain the audible beat on each channel. Recheck the oscillator injection voltage on each channel to verify that the voltage is within the specified limits.

UHF ALIGNMENT.—Ground the I-F transformer L307 by inserting a clip lead through the aperture provided in the top of the tuner. Ground the other end of the clip lead to the tuner case.

Connect the oscilloscope to the test point TP301, employing the preamplifier if needed with the oscilloscope used.

Connect the output of the UHF sweep generator, through a 300 ohm attenuator pad, to the antenna terminals and set the sweep generator to sweep channel 83, centered on 887.5 mc. Adjust the output of the sweep generator to full sweep width.

A test dial made to fit over the split gear on the tuner shaft is necessary for accurate alignment. Scribe marks at 0°, 9° and 168° should be marked on the test dial for reference. The 0° reference point is located with the capacitor plates fully meshed. By placing a 1/16" shim between the stop pin on the tuner and the stop plate on the gear assembly the plates will be in the proper fully meshed position.

Rotate the tuning dial to the 168°, Channel 83, position.

Connect the VHF signal generator in series with a 1000 ohm resistor to the rear terminal of the crystal holder and insert markers for 41.25 mc., 43.5 mc. and 45.75 mc.

Connect the UHF marker generator loosely to the antenna terminals and insert a marker at 887.5 mc.

Adjust R-F trimmer capacitors C315 and C316 for a maximum amplitude overcoupled response curve centered at 887.5 mc. as shown in figure 11(A).

Adjust the oscillator trimmer capacitor C307 until the 43.5 mc. marker coincides with the marker at 887.5 mc. The markers for 41.25 and 45.75 should be symmetrically located on the top of the response curve as in figure 11(A).

Set the UHF sweep and marker generators to 473.5 mc. Rotate the tuning dial to the 9°, Channel 14, position.

Adjust R-F coils L1 and L2 for a maximum amplitude over-coupled curve centered at 473.5 mc. as shown in figure 11(B). Adjust the oscillator trimmer C308 until the 43.5 mc. marker coincides with the 473.5 mc. marker, with the 41.25 and 45.75 markers as shown.

Repeat the above adjustments, as necessary, until the proper responses are obtained. Tune through the entire range and check the tracking. When perfectly tracked the three markers will be on the top of the response curves, however, mistracking to the extent that the 41.25 mc. and 45.75 mc. ride down the sides of the curves to a point not less than 70% will not seriously affect the alignment. Should the markers fall below this level, it will be necessary to knife the RF plates to correct the mistracking. The plates may be knifed through the two holes provided on the left side of the tuner. Always knife the plates while tuning lower in frequency to prevent affecting the tracking above the point of knifing. Check which section requires knifing by touching the plates with the knifing tool while observing the response, then proceed with the knifing of the proper section or of both sections if required.

Connect the "VoltOhmyst" to test point TP301. Set the "VoltOhmyst" to the 1.5v. DC scale. Tune over the entire range observing the reading on the meter. A reading between .05 and .4 volts should be obtained. Voltages outside these limits are an indication of low B voltage, low or high crystal impedence or an oscillator tube outside allowable limits.

Connect the "VoltOhmyst" to the "bias" terminal of the tuner (refer to figure 9). A reading between 0.5 and 2.5 volts should be obtained. Readings above or below this range will cause crystal currents outside allowable limits and in such cases the oscillator tube should be replaced. Replacement of the oscillator tube will require recalibration at the high and low frequency ends of the band as previously outlined.

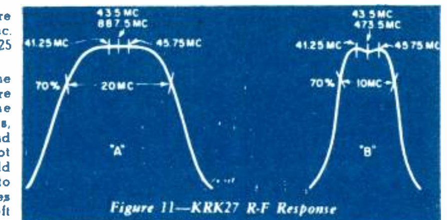


Figure 11—KRK27 R-F Response

VOLTAGE CHART

The following measurements represent [illegible] conditions. In the first condition a 15,000 micro-volt test pattern signal was fed into the receiver, the picture synced and the AGC control properly adjusted. The second condition was obtained by removing the antenna leads and short circuiting the receiver antenna terminals. Voltages were measured with a type WV97A senior VoltOhmyst between the indicated terminal and chassis ground and with the receiver operating [illegible] volts [illegible] cycles a-c. The symbol [illegible] means less than [illegible].

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	Notes on Measurements
V1 KRK29 or KRK29A	6BQ7A	R F Amplifier	15000 Mu V Signal	6	170			8	1	7		
			No Signal	6	133			8	1	7		
		R F Amplifier	15000 Mu V Signal	1	270			3	17	2		
			No Signal	1	260			3	133	2		
V2 KRK29 or KRK29A	6X8	Mixer	15000 Mu V Signal	9	160	8	160	6	0	7	2.4 to 3.0	
			No Signal	9	145	8	145	6		7	2.8 to 3.5	
		R F Oscillator	15000 Mu V Signal	3	95			6		2	3.8 to 5.5	
			No Signal	3	90			6		2	[illegible] to 5.1	
V101	6AU6	1st Sound I F Amp	15000 Mu V Signal	5	122	6	138	7	1.01	1		
			No Signal	5	113	6	[illegible]	7	.95	1		
V102	6AU6	2nd Sound I F Amp	15000 Mu V Signal	5	210	6	131	7	0	1	2.5	*Unreliable measuring point. Voltage depends on noise
			No Signal	5	205	6	122	7		1	*.12	
V103	6AL5	Ratio Detector	15000 Mu V Signal	7	1.7			1	21			7.5 kc deviation at 1 Kc cycles
			No Signal	7	4.1			1	11.8			
		Ratio Detector	15000 Mu V Signal	2	1.7			5	21			
			No Signal	2	4.1			5	11.8			
V104	6AV6	1st Audio Amplifier	15000 Mu V Signal	7	78			2	0	1	.7	At min. volume
			No Signal	7	76			2	0	1	.65	At min. volume
V105	6K6GT	Audio Output	15000 Mu V Signal	3	205	4	220	8	15.2	5		At min. volume
			No Signal	3	198	4	207	8	14.5	5	0	At min. volume
V106	6CF6	1st Pix I F Amplifier	15000 Mu V Signal	5	218	6	240	2	132	1	8.2	*Unreliable measuring point. Make measurement at T104 B
			No Signal	5	95.5	6	105	2	1.18	1	*.1	
V107	6CF6	2nd Pix I F Amplifier	15000 Mu V Signal	5	222	6	243	2	1		8.45	
			No Signal	5	95.5	6	1.5	2	153	1	.01	
V108	6CB6	3rd Pix I F Amplifier	15000 Mu V Signal	5	138	6	150	2	2.3	1		
			No Signal	5	130	6	143	2	2.2	1	.1	
V109A	12AU7	Picture 2nd Det	15000 Mu V Signal	1	25.8			3		2	.85	
			No Signal	1	14			3		2	.6	

VOLTAGE CHART

Tube No.	Tube Type	Function	Operating Condition	E Plate Pin No.	E Plate Volts	E Screen Pin No.	E Screen Volts	E Cathode Pin No.	E Cathode Volts	E Grid Pin No.	E Grid Volts	Notes on Measurements
V109B	12AU7	Horiz Sync Separator	15000 Mu V Signal	6	260			8	160	7	122	
			No Signal	6	255			8	105	7	94.5	
V110A	6X8	Video Amplifier	15000 Mu V Signal	9	120	8	147	6	9	7	1.65	AGC control set for normal operation
			No Signal	9	95	8	138	6	1.35	7	.6	AGC control set for normal operation
V110B	6X8	Vert Sync Separator	15000 Mu V Signal	3	79			6	90	2	26.8	
			No Signal	3	46.5			6	1.35	2	2.1	
V111A	12AU7	Video Output	15000 Mu V Signal	6	231			8	13	7		
			No Signal	6	225			8	12.5	7		
V111B	12AU7	AGC Amplifier	15000 Mu V Signal	1	55			3	135	2	125	
			No Signal	1	0.3			3	132	2	68	
V112A	6SN7GT	Sync Output	15000 Mu V Signal	1	83			3	0	2	3.8	
			No Signal	1	84			3	0	2	1.3	
V112B	6SN7GT	Vertical Oscillator & Discharge	15000 Mu V Signal	1	80			8	0	7	63.5	Depends on setting of Vert. hold control
			No Signal	6	182			8	0	7	64	Voltages shown are synced pix adjustment
V113	6K6GT	Vertical Output	15000 Mu V Signal	3	253	4	262	8	0	5	28.8	
			No Signal	3	245	4	253	8		5	27.5	
V114	6SN7GT	Horizontal Osc Control	15000 Mu V Signal	2	175			3	3.5	1	21	
			No Signal	2	177			3	5.5	1	17.5	
	6SN7GT	Horizontal Oscillator	15000 Mu V Signal	5	183			6	0	4	67	
			No Signal	5	179			6	0	4	65	
V115	6BQ6GT	Horizontal Output	15000 Mu V Signal	Cap	*	4	193	8	22	5	14	*High Voltage Pulse Present
			No Signal	Cap	*	4	185	8	[illegible] 5	5	13.5	*High Voltage Pulse Present
V116	1B3GT or 8016	H V Rectifier	15000 Mu V Signal	Cap	*			2 & 7	18,700			*High Voltage Pulse Present
			No Signal	Cap	*			2 & 7	18,350			*High Voltage Pulse Present
V117	6AX4GT	Damper	15000 Mu V Signal	5	261			3	*			*High Voltage Pulse Present
			No Signal	5	253			3	*			*High Voltage Pulse Present
V118	21EP4	Kinescope	15000 Mu V Signal	Cap	18,700	10	428	11	44.5	2	0	At average Brightness
			No Signal	Cap	18,350	10	425	11	39.5	2	0	At average Brightness
V119 V120	5U4G 5Y3GT	Rectifiers	15000 Mu V Signal	4 & 6				2 & 8	277			
			No Signal	4 & 6				2 & 8	271			

ELECTRICAL AND MECHANICAL SPECIFICATIONS

PICTURE SIZE 227 square inches on a 21EP4 Kinescope

TELEVISION R-F FREQUENCY RANGE

Models 21-S-354 & 21-S-362

All 12 television channels, 54 mc. to 88 mc., 174 mc. to 216 mc.

Models 21-S-354U & 21-S-362U

Any of 70 UHF channels 470 mc. to 890 mc.

Any of 12 VHF channels, 54 mc. to 88 mc., 174 mc. to 216 mc.

INTERMEDIATE FREQUENCIES

Picture I-F Carrier Frequency 45.75 mc

Sound I-F Carrier Frequency 41.25 mc.

POWER RATING 215 watts

AUDIO POWER OUTPUT RATING 4 watts max

VIDEO RESPONSE To 3.5 mc

SWEEP DEFLECTION Magnetic

FOCUS Magnetic

ANTENNA INPUT IMPEDANCE

Models 21-S-354 & 21-S-362

Choice. 300 ohms balanced or 72 ohms unbalanced.

Models 21-S-354U & 21-S-362U

UHF—300 ohms balanced.
VHF—300 ohms balanced.

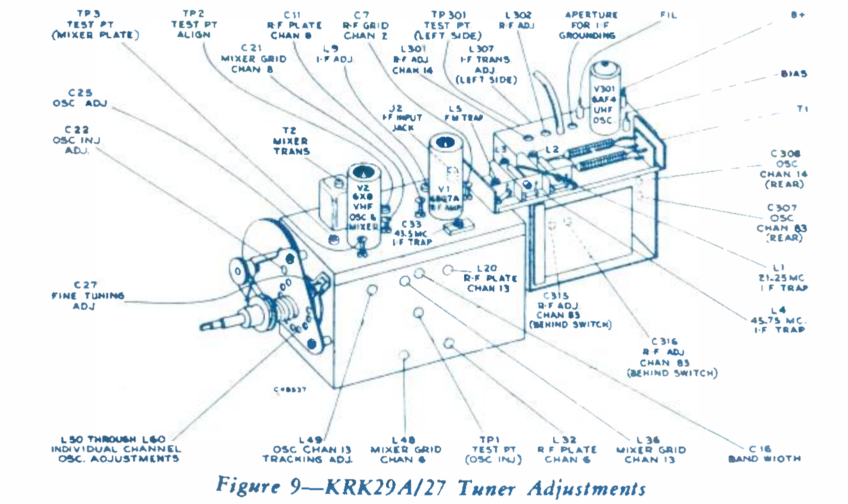
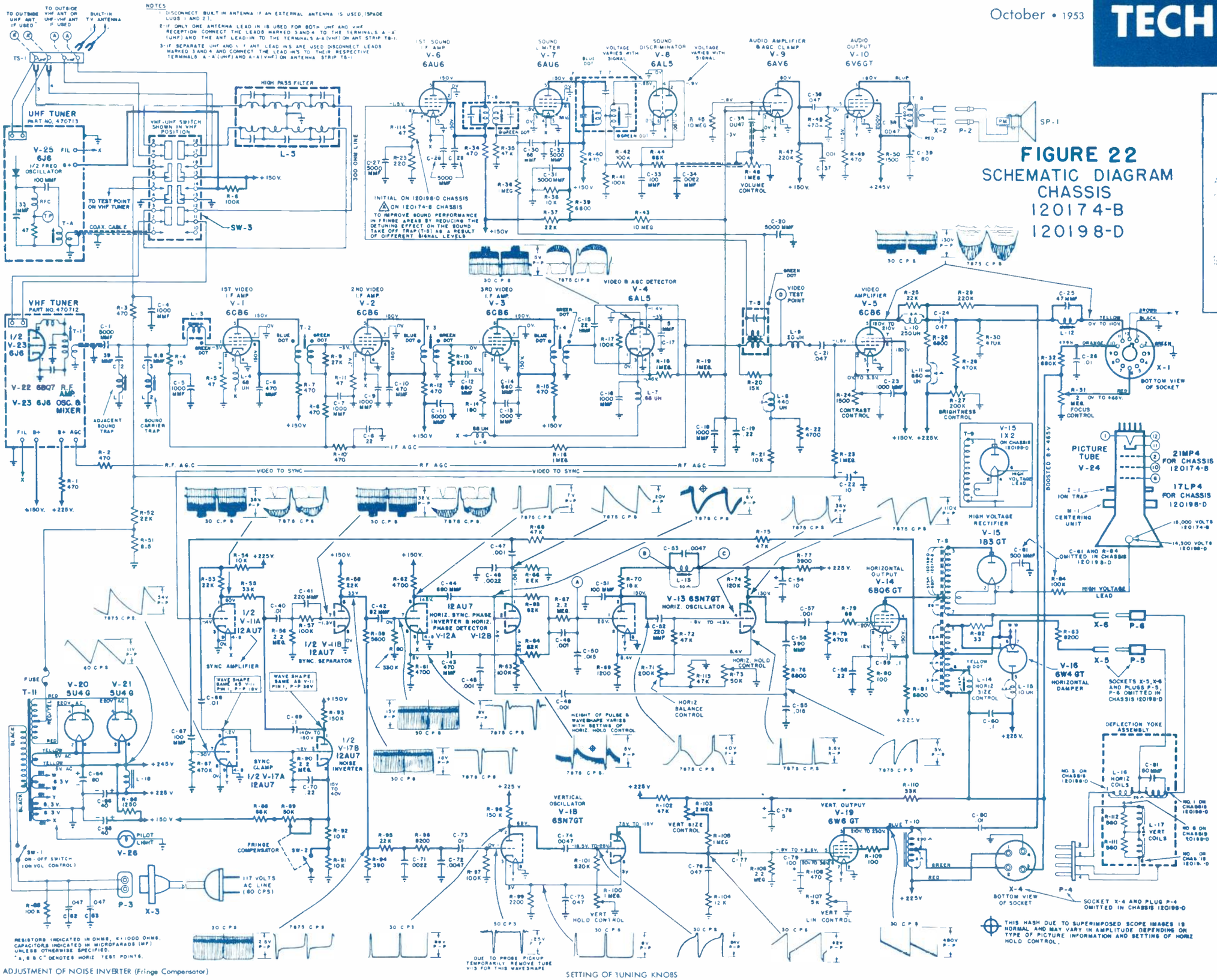
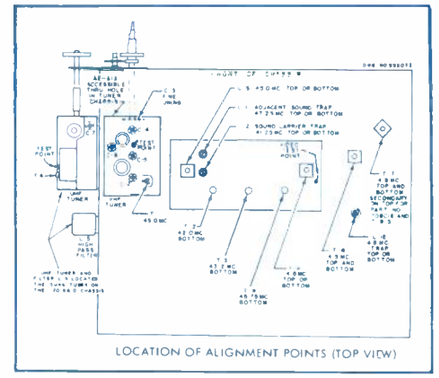


Figure 9—KRK29A/27 Tuner Adjustments

FIGURE 22
SCHEMATIC DIAGRAM
CHASSIS 120174-B 120198-D





GENERAL INSTALLATION INSTRUCTIONS

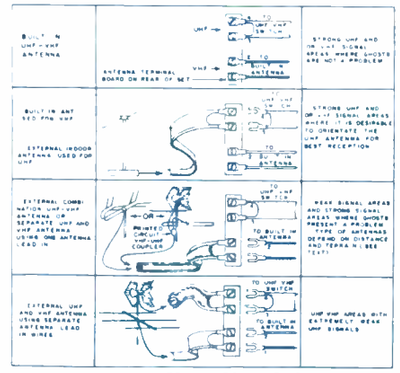
ANTENNA

This chassis is designed to operate from either its built in UHF-VHF antenna, an external combination UHF-VHF antenna or separate UHF and VHF antennas using one or two sets of antenna lead in wires.

This set os delivered is ready to operate from its built in UHF-VHF antenna. In most strong UHF-VHF signal areas this will suffice.

If it is necessary to install an external antenna, disconnect the built in antenna by removing the spade lugs (1 and 2) from the VHF antenna terminals.

If one antenna lead in is used for both UHF and VHF reception, it should be connected to the VHF input terminals. When the receiver is set for UHF reception, the UHF-VHF switch automatically transfers the single antenna lead in to the input of the UHF tuner removing it from the VHF tuner. This transfer will only take place providing the jumper twin lead connected to terminals 7 and 16 of the UHF-VHF switch is also connected to the UHF input antenna terminal strip by means of spade lugs 3 and 4.



ANTENNA CONNECTIONS

ADJUSTMENT OF NOISE INVERTER (Fringe Compensator)

1) Be sure the miracle picture lock has been properly adjusted (horizontal hold circuits).
2) Tune in a weak station. Turn fringe compensator switch to the "ON" position and adjust the fringe compensator control for best picture stability.
3) Try all channels and readjust fringe compensator if necessary for best overall picture stability.

NOTE: In most locations this added protection will not be necessary and the fringe compensator should remain in the "OFF" position. If this is not done, picture wiggle and or vertical roll might result in strong signal areas.

SETTING OF TUNING KNOBS

1) Make sure chassis has been adjusted in the cabinet so that the tuning shafts are perfectly centered through the cabinet hole
2) Insert fine tuning knob on shaft and rotate fully counter clockwise (no further rotation of outer U.H.F. dial shaft).
3) Remove fine tuning knob and insert the U.H.F. dial (contains U.H.F. channel Nos.) on U.H.F. dial shaft. Set the scribed line at 12 o'clock before placing on shaft. Do not twist or turn when inserting U.H.F. dial. The scribe line is a hair thickness and is located about 3/16" to the right of the heavy black line near 0 of channel 20
4) Place fine tuning and selector knobs on their respective shafts

NOTE: Leave enough space between knobs so that there will not be any binding

Chassis 120174-B:
models 752A, 755A, 784A

Chassis 120198-D:
models 753F, 785C, 785E

EMERSON
Chassis 120174-B
120198-D

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EMERSON
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120198-D

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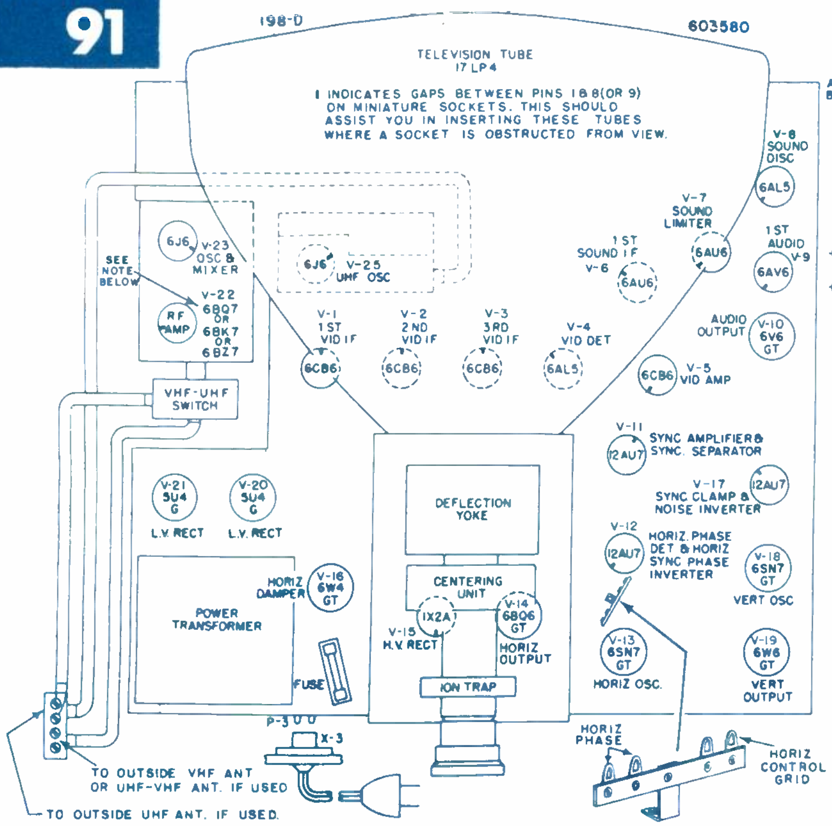
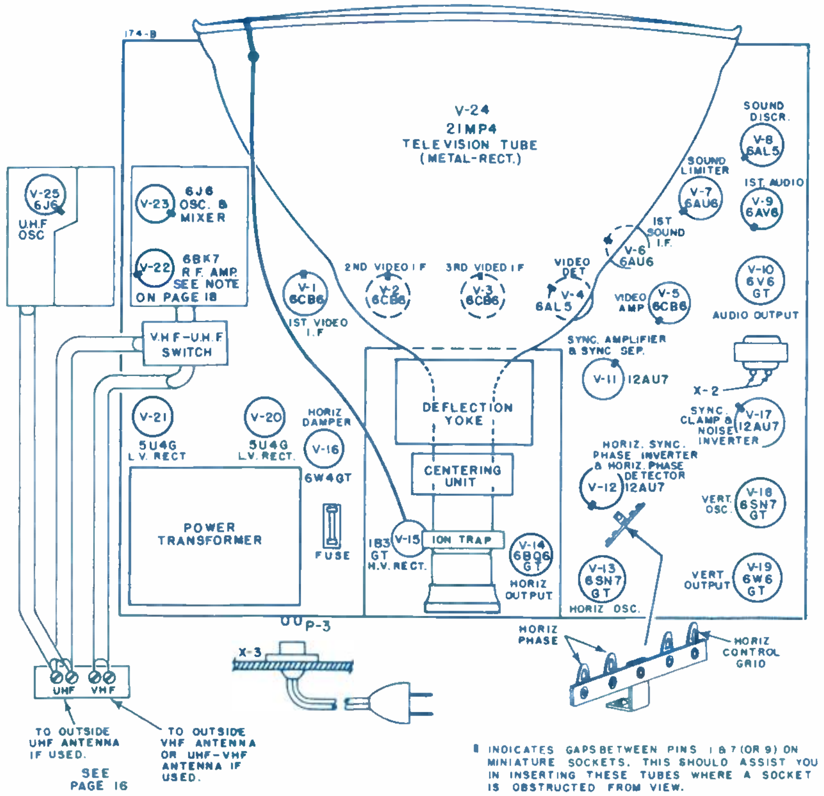
91

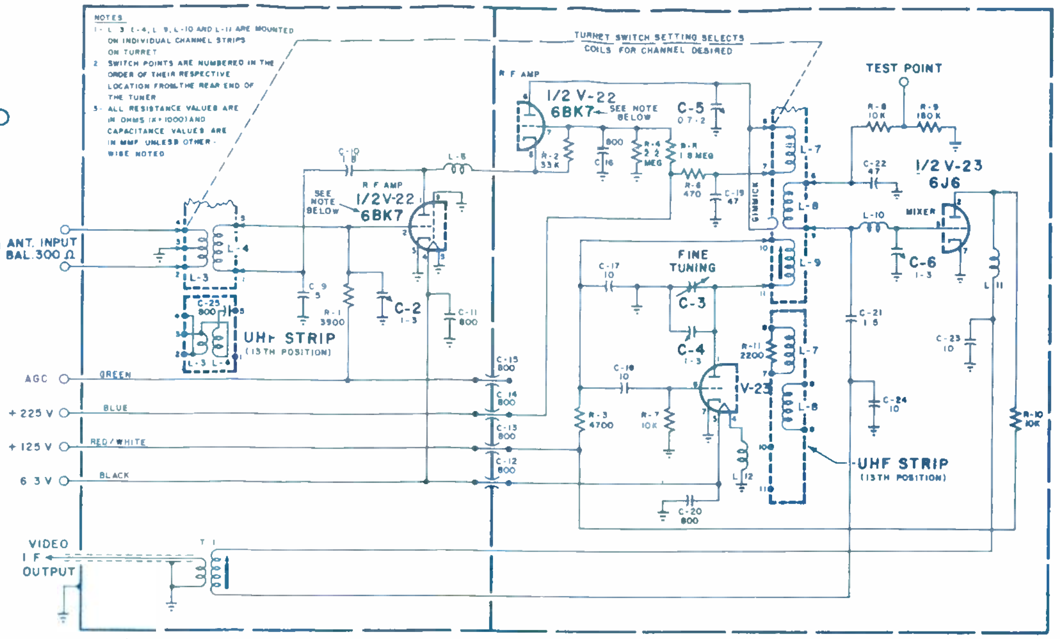
TUBE LOCATIONS DIAGRAM FOR CHASSIS 120198-D



NOTE: THE R F AMP TUBE PRESENTLY USED IS A 6BK7 IN THE FUTURE A 6BQ7, 6BQ7A OR A 6BZ7 MAY BE USED. THESE THREE TUBES ARE INTERCHANGEABLE, BUT DUE TO POSSIBLE VARIATIONS IN INTERELECTRODE CAPACITIES, SEVERAL TUBES MAY HAVE TO BE TRIED FOR BEST RESULTS.

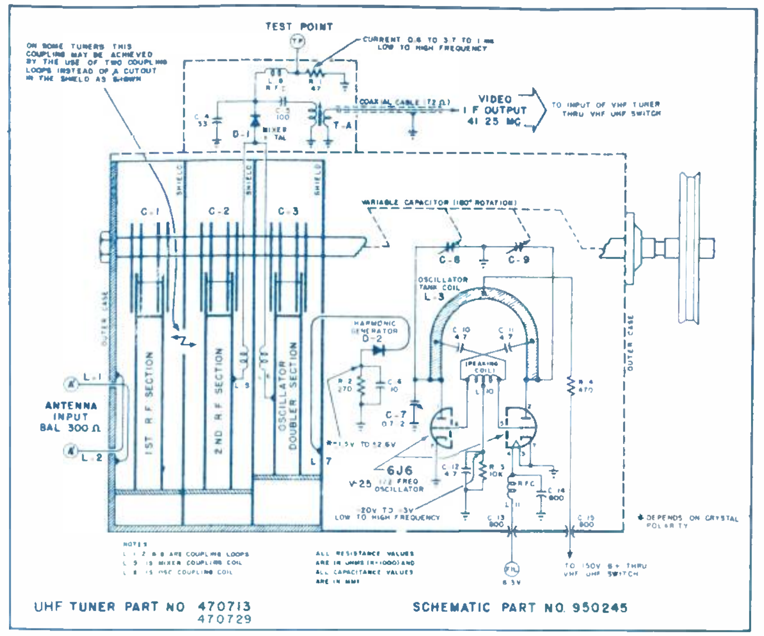
TUBE LOCATIONS DIAGRAM FOR CHASSIS 120174-B





NOTE THE R F TUBE PRESENTLY USED IS A 6BK7, IN THE FUTURE A 6BQ7, 6BQ7A OR A 6BZ7 MAY BE USED. THESE THREE TUBES ARE INTERCHANGEABLE, BUT DUE TO POSSIBLE VARIATIONS IN INTERELECTRODE CAPACITIES, SEVERAL TUBES MAY HAVE TO BE TRIED FOR BEST RESULTS.

SCHEMATIC DIAGRAM OF VHF TUNER 470712



SCHEMATIC DIAGRAM UHF TUNER 470713 470729

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS

The resistance measurements listed below are for chassis 120174B and 120198D with no triangle code markings.

Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above.

The picture tube, deflection yoke and high voltage circuits were connected to take the following readings and waveshapes.

1. Antenna disconnected and antenna terminals shorted on tuner and connected to chassis (use short leads).
2. Line voltage 117 volts (Disconnect power for resistance readings).
3. 3 volt bias battery connected to both I.F. and R.F. A.G.C. circuits, positive terminal to chassis, negative terminal to junction of R-19, C-19, C-18. Add a jumper wire from this junction to junction of R-16, C-8, R-10 so that bias battery is also applied to I.F. A.G.C. BIAS BATTERY USED FOR VOLTAGE READINGS ONLY.
4. All controls in position for normal picture. (Varied when it directly effects reading).
5. All measurements taken with a vacuum tube voltmeter and ohmmeter.
6. All readings listed in tables were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
8. N.C. denotes no connection.

WAVE SHAPE ANALYSIS CHART FOR CHASSIS 120174B AND 120198D

The information listed below was taken from a chassis with no triangle code markings.

Slight peak to peak voltage differences may be noticed if chassis is not triangle code marked as mentioned above.

The wave shapes shown here are arranged so as to give the serviceman an easy method of signal tracing. The peak to peak voltage given may vary slightly depending on signal strength and component variations.

To accurately observe the wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong wave shape readings. This is accomplished by using an Emerson low capacity probe as outlined previously in the service note for models 686L, 687L, and 696L using chassis 120142-R which was issued at an earlier date.

Connect antenna and tune receiver to channel where best reception has been obtained in the past.

Low end of the probe is connected to CHASSIS and the contrast control is set at MAXIMUM CONTRAST.

The 30 and 7875 C.P.S. oscilloscope sweep settings are used so as to permit the serviceman to observe two cycles of the wave shape.

NOTE: A wave shape seen in your oscilloscope may be upside down from same wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.

RESISTANCE READINGS FOR CHASSIS 120174-B AND 120198-D

SYMBOL	TUBE PIN NUMBERS											
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12
V-1	1 meg.	47	.2	0	†15K	†15K	0					
V-2	1 meg.	47	.2	0	†15K	†15K	0					
V-3	0	180	.2	0	†15K	†15K	0					
V-4	0	1 meg.	.2	0	100K	0	4.7K					
V-5	1 meg	Contrast 10 - 1.5K	.2	0	†21K	†15K	Contrast 10 - 1.5K					
V-6	1 meg.	0	0	.05	†15K	†15K	220					
V-7	47K	0	0	.05	†15K	8.5K	0					
V-8	0	100K	0	.05	170K	0	100K					
V-9	10 meg.	0	0	.05	1.8 meg.	1.8 meg.	215K					
V-10	N.C.	.05	†14K	†14K	470K	Volume Cont 0 - 200K	0	470				
V-11	†47K	15K	0	.05	.05	6K	2.5 meg.	0	0			
V-12	22K	280K	110K	0	0	†15K	330K	5K	.05			
V-13	2.2 meg	†32K	1.2K	Horiz Hold Control 100K - 150K	150K	1K	.05	0				
V-14	N.C.	0	N.C.	†22K	500K	N.C.	.05	110	Plate Cap of 6BQ6 †105K			
V-15	PIN 2 AND 7 INFINITE, PLATE †105K											
V-16	N.C.	N.C.	†105K	N.C.	†15K	N.C.	†105K	†105K				
V-17	160K	2 meg	Fringe Compen 17K to 9K to 10K	0	0	2 meg	470K	0	.05			
V-18	100K	180K	2K	Vert Hold Control 900K - 1.9 meg	Vert Size Control 1 meg. - 2.8 meg.	2.3K	.05	0				
V-19	N.C.	0	†15K	†15K	2.2 meg	260K	.05	Vert Lin Control 470 - 5.5K				
V-20	N.C.	†15K	N.C.	22	N.C.	22	N.C.	†15K				
V-21	N.C.	†15K	N.C.	22	10	22	N.C.	†15K				
V-24	0	0	N.C.	N.C.	N.C.	†Focus Control 0 to 470K to 90K	N.C.	N.C.	N.C.	600K	Brightness Control 200K to 280K	.05

† Varying resistance – wait until meter settles (about 30 seconds)

TROUBLE SHOOTING CHART (UHF TUNER)

Component		Variations Low to High Frequency	POSSIBLE TROUBLE (If voltage readings not normal)
6J6	B+ Filament R-3	+150V 6.3V A C -20V. to 3V.	C-10, C-15, C-11 shorted, the V H F - U H F switch L-11 open C-14, C-13 shorted R-3 open, C-12 shorted, L-10 open or shorted
D-2 Harmonic Gen Crystal	R-2	[illegible] 5V to [illegible] 6V	Crystal defective, L-7 shorted to chassis, C-7 shorted Voltage polarity depends upon crystal polarity
D-1 Mixer Crystal	Current thru R-1 Insert Millimeter	[illegible] to 1.00 ma (current)	D-1 defective, C-4 shorted, L-6 open

GENERAL TROUBLE SHOOTING INFORMATION (UHF TUNER)

Since the operation of this tuner is dependent almost entirely on its mechanical configuration, all component parts whether lumped constants or transmission line sections, have been manufactured and mounted as rigid as possible. If it is necessary to replace a component, the exact replacement part should be used. Be sure it is mounted in the same position using the same lead lengths as the original. This is very important since at UHF frequencies a small piece of wire has an appreciable inductance. Stray capacitances between components and chassis also tend to effect the circuit's operation to a marked degree.

Due to the simplicity of design and manufacture of this tuner, little trouble is to be expected. In the event that this tuner becomes defective in any way, the trouble shooting chart in this note can be used to good advantage.

If the crystal D-2 is open or shorted, or the oscillator is inoperative, there will be no bias developed across R-2. If replacing D-2 does not rectify this condition, then it can be assumed that the oscillator is not functioning.

REPAIR OF VHF TUNER

The majority of tuner troubles which are not due to defective tubes can usually be detected by a physical examination of the tuner (turret removed), such as burnt resistors, broken parts, bent or dirty contact fingers, cold solder joints, broken socket pins, etc.

If the tuner checks out physically it should then be checked according to the following trouble shooting chart.

It should always be borne in mind that a burnt tuner resistor is usually the result of a shorted condenser or tube.

The part numbers of items which are not generally commercially available are given on the tuner schematic. When replacing parts, leads should be kept as short as possible and components replaced in the same position as the original parts.

More detailed general information on turret tuner repairs can be found in Service Note titled "Emerson Turret Type Tuner #470651" released April 1, 1951.

TUNER TROUBLE SHOOTING CHART VHF TUNER

To take measurements from 6BK7 socket, remove 6BK7 tube but leave 6J6 tube in its socket, likewise when taking measurements from the 6J6 socket leave 6BK7 tube in its socket.

V-22 6BK7 or 6BQ7 or 6BQ7A or 6BZ7	PIN NO.	NORMAL READINGS VOLTAGE	NORMAL READINGS RESISTANCE	POSSIBLE TROUBLES IF READINGS NOT NORMAL
	Pin 1	130V.	1 meg.	(C-9, 3.3 mmf) shorted
	Pin 2	-2.5 V.	1.8 meg.	(R-2, 15K) or (R-1, 47K) open or shorted
	Pin 3	0V	0 Ω	Cold solder joint
	Pin 6	+215V	16 K	(C-5) trimmer shorted, (C-18, C-13) shorted, (L-9) open, (R-8, 470 ohm) open or shorted
	Pin 7	+130 V	1 meg.	(R-3, 330 K), (R-4, 180 K) or (R-5, 100 K) open or shorted, (C-15, 1000 mmf) shorted
	Pin 8	+130 V.	1 meg.	(C-9, 3.3 mmf) shorted
	Pin 9	0V.	0 Ω	Cold solder joint

V-23 6J6	PIN NO	NORMAL READINGS VOLTAGE	NORMAL READINGS RESISTANCE	POSSIBLE TROUBLES IF READINGS NOT NORMAL
	Pin 1	150 V.	16 K	(R-6, 4700 ohm) open or shorted, (C-12, 1000 mmf), (C-16, 10 mmf) or (C-17, 5 mmf) shorted
	Pin 2	150 V.	20 K	(L-13) open, (C-21, 1000 mmf), (C-22, 6.8 mmf) or (C-23, 1000 mmf) shorted, (R-11, 15 K) open or shorted
	Pin 5	0V	190 K	
	Pin 6	0V	8.5 K	(C-16, 10 MMF) shorted
	Pin 7	0V.	0 Ω	Cold solder joint
	Test Point	-1 V to -5 V.	200 K	Oscillator injection voltage varies between channels (low frequency channels have higher injection voltage about -4 v.)

VOLTAGE READINGS FOR CHASSIS 120174-B AND 120198-D

SYMBOL	TUBE PIN NUMBERS											
	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9	Pin 10	Pin 11	Pin 12
V-1	-3V.	.4V.	6.3V. AC	0V.	150V.	150V.	0V					
V-2	-3V.	.7V.	6.3V. AC	0V.	130V.	120V.	0V.					
V-3	0V.	2V	6.3V. AC	0V.	150V.	150V.	0V.					
V-4	0V.	†-1.4V.	6.3V. AC	0V.	†-.45V.	0V.	†-.3V.					
V-5	-1.9V.	0V. to 3.3V.	6.3V. AC	0V.	120V. to 210V.	150V.	0V. to 3.3V					
V-6	-1.3V.	0V.	0V.	6.3V. AC	150V.	150V.	1.4V.					
V-7	†-.5V.	0V.	0V.	6.3V. AC	150V.	55V.	0V.					
V-8	0V.	-.9V.	0V.	6.3V. AC	.05V.	0V.	-.85V.					
V-9	-.9V.	0V.	0V.	6.3V. AC	-3V.	-3V.	80V.					
V-10		6.3V.	190V.	200V.	0V.		0V.	-11.5V.				
V-11	60V.	-.4V.	0V.	6.3V. AC	6.3V. AC	33V.	†-3.3V.	0V.	0V.			
V-12	-.05V.	-.9V.	.25V.	0V.	0V.	145V.	†0V.	8V.	6.3V AC			
V-13	.25V.	150V.	5.4V.	-9V. to -13V.	130V.	5.4V.	6.3V.	0V.				
V-14		0V.		150V.	-20V.		6.3V.	12V.				
V-15	DO NOT MEASURE											
V-16	DO NOT MEASURE				22V.			DO NOT MEASURE				
V-17	Fringe Compen 140V. to 150V.	†-.2V.	15V to 40V	0V	0V	†-.2V	-50V	0V	6.3V AC			
V-18	0V.	68V.	3V.	-18.5V to -25V.	75V to 115V	3V	6.3V. AC	0V				
V-19		0V	210V to 230V.	210V to 230V.	†-9V. to +.25V.		6.3V AC	20V to 36V				
V-20		245V.		220V. AC		220V. AC		245V.				
V-21		245V.		220V. AC		220V. AC		245V.				
V-24	0V.	0V.				0V to 456V.				435V.	0V. to 110V	6.3V AC

‡ Voltage pulsates and varies with noise
† Varies depending on amount of stray pickup

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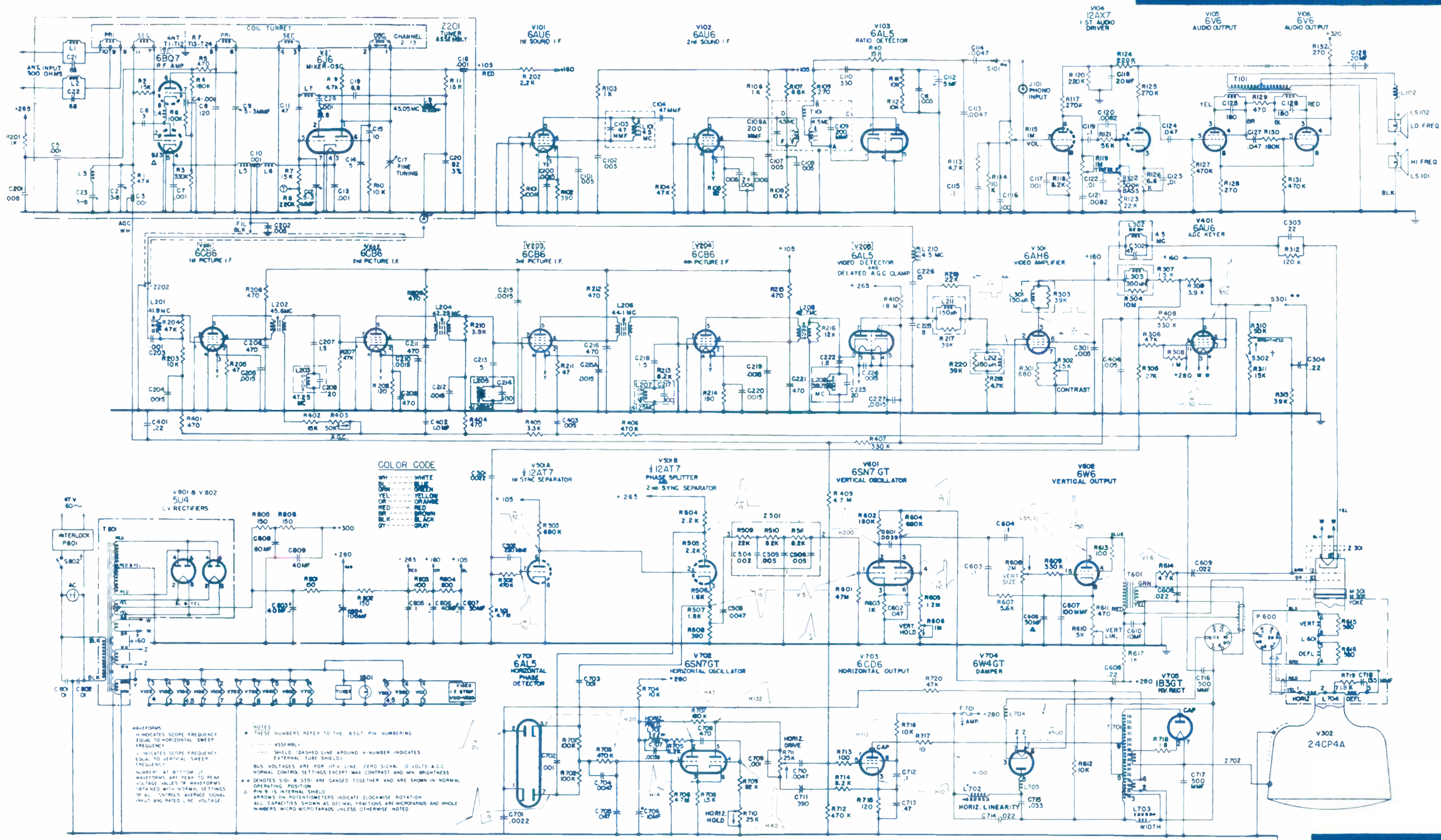
Schematic Diagram for Chassis 403



FOCUS ADJUSTMENTS

Magnetic focusing is being employed in the 400 series chassis. For correct focus adjustment, adjust focus control for maximum focus range. Readjust ion trap after making the initial focus adjustment. Check neck of picture tube, making sure it is in center of focus coil. Because magnetic focusing is being used, the off-on control switch now performs the function of removing the bias from the picture tube so that when the set is turned off, the small electron beam that is present will be out of focus, therefore preventing damage to the face of the picture tube.

HORIZONTAL DRIVE ADJUSTMENT

1. Turn the HORIZ. DRIVE control counterclockwise until a drive bar (thin, light vertical line) appears.
2. Turn the control clockwise until the drive bar just disappears. If no drive bar is obtained, set the control at the maximum counterclockwise position.

HORIZONTAL HOLD CONTROL

The HORIZONTAL HOLD control provides a vernier adjustment for the horizontal multivibrator operating frequency. Proper setting depends on correct adjustment of the HORIZ. FREQ. and HORIZ. DRIVE controls.

Turn the Horizontal Hold control until bending of the top portion of the picture is eliminated. This is best determined by noting the vertical lines in the picture.

HORIZONTAL FREQUENCY CONTROL

1. Turn the Horizontal Hold control to mid-range.
2. Turn the HORIZ. FREQ. control counterclockwise while switching the CHANNEL SELECTOR on and off channel until sync is lost.
3. Turn the control clockwise and check the number of bars which appear just before pull-in of the picture. Check circuit for abnormal operation if less than two bar pull-in occurs.
4. Continue turning control clockwise while switching the CHANNEL SELECTOR on and off channel until sync is lost.
5. Turn the control counterclockwise and check the point where picture pull-in occurs.
6. Turn the control an additional 1 2 turn counterclockwise.

AUTOMATIC GAIN CONTROL

This control and its associated circuits regulate R-F and I-F AGC voltages (within the limits of the AGC system). When the AGC control is turned full clockwise the greatest bias appears on the I-F AGC bus and the lowest bias appears on the R-F AGC bus for a given signal. When the control is reversed the I-F AGC bias voltage is minimum and the R-F AGC bias is maximum for a given signal. This source of high R-F bias is very useful when strong signals cause the video stages to overload, clipping the sync pulses. In very strong signal areas turn the AGC control counterclockwise until loss of sync is eliminated. Do not turn more than necessary because increase bias on the R-F amplifier with simultaneous decrease in I-F bias will lead to excessive noise in the picture after a certain point. Conversely, in weaker signal areas the control should be turned clockwise so that the R-F bias is reduced and the I-F bias is increased. This condition will improve the signal to noise ratio, minimizing "snow", in the picture. Again, do not over control or I-F stages may be overdriven. The optimum point is a function of signal strength. Use picture quality as an indicating device and adjust for optimum performance.

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HOFFMAN
Chassis 403-24
Models 24M725, 24B726, 24P727

Technician
CIRCUIT DIGEST
92

HOFFMAN
Chassis 403-24
Models 24M725, 24B726, 24P727

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CIRCUIT DIGEST
92

Sound I-F Alignment

Equipment: Connect the "hot" lead of the CW signal generator to the grid, pin 1, of V101, the 1st sound I-F tube, through a .005 uf isolating condenser as shown in Figure 4. Tune the generator frequency to 4.5 mc, unmodulated. Connect the voltmeter negative lead in series with a 10K isolating resistor to pin 7 of V103, one plate of the ratio detector, as shown in Figure 5. It is important that the 10K ohm isolating resistor be at the very end of the meter lead to avoid regeneration. Connect the positive voltmeter lead to ground.

Procedure: Adjust L101, L210 and T101 primary (bottom) to obtain a maximum voltmeter reading. The maximum voltage reading should be held at about 4 to 7 volts by decreasing the generator output as the transformer windings are turned to resonance.

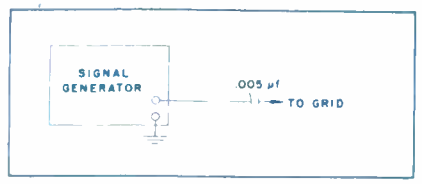


Figure 4. Signal Generator Isolation

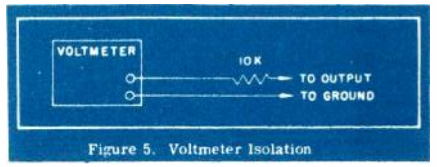


Figure 5. Voltmeter Isolation

Trap and Picture I-F Alignment

TUNING 4.5 MC TRAP

Equipment: Connect the CW generator through the .005 uf isolating condenser, to pin 7 of V205 (plate of video detector) and tune the generator to 4.5 mc. Connect the detector network and voltmeter between ground and the cathode of the picture tube as shown in Figure 6.

Procedure: Tune L302 (4.5 mc trap in plate circuit of video amplifier) for minimum indication on voltmeter.

TUNING 39.75 MC, 41.25 MC, AND 47.25 MC TRAPS

Equipment: Couple the CW generator "hot" lead to the tuner mixer grid. This may be done in several ways. The .5-3 uuf trimmer condenser (C12 in Bulletin 301 of the 1952 Service Manual) located in front of the 6J6 and nearest the contact side of the tuner is connected to pin 5 of the 6J6, the mixer grid. This plate of the trimmer condenser is accessible through

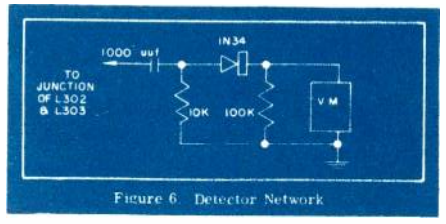


Figure 6. Detector Network

a hole in the side cover plate. The "hot" generator lead may be coupled to this point through a .005 uf isolating condenser, the condenser pigtail being clipped to the trimmer by some convenient means. Another method of coupling the generator is to remove the 6J6, wrap the isolating condenser pigtail around pin 5 of this tube, and replace it in its socket. In either method take care that the pigtail lead does not short to ground. A third method of coupling is to pull the 6J6 tube shield up on the tube until it is not grounded. Clip the "hot" lead of the generator directly to the tube shield. The tube shield and the tube electrodes form a condenser which capacitively couples the signal to the mixer grid. The capacity is much less than .005 uf, and a much higher level of generator output will be required if this method is utilized.

Connect the negative lead of the voltmeter to pin 1 of V301, the video amplifier grid, using the 10K ohm isolating resistor at the end of the lead; connect the voltmeter positive lead to ground. Connect the negative terminal of the 3 volt bias source to the AGC bus; connect the bias source positive lead to ground.

Procedure: Turn the CONTRAST control to its maximum position (extreme clockwise) for remainder of alignment. Tune the traps by setting the trap frequency on the CW generator and adjusting the trap slug for a minimum voltmeter reading. The order of tuning the traps is given in Table III. Keep signal low to avoid overloading I-F circuits.

TUNING PICTURE I-F COILS

Equipment: Instruments and set-up remain the same as for trap alignment during the first part of the procedure. For final adjustment the sweep frequency generator is also used and the voltmeter should be replaced by the oscilloscope. See Figure 7 for oscilloscope isolation details.

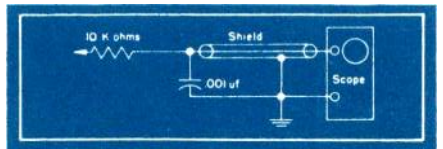


Figure 7. Oscilloscope Isolation

Procedure: Tune the I-F coils by setting the coil frequency on the CW generator and adjusting the coil for maximum voltmeter reading. The CW generator output must be attenuated so that the DC output voltage of the video detector (indicated on the voltmeter), remains at 1 volt as the I-F coils are tuned. The order of tuning is from the last I-F stage toward the tuner. Before tuning the grid coil of the 1st I-F stage, temporarily tune the tuner mixer plate coil for a minimum reading on the voltmeter at 43 mc. After the 1st picture I-F grid coil has been tuned, tune the mixer plate coil to 45 mc and repeat the trap and I-F alignment procedure until no additional change in adjustments is necessary.

When no further change takes place, replace the voltmeter with the oscilloscope and replace the CW generator with the sweep frequency generator. Use the same isolating condenser and input connection to the mixer grid. Loosely couple the CW generator (marker) to the input by clipping or touching the CW generator "hot" lead to the unshielded insulated end of the sweep generator "hot" lead. This will afford a small amount of capacitive coupling. If the CW and sweep generators are contained in the same instrument, it will only be necessary to switch on the sweep frequency generator in order to continue the procedure. Tune the sweep frequency generator to a center frequency of approximately 43.5 mc. Use a sweep width of approximately 10 mc so that the base of each of the two response curve skirts is well within the ends of the oscilloscope trace. Check the overall bandwidth, position of the picture carrier, dip in bandpass, and trappage by using the marker pip to locate frequency points on the response curve. See Figure 8. Tune the CW generator to 45.75 mc. The marker pip should appear at approximately the 50% point on the response curve skirt. Adjust individual coils to give proper bandpass. Adjust 1st I-F to set video carrier (45.75 mc) at 50% (6db) response point. Adjust 2nd I-F to set the 50% (6db) bandwidth point (42 mc) on sound side. Adjust 3rd and 4th I-F coils to eliminate any tilt in the response shape. It should not be necessary to adjust converter or input coil.

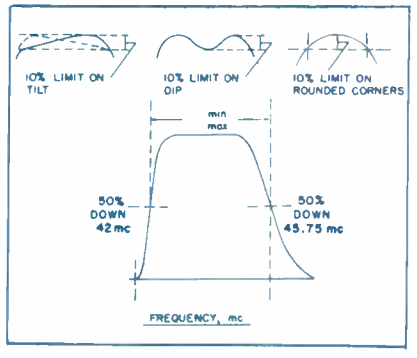


Figure 8. Picture I-F Response Curve

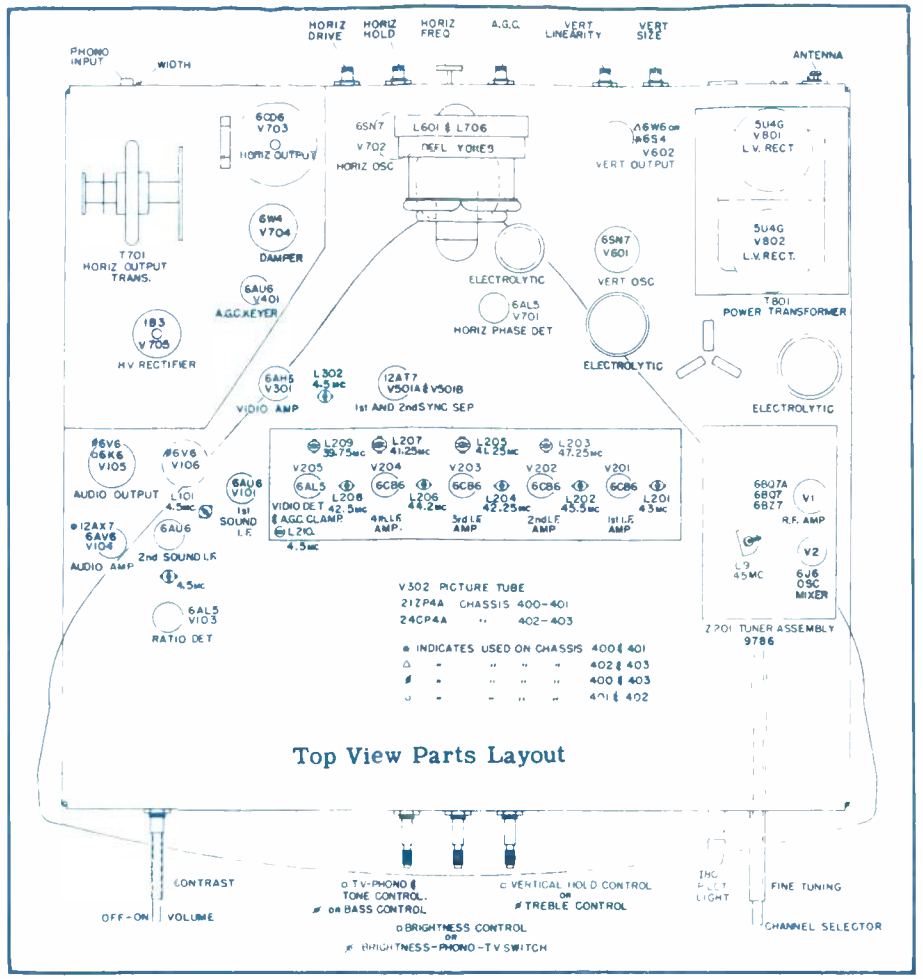
ALL-WAVE TUNER

The 9795 is the All-Wave Tuner. This tuner incorporates a 6BQ7, 6BQ7A or a 6BZ7 for an R-F amplifier; a 6T4 or 6AF4 as a UHF oscillator with a 6U8 acting as a mixer and VHF oscillator. Refer to Figure 12 for complete schematic of the 9795.

SHAFT FUNCTION

1. FINE TUNING - Outer shaft for VHF and UHF oscillators fine tuning.

2. SWITCHING - Center shaft includes nine detent positions, eight for UHF decade coil board strips covering frequency channels 14 to 19; 20; 29; 30 to 39; 40 to 49; 50 to 59; 60 to 69; 70 to 79 and 80 to 83. VHF channels 10 through 13 may be received on first UHF decade position. The ninth position allows VHF reception.



3. SWITCHING - Inner shaft includes twelve detent positions, ten for UHF unit digits (individual channel selection included within the above eight decades), twelve positions for VHF channels 2 to 13.

4. VHF TUNING - To receive VHF channels 2 through 13, set middle section of tuning knob assembly so that "VHF" and channel numbers are directly in front of pilot light. These VHF channel numbers will be found on the inner circle of numbers. To switch VHF channels, rotate front crown control knob only.

5. UHF TUNING - To receive UHF channels, rotate middle section either right or left from VHF position. First half of UHF channel number is controlled by middle knob. Second half of UHF channel number is controlled by front crown knob; example, channel 56 - the middle knob will place the first half of the UHF channel number (5) in front of the pilot light. The front crown knob will place the second half of this UHF channel number (6) in front of the pilot light, thus producing UHF channel 56.

ALL-WAVE I-F ALIGNMENT PROCEDURE - GENERAL

The combination All-Wave tuner contains two sections - the first (front section) contains the UHF portion. The second (rear section) is the usual 12-channel VHF turret tuner. There is one difference in the VHF section, in that it contains a contact board or cascode strip. This provides the equivalent of a 13th position, and is held out when the decade knob is in the VHF position. The units front knob then operates the rear turret from channel 2 to 13. It is also held out when the decade knob is in the 10's position for channels 10, 11, 12 and 13. UHF operation is obtained when the decade center knob is in the 10's position for channels 14 to 19 and for all succeeding decade positions, up to 83.

I-F ALIGNMENT

Set the tuner in the VHF position (on channel 10) and insert a signal at the test point (refer to figure 10) through a .005 capacitor with the proper termination for the generator being used. Use a -3 volts for the AGC bias. Observe the output of the video detector with a 10K resistor and a .001 capacitor isolation network which is connected to the oscilloscope vertical terminals or a voltmeter.

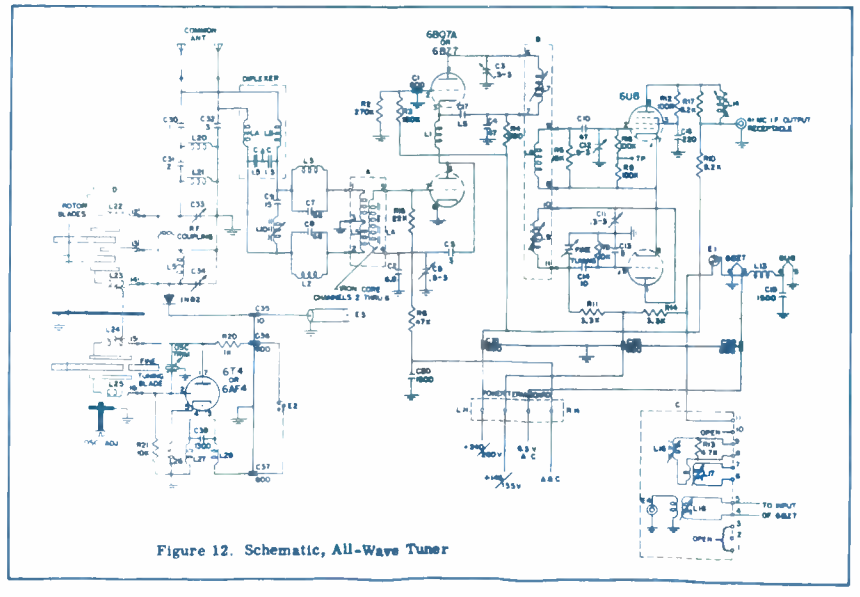


Figure 12. Schematic, All-Wave Tuner

A. Apply a 43 mc signal and align the 1st I-F grid coil until a maximum indication is observed.

B. Apply a 45 mc signal and align the output plate coil (L9) of the tuner for maximum indication. A sweep may then be applied and the I-F touched up for proper response. It is preferable to adjust coils in the I-F strip slightly, rather than accommodate discrepancies in the curve with changes in the settings of the adjustments mentioned in A and B.

R-F ALIGNMENT - Check VHF

Set the tuner to the VHF position on the decade center knob and the units front knob on channel 10. Connect a sweep to the VHF or the antenna point of the diplexer. Note overall wave shape and position of sound in video carrier. Adjust local oscillator slug to proper frequency with fine tuning in center of scale. A bias of 3 volts is applied to AGC during the above operation.

R-F ALIGNMENT - Check UHF

With the tuner at channel 19, with three or four volts of bias on the I-F AGC and three volts of R-F AGC. Connect a UHF sweep to the antenna terminals with the proper dummy termination (300 ohms total.) Observe the output on the video detector with proper isolation network. (10K resistor and a .001 capacitor on scope.) Use a 60 cycle sweep that is phased properly.

A. Check wave shape and operation of channels 14, 21, 31, 41, 51, 61, 71 and 81. These should operate positively and not be intermittent.

B. Note above operation to be made with fine tuner in center of fine tuning range.

NOTE

To adjust VHF local oscillators, place tuner in VHF position, remove knobs, place fine tuner in middle of range so VHF local oscillators can be reached with proper alignment tool through UHF unit.

To adjust UHF local oscillator, place tuner in UHF position, remove knobs, place fine tuner in middle of range. Rotate units front knob. Adjust front screw head.

TABLE III - TV ALIGNMENT PROCEDURE

STEP NO.	SIGNAL GENERATOR FREQUENCY, MC	CONNECT SIGNAL TO	OUTPUT INDICATOR	ADJUST	INSTRUCTIONS	SPECIAL CONNECTIONS AND SETTINGS
			SOUND I-F AND RATIO DETECTOR			
1	4.5 CW	Pin 1 of V301	Meter between pin 7 of V103 and ground.	T101 Pri. (bottom) L101 L210	Tune for maximum reading on meter.	Signal level should be low enough to obtain approximately 4 to 7 volts on meter. Use isolation networks shown in Figures 5 and 6.
2	4.5 CW	"	Meter across junction of R111 and R112 and switch side of R110.	T101 Sec. (top)	Tune for zero meter reading; use same signal level as in step 1.	Repeat tuning of T101 primary and secondary until adjustments do not change.
			TRAPS AND PICTURE I-F			
3	4.5 CW	Pin 1 of V301	Meter connected through detector network to picture tube cathode lead.	L302	Tune for minimum reading on meter.	Detector and isolating networks shown in Figures 5 and 7.
4	39.75 CW	Mixer grid	Voltmeter across pin 1 of V301 and ground	L209	Tune for minimum reading on meter.	Apply -3V bias to AGC bus. See text for connection to mixer grid. Use isolating resistor between negative voltmeter lead and pin 1 of V301. Keep generator output low. Bias V703 with -60V for remainder of procedure or remove high voltage fuse.
5	41.25 CW	"	"	"	"	
6	41.25 CW	"	"	L205	"	
7	47.25 CW	"	"	L203	"	
8	42.5 CW	Mixer grid	"	L208	Tune for maximum reading on meter	Set CONTRAST control for maximum contrast. Adjust signal level throughout I-F alignment so that a 1 volt DC output is maintained at pin 1 of V301.
9	44.2 CW	"	"	L206	"	
10	42.25 CW	"	"	L204	"	
11	45.5 CW	"	"	L202	"	
12	43 CW	Mixer grid	Voltmeter across pin 1 of V301 and ground.	L201		Temporarily tune mixer plate coil for minimum voltmeter reading at 43 mc.
13	45 CW	"	"	Mixer Plate L9		
14		Repeat steps 4 through 12 until adjustments do not change.				
15	Approximately 43.5 with 10-mc sweep. Marker required.	Mixer grid	High gain scope to pin 1 of V301.	Mixer Plate Coil and L201 1st. Other coils if necessary.	Adjust 1st I-F to set video carrier (47.75 mc) at 50% point. Adjust 3rd and 4th I-F to eliminate any tilt.	See Figure 7 for isolation network. Use markers to determine bandpass between picture carrier and 50% point on opposite skirt. Bandpass should be between 3.8 mc and 3.6 mc. Adjust other I-F coils to obtain proper curve only when absolutely necessary.

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October • 1953

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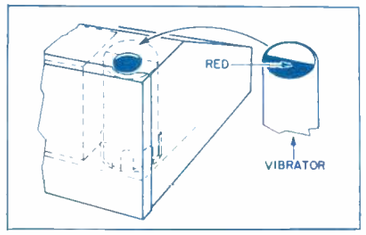
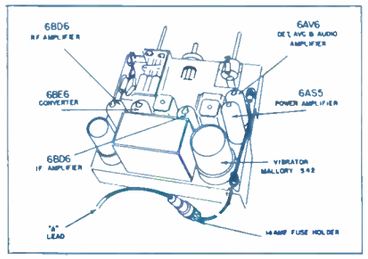
VIBRATOR CAUTION

The vibrator may be inserted in its socket in two ways, depending upon which terminal of the battery is grounded. Make sure the vibrator is inserted correctly before the set is turned on. The vibrator, filter capacitors and vibrator transformer may be damaged if power is supplied to the set with the vibrator inserted incorrectly.

If the positive (+) terminal of the battery is grounded, insert the vibrator so that red mark on the top of the vibrator shows through the hole in the case.

If the negative (—) terminal is grounded, insert the vibrator so that the red mark on the vibrator does not show through the hole in the case.





BENCH PREPARATION

STEP 1. Remove contents from carton.

STEP 2. Refer to reference chart. Locate make and year of car or truck in which receiver is to be installed in the column at the left of the chart. Follow to right across chart for the following information.

Column I — To determine vibrator polarity.

Column II — To determine receiver position for mounting—speaker opening facing up or down. Also if the speaker must be removed from the case and mounted separately.

Column III — To determine mounting position, whether custom or under dash.

Column IV — To determine whether radio opening trim plate must be removed before drilling mounting holes.

Column V — To determine template position on trim plate.

Column VI — To determine which antenna socket should be used.

Column VII — Special instructions and remarks.

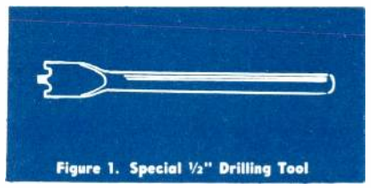


Figure 1. Special ½" Drilling Tool

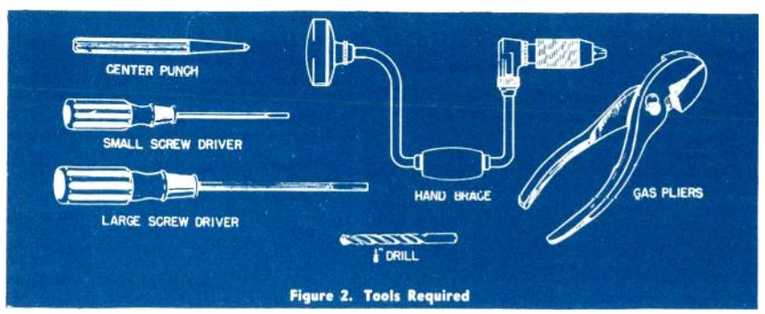


Figure 2. Tools Required

STEP 3. The tool illustrated in Figure 1 is supplied with the receiver. Other tools are necessary and must be obtained for the installation. The other tools required are illustrated in Figure 2.

STEP 4. Refer to Column I in reference chart. The positive (+) or negative (−) signs indicate which terminal of the battery in the car or truck is connected to the chassis or ground. Locate hole above vibrator at rear of case (refer to Fig. 3), and observe whether top of vibrator appears red at opening "A". If the red color is visible, the receiver is ready for installation in any car or truck with the positive battery terminal connected to chassis or ground. Receivers shipped from the factory have the vibrators in this position.

STEP 5. For those cars or trucks with the negative (—) terminal of the battery connected to chassis or ground, the vibrator polarity must be changed. To change the polarity of the vibrator to enable operation with the negative battery grounded, remove the eight (8) hex-head screws holding the chassis to the case. Slide the chassis out of the case and remove the vibrator from its socket and rotate 180 degrees and reinsert in its socket. Refer to Figure 4. In this position the red color will not appear in opening "A", Figure 3.

STEP 6. Before reinstalling the chassis in the case, refer to Column II of the reference chart and note whether the speaker is to be mounted separately.

STEP 7. If the word "separate" appears in column II the speaker must be removed from the case.

(A) Remove speaker from the case by removing the four mounting screws.

(B) Remove speaker leads from the speaker lead connectors. Extend speaker leads by pulling out slack wire which is coiled up near the transformer.

(C) Route speaker leads through holes in speaker opening on the front of the case.

(D) Locate speaker baffle board which is printed on the carton filler and cut out cross-hatch area.

(E) Determine grill opening size of the car or truck.

(F) If the available grill opening is approximately 5" x 7" cut out baffle board "A". If the opening is approximately 6" x 9" cut out baffle board "B". Refer to Fig. 5.

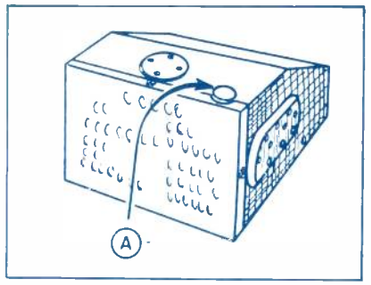


Figure 3. Vibrator Location

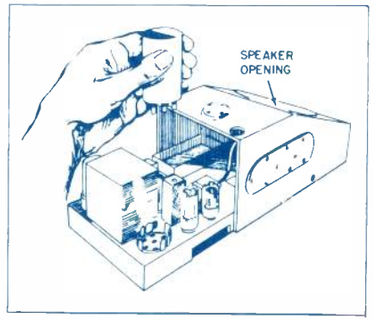


Figure 4. Changing Vibrator

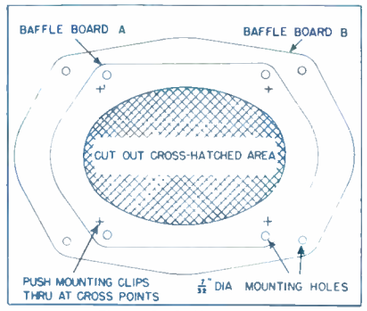


Figure 5. Baffle Board

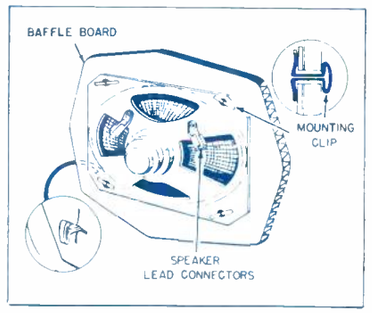


Figure 6. Speaker Mounting

(G) With the four mounting clips, secure the speaker to the baffle board as indicated in Figures 5 and 6.

(H) Install baffle board, with speaker mounted, in the position provided in grill or dash. Connect speaker leads to the speaker lead connectors after the receiver is permanently installed.

STEP 8. Refer to Column III and determine whether the receiver is to be custom or under-dash mounted. Refer to instructions under "Custom Mounting" or "Under-Dash Mounting."

CUSTOM MOUNTING

STEP 1. Refer to Column IV to determine whether the radio opening trim plate must be removed before drilling the mounting holes. Remove trim plate if specified in reference chart.

STEP 2. Refer to Column V to determine template position on radio opening trim plate. Dimensions "A" and "B" are listed which specify the position of the template. Where no dimensions are listed, refer to Column VII for special instructions. Dimension (A) is the distance from the right hand edge of the trim plate to the vertical center line to be scribed. Dimension (B) is the distance from the bottom of the trim plate to the horizontal center line to be scribed. See figure 7.

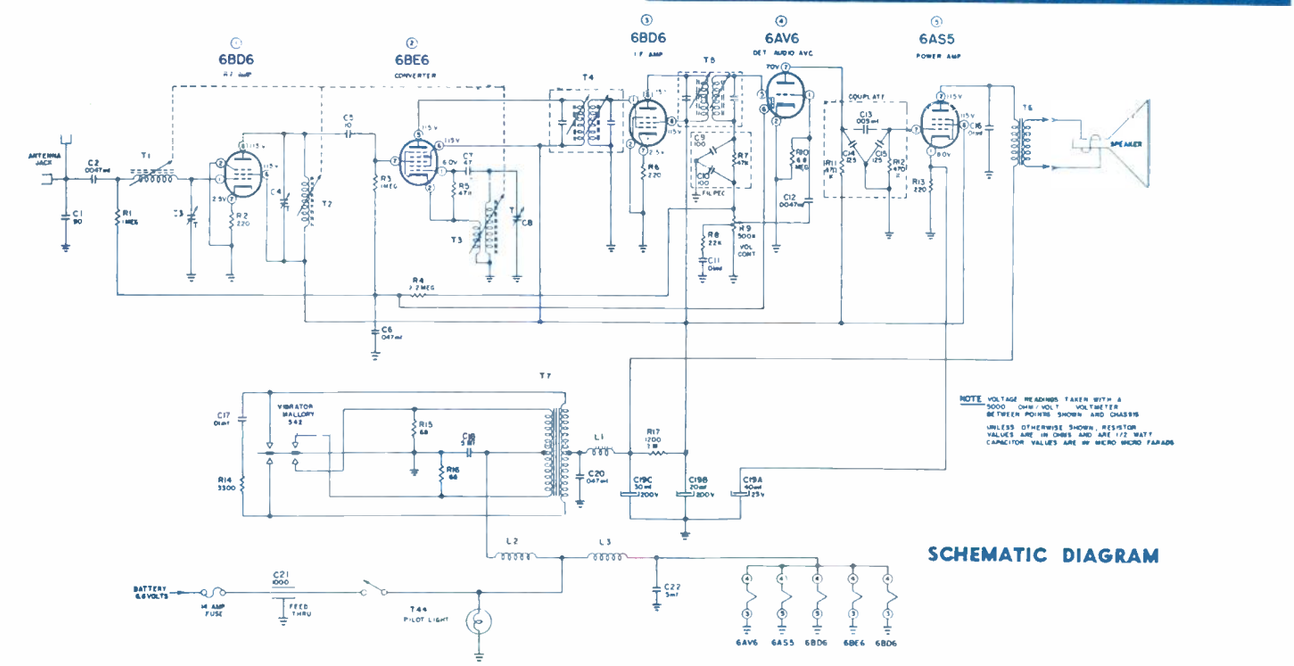
STEP 3. With a pencil mark off or scribe center lines on radio opening trim plate. Refer to Figure 7. Use care not to etch lines in trim plate.

STEP 4. Remove template from envelope and remove back protective covering from template as illustrated in Figure 8. Replace escutcheon in envelope.

STEP 5. Match center lines with scribed lines on radio opening trim plate. Carefully position template on radio opening trim plate. See Figure 9. If template is not properly centered, remove and reposition.

STEP 6. Center punch three holes as indicated on template.

STEP 7. Drill three ⅛" pilot holes.



NOTE VOLTAGE READINGS TAKEN WITH A 5000 OHM/VOLT VOLTMETER BETWEEN POINTS SHOWN AND CHASSIS

UNLESS OTHERWISE SHOWN, RESISTOR VALUES ARE IN OHMS AND ARE 1/2 WATT. CAPACITOR VALUES ARE IN MICRO MICRO FARADS

SCHEMATIC DIAGRAM

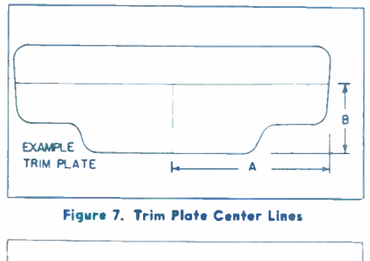


Figure 7. Trim Plate Center Lines

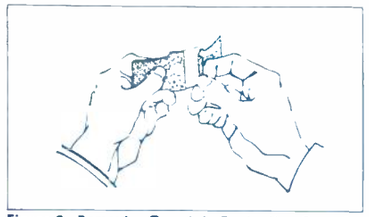


Figure 8. Removing Template Protective Covering

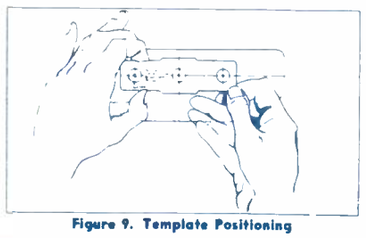


Figure 9. Template Positioning

STEP 8. Drill three ½" holes, using ⅛" holes as center guide and the hand brace with the special ½" drilling tool supplied with kit. Refer to Figure 10.

CAUTION: Use hand brace only when drilling ½" hole.

STEP 9. Adjust nuts on shaft bushings as shown in Figure 11. Approximately ⅜" of the threaded bushing should protrude beyond front surface when receiver is installed into the trim plate.

STEP 10. Refer to Column II to determine whether the speaker opening should face up or down.

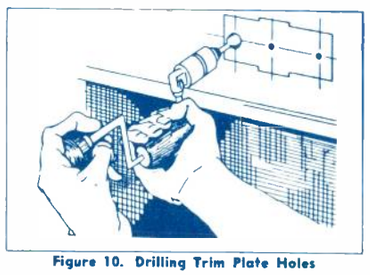


Figure 10. Drilling Trim Plate Holes

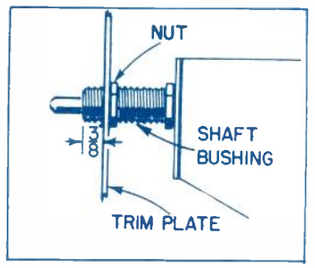


Figure 11. Adjusting Nuts on Shaft Bushing

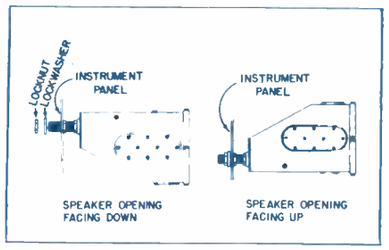


Figure 12. Speaker Opening Position

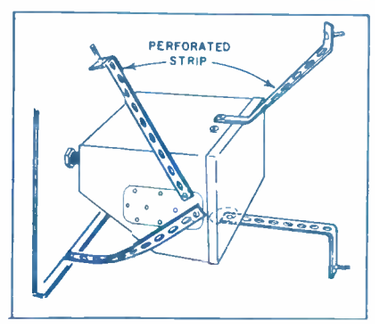


Figure 11. Receiver Mounting

STEP 11. Mount receiver in holes from back of instrument panel with lockwashers and locknut provided. See Figure 12.

STEP 12. Bend perforated strip so that it can support the rear of receiver by fastening to some support bracket nearby or to the firewall by means of the 8-32 screw, nut and washer provided. Mount perforated strip to side or under side of receiver case with #8 x ¼" self tapping screw. Refer to Figure 13.

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Model 35BR-6796A

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SPECIAL INSTALLATIONS

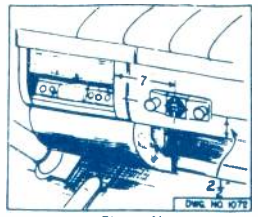

Figure X
1950 Nash

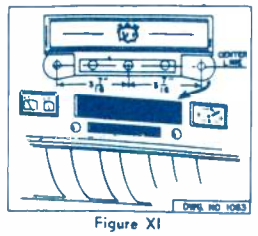

Figure XI
1951-1952 Dodge
(Coronet and Meadowbrook)

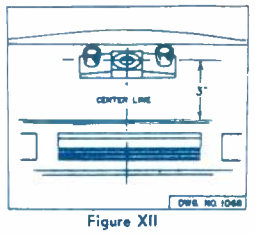

Figure XII
1951 Nash

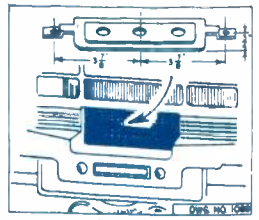

Figure XIII
1949-1950 Plymouth

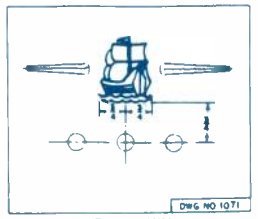

Figure XIV
1951-1952 Plymouth

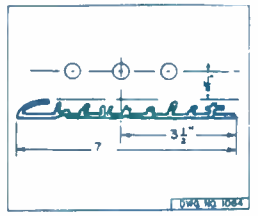

Figure XV
1949-1950 Chevrolet

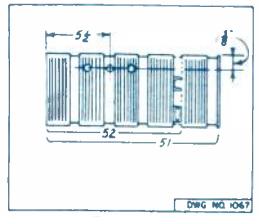

Figure XVI
1951-1952 Dodge
(Wayfarer)

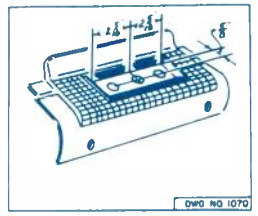

Figure XVII
1951-1952 Kaiser

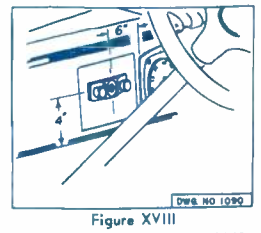

Figure XVIII
1948-1949-1950-1951-1952-1953
Dodge Truck

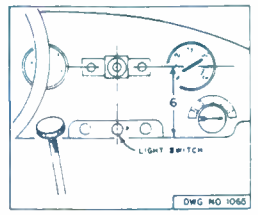

Figure XIX
Reo Truck

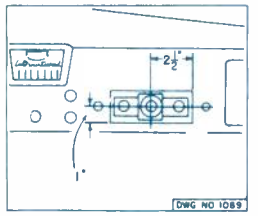

Figure XX
International Truck

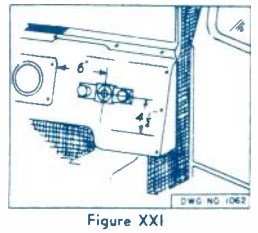

Figure XXI
White Truck Std.

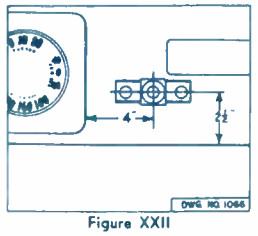

Figure XXII
White Truck

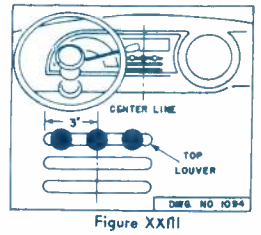

Figure XXIII
1953 Pontiac

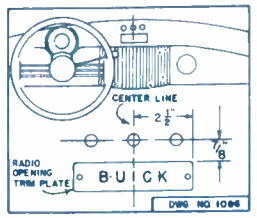

Figure XXIV
1953 Buick Special

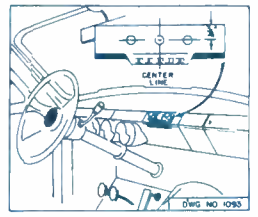

Figure XXV
1953 Studebaker

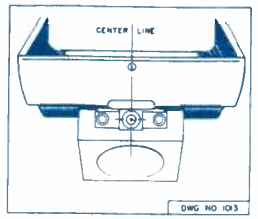

Figure XXVI
1952-53 Nash Statesman and Ambassador

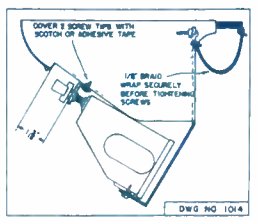

Figure XXVII

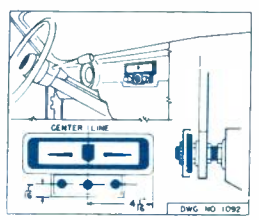

Figure XXVIII
1953 Dodge

REFERENCE CHART

MAKE OF CARS	YEAR	I BAT GND.	II SPKR. POSITION	III CUST U. DASH	IV REM. PLATE	V DIMENSIONS A	V DIMENSIONS B	VI ANT SOCK	VII SPECIAL INSTRUCTIONS
CHEVROLET	1941-48	—	UP	C	No	2½	1⅜	A	
	1949-50	—	DOWN	C	No	—	—	A	
	1951-52	—	UP	C	Yes	4-1/16	11/16	A	
	1953	—	UP	C	No	4-3/16	15/16	A	Remove cardboard from speaker grill
CROSLEY	1946-52	+	DOWN	C	No	4-1/16	1½	A	
DODGE	1941-48	+	DOWN	U	No	—	—	A	Under Dash
CORONET MEADOWBROOK	1949-50	+	UP	C	No	3⅛	13/16	A	
WAYFARER	1949-50	+	DOWN	C	No	—	—	A	Remove Medallion Mount in medallion location
WAYFARER	1951-52	+	DOWN	C	No	—	—	B	
CORONET MEADOWBROOK	1951-52	+	DOWN	C	Yes	3¼	¾	A	
WAYFARER MEADOWBROOK	1953	+	DOWN	C	Yes	4-1/16	7/16	A	
FORD	1941	+	FORWARD	*	Yes	—	—	A	
	1942-48	+	DOWN SEPARATE	C	No	4½	1-1/4	A	
	1949-50	+	DOWN SEPARATE	C	No	4-1/16	1-5/8	A	
	1951	+	DOWN SEPARATE	C	Yes	—	—	B	
	1952	+	DOWN SEPARATE	C	No	4¾	1⅜	A	
	1953	+	DOWN SEPARATE	C	No	4¾	1-9/16	A	
FRAZER	1947-48	+	DOWN	C	No	5-5/8	¾	B	
	1949-51	+	DOWN	U	No	—	—	A	Under Dash
HENRY J.	1951-53	+	UP	U	No	—	—	A	
HUDSON	1946-47	+	DOWN	U	No	—	—	A	Under Dash
	1948-50	+	DOWN SEPARATE	C	Yes	4⅜	1½	A	
	1951-53	+	UP SEPARATE	C	No	4-1/16	1⅛	A	
KAISER	1947-48	+	DOWN	C	No	5 5/8	¾	B	
	1949-50	+	DOWN	U	No	—	—	A	Under Dash
	1951-53	+	UP	C	No	—	—	A	
MERCURY	1941	-	FORWARD	*	Yes	—	—	A	
	1942-48	-	DOWN	C	No	4½	1¼	A	
	1949	-	DOWN SEPARATE	C	No	4-13/16	1-5/16	A	
	1952-53	+	SEPARATE	C	No	2½	1⅛	A	
NASH	1941-48	+	UP	C	No	2½	1	A	
	1950	+	DOWN SEPARATE	C	No	—	—	B	
	1951	+	DOWN SEPARATE	C	No	—	—	B	
PLYMOUTH	1941-48	+	DOWN	U	No	—	—	A	Under Dash
SPECIAL DE LUXE	1949-50	+	UP	C	No	—	—	A	
DE LUXE	1949-50	+	DOWN	C	No	6	1½	A	** See Note
CONCORD CAMBRIDGE	1951-52	+	DOWN	C	Yes	—	—	A	** See Note
CRANBROOK	1951-52	+	DOWN	C	Yes	4-1/16	5/8	B	
ALL	1953	+	DOWN	C	No	4-1/32	15/16	A	Mount in Audio Panel

REFERENCE CHART

MAKE OF CARS	YEAR	I BAT GND	II SPKR. POSITION	III CUST U. DASH	IV REM. PLATE	V DIMENSIONS A	V DIMENSIONS B	VI ANT SOCK	VII SPECIAL INSTRUCTIONS
PONTIAC	1941-48	—	DOWN	C	No	4-5/8	1⅜	A	
	1949-52	—	UP	C	Yes	4¼	1⅜	A	Drill from rear
STUDEBAKER	1947-49	+	UP	C	No	4¾	1-3/16	A	
COMMANDER	1950-52	+	DOWN	C	Yes	5	11/16	A	
CHAMPION	1950-52	+	DOWN	C	No	5	½	A	
WILLY'S AERO	1952-53	—	DOWN SEPARATE	C	No	2-3/16	1-1/16	A	
WILLY'S JEEP	1946-53	—	DOWN	U	No	—	—	A	Under Dash
MAKE OF **TRUCKS**									
CHEVROLET	1941-48	—	UP	C	No	2½	1⅜	A	
	1949-50	—	DOWN	C	No	—	—	A	
	1951-52	—	UP	C	Yes	4-1/16	11/16	A	
DIAMOND-T	1950-53	+	DOWN	U	—	—	—	A	Mount set on 1"
SMALL	1950-53	+	DOWN	U	—	—	—	A	spacers under
LARGE	1950-53	+	DOWN	U	—	—	—	A	glove compart.
CAB-OVER	1950-53	+	DOWN	U	—	—	—	A	
DODGE	1941-47	+	DOWN	*	—	—	—	A	Custom or under dash
	1948-50	+	DOWN	C	—	—	—	A	
	1951-52	+	DOWN	*	—	—	—	A	Custom or under dash
FORD	1941-47	+	DOWN	*	—	—	—	A	Custom or under dash
	1948-50	+	DOWN	C	—	4⅛	1⅜	A	Plastic plate
	1951-52	+	UP	C	—	4-3/16	1-5/8	A	Metal plate
INTERNATIONAL SMALL	1950-53	+	DOWN	C	Yes	—	—	A	
LARGE	1950-53	+	DOWN	C	Yes	—	—	A	
CAB-OVER	1950-53	+	DOWN	C	Yes	—	—	A	
MACK SMALL	1950-53	+	DOWN	U	—	—	—	A	Under Dash
LARGE	1950-53	+	DOWN	U	—	—	—	A	Under Dash
CAB-OVER	1950-53	+	DOWN	U	—	—	—	A	Under Dash
REO SMALL	1950-52	+	DOWN	C	—	—	—	A	
LARGE	1950-52	+	DOWN	C	—	—	—	A	
STUDEBAKER	1941-50	+	DOWN	U	—	—	—	A	Under Dash
	1951-52	+	DOWN	U	—	—	—	A	Under Dash
WHITE SMALL	1950-53	+	DOWN	C	—	—	—	A	
LARGE	1950-53	+	DOWN	C	—	—	—	A	
CAB-OVER	1950-53	+	DOWN	C	—	—	—	A	
WILLYS TRUCK	1951-52	—	DOWN	C	—	2-5/16	1⅛	B	
WILLYS STA. WAG.	1951-52	—	DOWN	C	—	2-5/16	1⅛	B	

** 1½-inch dimension "A" taken above chrome trim strip on panel 1½-inch below Plymouth name.

UNDER-DASH MOUNTING

STEP 1. Locate special under-dash mounting bracket provided with the kit.

STEP 2. Adjust nuts on shaft bushings as in Step 9 "Custom Mounting".

STEP 3. Refer to Column II to determine if the speaker opening should face up or down. Install under-dash mounting bracket with #10 slotted hex head self-tapping screws to the instrument panel in any convenient location.

STEP 4. Mount receiver in holes from back of under-dash mounting bracket with lockwashers and locknut provided. Refer to Figure 14.

STEP 5. Bend perforated strip so that it can support the rear of the receiver by fastening to some support bracket nearby or to the firewall by means of the mounting hardware provided. Mount perforated strip to receiver case with #8 x ¼" self tapping screw. Refer to Fig. 13.

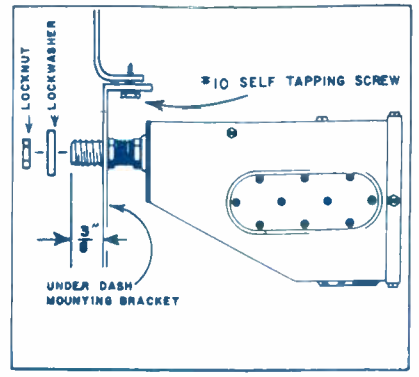

Figure 14. Under Dash Mounting

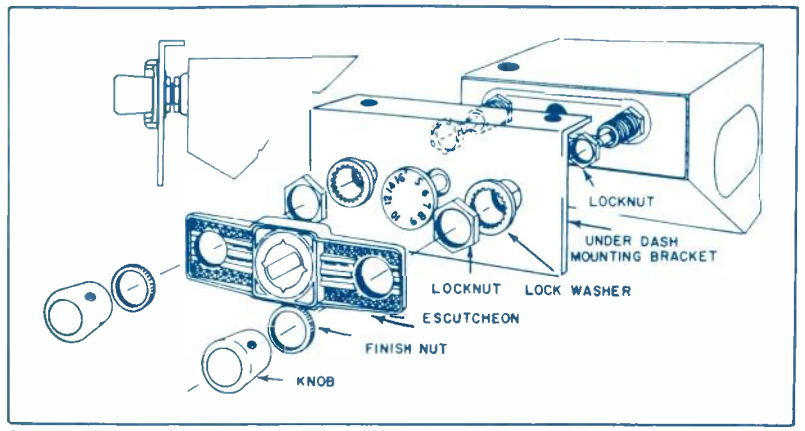

Figure 15. Illustrates the mounting assembly procedure for a clearer understanding of the overall installation.

MOUNTING ESCUTCHEON AND KNOBS

STEP 1. Place felt washer on dial scale flush to rear surface. Refer to Figure 16.

STEP 2. Turn tuning shaft completely counterclockwise. Push on dial scale with marker at the top. Dial scale must turn freely when tuning shaft is rotated.

STEP 3. Remove plastic escutcheon from envelope and install over bushings and dial scale. Secure in place with round finish nuts. Finish nuts should be finger tight. (See Fig. 17.)

STEP 4. Install tuning and volume knobs and tighten set screws with small screw driver. (Refer to Fig. 18)

STEP 5. If dial scale binds against escutcheon, remove receiver and readjust nuts on shaft bushings as indicated in Figures 11 and 14. Decrease distance from trim plate to end of shaft bushing.

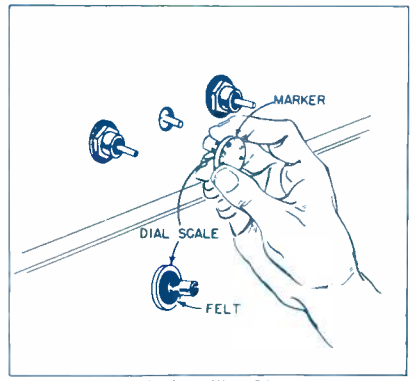

Figure 16. Installing Dial Scale

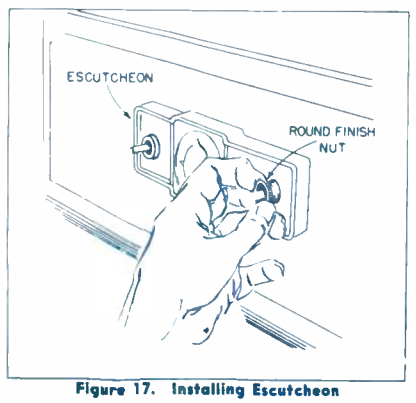

Figure 17. Installing Escutcheon

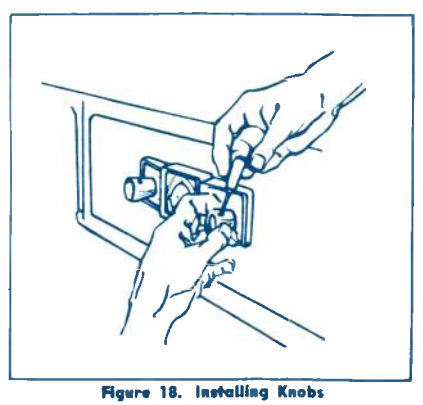
Figure 18. Installing Knobs

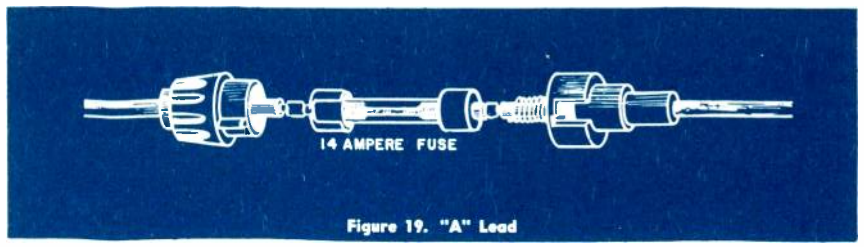

Figure 19. "A" Lead

FINAL CONNECTIONS AND ADJUSTMENTS

STEP 1. Connect "A" lead from receiver to ignition switch terminal on rear of Instrument Panel. If "A" lead is connected to cold side of ignition switch, the receiver will operate only when the ignition switch is turned on. The "A" lead contains a 14 ampere fuse. Make sure the fuse is not damaged or defective. (See Fig. 19)

STEP 2. Refer to Column VI to determine which antenna socket should be used. Insert the antenna lead into the antenna socket. (Refer to Fig. 20 for location of antenna sockets "A" and "B".)

STEP 3. Fully extend the antenna, turn the receiver on and tune in a weak station in the vicinity of 1400 kilocycles (halfway between 12 and 16 dial scale indications.) Use a small screw driver to adjust the antenna trimmer screw (Refer to Fig. 20 for location) for maximum volume.

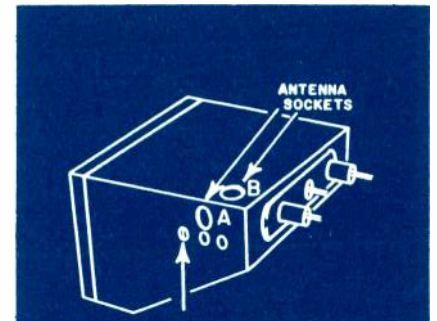

Figure 20. Antenna Trimmer and Socket Location

SPECIAL INSTRUCTIONS
Column VII on chart

"I" 1951 Nash requires speaker to be mounted in grill on instrument panel. Refer to Figure A.

"II" 1951 Ford—remove radio opening trim plate and install four large washers (supplied in kit), two to each shaft bushing—one in front and one in back of instrument panel.

"III" 1951-1952 Henry J. requires under dash mounting except that mounting bracket is reversed from that shown in figures 14 and 15 (lip faces forward) and speaker faces upward.

"IV" 1941 Ford and 1941 Mercury can be either under-dash or custom mounted through instrument panel. When custom mounted, the receiver mounts vertically and the knobs are on top of instrument panel.

"V" 1951-1952 Plymouth Concord-Cambridge — it is important that the radio grill panel (4 Phillips-Head screws) be removed to permit radio to fit close to panel.

"VI" 1950-1951-1952 Studebaker Commander—remove radio opening trim plate and break off center rib from back of plate.

"VII" 1953 Hudson Jet and Super Jet. Mount speaker first using 5x7 template and two #8x½ sheet metal screws (to be purchased by customer). Remove radio trim plate and drill from rear.

"VIII" 1950-1951 Mercury under dash mounting below custom speaker opening, speaker facing up. Remove cardboard from speaker grille. Reverse mounting bracket.

"IX" 1953 Dodge. Do not drill thru metal trim plate. After drilling 3 holes in plastic plate, remove metal plate and discard. Fasten plastic plate with 2 bolts and nuts. Use two large flat washers under radio escutcheon on each bushing.

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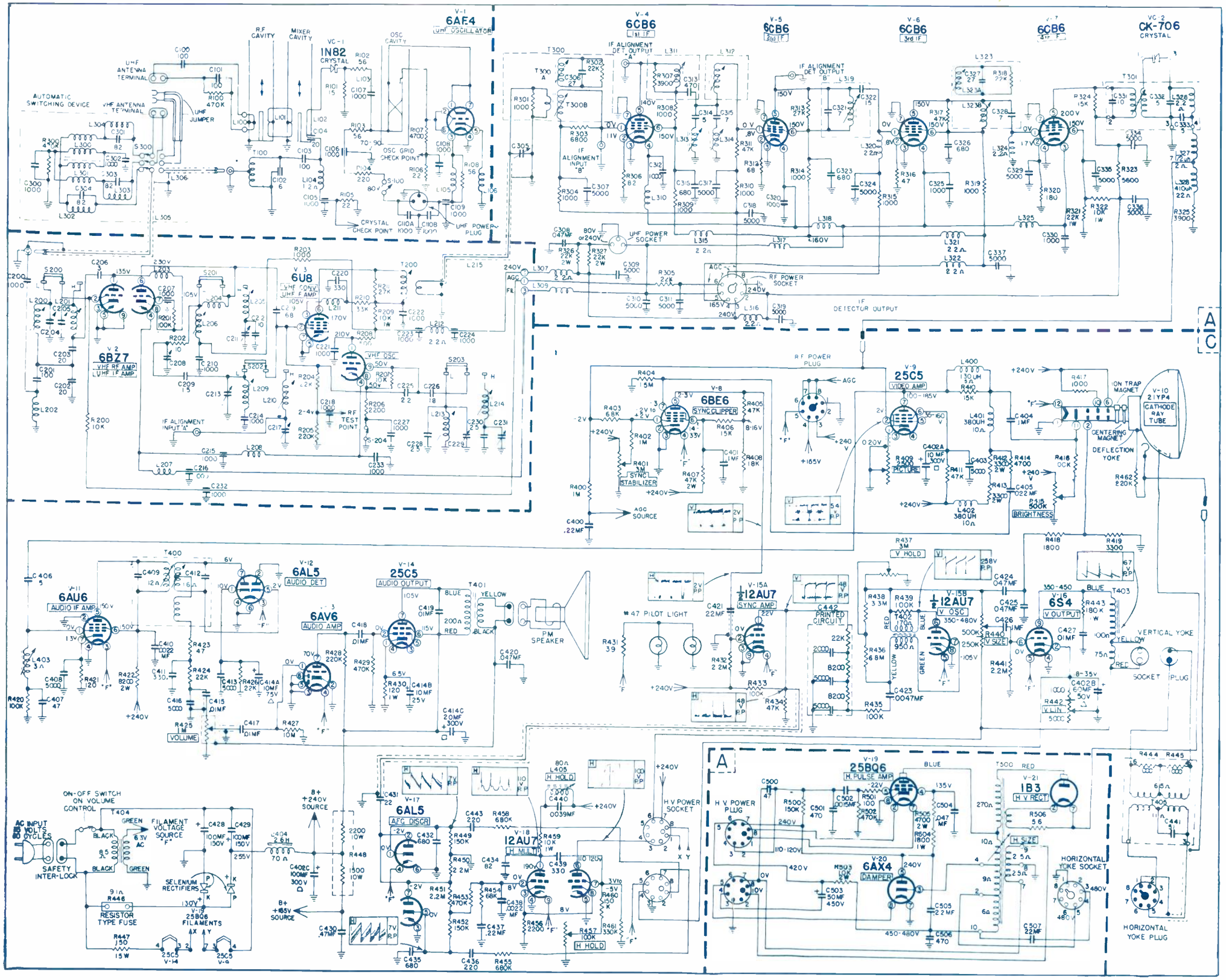
TECHNICIAN CIRCUIT DIGESTS



CAPACITORS Capacitor values are represented in micro-microfarad (MMF) unless otherwise indicated. "MF" denotes microfarad.

RESISTORS Resistor wattage is represented in 1/2 watt unless otherwise indicated. "K" denotes x 1,000 & "M" denotes x 1,000,000.

SWITCHES All switches are shown in the position for VHF operation.

VOLTAGE READINGS The voltage readings indicated at the various tube socket pins were measured with a 20,000 ohm per volt voltmeter, normal operation, no signal input and line voltage at 115V AC. Where control settings affect voltage readings, the minimum and maximum are indicated.

HIGH VOLTAGE High voltage is present on the plate caps of the 1B3 high voltage rectifier and 25BQ6 horizontal pulse amplifier. Do not measure this voltage. Measure CRT 2nd anode voltage with HV probe.

COIL DC RESISTANCE The DC resistance readings indicated near the transformers and coils have been taken with an ohmmeter directly across the coil being measured. Coils shown without a resistance reading have a DC resistance of less than one ohm. A tolerance of ±10% is permissible.

WAVE FORMS The wave forms illustrated are copies of those observed on a laboratory oscilloscope. These wave forms may be expected under normal operating conditions, with a transmitted signal and the picture in sync at all times. With each wave form is given the peak-to-peak voltage and a horizontal or a vertical notation representing vertical (60 cycles) or horizontal (15,750 cycles) scope frequency. The wave form and peak-to-peak voltage readings may vary somewhat, depending on the strength of the signal, the picture information being transmitted, and the adjustment of the various controls. When checking wave forms, connect the ground lead from the oscilloscope to the chassis, and the hot lead to the position indicated by the arrow.

REPLACING TUBES Before replacing tubes the cabinet back must first be removed. Removing the cabinet back disengages the safety interlock and removes the power to the receiver. Do not tamper with or attempt to defeat the purpose of the safety interlock, as severe shock may result. Do not remove tubes while the receiver is in operation as overloading or component failure may result.

Chassis 21T8:
models UM-2133, UM-213, UM-2135, UM-2136, UM-739, UM-2141, UM-2142, UM-144, UM-2145

RAYTHEON
Chassis 21T8

Technician
CIRCUIT DIGEST
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In This Issue (No. 14)

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SERVICE HINTS

Whenever the sync, AFC, Horizontal Multivibrator or H. Pulse Amplifier stage is suspected as the cause of the trouble, it will prove helpful to short the input grid of the Horizontal Multivibrator (pin 2, V18) to ground, readjust the horizontal hold control and then observe the picture. If the condition disappears you can assume that the source of the trouble is before the input grid of the oscillator. If, however, the condition remains, the trouble is probably after the grid of the multivibrator.

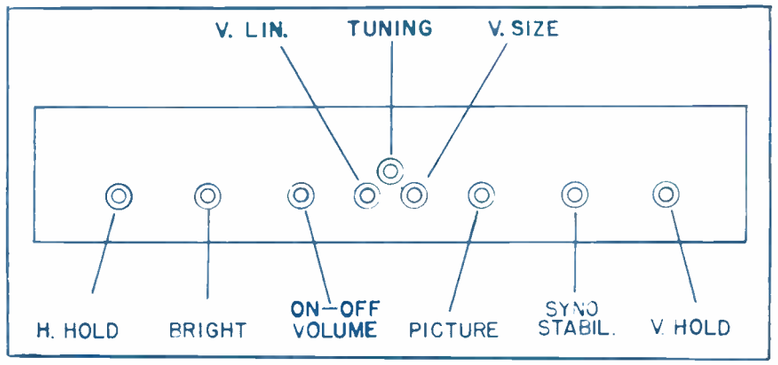
TUNER SERVICE HINTS

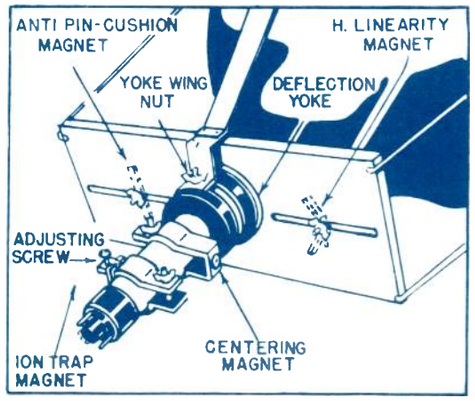
A convenient service check point is provided for measuring the UHF oscillator grid current to determine whether the oscillator is functioning. To measure this current place a multimeter on the 100 microamperes scale across resistor R106 (22 ohms). A reading of 10 to 30 microamperes should be obtained if the oscillator is functioning normally. Another check point has been provided for measuring the crystal current to check both the UHF crystal detector and oscillator. Place a multimeter on the 100 microamperes scale across resistor R105 (22 ohms) and a reading of 5 to 40 microamperes should be obtained if both the oscillator and crystal are functioning normally.

Before attempting service of the UHF tuner, it may prove helpful to check, if the same condition appears when tuned to a VHF station. If the condition appears on both UHF and VHF the cause of the trouble will generally be located in the I F amplifier or Video amplifier circuits. If, however, the condition appears only on UHF and a normal picture is observed on VHF, the UHF antenna installation should be checked for the possible source of trouble before suspecting the UHF tuner.

When attempting UHF servicing, it may prove helpful to bear in mind that when trouble occurs in the oscillator the picture will generally disappear and when there is a defect in the RF or mixer stage a decrease in signal will usually result.

If condition arises where trouble occurs on either high or low VHF band only, then it can be assumed that the trouble is definitely in the VHF tuner or VHF antenna installation. One other possibility may be due to defective switch contacts. Defective switch contacts can easily be replaced by removing the two question mark shaped spring lifting up the switch plate assembly and removing the black switch contact holder and replacing the switch contact.





WARNING

At all times during operation the chassis is at 125 volts DC potential above ground and it also may be at the line voltage potential depending on how the line cord plug is inserted in the power receptacle.

Extreme caution must be observed when working with the chassis outside the cabinet and when power is applied to the receiver with the cabinet back removed. SEVERE SHOCK may result from contact with chassis.

An isolation transformer between the line plug and power receptacle must be used when service is required. This removes AC line shock hazards. Damage to the receiver and test equipment may result without the use of an isolation transformer.

Isolation transfomers are available from the authorized Raytheon Television Distributor in your area and may be ordered by part number 11P-129.

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V. Hold:
The Vertical Hold control should be adjusted when the picture is rolling or flipping up or down. The proper setting of the vertical hold control is that point where the picture is moving slowly upward and just locks into place. At this control setting, noise will have the least tendency to interrupt vertical sync.

V. Size and V. Linearity:
The vertical size and linearity controls should be adjusted while a test pattern is being received. The linearity control affects the upper portion of the picture while the size control affects the overall size especially the lower portion of the picture. Adjust both controls simultaneously until the test pattern is symmetrical and fills the entire screen vertically. Readjust the vertical hold control if necessary.

Sync Stabilizer:
The control varies the operational characteristics of the sync clipper stage to obtain the optimum operation point for the least effect of noise interrupting synchronization. The control should be adjusted for a steady picture.

H. Hold:
Set the H. Hold control on the front of the set to the center of its range. Adjust the H. Hold coil on top of the chassis until a steady picture is obtained. Set the H. Hold coil to the center of its range (center position before going out of sync in either direction). To check the adjustment, tune from one station to another. If the controls are properly adjusted the picture will remain in sync at all times.

H. Size:
The horizontal size control should be adjusted until the picture fills the entire screen horizontally. A clockwise rotation will decrease size. To some extent the vertical size control setting may be affected by a major horizontal size adjustment.

Anti-Pin Cushion Magnet:
Adjust centering until left edge of the raster is visible. Loosen the positioning screw and slide the magnet until the edge of the raster is vertically straight. If keystoning is noticed adjust magnet in vertical plane.

Deflection Yoke:
The correct position for the deflection yoke is as far forward on the neck of the picture tube as the shape of the tube will allow. Tube shadow or a tilted raster may result from an incorrectly positioned yoke. If a position adjustment is necessary, loosen the yoke wing nut located at the top of the picture tube assembly.

H. Linearity Magnet:
The horizontal linearity magnet affects the linearity of the right side of the picture only. The magnet pulls or stretches the right side and has a greater effect when closer to the picture tube.

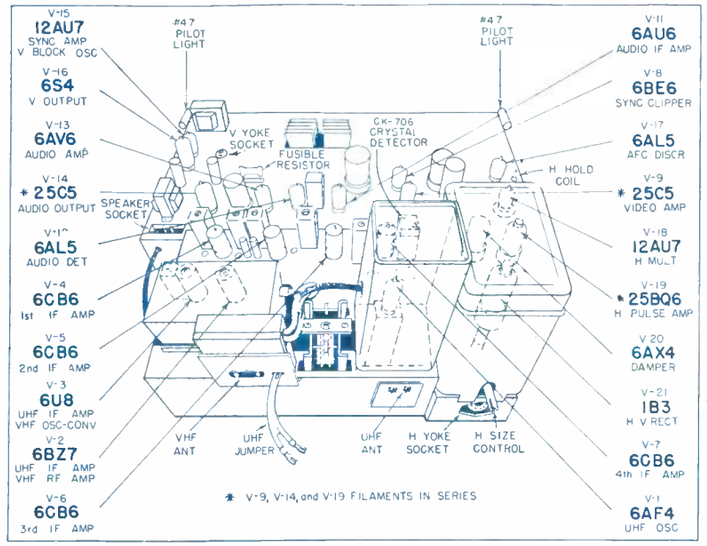
Ion Trap Magnet:
If adjustment is determined necessary, loosen the wing nut, rotate and slide the magnet until the position which gives maximum illumination is found. Adjust the screw for maximum illumination. Repeat the above two steps. Rotate and slide the magnet until the best focus position is found without sacrificing brilliance. Tighten wing nut. Adjustment should be made with brightness and picture controls set for normal viewing. The position of the ion trap magnet MUST be over the grid of the picture tube (second cylinder from the base identified by a flared forward lip) after the adjustment is complete.

Centering Magnet:
The centering magnet should be rotated and the control adjusted until the picture is properly framed keeping in mind that the effect of the control is governed by the position of rotation. If the control is above or below the neck of the picture tube, the picture can be moved up or down. To the left or right of the neck of the picture tube, the picture can be moved either to the left or right. The position of the centering magnet should be ¼ to ½ inch behind the deflection yoke.

SOUND CONDITIONS

It will always prove helpful when analysing a service condition to first determine if the sound section is functioning normally. Since the receiver is of the intercarrier type, both the sound and picture information are amplified simultaneously by the tuner, I F and video amplifiers. Due to the design of the receiver the video amplifier also amplifies both the sound and picture information. By analysing the above, it can be assumed that if the picture appears to be normal and the sound is not functioning properly the defect is located between the sound take off point (plate of the video amplifier) and speaker.

TUBE LAYOUT



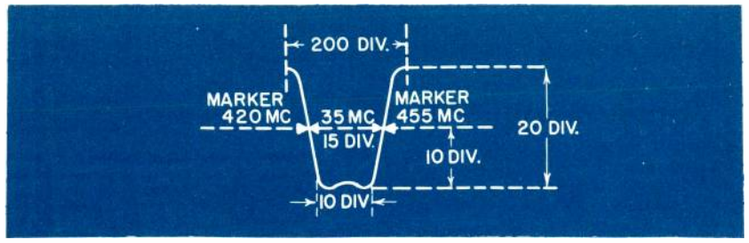
PRELIMINARY ALIGNMENT PROCEDURE FOR 21T8 and 24T2 CHASSIS

The following information may be used as preliminary alignment procedure.

1. Preheat the unit for approximately 5 minutes.
2. Connect a voltmeter in series with a 10K ohm isolation resistor and connect to the detector output.
3. Connect an RF generator to the IF alignment test jack input "A" (see schematic). This is located on top of the VHF tuner. A standard phono plug makes an ideal connector.
4. The VHF tuner should be set to an unused high band VHF channel in the vicinity of channel 7.
5. Set the marker generator to each of the following frequencies and adjust as indicated.

ADJUST	FREQ. MC.	RESPONSE	NOTE
T301	43.7	Maximum	Use minimum marker output needed to obtain adequate response. Too high an output will give false indications. Use 3 to 5 volt d.c. scale.
L323A Top	41.4	Minimum	
L323B Bottom	45.15	Maximum	
L319	42.0	Maximum	
L313 Top	41.25	Minimum	
L314 Top	47.25	Minimum	
T300A Top	41.4	Minimum	

6. Remove the voltmeter from the detector output and in its place substitute an oscilloscope.
7. Connect a marker generator and sweep generator to IF alignment test jack "A".
8. Use minimum RF output needed to obtain correct deflection on oscilloscope.
9. Sweep for over-all response curve. (as shown)



10. Adjust L311 bottom, L312 bottom, T200 bottom, T300 bottom, and C305 for maximum gain and optimum response with markers at 42.0 mc and 45.5 mc. Re-adjust if necessary to obtain proper response, curve, bandwidth, etc., while using sweep width of 6 mc. at center frequency of 43.75.
11. Rock T301 for flat top with optimum gain.

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capacitor replacements FOR SETS OF THE MONTH

PHILCO CHASSIS R-201, D-201

Symbol No.	Rating MF @ WVDC	Philco Part No.	Sprague Replacement
C100, C101	120 @ 150	30-2568-51	TVL-1425
C102	10 @ 50	30-2417-3	TVA-1304
C103, C707, C815A, C815B	10 @ 475/100+10 @ 300/100 @ 25	30-2584-27	TVL-4802
C413	2 @ 50	30-2417-7	TVA-1301

RCA CHASSIS KCS83C, KCS83D

(Models 21-S-354, -354U, -362, -362U)

Symbol No.	Rating MF @ WVDC	RCA Part No.	Sprague Replacement
C117	100 @ 400/20 @ 50	78212	TVL-3672
C119	80+20 @ 400	77644	TVL-2673
C124	10+5 @ 350/30 @ 50	78213	TVL-3637

EMERSON CHASSIS 120174-B, 120198-D

Symbol No.	Rating MF @ WVDC	Emerson Part No.	Sprague Replacement
C22, C39, C54, C65, C79	10 @ 450/80 @ 300/40 @ 250/100 @ 50	925221	TVL-4711
C64, C66, C78	5 @ 450/80+40 @ 300	925232	TVL-3792

HOFFMAN CHASSIS 403-24

Symbol No.	Rating MF @ WVDC	Hoffman Part No.	Sprague Replacement
C112	5 @ 50	4209	TVA-1303
C118, C128	20+20 @ 350	4259	TVL-2755
C605, C803, C804, C807	100+40+30 @ 350/50 @ 50	4251	TVL-4634
C610	10 @ 600	4253	R-1222
C706, C806	40+10 @ 350	4252	TVL-2735

AIRLINE MODEL 35BR-6796A

Symbol No.	Rating MF @ WVDC	Airline Part No.	Sprague Replacement
C19	20+20 @ 200/40 @ 25	8C-21726	R-1430
C9, C10, R7	Filter Plate	201-15005	100C1
C13, C14, C15, R11, R12	Audio Coupling	17A-21742	104C4

RAYTHEON CHASSIS 21T8

Symbol No.	Rating MF @ WVDC	Raytheon Part No.	Sprague Replacement
C402	100+10 @ 300/60 @ 50	8C-22523	R-1434
C414	20 @ 300/10 @ 75/10 @ 25	8C-22524	TVL-3634
C428, 429	100 @ 150	8C22286	TVL-1423
C503	50 @ 450	8C22544	TVA-1713
C442	Integrator Plate	17A-22376	101C1

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