Formerly TELEVISION RETAILING

CALDWELL-CLEMENTS'

TECHNICIAN

TELEVISION • ELECTRONIC • RADIO • AUDIO • SERVICE

November • 1953

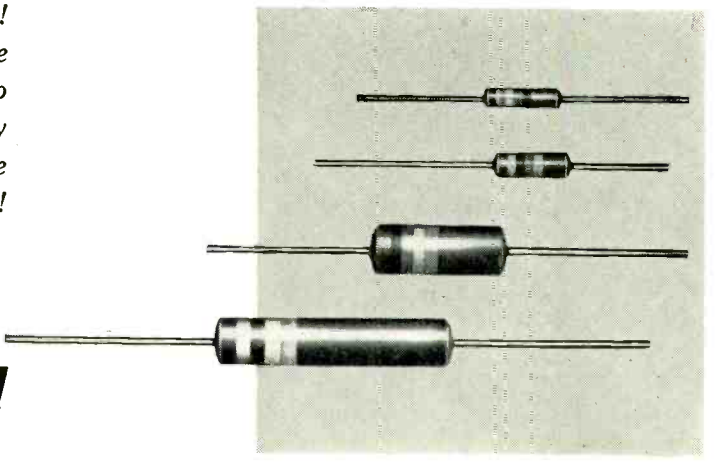
In This Issue: Tracking Down TVI
Vertical Circuit Problems • Color TV
Servicing Phono Motors • CIRCUIT DIGESTS

NO. 1 CHOICE

of **ALL** *Fixed Composition Resistors by almost*

3 to 1*...

**Not Claims! Not Predictions! But Plain Facts! Unbiased, authoritative, independent surveys (made regularly since 1930) show IRC BT RESISTORS to be the Service Technicians' choice by a continually increasing margin. Today, BT RESISTORS are preferred over the total of all other brands combined!*



Ask for IRC BT's...
Most Service Technicians Do!

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

CIRCULATION

This issue: 44,000. Guaranteed circulation by January 1954:

50,000

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

TECHNICIAN, November 1953, Vol. 58, No. 5. 50 cents a copy. Published monthly by Caldwell-Clements, Inc., Publication Office, Emmett St., Bristol, Conn. Editorial, Advertising and Executive Offices, 480 Lexington Ave., New York 17, N. Y. Application for acceptance as second-class matter pending at Bristol, Conn. M. Clements, President; Orestes H. Caldwell, Treasurer. Subscription rates: United States and Canada, $4.00 for one year; $6.00 for two years; $8.00 for three years. Pan-American and Foreign countries: $7.00 for one year; $10.00 for two years; $14.00 for three years. Printed in U.S.A.

NOVEMBER, 1953

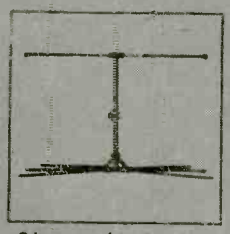
***CIRCUIT DIGESTS** (See page 73 and the following sheets)*

ARVIN: Chassis TE 359
CBS-COLUMBIA: Chassis 750-3
CROSLEY: Chassis 411, 411-1
SYLVANIA: Chassis 1-518-1, -2, -3
TRUETONE: Chassis 21T2A
WESTINGHOUSE: Chassis V-2243-1

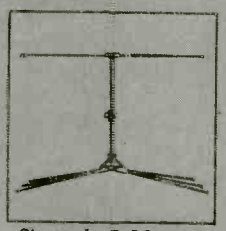
DEPARTMENTS

CALDWELL-CLEMENTS, Inc.
Publication Office, Bristol, Conn.
Editorial/Business Offices 480 Lexington Ave., New York 17, N. Y., Tel. Plaza 9-7880
Publishers also of MART and TELE-TECH & ELECTRONIC INDUSTRIES
*Reg. U. S. Patent Office

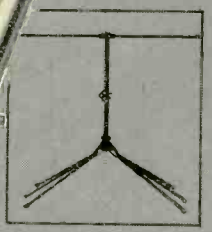
FALCON *Introduces -*



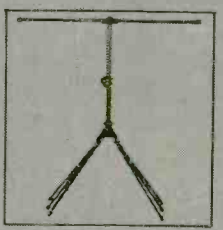
Channels 2-13, peaked for low channels (2 thru 6)



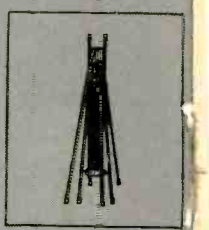
Channels 2-13, normal position, peaked for all VHF channels (2 thru 13)



Channels 2-13, peaked for high channels (7 thru 13)



Channels 2-83, peaked for UHF channels



Falcon "VARI-CON" folded for packing

Model VC-1

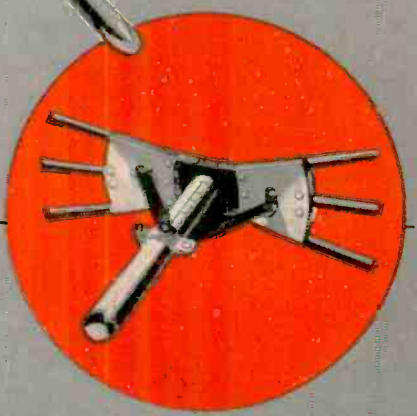
Model VC-2

Model VC-4

Stack them for added gain.

FALCON easiest of all antennas to assemble merely open like an umbrella and tighten wing nuts

There is NO ASSEMBLY problem with a FALCON "VARI-CON". It takes longer to explain the operation than to accomplish it! Your FALCON "VARI-CON" comes folded into one compact unit. You need only swing the reflector into position and tighten the wing nuts. Move the sliding sleeve to the calibrated channel setting you desire and tighten. The butterfly springs snap the elements into position and lock them securely. The FALCON "VARI-CON" is ready to install, ready to provide peak performance. *Changing the channel peaking of the "VARI-CON" is just as simple and easy as making the original setting. No tools are needed for either operation.*



Calibrated sleeve for quick peaking of antenna.

THE HEART OF THE "VARI-CON"

Above is a view of the new mechanism which enables anyone to adjust the peaking of the FALCON "VARI-CON" to any range of channels desired. The sliding sleeve, on the calibrated boom, automatically fans out the elements to their correct position.

A simple, trouble-proof, snap-action spring in the butterfly keeps the elements solidly in place. The insulated hinge assembly is extremely strong, durable and weather-resistant and has an extra long leakage path. Weight has been kept to a minimum, strength at a maximum in order to assure long life and freedom from wind and weather damage. A heavily plated mast clamp is supplied.

the "VARI-CON"

(The conical that's variable)

Provides all Channel Performance...

Yet can be Peaked for Increased Gain on any Channel Range

The FALCON "VARI-CON" was designed for today, tomorrow and years to come. Its unusual construction permits setting the "VARI-CON" for all-channel performance peaked to provide the additional gain needed on special channels. In addition, the variable patterns obtainable are of great value in ghost elimination.

There is no guess work; no tedious assembly; no field strength equipment needed to peak the "VARI-CON" for high-gain, sharp pattern performance in your area. It's as simple and easy as opening an umbrella. Here's all you do: Unpack the "VARI-CON"— Slide the adjusting sleeve to the calibrated marking on the boom for the best reception of channels in your area — Fan out the reflector elements — Tighten the locking wing nuts. The "VARI-CON" is automatically peaked WHERE YOU WANT IT and ready to install. It is the only conical that enables you to provide a custom-made installation resulting in higher gain and increased customer satisfaction.

The NEW FALCON "VARI-CON" is ruggedly constructed. Heavy-duty heads will not crack or break. The steel spring snap-action butterfly assemblies are unbreakable. Full length, 48 inch, elements are used. One of the most capable engineering staffs in the industry has worked out every last detail of this truly remarkable TV antenna. To the high gain all-channel performance and excellent line match of the conical, FALCON engineers have added the "plus" feature — adjustable, calibrated channel range peaking!

FALCON

The new "VARI-CON" is one of the most significant additions to antenna design. Watch for the other new FALCON antennas which will be announced in the near future! Each will represent the most advanced, most efficient antenna design of its type.

WRITE FOR ILLUSTRATED FOLDER AND PRICES

FALCON ELECTRONICS COMPANY • 2003 CEDAR ST. • QUINCY, ILLINOIS

NATIONAL ADVERTISING TO BACK NEW FALCON "VARI-CON"

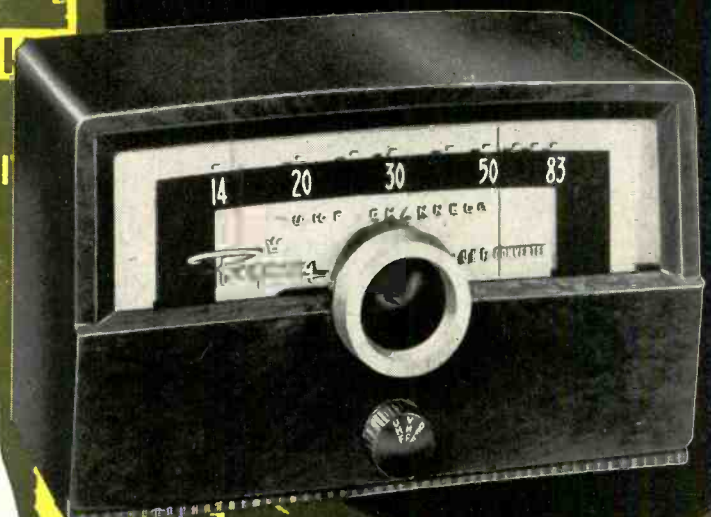
To stimulate sales on all levels, FALCON is conducting one of the most aggressive advertising campaigns in the industry. Full two-page color spreads are appearing regularly in many of the nation's top trade and consumer publications.

WE'LL TELL THE WORLD!

ONLY Regency HAS 5 WAY CONVERSION!

We'll tell them not to take chances with 2-way Conversion . . . that the Regency Quintuplet Converter, unlike *all* others, is designed to utilize any of 5 VHF channels in converting to UHF; other converters work only on 2 channels. Insure your customers against image interference, obsolescence! Sell them REGENCY'S Quintuplet Converter!
. . . and at $49.95 list, there's greater profit for you!

Yes, you'd better be ready for a big turnover this fall, because REGENCY'S promotional program is directing more traffic than ever *your* way!



Regency DIVISION OF I. D. E. A. INC.
Makers of VHF Boosters, FM Boosters, UHF Converters, Professional High Fidelity Equipment and Remote Control for Television.

Burton browne advertising


TRIO proudly announces
The New ZIG-ZAG
"TWIN-SIX"
(A significant addition to the Zig-Zag line)

. . . the greatest advance ever made in ALL-CHANNEL antenna design!

Not content to bring out just another all-channel antenna, TRIO studied and tested every other model available. Months of research produced the "Twin-Six", a Zig-Zag that provides all of the desirable features indicated above. Quantitative ratings for antennas are practically meaningless because of some exaggerated claims. For this reason, the "Twin-Six" is announced without the usual gain charts. The new "Twin-Six", however, equals and, in most cases, greatly exceeds the gains of these antennas on *every* channel. For instance, the "Twin-Six" showed a 2 to 6 db higher gain than a competitive antenna which is advertised as having a 12 db gain.

MINUTE-UP ASSEMBLY

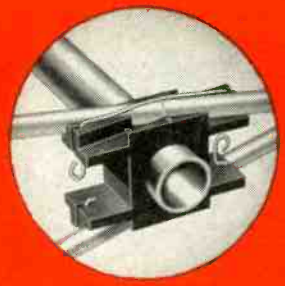
There's no antenna easier to assemble. Shipped with all hardware mounted on the boom. Complete assembly consists of matching elements to color coded insulators and snapping on spring clips. Improper assembly impossible.

NEW ZIG-ZAG "TWIN-SIX" OFFERS:

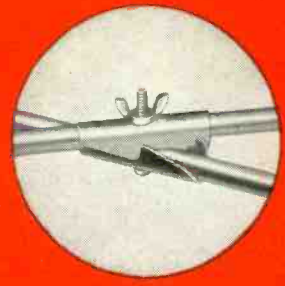
Measurable Higher Gain On All VHF Channels Than Any Other Single Bay All-Channel Antenna

PLUS

1. One Horizontal Bay Does It All!
2. Single Lead-In Operation!
3. Easy-Up, One Minute Assembly!
4. Rugged Construction Throughout — No Droop, No Sag! Light Weight — Attractive Appearance!
5. UHF Reception For All Primary Areas!
6. Low Standing Wave Ratio!
7. Built and Backed by TRIO — A Name You Can Trust!
8. Competitively Priced!



Insulators come mounted on boom and are so designed that "shorting-out" is impossible. Antenna elements mounted merely by snapping on the spring clips.



Pre-assembled high channel elements are swung into position and quickly locked by mating brackets.

Team the new Zig-Zag "Twin-Six" with the dependable TRIO rotator for the maximum in TV enjoyment!

TRIO

MANUFACTURING CO. GRIGGSVILLE, ILL.

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

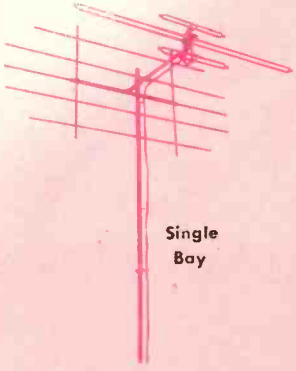
the CHAMPION is the most sensitive all-channel VHF antenna ever designed!

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

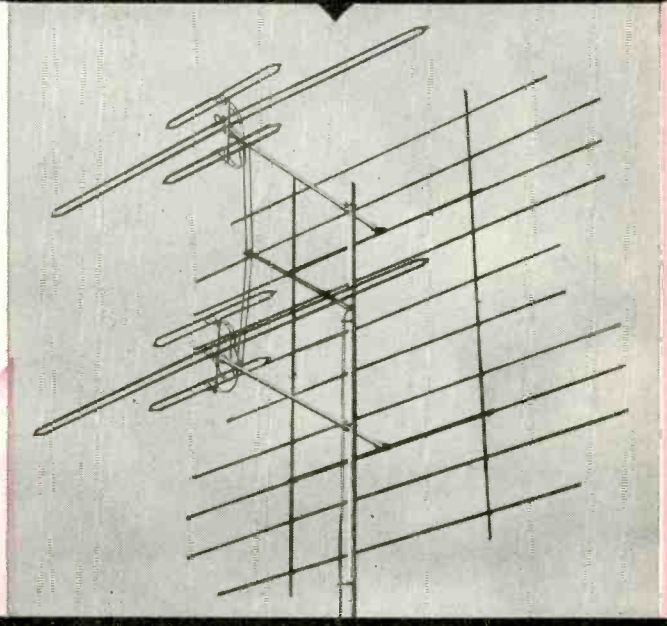
assembles faster than a 5-element yagi!

Collapsed "Pop-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.

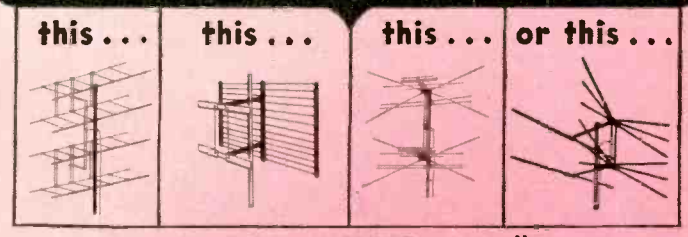
It's a *CHAMPION* in any area!

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

THIS ANTENNA...

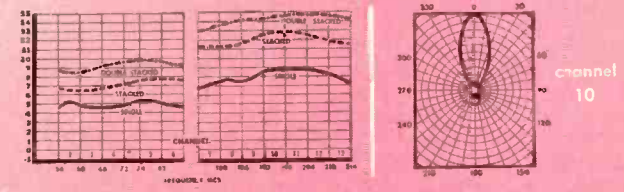


OUT-PERFORMS:



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

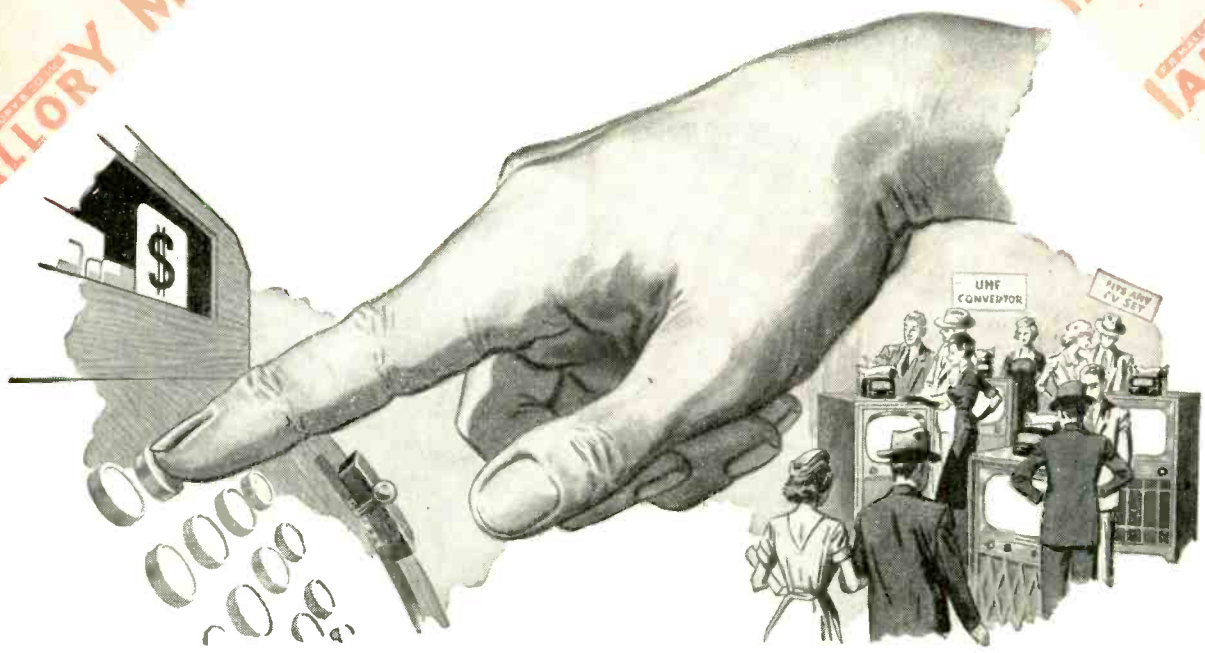
Send for complete technical literature.

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

Depend on Mallory

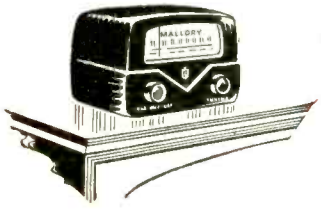
for

Approved Precision Quality



The MALLORY CONVERTER
Can Be Your Best Profit Maker in the New UHF Market

When UHF goes on the air in your area, thousands of sets will need converting. The Mallory UHF Converter can become your fastest moving item almost overnight. Be sure you are ready to take advantage of the opportunity . . . get your full share of the market.



- The Mallory Converter adds *all* UHF channels to any TV set without sacrificing reception of a single VHF channel.
- The Mallory Converter has outsold all other makes in every area where UHF is already on the air.
- A preselector in the Mallory Converter protects against image interference, interference at the IF frequency and oscillator radiation. It insures better selectivity.
- The attractive deep maroon plastic cabinet is smaller than most portable radios.
- The customer has nothing more to buy, no adjustments to make . . . even if he moves to another broadcast area.

YOUR MALLORY DISTRIBUTOR has complete details on the Converter. It has been an outstanding profit maker in other areas. It can be for you.

Installation is easy too. Simply connect the antenna leads and power lines from the Converter to the set . . . right in the customer's home.

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

LETTERS
To the Editors

BBB Headaches

EDITORS, TECHNICIAN:

A day never passes without some customer blasting me for "robbing" him, and I'm sick and tired trying to explain my bills. The same goes for every other service man here.

Only the manufacturers, with big advertising budgets behind them, can tell set-owners the facts. But why do only a handful of them help us? While they're at it, the manufacturers should also educate the Better Business Bureaus. Every week I get some BBB man in my shop giving me a hard time about some customer who has "reported" me for overcharging! The BBB man knows no more about repairing a TV set than the customer, and yet *he* tells *me* to watch my step!

Why should the little guy take such an unfair beating?

Ohio — L.K.

Chock-full

EDITORS, TECHNICIAN:

" . . . May I congratulate you on your first issue of TECHNICIAN and laud you for your continuation of the "Circuit Digests", which all of our members feel are one of the best additions to a serviceman's library, and fulfill a great need. If all other issues are as chock-full of knowledge as the first, you will never have to worry about subscriptions."

H. F. MACFARLAND
Executive Secretary
Long Island Electronic
Technicians Association
Williston Park, N. Y.

Agreement On Charges

EDITORS, TECHNICIAN:

I wish there was industry-wide agreement on fair service charges for at least the most common jobs such as is done in the automobile business. The next step would be for the entire industry to get out some literature to educate the public to the cost of equipment and training, as well as all the other business costs of the electronic service technician.

Connecticut — F.F.

Poor Business Men

EDITORS, TECHNICIAN:

It's your own fault, fellows! The fact is that electronic technicians are such poor businessmen that they allow so-called wholesale parts houses to sell to anyone who walks in the door; some even advertise wholesale prices in the classified newspaper columns.

8106 Liberty Ave. — ELMER FISCHER
Parma 29, Ohio

Says Licensing Is the Bunk

EDITORS, TECHNICIAN:

Before I'll let anybody "brand" me with a license, I'll sell my tools and close the front door! My dictionary defines licensing as *permission given by law to do something.* Thus, the implication that to do something *without* a license is illegal!

Things are bad enough in the TV repair business without adding more fuel to the fire. No, sir—there won't be any dog tag around my neck!

Newark, N. J. Burned Up

He's FOR Licensing

EDITORS, TECHNICIAN:

This may sound crazy, coming from a repair man, but I think a uniform license system should be made a 48-state law! If one could be effectively passed, it would weed out the crooks, amateurs and poorly trained, leaving only those men who could be trusted by the public.

By tests given once or twice a year, I think this could be done. I don't know how they could test a man's honesty, but there should be a way. Any step along these lines would help the men (including myself) who are both competent *and* honest.

New York City "Jimmy"

His Men "Steal" the Show!

EDITORS, TECHNICIAN:

The biggest headache in my shop (and in others, I'm sure) comes from the "extra curricular activities" of some of my men. It's bad enough knowing they "wildcat" after store hours (and at cut-prices) but they use MY PARTS to do it!

My city is fairly big, so it's not a matter of simply firing the culprits. They are the best men available—and they know it! I pay better than average wages for this area, and even give the men every Wednesday afternoon off. Still the chiseling goes on.

Can any of your readers give me a solution? Frankly, I'm just about licked, otherwise.

New York State O.P.G.

Give 'Em 'Facts of Life'

EDITORS, TECHNICIAN:

When is something going to be done about educating the public to the facts of TV life? I mean about understanding why we charge for our labor as well as for parts?

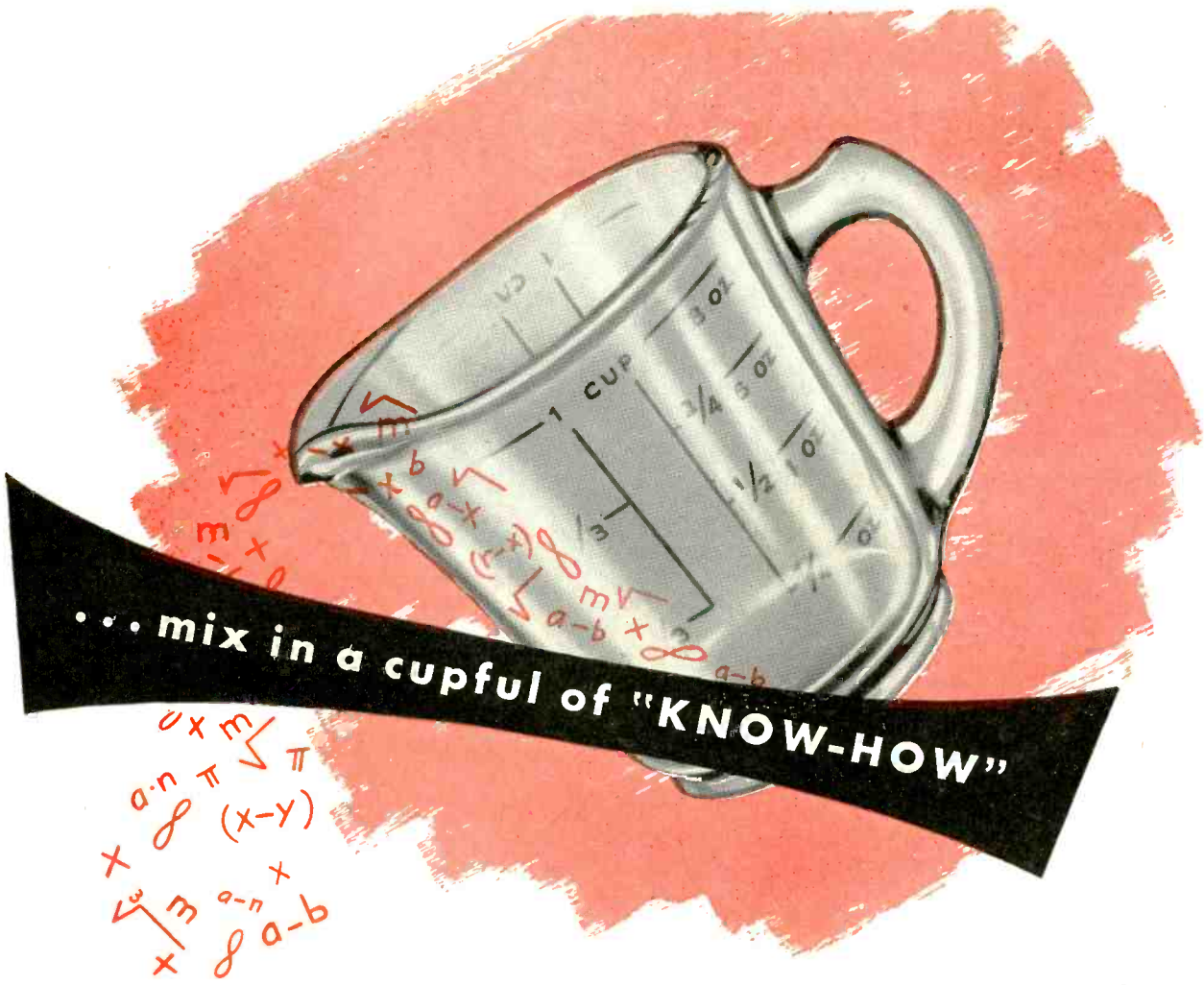
Pennsylvania C.K.

"Terrific!"

EDITORS, TECHNICIAN:

I have just received the new September TECHNICIAN. May I congratulate you and your staff on a very fine achievement. This issue is "terrific". It has everything the service technician wants in a magazine.

7 St. James Place SIDNEY KEITZ
New York 30, N. Y.



If knowledge came in containers, almost anyone could pioneer in the design and development of Electron Tubes — might even match RAYTHEON'S remarkable record of achievement in the industry.

But the kind of "know-how" that has helped RAYTHEON achieve so many industry-wide firsts, and established Raytheon Tubes as the quality standards of the industry, comes only through years of dedication to a single objective. For *thirty-years* that objective has been *to make the finest Electron Tubes in the world.* And the precious "know-how" accumulated during this period is now being used to maintain RAYTHEON TUBES' leadership in the years to come.

That's why you can use Raytheon Radio and Television Tubes — today and tomorrow — with complete confidence that you are using the finest. Ask your Raytheon Tube Distributor for them.

RIGHT . . . FOR SOUND AND SIGHT

RAYTHEON MANUFACTURING COMPANY

Receiving Tube Division

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

RAYTHEON®

Excellence in Electronics

RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

Again proving tube-design leadership...

40% OF 1952's NEW RECEIVING TUBES WERE G-E DEVELOPMENTS...TWICE ANY OTHER MAKE

FOURTEEN out of thirty-five registered *new* receiving-tube designs —40%— were G-E, in the last calendar year, 1952. As still further proof of leadership... new G-E types numbered more than twice those of any other manufacturer!

Outstanding research and development by General Electric have given to the TV-radio industry its newest, most advanced tubes. You can be sure, when servicing latest-model receivers, that G-E tubes are available for every need—that G-E leadership in tube development brings you the finest obtainable product. Every working day, you will receive extra dividends in superior performance and reliability.

You can expect more new and improved tubes from General Electric in the months ahead—types that will make your work easier and cut callbacks. Keep in touch with your G-E tube distributor for forthcoming new-tube announcements, each with a profit message for you! *Tube Dept., General Electric Co., Schnectady 5, N.Y.*

SHOWN BELOW: a few of the many *new* G-E tubes that are making money for service dealers.

You can put your confidence in—

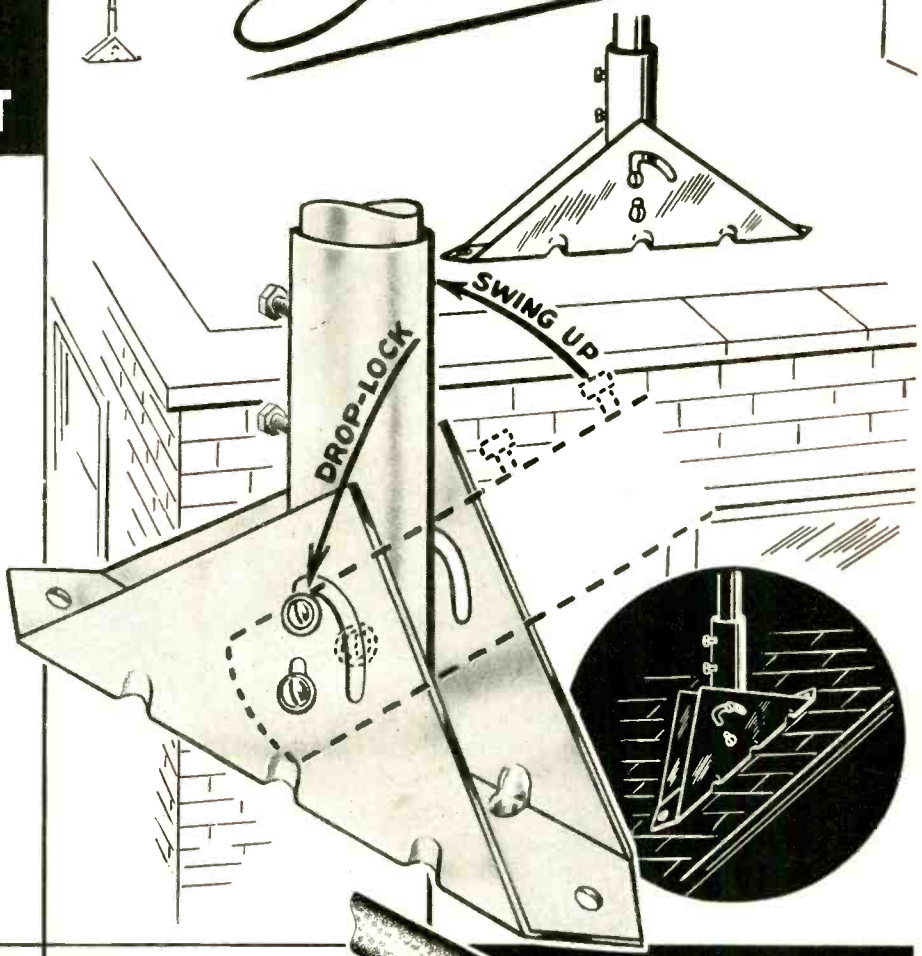
GENERAL ELECTRIC

161-1A8

NEW

Model RM-15 ROOF MOUNT

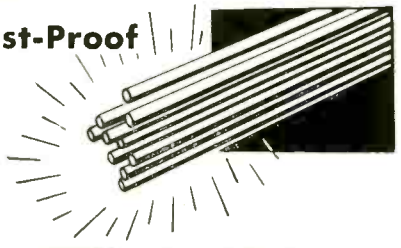
FROM *South River*



AGAIN South River has the serviceman in mind! With the new South River Roof Mount Model RM-15 his job is a quick, easy, efficient operation. A unique " walk-up drop-lock" feature permits ONE MAN roof-mounting for single mast installations. This mount allows fast, simple installation from a horizontal position. After the antenna and mast are "walked-up" to the vertical position, the mast holder DROPS into a special notch and LOCKS securely. The serviceman is then free to guy the mast.

Made of heavy-gauge metal, heavily plated for rust resistance and embossed at all critical points for extra strength and rigidity, the 5½" long mast socket accommodates masts measuring up to 1½" O. D.

The mast is secured in the mounting socket with 2 rugged hex screws, eliminating the danger of the installation vibrating loose. Two "in line" holes in mounting base permit bolting directly into heavy roof cross member.



ALUMINUM TUBING

Only South River is able to offer the industry this super-strength product extruded especially for us. The new aluminum tubing is fabricated of 63S-T6, a special structural alloy designed for maximum strength. Aluminum itself is bright and non-rusting, affording a lasting finish. Made with a .054 wall by 1-1/4" dia., in 10' lengths, the tubing is supplied 25 to a bundle.

Stronger, Tight-Twist GUY WIRE

Do the best installation job ... use South River's new hot-dip galvanized guy wire, carefully drawn with a tighter, stronger twist for extra durability under stress—providing tensile strength up to 70,000 lbs. per square inch. Produced in either 18 gauge or GENUINE 20 gauge, both available in either 4 or 6 strands, this vital product comes to you in 1,000' lengths on metal spool, or in continuous loops of 50' and 100' lengths.

Exclusive STEEL TUBING

Hot-Dip Galvanized Inside and Outside!

South River presents another FIRST in the industry ... 18 gauge steel tubing, hot-dip galvanized INSIDE AND OUTSIDE ... affording maximum utility and long life because of complete, all-over protection. It greatly increases the resistance of steel to the extreme atmospheric corrosion of shore and industrial areas. Hot-dip galvanizing is the only experience-proven rust resistant finish known. The tubing is available in 5' and 10' lengths, 10 to a bundle, is 1-1/4" dia., and is supplied with either plain or swedged end for mast extension.

South River's INSIDE AND OUTSIDE hot-dip galvanized steel tubing is another step forward in combating rust and corrosion. Your use of this product will prove that you keep abreast of important, new developments, for increased customer satisfaction.

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

Write for Complete Catalog

PIONEER MANUFACTURER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTINGS

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

FINAL EDITION

Test Equipment Good News

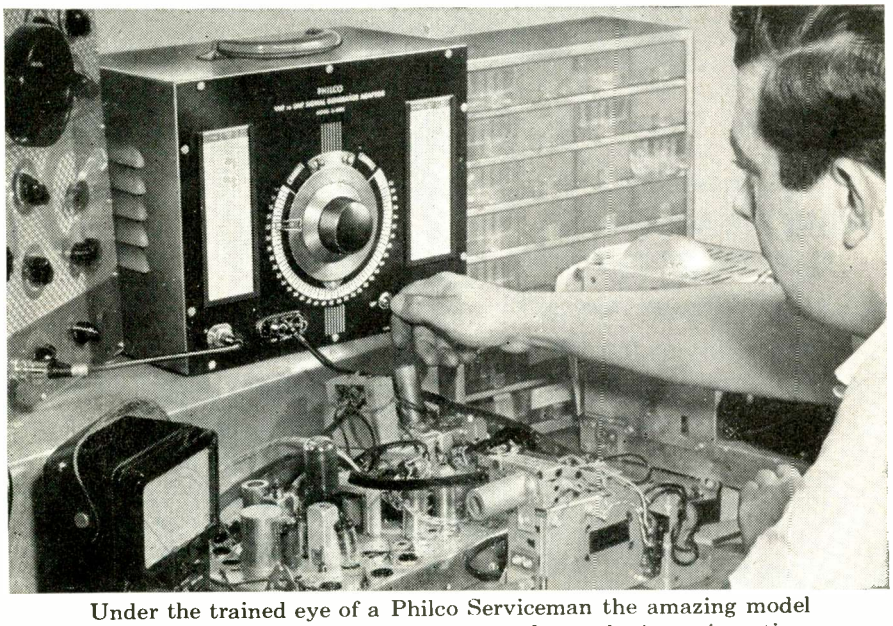
FINAL EDITION

PHILCO TEST EQUIPMENT SPECIFICALLY DESIGNED FOR THE SERVICEMAN

AGAIN PHILCO LEADS THE INDUSTRY

Serviceman's needs seen as Philco's Engineering Goal

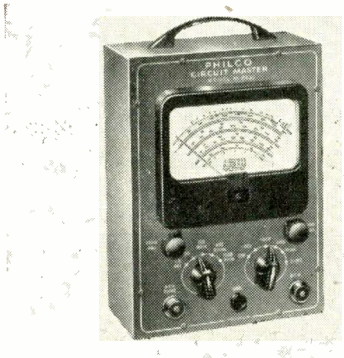
This new Philco VHF to UHF adapter pioneers a whole new approach to service problems and at the same time is the most economical and practical unit ever offered. Servicemen are taking full advantage of the introductory demonstrations of this amazing piece of equipment now offered by Philco distributors coast to coast.



Under the trained eye of a Philco Serviceman the amazing model G-8000 VHF to UHF signal generator adapter is shown in action.

The First and Only VHF to UHF Signal Generator Adapter

Continuing its engineering program designed to provide the serviceman with the best possible test equipment Philco Corporation now offers at a fraction of the usual cost an exclusive highly specialized adapter unit for converting the output of VHF TV servicing test equipment to UHF.



One of the Finest Vacuum Tube Voltmeters ever Designed

Facing up to the task of measuring high impedance circuits where loading effect must be kept to a minimum Philco has again designed a unit which meets the most rigid engineering specifications. All reports indicate this unit is unexcelled for complete and accurate measurements.

Practical Portable 3-inch Television Oscilloscope

The tremendous growth of television requires the most practical and versatile types of equipment to answer service needs. Philco has such equipment, particularly in its 3″ scope which is 2½ times smaller than other 3″ units, making it adaptable to either bench use or field servicing. High sensitivity and wide response make it ideal for TV work.

"Philco Test Equipment Specifically designed for the serviceman!" That's the theme of Philco's engineering program. A program which you, the serviceman, can depend upon to supply the very finest in service test equipment. Discover how easy it is to own a complete Philco Test Equipment Laboratory. Your Philco Distributor is eager to serve you by offering his new special payment plan to best accommodate your needs. Fill out the attached coupon as shown and mail to Philco Accessory Div.

PHILCO CORPORATION

Accessory Division

Allegheny Ave. & "A" St., Phila. 34, Pa.

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

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

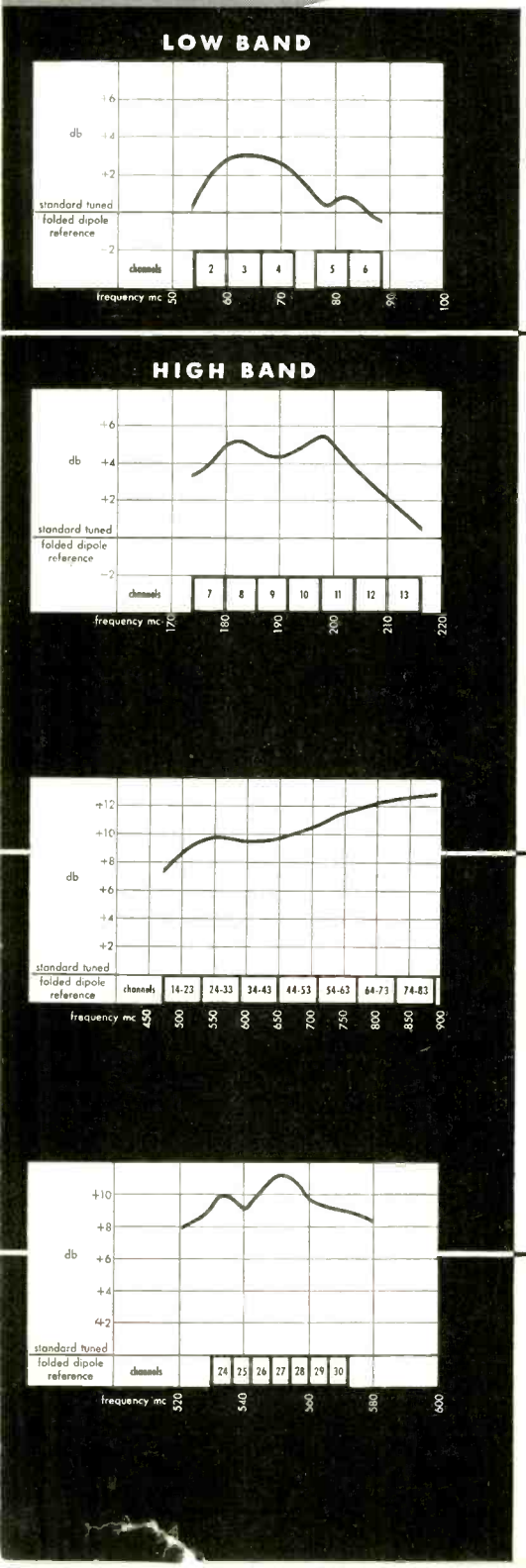
NAME .....

ADDRESS .....

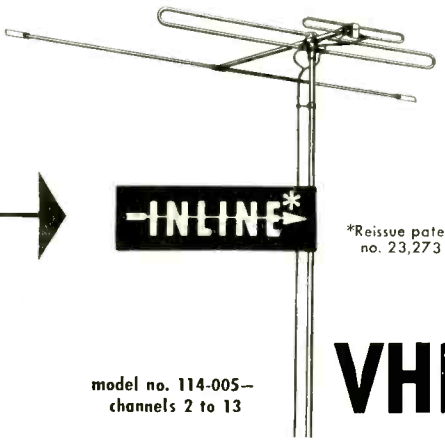
CITY ..... STATE .....

PROOF!

When measurement standards are uniform AMPHENOL antennas provide the best electrical characteristics*



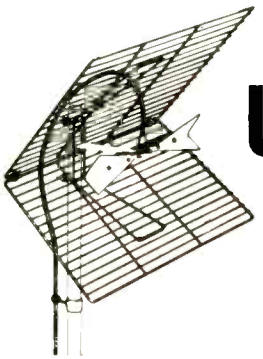
* All AMPHENOL VHF antenna measurements made in accordance with proposed RETMA standards.



*Reissue patent no. 23,273

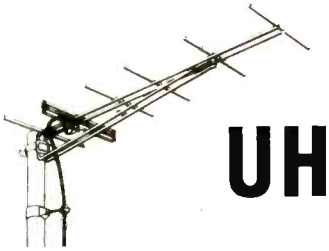
model no. 114-005—channels 2 to 13

VHF



UHF

Corner Reflector—model no. 114-058 for channels 14 to 83



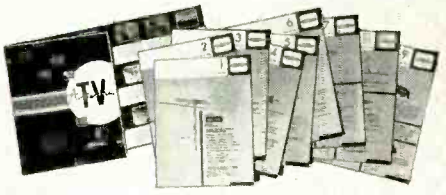
UHF

Yagi—model no. 114-054 (24-30) for channels 24 to 30 (models available for all channel groups)

Advertisements claiming 40 db gain for gilded coat hangers will be a thing of the past with the adoption of proposed RETMA antenna measurement standards. By this move, all antenna manufacturers will measure the performance of their antennas by the same methods.

The adoption of uniform standards will not affect AMPHENOL literature, however, as all AMPHENOL antenna measurements are, and have been, made in accordance with these proposed standards. The gain charts to the left represent ***reliable*** indices to the characteristics of three representative AMPHENOL antennas —give ***proof*** of top performance.

The superb ***electrical performance*** of AMPHENOL antennas plus the famous AMPHENOL ***craftsmanship construction*** has made these antennas the first choice of dealers, servicemen and installers all over the nation. They have found the AMPHENOL line to be the ***quality*** line on both top ***electrical performance*** and ***durable construction.***



For complete information on every AMPHENOL antenna, be sure and get your copy of the free "TV Antenna Folio" which contains antenna and accessories catalog sheets with full electrical data. **See your AMPHENOL distributor.**

AMPHENOL

AMERICAN PHENOLIC CORPORATION

chicago **50**, *illinois*

Decide on DuMont

on the basis of...

Microscopic look at the cathode surface reveals soft, even texture, necessary for efficient tube performance

Product Superiority

not too wet, not too dry—
not too light or heavy...

THE CATHODE plays an important role as source of electron energy in the picture tube. Moisture content and texture of the cathode coating must meet rigid standards to insure maximum picture tube life.

At Du Mont, exclusive processes are used for applying the cathode substance. The soft even texture achieved (see illustration) packs the effective emitting area (in circle) with extra electron power.

The resulting brighter performance over maximum tube life tells you why Du Mont is the right replacement for any set.

*Trade-mark

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

GUARANTEED PERFORMANCE

MONEY BACK GUARANTEED TO RECEIVE *All* UHF and *All* VHF STATIONS IN *All* DIRECTIONS FOR 60 MILES
WITHOUT A ROTORMOTOR OF ANY KIND!!

SO NEW! SO DIFFERENT! IT'S PATENTED!

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

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.

NEW **POLYMICALENE 4 CONDUCTOR TRANSMISSION LINE**

- Low Loss External - Air Dielectric
- Matched Impedance
- Eliminates End Sealing
- Eliminates Condensation
- Up to 50% Less Loss Than Tubular When Wet
- Easily Spiraled
- No Breaking or Shorting
- Patents Pending - T. M. Reg.

***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

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

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.

LIST PRICE
$36.75
SEE YOUR LOCAL JOBBER.

PRICE INCLUDES
Complete stacked array • 4 stacking bars • 9 position switch • Switch-to-set coupler • 2 - 7½" stand offs • Individually boxed in mailable carton

ALL CHANNEL ANTENNA CORP.
70-07 Queens Blvd., Woodside 77, N. Y. Hickory 6-2304

TECHNICIAN

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

FREE TUBE CHECKING — GOOD BUSINESS or BAD?

"TUBES CHECKED FREE." Does this sign appear in your window? If so, how much good is it doing you?

Do you know how much it costs, in labor time alone, to test each tube? Don't say it's a matter of seconds. Try timing it yourself. You have to warm up the checker and adjust it for line voltage. You have to set it up separately for each tube, more than once for multi-section tubes—and there are more of these today than ever before. You have to wait for each tube to heat. Added all together, two to three minutes is a reasonable estimate of time required to test each tube.

Let's suppose your shop man is doing the job. If his salary is in the range of $70 to $80 per week, he averages $2 per hour or more than three cents a minute, or about eight cents for each tube he tests. If you do the checking yourself, this cost is still higher. You still haven't counted time lost in talking to the customer or in breaking off another job and picking up the threads again; the cost of your tube checker plus its maintenance and depreciation; or any of the other overhead factors, like rent, electricity, paperwork, and insurance, that hang over every move you make.

Cost—12 to 14 Cents Per Tube

If you check an average of only 25 tubes a day—five customers with five tubes each will do it—your labor-cost factor alone is $2. Another dollar a day for other expenses is a conservative figure for this service. In addition, your tube checker itself (initial cost spread out over its useful life plus maintenance and depreciation) can easily account for 50 cents more. At this rate, tube testing will cost you $18 to $20 every week, or about 12 to 14 cents a tube.

But this is advertising, you say; you're buying good will. Good will from whom? You're playing to the fix-it-yourself crowd, the something-for-nothing bunch. The customer who marches in with a box full of tubes will solicit additional advice—also at no charge. He wants to know what he can next do to fix his set without paying you an honest fee for legitimate service.

Set Servicing More Profitable

Good will? Let's take cases. You've checked a bag of tubes for a customer whose TV set produces weak pix and sound. The local oscillator shows low emission and two IF tubes are on the borderline. You sell three new tubes. Actually you make less profit this way than you would have made on them if the set had wound up on your bench. Yet it turns out that the original oscillator was functioning anyhow and the IF tubes were also getting by. But there's an open grid-return resistor in the video amplifier that keeps on blocking signal after the new tubes are in.

Another case. Your checker shows a horizontal output tube is burned out. You sell a replacement. Half an hour later, your customer is back and in an unhappy mood. The same short circuit that finished off the original tube has just ruined your replacement. You can't get an exchange for this defect. Who bears the cost? Remember good will! If you satisfy your customer with a refund, how do you recover this loss?

Make a Minimum Charge

If you're against price cutting on your sales or other services, don't contradict your stand on this practice. A nominal testing charge, say 15 or 20 cents per tube, will do little more than protect you against loss of time and money. But it will guarantee you the minimum charge you have earned for a service performed. In addition, since it provides no escape from the minimum charge, it will put on your bench more of the sets that belong there. Your tube checker is a respectable instrument but, like your meter or scope, it is not the answer to all receiver defects by itself.

Finally, a charge for tube testing has the effect of saying to the set owner, "We are responsible people who do a skilled job, and we charge for it. We stand behind our work. We're not giving you pie in the sky; we're marketing our service."

Don't sell yourself short.

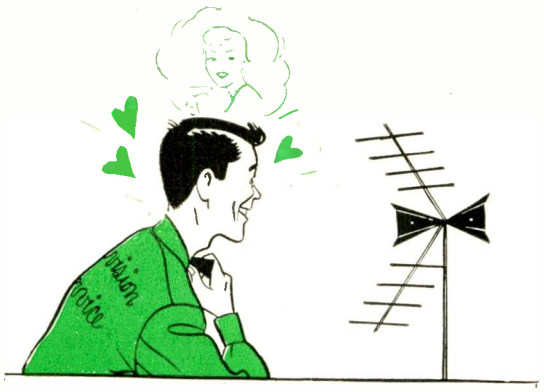
Tuning In the

NO DEPRESSION IN SIGHT, but good general business through first half of '54 seems to be the combined "best guess" of business soothsayers at this writing. The combined index of wholesale prices is expected to be steady to lower from now to 1954 mid-year. This will bring about a lower level of personal income by July. But chance of any real depression like 1929 is guarded against by these comparisons with 24 years ago.

Income is 198% higher.
Gross national product is 248% higher.
Total net private debt is only 75% higher.
Hourly earnings are 224% higher.
The cost of living is only 55% higher.
Dow-Jones industrial stock averages are 15% *lower.*

19% OF SETS SERVICELESS! Survey of New Brunswick, N. J., by Cunningham & Walsh, shows that this city of 38,768 people, 40 miles from New York City, has 71% saturation of TV sets. While replacement sales doubled last year, they still amounted to only 21% of total sets sold. When people do buy a second set, the purchase is actually replacement for smaller-screen set; the owner generally just "hangs on" to old set. Only 4½% of TV homes have two sets. High-cost-of-maintenance myth appears to be exploded by this latest survey of "Videotown." Some 19% of owners have "never had their sets repaired"; of sets purchased before 1951, there are still 4% which have "never been repaired." Average annual TV repair bill is $11, except for those few who have had to replace picture tube.

DRASTIC OVERHAUL OR REPLACEMENT work needs to be done on more than half of the outdoor antenna systems in use. Such services are required to insure better reception or for safety reasons. At an average service charge of $15 per system, the total is a tidy sum—a large potential to shoot at.



THE DOCTOR, THE PLUMBER, and the TV serviceman now have one common aspect in that they charge for a home call whether or not a service is performed, a prominent manufacturer points out. The physician cannot be substituted for, the plumber cannot be delayed, but the TV serviceman can not only be substituted by an amateur or part-time worker, but can be delayed indefinitely until the set is completely useless.

MOVIE OF TV SERVICEMAN in action, showing his usefulness and value to the public, is planned by Service Committee of the Radio-Electronic-TV Mfrs. Assn. A script costing $2500 is now being prepared. Black-white film is expected to cost $15,000 to complete; if in Technicolor $22,500 to $25,000. Prints of the 15-minute film will cost $25 each, and will be rented for $3.50 per showing or $12 per TV program.

IN THE RED-HOT PRICE-CUTTING BELTS, chiseling customers want that "something off" in cold cash when they buy sets these days. Chiseling dealers who offer to throw in antenna installations and free service contracts are finding that such inducements have lost their one-time luring power. Result: Technicians in such areas are running into plenty of "new work" from chiseling customers, and brother, they've got to watch their step—the servicers, we mean—in coming out of such deals with a profit.

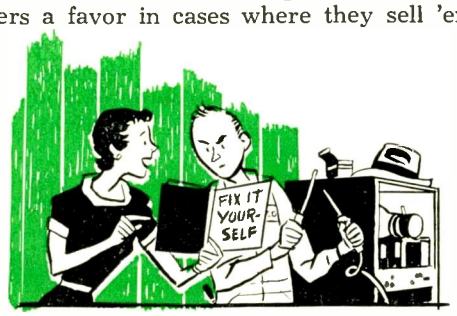
ABOUT HALF OF THE WHOLESALE-RETAIL parts houses in New York City will give dealers a break on Hi Fi equipment in cases where the latter provide letterhead or business card. The "breaks" given are considerably better than those offered the man who walks in off the street.

THE FINE LINE OF HONESTY—Where does it end and dishonesty begin, many service firm employers are asking themselves as they notice the disappearance of tubes and parts from their shelves and stockrooms. They know where the components are going but what can they do about it? Shall they accuse their day-time employes of working on their own after hours and using the bosses' materials for private profit?

MANY EYES ON RETMA'S TRAINING COURSE. The pilot program being developed in New York City will, if successful, be extended to other parts of the country, in an attempt to up-grade the quality of television servicing. Among the 85 candidates applying for admission for the NYC course starting this Fall, were servicemen working long hours at the bench, ready to give up the shreds of spare time they had left, in an effort to improve their technical ability. Eligibles who are accepted will be given the opportunity to work on late-model receivers of many different makes, and become familiar with a wide variety of test equipment.

Picture .....

PUBLIC PLACES, SUCH AS BARS are away behind homes in putting up with poor TV reception, almost always due to the operation of obsolete sets. Technicians who have plenty of headaches with out-of-date projection receivers, peanut-size screen jobs and other "trouble-makers" will be doing themselves and their customers a favor in cases where they sell 'em a new TV set.



MY "TOUGH DOG CORNER" is right in the home of a certain dog-owning customer of mine, writes a Georgia technician. "Kids don't bother me a bit, but this lousy canine gives me the jitters. He barks at me all the time I'm working, chews up the lead-in wire, and flies at me every time I make a move. To make matters worse, he's big as a lion, and about as ferocious, too. The people in the house say he's gentle as a kitten. I wonder!"

PLENTY TECHNICIANS ARE GRIPING THESE DAYS about "back-door" servicing by distributors, claiming that many of the set wholesalers go all-out in repairing consumers' receivers, and some in selling parts. Distributors have gripes, too, in this situation. Some of the big firms claim they don't want such consumer business but are usually forced into it by folk who claim they can't get proper service from their neighborhood repairman.

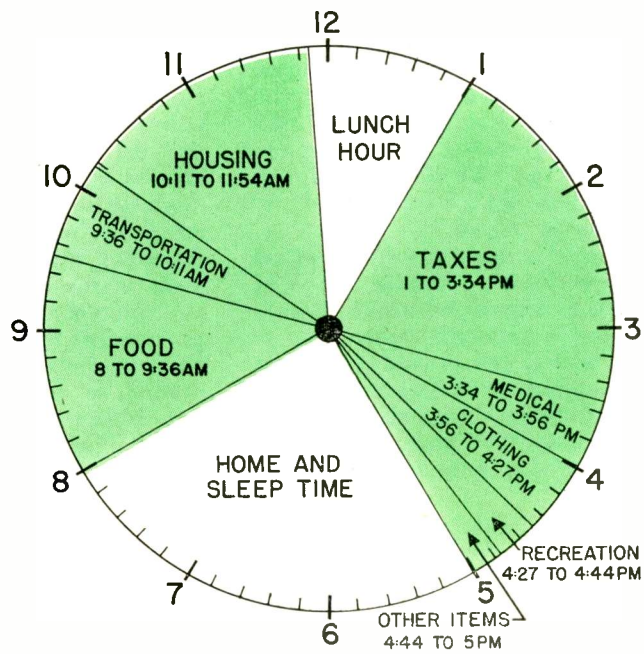
AND MUCH OF THE SERVICE WORK performed by distributors for consumers comes about as a result of letter-writing to factories by disgruntled users. Some manufacturers don't answer such complaints, but others do, sometimes recommending, in extreme cases, that the owners go to the distributor. Slews of griping mail pours into TV manufacturing plants. You'd be surprised how much!

TWO SOLUTIONS TO THE PROBLEM: 1. Get to know your distributor. And if you think he's taking away any of your bread and butter, tell him so and perhaps you can straighten out the situation. 2. Handle the "headache" customers with kid gloves. Try to put the "Tough Dog" receivers in good working condition, and be willing to go to the mat with your own customers to prevent them from going over your head with their complaints.

HAM INTERFERENCE IN TV RECEIVERS using "strips" to bring in UHF channel may pose a real problem for set owners, manufacturers, servicemen and hams. Under the dual conversion system used in strip tuning, the second harmonic as well as the fundamental frequency of the oscillator is employed to produce the first and second intermediate frequencies, respectively. The first intermediate-frequency, unfortunately, falls within the 144-148 MC amateur band. Since there are circuits in the front end that tune to the 150 MC frequency region (in tuners using strips), ham band signals in this part of the spectrum are accepted, and interfere with reception. Many amateurs have been staying off the air, to avoid ruining their neighbors' TV reception. Officials of the American Radio Relay League have announced, however, that their members cannot be expected to stay off the air because of design faults for which TV set manufacturers are responsible. If a serviceman is called in on a TVI complaint of the kind just described, he has a choice of one of two courses of action: 1—Acquaint the customer with the facts, and let it go at that. 2—Try lining the inside of the cabinet with a shield of some sort.

CONTROL OF PARTS STOCK vitally important. Millions of dollars' worth of new components go down the drain in service departments, in dealer stores, and in factories and distributor establishments. Loss occurs when employes take new parts out of stock, fail to use them, or just simply chuck 'em out. Huge sums are lost, too, when servicers "forget" to charge out components taken from shelves and bins. An efficiently operated accounting system is a must for every profit-minded operator.

WHAT WE ARE WORKING FOR



This clock diagram shows just how many minutes each day it takes you to earn the money for your family's food, housing, clothing, doctor bills and TAXES—if you work eight hours a day for an income around $4500 a year. Both direct and indirect taxes are included, as computed by Tax Foundation, 30 Rockefeller Plaza, New York City.

Tracking Down TVI

How to Troubleshoot External and Internal

By James A. McRoberts

• When interference is present in a set, the serviceman must determine whether the symptoms are internally or externally caused. Some technicians are apt to dismiss what is apparently a case of external interference with a statement like:

"Local interference is the cause of those lines, Mr. Smith. I'm afraid we can do nothing for you."

Have you heard this approach before? Contrast it with the following:

"We're not certain where you're

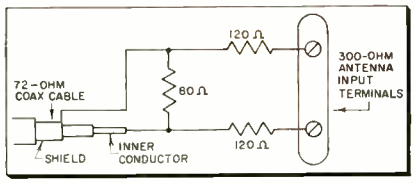


Fig. 1—Suggested matching network for connecting probe to receiver's antenna input.

symptoms originate, Mr. Smith. Suppose we leave this Superbo set with you for a few days—if the interference symptoms appear on this set too, we'll know for sure that the trouble is *outside* the set, and we can then go on to locate its source. If the symptoms *don't* appear on the Superbo, on the other hand, the trouble is probably originating *inside* your set. When our final test verifies this, we'll haul the set into the shop for repair."

Not only is this a practical method for determining whether the TVI present is originating inside or outside the customer's receiver—it is also a way of *demonstrating* this fact to the customer; and, in cases where an improperly designed set is responsible for TVI pickup, the demonstration may help sell a new set.

Still another pleasant feature of this lend-a-set technique may be mentioned: considerable time is saved by having the customer monitor the symptoms, without pay.

When it has been determined—by the lend-a-set method or some other technique—that the source of the TVI is external to the set, the possible routes of entry of the undesired signal should be considered. Determination of the route of entry will indicate whether the transmission line and antenna system, or the power line, must be signal-traced for the source of TVI, or whether direct pickup of the TVI via the chassis must be investigated.

While a cure may be effected during the course of such signal-tracing, TVI cures are not the subject of this article, which concerns itself primarily with TVI localization tests.

Tests to determine the TVI route of entry may be made by the technician; the customer (suitably guided by the technician, of course) may, in some cases, also make the tests.

The first check might logically be one to determine whether the TVI is entering via the power line. To make this test, install a commercial power-line filter between the set and the electric outlet. It is desirable to attach suitable plugs to the filter, so that it may be connected, not to the receiver line cord, but to the point where the line cord connects to the receiver proper. When an external ground connection is provided at the filter, a wire should be run between it and a good ground, to get maximum effectiveness from the filter.

If the symptoms of interference are now eliminated or greatly reduced, entry of the TVI via the power line is indicated. If the TVI is diminished to some extent—but not greatly—by the filter, signal tracing may start at the power line, using techniques to be described later; it should be kept in mind, though, that additional points of entry may be involved.

The check just described should be made before any of the others to be listed, to eliminate the possibility of TVI getting into the set *indirectly* (via radiation), from the line cord, as well as *directly* from the line cord, through the receiver's AC input terminals.

To determine whether the TVI is entering by way of the antenna system, disconnect the transmission line from the receiver's antenna-input terminals. If the intensity of the TVI symptoms is diminished, the interference is entering via this path. (The station signal will, of course, be attenuated when the antenna is disconnected.)

Sources, Tests, Remedies

If the TVI route of entry is the antenna-transmission line system, several possibilities must be considered:

1. *The frequency of the interfering signal is the same as that of the desired signal.* If this is the case, the TVI cannot be eliminated by filtering and trapping methods (such as those described in succeeding steps) without also eliminating or attenuating the desired signal. Sometimes re-orienting the antenna, re-routing the transmission line, or using a shielded lead-in will eliminate the symptoms. At other times, it may be

Fig. 2—Length of the probe may be between 6 and 100 feet (see text). Basic probe for tracking down television interference.

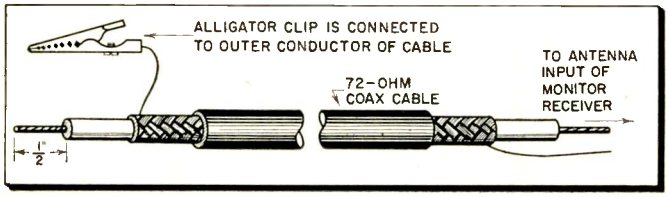
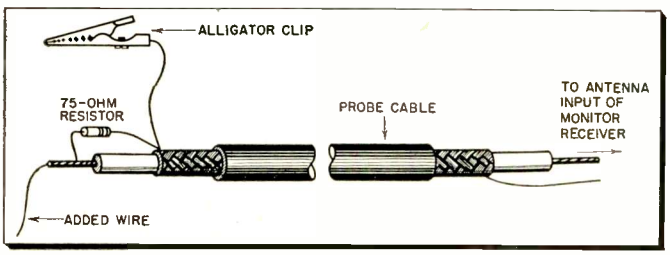


Fig. 3—TVI probe with a wire added to increase its pickup.



to Its Source

Interference, Using a Probe and a TV Receiver.

necessary to trace the unwanted signal to its source (which is usually nearby) and apply control measures at the latter point.

2. *The interference is present on all station channels.* This symptom indicates that the frequency of the offending TVI lies within the IF band of the receiver. To check whether this is the case, install at the antenna terminals a commercial trap that is tunable over the TV intermediate-frequency bandpass. If the TVI is reduced or eliminated by appropriate tuning of the trap, a cure as well as a localization of the trouble has been effected. If the interference is attenuated, but remains troublesome, signal tracing of the transmission-line antenna system will be necessary.

3. *The interference is due to some harmonic of an undesired signal.* A commercial trap at the antenna terminals will eliminate or attenuate this kind of TVI. Obviously, the trap must cover the frequency range of the possible interfering signals. The offending frequency will be some subharmonic (½, ⅓, ¼, etc.) of the frequency of the channel(s) on which the symptoms appear.

4. *The interference falls within the image-frequency band of the receiver, and is produced by a signal source operating outside the band of VHF TV channels. Ordinarily,* the undesired image will be separated from the station signal by a frequency of twice the receiver video IF. In cases where the oscillator operates *below*, rather than *above* the incoming signal, however, this will not be true. The set's schematic and service data should be checked, to determine what conversion system is actually being used. Try a suitable trap at the antenna input, to remedy this kind of TVI.

A relatively powerful, closely-situated source of TVI may cause unwanted signals to be picked up directly, by chassis wiring or other chassis components. This means of entry can be checked by moving the receiver from place to place about the room and observing whether the TVI intensity changes. Often, movement of the technician, or other people in the room, will produce this same intensity variation, eliminating the need for moving the receiver.

Troubleshooting Clues

Manipulation of a metal sheet (such as the mirror used in making raster adjustments) in the vicinity of the set, can provide clues to the origin of the interfering signal. This is so because the interfering signals travel in relatively straight lines. The ability of the metal sheet to reduce TVI, when positioned between the receiver and the TVI source, suggests chassis shielding as a possible cure for the trouble.

It is not at all unusual for some portion of the interference to be entering by all of the three routes previously mentioned: via the power source, the antenna-transmission line system, and direct chassis pickup. In this event, the tracing procedures to be described will start with that source of entry which seems responsible for most of the TVI; but the other routes will be kept in mind for subsequent investigation.

With respect to the tracing procedure itself, equipment is required which will pick up the interference and monitor its intensity, as we probe various locations. This equipment comprises, in most cases, a set which can tune in the interference (the customer's set, for example) and a shielded probe which permits only a small amount of the pickup energy to enter the set used as a monitor device. A 72-ohm coax cable is well suited for use as a probe; this type of shielded unit is desirable because we want the probe to pick up a minimum of interference signal.

We attach one end of the probe cable to the monitoring set *directly*, if the set has a 72-ohm antenna input; if a 300-ohm input is present, a matching pad (Fig. 1) is inserted between the probe and the receiver. The pad may be either a commercial or home-made unit (same type as the ones used for matching signal generators to antenna inputs).

To make the probe proper, simply remove some (about a half-inch) of the outer coaxial shield from one end of the coaxial cable (see Fig. 2). To the shield (at the end from which the half-inch section has been removed) attach a short length of lead, preferably shield braid; terminate the free end of this lead in a clip, as illustrated in Fig. 2.

Probe Length

The length of this elementary probe should be a minimum of one hundred feet, to be suitable for most cases of external interference; a minimum length of six feet is suggested for troubleshooting internal TVI (interference originating in set). The cable end opposite the clip-terminated one is connected to the input of a set which can pick up and display the TVI.

The end of the probe forms one

Fig. 4—Probe used with series condenser (C-1) in checking the power line for TVI. Additional connection of probe shield to line through C-2 will increase TVI pickup. C-2 may be .1 mfd.

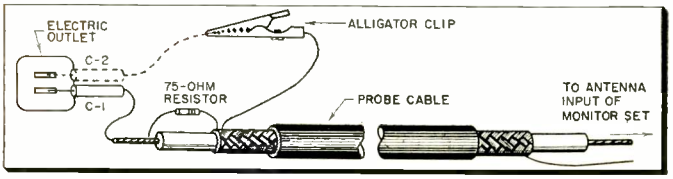


Fig. 5—How an exploring coil is connected to the probe.

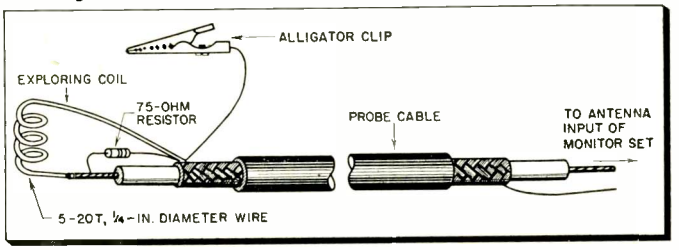


plate of a condenser, the metallic parts of the circuit near it comprise the other plate. Capacitative coupling is thus used to transfer the TVI from the circuit (or several circuits) being tested, to the probe.

The signal pickup of the probe may be insufficient at some stages of the test procedure. To increase it, attach a wire to the probe (see Fig. 3). The longer the wire, the greater the TVI pickup will become. The 70-ohm resistor connected between shield and inner conductor terminates the cable; this termination increases the probe pickup by preventing loss due to mismatching. You may remove this resistor if you choose, to decrease the sensitivity of the probe's TVI pickup.

If the addition of a piece of wire provides insufficient pickup of the TVI, connect the inner conductor directly to the circuit under test, through a condenser.

Such a hook-up, for use in power line tests, is illustrated in Fig. 4. Pickup may be increased by the connection of the shield to the grounded part of the circuit directly, or through a series condenser; the dotted lines in Fig. 4 illustrate the latter set-up.

In exploring a magnetic (interference) field, such as the one set up by oscillation in a TV front end, a coil may be of service as an accessory unit. Such an exploring coil is connected between the inner conductor and the shield of the probe, in parallel with the 70-ohm terminating resistor (see Fig. 5). The more turns on the exploring coil, the greater the pickup; you can use this fact as a guide in determining the number of turns to wind.

You may wish to pick up a signal that, you have discovered, is entering the chassis by way of the antenna, say by way of another antenna on the roof. A dipole (possibly an indoor type) could be attached to the probe terminals, as shown in Fig. 6, to form a signal-collecting unit. The dipole may be mounted on a pole for ease of manipulation, as well as to keep it away from your body, and prevent you from affecting the pickup appreciably. The 70-ohm resistor is omitted in this application, as the antenna furnishes the match to the transmission line.

Localizing TVI

To elaborate on some procedures mentioned previously: the process of localizing TVI necessitates the determination of whether the interference is of internal or external origin, as step number one. If external, we trace the route by which it has entered the set, said route including the circuits contributing the TVI—for example, power line to basement to landlord's oil burner, when the latter is the source of trouble.

The maximum intensity of TVI pickup is always sought; when the area of maximum interference is located, it should be a simple matter to identify the TVI source.

To make the technique entirely valid, some additional precautions are necessary with respect to the monitoring receiver. To avoid misleading indications, it is essential that TVI enter the latter set *only through its connecting probe and cable.* Entry from the AC source can be prevented by inserting a good commercial filter between the receiver and its power outlet. To avoid pickup along the length of the power line cord, the filter is inserted as close to the monitor receiver as possible. An extension cord can be used from the filter to the outlet.

If the TVI is radiating directly into the affected chassis, it may have the same action on the monitor receiver. To prevent this, the latter is physically separated from the set under examination as much as possible. The entire monitoring set may have to be shielded in addition. If the, monitor continues to pick up TVI after both these measures are applied (with no coupling present between the monitor and the set under test), the interference is so strong that it can generally be tracked to its (nearby) source without the use of the tracing techniques described here.

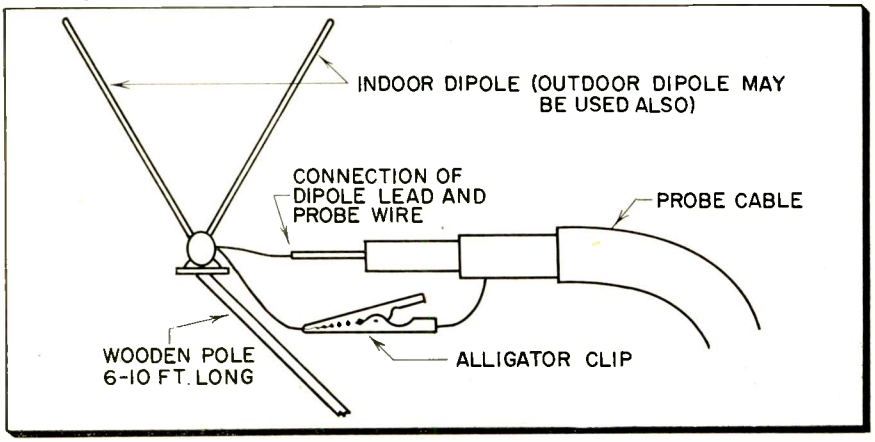
If internal TVI seems present, we move our probe about the chassis to locate the point of maximum intensity; this procedure discovers the circuit(s) which generate or transmit the TVI. (Example: parasitic oscillation of the horizontal amplifier and its B-feeds, the latter feed-lines acting as transmitters.)

Stage Gain

A word of caution is necessary concerning the troubleshooting of internal TVI. The factor of stage gain must be considered in such cases. For example, once interference is present in the audio or video systems, it is likely to be stronger, after amplification, at some point following the point of entry. In a case like this, tracing would have to proceed back, not to the area of maximum TVI intensity, but to the point of entry of the undesired signals in the circuit section that has been invaded. This is the point preceding which no TVI can be picked up.

The probe described here, together with its accessories, is useful for tracing other types of signals besides TVI. It may be used in conjunction with an oscilloscope to locate the cause of hum, video or sweep signal pickup by audio stages, or sweep signal pickup by video stages.

Fig. 6—Using a dipole in conjunction with the probe to pick up TVI signals.



Preventing Tube Damage

Data to Help You Locate the Cause of Some Premature Tube Burn-Outs

MOST OF THIS MATERIAL WAS WRITTEN AND ILLUSTRATED BY JOHN H. WYMAN.

• Many technicians perhaps do not realize that there is current flow in the control grid circuit of all tubes. Normally this current is on the order of a few microamperes. It is caused chiefly by residual gas, and/or emission from the first grid. In some closely-spaced high Gm triodes and some beam tubes, tube ventilation is inadequate; under these circumstances, grid current may rise as high as four or five microamperes. If this current flows through a one-meg grid resistor,

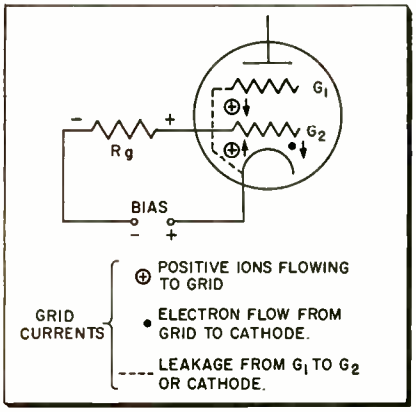


Fig. 1—Gas, leakage between elements (G_1 and G_2) and grid emission, may be responsible for lowering the tube bias to the point where cathode emission is destroyed.

four or five volts may be developed across the resistor (see Fig. 1). The polarity of this voltage is such that the tube bias is reduced, and the plate current consequently increased. This action can be cumulative, resulting in the quick destruction of the tube.

The moral of all this is, check the control grid-to-ground voltage when a premature failure of cathode emission in a tube is encountered, following up by a resistance check of the grid resistor, if an excessive positive voltage is present. Grid resistors over 100,000 ohms in value are particularly eligible candidates for the suspicious eye.

Inadequate cooling in the vicinity of the tube may also be a source of trouble. Check to see that the back of the receiver is some distance from the wall, and that vent holes are not obstructed, to remedy as well as prevent tube damage due to this factor.

Rectifier Limiting Resistors

Servicemen are sometimes uncertain about the function of the small resistor used in series with the rectifier plate in some radio receivers (see Fig. 2A). The technician may find one of these units burned out, and look around for a replacement; unable to locate one in the shop, he connects the rectifier plate to its source voltage, omitting the resistor. The set works fine—why bother getting another resistor?

The answer is, the resistor is a protective one, and promotes longer tube life. Most rectifiers can safely pass a certain peak plate current; if this current is exceeded, rapid deterioration of the tube cathode is apt to result.

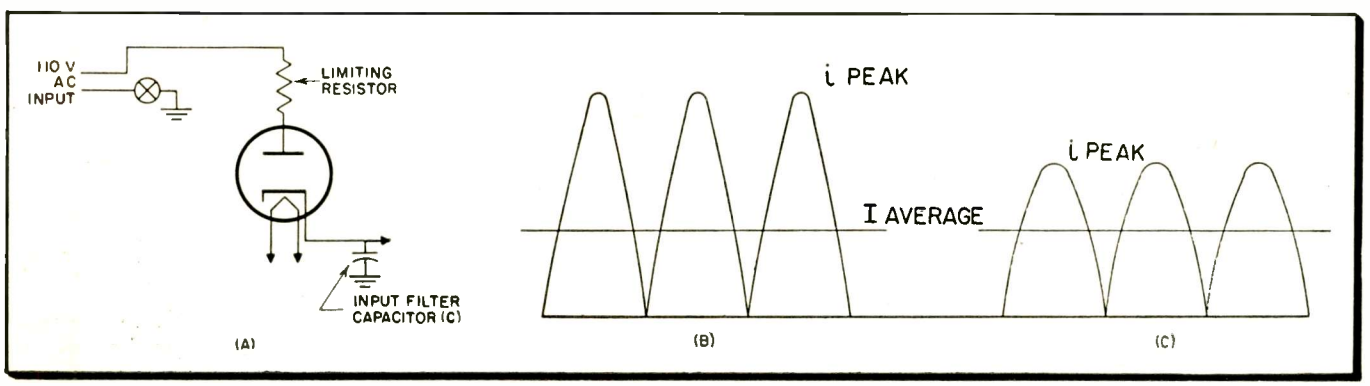
In a power supply, the peak current value (see Fig. 2B, C) is determined by the values of load resistance, input capacitance and the impedance of the tube and transformer (or tube and power line generator, in the case of a transformerless set). During each cycle, as C starts to charge, the impedance to current flow is practically zero; the rectifier impedance (and that of the transformer, when present) is the only factor limiting tube current flow. Since this impedance is very low, the tube will pass current up to the limit of the emission available from its cathode—an undesirable state of affairs that doesn't do the tube any good.

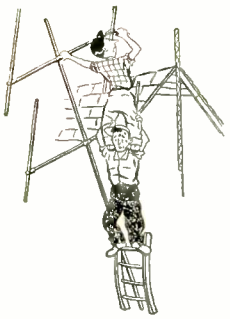
The insertion of a limiting resistor in series with the rectifier plate (in series with *each* plate, in case of a transformer-powered set) reduces peak current to a safe value. In the case of a transformerless set, the resistance may be in the vicinity of 40 ohms. When a power transformer is present, the limiting resistor value is between 100 and 150 ohms. Limiting resistors, incidentally, are seldom used in sets using power transformers. They are, however, almost always or always used in selenium rectifier circuits; the value of such a resistor in this application may be as low as 7.5 ohms.

Summary

Two important points are worth noting, in summing up: 1—Replace any limiting resistor found to be defective, to insure a normal life span for the rectifier present; 2—Avoid turning equipment on right after it has been turned off; the "hot switching surge" that takes place when the cathode is still hot and "rarin' to go," while the condenser has partly discharged (permitting a larger current to flow through it and the tube), is not healthy for the rectifier.

Fig. 2—A) Half-wave rectifier circuit with series limiting resistor. B) Instantaneous peak current with limiting resistor absent. C) Instantaneous peak current with limiting resistor present. Note that while the current peaks are considerably reduced, the average current is not appreciably affected.





Television Antenna

Wind Pressure Considerations. Setting Up Guy Wires.

By PHILIP THIER

• The major consideration in any antenna installation is, of course, keeping the antenna up in the air. A fallen antenna may be responsible for a considerable amount of property damage, as well as personal injury. Mounting problems are thus important, particularly in the case of tower-mounted antennas. Since antennas of this type are widely used in fringe areas, a careful examination of the problems associated with their installation may be helpful. These problems and their solutions also apply to the smaller rooftop antennas.

In a fringe area, a tower may be thirty to fifty feet high; a ten-foot mast on an apartment-house roof on the other hand, is about seventy-five feet above ground. Wind pressures on each antenna will be of similar magnitude; the main difference between the two types of installation will generally lie in the type of base mounting used.

Standards have been set up with respect to expected maximum wind pressures without specifying any antenna type. The National Bureau of Standards has set the maximum anticipated wind pressure at nine pounds per square foot. The Radio-Electronic-Manufacturers Association has more than doubled this value, choosing 20 pounds per square foot as their maximum. One apparent reason for the choice of the higher figure by RETMA is to make mandatory the use of at least a 100% safety factor. If the antenna installer wants to allow a safety factor above the RETMA value, more power to him. The importance of safe, secure installations cannot be stressed too strongly.

A wind pressure of even 20 pounds per square foot may not seem like a great load. Consider, however, that this force is acting on the end of a lever. As can be seen from Fig. 1, the base mount must be strong enough to resist the rotational force moment (or torque) created. Let us assume that the overall area of the antenna assembly exposed in any one direction is one square foot. At the base of a thirty-foot mast, the 20-pound per square foot wind pressure produces a torque of 600 foot-pounds. If this mast is set in a steel plate on a concrete base, the minimum safe stud-type expansion bolt diameter is ¾ in.

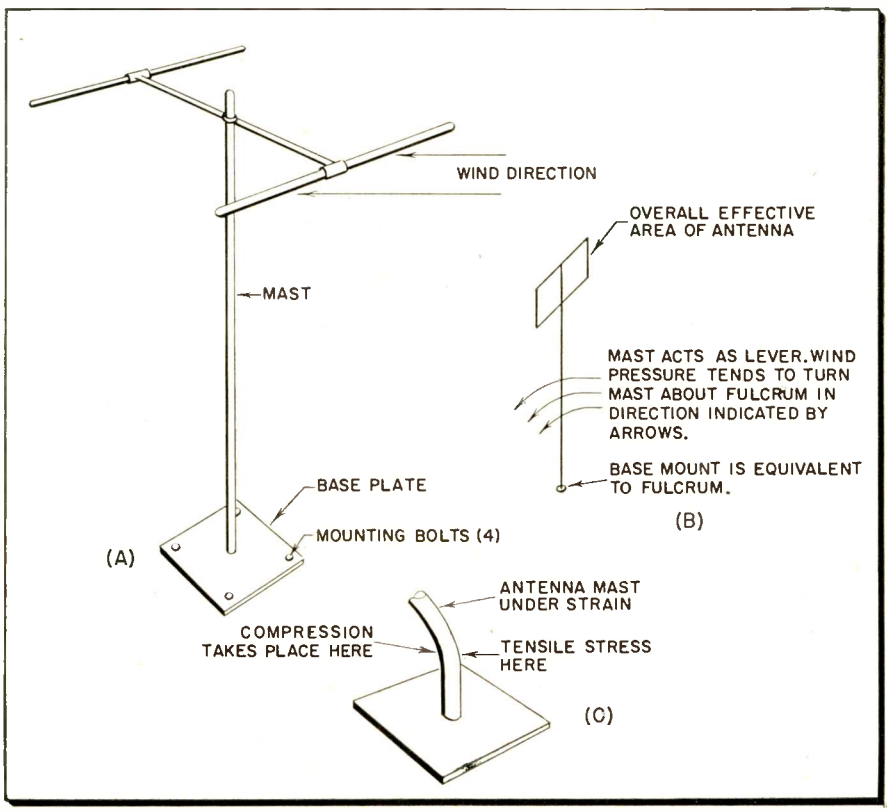
A relatively small rooftop antenna mount is subjected to forces of 200 foot-pounds or more. The safe bolt diameter in such cases is ½ in.

On an apartment house roof-top, the brick and mortar in the safety wall may become waterlogged and soft from many years of exposure to the elements. In these cases, it has been found necessary to drill clear through the safety wall, using steel plates on each side for reinforcements. The antenna mast is mounted to a steel plate.

Try to avoid any such installation if possible; should one be unavoidable, however, make doubly sure that the steel reinforcing plates are large enough to give secure purchase on the roof. From an inspection of Fig. 1C, it can be seen that tensile stresses in the mast itself must be taken into consideration. A good, solid base is not worth much if the mast above it bends or snaps. The wind pressure acting on the antenna will create forces that tend to bend the mast. Compression on one side and tension on the other combine to produce stresses in the mast material. When these stresses exceed the maximum safe limit for the metal used in the mast, it will shear; the entire structure then collapses. It therefore becomes very important to choose a mast made of the proper material. Our opinion, based on long experience, is that the best metals for the job are 24ST aluminum or a good grade of steel.

Another important consideration in antenna construction is the use of guy wires. After the antenna has been mounted, it may be strong enough to withstand wind pressure without shearing but it may, unless held in place securely, tend to sway continually. Constant bending, however slight, will weaken the metal and eventually result in breakage. Guy wires placed from the mast to a

Fig. 1—A) Diagram showing basic antenna elements and direction of wind. B) Antenna and force acting on it are comparable to lever and fulcrum. C) Mast may be compared to a crowbar ripping bolts out of a housing.



Mounting Problems

Minimizing Corrosion. Corking Mast Ends

secure anchor post increase the overall strength and stability of the tower or mast. Six-foot masts on the top of an apartment house have been known to vibrate enough to shatter the bricks to which they were mounted, and collapse. An easily installed set of guy wires would have prevented the vibration, thereby saving the antenna and possibly the technician's reputation.

In the case of large masts, or in areas where high winds are common, guy wires are absolutely essential. At times as many as four sets of guys are needed to support an extra tall tower. Guy wires should be attached to the mast and to the anchor posts in such a way that the angle between each wire and the ground at the anchor post will be from 30 to 60 degrees (see Fig. 2A). An angle of 45 degrees is considered the most efficient, but variations of plus or minus 15 degrees can be tolerated. The choice of angle depends on space limitations. The 60-degree angle uses least space, and the 30-degree angle most space, from the antenna base.

If three guy wires are used, place them at angles of 120 degrees apart (Fig. 2 B); four wires are placed at right angles to each other.

To facilitate guying placement calculations, Fig. 2A shows only *one* of the set of wires actually used for each support angle. Note that the wire going to the top of the mast makes a 60-degree angle with the ground. If space permits, the wires may be anchored further from the base, as indicated by the dotted lines in Fig. 2A. Shorter masts, such as the ten-foot lengths commonly used, can be adequately supported by only one set of guys placed at the top of the mast. Guy wires are fastened to the mast by guy rings or clamps, as shown in Fig. 3.

Guy-Wire Insulators

Place insulators in the guy wire, to break it into independent lengths which are not equal to, or any integral multiple of, the length of any single element in the antenna. This will prevent the guy wire itself from resonating at the frequencies for which the antenna is cut, thus eliminating the possibility of the guy wire re-radiating incoming signals and causing multiple images (ghosts) in the receiver.

Corrosion will greatly reduce the tensile strength of any metal. To prevent or minimize corrosion, it has been found advisable to clean each mast and paint it with at least two coats of aluminized radiator paint. Then, after installation, the mast is coated with grease. The same paint and grease treatment will protect the rest of the antenna structure against the ravages of nature. The paint serves to protect the metal from corrosion and the grease helps to prevent the formation of ice. Ice loading on the antenna structure can increase tensile stresses and torque forces by two or three hundred percent. Since ice formation increases the overall antenna area, wind pressure effects increase by a like amount.

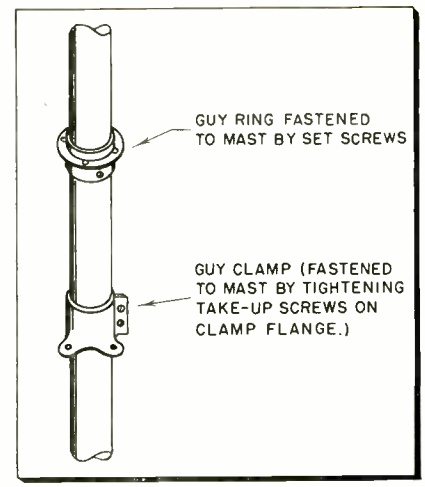


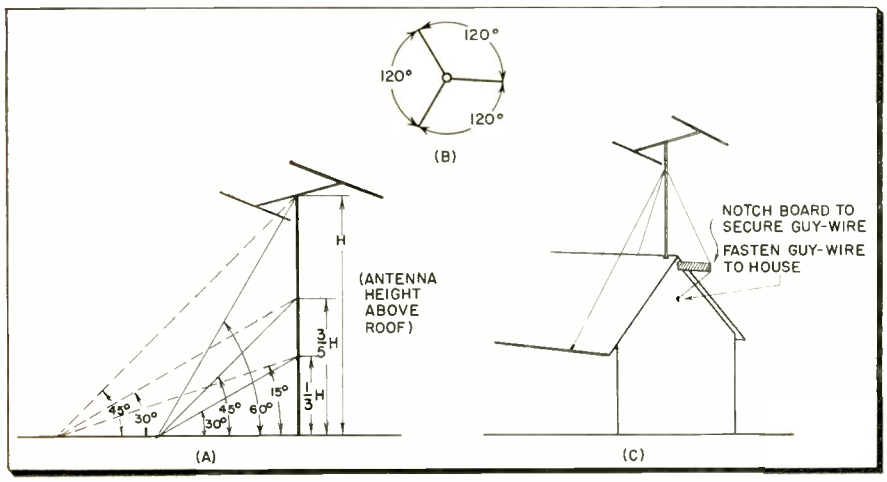
Fig. 3—Methods of fastening guy wires to mast, using either a guy ring or guy clamp.

The mast and the antenna elements are usually tubular (hollow rod). The open ends of the units should be plugged with cork or rubber stoppers. Certain commercially-available masts are made of rolled-plate metal, which has been mechanically seamed to form a tube. These may be less expensive than the seamless-type mast, but they are much weaker, in the opinion of the writer.

To illustrate the desirability of closing off the mast ends, particularly when a seamed mast is being used, the following case history is presented. A seamed-tube mast was installed on an apartment-house roof in New York City. The mast top was not plugged, but the bottom was flush against the rooftop. Rainwater filled the mast and then froze. The expanding ice burst the mast asunder and the entire antenna collapsed.

In our next article, matching problems in antenna installations will be dealt with.

Fig. 2—A) Three sets of guy wires should be attached to an antenna when a large mast is to be reinforced. The solid-line wires illustrate the positioning of one wire in each set, when roof space is limited. Dotted lines illustrate guy-wire set-up when more roof space is available. Suggested angles for heights of 1/3 H, 3/5 H and H are shown. B) Diagram indicating spacing of anchor bolts, when a group of 3 guy wires is connected to the mast. C) A 2x4 board nailed under the walls of a pitched roof maintains 120-degree spacing between guy wires.



Troubleshooting Vertical

Fast Checks for Defective Tubes, Vertical Output Transformer,

By M. M. GERSHUNY

• The vertical deflection circuits of a television set are probably the simplest circuits to service in the receiver. There are usually only two stages involved, both of which are relatively uncomplicated. An understanding of some simple facts about these circuits should enable the technician to service them with a minimum waste of time and parts.

Possible symptoms produced by defects in vertical deflection systems may be classified as follows: 1. Complete loss of vertical deflection; 2 Insufficient height; 3. Foldover; 4. Loss of synchronization; 5. Distortion (non-linearity).

Although it is entirely possible that a single defect may cause more than one of the above symptoms to appear, it has been the writer's experience in the majority of cases that one symptom alone has generally had to be dealt with.

The vertical circuit shown in Fig. 1 is typical of many television sets in use today. Another circuit in common use is illustrated in Fig. 2. The troubleshooting suggestions for these circuits may be easily adapted to other similar ones.

Let us consider the first possibility, complete loss of vertical deflection. This problem involves two approaches. One is the procedure of the serviceman in the customer's house, carrying a minimum of test equipment and parts. The other is that of the benchman who has a wide assortment of equipment and parts readily available.

The usual procedure in the customer's house is to check the tubes in the vertical circuits by substitution. Most cases of vertical trouble are due to defective tubes. In checking this circuit, it is desirable to replace both oscillator and amplifier tubes at the same time; if the trouble disappears, replace the old tubes *one at a time.* In this way, if both tubes happen to be defective, they will be quickly found.

Should the tube substitution test prove inconclusive, the next logical procedure would be a check of the height and vertical linearity controls. (Some servicemen might prefer to check the setting of these controls *before* substituting tubes—Ed.) Each of these controls should be turned from one extreme to the other, while the CRT screen is observed, to determine whether the control action is normal. It is not too uncommon to find that a defect in one of these controls is responsible for a loss of vertical deflection. The same is true, of course, of the vertical hold control. If one of the controls is found to be defective, an emergency repair can sometimes be made in the customer's home.

It will be found that, in most sets, potentiometers are used for vertical controls. Usually one side of the pot will be tied to the variable arm, or left unconnected. If the wire on one end of the defective pot is transferred to the unused terminal, the circuit will frequently work quite satisfactorily. If the serviceman has an ohmmeter with him, this need not be a matter of guesswork.

Defective New Tubes

If the foregoing procedures do not bring desired results, the next logical procedure is to "pull" the chassis to the shop for repair. Once the chassis is set up on the bench, the experienced benchman will usually check the tubes again. All too often, the new tubes in the service kit are found to be defective.

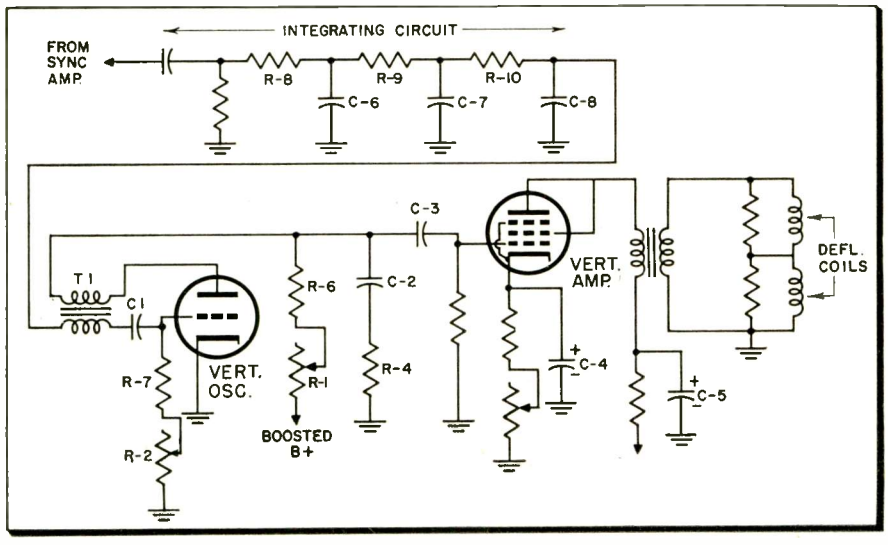
While checking the tubes, the technician can also test the output transformer and yoke by rocking the output tube in its socket. If the disturbance makes the bright line on the CRT jump up and down (total loss of vertical deflection is assumed), these components are probably in good condition. If not, they should be first on your list of suspects.

The amplifier stage can be rapidly checked by placing a finger on its control grid. (Applying a 60-cycle hum signal through a .1 mfd condenser would be a safer procedure —Ed.) The easiest way to do this is to hold a long, thin screw-driver by the handle, placing one finger on the blade; the tip of the blade is then touched to the grid pin. The AC voltage picked up by your body is thus applied to the vertical amplifier; if the amplifier is functioning properly, some deflection will now be seen on the screen of the CRT. This will isolate the trouble to the oscillator, which can now be checked with a vacuum-tube voltmeter.

The typical vertical oscillator has comparatively few components, which simplifies the technician's job. Since the tube, vertical hold control and height control have already been tested, only a few components remain to be checked.

If the preliminary test indicates trouble in the vertical output circuit, simple voltage checks at the plate and cathode of the output tube will speedily indicate the source of the de-

Fig. 1—Typical vertical circuit using blocking oscillator. R-1 is height, R-2 hold control.



Deflection Circuits

Yoke, and other Components. Troubles, Tests.

fect in most cases. On the rare occasions that, by the process of elimination, the yoke becomes suspect, the writer has found that the best check is to substitute another yoke. If one of the correct inductance is not available at the moment, any unit can be used, provided that it is kept in the circuit only long enough to verify the diagnosis.

The problem of insufficient height has plagued the serviceman since the onset of television. This trouble has two variations. One is the condition in which, with height and linearity controls fully advanced, the picture does not fill the screen. The other is the less obvious but equally annoying condition of being able to fill the screen, but only by severely distorting the picture. (The writer has noticed that the average person is much more disturbed by vertical than horizontal distortion.)

Tube Substitutions

The approach to this problem can be split up into field and shop techniques. The field technician is limited, in the average service operation, to tube substitution. In addition to replacing the oscillator and amplifier tubes, the low-voltage rectifier tube or tubes should be replaced. If the set uses selenium rectifiers, these should be checked in the shop.

In some cases, where the amount of picture shrinkage is small, and ordinary substitution does not help, substitution of a different tube type may be worth trying. Types 6V6 or 6W6 have been successfully used in place of a 6K6 vertical amplifier to give just the extra bit of deflection needed. In circuits using a 6SN7 vertical amplifier, a 6BL7 has been used with good results.

This practice is desirable only in the field, in cases when the customer does not want to stand the expense of a shop repair. The set owner should, incidentally, be made aware of what has been done, and why. Over several years, the writer has never seen any ill effect resulting from this type of substitution. We must confess having encountered a small minority of cases where the method did not work.

If the problem proves too much for the outside serviceman, the benchman comes into the picture. He can simplify his problem by first inspecting a picture, or, preferably, a test pattern. The benchman will find that either the height control or the vertical linearity control will lack sufficient range to bring the picture into good linearity at the proper size. If the height control is found wanting, the trouble is most likely in the oscillator or the grid circuit of the output tube. If the vertical linearity control does not have enough range, the trouble is in the cathode or plate circuit of the amplifier.

A trouble commonly encountered is a leaky coupling capacitor (C-3, Fig. 1; C-71, Fig. 2). This defect usually causes a compression at the bottom of the picture, and possibly a short foldover. One very confusing problem can be caused by a defective C-1 (Fig. 1). The writer has seen cases where, with C-1 partially shorted, the vertical sweep frequency went up to over 400 cycles per second. In addition to severe loss of height, the resulting jumble on the screen resembled a loss of horizontal sync. Only close inspection of the raster, showing uneven spacing of scanning lines, especially the oddly-rambling vertical retrace lines, gave a hint of the real trouble.

Vertical Amp. Tests

The output circuit of the vertical amplifier is best checked by substituting parts. The author does not recommend substituting parts from junked sets for test purposes. If the vertical output transformer is not a good impedance match between the amplifier and the yoke, adequate height may not be attained. In the case of permanent replacement, it is a false economy to use any but an exact replacement part.

In many cases, where the height is almost, but not quite satisfactory, replacement of the vertical amplifier's plate decoupling and cathode bypass condensers (after a bridging test) will bring it up to par.

Among the easiest symptoms to recognize are some of those produced by a defective yoke. When we have loss of height due to yoke trouble, a trapezoidal raster will almost always be seen. When one side of the raster is noticeably different

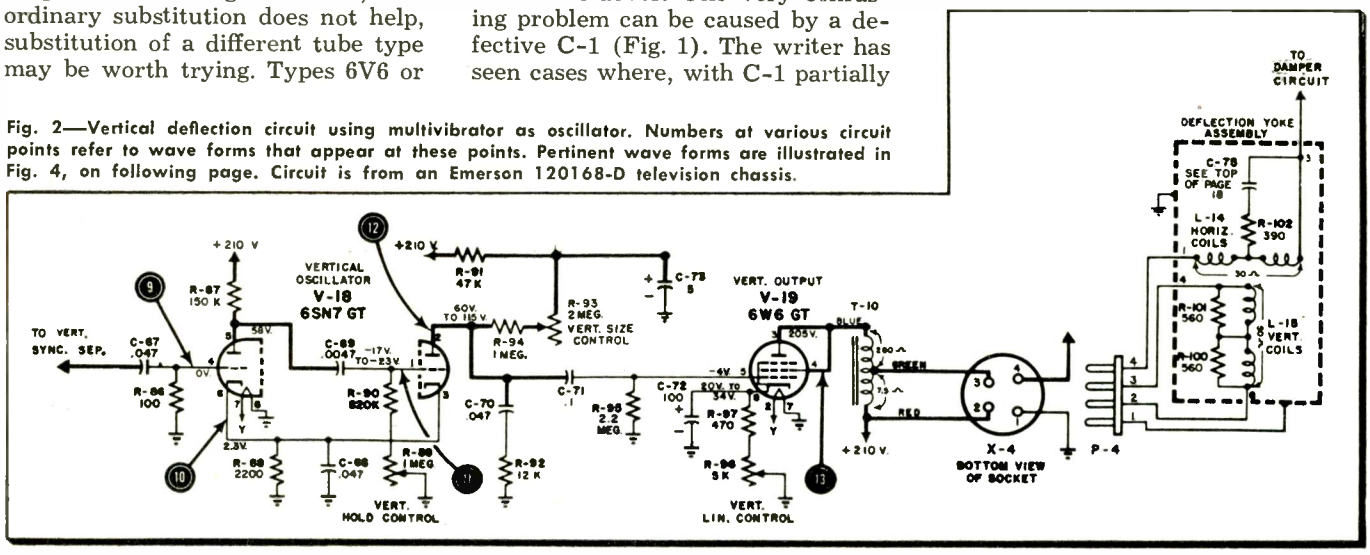


Fig. 2—Vertical deflection circuit using multivibrator as oscillator. Numbers at various circuit points refer to wave forms that appear at these points. Pertinent wave forms are illustrated in Fig. 4, on following page. Circuit is from an Emerson 120168-D television chassis.

in size from the other, look no further; replace the yoke. (It would seem wise to check components in parallel with yoke windings, before condemning the yoke—Ed.)

Vertical foldover is caused by distortion in the vertical sawtooth wave applied to the deflection coils, or by a slow vertical retrace. In the first case there will be foldover at the bottom of the picture; in the second, a foldover will appear at the top. Bottom foldover can usually be cleared by replacing tubes. Sometimes, an improperly-adjusted vertical linearity control will introduce foldover; the condition is, of course, eliminated by proper control adjustment.

When vertical foldover seems present, the settings of all vertical controls should be carefully checked. Sometimes, when the vertical oscillator locks in at an incorrect frequency, the picture looks as though it has a bad vertical foldover.

Next to the tubes, the most common cause of foldover, in our experience, is a leaky coupling capacitor. Even when leakage in C-3 (Fig. 1) is so slight that a resistance of several megohms is measured across it, an annoying foldover at the bottom of the picture is apt to be produced. The best way to check this capacitor is to disconnect it at the grid of the output tube and measure for DC voltage between the open side of the capacitor and ground. With a good capacitor, the meter may fluctuate around some low reading, no higher than about three volts. A bad capacitor will cause an appreciably larger reading. A leak in the charge-discharge capacitor (C-2, Fig. 1; C-70, Fig. 2) can cause a severe compression at the bottom of the picture, resembling a foldover. This condenser may be checked in the same manner as the coupling capacitor.

Foldover at the top of the picture is relatively rare. It may be caused by an increase in the value of the peaking resistor (R-4, Fig. 1; R-92, Fig. 2), or a bad output transformer or yoke. Unfortunately many customers prefer to live with this condition rather than pay for its cure.

When the all-too-frequent complaint, "The picture jumps," is heard, the experienced technician goes to the customer's house prepared for anything, from fixing the antenna to suggesting new glasses for the customer. There is probably no other television defect with as many possible causes as unstable vertical hold. To mention just a few, this condition can be caused by electrical interference, incorrect antenna orientation, improper adjustment of the fine tuning control, and video IF misalignment. We will discuss only defects in the vertical circuits which may be the cause of this condition.

Vertical Amp. Tests

Under the normal operating conditions, in the case of most television sets, the vertical sync pulses are separated from the horizontal ones by a low-pass filter—the integrating circuit. These pulses are fed to the vertical oscillator, and lock it into synchronization with the corresponding oscillator at the transmitter. The normal or free-running frequency of the vertical oscillator should be somewhat less than sixty CPS for optimum control by the sync pulse. The oscillator's free-running frequency is adjusted by the vertical hold control. The height control also has some effect on frequency; it should be possible to compensate for this effect by re-setting the hold control.

There are three possible conditions pointing to a defect in the vertical hold circuit. One would be the condition in which the vertical oscillator is not locked in. The hold control can be adjusted to approximately sixty CPS, but the picture continues to drift up or down. A second condition would be where the vertical hold setting does not bring the oscillator close enough to sixty cycles to permit it to lock in. In this case, the picture can frequently be locked at a multiple of sixty cycles, or even at thirty cycles, depending on whether the frequency is too high or too low. The third problem exists when the vertical oscillator frequency drifts, requiring readjustment of the hold control; eventually, the drift in frequency is too great for hold control re-setting to correct, and condition two results.

It should be immediately apparent that the vertical sync pulse is not reaching the oscillator in the first condition described. If the picture is not out of horizontal sync at the same time, then the likeliest place for the pulse to be lost is the integrator. Since the fault is a sync rather than a vertical circuit defect, we will not discuss it further.

For condition two—oscillator too far out of range—the oscillator grid components (C-1, R-7 and R-2 in Fig. 1; C-69, R-90 and R-89 in Fig. 2) are the ones to check, since they control the oscillator frequency. The technician should note whether the picture is rolling up or down. If the picture rolls *up*, the oscillator frequency is *less* than sixty cycles. If it rolls *down*, the frequency is *above* sixty cycles.

An increase in the time constant of C-1, R-7, and R-2 would make the oscillator frequency too low. This is commonly caused by an increase in the value of the resistor in series with the hold control (R-7, Fig. 1). Conversely, an increase in oscillator frequency would be caused by a *decrease* in the time constant just mentioned. This could very well be due to a loss in the capacitance of C-1 (Fig. 1).

Condition number three (drift) can usually be cured by replacing both C-1 and R-7 (Fig. 1). We have seen cases where a defect in the hold control was responsible for drift; this is, however, very unusual.

Distortion in the vertical direction is relatively rare. It can be caused by a defective vertical amplifier tube, or an open coupling capacitor. Strong hum in the B supply can cause apparent stretching and compression of the picture in the vertical direction. If the transmitter is powered from a different source than the receiver, the stretched and compressed areas will slide up or down, causing an effect like trick mirrors at a carnival. The open capacitor can be found, of course, by successively bridging the different electrolytics in the B supply.

Fig. 3—Normal waveforms and their amplitudes in a typical vertical circuit using a blocking oscillator. A—Grid of vertical oscillator (135v p-p) B—Plate of vertical oscillator (105v p-p) C—Grid of vertical output tube (105v p-p) D—Plate of vertical output tube (900v p-p) E—Cathode of vertical output tube (1v p-p). (*Courtesy, RCA*)

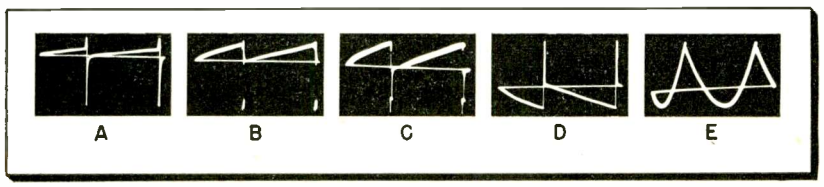
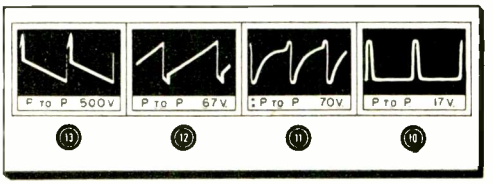


Fig. 4—Waveforms and their amplitudes in the circuit of Fig. 2 (preceding page). Numbers under the waveforms refer to the circuit points in Fig. 2 at which the waveforms were obtained.



Vertical Circuit Troubles

Common Defects, and How They Affect the Test Pattern

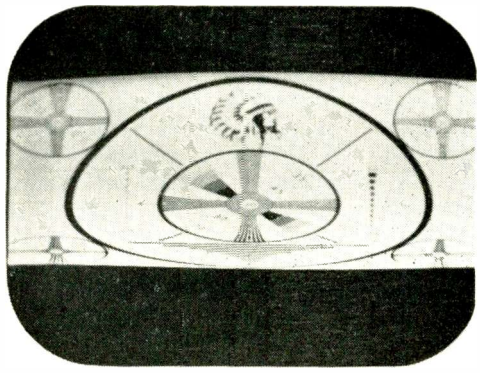


Fig. 1—Loss of height, vertical linearity poor. Possible sources of the trouble include: Low emission in the vertical sweep amplifier tube; insufficient signal input to this amplifier; defective sweep output transformer; insufficient B-voltage feed to the vertical amplifier; loss of capacitance in the vertical amplifier cathode bypass condenser.

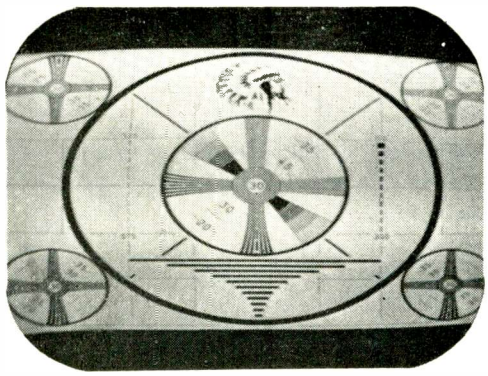


Fig. 2—Insufficient picture height, vertical linearity approximately normal. Possible sources of trouble: Loss of emission in the vertical oscillator or sweep amplifier; increase in value of oscillator (multivibrator) plate resistor; defective vertical output transformer; improper plate or grid voltages on output tube; loss of capacitance in the vertical amplifier cathode bypass condenser.

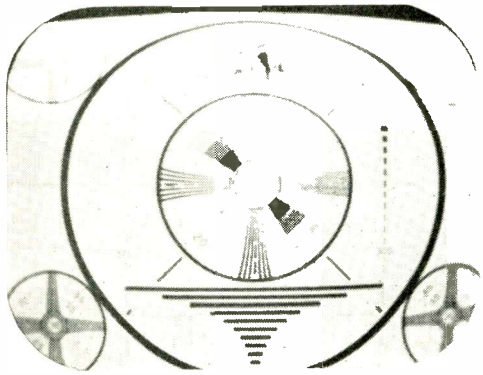


Fig. 3—Poor vertical linearity; height can be adjusted satisfactorily. Possible sources of trouble: Improper setting or defect in linearity control potentiometer or other linearity circuit components; vertical amplifier tube may require replacement; loss of capacitance or leakage in the cathode bypass condenser of the vertical amplifier.

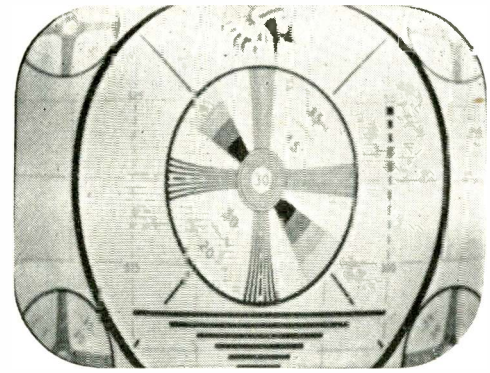


Fig. 4—Excessive height. Usually caused by excessive "drive" at grid of vertical amplifier. Check for decrease in value of charge resistor in plate circuit of vertical oscillator; reduced capacitance in charging capacitor; defective height control.

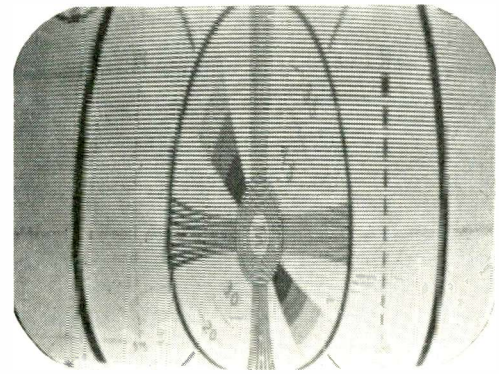


Fig. 5—Excessive height, vertical linearity poor, foldover at bottom of raster. Possible sources of trouble include: Leakage in the coupling capacitor between the vertical oscillator plate and amplifier grid; loss of capacitance in the oscillator's charging capacitor.

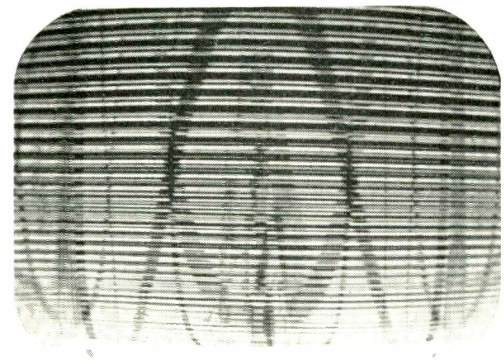


Fig. 6—Excessive height. Sweep is so great that the horizontal scanning lines are pulled apart. Severe leakage in the coupling condenser between vertical oscillator and amplifier may cause this.

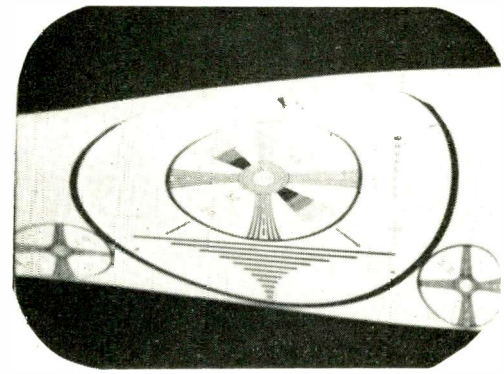


Fig. 7—Vertical keystone effect. Possible trouble sources: Change in value of a shunt resistor across one of the vertical yoke coils; shorted turns in vertical yoke. (Photos on this page courtesy GE; captions based on GE text.)

Color vs BLACK & WHITE

Block Diagram of First Color Set. Similarities and Differences

By Peter W. Orne

• In this article we will consider the block diagram of the NTSC color television receiver and discuss the functions and purposes of the new circuits. Future articles will consider these circuits in greater detail. It might be added that the receiver under discussion is the equivalent of the famous RCA 630 black and white chassis. Like the 630 chassis, this receiver is designed to take as much advantage as possible of the capabilities of the system. It should be kept in mind that present-day monocrome receivers do not follow the 630 design, and it is likely that there will be many short-cuts introduced in later color receivers. This prototype is expensive and good, its main purpose aimed at getting customer acceptance of color.

Comparing Figs. 1a and 1b, the sectional block diagrams of a monochrome and an NTSC color receiver, respectively, we find a number of similarities. Note that all the sections used in the monochrome receiver are also necessary in the color receiver. It should be understood that the sections are *not* the same in circuitry; the fact that they serve the same functions, however, is important to remember for servicing. This is so because symptoms produced by defects in various sections of the color receiver will be similar to those produced by comparable faults in the corresponding sections of a black and white set.

Service Predictions

The reader will note that the color receiver has a number of sections that have no parallel in the black and white set. Furthermore, the sound signal is taken off at a different point, in a way similar to the one used in older split-sound receivers.

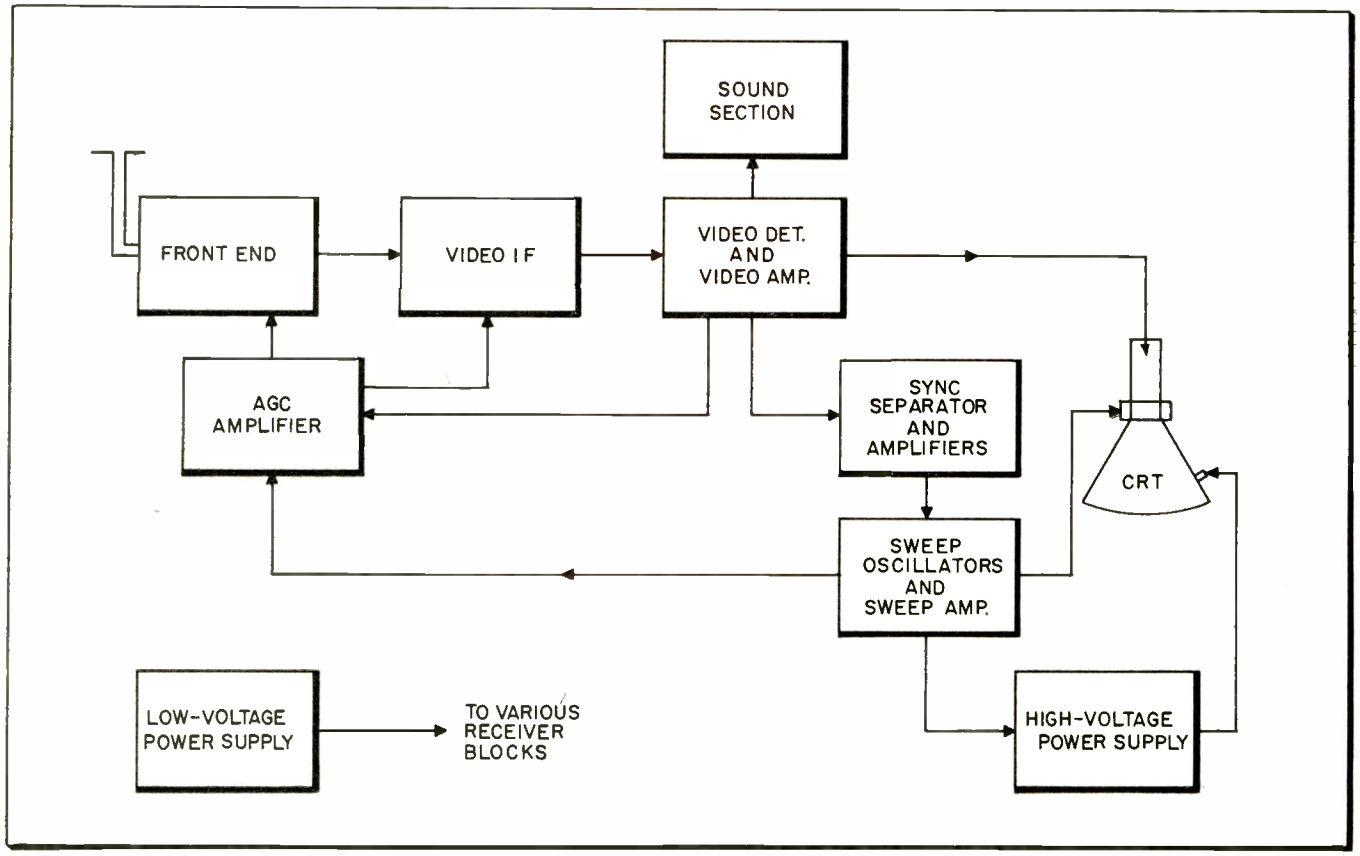
It may be interesting to give service-wise consideration to some of the familiar-looking color TV sections, and try to predict the symptoms that would be produced by a dead stage in these sections. We will do this from time to time as we proceed.

Since the front end of the color receiver is very similar to that of the black and white set, a dead stage in either set's tuner section will tend to eliminate or severely attenuate picture and sound, without affecting the raster. Trouble in the video IF section of each set will similarly tend to produce corresponding sets of symptoms.

The color receiver's IF system is somewhat different from the one present in the black and white set. Color information is transmitted interleaved with the high video frequencies; the frequency response of the color receiver's video IF stages should therefore be the full 4.2 MC transmitted, if a good color picture is to be reproduced.

The color receiver's video detec-

Fig. 1—A) Sectional block diagram of monochrome receiver. B) Page opposite—Block diagram of NTSC color receiver. Note the similar blocks.



TV Receiver Circuits

Between Monochrome and Color Chassis. Sectional Troubles

tor should be as linear as possible. This necessitates a relatively large output from the IF section. As a result of these considerations, the IF system in the color receiver contains five stages, compared to the corresponding three or four stages in a monochrome set.

The wide frequency response of the video IF stages in the color receiver necessitates the incorporation of a very efficient sound trap. The trap is needed to eliminate the 920 KC beat that tends to be produced in the video detector by the heterodyning of the sound carrier and the color subcarrier.

To prevent such a beat note from producing an interference pattern on the screen, there must be very little or no sound signal present in the video detector. The sound signal is, consequently, taken off at some point in the video IF section (rather than at the video detector or amplifier) and fed to the sound stages. A sound rejection trap is present in the last video IF stage, to insure against the presence of an appreciable sound signal in the video detector.

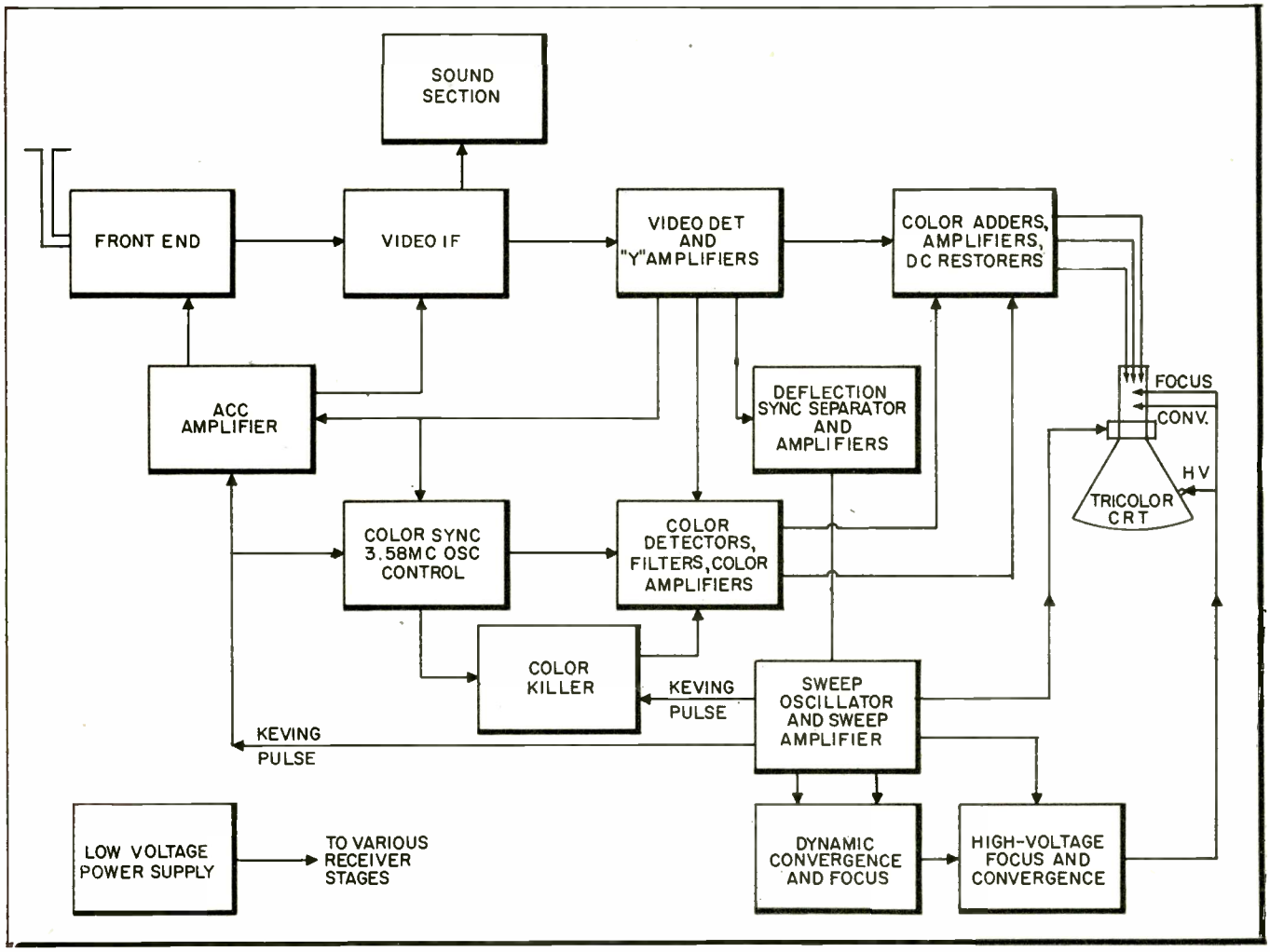
Sound Section

We should point out that it is not the sound signal alone that is taken off in the video IF section; a portion of the sound *and* video signal is removed, for application to the sound section. This is done to permit the advantages of intercarrier operation to be obtained—i.e., good tuning, better stability, etc.

Two detectors are required in the sound section. The first one operates like the video detector in a black-and-white intercarrier set, converting the high-frequency sound IF signals down to 4.5 MC. The other detector removes the modulation from the sound IF signals. From this point on, the sound stages in the color and black and white receivers are practically identical.

We may point out that, in the intercarrier set, the symptoms *no picture, no sound, good raster* indicate the presence of trouble in the front end, or the video IF, video detector, or video amplifier stages. In the color receiver, on the other hand, the same set of symptoms points to trouble in the front end or video IF section only, since neither the video detector or amplifier affect the sound.

The video detector and "Y" amplifiers correspond to the video detector and video amplifier sections in the monochrome receiver. The



"Y" signal is the luminance information of the color signal—that is, it contains information regarding the brightness of each pictorial unit. This "Y" signal is, incidentally, the only one of the several video signals present in the color transmission that a monochrome set will also respond to, and is equivalent to a monochrome video signal.

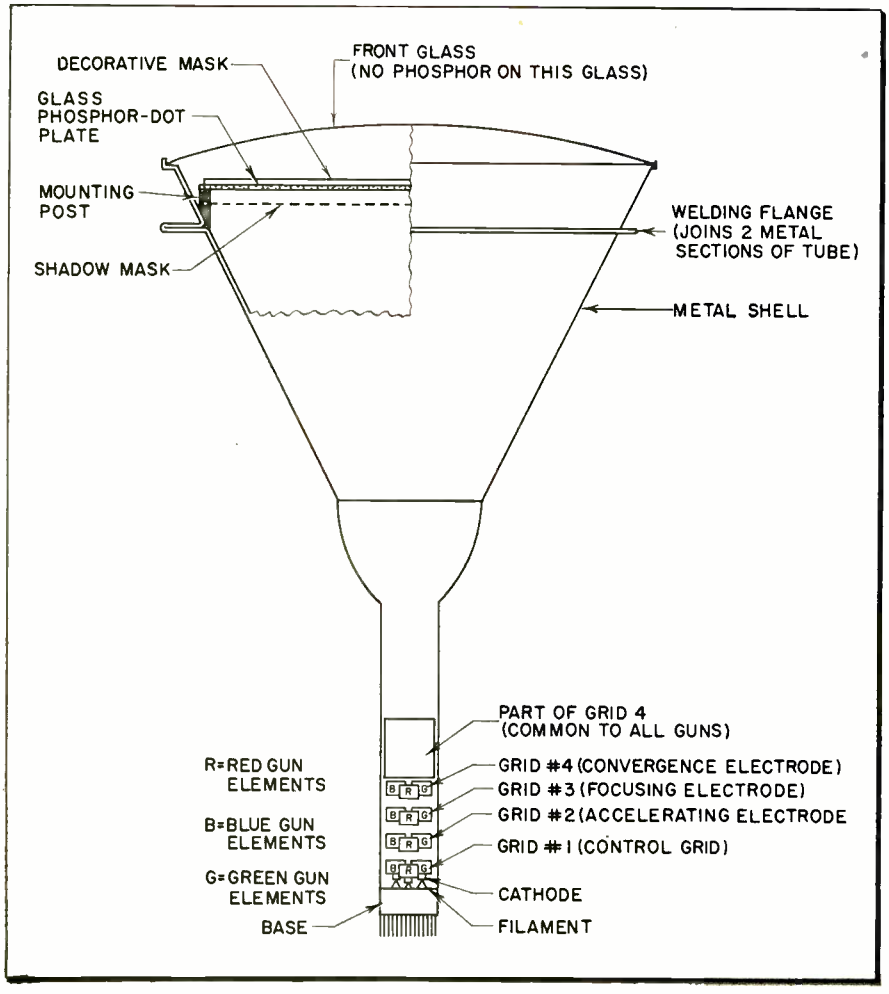
The only difference between the video amplifiers in the color set, and the ones used in the monochrome receiver, lies in the better linearity of the color set's video amplifier. By linearity we are not, of course, referring to deflection linearity, but the faithfulness with which the output signal reproduces the input one. Any non-linearity (i.e., any deviation from Class A amplifier operation) will tend to cause cross-talk or interaction between chrominance or color information, and "Y" or monochrome signals. This cross-talk or cross-modulation will severely affect the reproduction of color on the CRT screen. Whereas in a monochrome receiver, video amplifier non-linearity that causes cross-talk (between video and sound signals, or between different video signals) tends to introduce an almost unnoticeable fine interference pattern, in the color receiver the picture is far more visibly affected, since the colors deteriorate. More than one video amplifier is necessary in the color receiver, because of signal losses in various circuits.

From the video amplifier, signal is fed to the sync separator, which is the exact equivalent of the corresponding sync stage in the monochrome receiver. Just as in the monochrome receiver, many different sync circuits may be present. Symptoms such as picture rolling, tearing, or both will have similar sources in both the monochrome and color receiver.

The Deflection Sync Separator and Amplifiers block corresponds to the *Sync Separator and Amplifiers* block in the black and white receiver. The word *deflection* is used in front of *Sync Separator* to differentiate this sync section from the color sync section.

The sweep sections of the color and monochrome receivers are very much alike. The vertical oscillator and amplifier, and the horizontal oscillator stages, are or can be identical. The horizontal output stage is similar in both receivers; in the color receiver, however, better linearity is demanded of this stage. This is so because the necessary convergence of the three electron beams exciting the red, blue and green phosphors cannot be obtained over the length of a horizontal line if the linearity is not good; improper color reproduction will be produced in such a case. This business of convergence will be treated in detail a bit later. Because of the more stringent linearity requirements, components in the sweep section such as the yoke, vertical and horizontal output transformers, and width coil differ in design from corresponding units in black and white sets.

Fig. 2—RCA tricolor three-gun kinescope. A part of the metal shell is cut open to show the internal assembly of the phosphor-dot plate and shadow mask. The gun mounting supports and connecting wires have been omitted. For a more accurate sketch of the shadow mask, see Fig 3.



Keying Pulses

Keying pulses are derived from the horizontal sweep section which are used in a number of circuits in the color receiver. The keyed AGC system, which uses one of these pulses, employs it in the same manner as the corresponding system in a monochrome set. The keying pulse applied to the block labeled *Color Killer* will be discussed later.

We can take a breath at this point and consider some familiar symptoms that will be produced in a color receiver by failure in some of the sections we have been discussing. An inoperative vertical sweep stage will produce a horizontal line; a defective horizontal sweep will eliminate the raster (since a kickback type high-voltage power supply is used in the color receiver); an improperly-functioning AGC system will tend to introduce buzz and poor or no syncing of the picture (as well as contrast troubles, negative pix, etc.).

Considerable differences are present in the color receiver's kickback high-voltage power supply (as compared to the monochrome set's HVPS). The regulation of the color receiver's HVPS must be very good —i.e., the high voltage must remain constant or unchanging. This is so because the cathode-ray tube requires a constant high voltage to provide correct coloring and brightness to the picture. This constancy must be maintained in the presence of, or in spite of, brightness level changes.

In the monochrome receiver, a change in brightness tends to cause a change in picture size. The high voltage rises when the brightness is reduced (due to reduced loading on

ne HVPS), causing the picture to rink. The reverse happens when ie brightness goes up. While such ffects are hardly noticeable in a onochrome set, they affect a color cture very seriously. This is so cause the correct rendition in or of one pictorial unit depends the impingement on the CRT een of three correctly-oriented beams. If the raster size ges, the points struck by the beams change as well, and oper color reproduction thus to result. The color receiver's must, consequently, be a ated one.

High Voltage Focus and Con-nce section supplies the tri-cathode-ray tube with volt-t requires for correct beam ion. The 2nd anode voltage is 20 kv; focus voltage, app. approximately, to chassis) correctly-sized spot on the creen. The convergence elec-(which is at a potential of approximately to chassis) the three color beams con-t one point on the screen. ne focus electrode draws ap-e current, a single HV recti-not sufficient to supply *its* as well as those of the HV sec-anode; a separate rectifier fore is used for the focus circuit. e low-voltage power supply in color receiver differs from the employed in the monochrome in that it delivers a higher out-voltage and more current. The ier voltage is required mainly provide a more linear sweep sys-. (The greater the voltage ap-d to a sweep amplifier plate, the less is the plate current required for the same watts output. A smaller plate current means that the tube will operate on a smaller part of its Eg-Ip characteristic, avoiding the extreme or non-linear part of this characteristic. A more linear output is thus possible.) The larger current-handling ability of the low-voltage power supply is needed because of the greater number of tubes used in the color receiver. An inoperative low-voltage supply will, of course, result in no raster and sound in the color receiver.

Color Tube

To understand the functions of color receiver sections that have no equivalent in the monochrome set, some understanding of the color CRT is necessary. Many different types of color tubes are currently being experimented with. The only one that will be discussed here is the RCA tricolor kinescope, since the NTSC receiver is really built around this CRT. Fig. 2 shows constructional features of the tube.

The tube contains three electron guns, one for each "primary" color: red, green, and blue. In the front of the tube there is a flat glass plate on which an orderly arrangement of red, green, and blue phosphor dots is deposited. Three dots—one of each color—form a triangle; about 195,000 such triangles cover the viewing area in the tube.

The latter is a 16-inch metal-shell round tube; its viewing area is about 11½ by 8½ inches. Behind the phosphor-dot plate there is a shadow mask with as many holes as there are dot triangles. The shadow mask is so arranged with respect to the three guns and the phosphor dots that the beam from each gun can only strike a phosphor dot of its own color. This precision set-up indicates why a high degree of accuracy is required in the yoke, and the high voltage and focus supplies; any variation in the focusing or direction of the beam may cause it to hit the wrong color spot. To avoid stray magnetic fields from affecting the beams, a magnetic shield is placed around the tube's metal cone.

We may point out, in passing, that an improper yoke adjustment may produce not only neck shadow, or a tilted picture, but also improper color reproduction. The last-named fault is due to the fact that the yoke determines the starting point from which the beams are reflected; a change in the starting point may cause the beams to hit the wrong-color phosphor dots.

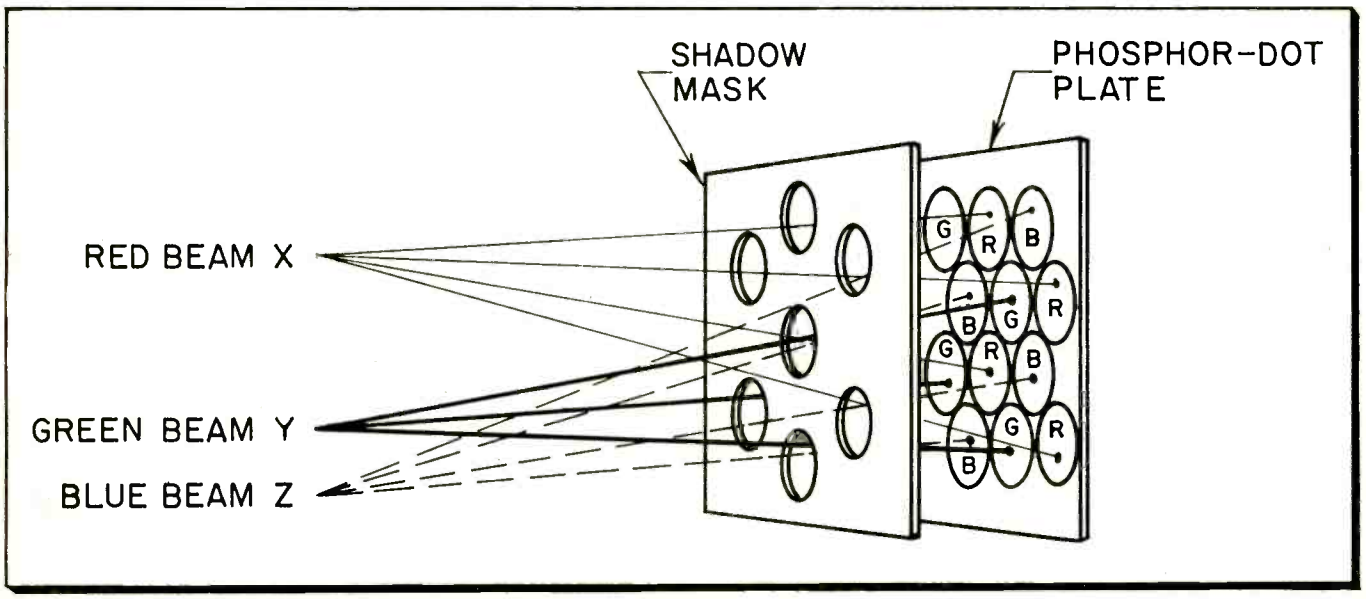
The construction of the tricolor CRT is the reason for the presence of the section in Fig. 1b labeled *Dynamic Convergence and Focus*.

The need for and function of this section may be explained as follows: Because of the flatness of the color dot plate, the distance from each gun to the center of the plate is shorter than the distance to the edges. Now, a focus voltage that assures proper focus at the center will not provide it at the ends of the plate, under such conditions. An additional potential must therefore be introduced, to provide suitable compensation.

The principle is similar to the one

(*Continued on page* 62)

Fig. 3—Detailed sketch showing how the beam from each gun can only hit a phosphor dot of its own color when the tube has been properly adjusted. High adjustment accuracy is obviously vital. X, Y, and Z indicate points where deflection begins for each beam.



Servicing Phono Motors

Wow, Rumble, and Scraping Problems in

By Harry Mileaf

• In a preceding article, we discussed the overall Hi Fi system. This piece will confine itself to one element in that system: the record player.

The record player is primarily a mechanical device. It is more important to prevent the introduction of noise and distortion at the record player than in any other part of the overall audio system. This is so because distortion or noise developed at the player passes through the entire system and is greatly amplified; more so than the distortion or noise that is developed at any other point in the audio system. The chief troubles that develop at the player are wow, rumble, and scraping.

The basic parts of the record player are: 1—The motor. 2—The drive assembly. 3—The turntable. 4—The pickup arm and cartridge. The last-named units will be discussed in another article.

The Motor. Noise and distortion can be developed by the motor in many ways. If the armature (see Fig. 1) is not seated properly in a vertical position, it will rub against the field poles. If it is only slightly off the vertical plane, it may merely cause a scraping sound to be audible. If the armature is too far off, however, and there is too much pressure applied to it by the field poles, the speed of the armature will decrease, possibly causing wow; or the armature may not turn at all.

Ordinarily, this condition is brought about when the screws holding the bearing bracket have worked loose. The trouble can easily be remedied by shifting the position of the bearing bracket (while rotating the armature) until the armature rotates freely. Hold the bearing bracket in this position and tighten the bracket screws, to complete the repair.

If the bearing portion of the bearing bracket wears too much, the armature will tend to vibrate from side to side, introducing excessive noise. A worn bearing can easily be located by inspection. The only remedy for the condition is replacement of the bearing bracket.

Armature Vibration

Armature vibration can also occur in the vertical direction. This condition is brought about by worn, bent or broken washers (see Fig. 1). The purpose of the washers is to hold the armature firmly in position and prevent it from bobbing up and down. If any of these washers are bent, broken, or missing, the armature will tend to vibrate and cause noise. The washers referred to usually snap into grooves that are cut around the armature shaft. On some motors, the armature is held in place by the front and rear of the armature itself; there are usually a number of "shim" washers between the armature and the bearing bracket, to hold the armature in position as firmly as possible

Phono motors require lubrication periodically, not only to prevent unnecessary wear on the armature and bearings, but to keep the armature as free-running as possible. If there is a lack of lubrication at the bearings, the armature shaft will tend to bind. The extra pressure exerted due to the lack of lubrication tends to slow down the motor and may cause wow. A light grease should be used for lubricating purposes; oil splatters and is easily lost. A heavy grease tends to slow down the motor, and should not be used for this reason.

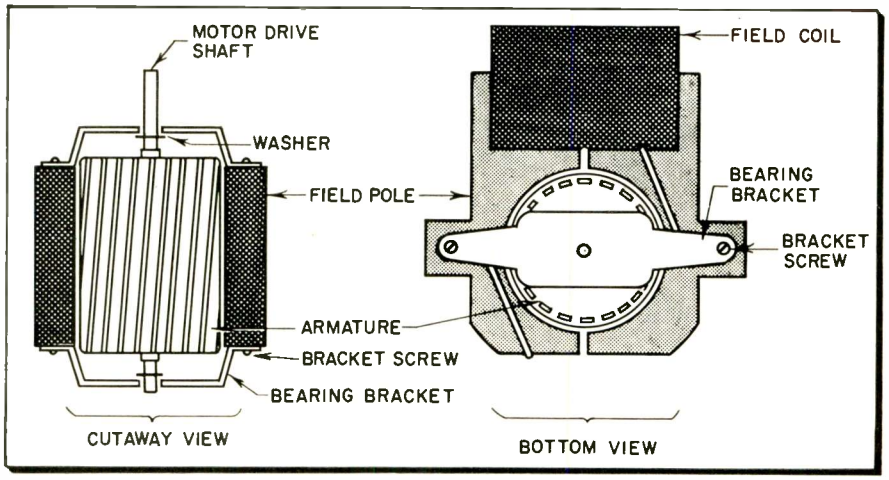
The phono motor may develop a high resistance in its windings, or a low magnetic field, causing it to slow down. The only remedy for such a condition is to replace the motor. Use only a direct factory replacement. This is necessary because the diameter of the motor drive shaft helps determine the speed of rotation of the turntable.

The Drive Assembly. The drive assembly is generally the most troublesome section of the record player. The purpose of the drive assembly is to couple the motor drive shaft to the turntable, and keep the turntable rotating at a proper, constant speed. Never apply oil or grease to the drive assembly. This unit depends on friction for its proper operation; the application of a lubricant will cause slipping, and may result in the turntable not rotating at all. Fig. 2 illustrates a basic one-speed drive assembly.

The drive wheel has a rubber tire that is the coupling surface between the motor drive shaft and the rim of the turntable. This rubber tire develops various defects that affect the operation of the record player. In its normal condition, the tire provides friction and is perfectly round. If either one of these characteristics changes, noise, or wow due to slipping, may result.

The rubber tire is so constructed that it provides good traction at the rim of the turntable. If the outer edge of the rubber tire becomes excessively smooth, it will slip and cause the turntable to rotate at a slower speed, or possibly not at all. After the rubber tire is in use for a

Fig. 1—Shaded 4-pole squirrel-cage phonograph motor. If this assembly is not properly seated in the vertical direction, correct turntable speed will not be obtainable.



and Drive Assemblies

Single-Speed and Three-Speed Record Players.

while, it may wear irregularly and develop flats or indentations (see Fig. 3A). This condition will cause a thump or rumble whenever the tire comes in contact with the motor drive shaft and the turntable. Fig. 3B shows how the rubber tire may be removed from the drive wheel.

If the drive wheel binds on the drive wheel shaft, it will cause the turntable to rotate slowly or not at all. Lubricating the drive wheel shaft will ordinarily prevent this. Care must be taken, when applying the lubricant, to prevent the latter from coming in contact with the drive wheel rubber surface.

Slipping may also be caused by a weak drive wheel spring. The purpose of the spring is to pull the drive wheel tightly against the turntable rim. A weak spring will cause the drive wheel to slip, resulting in the turntable rotating slowly or not at all.

The purpose of the cotter pin is to prevent the drive wheel from rising. If the cotter pin is missing, the drive wheel will be pushed up, causing it to rub against the underside of the turntable.

A 3-speed record player system is shown in Fig. 4. The basic difference between a 3-speed and 1-speed player lies in the use of three idler wheels in the 3-speed unit (one for each speed). When the control arm is moved to the speed position desired, the idler wheel for that speed is moved between the motor drive shaft and the drive wheel. The three-speed record player is subject to the same troubles as the single-speed unit. The lower section of the idler wheels are rubber-rimmed, and develop the same defects drive wheels do.

The Turntable. The turntable has definite requirements to fulfill, to provide adequate operation. It must be flat, parallel to the mounting board and able to rotate freely; it should also grip the record being played.

If the turntable is warped, the record being played will wobble, causing the pickup needle to skip and jump grooves.

If the turntable is not parallel to the mounting board, it will probably come in contact with the mounting board, resulting in scraping. This turntable scraping is usually the result of the spindle not being properly seated in a vertical position. A simple bend-adjustment can easily remedy the condition.

The turntable center-hole can

Fig. 2—Single-speed drive assembly. The drive wheel makes contact with the turntable rim.

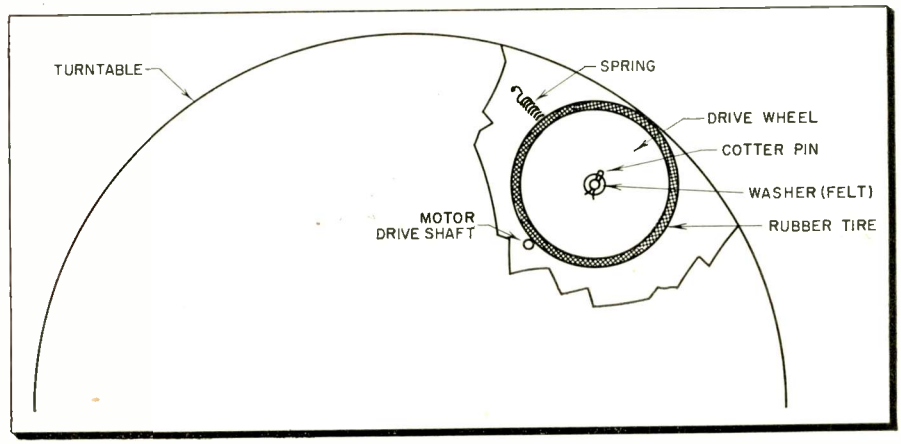


Fig. 3A—Flat and identation on drive-wheel tire. B—Removing tire from drive wheel.

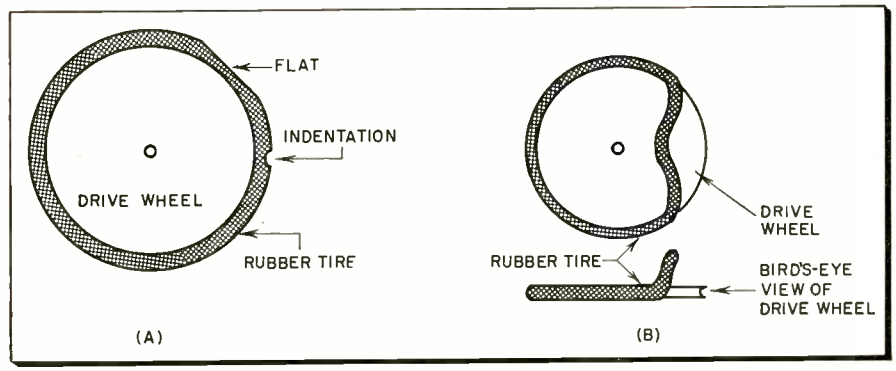
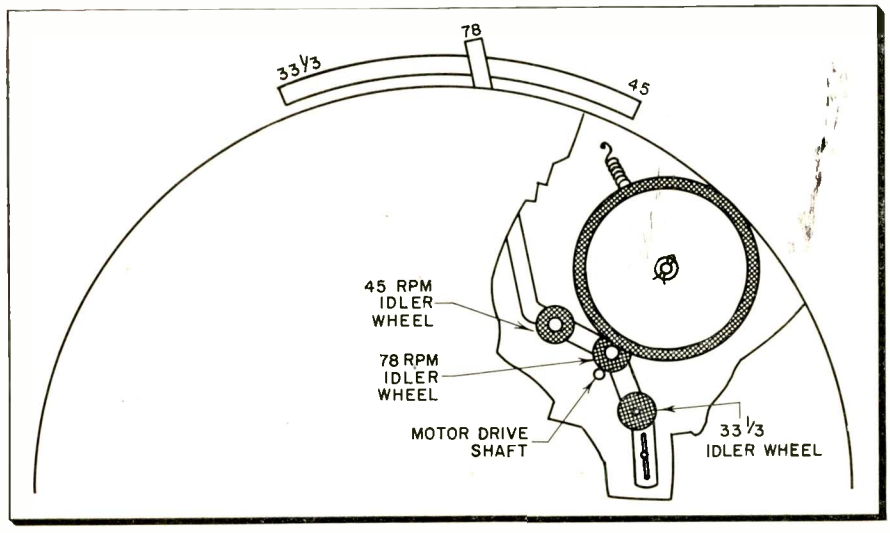


Fig. 4—Three-speed drive assembly showing separate idlers mounted on selector lever.



become enlarged due to wear, causing the turntable to rest too loosely on its support; the turntable will tend to slant and scrape the mounting board in consequence. If the spindle wears excessively, a similar condition will be produced.

In some cases, the turntable may show a tendency to bind on the spindle, causing it to slow down or jam. Applying grease to the bearing portion of the spindle will solve the problem in most instances. If it does not, the spindle or the center-hole of the turntable should be smoothed down with emery cloth.

The turntable must "grip" the record, so that the latter turns at the exact same speed as the turntable. If there isn't enough grip, the weight of the pickup arm will cause the record to slip, producing wow. This grip is brought about by the flock (furry substance) that is sprayed over the top of the turntable. If the flock wears off, the turntable should be re-flocked or replaced.

Sometimes mechanical noises, referred to as rumble, are too slight to be heard at their point of origin; when transferred to the pickup cartridge and amplified, however, they become annoyingly noticeable at the speaker. The presence of rumble may be checked for as follows: 1—Set the record player in operation. 2—Place the pickup arm on the run-off grooves of the record. 3—Turn up the volume only so far that the surface noise of the record is barely noticeable. 4—No rumble should now be heard.

It is important to note that the size of the various parts of the record player helps determine the speed of rotation of the turntable. Because of this fact, the identical replacement parts supplied by the player manufacturer should be used.

Servicer's Advice to Mfrs.

1. Use self-tapping screws or similar units in mounting transformers, large resistors, and other items that are very likely to burn out. Do not use rivets to fasten such items to the chassis.

2. Do not place parts in such positions that it is necessary to disconnect several components to get at the defective one.

3. Do not use filter capacitors, or other components that have more than three separate sections enclosed in one envelope.

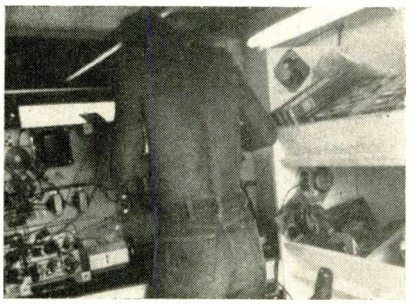
4. In the case of condensers intended for use in semi-tropical states, by all means use plastic moulded paper capacitors in place of the wax-sealed cardboard tubular variety.

5. If you manufacture a set whose components are unlikely to be stocked by distributors in most TV cities of the country, use major components (such as power and other transformers, focus units, yokes, etc.) that are generally available at local distributors. In your service information, present cross-references indicating the "substitute" part that may be purchased, when the original replacement is unavailable.

6. Do not use an unplated steel chassis if you expect your television set to last a few years in a damp climate.

Little Stories of Servicers' Success

Shop-on-Wheels Pays Off in Florida



"Eight years ago I got tired of fighting frozen radiators, sleet, snow and cold, and fled to the sunny sands of Florida. We had no TV here then, but everyone had a radio. Not having too much money, I purchased a house-car trailer, sixteen feet long for $50 down and $50 a month. I proceeded to set up a Radio Shop-on-Wheels, all repairs made right at the customer's home. Of course, the repair work was done in the trailer, where I had a bench, test equipment and power supplied by a 150-ft. extension, which was on a reel and plugged into the customer's line," begins a letter to TECHNICIAN from Carroll S. Shaw, 5814 Hallendale Beach Blvd., Hollywood, Fla. He continues:

"Being the father of four children, I had to make money. My plan was ridiculed by all competition, the argument being you can't make money unless you pull the set into the shop.

Expansion a Mistake

"All work was secured by a direct house-to-house canvass. This only lasted about two months, after which time my recommended business became so great that I did no more canvassing. Then I started to expand. I bought another trailer and hired a service-man to run it. This was mistake No. 1. I could go out in the trailer and clear from $100 to $300 a week, but the employed man usually turned in only about $30 a week. I changed men three or four times. It always worked out the same—no business from the hired man—while the trailer I ran still paid off beautifully.

"A customer would call up and complain—the set you fixed doesn't work—and after looking through the files, I would find no card on that job. Upon investigation I found the service-man had fixed this set and many more and put the money in his pocket—thus no business. I solved this problem by hiring older men, men over fifty with no radio experience but with sales experience. They solicited the business in the same trailers and brought it into the shop. The shop-man fixed it. I priced the job, and the trailer operator took it back.

"This operation worked out very good. I finally sold the whole business, which at that time was comprised of two stores, five trucks and trailers, three shop-men and one secretary.

Back to One-Man Operation

"A year ago I moved from Miami, Fla., to Hollywood, Fla., a small town of some 10,000 population, and in less than six months of operating a complete Shop-on-Wheels, with my wife taking the phone calls and my doing all my own repair work, I had to start turning down business. I now have more than I can do. I get very good prices for my work.

"I believe I have the most honest operation in the country. If the customer wishes, I have a nice soft seat in the truck so he or she can sit and watch me repair the set. Ninety-eight percent of all work is done on the job. I rarely pick up a set.

"Today I do not take on many new customers, because I cannot handle them. My customers are so happy with the speed of the service and so confident in the honesty of this operation that they rarely ever question the price on any job I am called in on.

"All work is C.O.D. I sell no sets. I specialize in service. I have whipped the big overhead problem. My only expense is phone and truck maintenance.

"My twin boys, aged 15, help on Saturdays and after school, putting up aerials and repairing AC-DC sets. TV Service, believe me, can be a very lucrative business."

COLOR SHORTS

THIRTEEN DIFFERENT color-TV receivers built independently by as many competitive manufacturers, gave a 100% performance on the new NTSC color-TV standard signal at New York, October 15th. The two-hour test demonstrated that color TV is here as a practical workable service, as soon as approved by the FCCommissioners who, with 500 other industry leaders, watched the presentation. FCC members revealed themselves as greatly impressed, indicating that official approval will come quickly, and that color-TV will soon be a commercial reality.

COOPERATING in the October 15th demonstration besides the CBS, DuMont and NBC broadcasting stations, were Admiral, CBS-Columbia, Crosley, Emerson, GE, Hallicrafters, Hazeltine, Motorola, Philco, RCA, Sylvania, Westinghouse and Zenith.

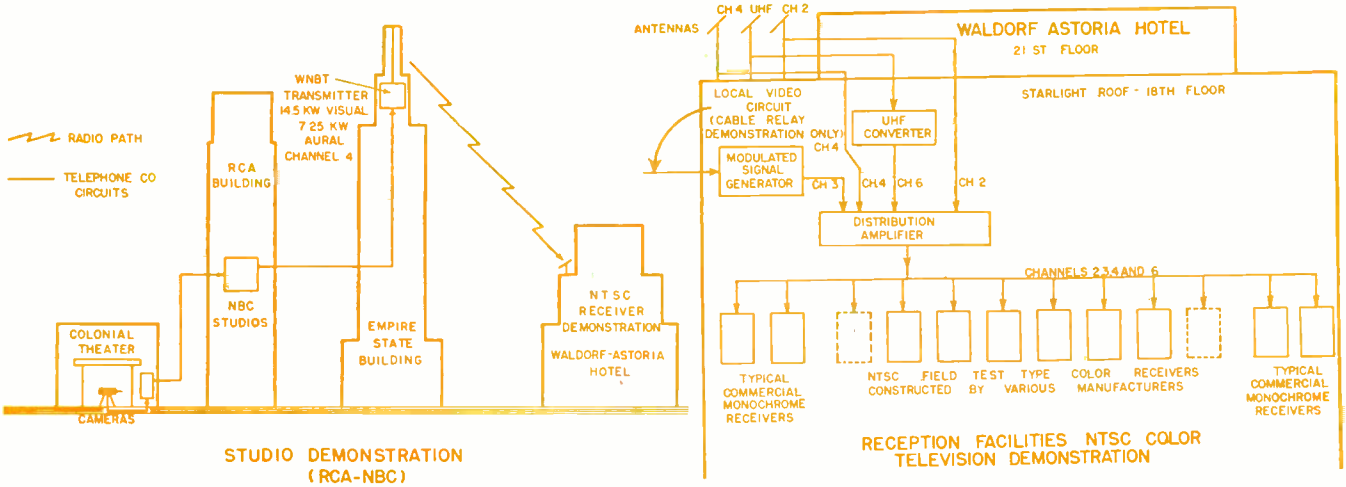
NTSC CHAIRMAN BAKER said: "Let me emphasize that the equipment at the studios and at the transmitters, and even more important, the receivers which you see in front of you, represent individual designs of individual companies. There has been no pooling of apparatus know-how—instead, there has been only the strongest possible incentive for the development of competitive individual apparatus designs. And that incentive will continue and reach new heights, should the Commission proceed to the adoption of these proposed standards. The Commission will not, of course, by such action be approving or disapproving particular apparatus; just as the NTSC today is not indorsing or withholding indorsement of individual apparatus. The apparatus is here in order to establish that the companies in this industry are capable of originating and transmitting successfully the signal described by the NTSC in this pending proposal; and similarly, that the companies in the industry can successfully develop receivers capable of receiving this color transmission in color, and, furthermore, without making any changes whatsoever, of receiving a monochrome transmission in monochrome. Finally, there are receivers, similarly representing designs of individual manufacturers, which are here for the purpose of demonstrating that the color transmissions under the proposed standards result in satisfactory monochrome pictures on existing monochrome receivers."

"THESE TV STANDARDS" Dr. Baker continued, "are the culmination of over a million engineering man-hours, and therefore cannot be evaluated on the basis of a single 70-minute showing." "All of us associated with this demonstration," Dr. Baker said, "have confidence in the basic soundness of the proposed technical transmission standards."

FCC REPS at the Oct. 15 demonstration included Chairman Rosel Hyde and Commissioners Frieda B. Hennock, Edward M. Webster, Robert E. Lee, John C. Doerfer, George E. Sterling, Robert T. Bartley. Other staff members attending were: Curtis B. Plummer, chief BC bureau; Arthur Scheiner, rules and standards division; Sol Schildhause, acting chief, Division of Operations; Hart S. Copperthwaite, chief of the Technical Branch, TV Facilities Division; Edward W. Chopin, chief labor division, office of chief engineer; William C. Boese, chief of Technical Research Division, office of chief engineer; Wilar Roberts, Labor Division; Warren E. Baker, general counsel, and George O. Gillingham, Chief of Information for the FCC.

MUCH INTEREST was shown in the new CBS-Hytron structural modification of the RCA-Goldsmith mask-type color tube, greatly reducing picture-tube weight and cost. Despite earlier difficulties, the CBS tube worked very well on the NBC color signal, and industry observers heretofore skeptical of color-TV's immediacy, opined that the CBS tube might soon bring 21-inch color sets to a $400 price level, instead of the $800 price heretofore generally predicted.

DU MONT'S color-TV equipment used in presenting the UHF color demonstrations was developed by the company's Research Division under the supervision of Dr. Thomas T. Goldsmith, Jr., director of research. To present the UHF color signals during the demonstration, two DuMont Universal color scanners were used to reproduce pictures from the selected color slides. Operating on the principle of flying spot scanners, the color scanners pick up the pictures in green, red and blue channels, feeding them to a color encoder. This unit scrambles the channels into a combined signal containing the necessary color brightness and the proper chrominance, or color content. The combined signal is then fed to the DuMont UHF transmitter and broadcast. The antenna is located on top of the building at 515 Madison Ave.



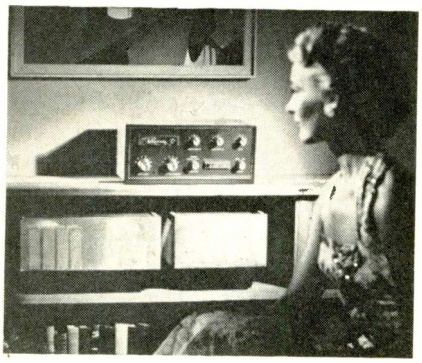
How color signal was transmitted through Empire State tower to color receivers in Waldorf

New Audio Gear

Hi Fi Amplifiers Microphones, Loudspeakers and Housings

Regency HI FI ENSEMBLE

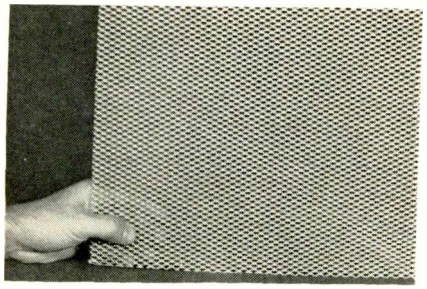
Regency model 1000 Hi Fi ensemble, designed for decorative appearance, need not be housed in a cabinet. It consists of three moisture-protected units: a preamp-equalizer, power amplifier, and power supply. A built-in variable crossover network for correct matching to loudspeaker systems is said to be an innovation. Other features: One low- and two high-impedance inputs



with independent level adjustments; low noise input level; flat response beyond the limits of audibility. Controls include compensated loudness, gain, tone, and a six-position cross-over switch for different recordings. The tone controls are separate bass and treble stepped adjustments. The ensemble sells for $995, Regency Division (I.D.E.A.), 7900 Pendleton Pike, Indianapolis 26, Indiana.—TECHNICIAN

Insuline SPEAKER GRILLS

Aluminum mesh grills, intended to protect the loud speakers of custom-built sound installations. Finished in non-tarnishing gold color. Available in three sheet sizes: the



No. 3947, 12-in. x 18-in., at $2.35; the No. 3948, 18-in. x 24-in., at $4.65; the No. 3949, 24-in. x 36-in., at $9.35. Insuline Corp. of America, 3602 35th Ave., Long Island City 1, N.Y.—TECHNICIAN

Approved HI FI TUNER

Model V12 is a 12-tube Hi Fi AM-FM tuner, RF stage is used on both AM and FM; 456 KC IF stages and crystal detector are used on AM; 2-stage 10.7 MC IF strip and double limiter and discriminator stages used on FM. Printed circuit capacitors, temperature compensated where necessary, are used. Common slide rule tuning with separate RF and IF channels on AM and FM; neon-lamp channel indicators present. AM-FM selector switch. Common cathode follower output for FM and AM tuning range. Net price, $85.00. Approved Electronic Instrument Co., 928 Broadway, New York 10, N.Y.—TECHNICIAN

Fold-A-Flex SPEAKER HOUSING

The Fold-A-Flex speaker cabinet incorporates within its construction, characteristics common to three of

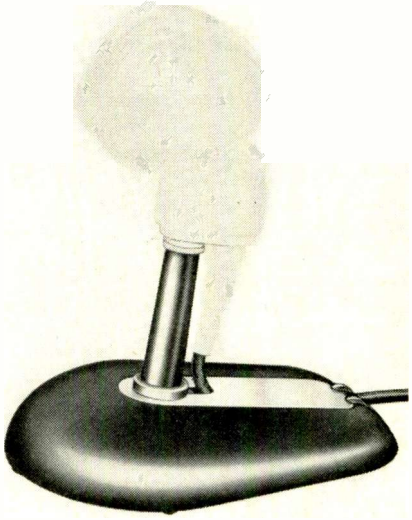
the most popular loudspeaker cabinet types. It is possible by simple mechanical means to change the enclosure into 1) infinite baffle, 2) bass reflex, 3) folded horn. Choice of the enclosure type is determined by the listener, on the basis of room acoustics and his particular listening preferences. The Fold-A-Flex will incorporate the Stephens TRU-SONIC 206AX coaxial speaker. The three-in-one cabinet contains three ports with variable openings which, in different combinations, embody the three basic cabinet types in common use. Stephens Manufacturing Co., Culver City, Calif.—TECHNICIAN

Bell AMPLIFIER

Bell amplifier, model 3717-MB, is intended for mobile use and has a built-in 78 RPM rim-drive phono with crystal pickup and separate volume control. Microphone input also has separate volume control. A stand-by switch saves power while keeping filaments hot. Operates on either 115 V AC or 6 V DC; cables for both types of connection are supplied. Where a complete range of turntable speeds is necessary, the deluxe model, 3717-MB3, is available. This model has a three-speed motor and turnover-type pickup for 33⅓, 45, and 78 RPM records. Bell Sound Systems, Inc., 555 Marion Rd., Columbus 7, Ohio.—TECHNICIAN.

Atlas MIKE STAND

The Atlas model DS-10 desk stand for all types and styles of microphones incorporates a new rear cable exit feature. The microphone cable is concealed in a slot below the center section of chromium trim and is directed out at the rear of the base. All parts are die cast and finished in gun metal enamel and chro-



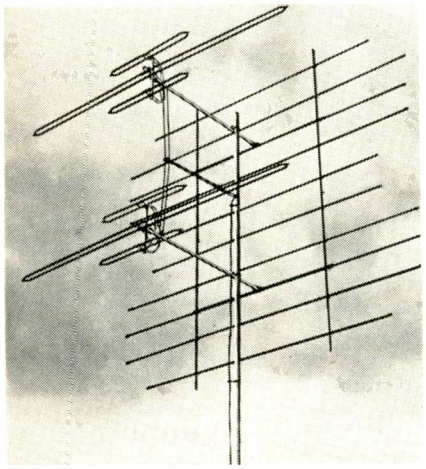
mium. Atlas also has a new swivel, Model SW-1, for microphone positioning. It moves through 360° and can be used on any desk or floor stand. Unit is locked in any position by a turn of the locking knob. The parts are die cast and chrome finished. Atlas Sound Corp. 1451—39 St. Brooklyn 18, N.Y.—TECHNICIAN.

Antennas and Accessories

UHF-VHF Antennas, Boosters, Converters, Installation Aids

Channel Master VHF ANTENNA

The "Champion" provides reception on all VHF channels, equal to or exceeding that obtainable with many single-channel antennas, according to the manufacturer. A reflecting screen is claimed to increase sensitivity without introducing frequency discrimination. The manufacturer states that, in addition to high sensitivity and sharp directivity, this broad-band system maintains a match close to 300 ohms. The antenna takes into account the fact that the high portion of the VHF band (channels 7 to 13) is approximately the third harmonic of the low portion of the VHF band (Channels 2 to 6). The antenna's design is accordingly based on a dipole cut for sensitivity on the low band, which is made to act as three dipoles, in the same phase, on the high band. This is achieved by addition of other elements and a phasing and matching harness. Factory pre-assembly facilitates rapid installation. The antenna is made in 1-, 2-, and 4-bay versions. List prices: model No. 325 (1-bay), $20.83; model No. 325-2 (2-bay), $43.36; model No. 325-4 (4-bay), $88.68. Channel Master Corp., Ellenville, N.Y.—TECHNICIAN



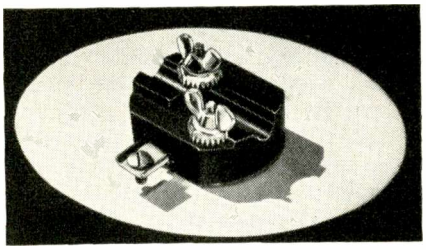
RMS BROAD-BAND YAGIS

Six 10-element broad-band models cover the VHF band as follows: model STY1024 covers channels 2-3-4; STY1025, 2-3-4-5; STY1026, 2-3-4-5-6; STY1036, 3-4-5-6; STY-1046, 4-5-6; STY10713, 7 through 13. No hardware bag is needed for installation. The elements swing out and are tightened. RMS, 2016 Bronxdale Ave., New York 62, N.Y. —TECHNICIAN

JFD UHF-VHF ANTENNA

A rhombic section for UHF pick-up, mounted in front of a conical section for VHF channels, is combined to provide all-channel coverage with a single antenna. Jetomic models JeT454 (single-bay) and JeT454S (two-bay array) are factory pre-assembled, and use simple quarter-wave copper jumpers for UHF-VHF matching in place of couplers or cross-over networks. List prices: JeT454, $16.50; JeT454S, $34.50. JFD Manufacturing Co., 6101 16th Ave., Brooklyn 4, N.Y.—TECHNICIAN

iE LIGHTNING ARRESTOR



A lightning arrestor designed to carry all common types of transmission lines, including the tubular, small oval, large oval, open line, 300 ohm and Anaconda line, is claimed by the manufacturer. Positive contact is made by long piercing teeth which bite into the insulation, to shunt lightning and static charges to the ground. Insulation need not be stripped. Impedance of line is not disturbed. The iE arrestor is readily adaptable for indoor or outdoor installation; may be used on walls, windows, masts or pipes. Model No. 4000 lists at $1.25; No. 4005, with stainless steel strap for pipe mounting, lists at $1.50. iE Mfg. Co., 325 N. Hayne Street, Chicago, Ill.—TECHNICIAN

Bogen UHF CONVERTER

Unusually high gain is claimed for model UCT-1 UHF converter. This is achieved by reduction of the noise figure to only 13 db. Installed by connection to the antenna input of a standard VHF receiver, the unit provides reception on all 70 UHF channels and feeds through either Channel 5 or 6 on the standard receiver. Changeover from UHF to VHF is accomplished by a simple switch which, when in the VHF position, bypasses the converter without attenuating signals. List price, $42.50. David Bogen Company, 29 Ninth Avenue, New York 14, N.Y. —TECHNICIAN

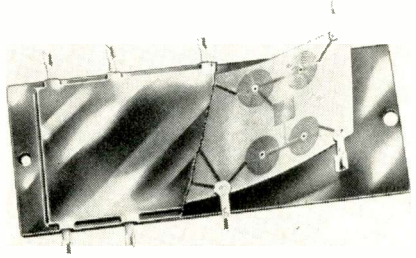
Saxton TRANSMISSION LINES

Open-wire UHF transmission lines, available in a choice of 300- or 450-ohm types. Either plain or formvar covered, the wire comes in spools of 100, 250, 500, or 1000 feet. Also available for this wire: stand-off insulators, window straps, rotor straps, and a device to permit the wire to be used in places where sharp turns are necessary. Saxton Products, Inc., 2101 Grand Concourse, New York 53, N.Y.—TECHNICIAN

ITI UHF BOOSTER

Model IT-133 UHF Autobooster is a continuously tunable amplifier covering the entire UHF band. Featuring a 6AJ4 low-noise triode, the booster provides high usable gain with low noise, according to the manufacturer. Industrial Television, Inc., 369 Lexington Avenue, Clifton, N.J.—TECHNICIAN

Tescon VHF-UHF CROSSOVER



Triple-tie cross-over filter, model UV-3, employs a printed circuit to eliminate the need for two down leads when both a UHF and VHF antenna are in operation. Use of one down-lead eliminates interaction between the UHF and VHF systems, in addition to simplifying the installation job. Impregnation before encasement to make the unit moisture-proof and fungus-proof also eliminates possibility of drift or shorting of components. TV Products Co., Springfield Gardens, N.Y.—TECHNICIAN

Is YOUR Number in the Book?

Many TV Technicians Find Classified Telephone Ads Helpful

There are two things that usually happen when a home-owner's TV set breaks down. If he's like most people, his initial act is to howl like a wounded bear as he rushes to tinker with the ailing receiver.

After a "thorough examination," (he really knows little about the set but feels he might as well twist a few knobs) the now thoroughly frustrated owner takes step number two—the locating of a service man who will respond to his frantic plea for help—within a minimum of sixty seconds!

Seriously though, a TV set's failure is almost a critical one today because it forms such a major part of a family's entertainment. Even the slightest loss of use is now likened to the automobile which conks out just as the long-planned picnic trip gets underway.

But let's get back to our unhappy set-owner who's now in dire need of a competent and quick TV repair man.

There are probably several TV shops in his town, perhaps dozens if he lives in a larger city. He's seen a few of them many times but at this particular moment can't recall the name of a single one. Or, maybe he *does* know the name but *doesn't* have the telephone number!

Far-fetched? Not at all. Similar situations have confronted all of us, probably more times than we'd care to admit.

One solution to our mythical friend's problem is for him to consult the "Yellow Pages" of his local "Redbook" Classified Telephone Directory, a volume usually as close at hand as the telephone itself.

In it the set-owner will find TV service firms listed alphabetically, under a bold-faced heading which immediately identifies their line of work. In many cases, the trade-names of sets a shop specializes in are also listed. Thus, the harried customer gets his man!

Always identifiable by its well-known "Yellow Pages," whether in a separate volume or bound as part of a regular telephone book, a classified directory is declared to provide its advertisers with the most inexpensive advertising medium available. Continuous surveys made by the telephone companies *and* by prominent manufacturing concerns bear out this statement.

What Servicemen Say

TECHNICIAN, too, has interviewed servicemen on the relative merits of classified directory advertising. Spot-checking has revealed answers which are much the same as those obtained by commercial survey organizations.

One technician, who had particularly good results from his medium-sized ad, said he simply couldn't afford *not* to be in the book! Still another service man stated that he had dropped his former method of advertising to "concentrate solely on the telephone book kind." To be sure, many of those interviewed said they used the "Yellow Pages" only because their competitors did. Almost all queried, however, felt that the directory was a good source of business, particularly for the emergency repair calls they received.

One major TV manufacturer conducted its own national survey to determine the value of classified directory advertising as it affected sales and service shops. Here are some of the facts that survey disclosed:

51% of *all* telephone subscribers (your potential customers) use the directories one or more times in any given week; 90% use them one or more times a year. This means nine out of ten subscribers in *every* community *actually use* their directories as buying sources! And, as the telephone companies point out, these people are in a "buying frame of mind" when they look you up!

The Cost Factor

Based upon the circulation of directories in his area, a serviceman's one-line listing can cost him as little as fifty cents a month. Larger listings (more than one line) and display ads are proportionally higher but still less expensive than any other form of advertising, it is claimed.

There are some 15 kinds of listing and display-type ads from which to choose, and should an advertiser wish to illustrate his, free art service and advice are available.

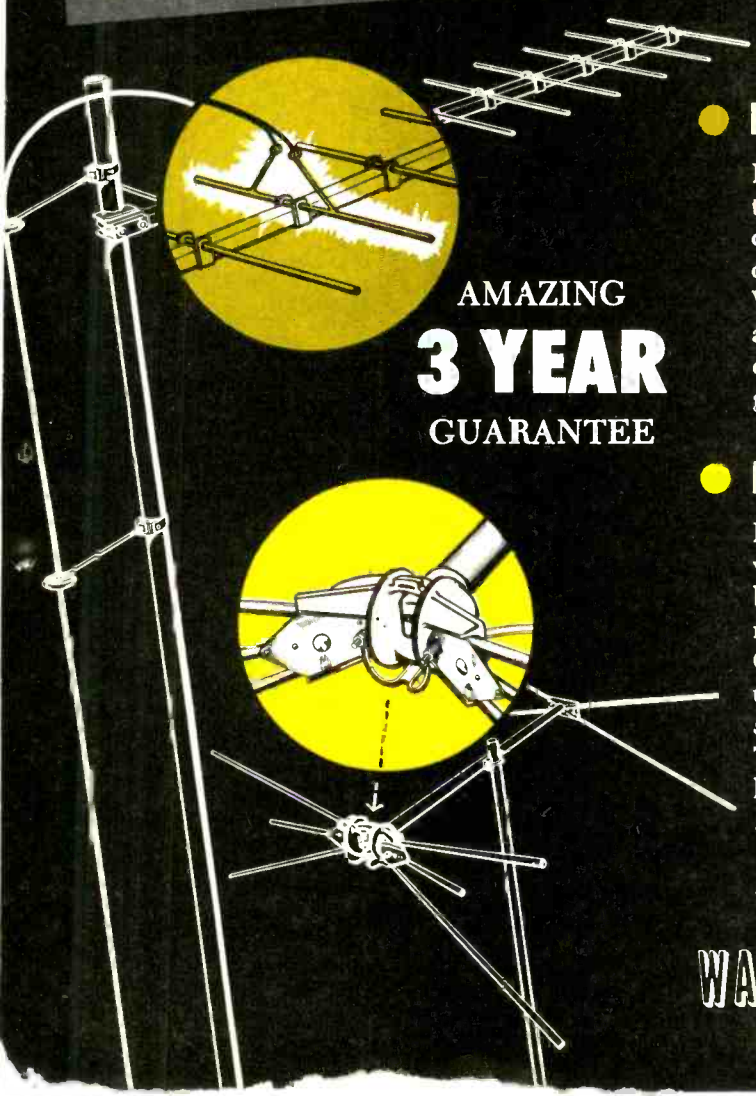
It has been said that no matter what size space an advertiser uses, his name in the "Yellow Pages" insures "the maximum return on all of his present sales efforts, for rather than compete with other advertising, the directory supplements it."

Here's what that means. Suppose a service man runs a small newspaper ad. Those interested will clip it out. But suppose they later lose it. Probably they've remembered the name of the shop but not the telephone number. Where do they find it?—the classified telephone directory. Similar situations can also apply to billboards, cards, circulars, envelope stuffers and other mass forms of promotion: seen today, forgotten tomorrow.

Remember, too, you *don't* have to be an artist, copywriter or engraver to create an effective ad. The directory representative in your area is skilled in this work and it's part of his job to help with such problems.

Those who produce them feel the classified telephone directories occupy a unique position in the advertising field. Like the "straight line" in mathematics, the directory, they say, represents the shortest distance between two points—"the customer and the cash register!"

DISCOVER WHAT GOLD AND 2 INCHES OF AIR DO FOR 2 NEW WALSCO ANTENNAS



AMAZING
3 YEAR
GUARANTEE

NEW WALSCO GOLD DIPOLE YAGI *(UHF)*

No less than *24 kt. gold* plating on the receiving dipole of this great, new, 10 element Yagi. Why *gold?* Because *gold* resists corrosion better than any other metal... and *gold* is an excellent conductor. Like the most powerful *radar* antennas, the Walsco *Gold* Dipole Yagi guarantees *permanent* high gain in any location, under all weather conditions. It's custom-made for each location. The *only* Yagi that carries a *3 year* unconditional guarantee! And it costs no more than conventional Yagis.

NEW WALSCO IMPERIAL CONICAL *(VHF)*

Here's the first radical improvement in Conicals. A new insulator which utilizes "barrier discs" and *2 inches of air space* between the terminals prevents "shorts." Soot deposits, dirt, moisture, salt, etc., *cannot* affect the insulator. This great, new Conical will therefore maintain high gain performance under any and all weather conditions. Front-end hardware is *stainless steel* to prevent corrosion losses permanently. Takes only 2 minutes to assemble because there's no loose hardware. Nothing compares to the Walsco Conical at any price ...and it's backed by the *only* 3 year unconditional guarantee!

Write for complete information

WALSCO ELECTRONICS CORPORATION

3602 Crenshaw Boulevard, Los Angeles 16, California

Shop Hints to Speed Servicing

Tips for Home and Bench Service Contributed by Readers

Intermittent Tube Filaments

My method of locating intermittent tube filaments cuts down most of the time usually required to "nail" this type of trouble. When an intermittently-open tube filament seems to be present, it can be easily located by shunting a ¼-watt, 125-volt neon lamp across the heater pins. When the filament opens for even an instant, the neon lamp lights up. I usually place the set on the bench, with the neon lamp hooked to a tube socket, while I work on another set. If the neon lamp doesn't glow after a reasonable time, I move the lamp to the next socket, continuing this procedure until the open filament is found. On AC-DC sets, a flickering pilot lamp will often indicate the presence of this type of trouble. 50L6's have been found to be frequent offenders.—*Joseph Amorose, Richmond, Va.*

Removing Frozen Yokes

Now and then the TV serviceman is plagued by the necessity of removing a "frozen" yoke. If solvent applied around the neck of the picture tube fails to loosen the yoke, many manufacturers recommend the application of a suitable AC voltage (25 to 50 volts) to the yoke's horizontal windings. To reduce the line voltage, a variable voltage transformer is often recommended. The use of this device may be impractical for at least two reasons: less expensive transformers of this type do not permit a sufficiently gradual variation of voltage output in the desired range, introducing the danger of yoke damage; and many service shops do not have such a transformer available at all. The following method requires an accessory that can be assembled easily and inexpensively:

Arrange three light-bulb sockets, an outlet and a line cord in the manner shown. Attach one end of a line-cord wire, to the other end of which a male plug has been connected, to the horizontal section of the yoke. (First disconnect the yoke from the circuit, of course.) Insert this male plug into the socket on the test device. By screwing various sizes of electric bulbs into the three parallel sockets, enough heat will be generated in the yoke so that it can be slipped off.

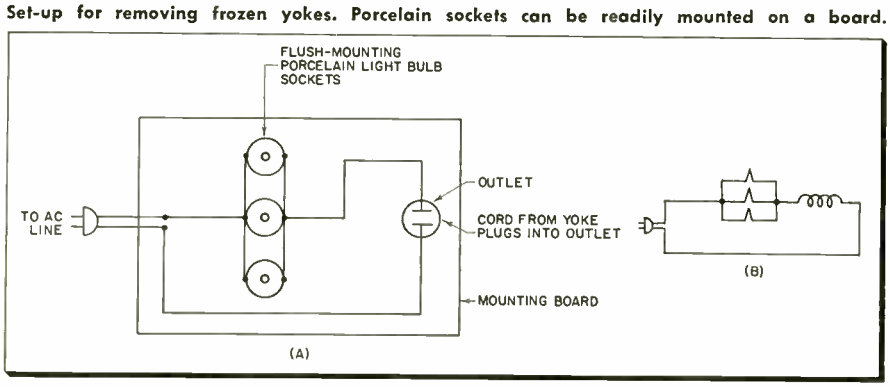
Use the smallest wattage (highest resistance) bulbs that will do the trick. Application of some vaseline or similar lubricant to the portion of the CRT neck over which the yoke must slide may prove helpful. Remove the yoke with a gentle, rocking motion.

Note that the light-bulb sockets are electrically in parallel with each other, but in series with the yoke and the AC line. Using higher wattage bulbs or placing bulbs in parallel reduces the resistance in series with the yoke. This increases current and voltage in the yoke's windings.—*B. O. Riis, Little River, Miami, Fla.*

Keeping Resistors Handy

A neat, space-saving way for keeping an assortment of resistors handy to the service bench is to stretch a length of a discarded coiled heater element between two hooks above the bench. Bend a hook on the end of one lead on each resistor, and hook the resistors along the coil. The color code will show readily and, if the resistors are arranged in the order of their value, a desired one may be selected quickly.—*S. Sandler, Providence, R.I.*

Set-up for removing frozen yokes. Porcelain sockets can be readily mounted on a board.



Faulty CRT Prongs

I frequently find poor connections on the pins of picture tubes, especially filament pins. Inserting a piece of fine wire in the pin when resoldering establishes better contact, eliminating this trouble completely.—*Richard P. Thull, Rutland, Vermont.*

Auto Radio Noise

Before attempting to troubleshoot an auto radio afflicted with undue static, open up the drain hole in the bottom of the aerial (with which some antennae are equipped) and let the water out. The drain holes in some of these aerials become clogged, and allow water to accumulate in the tube, with noisy reception resulting in consequence.—*Harvey Muller, Danboro, Pennsylvania.*

Overheated Resistors

Dual triodes used as TV RF amplifiers, such as the 6BK7, 6BQ7, and 6BZ7, often develop intermittent shorts. When such a defective tube is replaced, go a little further: check the voltage-dropping resistors to the tube. Frequently the tube short results in overheating of these resistors, causing an increase in their resistance value and a subsequent loss of gain. Turn the set on and let the resistors warm up for a while before measuring their value. Replacing the resistors that have changed in value will restore the set to its original sensitivity.—*Patrick E. McGee, Raritan, Ill.*

Replacing Socket Lugs

Undoubtedly many of your readers, at one time or another, have broken a lug in a *molded* socket. Instead of replacing the socket, they have tried to replace the lug, only to have the socket (in a tuner, of course) also break. To remove the broken lug from the socket, solder a short length of No. 12 or No. 14 wire to the top side of the broken lug and simply pull the wire out. The broken lug will come out with it, and a replacement may be readily slipped in.—*Thomas A. Donaldson, Smyrna, Delaware.*

ONLY JFD OFFERS YOU A *FULL YEAR* "GOLD SHIELD" GUARANTEE AGAINST RUST!

Every screw, nut, bolt, washer and bracket in JFD's new "*Gold Shield*" UHF antennas is "*Bronzidite*" plated! *Only these* spectacular performing antennas carry a full year's *guarantee* against damaging rust. Safeguard your antenna installation and your reputation . . . depend on the new JFD "*Gold Shield*" gold-colored UHF antennas.

See them at your jobber or write for brochure #229.

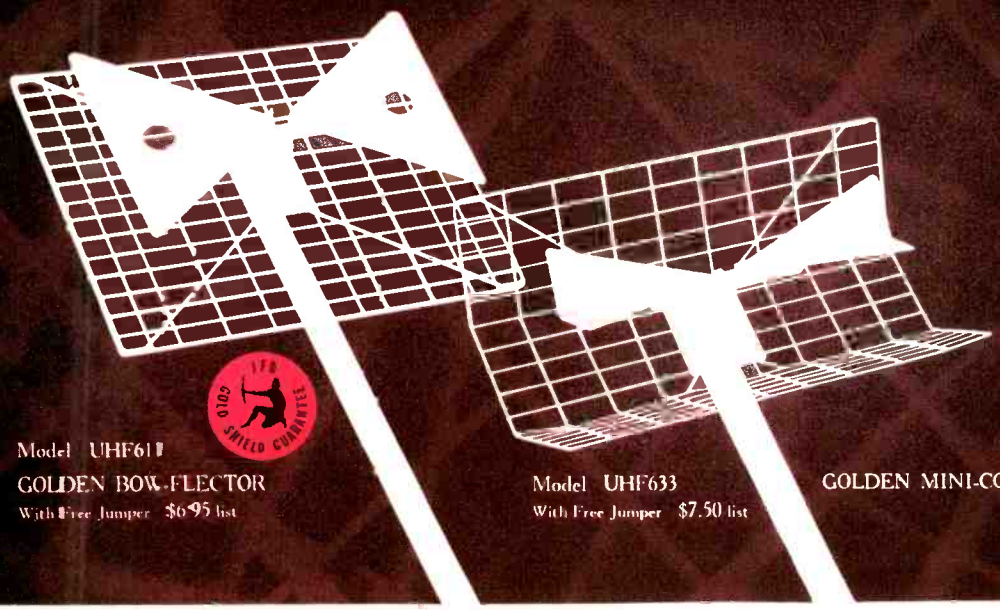
JFD

Model UHF411-GOLDEN BRIDGE
$11.75 list

Model UHF400-GOLDEN MAXI-COR $14.95 list

JFD MFG. CO., BROOKLYN 4, N.Y.
World's largest manufacturer of TV antennas and accessories

GOLD SHIELD GUARANTEE



Model UHF611
GOLDEN BOW-FLECTOR
With Free Jumper $6.95 list

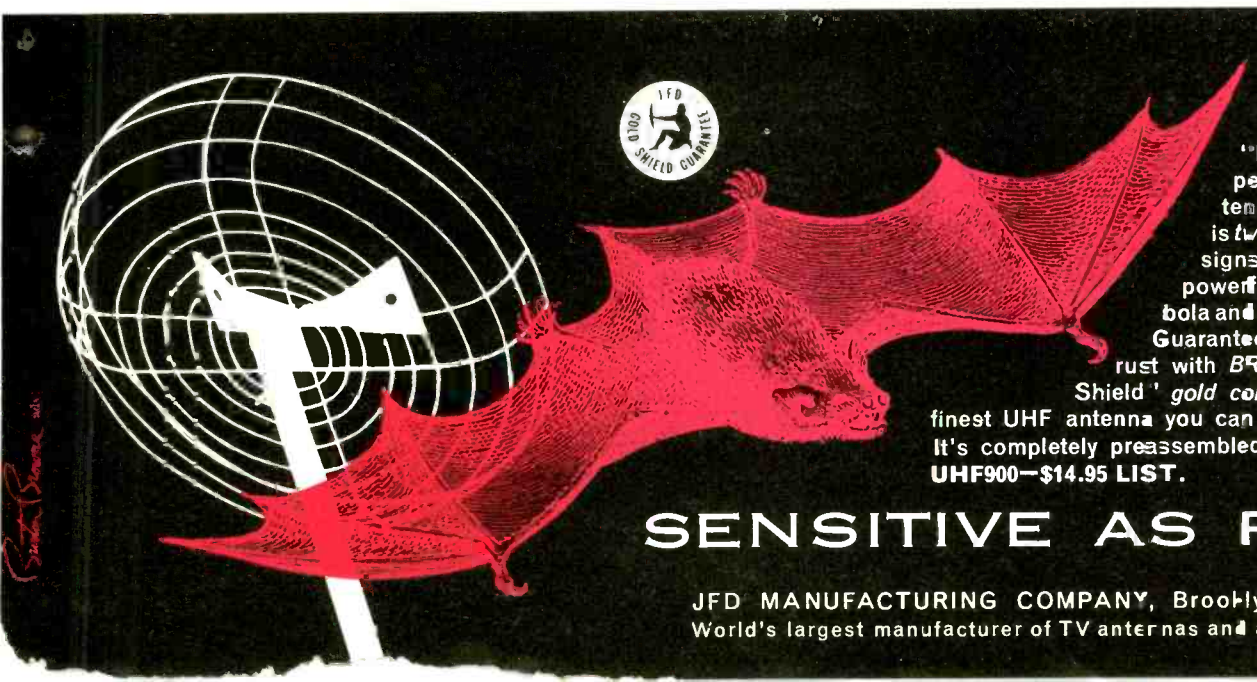
Model UHF633
With Free Jumper $7.50 list

GOLDEN MINI-COR

JFD introduces something NEW in UHF antenna design. Now you can offer gold-colored antennas with a *full year* guarantee against the ruinous rust and corrosion that impairs the UHF picture. JFD "*Gold Shield*" UHF antennas deliver the POWER needed for brilliant reception, plus the exclusive "*Bronzidite*" Army-Navy "spec" plating that means more profits for you—without call-backs—See them at your jobber or write for Bulletin No. 225.

JFD

JFD MFG. CO., BROOKLYN 4, N.Y.
World's largest manufacturer of TV antennas and accessories



The JFD Golden "Para-Bow" delivers the performance of *two* antennas because it actually is *two* sensitive antenna designs combined into *one* powerful array: the radar parabola and the time-tested bowtie. Guaranteed for a full year against rust with *BRONZIDITE*, the "Gold Shield" *gold colored* Para-Bow is the finest UHF antenna you can offer your customers. It's completely preassembled, too **UHF900—$14.95 LIST.** Write for bulletin 231.

SENSITIVE AS RADAR

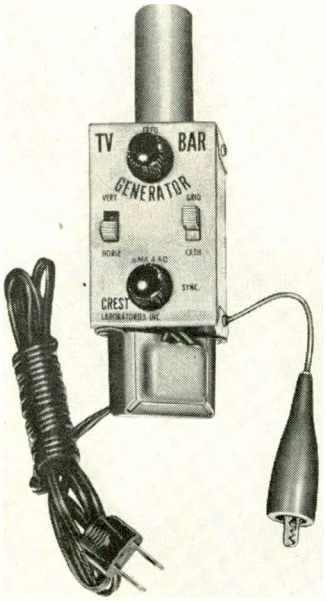
JFD MANUFACTURING COMPANY, Brooklyn 4, N.Y.
World's largest manufacturer of TV antennas and accessories

JFD

Shop Equipment and Instruments

Crest MIDGET BAR GENERATOR

Model MA4-AC is a self-powered, pocket-size bar generator, usable with all TV sets. Plugged into any AC wall outlet, it is immediately



ready for use. The number of vertical or horizontal bars is adjustable. Dealer net, $14.85. Crest Laboratories, Rockaway Beach, N.Y.—TECHNICIAN

Precise OSCILLOSCOPE

The model No. 308 oscilloscope, using an 8½-inch 8CPI cathode-ray tube, is available either in kit or assembled form. A switch-controlled synchronizing circuit is intended for "difficult-to-sync" applications. Other features: voltage regulation, and a high accelerating potential. Kit form, $129.50; assembled, $229.50. Precise Development Corp., 999 Long Beach Road, Oceanside, N.Y.—TECHNICIAN

Centralab CALCULATOR

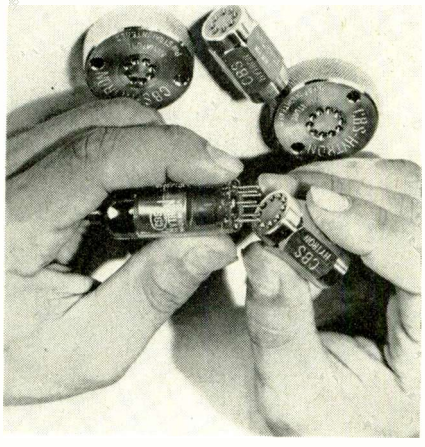
Centralab's color-code calculator for capacitors and resistors has seven rotating wheels from which capacitance or resistance, tolerance, and temperature co-efficient can be read directly. The calculator covers RETMA color code specifications on normal and extended-range tubular ceramic capacitors, and radial or axial lead resistors. It is on sale at Centralab distributors.

Triplett TUBE TESTER

Mutual conductance tube tester, Triplett model 3423, tests tubes by applying a high-frequency signal to the grid and measuring the signal component in the output. Tubes with widely varying characteristics can be checked without overloading or otherwise damaging the tube. Flexible switching arrangement; roll chart for testing. The Triplett Electrical Instrument Co., Bluffton, Ohio—TECHNICIAN.

CBS PIN STRAIGHTENER

The CBS-Hytron twin pin straightener is designed to accommodate all types of miniature tubes. Made of wear-resistant steel dies, it consists of one 7-pin and one



9-pin straightener, mounted back to back. The compact device may be carried in the tool box or in a pocket. CBS-Hytron, Danvers, Mass.—TECHNICIAN

EMC SIGNAL GENERATOR

Model 700 is a generator with several types of output. It may be used as a bar generator for TV adjustment with a variable number of bars available for horizontal or vertical adjustments; a square-wave generator to 20 KC, or a Wien bridge AF oscillator with sine wave output from 18 CPS to 300 KC. A Colpitts RF oscillator produces output signals ranging from 300 KC to 108 MC on fundamentals—up to 216 MC on second harmonics. The instrument is priced at $55.90. Electronic Measurements Corp., 280 Lafayette St., New York, N. Y.—TECHNICIAN.

Industrial HV METER

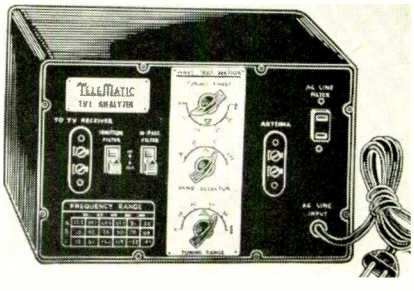
Model No. 520 Hi-Volt, designed for television and other high-voltage DC supplies, has a range up to 30,000 volts. Instead of a conventional meter movement, a glow lamp indicator that is burnout-proof, according to the manufacturer, is present. A knob is turned until the neon lamp extinguishes; then voltage is read directly off the dial. In use, the meter's test-clip lead is grounded; the insulated test prod is touched to the high-voltage terminal. List price: $11.00. Industrial Devices, Inc., Edgewater, N.J.—TECHNICIAN

Raytheon TELE-JAR ROTOR

Raytheon's Tele-jar Rotor is a shop aid for servicemen. It has 48 plastic, unbreakable jars for storing miniature tubes, crystal diodes, panel lamps, resistors, small condensers, insulators and hardware. The jars are held on eight shelves mounted on a ferris wheel rack. They can be set on a bench or wall-mounted. Raytheon Mfg. Co., Receiving Tube Div., 55 Chapel St., Newton 58, Mass.—TECHNICIAN.

Tele-Matic TVI ANALYZER

The TVI Analyzer, designed to identify TV interfering signals, contains a hi-pass and ignition filter section, an AC line-filter section, and a full range of calibrated wave traps. The desired wave trap is selected by a rotary switch; tuning is accomplished with 2 calibrated selector



knobs. The wave traps and filters can be used either singly or in any combination, as required. The unit is housed in a compact steel case measuring 5½ by 7-in. Net price to servicemen is $19.95. Tele-Matic Industries, Inc., 1 Joralemon St., Brooklyn 1, N.Y.—TECHNICIAN.

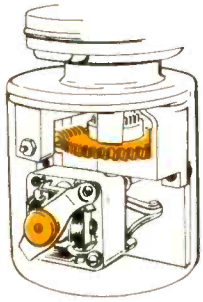
Why didn't someone do this before?

Only Superotor®

has the Quick Detachable Drive Unit

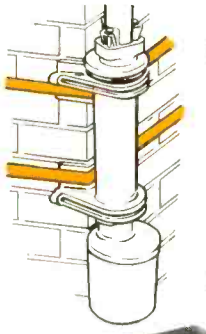
A Leader FIRST!

"TERRIFIC!" say TV servicemen — and you'll echo their words when you see the amazing new **Superotor**. Imagine — a drive unit as easy to replace as a light bulb! Strictly a one-man job! No fussin', no cussin', — no need to dismount the antenna — no need to interrupt TV viewing while the drive unit is being serviced. **Great?** Yes! — and this is just one of FIVE major advances that put **Superotor** years ahead of anything on the market. **No wonder the big switch is to Superotor!**



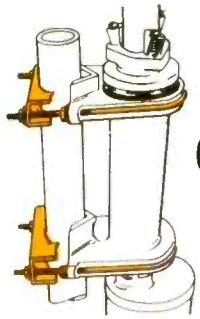
• Double Lock Stop Prevents Drift & Coast

A Leader FIRST!



• Built-in Chimney Mount Design

A Leader FIRST!



• Steel Reinforced Construction

A Leader FIRST!

VP* Tuning

*Vernier Precision

A Leader FIRST!

Patent Applied for

Copyright

Leader ELECTRONICS INC.

2925 EAST 55th ST., CLEVELAND 27, OHIO

... LEADING THE WAY TO BETTER PRODUCTS

"Tough Dog" Corner

Difficult Service Jobs Described by Readers

Flicker on UHF

A complaint of flickering—on UHF stations only—occurred on a set that used a single antenna for UHF and VHF reception. Since a converter was being used for UHF, I tried another converter. The set still flickered. Suspecting the antenna or lead-in might be the cause of the flicker, on UHF, I hooked up an indoor antenna, and left the lead-in from the outside antenna lying on the floor near the set. The receiver still flickered. With the indoor aerial connected, I picked up the lead-in from the outdoor antenna, curled it up, and placed it as far away from the set as possible. Result: the flickering was greatly reduced.

I checked the outside antenna on the roof, as well as the lead-in to the apartment, and everything appeared all right. While on the roof I noticed another antenna. It was a double corner-reflector, providing much too high a gain for that signal area. I also noticed that it used no stand-offs. The only anchoring was by means of a house brick placed on the transmission line just before the line went over the side of the roof. The slightest breeze would move the lead-in, which would then rub against a vent pipe in one place. Deciding to be a good Samaritan, I pulled the wire away from the vent pipe and fastened it down with a stand-off.

I did not have to wait long for a reward for my good deed. On returning to my customer's apartment, I found the picture had stopped flickering. Apparently the flapping line not only varied the signal strength of the antenna to which it was connected, but also that of nearby antennas, including the one belonging to my customer.—*F. Mattioli, Madison, Wisconsin.*

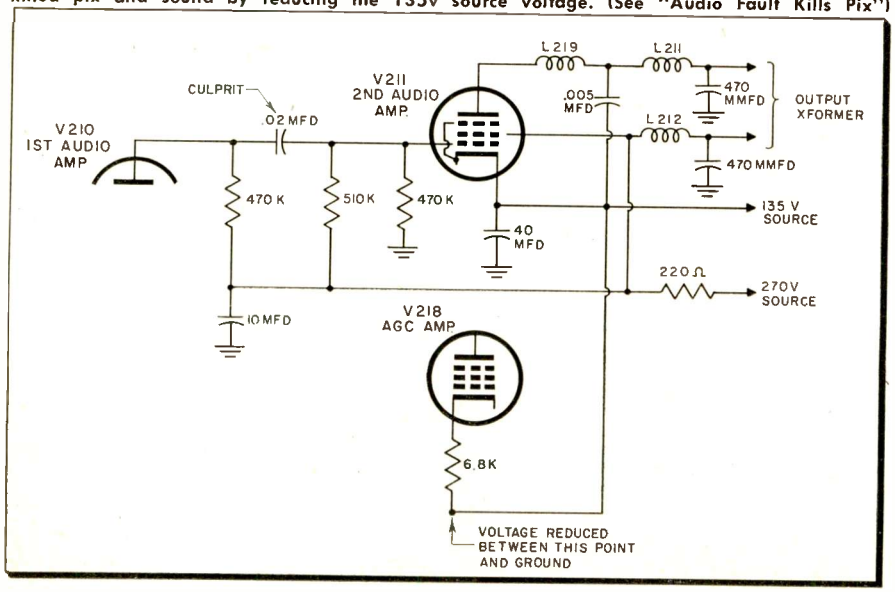
Audio Fault Kills Pix

Here is a Tough Dog whose cause you would never suspect unless you were thoroughly familiar with the circuit, which was a Du Mont RA 164-5 chassis. These were the symptoms: when the set was turned on, picture and sound would come in for about five seconds and then go completely out, leaving just the raster.

After the routine of substituting front-end and IF amplifier tubes, I decided to take IF amplifier voltage measurements, starting with the control grids (AGC voltage). This negative voltage was definitely much higher than normal, no doubt cutting off the tubes. I was so sure that the fault was in the AGC circuit that I focused all my attention on tracking down the trouble there (see Fig. 1). That was where I made my mistake, although my meter showed a below-normal B-plus voltage between cathode of the AGC amplifier, V-218, and ground.

I finally realized that the AGC cathode voltage came from the same source as the voltage for the cathode of the audio output tube, V-211. Then I started looking for the trouble in the audio amplifier. On the grid of the audio output tube, V-211, I got a reading of 60 volts positive although the normal reading given was +115 v. The next logical step—a resistance check of the .02 mfd coupling capacitor—showed leakage in this component. I replaced it. Picture and sound were restored. (Heavy plate current flow in V-211, caused by its positive biasing, was producing increased drops in B supply resistors, and thus lowering the voltage available at the +135 v terminal, to which the cathode of the AGC amplifier was connected.—Ed.) —*John L. Mancini, Winthrop, Mass.*

Schematic of section of Du Mont RA 164-5 chassis in which leaky audio coupling condenser killed pix and sound by reducing the 135v source voltage. (See "Audio Fault Kills Pix")



Cracked 1B3

This defect baffled a number of TV servicemen before it was remedied. The set happened to be a Philco using a conventional high-voltage flyback supply, with 6SN7, 6BG6, 6W4, and 1B3 tubes.

When I was called in to service the receiver, the woman of the house complained that the set would go dead after playing one hour. Everything was normal when I examined the set. On my return one hour later, I found the set dead. There was no picture or raster. Careful visual inspection in time showed a thin crack in the glass shell of the 1B3 tube. In order to see this, a watchmaker's eye-piece was used. The tube was replaced and the problem was solved. As these cracks cannot always be seen by the naked eye, they are difficult to locate. The crack permitted air to enter and cut off the tube after one hour of playing.—*Gelman's TV, Philadelphia, Penna.*

Times Have Changed Dep't.

Service manager (to boy applying for a job as TV apprentice): "Are you willing to work long hours?"

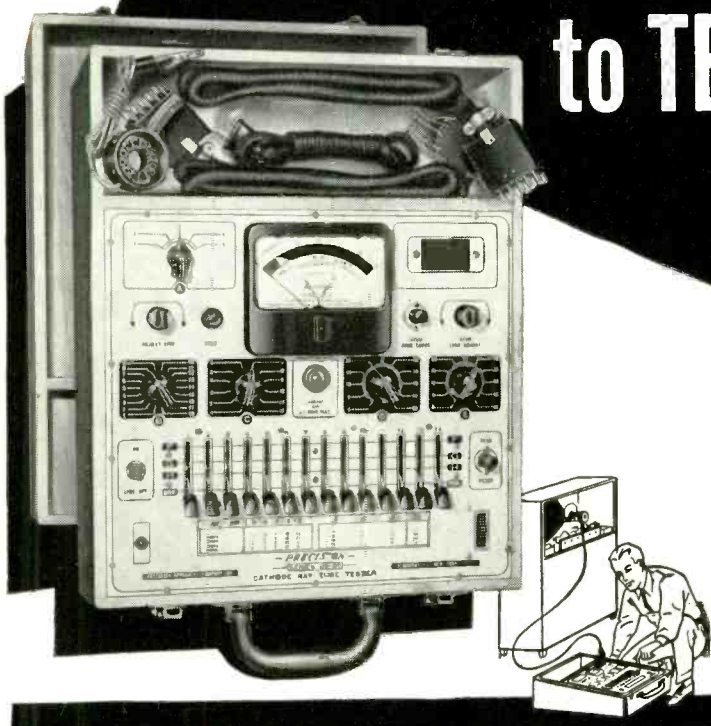
Boy (eagerly): "Yes, I am."

Service manager: "And will you accept a very low starting salary?"

Boy: "I will."

Service Manager: 'Then I'm sorry—we can't use you. We're looking for an intelligent lad, not a fool!"

It takes a CR TUBE TESTER to TEST a CR TUBE...



...because CR tubes are electrically and physically different from all other types of electron tubes! Some of the more obvious differences include:

PICTURE PRODUCING BEAM CURRENT
EXTREMELY LOW ANODE CURRENTS
DIFFERENT, MULTIPLE OPERATING VOLTAGES
HIGH LEAKAGE and SHORT CHECK LIMITS
MORE and DIFFERENT TUBE ELEMENTS
- ELECTROSTATIC FOCUS ELEMENT
- ELECTROSTATIC DEFLECTION PLATES
- ELECROMAGNETICALLY FOCUSED GUN
- ELECTROMAGNETICALLY DEFLECTED BEAM

ETC., ETC., ETC.

YES, IT TAKES A CR TUBE TESTER TO TEST A CR TUBE...

AND THE ***PRECISION CR-30***

WAS SPECIALLY DEVELOPED FOR THIS VERY IMPORTANT PURPOSE!

TESTS ALL TV PICTURE TUBES

Magnetic & Electrostatic
Oscilloscope & Industrial Types

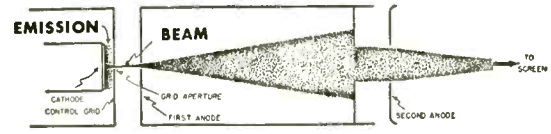
...FOR BEAM CURRENT INTENSITY (Proportionate Picture Brightness)

Stop Guess-Checking with CABLE ADAPTERS!

- *Receiving* tube checkers were made for testing *receiving* tubes and NO CABLE ADAPTER can *adapt them to do the job of the CR-30.*
- CABLE ADAPTERS only check for filament continuity, a degree of inter-element short and a so-called emission test.
- CABLE ADAPTERS do not test for the all-important, picture producing beam current.

You can't afford to guess when you test the most expensive component of a TV set.
Be sure with PRECISION Model CR-30!

IT IS THE ELECTRON BEAM **(and NOT total cathode emission) which traces the pictures on the face of the CR tube.**



Cathode emission can be high, and yet Beam Current (and picture brightness) unacceptably low. *The CR-30 will reject such tubes* because it is a Beam Current tester. Conversely, cathode emission can be low and yet Beam Current (and picture brightness) perfectly acceptable. *The CR-30 will pass such tubes because it is a Beam Current Tester.*

The CR-30 incorporates additional special test facilities necessary for overall performance evaluation of the CR tube as will permit positive answer to the question "Is it the Picture Tube or the TV Set?" And the CR-30 gives the answer in but a fraction of the time required to test the other 2 dozen or so tubes in the set.

SERIES CR-30: In hardwood, tapered, portable case, with hinged, removable cover. 17¼" x 13¾" x 6¾". Complete with standard picture tube cable, universal CR tube test cable and detailed instruction manual. Shipping weight: 22 lbs.

NET PRICE $104.75

PRECISION TEST EQUIPMENT — Standard of Accuracy

PRECISION APPARATUS COMPANY, INC.
92-27 HORACE HARDING BLVD., ELMHURST 13, N. Y.
Export Division: 458 Broadway, New York 13, U.S.A. • Cables—Morhanex
In Canada: Atlas Radio Corp., Ltd., 560 King Street, W., Toronto 2B

NEWS of the TRADE

At the NATESA banquet in Chicago. Left to right, Bert Lewis, Rochester, N. Y.; William Briza, Omaha, Neb.; Milton Klarsfeld, Albany, N. Y.; Fred Colton, Columbus, Ohio; Frank J. Moch, Chicago (President); John Cecich, Chicago (Convention Chairman); Vincent Lutz, St. Louis; Jack McDowell, Kansas City; Harold Rhodes, Paterson, N. J., and John Hemak, Minneapolis, Minn. (Treasurer).

NATESA Plans Industry-Relations Program for '54

The National Alliance of Television & Electronic Service Associations plan a comprehensive three-point industry relations program for the coming year, Frank J. Moch, president announced at the close of the fourth annual TV-Radio Service Industry Convention and Show held at the Morrison Hotel, Chicago, October 9, 10 and 11. The convention brought delegates from thirty-eight states and Canada to view the thirty-two manufacturers' displays and to attend the seminars, color-television symposium and discussion groups and the gala annual NATESA banquet.

All present officers of NATESA were re-elected for the 1954 term and one additional office was filled. Four new affiliate groups joined NATESA. Officers re-elected included Frank J. Moch, Chicago, President; John Hemak, Minneapolis, Treasurer; J. B. McDowell, Kansas City, Kansas, Secretary-General; Bertram Lewis, Rochester, New York, Eastern Vice President; Fred Colton, Columbus, East Central Vice President; Harold (Dusty) Rhodes, Paterson, N.J., Eastern Secretary; Francis Fingado, Denver, Western Vice President; Vincent Lutz, St. Louis, West Central Vice President and W. A. Rosenberg, Wichita, Kansas, West Central Secretary. C. N. Burns, Memphis, was elected East Central Secretary.

The three-point program outlined by NATESA includes an integrated public relations and customer relations program in cooperation with the regional and local affiliates which will include promotional and advertising material; an expansion program and a manufacturer-relations program which was described by President Moch as presaging closer liaison between suppliers and service groups, and a training program. This latter will include a speakers bureau, lectures, films and training sessions in cooperation with manufacturers.

New affiliates of NATESA announced at the Convention include the Utah Association of Radio and Television Servicemen; the Rhode Island Radiomen's Business Association; the Radio and Television Service Association of Western New York and the Associated Television Service Companies of Cincinnati.

Two companies were nominated for the NATESA Friends of Service Management Award—the Radio Corporation of America and Howard W. Sams & Co., Inc.; and two others were given continuing awards—General Electric Company and Sylvania. Formal awards to RCA and Sams will be made in these companies' plants at a later date.

The fifth annual NATESA TV-Radio-Electronic Service Industry Convention will be held in Chicago in mid-September, 1954, President Moch announced.

Calendar of Coming Events

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

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

Technician Is Custodian of TV's Good Will

"Without in any way detracting from the importance of the other segments of the industry, the distributors and dealers, I believe it is fair to say that the prosperity of all four groups depends upon the proficiency and the honesty of the manufacturer and the service technician," said James D. Secrest, executive vice-president Radio-Electronic-TV Mfrs. Assn., speaking before a servicemen's audience at Fort Worth, Texas.

"The distributor and the dealer are highly important from the sales point of view, but it is the manufacturer and the serviceman who are responsible for the customer's satisfaction and consequently, in the final analysis, for industry stability.

"The manufacturer certainly has the initial and major responsibility. If he does not make a product that is properly engineered, manufactured, and inspected, everybody concerned with the selling and servicing of that receiver will suffer the consequences. If he produces a good set, everyone's job is made easier all down the line.

"The serviceman, given a satisfactory product, is probably more often responsible than the manufacturer for the consumer's satisfaction or complaints. In all instances he is closer to the set owner than the manufacturer and therefore in a better position to create good or ill-will for the product and the industry," declared Mr. Secrest in closing.

At left, John Cecich, chairman of the NATESA convention committee gives address of welcome. Center, Frank Hoffman receives attendance award from President Frank J. Moch, right.

now . . . new beauty for the housetops

DAVE CHAPMAN, S. I. D.

Dave Chapman, renowned designer and prominent member of S.I.D., has given to "Circle-vane" the artistic touch and architectural correctness that no other TV Antenna has ever had.

the Circle-vane first of the new antennas in the WARD STYLECRAFT LINE

Antennas, styled to the modern tempo . . . cleverly patterned to enrich the appearance of any house . . . expertly engineered to give finer pictures . . . skillfully designed by the famous Dave Chapman, (S.I.D.) . . . these new Ward Circle-vane Antennas complement the home and add dignified charm and beauty. Everybody, dealers and owners alike, have been waiting for "something new" in antennas — The new, finer Ward Circle-vane supplies the answer. The Ward Circle-vane is constructed of aluminum elements with a cross-arm of durable Permatube . . . Comes completely pre-assembled.

Be first with this Ward FIRST in your territory. Order today.

THE WARD PRODUCTS CORP.
DIVISION OF THE GABRIEL COMPANY

A GABRIEL PRODUCT

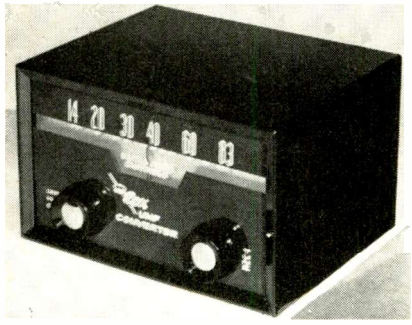
1148 Euclid Avenue, Cleveland 15, Ohio • In Canada: Atlas Radio Co., Ltd., Toronto, Ont.

For the Technician

Useful Products for Sales and Service

Rex UHF CONVERTERS

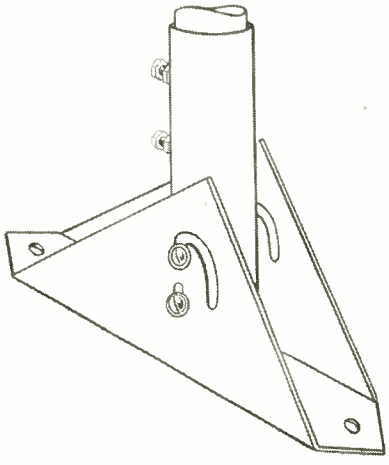
Designed for stability and high signal-to-noise ratio, models UC-1 and UC-2 both feature a silver printed-circuit tuner. Quiet, efficient performance, easy connection to standard receivers, and unimpaired reception of existing VHF channels are claimed for these converters.



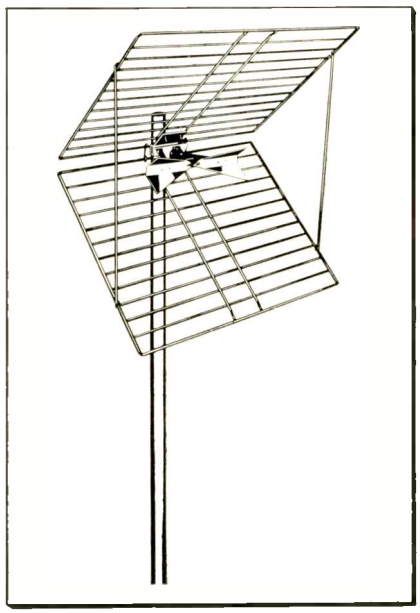
The units normally convert to Channel 5 or 6, but can be used on Channel 4 without adjustment. Model UC-2 is intended for use in metropolitan areas up to 15 miles from the transmitter. List prices: model UC-1, $39.50; model UC-2, $29.50. Rex Electronics Corp., 1351 DeLoss Street, Indianapolis 2, Indiana.—TECHNICIAN

South River MAST MOUNT

For use on either a flat or pitched roof, model RM-15 is claimed to simplify one-man installation techniques while assuring vertical positioning of the mast. Mast and antenna are set in the base, then "walked up" to the vertical position and locked. South River Metal Products, South River, N.J.—TECHNICIAN



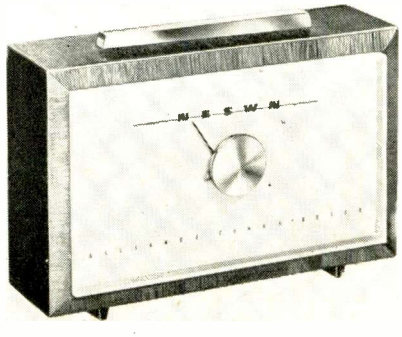
Telco UHF ANTENNA



Rapid three-step installation is claimed for model 8984 UHF corner reflector antenna. Pre-assembled at the factory, the antenna is plated to prevent corrosion and comes with a vibration-proof mast bracket. Television Hardware Mfg. Co., Div. General Cement Mfg. Co., 904 Taylor Street, Rockford, Ill.—TECHNICIAN

Alliance TENNA-ROTORS

The model U-83 Tenna-Rotor provides automatic rotation to any preselected stop position; model T-10, the manually operated unit, features a control bar across the top of the rectangular control case. Other improvements over older models made by the same manufacturer include a die-cast housing on rotator, faster rotation, new magnetic brake, more accessible terminal block and guy wire attachment on clamp plate. Both models are priced at $44.95. Alliance Mfg. Co., Alliance, Ohio—TECHNICIAN.



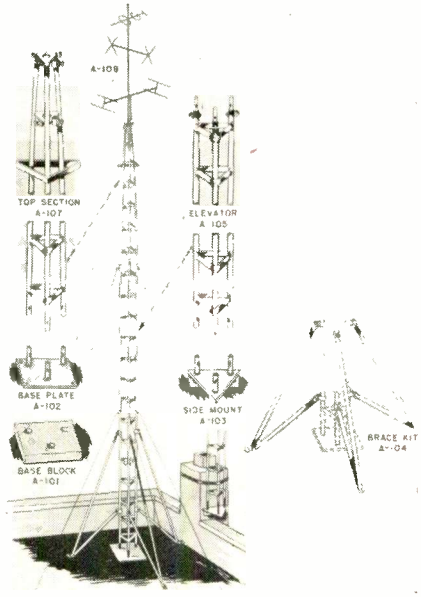
Vineta TV TURNTABLES

The Vinetta model 14 turntable is of welded wrought-iron with ball-bearing rotor. Adjustable for any TV set up to 32″ wide; will support up

to ½ ton. Legs are 22″ high. List price, $14.95. The same manufacturer makes a model P-104 with table-top in natural mahogany finish, and a model P-106 with limed oak table-top finish. Both list at $24.75. Vineta Mfg. Co., 2738 No. Sheffield Ave., Chicago 14, Ill.—TECHNICIAN.

M-S TV TOWERS

Mechanical Steel Tubing Corporation's line of TV towers and telescoping masts includes 10-foot elevator sections which can be used to erect towers from 70 to 150 feet in



height; also telescoping masts which can go up to 50 feet, and a one-piece 20-foot "Economy Jiffy Tower." Mechanical Steel Tubing Corp., 1801 Eighth Ave., Brooklyn 15, N.Y.—

Sprague Capacitor Guide

Intended to supplement the *Sprague TV Capacitor Replacement Manual,* this brown and yellow card, *Supplement C-45,* shows listings of Sprague Twist-Lok electrolytics being used in almost every 1953 model TV set. Available from Sprague distributors.

CBS Substitution Chart

This TV picture tube substitution chart lists all magnetically-deflected tubes, regardless of make. Physical and electrical differences are given so that the technician may decide which tube may be substituted for another, with a minimum number of alterations to the receiver. May be obtained from CBS-Hytron distributors or CBS-Hytron, Danvers, Mass.

Weller Guns as Xmas Gifts

A complete package of Christmas sales helps is available to distributors and dealers by Weller Electric Corporation, Easton, Pa. Weller experience over several years has shown their soldering gun to be a hot Christmas item among Servicemen and Mechanics.

A special 3-dimensional counter display promotes the guns as gifts and shows them off to best advantage. Side panels illustrate the great number of jobs that can be done with Weller Guns.

Hi-Fi Speakers from England Are Marketed by Beam

Beam Instruments Corp., 350 Fifth Ave., New York, N. Y., has announced a complete new line of full-range high-fidelity loudspeakers, manufactured especially for the American audio market by the Whitely Electrical Radio Co. in England, and sold in the U.S. under the brand name Beam "Stentorian." The line includes "Duplex" twin-concentric speakers with crossover networks which are offered in 10 and 12-in. models. Also available is a complete range of high-frequency tweeters, woofers, and single-cone direct-radiator type loudspeakers. All the speakers in the line incorporate a low frequency cone of a new design. A new method of cone processing is said to bring low frequency response down to about 20 cycles, without loss of sensitivity.

Also exhibited by Beam was a new development by Whitely, a Quadruplex wide-range speaker system, the first integrated design employing four independent driving mechanisms on a common axis.

SERVICE ASS'N REPORTS

LBRT Is Active in Southern California

Covering all of southern California, the Long Beach Radio Technicians Assn. is one of the most energetic groups in the country. It is also the oldest and largest, according to Harry E. Ward, general chairman, public relations division. The Long Beach chapter holds dinner meetings twice monthly, while all chapter presidents and secretaries meet monthly for general discussions on common problems.

Current officers of the Long Beach group are Joseph Martin, president; Fred Abrams, vice-president; Merlyn Cochems, secretary; Clarence Spencer, treasurer.

RTSA of Buffalo, N. Y.

Instituted in November, 1951, the Radio Television Service Assn. of Buffalo (N.Y.) is one of many organizations rapidly gaining recognition. Meetings are held on the first Monday of each month at the Hotel Lafayette in Buffalo. Dues are $12 a year plus a $5 initiation fee. Present officers of the group are Ferdinand J. Lynn, president; Clarence Thielke, vice-president; John G. Wick, secretary; William Harrington, treasurer; William Wagner, sergeant-at-arms. Wick is a member of a prominent Buffalo law firm.

NETSDA at Trenton, N. J.

The National Electronic Technician And Service Dealers Assoc. (NETSDA) met in Trenton, N. J. Sunday October 4th in the Stacy-Trent Hotel. President Roger Haines of Haddonfield, N. J., presided. Among the items of business conducted were: Plans for the proposed Eastern Conference which is scheduled for Philadelphia, Pa. in early February, dates to be announced. Samuel Brenner, President of PRSMA, associating with the newly formed Philadelphia Council, was appointed Chairman of the Conference arrangements for NETSDA. Max Leibowitz, President of the New York State Federation was appointed co-chairman. NETSDA went on record endorsing a TV lecture course for the coming year, which is promoted by many leading manufacturers for NETSDA members.

It was decided by the delegates, that under their charter, three meetings per year will be held. The first Sundays in February, May and October were selected as regular meeting dates for the organization. The next meeting will be held in Philadelphia, Pa., Sunday, February 7. John Wheaton, 464 Sagamore Avenue, East Williston, Long Island, N. Y. is corresponding secretary, and L. J. Helk, 67 S. Main St., Carbondale, Pa., is in charge of publicity.

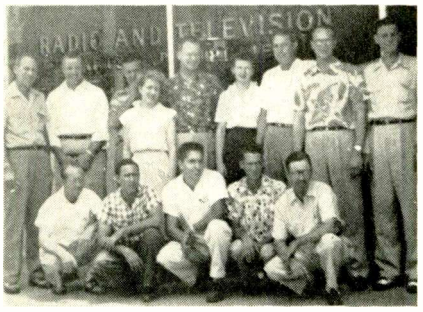
Ten Ways to Kill an Association

1. Don't go to meetings.
2. If you do go, go late.
3. If the weather doesn't suit you, don't think of going.
4. If you do attend a meeting, find fault with the work of the officers and members.
5. Never accept office, as it is far easier to criticize than to do things.
6. Get sore if you are not appointed on a committee, but if you are, never attend the committee meetings.
7. If asked by the president to give your opinion on some matter, tell him you have nothing to say.
8. After the meeting tell everyone how things should have been done.
9. Do nothing more than absolutely necessary, but when other members use their ability to help matters along, howl out that the organization is run by a clique.
10. Hold back your dues, or don't pay at all.

—J. Henderson Stock,
Mechanicsburg, Pa.
in NATESA Scope

Texas Town Prepares for UHF

Wholesale Electronic Supply, of Dallas, Tex., has opened its first branch store at 203 S. High, Longview, Tex., under the management of Tom W. Fickling, who had previously traveled the east Texas area since the beginning of the business in November, 1950. The branch is to serve a 100-mile radius of Longview, traveling one other salesman, Charles Renner. Renner will be ably backed up by the experience of Bob Townsend, who has also been with the firm since its inception, except for a year in Korea. As Longview is to have a UHF station in the near future, the firm will house a large stock of TV and radio supplies in its warehouse.



Radio Institute Alumni

The Buffalo (N.Y.) Radio Institute Alumni, an organization of electronic technicians, held its first meeting in February of 1952 in that city's Downtown Branch Y.M.C.A. Membership now exceeds 100. Meetings are held the first Monday of each month, except in July and August.

Since its inception, the BRIA has played host to GE, Philco, Motorola, Sylvania and other companies who have sponsored service clinics and demonstrations at meetings. The organization also provides free service literature and pamphlets for members, according to Philip Oebler, corresponding secretary.

Current officers, in addition to Oebler, are Albert Licata, president; Peter Stasio, vice-president; Edward McGuire, treasurer; David Stephens, sergeant-at-arms.

More Letters From Our Mailbox

Distributor Competition

EDITORS, TECHNICIAN:

How is the ordinary technician to compete with service shops owned and operated by TV manufacturers' distributors? These shops purchase replacement parts at jobber prices and have the prestige of the manufacturers' names. It's a tough struggle against that kind of competition.

10380 W. Chicago — MALCOLM R. WRIGHT
Detroit, Mich.

Sets Shipped with Schematics

EDITORS, TECHNICIAN:

I went through the September issue of Technician with a great deal of interest, even down to reading the "Letters to the Editors" column. Mr. J. R. D. wants to know why major television manufacturers do not include scheatics with their television sets as do mail-order houses like Sears Roebuck. I would like to advise J. R. D. that every one of our television sets for the past few years has packed with it a complete schematic diagram for whatever chassis is used in the receiver. In addition to this our chassis are clearly stamped with run numbers and model numbers, and they also include a tag which lists the various tests that the set has been subjected to before it left the factory. This tag when returned to us properly filled out enables us to pinpoint whatever problems may be arising in the field and immediately be able to correct the condition.

Lots of success with your new magazine.

Admiral Distributors
New York City

SIDNEY KAPLAN
Service Manager
Radio & Television

"TUBES TESTED FREE"

Here's What NATESA and President Frank J. Moch Have to Say About This Practice

How many times a day have you found it necessary to ask one of your shop technicians (of which there is great shortage) to drop everything to test a 'bushelbasket' of tubes, which you are expected to test free. In radio days this was not a serious problem since the average set contained only 5 to 12 tubes, most only five. These tubes generally were simple single section tubes. In TV, however, 20 to 30 tubes, many of which are multi-section types, require multiple tests.

Let us analyze this free testing idea. Even with the most efficient technician and the best tester each tube will require a minimum of 2½ minutes per tube. Since good technicians normally used in the shop are paid anywhere from $2 to $2.50 per hour simple arithmetic will show that his cost to you per minute is about 4.1 cents, further it is obvious that the cost per tube is 10.25 cents. Consider also that whenever you pull your man off a job he losses time getting back on the track of his mental processes. The tester costs you anywhere from $80 to $250. Its life is about 5 years meaning that the cost to you per day is about $1.00. Thus it is obvious that the actual *cost* to test a tube runs about 13 cents per tube.

Don't "Absorb" This Cost!

Don't make the serious mistake of thinking that you should absorb this cost since you are making a mark-up on the possible sale of replacement tubes. Actually this mark-up covers the normal costs of handling the tube such as rental of space, insurance, breakage, shrinkage, billing expense, etc. and your profit on your investment. Another factor to consider is that you are not buying good will in testing tubes since most people who bring tubes in for test are 'chislers' who are trying to 'do' a service company out of a service job. After all service is your business and any actions which reduce the possible volume of service are contrary to your best interests. Yet another thing to consider is that after you have tested the tubes you will in all probability be 'pumped' for advice on how to correct the trouble.

You Sell Knowledge

Never forget that you *sell* knowledge and that therefore you would have to be a class A fool to give it away. Yet another problem faces you; certainly you have sold tubes across the counter only to have the buyer insert them into the wrong socket, one of higher voltage, ruining the tube, and then demanding that you exchange the tube. Your parts jobber justifiably, will not honor such burnt out tubes.

As a summary, tube testing cannot and should not be done without a charge since definite costs and risks are attendant upon such activities. It is suggested that a charge of 10c or 15c per tube be made to cover these hazards. In any case where the charge is challenged the above facts are sufficient to handle any reasonable person. There is no reasonable reason why you should deprive yourself of income from service and in addition pay for the privilege of doing so.—*Natesa Scope*

Du Mont Teletron Service

Expansion to new and larger quarters at 760 Bloomfield Avenue, Clifton, N.J. for the teletron service department of Allen B. Du Mont Laboratories, Inc., cathode-ray tube division, has been announced by B. C. Scales, sales manager of the division.

The department coordinates the servicing and adjustments of Du Mont's television picture tubes with distributors and other television receiver manufacturers.

The department, under the supervision of Robert G. Scott, sales engineering manager, is moving from 750 Bloomfield Avenue.

Color vs Black & White (*Continued from page 41*)

used in dynamic focus in monochrome sets, in which an AC current derived from the horizontal sweep section is suitably modified and added to the focus current. In the color receiver, suitable amounts of horizontal and vertical sweep voltages, appropriately modified in waveshape, are applied to the focus and convergence electrodes; these additional voltages assure correct and uniform focus over the whole screen. Any defect in this section of the color receiver will tend to cause blurring and/or incorrect coloring in some portion of the picture.

The three guns of the tricolor kinescope must be supplied with signals of the proper color. This job is taken care of by the color adders. These stages add the right amount of "Y" signal to the detected color information, in the proper phase, thus providing the correct color for each gun. The color amplifiers in this section build up the color signals to levels required by the CRT for proper operation. The DC restorers function in the same way that they do in the monochrome sets. Individual DC restorers, as well as individual amplifiers, are required for each color. Since the colors in this part of the receiver (color adder, DC restorer, color amplifier section) are separate from each other, any (single) trouble in a stage will affect one color alone, providing a clue to the faster localization of the circuit at fault. For example, if the picture contains no reds, then suspicion is narrowed down to the red adder, the red amplifier, the red DC restorer, and the red gun of the CRT.

Since the color receiver is intended to receive black and white transmissions as well as color programs, receiver stages that process color signals must be disabled, to prevent them from giving black and white signals an undesired going-over. The *color killer* has this watch-dog type function. It performs this function by biasing an amplifier tube to cut-off when no color sync burst is received. The resultant action of this tube prevents the black and white signal from reaching the color detectors.

Defects in Color Killer

There are basic symptoms that defective operation of the color killer may introduce: 1—If the monochrome signal is permitted to get to the color detectors, the picture will probably have a meaningless, constantly-shifting coloring. 2—If the color signal is cut off from the color detectors, it will be reproduced as a black and white picture. Which basic symptom will manifest itself depends on what component goes bad.

The keying pulse applied to the color killer prevents it from being triggered by the wrong signals, and improves its performance in the presence of noise.

The blocks labeled *Color Detector, Filters, and Color Amplifiers* and *Color Sync, 3.58 MC and Control* will be discussed in the article to follow. For the present, it will suffice to point out that the color detectors (also called *decoders*) remove or detect color information from the carrier-modulated signal applied to them; the color amplifiers amplify the (unseparated) colors; and the filters remove cross-talk and spurious signals. The color sync section keeps the color detectors working in proper phase with respect to the transmitted color sync signal.

REP NEWS

Perlmuth-Colman Moves to Larger Quarters

The firm of Perlmuth-Colman & Associates, who are celebrating their thirtieth year in the manufacturer's representative business in the California-Arizona territory, announce their removal to new and enlarged quarters at 2419 South Grand Avenue, Los Angeles 7, Calif. These new facilities include modern offices, as well as conference and sales rooms and larger warehouse space, which will enable them to offer fast efficient service to their principals and customers.

Rohn Reps

Rohn Manufacturing Company, 116 Limestone Bellevue, Peoria, Ill., announces the following appointments as sales representatives for the Rohn tower and accessories line: W. B. Golliher, 1003 Grandview Ave., Boulder, Colo. Territory: New Mexico, Colorado, Utah, Wyoming. The Branum Co., 123 Manufacturing St., Dallas, Texas Territory: Texas, Oklahoma, Louisiana, Arkansas. Arthur Hess, 62-07 68th Ave., Brooklyn 27, N.Y. Territory: Upper State New York. Sam Karns Company, 36 Oak Avenue, Tuckahoe, N.Y., Territory: Metropolitan New York, Northern New Jersey.

Interested distributors are invited to contact these representatives.

Plastic Capacitors Names Rep

Plastic Capacitors, Inc., Chicago, has apointed the Conrad R. Strassner Co., 1865 N. Western Ave., Los Angeles, as its exclusive representative in California, Arizona, Nevada and New Mexico. Plastic Capacitors specializes in the development and production of capacitors.

Atlas Sound's New Rep at Minneapolis

Robert C. Reinhardt, president of Atlas Sound Corp., 1451—39th St., Brooklyn 18, N.Y., manufacturers of the complete Atlas line of public-address loudspeakers and microphone stands and accessories, has confirmed the appointment of Clark R. Gibb as sales rep for the territory of Minnesota, Western Wisconsin and North and South Dakota.

Well-known for his technical and merchandising experience, Mr. Gibb will have his business headquarters at 312—16th Avenue, S.E., Minneapolis 14, Minn.

TWO REASONS for the TV Servicing Industry's Greatest Publishing

SUCCESS

1 **GIANT-SIZE EDITORIAL SERVICE! Yes, TECHNICIAN's editorial is *giant-size in quality* (thanks to the largest and most experienced staff in the field) . . . *giant-size in quantity* (giving the reader far, far more helpful service and installation features than any other magazine in the field). That's why TECHNICIAN is winning increasing leadership in trade paper surveys to the nation's TV servicemen.**

COMPARE —

PUBLICATION	NUMBER EDITORIAL PAGES SEPTEMBER, 1953	TECHNICIAN'S EDITORIAL SPACE IS GREATER BY—
TECHNICIAN	**77.6**	
Service	53.8	**44%**
Service Dealer	40.0	**94%**
Service Management	25.6	**203%**

(TECHNICIAN is not compared with the television newstand magazines in the field, because they dilute their editorial with features for students, experimenters, and amateurs.)

The editorial pages in TECHNICIAN include the famous CIRCUIT DIGEST feature that gives schematics and service data on large quantities of TV sets currently reaching the market. Exclusive with TECHNICIAN, it's the most costly editorial feature ever prepared by any trade paper. Servicemen from coast to coast have acclaimed CIRCUIT DIGESTS in thousands of voluntary testimonials!

Remember—TECHNICIAN is the magazine now being credited with upgrading the editorial content of all service publications—and that benefits not only the readers, but the advertisers, too!

2 **AD ACCEPTANCE POLICY PROTECTS MANUFACTURERS! Advertising quoting cut-prices is accepted only if the advertiser can show the manufacturer's consent. Otherwise, the advertiser must choose between the mention of the brand name or the price—but may not use both. TECHNICIAN protects the manufacturer's equity in his nationally advertised products.**

FIRST! ***FIRST!*** ***FIRST!*** ***FIRST!*** ***FIRST!***

***First* in servicemen's preference! *First* in number of editorial pages! *FIRST* in upgrading editorial to advertisers' benefit! *First* in circulation! *First* in economy! *First* in price-protection for manufacturers! *First* in experience!**

No matter how you look at it, TECHNICIAN is the *first* publication in the TV-service field. Make it *first* on your media schedule, too.

FIND OUT FOR YOURSELF

Prove to yourself—at our expense—that the nation's servicemen *prefer* TECHNICIAN. Here's how: Pick any group of servicemen listed in the yellow pages of any phone directory. (They *must* have a phone.) Ask them by mail what television service publication is most helpful in their work. Tabulate the answers. We'll underwrite your costs, provided you let us use the results. Why not accept our challenge and write us for details today?

TECHNICIAN • **CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue • New York 17, N. Y.**

Magne-Pulse RECORDER

The Magne-Pulse recorder is capable of detecting and indicating the presence of intermittent troubles in radio and TV receiver circuits; unit sounds a buzzer and lights a lamp when an intermittent defect occurs. The instrument contains three VTVM circuits which may be used to monitor three different voltages simultaneously. When the defect causes a voltage deviation from normal, the associated VTVM circuit detects the deviation and causes the appropriate lamp to light and the buzzer to operate. The lighting and buzzing continue even if the voltage returns to normal. A manual reset is provided to turn the warning signals off. AC or DC voltages may be monitored. Magne-Pulse Corp., 140 Nassau St., New York 38, N. Y.—TECHNICIAN.

Acrolite PLASTIC SPRAY

Acrolite's new plastic protective coating is a heavy-duty acrylic plastic made to insulate, waterproof, and stop rust and tarnish. It will eliminate TV "highlights" and corona, and prevent antennas from rusting, according to the manufacturer. A single can (12 oz.) retails for $1.79. Acrolite International, Hillside, N.J. —TECHNICIAN.

"Better make sure first that it's equipped with a Jensen needle."

NEW BOOKS

TELEVISION FUNDAMENTALS. By Kenneth Fowler and Harold B. Lippert. McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. 524 pages, $7.

Television Fundamentals presents, on a fairly simple level, the basic principles needed by the radio technician to install and service TV sets. The first 12 chapters deal with the theory of operation of the various TV receiver sections. Chapter 13 discusses receiving antennas and their installation; Chapter 14, test equipment and alignment; Chapter 15, servicing; Chapter 16, trouble-shooting by picture analysis.

HOW TO USE SIGNAL AND SWEEP GENERATORS. By J. Richard Johnson. John F. Rider Publisher, Inc., 480 Canal Street, New York 13, N.Y. 144 pages, paper binding. $2.10.

This book is beamed at radio and TV technicians, as well as students and experimenters. It discusses the various types of signal and sweep generators available; their basic operating principles; controls and adjustments present; set-up and adjustment of generators for various applications; and generator maintenance. Only basic knowledge of radio theory needed to understand the book.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF

TECHNICIAN published monthly at Bristol, Conn., for October 1, 1953.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, M. Clements, Rumson, N. J. Editor, Orestes H. Caldwell, Catrock Road and Bible St., Cos Cob, Conn. Managing Editor, Sol Heller, 124 W. 93rd St., New York 25, N. Y. Business Manager, M. H. Newton, 583 W. 215th St., New York, N. Y.

2. The owner is (if owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given.) Caldwell-Clements, Inc., 480 Lexington Avenue, New York 17, N. Y.; M. Clements, Rumson, N. J.; O. H. Caldwell, Catrock Rd. and Bible St., Cos Cob, Conn.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) ORESTES H. CALDWELL

Sworn to and subscribed before me this 29th day of September, 1953.

ALICE H. POND
Notary Public, State of New York
No. 03-8406175
Qualified in Bronx County
Cert. filed with N.Y. Co. Clerk
Commission expires March 30, 1954

MFRS' Catalogs & Bulletins

Admiral Antenna Catalog

The accessories division of Admiral Corp. published October 15, a 20-page, two-color catalog listing antennas, masts and towers, tables and bases, multiple installation equipment, transmission line and hardware. Raymond W. Peterson, manager of the division, said the catalogs are being offered with distributors' imprints.

"Our department's sales have increased over 300% over 1952 and many distributors are discovering that accessory sales are easy to get, easy to handle, and profitable."

Vee-D-X Antenna Booklet

A 30-page illustrated booklet describing the entire Vee-D-X line of UHF and VHF antennas and accessories is now available. Thirty-six different products, including the company's antenna rotator, are described in this wallet-sized guide. For a copy, write to LaPointe Electronics Inc., Rockville, Conn.

Capehart Serv-U-Facts

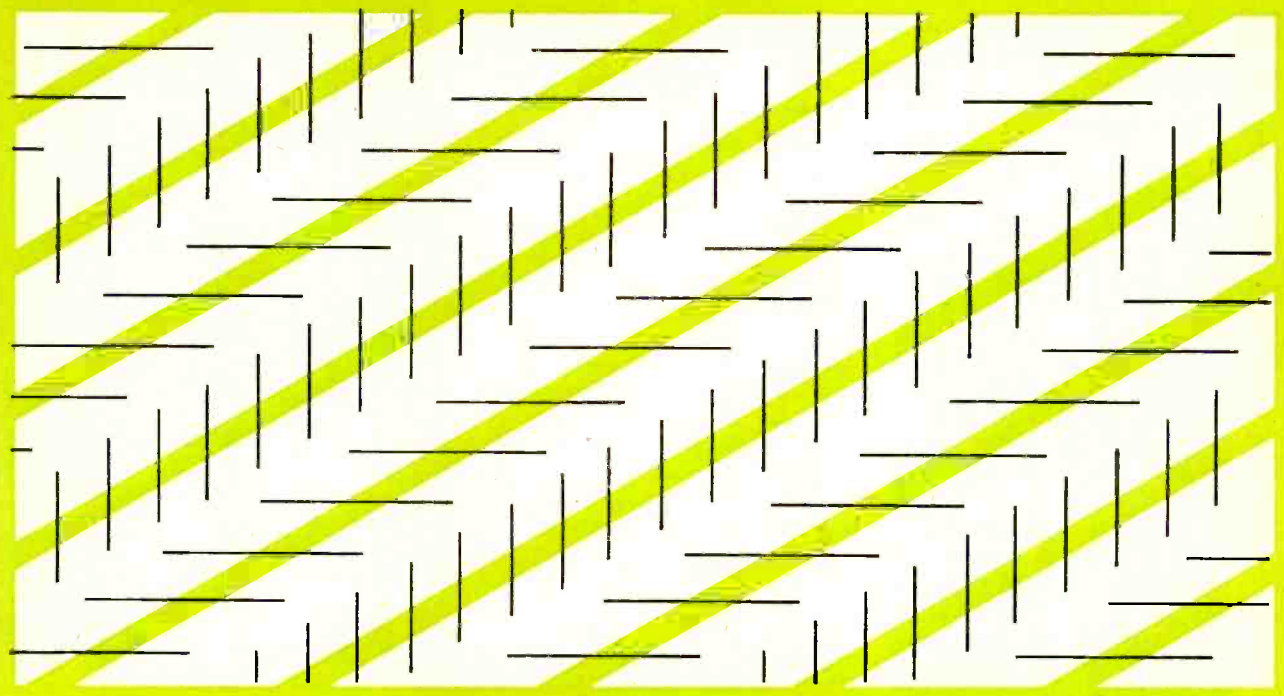
Capehart's new Serv-U-Fact booklet presents schematic and alignment data, tube location guide, waveforms and voltage readings on current Capehart receivers. This material appears on loose-leaf charts bound into a sturdy easel-type binder. Adequate room is provided for insertion of new charts. The large, readily-removed schematics will no doubt be appreciated by servicemen. Net price of Serv-U-Facts is $3. Copies may be obtained from Capehart distributors or the Capehart-Farnsworth Co.'s service department in Fort Wayne, Ind.

Vidaire Bulletins

Two bulletins published by the Vidaire Electronics Mfg. Co., and titled *Better Sound for Your Pictures* and *TV Interference and Its Remedies*, are available. The first one describes methods of improving sound quality in TV receivers; the second is devoted to TVI causes and cures. Write Vidaire Sales Office, 6 E. 39th St., New York, N. Y., for a copy.

Delco Electronic Catalog

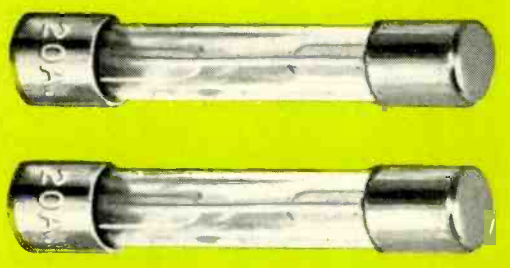
Bulletin 6A-100 is a 63-page catalog listing the complete line of Delco electronic parts, including tubes, vibrators and TV components. Available from United Motors Service Div. of General Motors Corp., GM Bldg., Detroit 2, Mich.

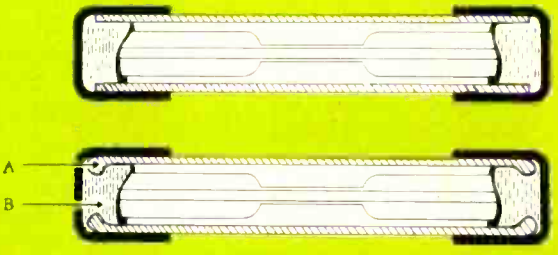


THINGS ARE NOT AS THEY SEEM...

The long lines are strictly parallel—
that they appear otherwise is an optical illusion.

This fuse merely has the metal caps cemented to the glass.





The difference between these two fuses is no illusion . . .

This Littelfuse has the caps locked to glass like this.

The ends of the glass are formed[A]. The solder which is bonded in a separate operation to the cap reflows through the small aperture and spreads out to form a permanent collar-button lock[B] between cap and glass—impervious to moisture and vibration. The exclusive Littelfuse feature eliminates fuse failure due to loose caps.

Littelfuse leads all other fuse manufacturers in design patents on fuses. ***Lock-cap assembly patent no. 1922642***

LITTELFUSE

DES PLAINES, ILLINOIS

Complete Index of

ALL "CIRCUIT DIGESTS" TO DATE

Including Current Issue. CIRCUIT DIGEST NOS. 95 to 100 will be found in this issue of TECHNICIAN.

All Units Are TV Receivers Unless Otherwise Noted

ADMIRAL — Circuit Digest No.

Chassis 2242: Models 520M15, 520M16, 520M17. Chassis 22A2A: Models 520M11, 520M12. Chassis 22M1: Models 121M10, 121M11A, 121M12A, 121M11, 121M12, 121K15A 121K16A, 121K17A, 121K15, 121K16, 121K17, 221K45A, 221K46A, 221K47A, 221K45, 221K46, 221K47. Chassis 22Y1: Models 321M25A, 321M26A, 321M27A, 321M25, 321M26, 321M27, 421M15A, 421M16A, 421M15, 421M16, 421M35, 421M36, 421M37, 521M15A, 521M16A, 521M17A, 521M15, 521M16, 521M17 — 1

Chassis 19B1: Model 17DX10, 17DX11. Chassis 19C1: Model 121DX12, 121DX16, 221DX15, 221DX16, 221DX17, 221DX26, 221DX38. Chassis 19F1A: Model 121DX11. Chassis 19H1: Model 222DX15 — 15

ANDREA

Chassis VM21: Models T-VM21, C-VM21, 2C-VM21, CO-VM21 — 44

ARVIN

Chassis TE331: Models 6175TM, 6179TM — 13

Chassis 337-341: Models 7210, 7212, 7214, 7216, 7218, 7219 — 45

TV Dual Tuner, used in Chassis TE 330,332, 340, 341 — 75

Chassis TE 359: 9200 series — 100

BENDIX

Chassis T14: Models 21K3, 21KD, 21T3, 21X3, OAK3 — 20

Chassis T17: Models KS21C, TS21C. Chassis T17-1: Model TS17C — 50

CAPEHART

Chassis CX-36, RF-IF chassis coded R-3, Deflection chassis coded D-4: Models 1T172M, 2C172M, 3C212M, 32212B, 4H212M, B, 5F212M, 6F212M, B, 7F212M, 8F212B, 9F212M, 12F272M, 10W212M, 11W212M — 17

Chassis CX-37: Models 1T172MA, 1T172BA, 3C212MA, 3C212MG, 3C212BA, 4H212MA, 4H212BA, 5F212MA, 6F213B, 7F212MA, 8F212-BA, 9F212MA, 11W212MA, 1C213M, 2F213F. 3C213M, 4T213M, 4T213B, 5H213M, 8F213B — 37

CBS-COLUMBIA

Chassis 817: Model 17T18, 17M18, 17C18. Chassis 820: Model 20T18, 20M18, 20M28 — 14

Chassis 1027: Models 27C11, 27C21 — 77

Chassis 750-3: Models 17MO6, 22CO6, 22C38 — 95

COLUMBIA RECORDS

360 Phono Amplifier — 43

CROSLEY

Chassis 380: Models EU17COM, EU-17TOB, EU-117TOM. Chassis 381: Models EU-21CDB, EU-21CDM, EU-21CDN, EU-21COBa, EU-21-COMa — 2

VHF Chassis 392: Models EU-COMUa, 21COBUa, 21CDMU, 21CDBU, 21CDNU (Chassis 392 is very similar to the 380—refer to Circuit Digest No. 2)

Chassis 388: Models EU-30COMU, 30COBU — 33

Chassis 393: Models EU-21TOLU, EU-21-TOLBU. Chassis 394: Models EU-21COLU, EU-21COLBU — 46

Chassis 402: Models F-17TOLH, F-17TOLBH; Chassis 403: Models F-21TOLH, F-21TOLBH; Chassis 404: Models F-21COLH, F-21COLBH, F-21CDLH, F-21CDLBH; Chassis 402-1: Models F-17TOLU, F-17TOLBU; Chassis 403-1: Models F-21TOLU, F-21TOLBU; Chassis 404-1: Models F-21COLU, F-21COLBU, F-21CDLU, F-21CDLBU — 82

Chassis 411: Models F-24COLH, F-24COLBH; Chassis 411-1: Models F-24COLU, F-24COLBU — 96

DE WALD

Models ET-14OR, DT-163R, DT-163A, ET-170, ET-171, ET-172, ET-191, DT-190D — 69

DU MONT — Circuit Digest No.

Chassis RA-164: Model Clinton. Chassis RA-165: Models Beverly, Ridgewood, Shelburne, Milford, Wakefield — 3

Chassis RA-166/167, 170/171: Models 17T350, 21T327, 21T328, 21T329, 21T359, 21T366, 21T376, 21T377, 21T378

EMERSON

Chassis 120166-D: Models 721D, 728D — 10

Chassis 120168-D: Models 716F, 717F, 719F, 727D. Chassis 120169-B: Models 711F, 712F, 720D, 732B, 734B — 31

Chassis 120174-B: Models 752A, 755A, 784A; Chassis 120198-D: Models 753F, 785C, 785E — 91

ESPEY

513-C AM-FM Tuner — 70

FADA

The "Imperial" Series: Models 17T6, 17T9, 17C2, 17C4 — 25

Models U2100C, U2150C, U2100T, UDL2100T, UH21T — 83

GENERAL ELECTRIC

"Stratopower" chassis: Models 17C125, 20C107, 21T1, 21C208, 21C204, 21C201, 21C202, 21C214, 21C206 — 4

UHF-Tuner Model UHF-103 — 52

"F" Chassis: Models 17C127, 21T14, 21C115, 21C116, 21C117, 21C119, 21C120, 21C121, 17T15, 21T10, 21T12, 21T4 — 84

GRANCO

UHF Converter Model CTU — 74

HALLICRAFTERS

Chassis A1200D, K1200D or W1200D: Models 1010P, 1012P. Chassis D1200D, L1200D or X1200D: Models 1021P, 1026P. Chassis F1200D: Model 1013C. Chassis G1200D: Models 1022C. 1027C. Chassis U1200D: Model 1056C. Chassis T1200D: Models 1051P, 1055C, 1056C, 1060C, 1061C. Chassis P1200D: Model 1052P. Chassis R1200D: Models 1053P, 1054P. Chassis P1200D: Models 1057C, 1062C, 1063C. Chassis Z1200D: Model 1057U — 21

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
89- 94	Oct. 1953
95-100	Nov. 1953

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

Circuit Digest No.

Chassis A1300D: Model 1075 — 38

Model TW-1000 World-Wide 8-Band Portable Radio — 49

HOFFMAN

Chassis 213: Models 21M903, 21B904, 21P905 — 32

Chassis 403-24: Models 24M725, 24B726, 24P727 — 92

JACKSON

Chassis 317A, 320A, 321A, 324A: Models 277, 217, 221-T, 321-C, 217-T, 317-C, 221-C, 621 — 64

MAGNAVOX

Model J, K-105 Series: CT331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349 — 23

UHF Converter Tuner Model 700359 — 53

107 Series: Chassis CT 358 — 65

UHF Converter Tuner 595461 (700359 Revised) — 80

MAJESTIC

Chassis Series 110-111: Models 21T20, 21T21, 21C30, 21C31, 21D50, 21D51, 21P60, 21P61, 21P62, 21P63, 21P70, 21P71 — 26

Chassis 112: Models 17T38, 17T40, 17T41, 17C42, 17C43; Chassis 113: Models 21T40, 21T41, 21C42, 21C43 — 76

MALLORY

TV-101 UHF Converter — 58

MOTOROLA

Chassis TS-292: Models 21C1, 21C1B, 21F2, 21F2B, 21F3, 21F3B, 21K4, 21K4A, 21K4B, 21K4W, 21K5, 21K5B, 21K6, 21K7. Chassis TS-324: Models 21T4A, 21T4EA, 21T5A, 21T5BA — 9

Models TC-101, TC-101B UHF Converters — 59

Auto Radio Mopar Models 610T — 72

MUNTZ

Chassis 17B1 or 17B2: Models 2053A, 2054-A, 2055-A, 2056-A. Chassis 17B2: Model 2055-B. Chassis 17B3 or 17B4: Models 2457-A, 2461-A. Chassis 17B5 or 17B6: Models 2158-A, 2159-A, 2162-A — 39

OLYMPIC

Chassis TK: Models 17T40, 17T48, 17C44, 17K41, 17K42, 17K50. Chassis TL: Models 20T46, 20T47, 20C45, 20C52, 20C53, 20D49, 20K43, 20K51 — 30

Chassis TMTN: Models 17T56, 17C57, 17K55, 21T58, 21T69, 21T70, 21T74, 21C65, 21C68, 21C72, 21C73, 21D60, 21D64, 21K61, 21K62, 21K63 — 68

PACKARD-BELL

Chassis 2720: Models 2721, 2722. Chassis 2710: Models 2723, 2724 — 60

PHILCO

RF Chassis 91, Deflection chassis J-1 used in 1953 Code 126: Models 2269, 2270, 2271, 2273, 1853, 1853L, 2127, 2266, 2268, 2285, 2286, 2287 — 5

RF Chassis 81, Deflection Chassis H-1: Models 1824, 1825, 1826, 1852, 1852L, 2125, 2125L, 2152, 2152L, 2226, 2227, 2262, 2272, 2272L — 22

R-F chassis 97, Deflection chassis J-7: Model 2750 — 47

All-Speed Record Changer: Model M-24 — 29

R-F Chassis R-201, Deflection Chassis D-201: Models 4308, 4110, 4108, 3104, 4008 — 89

RADIO CRAFTSMEN

AM-FM Tuner C-800 — 28

(Continued on page 70)

Circuit Digest Index

(*Continued from page 69*)

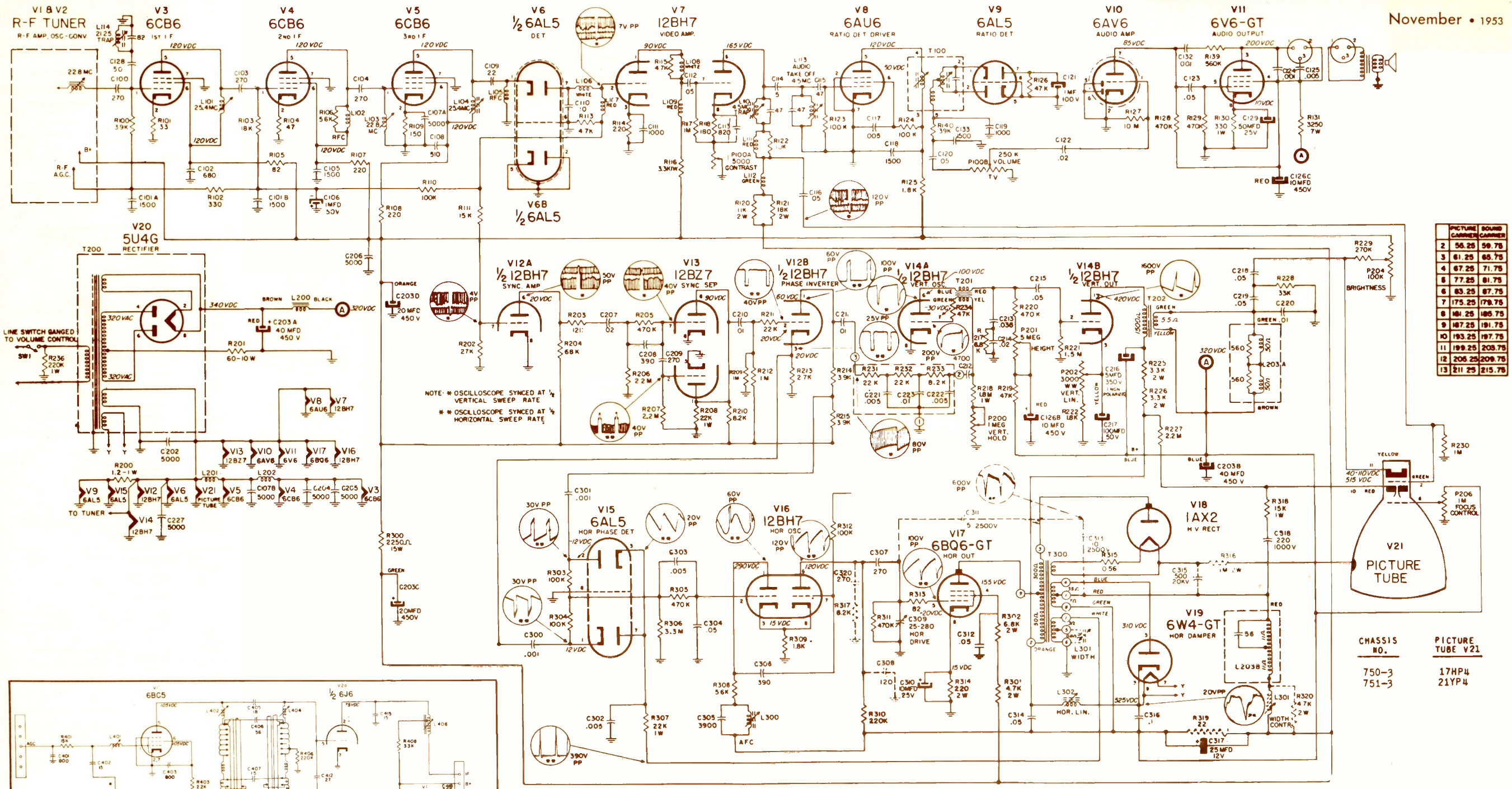
INDEX TO ADVERTISERS
NOVEMBER, 1953

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.

TECHNICIAN
CIRCUIT DIGESTS

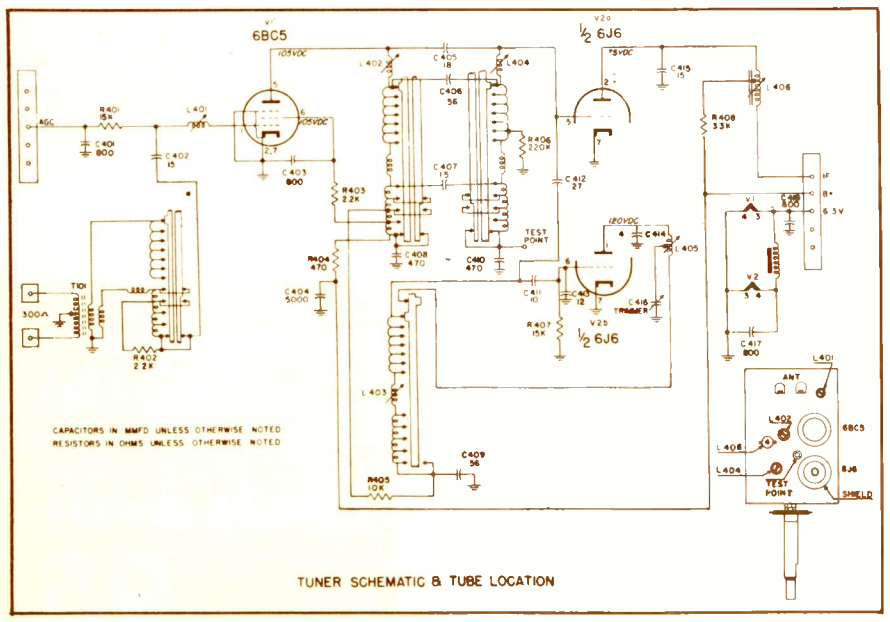
November • 1953

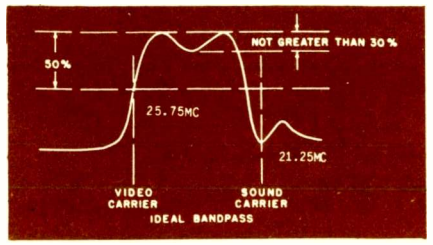
NOTE:
UNLESS OTHERWISE NOTED:
1. ALL CAPACITORS MARKED LESS THAN 1, IN MFD.
2. ALL CAPACITORS MARKED MORE THAN 1, IN MMF.
3. ALL CAPACITORS RATED 600v.
4. ALL RESISTORS IN OHMS.
5. ALL VOLTAGES MEASURED WITH VTVM FROM SOCKET TERMINALS TO GROUND WITH LINE VOLTAGES OF 117VAC AND ANTENNA TERMINALS SHORTED.
6. ALL RESISTANCE VALUES OF TRANSFORMER WINDINGS APPROXIMATE.
7. IN CHASSIS DESIGNATED 750-3, C311, 313, C315 and R316 ARE OMITTED. LOW SIDE OF STANDOFF INSULATOR USED IN PLACE OF C315 IS CONNECTED TO CHASSIS.
8. IN CHASSIS DESIGNATED 751-3; C320 & 317 ARE OMITTED, C308 IS 390 MMF: R319 IS 47 OHM, AND L301 (WIDTH CONTROL) IS SERIES CONNECTED IN LOW SIDE OF YOKE HORIZONTAL WINDING SHUNTED BY R 20.



	PICTURE CARRIER	SOUND CARRIER
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

CHASSIS NO.	PICTURE TUBE V21
750-3	17HP4
751-3	21YP4





HORIZONTAL OSCILLATOR ALIGNMENT

If the Horizontal Hold control fails to maintain sync, the horizontal oscillator should be reset. To reset this screwdriver adjustment, set the horizontal hold control in the center of its range and sync the picture with the horizontal A.F.C. adjustment screw. Check the hold control action on various channels and alter the screw adjustment as required to provide sync on all channels.

DEFLECTION YOKE, ION TRAP AND FOCUS ADJUSTMENT

Following is the proper procedure for adjusting the Deflection Yoke, Ion Trap and Focus.

The receiver should be turned on but not connected to an antenna. These steps should then be taken in the following order:

1 – The Deflection Yoke should be moved as far forward as possible on the neck of the CRT.

2 – The Brightness control should be turned to maximum (clockwise) and the Contrast control should be turned to minimum (counterclockwise).

3 – The Ion Trap should be rotated and at the same time moved forward and backward to find the position which produces the brightest raster on screen.

4 – The Deflection Yoke should be rotated so that the top and bottom edges of the raster are parallel to the top of the chassis.

5 – The Brightness control should now be reduced (ccw) to a point where the raster is slightly above normal brilliance.

6 – With Brightness and Contrast controls at normal positions, adjust the Focus control (rear of chassis) for well-defined scanning lines.

HEIGHT, WIDTH AND LINEARITY

To adjust the overall size and linearity of the picture it is almost mandatory that a test pattern transmitted from a local station be used. It should also be remembered that in areas where more than one station is being received, that pictures transmitted from different stations will vary slightly in size. The smallest transmitted picture should be made to fill the area outlined by the mask.

The Width control (rear of H.V. cage) should be adjusted to give a picture that will fill the mask horizontally.

The Height and Vertical Linearity controls (both rear of chassis) should then be adjusted for a linear picture that will fill the mask vertically.

Chassis 750-3:
Models 17M06, 22C06, 22C38

CBS-COLUMBIA
Chassis 750-3

Technician
CIRCUIT DIGEST
95

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N.Y. • PLaza 9-7880

CBS-COLUMBIA
Chassis 750-3

Technician
CIRCUIT DIGEST
95

TELEVISION ALIGNMENT PROCEDURE

Aligning a television receiver is an exacting procedure and involves the use of bench space, test equipment and skilled personnel at the service shop, as well as the cost of making two trips to the customer's home. Before deciding that the chassis must be pulled and aligned at the shop, the serviceman should check these very common sources of trouble:

1 – The antenna and installation.

2 – Front panel and rear chassis controls, including picutre tube adjustments.

3 – Reception on all available channels.

4 – Tube failures. Substitute from your kit of known good replacements.

5 – Visual inspection of underside of chassis for obvious faults, such as loose connections, etc.

TEST EQUIPMENT REQUIRED FOR ALIGNMENT

The equipment specified below is desirable, but in cases where this equipment in not available, it is possible to align the receiver by use of a 20 to 30 mc. modulated r-f signal generator, using the picture and speaker as indication of alignment.

1 – Signal Generator with an output variable between 100 and 100,000 microvolts, and crystal controlled or crystal-calibrated at the following frequencies:

a– 4.5 megacycles

b– 22.8 megacycles

c– 25.4 megacycles

d– 21.25 megacycles

2 – DC Vacuum Tube Voltmeter with 5 volt and 10 volt scales.

3 – A pair of balanced (± 1%) 100K carbon resistors.

TEST EQUIPMENT REQUIRED FOR SWEEP ALIGNMENT CHECK

1 – R-F sweep generator with frequencies ranging from 40 to 220 megacycles, having sweep width of approximately 10 megacycles, and having adjustable output to approximately 0.1 volt.

2 – Crystal-controlled or crystal-calibrated markers for the picture and sound carriers of each channel.

3 – Cathode Ray Oscilloscope with good low frequency response.

CAUTION: THE SECOND ANODE LEAD TO THE PICTURE TUBE HAS A HIGH POTENTIAL. DURING THIS ALIGNMENT IT IS ADVISABLE TO REMOVE THE HORIZONTAL OUTPUT TUBE FROM ITS SOCKET, THUS ELIMINATING THIS HIGH VOLTAGE HAZARD.

I.F. ALIGNMENT PROCEDURE

1 – Connect "high" lead of signal generator to the test point located on the top of the RF tuner unit (Refer to the R-F tuner location diagram located on inside of cabinet). Connect ground to chassis.

2 – Connect DC VTVM lead (through 10K isolating resistor) to 4.7K diode load resistor (R113); ground to chassis. Set VTVM to 5 volt scale, negative polarity.

3 – Set I.F. generator to 25.4 megacycles with sufficient output to read approximately 3 volts on the VTVM.

4 – Carefully adjust L101 and L104 (see tube and tuner location) for maximum deflection on VTVM. Adjust sweep generator output to keep meter reading approximately 3 volts.

5 – Set I.F. signal generator to 22.8 megacycles with sufficient output to read approximately 3 volts on the VTVM.

6 – Carefully adjust L406, L103 (see tube and tuner location) for maximum deflection on VTVM. Adjust signal generator output to keep meter reading approximately 3 volts.

7 – Set I.F. signal generator to 21.25 megacycles, set VTVM to 10 volt scale (negative polarity), and adjust signal generator output for convenient deflection on VTVM.

8 – Adjust L114 for minimum deflection on VTVM.

SWEEP ALIGNMENT CHECK

Although not essential, a sweep alignment check is a desirable verification of good R-F and I.F. response. Proceed as follows:

1 – Connect R-F sweep generator to antenna terminals (antenna impedance 300 ohms.)

2 – Calibrate oscilloscope for convenient 5 volts peak-to-peak vertical deflection (5 volts peak-to-peak is approximately 1/4 of the peak-to-peak voltage of the 6.3V A.C. filament).

3 – Connect vertical input of oscilloscope (through 10K isolating resistor) to 4.7 diode load resistor (R113); ground to chassis. Connect horizontal input of oscilloscope to "scope" terminals of R-F generator; adjust for convenient horizontal sweep.

4 – Set R-F sweep generator to channel 3, television receiver to channel 3, and if necessary, adjust sweep generator output, sweep width, and scope horizontal setting for convenient band-pass display having 5 volts vertical deflection as previously calibrated. (If you must touch scope vertical settings during these adjustments recalibrate scope for 5 volts peak-to-peak as in step 2 above).

5 – Couple crystal-controlled R-F carrier markers very loosely to antenna terminals, adjust receiver FINE TUNING control till video carrier marker is 1/2 down on curve. Turn up marker output till R-f sound carrier is visible on bandpass and adjust sound trap (L114) to minimize effect of sound carrier marker.

6 – Check all channels as above.

SOUND ALIGNMENT

1 – Connect 4.5 megacycle signal generator to pin 2 of 12BH7 (V7) video amplifier.

2 – Connect DC V.T.V.M. lead to pin 7 of 6AL5 (V9) ratio detector, negative polarity.

3 – Adjust signal generator to precisely 4.5 megacycles; adjust output to read approximately 5 volts on V.T.V.M.

4 – Adjust L113 and bottom of T100 for maximum deflection on V.T.V.M. Keep V.T.V.M. reading below 10 volts at all times.

5 – Attach two series-connected 100K(± 1%) resistors across R126 (Ratio Detector Load Resistor). Connect DC V.T.V.M. to center-tap of 100K resistors, and connect ground wire of V.T.V.M. to junction of C119 and C120 (Audio Take-Off of T100).

6 – Adjust top of T100 for zero reading on V.T.V.M. between a plus and a minus peak.

VIDEO AMPLIFIER TRAP

When necessary, the video amplifier 4.5 mc trap (L110) should be adjusted as follows:

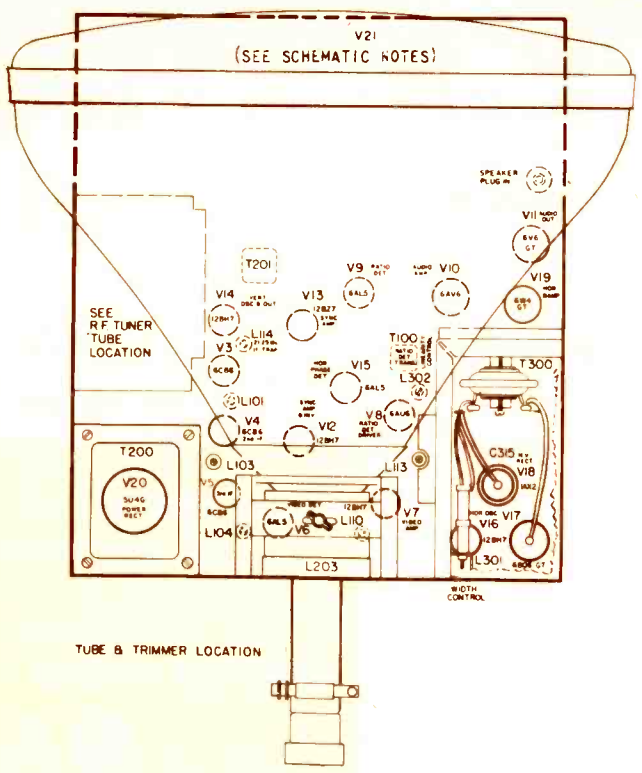
1 – Connect 4.5 mc signal generator "high" lead to picture tube grid; ground to chassis.

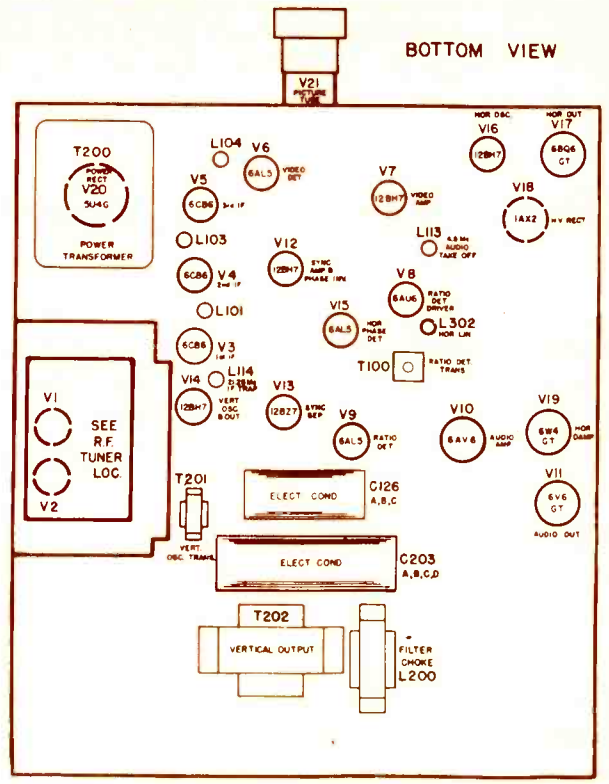
2 – Connect DC V.T.V.M. to pin 7 of 6AL5 (V9) ratio detector, 10 volt scale, negative polarity.

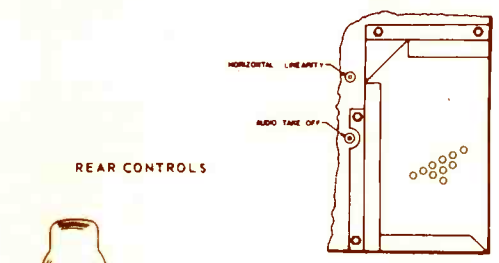
3 – Adjust L110 for minimum deflection on V.T.V.M.

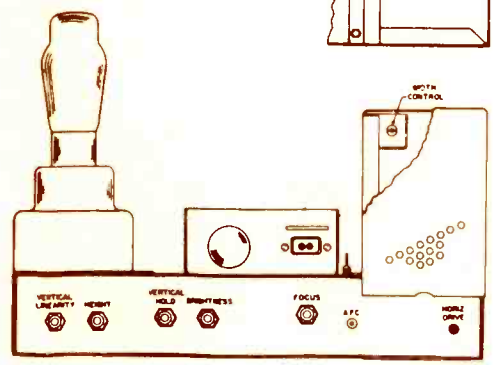
R-F OSCILLATOR

If all channels are not within range of FINE TUNING control, adjust two screws located in front of r-f tuner unit for adjustment of either low or high band. CAUTION: Do not touch adjustments on top of r-f tuner unit, other than converter plate coil, L404, during IF Alignment.









PARTS LIST

CAPACITORS

SCHEM. LOC.	CHASSIS*	PART NO.	DESCRIPTION
C100		PE190-133	Mica, 270mmf 500V ±10%
C101		PA19147	Ceramic, Shielded Dual Disc, 1500mmf GMV
C102		PE556-234	Ceramic Tubular, 680mmf 350V ±10%. (Insul.)
C103		PE190-133	Mica, 270mmf 500V ±10%
C104		PE190-133	Mica, 270mmf 500V ±10%
C105		PA19148	Ceramic, Single Disc 1500mmf GMV
C106		PA20138	Electrolytic, 1mfd 50V
C107		PP19163	Ceramic, Shielded Dual Disc 5000mmf GMV
C108		PE190-140	Mica, 510mmf 500V ±10%
C109		PE190-107	Mica, 22mmf 500V ±10%
C110		PE555-101	Ceramic Tubular 10mmf. 500V ±20%. (Unins.)
C111		PE555-136	Ceramic Tubular 1000mmf 350V ±20%. (Unins.)
C112		PE194-160	Paper, .05mfd 600V ±20%
C113		PP19201	Ceramic Tubular, 820mmf 350V ±10%. (Unins.)
C114		PE555-100	Ceramic Tubular, 5mmf 500V ±10%. (Unins.)
C115		PE555-113-2	Ceramic Tubular, 47mmf 500V ±20%. NPO
C116		PE197-160	Molded Tubular .05mfd 600V ±20%
C117		PE194-151	Paper, .005mfd 600V ±20%
C118		PA19148	Ceramic Single Disc 1500mmf GMV
C119		PE556-236	Ceramic Tubular, 1000mmf 350V ±10%. (Insul.)
C120		PE194-160	Paper, .05mfd 600V ±20%
C121		PA620181	Electrolytic, 1mfd 100V
C122		PE194-156	Paper, .02mfd 600V ±20%
C123		PE194-160	Paper, .05mfd 600V ±20%
C124		PE194-145	Paper, .001mfd 600V ±20%
C125		PE194-151	Paper, .005mfd 600V ±20%
C126		PA20135	Electrolytic, 10-10-10 mfd 450V
C127		PE194-145	Paper, .001mfd 600V ±20%
C128		PE555-100	Ceramic, 5.0mmf 500V ±10% (Uninsul.)
C129		PA20182	Electrolytic, 50mfd 25V
C132		PE194-145	Paper, .001mfd 600V ±20%
C133		PE556-136	Ceramic Tubular, 1500mmf 350V ±20%. (Insul.)
C201			
C202		PA19109	Ceramic, Single Disc 5000mmf GMV
C203		PA20144	Electrolytic, 40-40-20-20-mfd 450V
C204		PA19109	Ceramic, Single Disc 5000mmf GMV
C205		PA19109	Ceramic, Single Disc 5000mmf GMV
C206		PA19109	Ceramic, Single Disc 5000mmf GMV
C207		PE194-156	Paper, .02mfd 600V ±20%
C208		PE190-137	Mica, 390mmf 500V ±10%
C209		PE190-133	Mica, 270mmf 500V ±10%
C210		PE194-155	Paper, .01mfd 600V ±20%
C211		PE194-155	Paper, .01mfd 600V ±20%
C212		PE192-163	Mica, 4700mmf 500V ±10%
C213		PE194-159	Paper, .035mfd 600V ±20%
C214		PE194-156	Paper, .02mfd 600V ±20%
C215		PE194-160	Paper, .05mfd 600V ±20%
C216		PA20174	Electrolytic, 5mfd 350V (Non-Polarized)
C218		PE194-160	Paper, .05mfd 600V ±20%
C219		PE194-160	Paper, .05mfd 600V ±20%
C220		PE194-155	Paper, .01mfd 600V ±20%
C221		PE194-151	Paper, .005mfd 600V ±20%
C222		PE194-151	Paper, .005mfd 600V ±20%
C223		PE194-155	Paper, .01mfd 600V ±20%
C227		PA19109	Ceramic, Single Disc 5000mmf GMV
C300		PE194-145	Paper, .001mfd 600V ±20%
C301		PE194-145	Paper, .001mfd 600V ±20%
C302		PE197-151	Molded Tubular .005mfd 600V ±20%
C303		PE197-151	Molded Tubular .005mfd 600V ±20%
C304		PE194-160	Paper, .05mfd 600V ±20%
C305		PE195-261	Mica, Silver, 3900mmf 500V ±5%
C306		PE190-137	Mica, 390mmf 500V ±10%
C307		PE190-133	Mica, 270mmf 500V ±10%
C308	750-3	PE190-125	Mica, 120mmf 500V ±10%
C308	751-3	PE190-137	Mica, 390mmf 500V ±10%
C309		PA1772	Trimmer, 25-280mmf
C310		PA20137	Electrolytic, 10mfd 25V
C311	751-3	PP19145	Mica, 5mmf 2500V GMV
C312		PE197-160	Molded Tubular .05mfd 600V ±20%
C313	751-3	PP19146	Mica, 10mmf 2500V GMV
C314		PE197-160	Molded Tubular .05mfd 600V ±20%
C315	751-3	PA1998-3	Ceramic, 500mmf 20kv
C316		PE197-162	Molded Tubular .1mfd 600V ±20%
C317		PA20147	Electrolytic 25mfd 12V
C318		PP19180	Mica, 220mmf 1000V ±10%
C320	750-3	PE190-133	Mica, 270mmf 500V ±10%

RESISTORS

SCHEM. LOC.	CHASSIS*	PART NO.	DESCRIPTION
R100		PE231-1163	Carbon, 3900 Ohm 1/2W ±10%
R101		PE231-1113	Carbon, 33 Ohm 1/2W ±10%
R102		PE231-1137	Carbon, 330 Ohm 1/2W ±10%
R103		PE231-1179	Carbon, 1.8K ohm 1/2w ±10%
R104		PE231-1117	Carbon, 47 Ohm 1/2W ±10%
R105		PE231-1123	Carbon, 82 Ohm 1/2W ±10%
R106		PE231-1167	Carbon, 5600 ohm 1/2w ±10%
R107		PE231-1133	Carbon, 220 Ohm 1/2W ±10%
R108		PE231-1133	Carbon, 220 Ohm 1/2W ±10%
R109		PE231-1129	Carbon, 150 Ohm 1/2W ±10%
R110		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R111		PE231-1177	Carbon, 15k Ohm 1/2W ±10%
R112			
R113		PE231-1165	Carbon, 4700 Ohm 1/2W ±10%
R114		PE231-1133	Carbon, 220 Ohm 1/2W ±10%
R115		PE231-1165	Carbon, 4700 Ohm 1/2W ±10%
R116		PE232-1161	Carbon, 3300 Ohm 1W ±10%
R117		PE231-1221	Carbon, 1.0 Megohm 1/2W ±10%
R118		PE231-1131	Carbon, 180 Ohm 1/2W ±10%
R119			
R120		PE233-74	Carbon, 11k Ohm 2W ±5%
R121		PE233-1179	Carbon, 18k Ohm 2W ±10%
R122		PE231-1173	Carbon, 10k Ohm 1/2W ±10%
R123		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R124		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R125		PE231-1155	Carbon, 1800 Ohm 1/2W ±10%
R126		PE231-1189	Carbon, 47k Ohm 1/2W ±10%
R127		PE231-1245	Carbon, 10 Megohm 1/2W ±10%
R128		PE231-1213	Carbon, 470k Ohm 1/2W ±10%
R129		PE231-1213	Carbon, 470k Ohm 1/2W ±10%
R130		PE232-1137	Carbon, 330 Ohm 1W ±10%
R131		PC21134-4	Wirewound, 3250 Ohm 7W ±10%
R136		PE231-1173	Carbon, 10k Ohm 1/2W ±10%
R139		PE231-1215	Carbon, 560K ohm 1/2w ±10%
R140		PE231-1187	Carbon, 39K ohm 1/2w ±10%
R200		PE21151	Wirewound, 1.2 Ohm 1W ±10%
R201		PC21134-2	Wirewound, 60 Ohm 10W ±10%
R202		PE231-1183	Carbon, 27k Ohm 1/2W ±10%
R203		PE231-1175	Carbon, 12k Ohm 1/2W ±10%
R204		PE231-1193	Carbon, 68k Ohm 1/2W ±10%
R205		PE231-1213	Carbon, 470k Ohm 1/2W ±10%
R206		PE231-1229	Carbon, 2.2 Megohm 1/2W ±10%
R207		PE231-1229	Carbon, 2.2 Megohm 1/2W ±10%
R208		PE232-1181	Carbon, 22k Ohm 1W ±10%
R209		PE231-1221	Carbon, 1.0 Megohm 1/2W ±10%
R210		PE231-1171	Carbon, 8200 Ohm 1/2W ±10%
R211		PE231-1181	Carbon, 22k Ohm 1/2W ±10%
R212		PE231-1221	Carbon, 1.0 Megohm 1/2W ±10%
R213		PE231-1159	Carbon, 2700 Ohm 1/2W ±10%
R214		PE231-1163	Carbon, 3900 Ohm 1/2W ±10%
R215		PE231-1163	Carbon, 3900 Ohm 1/2W ±10%
R217		PE231-1169	Carbon, 6800 Ohm 1/2W ±10%
R218		PE232-127	Carbon, 1.8 Megohm 1W ±5%
R219		PE231-1189	Carbon, 47k Ohm 1/2W ±10%
R220		PE231-1213	Carbon, 470k Ohm 1/2W ±10%
R221		PE231-1225	Carbon, 1.5 Megohm 1/2W ±10%
R222		PE231-1155	Carbon, 1800 Ohm 1/2W ±10%
R225		PE233-1161	Carbon, 3300 Ohm 2W ±10%
R226		PE233-1161	Carbon, 3300 Ohm 2W ±10%
R227		PE231-1229	Carbon, 2.2 Megohm 1/2W ±10%
R228		PE231-1185	Carbon, 33k Ohm 1/2W ±10%
R229		PE231-1207	Carbon, 270k Ohm 1/2W ±10%
R230		PE231-1221	Carbon, 1.0 Megohm 1/2W ±10%
R231		PE231-1181	Carbon, 22k Ohm 1/2W ±10%
R232		PE231-1181	Carbon, 22k Ohm 1/2W ±10%
R233		PE231-1171	Carbon, 8200 Ohm 1/2W ±10%
R234		PE231-1189	Carbon, 47k Ohm 1/2W ±10%
R236		PE232-1205	Carbon, 220K ohm 1w ±10%
R300		PC21134-16	Wirewound, 2250 Ohm 15W ±10%
R301		PE233-1165	Carbon, 4700 Ohm 2W ±10%
R302		PE233-1169	Carbon, 6800 Ohm 2W ±10%
R303		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R304		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R305		PE231-1213	Carbon, 470 k Ohm 1/2W ±10%
R306		PE231-1233	Carbon, 3.3 Megohm 1/2W ±10%
R307		PE232-1181	Carbon, 22k Ohm 1W ±10%
R308		PE231-1167	Carbon, 5600 Ohm 1/2W ±10%
R309		PE231-1155	Carbon, 1800 Ohm 1/2W ±10%
R310		PE231-1205	Carbon, 220k Ohm 1/2W ±10%
R311		PE231-1213	Carbon, 470k Ohm 1/2W ±10%
R312		PE231-1197	Carbon, 100k Ohm 1/2W ±10%
R313		PE231-1123	Carbon, 82 Ohm 1/2W ±10%
R314		PE233-1133	Carbon, 220 Ohm 2W ±10%
R315		PE23163	Carbon, 0.56 Ohm 1/2W ±10%
R316	751-3	PE233-2321	Carbon, 1.0 Megohm 2W ±20% (Allen Bradley)
R317	750-3	PE231-1171	Carbon, 8200 Ohm 1/2W ±10%
R318		PE232-1177	Carbon, 15k Ohm 1W ±10%
R319	750-3	PE231-1109	Carbon, 22 Ohm 1/2W ±10%
R319	751-3	PE231-1117	Carbon, 47 Ohm 1/2W ±10%
R320	751-3	PE233-1165	Carbon, 4700 Ohm 2W ±10%

CHOKES & COILS

SCHEM. LOC.	CHASSIS*	PART NO.	DESCRIPTION
L101		A3392	Coil, Pix IF
L102		A28253	Choke, RF
L103		A3392	Coil, Pix IF
L104		A3392	Coil, Pix IF
L105		A28253	Choke, RF
L106		A28255-2	Coil, Peaking (White)
L107		A28255-1	Coil, Peaking (Red)
L108		A28255-2	Coil, Peaking (White)
L109		A28255-1	Coil, Peaking (Red)
L110		A28286	Coil, 4.5 MC Trap
L111		A28255-1	Coil, Peaking (Red)
L112		A28255-4	Coil, Peaking (Green)
L113		A28286	Coil, 4.5 MC Audio Takeoff
L114		A28314	Coil, 21.25 MC IF Trap
L200		A1406	Coil, Filter Choke
L201		A28276	Choke, Filament
L202		A28276	Choke, Filament
L203	750-3	A28328	Coil, Deflection Yoke
L203	751-3	A28330	Coil, Deflection Yoke
L300		A28263	Coil, Horiz. Freq. Control
L301	750-3	A28279-1	Coil, Width Control
L301	751-3	A28318-1	Coil, Width Control
L302		A28292	Coil, Horiz. Linearity
		A28331	Deflection Yoke Cover w/Centering Device

TRANSFORMERS

SCHEM. LOC.	CHASSIS*	PART NO.	DESCRIPTION
T100		A1201 or 1202	Ratio Detector
T200		A10109	Power
T201		A10106	Vertical Oscillator
T202		A10152-.	Vertical Output
T300		A10136 or A10137	Horizontal Output

CONTROLS

SCHEM. LOC.	CHASSIS*	PART NO.	DESCRIPTION
P100		A24142	Contrast-Volume, 5K-250k ohm
P200		A24112	Vertical Hold, 1.0 Megohm
P201		A24111	Vertical Size, 5.0 Megohm
P202		A24114	Vertical Linearity, 3K ohm Wirewound
P204		A24110	Brightness, 100K ohm
P206		A24112	Focus Control, 1.0 Megohm

MISC. CHASSIS ACCESS. & PARTS – ALL CHASSIS

PART NO.	DESCRIPTION
A65100K	Chassis
A5355	Shield, H.V. Supply
A5356	Cover, H.V. Supply Shield
A54609	Bracket, Horiz. Freq. Control Coil
A541059	Bracket, Interlock
A541242	Grounding Spring CRT Coating
A540-62	Terminal Strip, AAAEAAEAA
A540-67	Terminal-Strip, AAAEAA
A540-44	Terminal Strip, AAEAA
A540-19	Terminal Strip, AEA
A540-34	Terminal Strip, AAEA
A18155	Socket, Octal Moulded
A18210	Socket, Octal Moulded Bakelite Saddle
A18173	Socket, 9 Pin Moulded
A18171	Socket, 9 Pin Moulded No Saddle
A18157	Socket, 9 Pin Wafer
A18147	Socket, 7 Pin Wafer
A18101	Socket, Speaker-Plug
A541131	Socket, H.V. Cond.
A562-6	Capacitor Clips; 1-3/8
A562-3	Capacitor Clips; 3/4
A54618-1	Tube Shield
A3206	Ion Trap
A541341	Anode Lead Holder

MISC. CHASSIS ACCESS. & PARTS – 17" TUBE

PART NO.	DESCRIPTION
A54851	Bracket, Yoke Hood & Support
A541084-1	Channel, CRT Front Support; Left
A541084-2	Channel, CRT Front Support; Right
A54827	Strap, CRT; Right
A54828	Strap, CRT; Left
A541086	Bracket; CRT Stop
A55141-1	Anode Connector Assembly
A541085	Cushion, Rubber; CRT Channel
A541110-2	Cushion, Sponge Rubber; CRT Strap, Right
A541110-1	Cushion, Sponge Rubber; CRT Strap, Left
A54971-18	Cushion, Cork; CRT Stop Bkt.
A18197-3	Socket, Kinescope

MISC. CHASSIS ACCESS. & PARTS – 21" CHASSIS

PART NO.	DESCRIPTION
A541251	Bracket, Interlock
A541248-1	Bracket, CRT Rear Support (Left)
A541248-2	Bracket, CRT Rear Support (Right)
A541000	CRT Rubber Grommet
A541246	Bracket, Yoke Hood and CRT Grommet
A541250-1	Bracket, Yoke Hood Support (Left)
A541250-2	Bracket, Yoke Hood Support (Right)
A541363	Bracket, CRT Front Support and Stop
A541249	Bracket, Tie Rod
A541254	CRT Strap Assembly
A541261-1	Rubber Cushion (CRT Front Support and Stop Bkt.)
A541261-2	Rubber Cushion (CRT Front Support and Stop Bkt.)
A541102-6	Rubber Cushion (CRT Strap)

*Used on all chassis unless otherwise specified in this column. If specified, the part is used only on the chassis indicated.

	MODEL 17M06	MODEL 22C06	MODEL 22C38
CABINET	A60215	A60201	A60201
SAFETY GLASS	A62457-23	A62457-25	A62457-25
GLASS RET. CLIP	A62466 or A6205	A –	–
RET. CLIP LOCKING SPRING	A541440 or w/ A62466	–	–
MASK	A62470	A62481	A62481
BACK COVER	A62329	A62483-2	A62495
SPEAKER	A5866 – 5" PM	A5124 – 8" PM	A58124 – 8" PM
KNOB, CHANNEL SELECTOR (VHF)	A39281-2	A39281-2	A39281-2
KNOB, CHANNEL SELECTOR (VHF & UHF)	A39277-2	A39277-2	A39277-2
KNOB, ON-OFF-VOLUME	A39280-2	A39280-2	A39280-2
KNOB, PIX CONTROL	A39279	A39279	A39279
KNOB VERNIER	A39278	A39278	A39278
INDICATOR DISC (UHF)	A40152	A40152	A40152

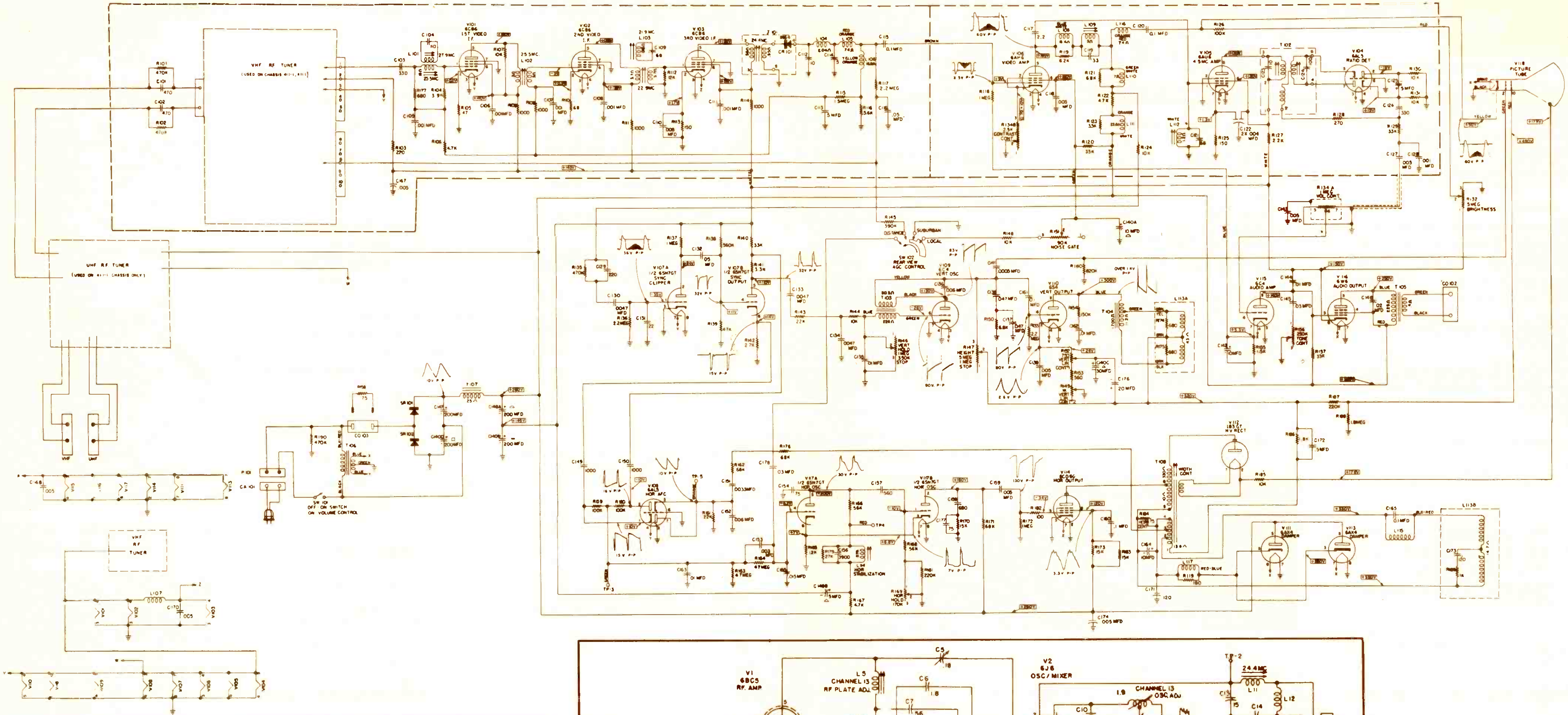
An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

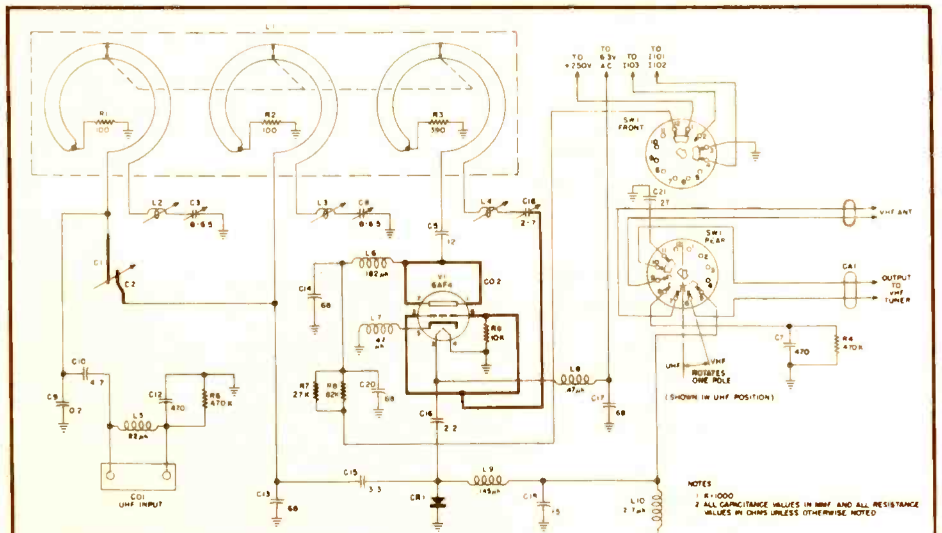
An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

TECHNICIAN
CIRCUIT DIGESTS

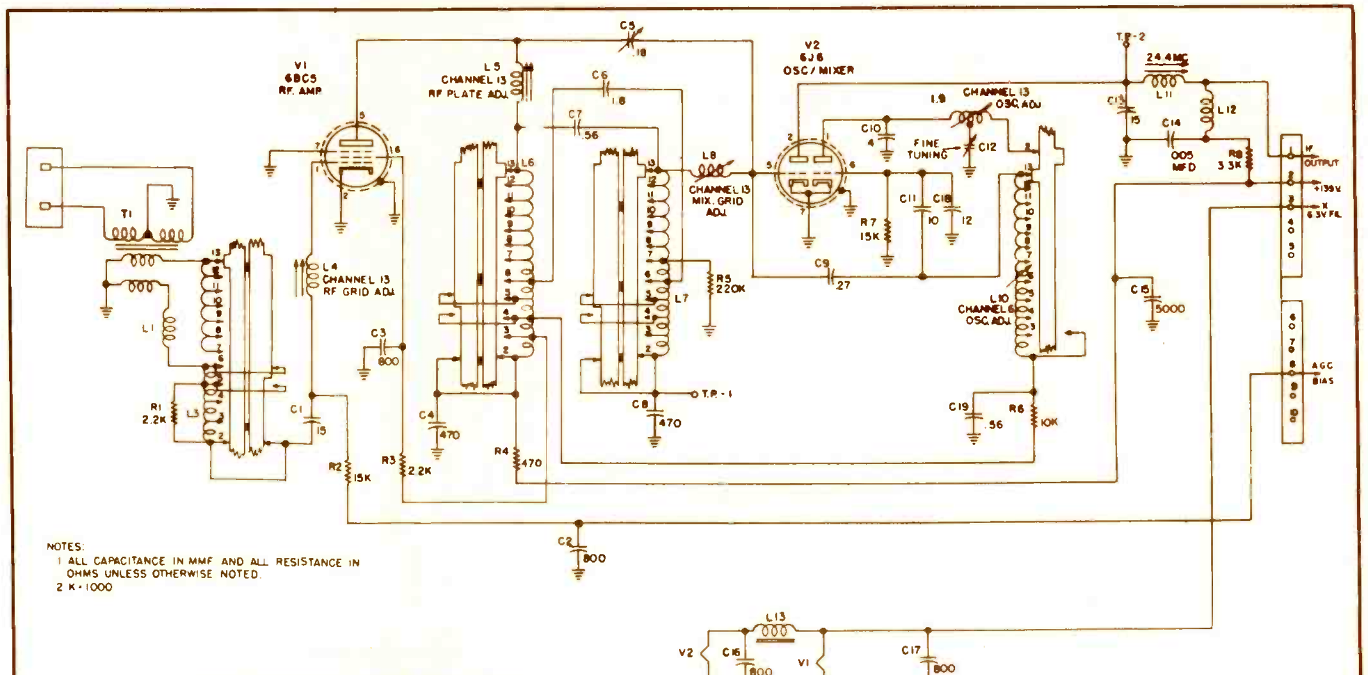
November • 1953

NOTES
1. ALL VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC
3. K=1000
4. ALL CAPACITANCE VALUES IN MMF, AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE NOTED.





SCHEMATIC WIRING DIAGRAM
UHF CONVERTER



NOTES:
1. ALL CAPACITANCE IN MMF AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
2. K=1000

VHF TUNER SCHEMATIC

Chassis 411:
Models F-24COLH, F-24COLBH

Chassis 411-1:
Models F-24COLU, F-24COLBU

CROSLEY
Chassis 411, 411-1

Technician
CIRCUIT DIGEST
96

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

CROSLEY
Chassis 411, 411-1

Technician
CIRCUIT DIGEST
96

ADJUSTMENTS

LOCAL-DISTANCE (AGC) SWITCH:

The LOCAL-DISTANCE SWITCH can be set to prevent the receiver from overloading in strong signal areas or to reduce "snow" in the picture in weak signal areas. In strong signal areas, the "LOCAL" (counter-clockwise) position of the switch must be used. The second and third positions "SUBURBAN" and "DISTANCE" are to be used in medium to weak signal areas. Use the position with which the best picture is obtained with a minimum of overloading of the receiver when the CONTRAST control is advanced.

NOISE GATE CONTROL:

This control makes it possible to obtain improved picture stability in the presence of electrical interference (noise), when the LOCAL-DISTANCE SWITCH is in the "SUBURBAN" or "DISTANCE" position. When the control is turned completely counter-clockwise, it is out of the circuit and has no effect. Adjust the control by turning it clockwise until the picture is stable. The limiting factor of this adjustment, is the buzz or noise that may be introduced, if the control is turned too far in the clockwise direction.

VHF OSCILLATOR ADJUSTMENT USING A TELEVISION SIGNAL:

Do not make any adjustments on the two oscillator adjusting screws unless the FINE TUNING control range is insufficient to properly tune-in the station. The adjusting screws are accessible through holes in the front of the chassis after the tuning knobs are removed. To make the adjustment, proceed as follows:

a. Turn the receiver on and allow a warm-up period of approximately five minutes.

b. For stations from channel 13 to channel 7, set the Station Selector Switch to the highest channel received and adjust the Contrast and Volume control for normal sound and picture. Set the Fine Tuning Control in the center of its range.

c. Using a small non-metallic screwdriver, adjust the slotted head brass screw located above and to the right of shaft and above the fiber disc for the clearest and sharpest detail in the picture. This adjustment will be effective on all channels between 13 and 7. If other stations are operating in this range, it may be necessary to compromise slightly on the high channel adjustment so the other channels may be properly tuned-in.

d. For Stations on channel 6 and below, set the station Selector Switch to the channel received closest to channel 6 and adjust the Contrast and Volume control for normal sound and picture. Set the Fine Tuning control in the center of its range.

e. Using a small non-metallic screwdriver, adjust the slotted head brass screw located below the shaft for the clearest and sharpest detail in the picture. This adjustment will effect all channels between 6 and 2.

HORIZONTAL HOLD ADJUSTMENT

1. Tune in a local television signal and adjust contrast control for normal picture.
2. Connect electronic voltmeter between TP-3 (green lead) and chassis.
3. Short TP-5 (orange lead) to chassis and adjust electronic voltmeter to zero.
4. Remove short from TP-5. Do not change zero on electronic voltmeter.
5. Connect a 0.1 mfd. 600 volt capacitor between TP-4 (red lead) and chassis.
6. Adjust Horizontal Hold control for zero reading on the meter.
7. Remove the 0.1 mfd. capacitor from TP-4 and chassis. Do not disturb setting of horizontal hold control.
8. Adjust Horizontal Stabilizer coil (L114) for zero reading on the meter.
9. Remove electronic voltmeter from TP-3.
10. Check horizontal pull-in range. The pull-in range should be approximately 50° of the control's rotation.

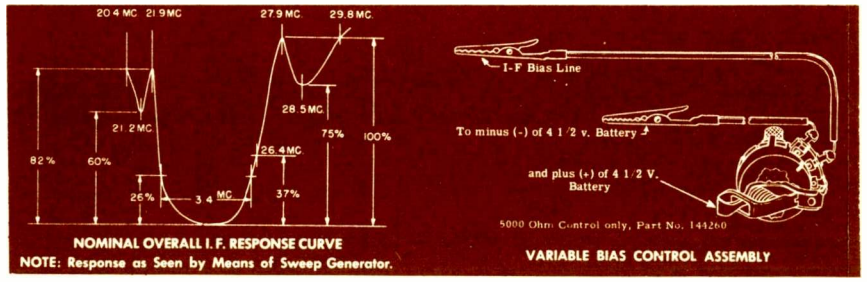
I. F. ALIGNMENT

All lead connections from the signal generator and wobbulator must be shielded. Keep the exposed ends and ground leads as short as possible (about one inch). Always locate the ground lead connections as close as possible to their respective "hot" leads in the television receiver chassis. The wobbulator, signal generator output, and contrast control must be kept low enough to prevent overloading the television receiver circuits.

CAUTION: One side of the chassis is connected to the power line. Therefore, test equipment should not be connected to the receiver unless an isolation transformer is used between the power line and the receiver. DO NOT GROUND THE RECEIVER CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED.

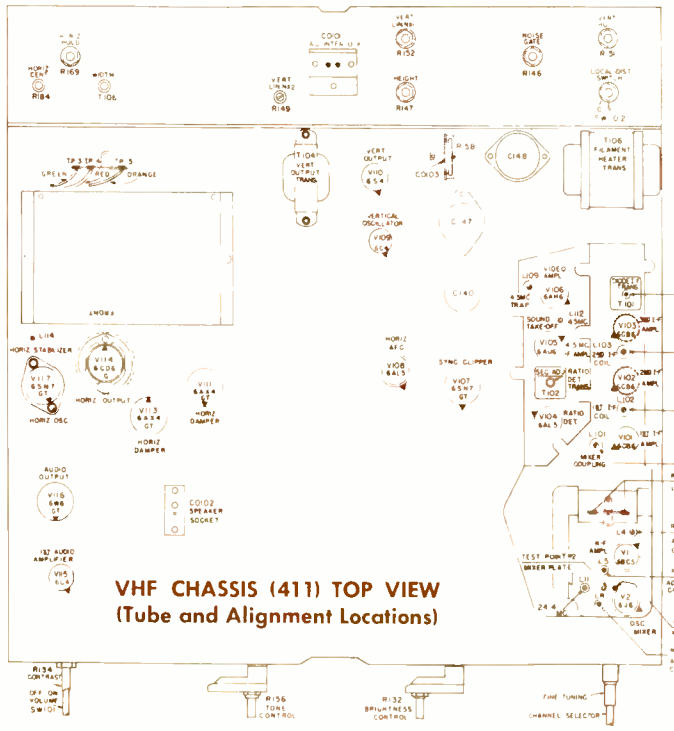
1. **To Check I.F. Alignment on Oscilloscope:**
   a. Lift the shield of the Oscillator-Mixer tube V2 sufficiently to clear the socket ground clips. Connect sweep signal generator "hot" lead to the ungrounded tube shield and generator ground lead to the tuner chassis.
   b. Connect high side of oscilloscope to high side of contrast control, and the low side to chassis.
   c. Apply -3.0 volts D.C. bias to I.F. Bias line (see sketch "Variable Bias Control"). Contrast control should be set in the maximum counter-clockwise position.
   d. With the generator sweep set at zero, connect an electronic voltmeter between top of detector load and chassis. Adjust the output of the generator to obtain a reading of 2 volts D.C. on the meter.
   e. Set generator to sweep from 20 mc. to 30 mc.
   f. Connect marker generator to sweep generator output leads and adjust to provide markers that appear in the curve. See nominal response curve.
   g. Observe curve and position of markers (see nominal response curve). Slight deviation in shape from the nominal response curve is permissible, but if any great deviation is noted, it will be necessary to realign the I.F. Amplifier.

2. **Alignment, I.F. & Tuner Assembly (with electronic voltmeter):**
   a. Connect -3.5 volts D.C. bias supply to I.F. Bias line.
   b. Connect signal generator "hot" lead through a 1000 mmf. capacitor to TP-1 (wire protruding from tuner directly adjacent to the oscillator mixer tube V2) and the ground lead to the R.F. tuner case.
   c. Connect high side of Electronic Voltmeter to top of detector load resistor, R118, and low side to chassis; zero the meter.
   d. Set signal generator to 24.4 mc. and adjust top of T101 for maximum D.C. meter indication on voltmeter. Adjust the signal generator amplitude to make this peak indication 2 volts D.C., approximately.
   e. Set signal generator to 22.9 mc. and adjust top of L103 for maximum D.C. meter indication, limiting meter deflection to 2 volts D.C. by adjusting input of attenuator.
   f. Set the signal generator to 21.9 mc. and adjust bottom of L103 for minimum D.C. meter deflection. Input should be high enough to permit a definite null to be observed on meter.
   g. Repeat steps "e" and "f".
   h. Set signal generator to 25.5 mc. and adjust top of L102 for maximum meter deflection, limiting meter deflection to 2 volts D.C. by adjusting input attenuator.
   i. Reset signal generator to 24.4 mc. Connect a 100 ohm resistor in series with a 1000 mmf capacitor across L101. Adjust converter output, L11 of R.F. Tuner for maximum meter deflection, but limit output of generator so this reading does not exceed 2 volts D.C. Remove the 100 ohm resistor and the 1000 mmf. capacitor.
   j. Reset signal generator to 27.9 mc. and adjust the bottom of L101 for minimum D.C. meter deflection. Signal generator amplitude must be sufficiently high to produce a definite null.
   k. Set signal generator to 25.5 mc. Connect the 100 ohm resistor and the 1000 mmf. series capacitor from TP-2 (wire protruding from the tuner through the insulated eyelet between the brass adjusting screws) on the R. F. Tuner to the tuner case and adjust L101 for maximum D.C. meter indication, adjusting amplitude of signal generator to make this maximum indication approximately 2 volts D.C. Remove the 100 ohm resistor and the 1000 mmf capacitor.
   l. Repeat steps "j" and "k".
   m. Check sensitivity. The input, to obtain 2 volts D.C. output with zero bias, should not exceed 650 microvolts at 24.4 mc. with generator properly terminated and generator fed into grid of first I.F. Amplifier.
   n. Remove the signal generator and electronic voltmeter.
   o. Note: When aligning bottom of L103 and bottom of L101 the first null obtained when running the core into the trap winding from the Tinnerman Clip end of the trap winding is the proper alignment null.

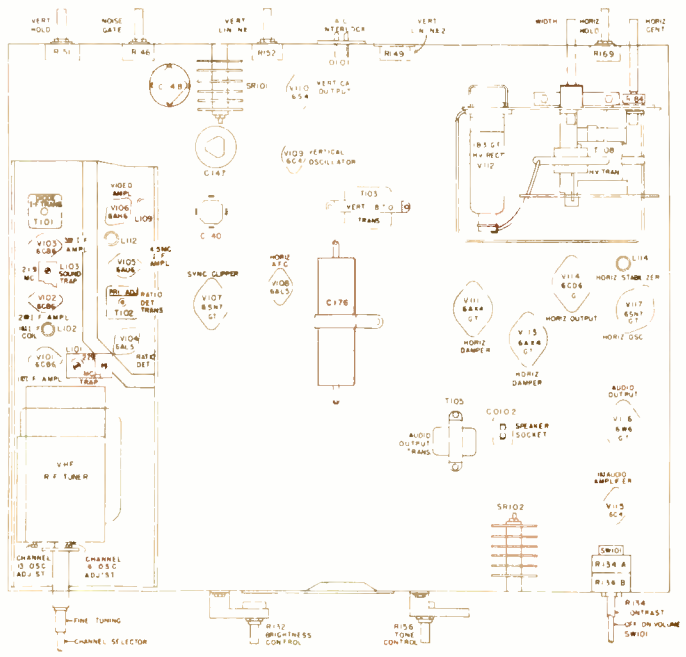


NOMINAL OVERALL I.F. RESPONSE CURVE
NOTE: Response as Seen by Means of Sweep Generator.

VARIABLE BIAS CONTROL ASSEMBLY



VHF CHASSIS (411) TOP VIEW
(Tube and Alignment Locations)



VHF CHASSIS (411) BOTTOM VIEW
(Tube Socket and Alignment Locations)

SOUND ALIGNMENT

1. Connect crystal controlled 4.5 mc. 400 cycle amplitude modulated signal, modulated 30% or greater, between grid of video amplifier and chassis.
2. Connect high side of scope through detector probe to the picture tube cathode (pin 11). Connect low side of scope to chassis. Adjust 4.5 mc. trap, L109, for minimum 400 cycle deflection on scope.
3. Connect electronic voltmeter to lug 2 of ratio detector, V104, and adjust 4.5 mc. sound take-off (L112) and bottom of ratio transformer (T102) for peak reading on voltmeter. Adjust input to make this peak reading 4 volts.
4. Adjust input to obtain 12 volts output. Transfer electronic voltmeter to junction of R129 and C128 (refer to Schematic Wiring Diagram). Adjust top of T102 for zero balance on electronic voltmeter.
5. Recheck steps 2, 3 and 4 above.
6. Remove input signal, scope and electronic voltmeter.

UHF ALIGNMENT

ALIGNMENT NOTES:

CAUTION: This UHF converter unit is used with a VHF receiver that has one side of the chassis connected to the power line. DO NOT CONNECT TEST EQUIPMENT TO ANY PART OF THE RECEIVER OR GROUND THE CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED BETWEEN THE POWER LINE AND RECEIVER.

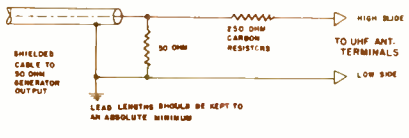
1. Remove the UHF Converter from the VHF receiver chassis.
2. Disengage the toggle coupling from the switch throw arm on the front of the UHF chassis.

   To accomplish this: -

   a. Turn the UHF tuning control clockwise until the pin located on the rear of the drive pulley is free from the toggle coupling.
   b. Loosen the two set screws in switch throw arm collar and remove from switch shaft.
   c. Turn the switch clockwise to the UHF position; contact blade on switch rotor must contact and center on the two switch fingers with the red wires attached. Leave switch in this position while aligning.
3. Connect the output leads of the UHF converter to the R.F. input terminals of the VHF Tuner.
4. Connect the B- and filament leads of the tuner to their respective points from which they were removed on the VHF receiver. Connect UHF Converter chassis to B- (VHF receiver chassis).
5. Keep all leads as short as possible. One way of accomplishing this is to mount the UHF Converter at right angles to the TV chassis with one mounting screw. Most of the leads on the UHF Converter will then be of sufficient length and no additional length need be added.
6. Set VHF Tuner to Channel 6.
7. Alignment should be followed in the order shown.

OSCILLATOR ALIGNMENT:

1. Connect an electronic voltmeter or scope across the second detector load resistor.
2. Turn on the power.
3. Apply a 460 mc. (amplitude modulated when scope is used) signal to the UHF antenna terminals through the antenna matching network (see Antenna Matching Network Sketch).

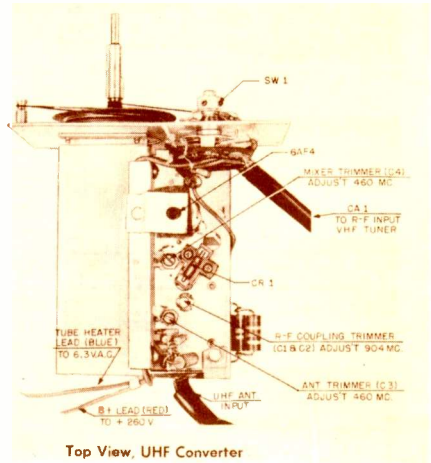


Antenna Matching Network

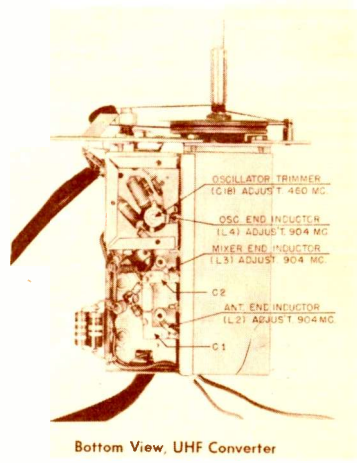
4. Turn out the adjusting screw of the mixer circuit trimmer C4 so that the flat side of the head is 5/8" above the chassis before aligning oscillator.
5. With the tuner shaft at maximum *CCW position, adjust the oscillator trimmer C18 for peak reading on the electronic voltmeter or maximum indication on the scope (oscillator frequency is set to 84 mc below the carrier frequency).
6. Set the signal generator to 904 mc.
7. Rotate the tuner shaft to maximum *CW position and adjust the oscillator end inductor, L4 up or down for maximum reading on the voltmeter.
8. Repeat steps 3 through 6 until maximum reading is obtained.

R-F CIRCUIT ALIGNMENT:

1. With the signal generator and electronic voltmeter or scope connected as for the Oscillator Alignment above, set the R.F. coupling trimmer, C1 and C2 to minimum capacity by turning the screw CCW.
2. Set the signal generator to 460 mc. (Amplitude modulated when scope is used).
3. With the tuner shaft at maximum CCW position, adjust the antenna and mixer trimmers, C3 and C4 for maximum meter reading (or scope indication).
4. Reset signal generator to 904 mc.
5. Rotate the tuner shaft to maximum CW position and adjust the antenna and mixer end inductors, L2 and L3, for maximum reading on meter or scope, by forming larger or smaller loop.
6. Repeat steps 2 through 5 until maximum reading is obtained.
7. Turn the tuner shaft to maximum CW position and adjust the coupling trimmer, C1 and C2 for peak reading at 904 MC.
8. Turn the power switch to the "OFF" position.
9. Disconnect the generator and electronic voltmeter, or scope.
10. Re-engage the toggle coupling in the pin on the switch throw arm and the pin on the drive pulley as follows:
    a. Rotate the tuning control shaft clockwise until the pin on the rear of the drive pulley is toward the base of the chassis.
    b. Turn the tuning shaft CCW and guide the pin on the rear of drive pulley into the fork of the toggle coupling, then continue to turn tuning shaft CCW to stop. The coupling is now in the proper operating position.
    c. With the switch set to the VHF position (CCW) replace the switch throw arm so that the pin on the arm engages the fork of the toggle coupling. In this position it is approximately 30° CW from horizontal. Tighten the two set screws in the switch throw arm collar.
    d. Function switch should be checked for proper operation under conditions of customer use. At full CCW rotation of tuner shaft, all VHF position contacts must be fully and firmly made and all UHF position contacts must be fully broken. All UHF position contacts must be fully and firmly made and all VHF position contacts must be fully broken, when tuner shaft is 7 1/2° or more from full CCW, as tuner shaft is rotated toward stop from UHF position.
11. Replace the UHF Converter on the VHF receiver chassis.

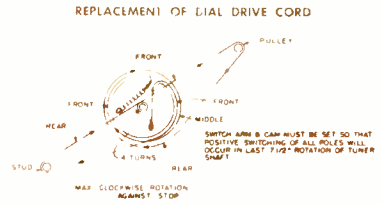


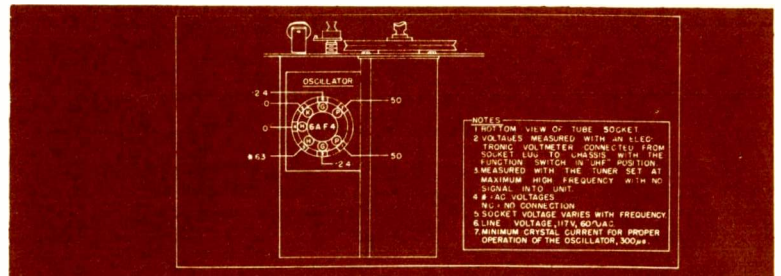
Top View, UHF Converter



Bottom View, UHF Converter

REPLACEMENT OF DIAL DRIVE CORD





*CCW (Counter-Clockwise)
CW (Clockwise)

UHF Socket Voltage Chart

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

TECHNICIAN
CIRCUIT DIGESTS

Note 1: The terms "Horizontal," or "Vertical," refer to the oscilloscope sweep employed.

Note 2: All waveforms are taken with the oscilloscope horizontal sweep direction from left to right and with upward deflection corresponding to positive polarity.

Note 3: In some instances the waveforms obtained will not be identical with those shown, due to the electrical characteristics of the oscilloscope used.

Note 4: All waveforms are measured with respect to chassis unless otherwise indicated.

Note 5: Have Picture (Contrast) control at maximum.

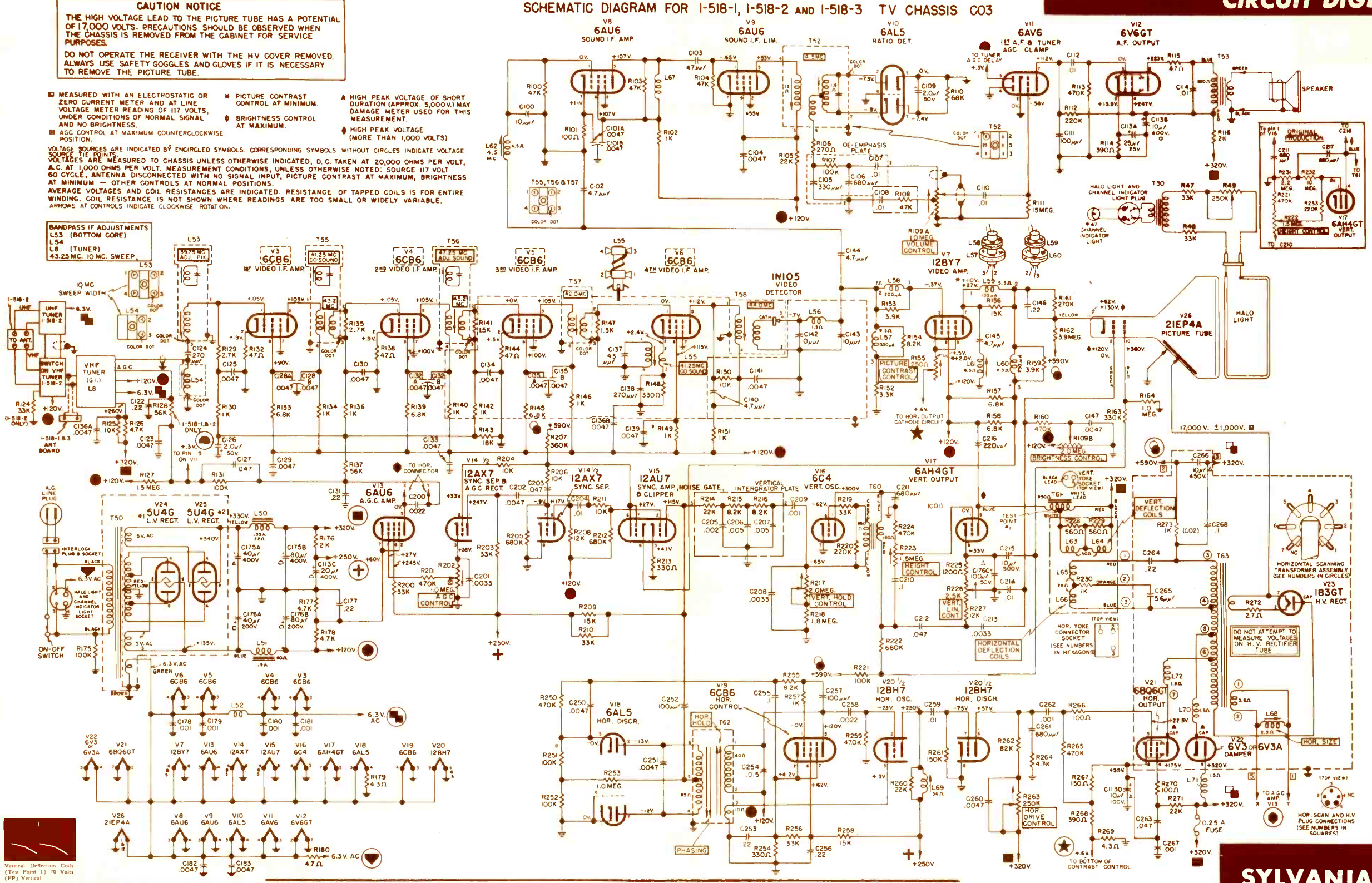
*The peak to peak (PP) voltages of these waveforms are dependent on the depth of modulation of the transmitted signal; voltages shown are obtained when modulation is approximately 90 percent.

CAUTION NOTICE

THE HIGH VOLTAGE LEAD TO THE PICTURE TUBE HAS A POTENTIAL OF 17,000 VOLTS. PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES.

DO NOT OPERATE THE RECEIVER WITH THE HV COVER REMOVED. ALWAYS USE SAFETY GOGGLES AND GLOVES IF IT IS NECESSARY TO REMOVE THE PICTURE TUBE.

SCHEMATIC DIAGRAM FOR 1-518-1, 1-518-2 AND 1-518-3 TV CHASSIS C03



A MEASURED WITH AN ELECTROSTATIC OR ZERO CURRENT METER AND AT LINE VOLTAGE METER READING OF 117 VOLTS, UNDER CONDITIONS OF NORMAL SIGNAL AND NO BRIGHTNESS.

B AGC CONTROL AT MAXIMUM COUNTERCLOCKWISE POSITION.

***** PICTURE CONTRAST CONTROL AT MINIMUM.

♦ BRIGHTNESS CONTROL AT MAXIMUM.

▲ HIGH PEAK VOLTAGE OF SHORT DURATION (APPROX. 5,000 V.) MAY DAMAGE METER USED FOR THIS MEASUREMENT.

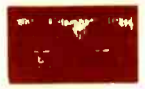
♦ HIGH PEAK VOLTAGE (MORE THAN 1,000 VOLTS)

VOLTAGE SOURCES ARE INDICATED BY ENCIRCLED SYMBOLS. CORRESPONDING SYMBOLS WITHOUT CIRCLES INDICATE VOLTAGE SOURCE TIE POINTS.

VOLTAGES ARE MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED, D.C. TAKEN AT 20,000 OHMS PER VOLT, A.C. AT 1,000 OHMS PER VOLT. MEASUREMENT CONDITIONS, UNLESS OTHERWISE NOTED: SOURCE 117 VOLT 60 CYCLE, ANTENNA DISCONNECTED WITH NO SIGNAL INPUT, PICTURE CONTRAST AT MAXIMUM, BRIGHTNESS AT MINIMUM — OTHER CONTROLS AT NORMAL POSITIONS.

AVERAGE VOLTAGES AND COIL RESISTANCES ARE INDICATED. RESISTANCE OF TAPPED COILS IS FOR ENTIRE WINDING. COIL RESISTANCE IS NOT SHOWN WHERE READINGS ARE TOO SMALL OR WIDELY VARIABLE.

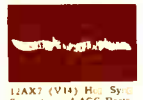
ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION.

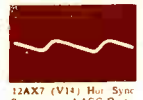

12BY7 (V7) Video Amplifier Control Grid (Pin 2) 35 Volts (PP) Vertical


12BY7 (V7) Video Amplifier Plate (Pin 7) 75 Volts (PP) Vertical

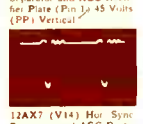

*12BY7 (V7) Video Amplifier Control Grid (Pin 2) 35 Volts (PP) Horizontal


*12BY7 (V7) Video Amplifier Plate (Pin 7) 75 Volts (PP) Horizontal


12AX7 (V14) Hor. Sync Separator and AGC Rectifier Cathode (Pin 3) 6 Volts (PP) Vertical


12AX7 (V14) Hor. Sync Separator and AGC Rectifier Cathode (Pin 3) 40 Volts (PP) Horizontal

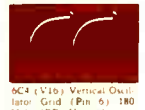

12AX7 (V14) Hor. Sync Separator and AGC Rectifier Plate (Pin 1) 45 Volts (PP) Vertical

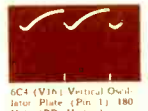

12AX7 (V14) Hor. Sync Separator and AGC Rectifier Plate (Pin 1) 45 Volts (PP) Horizontal


12AX7 (V14) Sync Separator Plate (Pin 6) 40 Volts (PP) Vertical

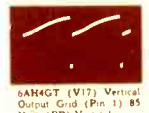

12AU7 (V15) Sync Amplifier and Clipper Plate (Pin 1) 90 Volts (PP) Vertical


12AU7 (V15) Sync Amplifier and Clipper Plate (Pin 1) 40 Volts (PP) Horizontal

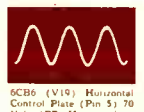

6C4 (V16) Vertical Oscillator Grid (Pin 6) 180 Volts (PP) Vertical

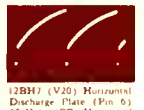

6C4 (V16) Vertical Oscillator Plate (Pin 1) 180 Volts (PP) Vertical

Vertical Deflection Coils (Test Point 1) 70 Volts (PP) Vertical


6AH4GT (V17) Vertical Output Grid (Pin 1) 85 Volts (PP) Vertical


6AL5 (V18) Horizontal Discriminator Plate (Pin 2) 55 Volts (PP) Horizontal


6CB6 (V19) Horizontal Control Plate (Pin 5) 70 Volts (PP) Horizontal


12BH7 (V20) Horizontal Discharge Plate (Pin 6) 85 Volts (PP) Horizontal


6AH4GT (V17) Vertical Output Plate (Pin 5) 700 Volts (PP) Vertical


6AL5 (V18) Horizontal Discriminator Plate (Pin 7) 55 Volts (PP) Horizontal


12BH7 (V20) Horizontal Oscillator Plate (Pin 1) 80 Volts (PP) Horizontal


AGC Winding of Horizontal Output Transformer (Point X to Ground) 300 Volts (PP) Horizontal

ADJUSTMENT OF HORIZONTAL AFC CIRCUIT

Horizontal Hold Adjustment

1. Tune in a strong station and adjust Picture (Contrast) and Brightness controls for a normal picture.
2. With the picture adjusted for best horizontal linearity and correct width, turn the Horizontal Drive control to a fully clockwise position. Normally, crowding or vertical white lines will appear in the center of the picture at this setting. Back off on the control slightly beyond the point where the crowding disappears. This is the correct setting of the Horizontal Drive control. DO NOT OPERATE THE RECEIVER WITH THE HORIZONTAL DRIVE CONTROL IMPROPERLY ADJUSTED.
3. Remove V18, the 6AL5 Horizontal Discriminator tube to allow free running of the horizontal oscillator, and turn the Horizontal Hold adjustment screw on top of Horizontal Discriminator transformer T62 until the picture moves slowly back and forth with the blanking bar vertical.
4. Replace the 6AL5 and allow to warm up.
5. Turn to a channel on which no signal is received then return to the original station. The picture should immediately fall into synchronization.

If operation of the Horizontal AFC circuit is unsatisfactory after the foregoing adjustment, proceed with "Phase Adjustment".

Phase Adjustment

1. Turn the adjustment screw in Ringing coil L69 all the way out (counterclockwise) and short R264, the 4700 ohm charge circuit peaking resistor.

(Continued on reverse side)

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

SYLVANIA
Chassis 1-518-1,-2,-3

Chassis 1-518-1,-2,-3:
Models 175-18, 372, 373, 375, 376, 377

Technician
CIRCUIT DIGEST
97

SYLVANIA
Chassis 1-518-1,-2,-3

Technician
CIRCUIT DIGEST
97

(Continued from reverse side)

2. Repeat steps "3", "4" and "5" of "Horizontal Hold Adjustment".
3. Adjust the Phasing screw on bottom of Horizontal Discriminator transformer T62 until equal blanking is observed on both sides of the picture. It will be necessary to turn the Picture (Contrast) control to minimum, readjust the Brightness control and move the picture to the left and to the right with the centering lever to see the blanking.
4. Repeat steps "3" and "4" of "Horizontal Hold Adjustment".
5. Recheck phasing as in step "3". It is important that both "free running" and phasing are correct.
6. Remove the short from across R264 and readjust the Horizontal Drive control as in step "2" of "Horizontal Hold Adjustment".
7. Turn the adjustment screw in Ringing coil L69 until equal blanking is again visible on both edges of the picture.
8. Repeat steps "3", "4" and "5" of "Horizontal Hold Adjustment".

UHF TUNER ALIGNMENT

CHASSIS 1-518-2

PRELIMINARY INSTRUCTIONS

1. Allow receiver to warm up for fifteen minutes before performing UHF alignment.
2. Check Video IF response as outlined in "Video IF Alignment". It is particularly important that the respective band pass circuit be aligned for correct response as shown in step 2 of "Video IF Alignment". Leave detector circuit connected for use in UHF tuner alignment.
3. When the Video IF band pass adjustments have been checked, switch to "UHF" position and proceed with alignment as indicated in the following paragraphs.

OUTPUT CIRCUIT ALIGNMENT

Apply 43.25 MC sweep (10 MC sweep width) into test point on UHF tuner. Apply 42.1 MC and 45.75 MC markers as shown in "VHF Tuner Alignment Setup" and adjust T25 on UHF tuner for response curve shown in accompanying Figure B.

OSCILLATOR ALIGNMENT

1. With accurately calibrated UHF signal generator tuned to 896 MC fed into antenna terminals of UHF tuner, connect DC VTVM across Video Detector Load resistor, R152 - 3.3K.
2. Turn UHF tuning knob to extreme high frequency end of dial. At this point UHF tuning capacitor plates are fully unmeshed.
3. Adjust C28 (See UHF Tuner Layout drawing) for Maximum reading on VTVM.

PRESELECTOR ALIGNMENT

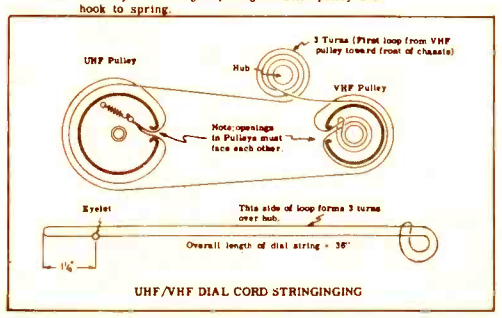
1. Inject 42.1 MC and 45.75 MC markers as shown in "VHF Tuner Alignment Setup".
2. Apply UHF sweep signal to UHF antenna terminals through a properly terminated output cable (matched to 300 Ohms) or through the matching pad shown in Figure A.
3. Tune UHF sweep generator and UHF tuner simultaneously across entire tuning range from 464 MC to 896 MC and observe response curve.
4. Adjust trimmers C37, C38 and C39 for best compromise on dip and tilt; if necessary, additional adjustment may be accomplished by bending the rotor plates slightly. Overall response curve should appear as in Figure B.
5. Disconnect test equipment, remove 330 Ohm resistor and reconnect T55 into circuit.

NOTE: DO NOT attempt to correct for tilted response curve by adjusting band pass circuit (18, L53 and L54). Readjustment of these circuits will adversely affect VHF reception of receiver.

DIAL CORD STRINGING

In replacing the dial drive cord, position the eyelet in the cord as shown and proceed in the following order. See VHF - UHF Dial Cord Stringing drawing.

1. Loop around shaft of VHF pulley.
2. Loops around VHF pulley in each direction.
3. Three turns around hub on anti-backlash gear.
4. Loops around UHF pulley in each direction.
5. Feed eyelet through opening in UHF pulley and hook to spring.



UHF/VHF DIAL CORD STRINGINGING

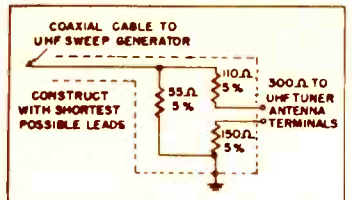


FIGURE A - UHF MATCHING PAD

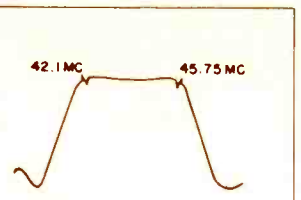
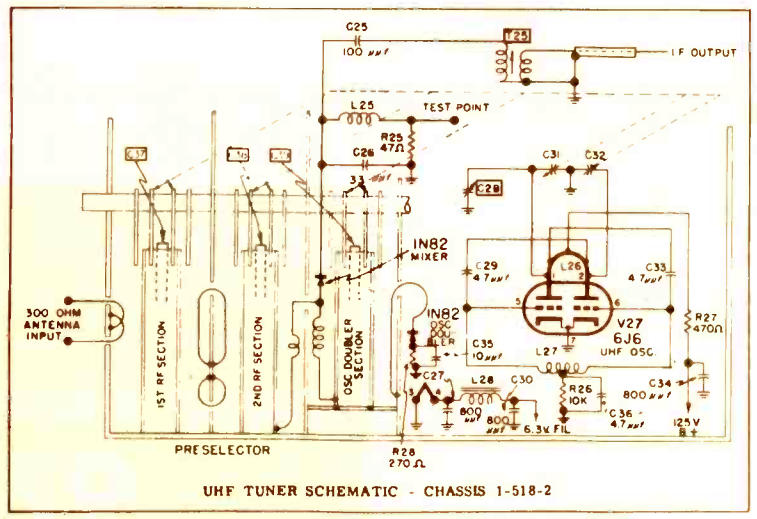
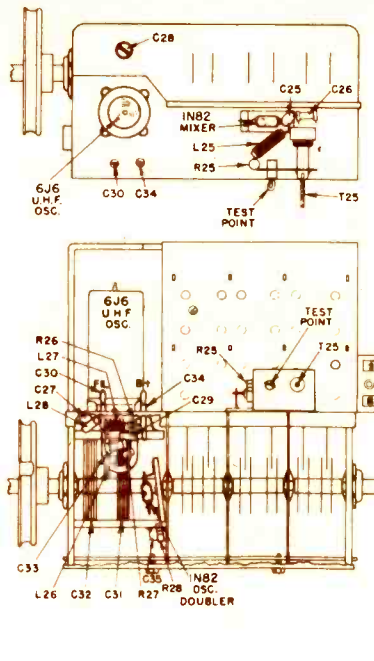


FIGURE B - UHF TUNER OUTPUT RESPONSE



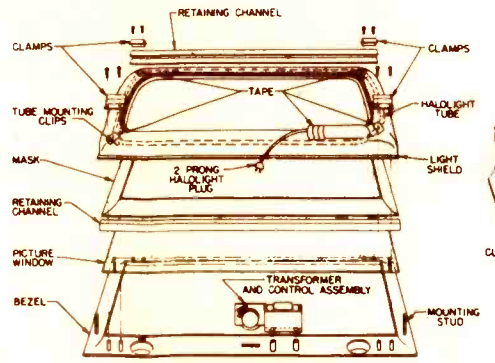
UHF TUNER SCHEMATIC - CHASSIS 1-518-2



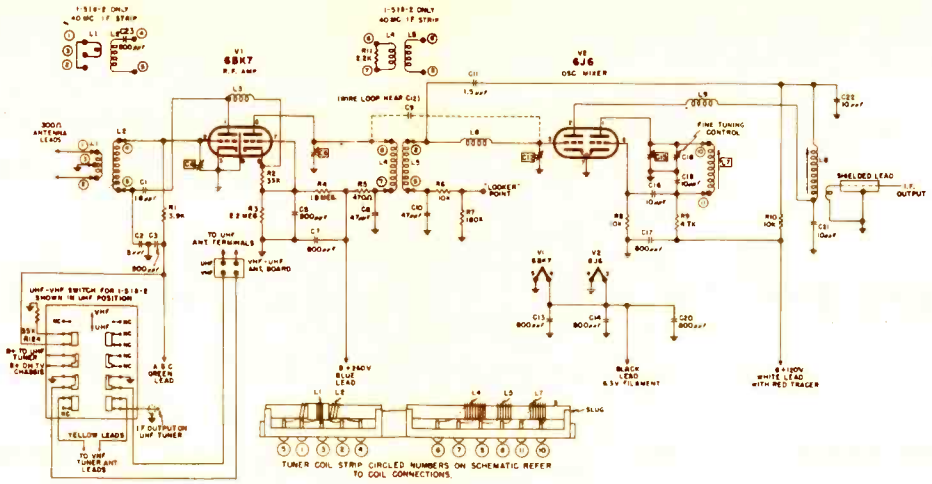
UHF TUNER LAYOUT - CHASSIS 1-518-2

HaloLight Tube Replacement

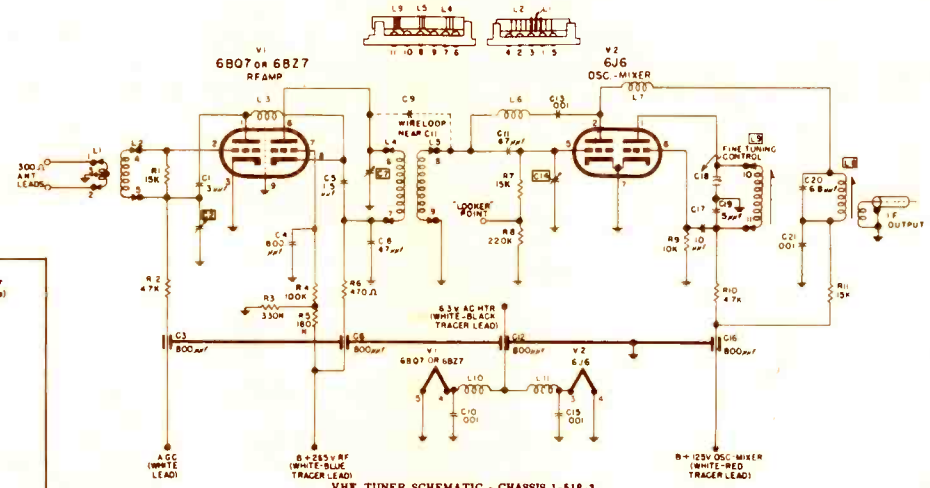
1. Remove chassis from cabinet.
2. Unfasten the 6 nuts that hold the bezel assembly to the cabinet and remove assembly.
3. Lay bezel assembly face down on a surface that will not scratch bezel.
4. Remove clamps holding light shield and mask to bezel.
5. Remove HaloLight plug, and transformer and control assembly.
6. Remove retaining channels and lift HaloLight shield from assembly.
7. Remove tape holding HaloLight tube mounting clips and leads to shield.
8. Remove vinyl tubing from ends of tube and carefully lift tube from shield.
9. Unsolder leads from tube.
10. To replace tube, follow the foregoing steps in reverse order. It is important that all tape removed from assembly be replaced in order that dust will not collect on picture tube face.



HALOLIGHT TUBE REPLACEMENT



VHF TUNER SCHEMATIC - CHASSIS 1-518-1, 1-518-2



VHF TUNER SCHEMATIC - CHASSIS 1-518-3

VIDEO IF, 4.5MC TRAP AND SOUND ALIGNMENT PROCEDURES

PREALIGNMENT INSTRUCTIONS — READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

1. Lay chassis on side for under chassis adjustments.
2. Ground all test equipment unless otherwise stated.
3. When constructing detector circuit keep leads short
4. Use proper insulated alignment tools for powdered iron cores with hex holes or slots and metallic screw drivers for those cores adjusted by brass screws.
5. Allow receiver to warm up for approximately 15 minutes before proceeding with alignment.

NOTE: During Video IF Alignment, when indicated, raise shield on Oscillator-Mixer tube so that ground contact is broken.

VIDEO IF ALIGNMENT

STEP	SIGNAL GENERATOR Connection	Freq.	SWEEP GENERATOR Connection	Freq.	VTVM CONNECTION	OSCILLOSCOPE CONNECTION	ADJUST	OUTPUT READING	COMMENTS
1	To raised tube shield on Osc - Mixer	39.75 MC	——	——	Across Diode Load Res. R152 3.3K	——	L53 (Top Core)	Min	Set Tuner to free channel. Apply -12 V. between junction of R137 and C131 and chassis. Use sufficient output for satisfactory readings.
2	Loosely couple marker to control grid pin 5 of 6J6 Osc - Mixer through hole in Tuner Cover	45.75 MC 42.1 MC	Through Hole in tuner cover to Pin 5 of 6J6	43.25 MC 10 MC Sweep	——	Plate Pin 5 of V3 6CB6 through Detector Circuit See "Comments"	L53 (Bot. Core) L6 (Tuner) L54	Response Curve shown in Fig. A	Remove AGC voltage. Disconnect T55 primary from pin 5 of V3 6CB6; connect a 330 ohm resistor in its place. Lower Osc - Mixer tube shield. Set VHF tuner between any two channels. L54 controls width of curve.
3	Repeat step 2 adjustments until curve is flat with 42.1 MC and 45.75 MC markers on corners. REMOVE 330 OHM RESISTOR AND RECONNECT T55 before proceeding with step 4.								
4	To raised tube shield on Osc - Mixer	41.25 MC	——	——	Across Diode Load Res. R152 3.3K	——	L55 6th video IF Trap	Min	Set Tuner to free channel. Apply -12 V. between junction of R137 and C131 and chassis. Use sufficient output for satisfactory readings.
5	Same as 4	47.25 MC	——	——	Same as 4	——	T58 (Top Core)	Min	Same as 4
6	Same as 4	41.25 MC	——	——	Same as 4	——	T55 (Top Core)	Min	Same as 4
7	Same as 4	44.0 MC	——	——	Same as 4	——	T58	Max	Same as 4. Reduce Sig. Gen. output to keep VTVM reading between 1 and 3 Volts.
8	Same as 4	48.0 MC	——	——	Same as 4	——	T57	Max.	Same as 7
9	Same as 4	45.2 MC	——	——	Same as 4	——	T56 (Bot. Core)	Max.	Same as 7
10	Same as 4	43.2 MC	——	——	Same as 4	——	T55 (Bot. Core)	Max.	Same as 7
11	Repeat steps 4 to 9 inclusive.								
12	Loosely couple marker to raised tube shield on Osc - Mixer	41.25 MC 42.1 MC 45.75 MC 47.25 MC	To raised tube shield on Osc - Mixer	43.25 MC 10 MC Sweep	——	Across Diode Load Res R152 3.3K with 33K resistor in series with hot scope lead.	T58 T57 T56 (Bot. Core) T55 (Bot. Core)	Response Curve shown in Fig. B	Same as 4 except use low signal input and high scope gain.

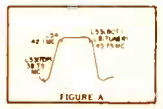
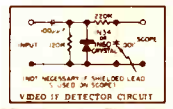


FIGURE A



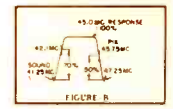


FIGURE B

4.5MC TRAP ALIGNMENT

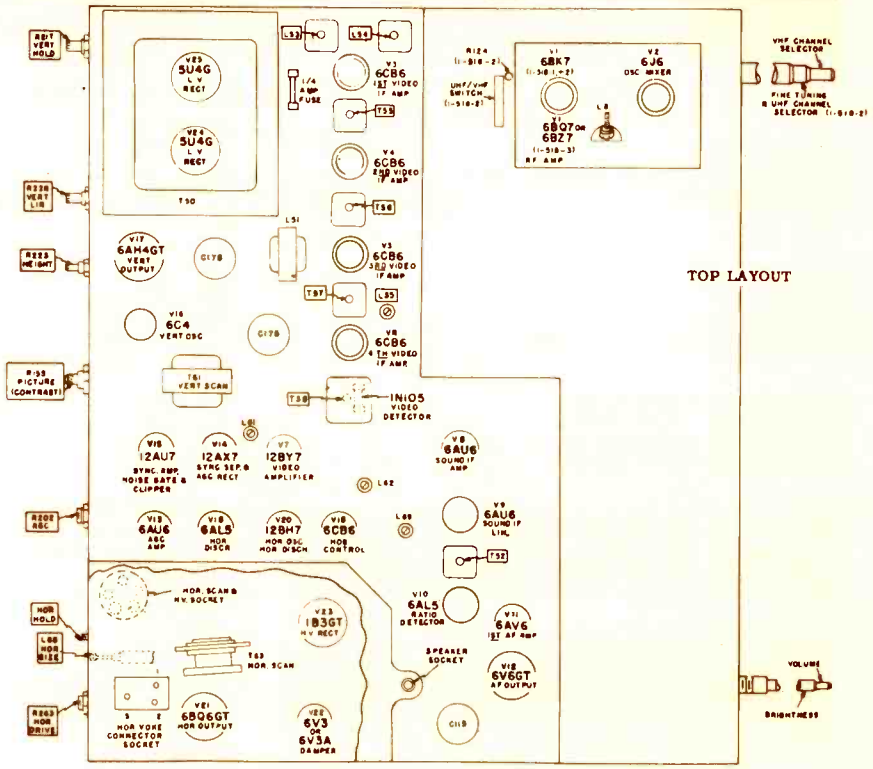
STEP	SIGNAL GENERATOR Connection	Freq.	VTVM CONNECTIONS RF Probe	Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1	To Pin 3 of 12BY7 Video Amplifier	4.5 MC	RF Probe connected to Cathode (Pin 11) of Picture Tube	To chassis	L61	Min	Short Pin 1 of V8 6CB6 4th Video IF Amplifier to Chassis

SOUND ALIGNMENT

STEP	SIGNAL GENERATOR CONNECTION	VTVM CONNECTIONS DC Probe	Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1	45 MC and 4.5 MC generators each connected through a 1000 ohm resistor to pin 1 of V3 6CB6 1st Video IF Amplifier or 45 MC generator with 4.5 MC marker (preferably crystal controlled) through 1000 ohm resistor to pin 1 of V3	To pin 7 of V10 6AL5	To pin 5 of V10 6AL5	T52 Sec (Top Core) T52 Pri (Bot Core) L63	Max.	Set tuner to free channel with minimum interference.
2	Same as 1	To junction of two matched 100K resistors connected in series across R310	To pin 1 of de-emphasis plate through 100K resistor	T52 Sec. (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading
3	Remove test equipment and resistors.					

ALTERNATE SOUND ALIGNMENT

STEP	SIGNAL SOURCE	VTVM CONNECTIONS DC Probe	Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1	Connect a good antenna installation to the receiver					
2	Strong station	To pin 7 of V10 6AL5	To pin 5 of V10 6AL5	T52 Pri (Bot Core) L63	Max	Repeat all adjustments until maximum is reached
3	Strong station	To terminal 5 of T52	To junction of two 100K resistors in series from pin 5 to pin 7 of V10 6AL5	T52 Sec (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading
4	Remove test equipment and resistors					



TOP LAYOUT

TECHNICIAN CIRCUIT DIGESTS

WAVE FORM ANALYSIS

The drawings on this page illustrate the wave forms at various positions within the receiver. The wave forms are not theoretical but exact copies of that shown by an oscilloscope and were taken under 'Normal operating conditions, with a transmitted signal and the picture in sync at all times.

When checking the wave forms, connect the ground lead from the oscilloscope to the top chassis plate and the hot lead to the position indicated. The wave shapes may vary somewhat depending on the strength of the signal, the picture information being transmitted and the adjustments of the various controls.

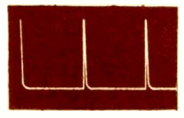
Under each wave form is the schematic reference, position taken at, peak-to-peak voltage and the type of wave form indicated (Vertical -60 cycles and Horizontal -15,750 cycles).

VERTICAL PULSE

Pin 5 of Tube 12.
Plate of Sync Clipper
25 volts Peak-to-Peak

HORIZONTAL PULSE

Pin 5 of Tube 12.
Plate of Sync Clipper
25 volts Peak-to-Peak



VERTICAL PULSE

Pin 3 of Tube 13
Cathode of V. Blocking Osc.
125 volts Peak-to-Peak

VERTICAL PULSE

Pin 4 of Tube 13
Grid of V. Output
95 volts Peak-to-Peak

HORIZONTAL PULSE

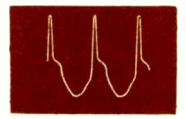
Pin 2 of Tube 14
Plate of A.F.C. Discr.
4 volts Peak-to-Peak

HORIZONTAL PULSE

Pin 1 or 5 of Tube 14
Cathode of A.F.C. Discr.
15 volts Peak-to-Peak

HORIZONTAL PULSE

Pin 7 of Tube 14
Plate of A.F.C. Discr.
6 volts Peak-to-Peak



HORIZONTAL PULSE

Pin 5 of Tube 15
Plate of H. Mult.
35 volts Peak-to-Peak

HORIZONTAL PULSE

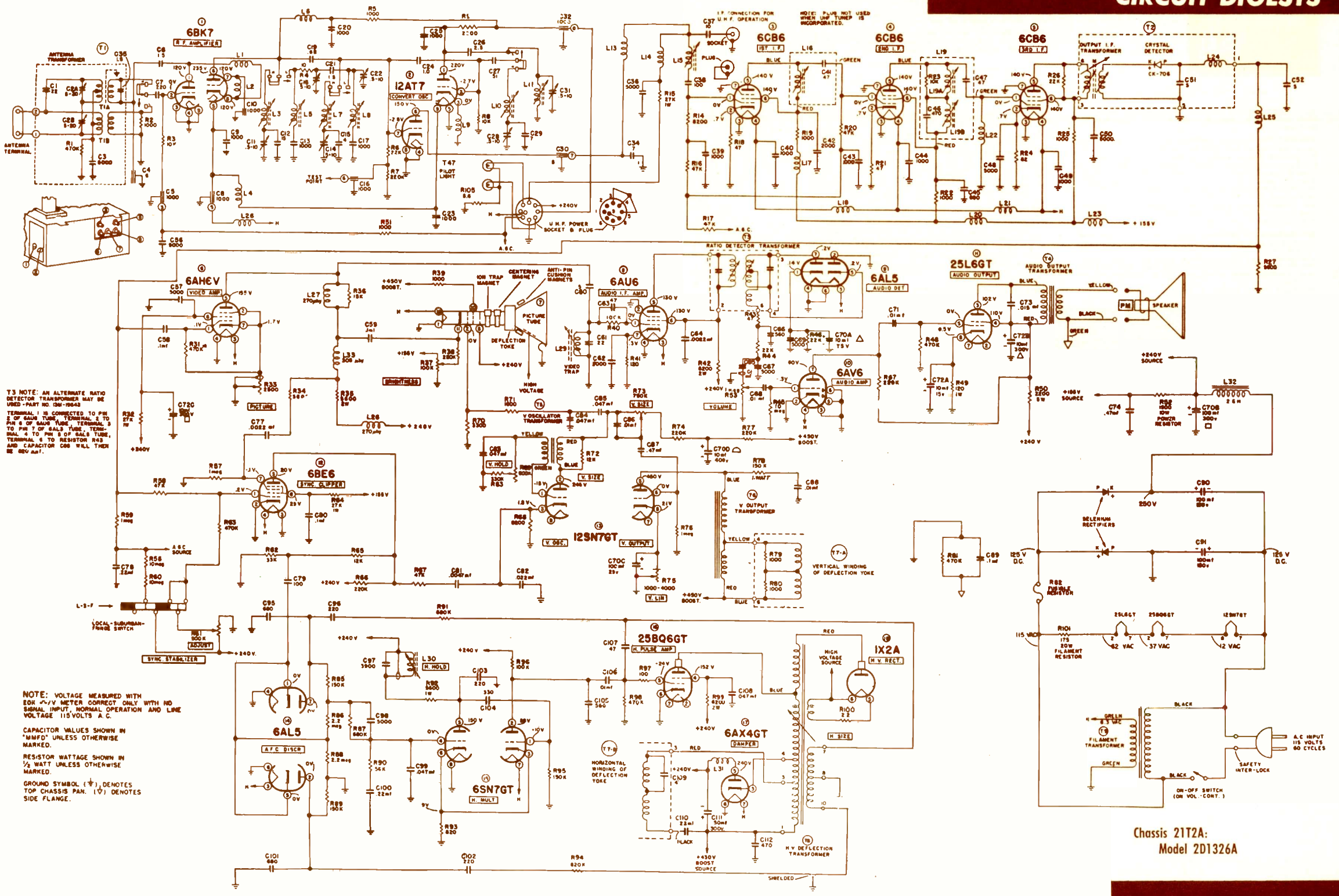
Pin 5 of Tube 16
Grid of H. Pulse Amp.
100 volts Peak-to-Peak

BUILT-IN VHF TV ANTENNA

The new Built-in VHF Television Antenna incorporated in your receiver eliminates the need of an outside VHF antenna in most locations. In areas too distant for normal reception with a built-in antenna, provision is made for outside antenna connections. If any other type of antenna is used with the set, disconnect the transmission line from the built-in antenna to the antenna terminals. When connections are made, check to see that the antenna terminal screws are moderately tight.

The antenna is mounted inside the cabinet and is operated by the use of a knob at the top of the back of the cabinet. Since the antenna is fastened to the cabinet, it may be necessary to orient the cabinet to obtain the best reception. It is desirable that either the front or the back of the cabinet face the transmitting station. If however, "ghosts" or multiple images appear, the cabinet may be rotated slightly to minimize this condition. In some cases it may be necessary to face the back or the front of the cabinet toward a window to obtain a television picture. This may be due to walls, water pipes, or a steel structure in your location preventing television reception.

VHF ANTENNA KNOB—The antenna tuning knob for the built-in VHF antenna should be used as a fine tuning control and should be adjusted until the best picture is obtained. In order to eliminate "Body Effect" when adjusting the antenna, stand in front and reach over the top of the set. Do not at any time force the knob in either direction if it becomes difficult to turn.



T3 NOTE: AN ALTERNATE RATIO DETECTOR TRANSFORMER MAY BE USED - PART NO. 134-1064B

TERMINAL 1 IS CONNECTED TO PIN 8 OF 6AU6 TUBE, TERMINAL 2 TO PIN 6 OF 6AU6 TUBE, TERMINAL 3 TO PIN 7 OF 6AL5 TUBE, TERMINAL 4 TO PIN 8 OF 6AL5 TUBE, TERMINAL 6 TO RESISTOR R43 AND CAPACITOR C86 WILL THEN BE .005 mf.

NOTE: VOLTAGE MEASURED WITH EOK ∿/V METER CORRECT ONLY WITH NO SIGNAL INPUT, NORMAL OPERATION AND LINE VOLTAGE 115 VOLTS A.C.

CAPACITOR VALUES SHOWN IN "MMFD" UNLESS OTHERWISE MARKED.

RESISTOR WATTAGE SHOWN IN ½ WATT UNLESS OTHERWISE MARKED.

GROUND SYMBOL (⏚) DENOTES TOP CHASSIS PAN. (▽) DENOTES SIDE FLANGE.

Chassis 21T2A:
Model 2D1326A

High Voltage Power Supply:

In the process of inspection, repairs, changing of tubes or transformers, or for any other reason where it is necessary to work within the high voltage power supply, the following should be closely observed.

1. Terminals on the 1X2A socket must be dressed toward the inside of the corona ring and be free of sharp protrusions.
2. The corona ring must be dressed in such a way as to make its presence useful, that is, properly centered and about 1/8-inch below the socket terminals.
3. All leads must be dressed as far away as possible from the transformer winding. Excess lead length should be transferred to the top side of the chassis.

When replacement of the H.V. deflection transformer is necessary, be sure to closely follow the precautions listed above. The transformer can easily be replaced with the chassis in the cabinet by the following procedure.

1. Remove two (2) hex head screws on either side of the H. Size control.
2. Disengage the H.V. lead holder ring. (back side of shield can)
3. Remove 25BQ6 plate cap.
4. Remove shield can by pushing back side of shield can toward front and lifting up.

Sync Stabilizer Adjust Control (R-61):

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.

Horizontal Hold Control (L-30):

The horizontal hold control is located on the rear flange of the chassis and should be adjusted in the following manner.

Set the picture control to its normal operating position. Turn the thumb screw clockwise until it reaches its stop. Turn two complete turns counter-clockwise. The thumb screw is a vernier adjustment and will then be in the center of its range.

Turn the iron core with a small screwdriver or adjusting tool until the picture is steady (no horizontal movement). Set the core to the middle of its range.

After the iron core has been properly adjusted the thumb screw should then be used as a vernier adjustment to control synchronization when necessary.

Centering Magnet (Figure 3):

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 will be moved up or down. To the left or right of the neck of the picture tube, the picture will be moved either to the left or right.

Anti-Pin Cushion Magnet - 21" only (Figure 3B):

Adjust centering until an edge of the raster is visible. Loosen the positioning screws and slide the magnet backward or forward until the edge of the raster is vertically straight. If keystoning is noticed adjust magnets in vertical plane.

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

TRUETONE
Chassis 21T2A

Technician
CIRCUIT DIGEST
98

TRUETONE
Chassis 21T2A

Technician
CIRCUIT DIGEST
98

DIAL CORD REPLACEMENT

DIAL CORD STRINGING: Two separate dial cords are used and can be restrung separately if replacement is necessary.

POINTER PULLEY STRINGING: Follow the above diagram (front view) and start by attaching the dial cord to the tension spring, route to pointer pulley and make 2½ clockwise turns around pulley, wraping dial string under pointer lug as shown in the diagram. Route under tuning shaft to small pulley of driven pulley assembly, make 2½ clockwise turns around pulley, make one complete turn around the driven pulley lug as shown in the diagram and connect to other end of tension spring. Tension spring must be in location shown when tuning shaft is rotated to extreme clockwise position.

MECHANICAL TRACKING: If for any reason the stop washers do not correspond to the stop position of the tuner, loosen the two (2) drive pulley allen head set screws and reposition. Turn both the tuning shaft and tuner shaft to the extreme clockwise position. Turn tuner shaft back 1/6 turn counter-clockwise. Tighten allen head set screws.

POINTER POSITIONING: If when a station is properly tuned in and the pointer is off calibration, reposition the pointers as follows:

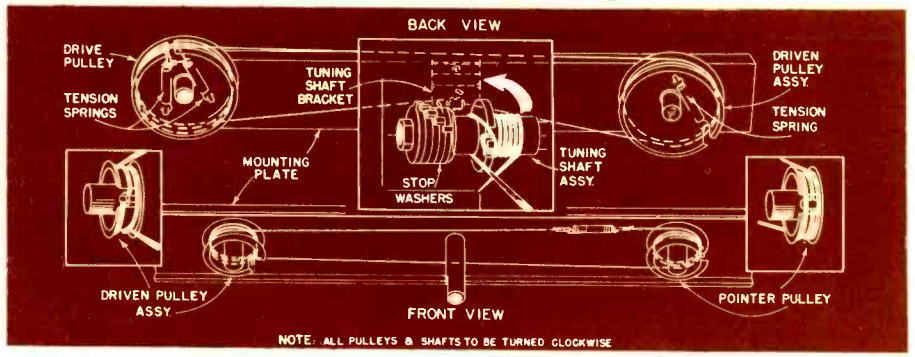
1. Remove the on-off volume and tuning knobs. (pull straight out)
2. Remove two outside escutcheon screws and one small screw in center (in tuning knob recess), then remove escutcheon.
3. Remove pointer indicator and reposition.

DRIVE PULLEY STRINGING: Drive pulley restringing requires removal of the mounting plate assembly. To remove the mounting plate assembly follow the simple instructions below.

1. Remove two (2) star knobs
2. Remove two (2) pilot light shields and pilot light bulbs.
3. Loosen two (2) drive pulley allen head set screws.
4. Remove three (3) spacer screws.
5. Pull assembly straight out.

To restring the drive pulley turn the tuning shaft completely clockwise. Follow the above back-view diagram (this view is 180 degrees reversed for clarity) and start by attaching the dial cord to the tension spring shown at the extreme left on the drive pulley. Route the cord through the opening in the pulley and make a ½ counter-clockwise turn around the pulley and route under the tuning shaft. Make 5 counter-clockwise turns around tuning shaft between mounting plate and lugged washer. Then make one counter-clockwise turn around lug on washer and continue in the counter-clockwise direction and make ½ turn around the tuning shaft between the lugged washer and stop washers. Route to the large driven pulley assembly, and make 1½ turns around the pulley and then route to the drive pulley. Make two (2) complete counter-clockwise turns around the pulley and route through the opening and attach to the tension spring. Add second tension spring as shown. Add another tension spring in the driven pulley assembly as shown on the right side.

Replace mounting plate assembly and follow directions for mechanical tracking.



COIL DC RESISTANCE CHART

The DC resistance readings shown in the chart below have been taken with a ohmmeter directly across the coil being measured. The coils not listed in the chart have a DC resistance reading of less than one ohm. A tolerance of ± 5% is permissible.

COILS	RESISTANCE IN OHMS
L17	1.5
L20	1.5
L22	2.2
L23	2
L24	2
L25	2
L27	8
L28	8
L29	1.5
L30	80
L31	2.3
L32	72
L33	8.5
L34	2.3
T3 pri.	4.7

COILS	RESISTANCE IN OHMS
T4 pri.	170
T5 pri.	960
sec.	160
T6 pri.	1100
sec.	6.6
T7A	68
B	12.5
T8 25HQ6 plate to 1X2A plate	180
25HQ6 plate to term 4	9.5
25HQ6 plate to term 3	17.5
25HQ6 plate to term 1	25.5
term 7 to term 8	2.6
term 7 to term 10	5.4
T9 pri.	7

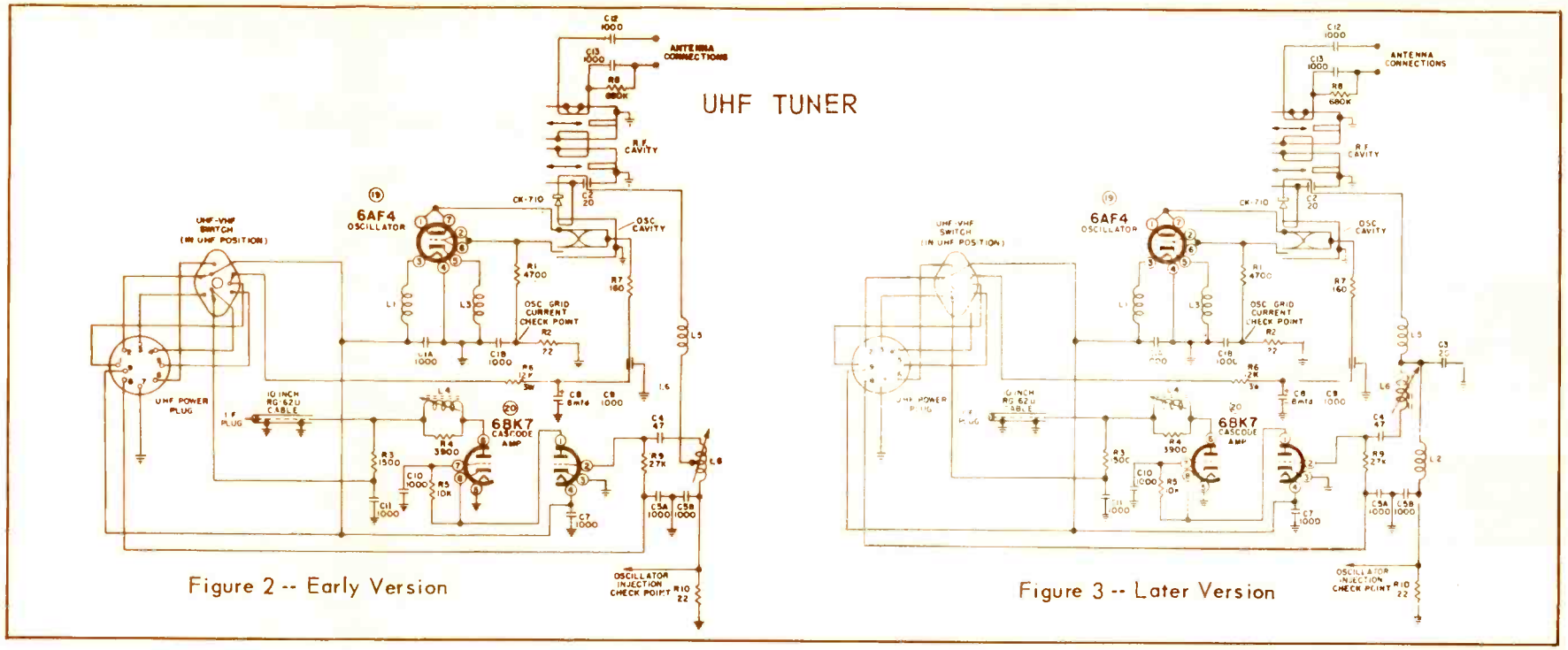


Figure 2 -- Early Version

Figure 3 -- Later Version

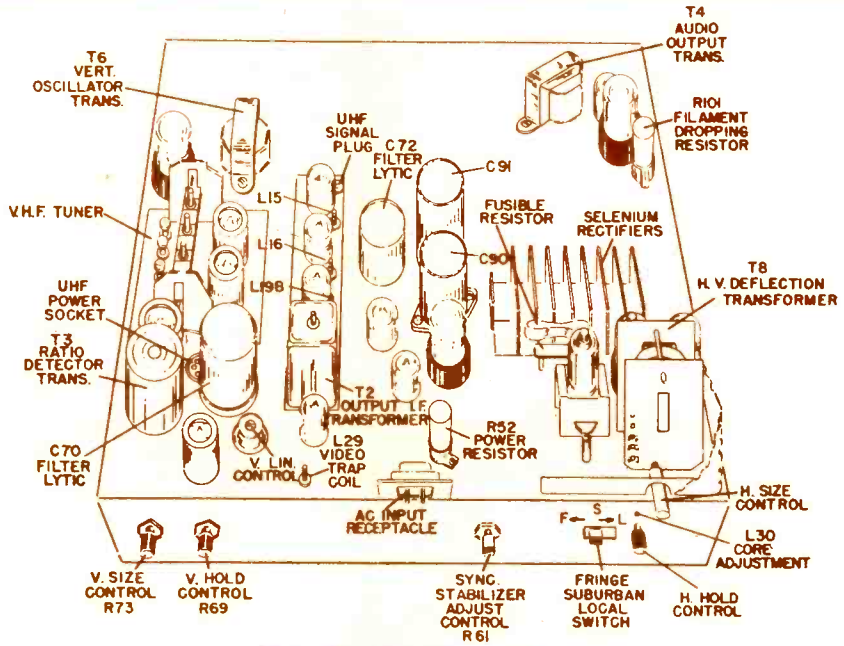
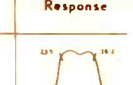


Figure 6. Top Chassis View.

VIDEO IF ALIGNMENT

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq. (mc.)	Signal Input Point	Output Point	Remarks	Adjust	Response
1	23.5 26.2	25	Pin 1 of tube 5	Scope at junction of L25, R27, C58	Connect short between pin 5 and pin 6 of tube 4	T2 pri. T2 sec. Coupling Rod	
2	Calibrate scope for sensitivity of one volt per inch. Adjust peak response for one inch deflection. Marker should fall 10% down. If response curve is not as shown readjust coupling rod (bottom of T2) for proper band-width and T2 primary and secondary for flat response and maximum gain.						
3	21.4	———	Converter grid *	VTVM at junction of L25, R27, C58	Remove Short. Adjust generator for output of approx. 2 volts DC	L19-B (top of chassis)	Maximum Reading
4	26.5	———	Converter grid *	VTVM at junction of L25, R27, C58	Adjust generator for output of approx. 2 volts DC	L19-A (bottom of chassis)	Maximum Reading
5	21.4	———	Converter grid *	VTVM at junction of L25, R27, C58	Remove Short. Adjust generator for output of approx. 2 volts DC	L19-B (top of chassis)	Maximum Reading
6	23.8	———	Converter grid *	VTVM at junction of L25, R27, C58	Adjust generator for output of approx. 2 volts DC	L16	Maximum Reading
7	25.0	———	Converter grid *	VTVM at junction of L25, R27, C58	Adjust generator for output of approx. 2 volts DC	L15	Maximum Reading
8	———	25	Converter grid *	Scope at junction of L25, R27, C58	———	T2 pri. (top of chassis)	Rock for flat response
9	23.5 26.5	25	Converter grid *	Scope at junction of L25, R27, C58	Marker should be 50% down and response curve should be as shown-If not, repeat alignment.	Check point only	

Picture IF frequency 26.25 MC -- Sound IF frequency 22.25 MC.
* NOTE: A very short lead from the generator must be used to prevent regeneration.

UHF TUNER SERVICE DATA

To determine whether the oscillator section is functioning, a convenient check point has been provided where the oscillator grid current can be measured. To measure the oscillator grid current, place a Simpson Model 260 Multimeter (or equivalent) on the 100 microamp scale across the 22 ohm resistor (R2). See figure 4. A reading of 10 to 30 microamperes should be obtained if the oscillator is functioning normally.

Both the oscillator and crystal detector can easily be checked by measuring the oscillator injection current. Place a Simpson Model 260 Multimeter (or equivalent) on the 100 microamp scale across the 22 ohm resistor (R 10) at the terminal indicated in Figure 5A or 5B depending on the version of the tuner. A reading of 5 to 40 microamperes should be obtained if both the oscillator and crystal are functioning normally.

CRYSTAL DETECTOR: If replacement of the CK-710 Crystal Detector is necessary, the picture tube must be removed along with the crystal cover (refer to figure 6). The crystal is soldered into place and should be carefully resoldered after replacement. Overheating may damage the crystal. To dissipate the heat, grasp each crystal lead with a pliers when soldering into place.

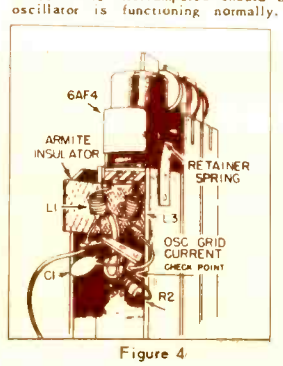


Figure 4

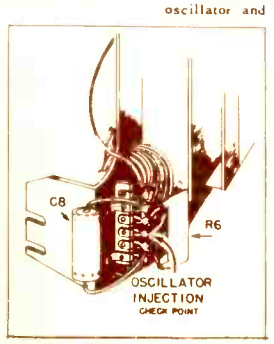


Figure 5A
Early Version

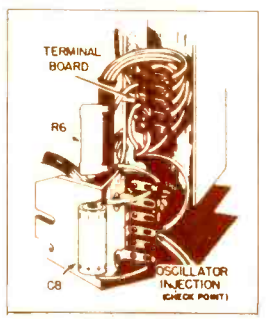


Figure 5B
Later Version

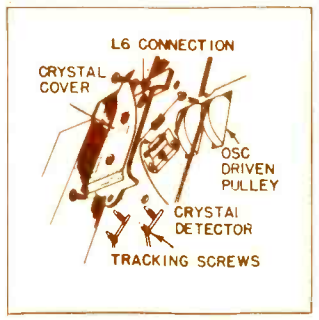


Figure 6

UHF ALIGNMENT

Since UHF is a relatively new field, test equipment necessary for RF and Oscillator Alignment is highly expensive and not readily available on the market at the present time. Therefore, a complete alignment procedure is not presented in this manual.

The cascode Pre-IF Amplifier can easily be realigned if necessary by connecting a 25 MC unmodulated signal to the center tap of L6 (see figure 7) or to the junction of Coil L5 and Capacitor C2 (see figure 6), depending on the version of the tuner and a VTVM at the video IF Detector output of the receiver. Connect generator through a 1 mmf capacitor. Adjust both L4 and L6 for maximum VTVM reading.

If for any reason such as dial cord replacement, component replacement, etc., the RF cavities may be adjusted for peak performance. Before attempting adjustment, note position of ribbons and mark the UHF drive gear so that original positions can be relocated if necessary. Loosen the pulley positioning screw (refer to figure 8) and rotate the pulleys for the sharpest and clearest picture.

CAUTION: Do not under any circumstances attempt adjustment of the tracking screws, oscillator trimmer screw or oscillator cavity. Precision test equipment is necessary for the adjustment.

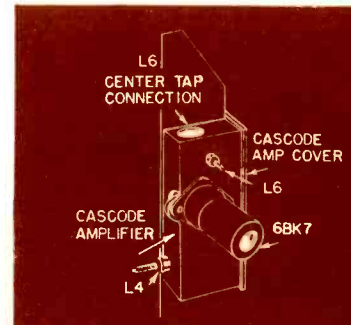


Figure 7

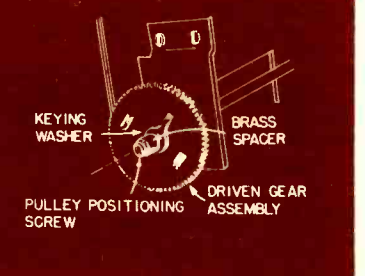


Figure 8

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

HORIZONTAL RINGING COIL

The horizontal ringing coil (L400) should be adjusted as follows:

1. Short out the ringing coil with a short jumper wire.

2. Set the horizontal hold control to the middle of its range, and leave it in this position during the steps that follow.

3. Connect a VTVM to the pin #2 grid circuit of the horizontal multivibrator, so as to measure the DC voltage between this point and ground.

4. With the receiver tuned to a TV station, adjust C421 (located on the rear of the chassis) for zero voltage on the meter. If zero voltage can be approached but not quite reached at one extreme of the C421 adjustment, it may be necessary to set the horizontal hold control slightly to one side of mid-position to obtain zero voltage.

5. Remove the jumper from across the ringing coil.

6. Adjust the ringing coil for zero voltage on the meter, and check the adjustment by switching to another channel and then back again. The receiver should pull into horizontal synchronization on all channels.

AGC CONTROL

Allow the receiver to warm up for at least five minutes before adjusting the AGC control. With the receiver tuned to the strongest signal in the area, rotate the AGC control clockwise until the receiver begins to overload or, if the signal is weak, until snow on the picture becomes more pronounced. Then rotate the control counterclockwise to the position where best picture with minimum snow and no sign of overload is obtained. Make certain that overload does not occur on any channel. If evidence of overload is noticed, rotate the AGC control counterclockwise until the condition disappears.

It is recommended that the strongest signal in the area be used when adjusting the AGC control. If a weak signal is used during the adjustment, the control may be set too far in a clockwise direction to permit reception of a strong signal without overload.

CRITICAL LEAD DRESS

All leads located near the horizontal multivibrator trimmer capacitor, C421, must be dressed away from the capacitor and close to the chassis.

All resistors rated above one watt must be dressed away from each other and clear of other wires and components.

Video peaking coils should be dressed away from the chassis and clear of adjacent parts.

All leads in the high voltage unit must be dressed away from the high voltage transformer to prevent arcing.

Keep all leads in the IF and video circuits as short as possible.

REFLECTION ELIMINATION

Light reflection from the pilot lamp can appe on the lower right hand corner of the CRT and the safety glass unless preventive measures are taken. To eliminate the reflections, one piece of electrical tape (1¼" x 10") is applied to the lower, right edge of the CRT face, and another piece of tape (1" x 8") is applied to the lower, right edge of the front glass plate.

When replacing a CRT, the electrical tape must be applied to the new tube in the same manner as it was applied to the old tube.

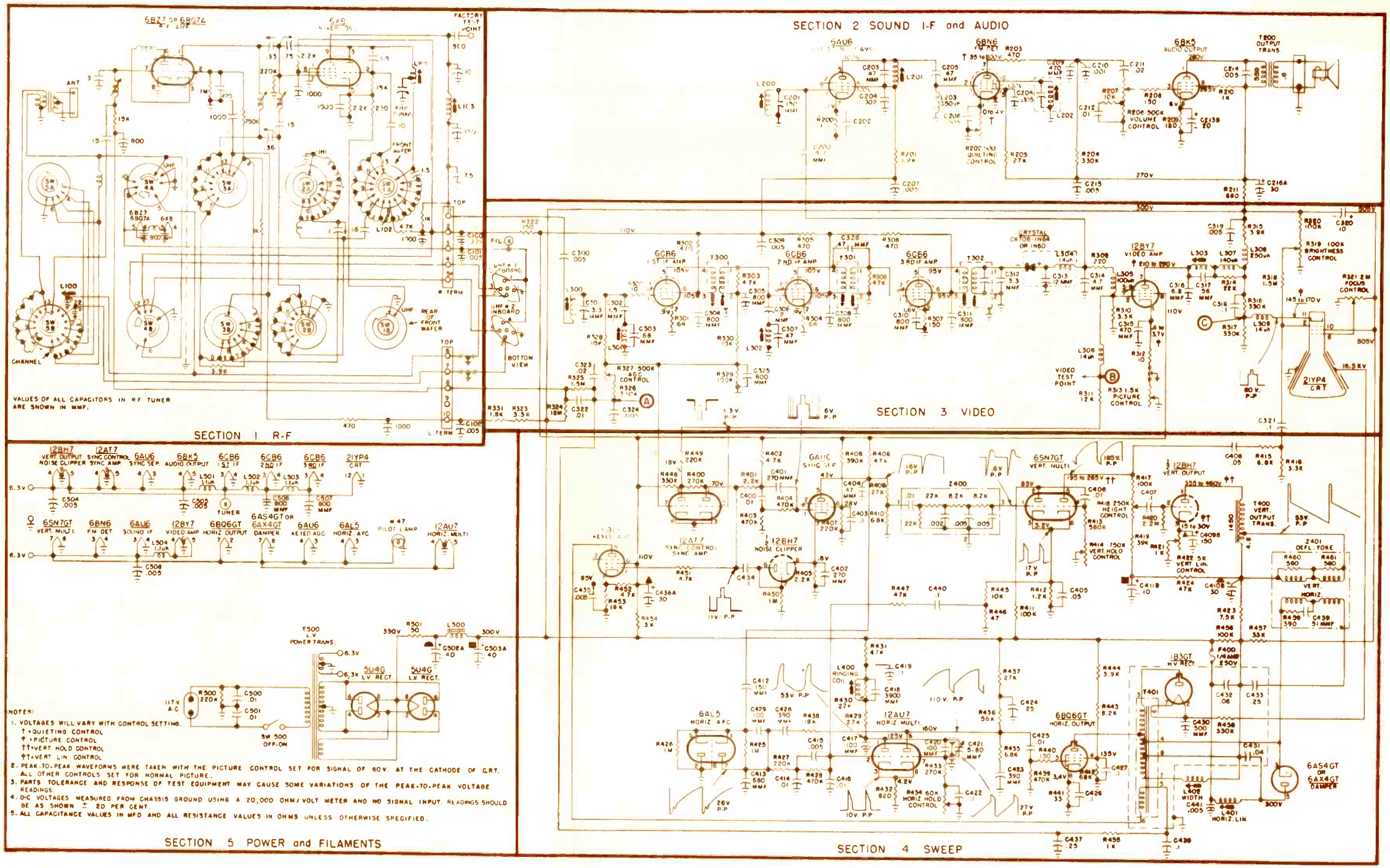
NEW FEATURES IN V-2243-1 CHASSIS

AUXILIARY OPERATING CONTROLS

For operating convenience, the horizontal hold, vertical hold and brightness controls, which normally require only occasional adjustment, are located behind a trap door on the front of the cabinet, within easy reach and yet inconspicuous.

DIAL LIGHT

A dial light is included as part of the new channel indicator arrangement. The light is easily accessible for replacement by removing the front knobs, removing the four #8 self-tapping screws that mount the control panel assembly, and pulling off the shield which directs the light toward the channel selector.



AGC CONTROL

An AGC control is included on the rear of the chassis. This control is a screwdriver adjustment which allows the receiver to be adjusted for optimum sensitivity, compensating for variations in IF amplifier tube characteristics.

IMPROVED WIDTH AND HORIZ. LINEARITY CONTROLS

Adjustment of the width and horizontal linearity controls is facilitated through the use of slider type rather than screw type controls.

IMPROVED DEFLECTION YOKE MOUNTING BRACKET

The new deflection yoke mounting bracket makes it easier to position the deflection yoke and assures that the CRT cushions firmly support the flare in the CRT.

UHF BELT DRIVE

A new UHF drive system is used in the V-2243-1 chassis. Tension on the drive belt can be adjusted without removing the chassis from the cabinet. To increase the belt tension, simply push down the tightener arm which is located in front of the VHF RF tuner as indicated on Fig. 5.

EASY UHF INSTALLATION

Installation of UHF Receptors or an all-channel UHF tuner is made easier by the new layout of the chassis.

REMOVABLE SAFETY GLASS

The front glass plate on the models covered by this service note can be removed for cleaning purposes without removing the chassis from the cabinet. To remove the glass, first remove all control knobs. Then use a ¼" spintite to remove the four self-tapping screws which hold the control panel to the cabinet, and remove the control panel. Remove the four self-tapping screws from the bracket which holds the glass to the cabinet, and carefully ease the bottom of the glass plate forward.

After cleaning, replace the glass plate by setting it into position in the cabinet and mounting the bottom bracket. Use care when tightening the bracket mounting screws. Replace the control panel assembly and the control knobs.

Chassis V-2243-1:
Models H-770T21, H-771T21,
H-772K21, H-773K21, H-774K21,
H-775K21, H-776T21

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

WESTINGHOUSE
Chassis V-2243-1

Technician
CIRCUIT DIGEST
99

WESTINGHOUSE
Chassis V-2243-1

Technician
CIRCUIT DIGEST
99

ALIGNMENT

TEST EQUIPMENT

To service these chassis, the following test equipment should be available:

1. R-F sweep generator that is capable of producing a 10 mc. sweep at center frequencies ranging from 10 to 90 mc. and 170 to 216 mc. The output must be adjustable from at least 100,000 microvolts down to a very low minimum, and the output must be flat at all positions of the attenuator.

2. Cathode ray oscilloscope, preferably one with a wide-band vertical deflection amplifier and a low-capacitance input probe. The oscilloscope should have good low-frequency response characteristics.

3. Signal generator or generators capable of producing an accurate signal at all intermediate frequencies between 4.5 and 50 mc. and all picture and sound RF frequencies. Provisions for AM and FM modulation of the signal should be included. The accuracy of these frequencies is very important. If the signal generator does not include a crystal calibrator, a heterodyne frequency meter equipped with a crystal calibrator should be used to insure accuracy. The output level must be adjustable from at least 100,000 microvolts down to a very low minimum.

4. Vacuum tube voltmeter equipped with a high voltage multiplier probe for measurements up to 15,000 volts and an R-F probe for measuring R-F voltages.

GENERAL INFORMATION

The chassis and the test equipment should be bonded together by short lengths of heavy braided copper ribbon, and all interconnecting leads should be shielded and should be as short as possible consistent with ease in making connections. The effectiveness of the bonding can be checked during alignment by placing the hand on the chassis or test equipment case. If the response curve or meter reading changes, the bonding must be improved before the circuits are aligned.

It is important that the coaxial cable used to couple the sweep generator output to the receiver be terminated at its output end in the characteristic impedance of the sweep generator output circuit. To accomplish this, connect the appropriate value of resistance across the output leads at the open end of the cable. The oscilloscope vertical input cable and the generator output cables must be well separated from each other.

ALIGNMENT TOOL

To adjust the slugs in the common I-F transformers a special tool is required. This tool must fit into the .035" x .093" slot in the slug. ***An incorrectly designed tool will cause chipping of the slug.*** A suitable tool is stocked under Westinghouse part number V-8345.

COMMON I-F ALIGNMENT PROCEDURE

The common I-F system uses over-coupled I-F transformers to obtain the required band width. In the alignment of this type system, the visual method of stage-by-stage alignment is used. A sweep generator is used to develop the I-F response curve on the oscilloscope, and an unmodulated signal generator (marker) is used to provide spot frequency indications on the curve.

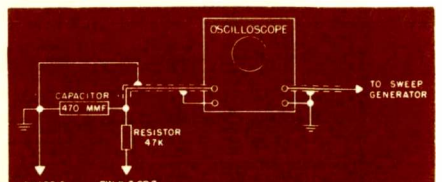


FIG. 2 — OSCILLOSCOPE CONNECTIONS

With some of the I-F transformers, peaks may be obtained at two positions of the adjustment slugs. If a transformer is badly out of adjustment, it is advisable to turn the slug out (counterclockwise) as far as possible before beginning alignment. Then turn the slug clockwise until the first peak is reached. This procedure is recommended to obtain the correct peak rather than an undesired second peak which is sometimes obtained when the slug is turned farther clockwise.

The alignment procedure to be used is given in the following steps:

1. To avoid undesirable beat response during alignment, remove the 6BZ7 R-F amplifier tube from its socket and rotate the channel selector to channel 13. The channel selector is on channel 13 when the flat of the shaft is facing straight up.

2. Connect the vertical input of the oscilloscope to the video test terminal (point "B" on Fig. 5) through the decoupling network shown in Fig. 2. The oscilloscope horizontal input should be connected to the sweep (synchronizing) output from the sweep generator ***through well shielded leads.*** Turn the sweep control on the oscilloscope to the "x" or "off" position.

3. Connect the negative terminal of a 9 volt bias battery to the AGC line (point "A"). . . . . and connect the positive terminal to chassis ground.

4. Couple the marker generator output to the sweep generator output so that the two signals are applied together to the points specified in the steps that follow. Some sweep generators have facilities for connecting the marker output directly into the sweep generator. With other sweep generators, the marker can be coupled to the sweep by wrapping a few turns of insulated wire around the center conductor of the sweep generator output cable and connecting the marker generator to this wire. The loose coupling obtained in this manner is desirable because ***excessive marker signal injection will distort the response curve.***

5. Adjust the sweep generator for a center frequency of 44 mc. with a sweep deviation of 10 mc.

6. Connect the high side of the sweep generator output cable directly to the control grid of the 3rd I-F amplifier, and connect the ground side of the cable to the chassis partition as close as possible to the ground point for the 3rd I-F amplifier tube. Keep the leads from the cable as short as possible.

7. Detune the plate circuits of the 1st and 2nd IF amplifiers by attaching alligator or similar type clips to pin #5 of the 6CB6 1st and 2nd IF amplifier tubes. *Use care to avoid shock.* This step is necessary to avoid absorption of the signal that is applied to the 3rd IF grid.

8. Adjust the oscilloscope vertical gain and the sweep generator output level to obtain a curve on the oscilloscope. To avoid a distorted curve, the recommended practice is to use maximum oscilloscope vertical gain and only enough sweep signal amplitude to obtain a good curve.

9. Set the marker generator to 44 mc. with the output attenuated until the marker pip is barely visible on the curve, and adjust the primary of the 3rd common I-F transformer, T302, until the 44 mc. marker pip is at the highest point on the response curve.

10. Adjust the secondary of T302 to make the top of the response curve symmetrical.

11. Make certain that the response curve coincides with Fig. 6A, using the marker to check at the appropriate frequencies. The 44 mc. pip must strike the center of the flat response region, the 42.25 mc. and 45.75 mc. points must be at equal heights, and the 43 mc. and 45 mc. points must be at equal heights. Re-adjust the primary and secondary of T302 if necessary to obtain these conditions.

12. Remove the detuning clips that were attached in step 7.

13. Disconnect the sweep generator from the grid of the 3rd IF amplifier.

14. Connect a signal generator that has an output of .02 volt or higher to the grid of the 1st IF amplifier, "high" side to the grid and ground side to the chassis. Adjust the signal generator to 47.25 mc. amplitude modulated, and increase the output until a sine wave response is visible on the oscilloscope.

15. Adjust the adjacent channel sound trap, L302, for minimum response on the oscilloscope.

NOTE: If a signal generator is not available and the receiver is located in a strong signal area where adjacent channel sound interference occurs, L302 can be adjusted by tuning the receiver to the channel on which the adjacent channel interference occurs, carefully adjusting the fine tuning control to its correct setting, and adjusting L302 to the position where the adjacent channel sound interference is eliminated.

16. Attach a detuning clip to the plate of the 1st IF amplifier tube, and remove the amplitude modulated signal generator connections.

17. Connect the high side of the sweep generator output cable directly to the control grid of the 2nd IF amplifier. Connect the ground side of the cable to the chassis partition as close as possible to the ground point of the 2nd IF amplifier tube.

18. Adjust the primary of the 2nd common I-F transformer, T301, for maximum height of the response curve at 44 mc., and adjust the secondary of T301 to make the top of the curve symmetrical.

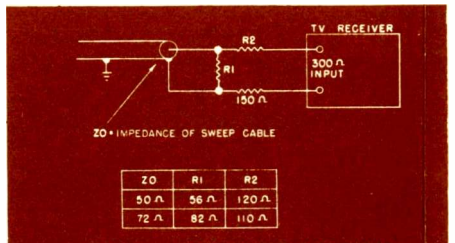
19. Make certain that the curve corresponds to Fig. 6B. The 44 mc. pip must strike the center of the flat response region, the 42.25 mc. and 45.75 mc. points must have equal heights, and the 43 mc. and 45 mc. points must have equal heights. Re-adjust the primary and secondary of T301 if necessary.

20. Remove the detuning clip from the plate of the 1st I-F amplifier.

21. Move the sweep output connection from the grid of the 2nd I-F amplifier to the grid of the 1st I-F amplifier, and connect the ground side of the cable as close as possible to the ground point for the 1st I-F amplifier tube.

22. Detune L103 located on the tuner by rotating it several turns counterclockwise. Otherwise, the setting of L103 will affect the waveshape in the following step.

23. Adjust the primary of the 1st common IF transformer, T300, for maximum height of the response curve at 44 mc., and adjust the secondary of T300 to make the top of the curve symmetrical.



ZO	R1	R2
50Ω	36Ω	120Ω
72Ω	82Ω	110Ω

FIG. 3 — IMPEDANCE MATCHING NETWORK

24. Adjust L103 so that the dip or "suck-out" which it produces on the response curve is at 44 mc. (center of curve).

25. Make certain that the curve corresponds to Fig. 6C. If the marker frequencies fall at the correct points, no transformer re-adjustments are required.

26. Remove the sweep output connection from the grid of the 1st IF amplifier.

27. Replace the RF amplifier tube which was removed in step 1.

28. Adjust the sweep generator to channel 13 (210 to 216 mc.), and connect its output cable to the receiver antenna terminals through the impedance matching network shown in Fig. 3. Keep the leads as short as possible.

When working with very high frequencies, the impedance matching network is required because response curves are of no value unless the sweep generator output cable is terminated in its characteristic impedance. Any mis-match present results in standing waves which may seriously affect the observed waveform depending upon the amount of mis-match.

29. Couple the marker generator output to the sweep generator output by using the loose capacitive coupling provided by a one turn loop, or connect both the high side and the ground side of the marker generator cable to the receiver chassis. Loose coupling between the marker generator and the receiver is desirable to avoid distortion of the response curve.

30. Set the channel selector to channel 13 and the fine tuning control to the middle of its range.

31. Adjust the sweep generator output to the lowest level that provides a usable response curve on the oscilloscope, and adjust the marker output so that the marker pip is barely visible.

32. Adjust the 1st IF reactor, L300, for a symmetrical response curve.

33. Set the marker generator to 41.25 mc., and adjust the 41.25 mc. sound trap, L301, to minimize the amplitude of the marker pip.

34. Using the marker generator at 41.25 mc., 42.25 mc., 43 mc., 44 mc., 45.75 mc., and 45.25 mc., see that the marker pips fall as indicated on Fig. 6D. If the curve is satisfactory on channel 13, all other channels should also be satisfactory.

4.5 MC. TRAP ALIGNMENT PROCEDURE

1. Connect the high side of the signal generator to the video test terminal (point "B" on Fig. 5) through a .001 mfd mica capacitor, and ground the low side to the chassis.

2. Adjust the signal generator to 4.5 mc. (unmodulated). The accuracy of this frequency is very important. If a crystal controlled signal generator is not available, the frequency should be checked with an accurate frequency meter.

3. Connect the common lead from the VTVM to the chassis, and connect the ***R-F probe*** from the VTVM to the cathode of the CRT. This point is shown as point "C". . . . . Note that this point is above ground potential and, therefore the R-F probe must contain a blocking capacitor.

4. Using a strong 4.5 mc. signal, adjust the 4.5 mc. trap, L303 for minimum indication on the meter.

SOUND ALIGNMENT PROCEDURE

The sound system can be aligned using either locally generated signals or a received TV signal. Since the latter method does not require signal generating equipment, it will be described first and will be followed by the procedure using locally generated signals.

To use an "air" signal for alignment:

1. Tune the receiver to a TV station and connect an attenuator between the receiver and the antenna so that the strength of the signal can be varied from weak to strong.

2. Set the quieting control (R202) located on the back of the chassis approximately to its mid-position.

3. Adjust the 4.5 mc. IF slugs (L200 and L201) for maximum program sound. If peaks occur at two different positions of the slug, use the peak that occurs when the slug is farthest counterclockwise. Reduce the signal to its lowest usable level and recheck the adjustments.

4. Apply a ***strong*** signal to the receiver, and adjust the quadrature coil (L202) for maximum program sound. If peaks occur at two different positions that are widely separated, use the one that occurs with the slug farthest counterclockwise. If two peaks occur within a *narrow* range of adjustment, sufficient signal is not being applied to the receiver or the quieting control is not set at the desired position.

5. Apply a very weak signal that allows noise to be heard and adjust the quieting control (R202) for minimum noise. The position at which the noise is minimized depends on the strength of the signal; therefore, the weakest usable station in the area should be used for this adjustment. This control determines the AM rejection characteristics of the sound system, and its correct setting is normally about mid-position. ***Do not leave the quieting control set at its maximum counterclockwise position.***

To use locally generated signals for alignment:

1. Connect an oscilloscope or an AC voltmeter across the volume control for use as an indicator.

2. Apply a 4.5 mc. FM signal (deviation approximately 7.5 kc.) to the video test point (B on Fig. 5).

3. Using the lowest signal level that will produce an indication, adjust L200 and L201 for maximum output.

4. Using a ***strong*** signal, adjust L202 for maximum output.

5. Apply a 4.5 mc. AM signal (modulated approximately 30 percent) to the video test point.

6. Beginning with a very low signal level, increase the generator output, while rotating the quieting control back and forth, until the signal level is such that the AM output across the volume control dips to ***zero*** with a rise on each side as the quieting control is rotated. Set the quieting control for zero output at this signal level.

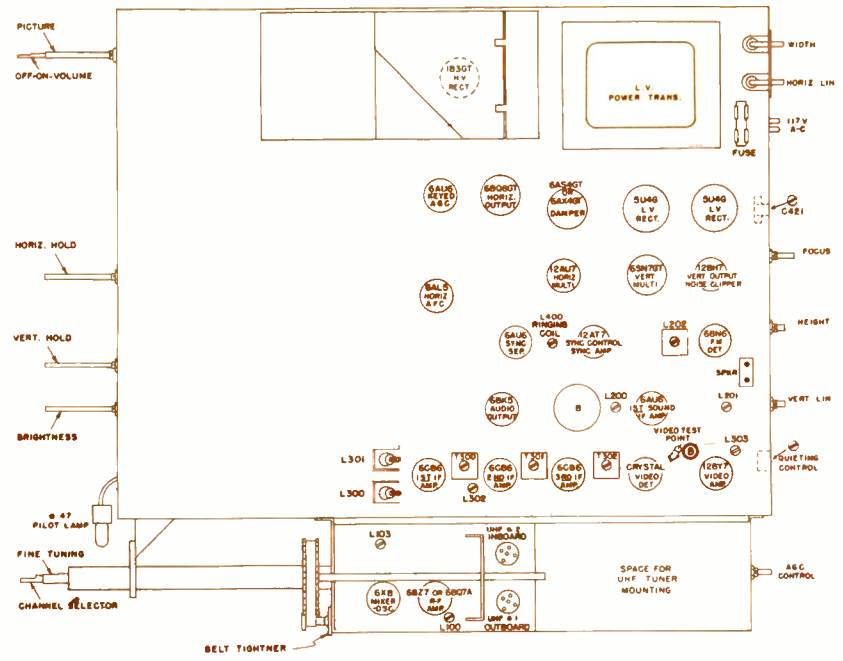


FIG. 5 — TOP VIEW OF CHASSIS

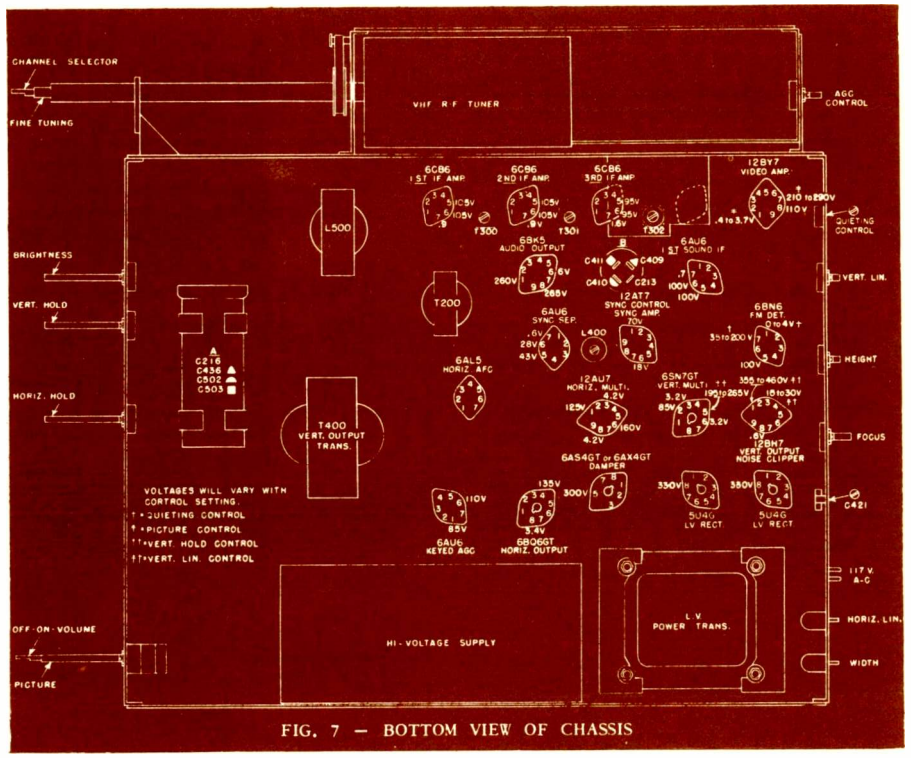


FIG. 7 — BOTTOM VIEW OF CHASSIS

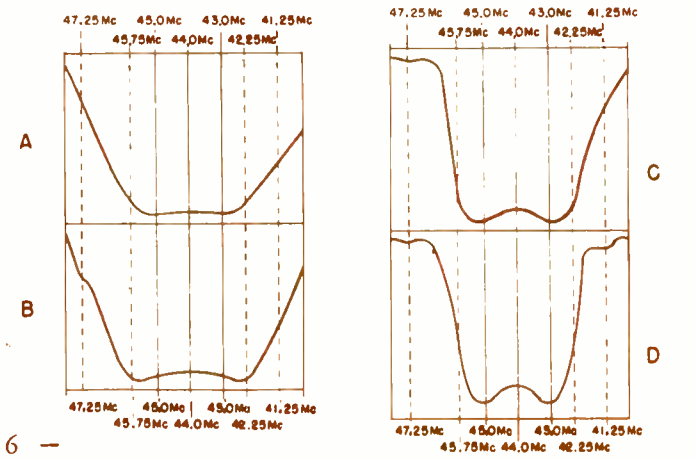
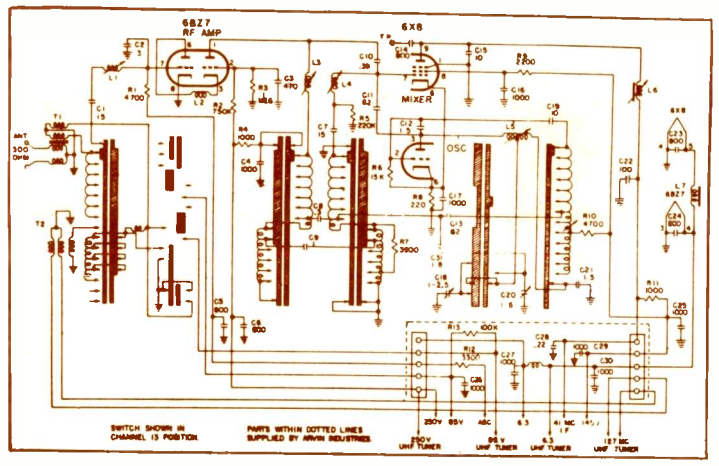


FIG. 6 — RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

TECHNICIAN
CIRCUIT DIGESTS

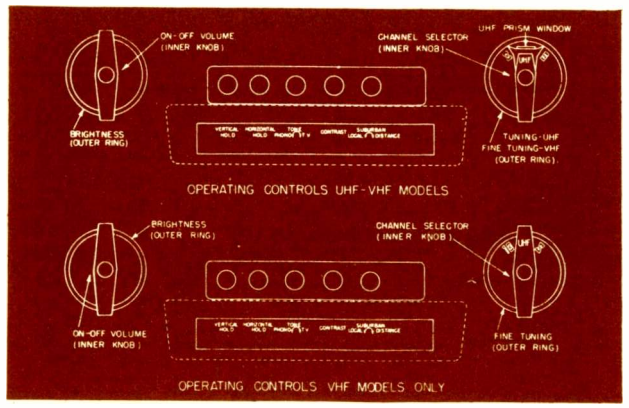


1. RESISTANCES ARE SHOWN IN OHMS; K=1000, MEG=1,000,000
2. CAPACITANCE VALUES LESS THAN (1) ARE IN MFD AND MORE THAN (1) IN MMFD UNLESS OTHERWISE NOTED
3. COIL RESISTANCE VALUES LESS THAN (1) OHM ARE NOT SHOWN
4. ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION
5. D.C VOLTAGES ARE READ WITH VOLTOHMYST ANTENNA TERMINALS SHORTED, LINE VOLTAGE 117 VAC, 60 CYCLES *
6. RESISTANCE VALUES SHOWN ARE WITH PART OUT OF CHASSIS.
7. ALL WAVEFORMS ARE PEAK TO PEAK VOLTAGE NORMAL PICTURE.

* ALL CONTROLS SET FOR NORMAL PICTURE BEFORE SIGNAL WAS REMOVED FROM ANTENNA TERMINALS CHANNEL SELECTOR ON VHF POSITIONS

*** DEPENDS UPON SETTING OF ELECTRONIC STABILIZER

** 135V ON STRONG SIGNAL. 90V ON NO SIGNAL. NUMERALS BESIDE SUPPLY VOLTAGES INDICATE NUMBER OF THOSE SUPPLY POINTS ON SCHEMATIC.



OPERATING THE TELEVISION CONTROLS (UHF) ON (UHF-VHF MODELS)
UHF operation is identical to (VHF) operation as outlined above, with the exception of step 3 and 4 which differ as follows:

3. Rotate the CHANNEL SELECTOR to UHF position-prism window UP.
4. Rotate the FINE TUNING until the dial pointer in the prism window is approximately at the desired channel number. Adjust the FINE TUNING for best picture definition--the sound will automatically be best at this point due to "synchro-sound tuning."
NOTE: In its normal tuning position the FINE TUNING control moves the UHF dial pointer very slowly for accurate tuning. By PUSHING FIRMLY IN on the Fine Tuning Knob a direct drive will be engaged. This will allow very rapid movement of the UHF dial over the complete UHF band when the FINE TUNING is turned. When the dial pointer is in the vicinity of the desired channel number, the FINE TUNING Should be released into its normal "geared-down" position for careful tuning of the station.

Chassis TE359:
9200 series

ARVIN
Chassis TE 359

Technician
CIRCUIT DIGEST
100

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N. Y. • Plaza 9-7880

TECHNICIAN*

*Trademark

November • 1953

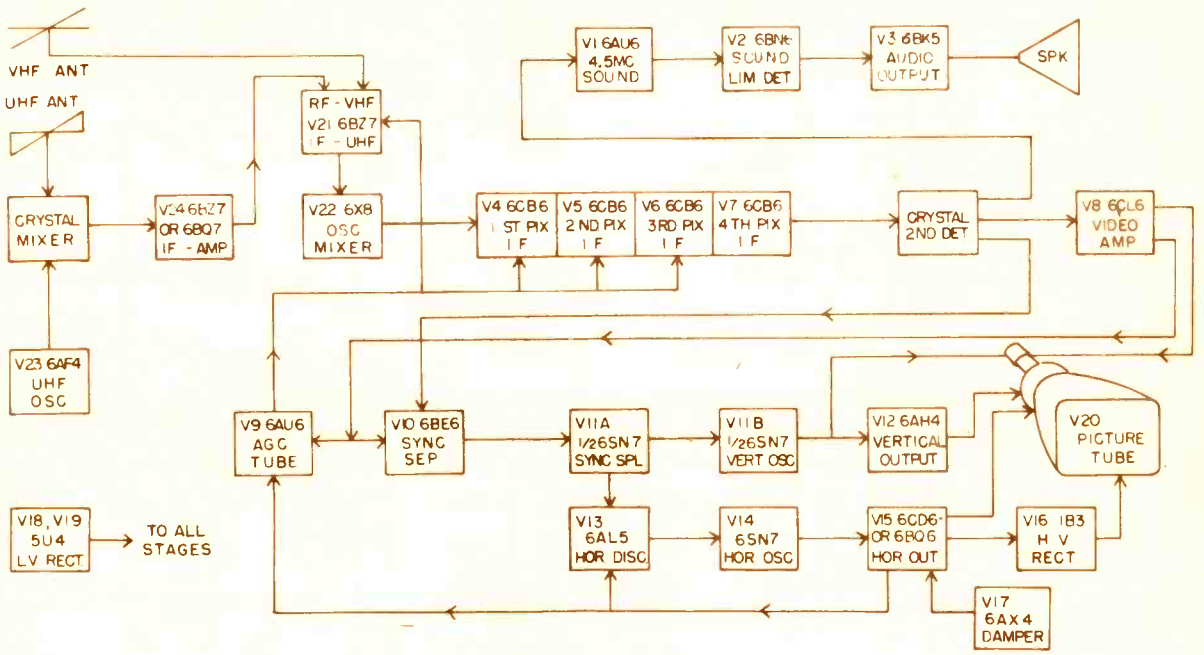
CIRCUIT DIGESTS

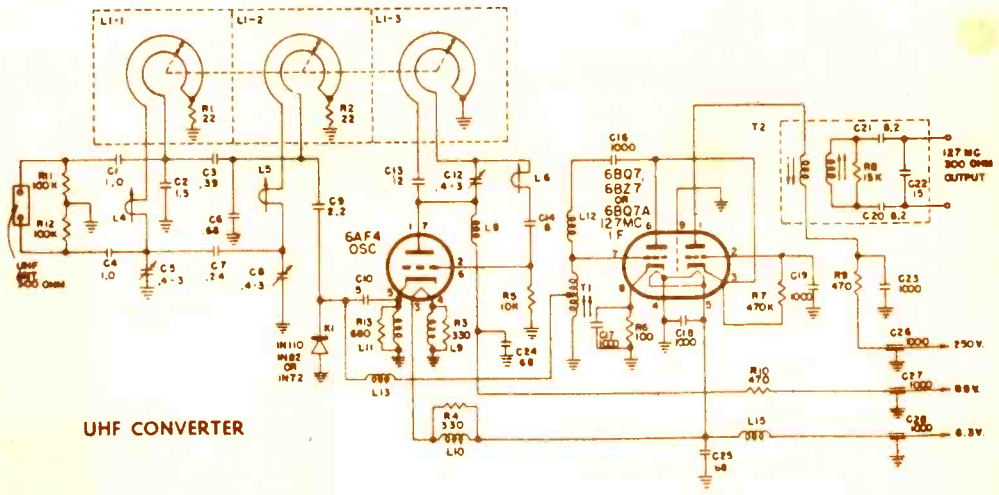
In This Issue (No. 15)

Circuit Digest No.

15

For complete Index to all earlier Circuit Digests, see second preceding right-hand page in main magazine





UHF CONVERTER

ARVIN
Chassis TE 359

Technician
CIRCUIT DIGEST
100

ARVIN
Chassis TE 359

Technician
CIRCUIT DIGEST
100

BUZZ CONTROL
This control is provided to adjust the AM rejection characteristics of the sound system (sync buzz, noise, or hiss). Since this control has been adjusted for an optimum setting at the factory, do not attempt to make this adjustment unless sync buzz noise or hiss is present. Caution: Turn this control slowly from the present preset position --- usually not more than 30 degrees rotation in either direction will be necessary.

HORIZONTAL LOCK
For best adjustment turn horisontal control maximum counter clock wise and set the horisontal lock coil so that the pattern will break on 3 to 4 bars at this point.

VERTICAL LINEARITY
This control affects the linearity of the top of the picture --- for instance, improper setting of this control will cause a person being televised to have a stretched or flat head.

PHONO
Phono jack is on rear panel. Switch on tone control must be turned when using this receiver as a phono amplifier.

HORIZONTAL DRIVE
Adjust HORIZONTAL DRIVE TRIMMER to the right to the point where "overdrive" lines just disappear. "Overdrive" lines appear as a vertical white line in the left portion of the picture. The Horizontal Drive Trimmer is located in the control grid circuit of the Horizontal Output Tube controlling the operating characteristics of the tube. Turning the HORIZONTAL DRIVE TRIMMER to the right reduces the Horizontal Drive.

AUTOMATIC ELECTRONIC STABILIZER CONTROL
This control provides a means of stabilizing the sync circuit against electrical interference (such as automobile ignition and other impulse type noises.) This control is set at the factory for best overall results. When electrical interference makes the picture unstable tune in strongest station available and turn control clockwise until picture shifts or distorts. Then turn control counter clockwise until picture shifting or distorting disappears. If a strong signal is not available turn control until picture becomes most stable. (Usually about one-half of full rotation.)

HORIZONTAL LINEARITY
Adjust for uniform linearity across face of tube. Should one or two horisontal white bars appear on the right side of the picture with the horisontal drive, width and HORIZONTAL LINEARITY CONTROLS set properly, turn the HORIZONTAL LINEARITY CONTROL clockwise until these bars disappear.

FOCUS CONTROL
This control is operated by a plastic rod with a loop end which protrudes from an opening near the center of the rear cover. Rotate this plastic rod for the sharpest detail.

CENTERING
Loosen lock screw move CENTERING CONTROL until picture is properly centered.

TRIPLE-POWER SWITCH
The normal position of the switch is in the "distance" position (maximum to the right) and should be moved to the "suburban" position (center) if picture shows evidence of overloading or distortion. In extreme cases where the receiver is operated in close proximity to television station, it may be necessary to turn this switch to the "local" position (maximum to the left) to prevent this overloading.

TWEET ADJUSTMENT (UHF MODELS ONLY)
This adjustment is made accessible by removing channel selector and fine tuning knobs. This adjustment is the center of the three screw driver adjustments and is the furthest to the right. This UHF position oscillator trimmer should not be adjusted unless some type of interference is present at the 127 megacycle frequency.

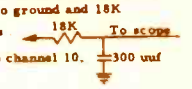
STAGGER-TUNED I.F. ALIGNMENT PROCEDURE

1. Set tuner to channel 9-10 or 11.
2. Pull AGC tube V9 out.
3. Connect -2.5 volts bias from junction R304 and R303 to ground with triple power switch in Suburban position.
4. Connect VTVM across R217 and R218. Isolate VTVM with 18K resistor. Use -5V scale.
5. Connect RF signal generator to ungrounded mixer tube shield i.e, lift mixer tube shield until it is just ungrounded.
6. Good R.F. grounding between TV receiver on test and test equipment is necessary. A metal surface bench top should be used to insure proper RF grounding.

STEP	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	39.75 mc	Top T201 for min.	
2.	41.25 mc	Bottom T202 for min.	Outer peak
3.	47.25 mc.	Bottom T203 for min.	Outer peak
4.	43.2 mc UHF-VHF 42.8 mc VHF	Tuner coil for max.	Note: Turn bottom T201 completely out before making this adjustment.
5.	45.2 mc UHF-VHF 45.0 mc VHF	Bottom T201 for max.	
6.	44 mc	Top T202 for max.	Outer peak
7.	42.2 mc	Top T203 for max.	Outer peak-recheck steps 6 and 7
8.	40.3 mc	Bottom T204 for max.	
9.	45.2 mc	Bottom T205 for max.	
10.	43 mc	Bottom T206 for max.	Recheck steps 8-9 and 10

OVERALL SWEEP CHECK

1. Connect RF signal generator to chassis near V4 for marker generator. Push shield down on mixer tube.
2. Connect oscilloscope across R217 & R218. Isolate oscilloscope lead with 300 uuf to ground and 18K resistor in series.
3. Increase bias to -3.5 volts.
4. Connect sweep generator to antenna terminals. Adjust sweep generator & tuner to channel 10.



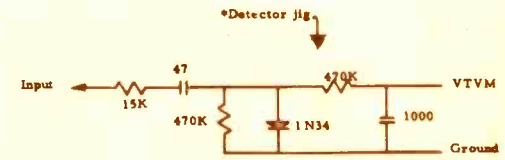
ADJUSTMENT	INSTRUCTIONS
T205	T205 positions 45.75 marker
T206	T206 adjusts tilt of curve
Note: If desired curve cannot be obtained, slight adjustment of tuner coil and bottom T201 may be necessary.	

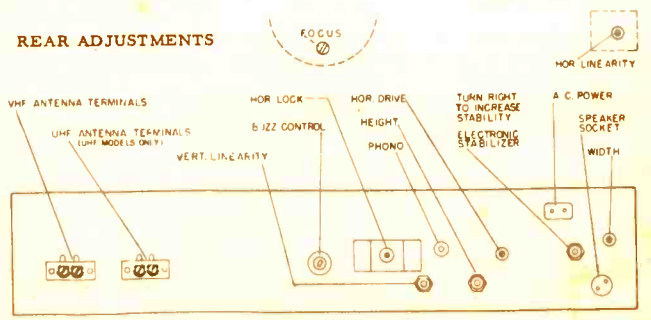
SOUND AND 4.5 MC TRAP ALIGNMENT

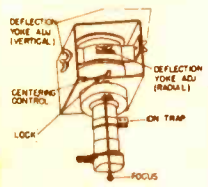
1. Tune in available TV station and reduce signal into set until hiss is heard with sound. This can be done by inserting an attenuator in the antenna lead-in or by removing antenna lead-in from the set and stray feeding in signal by placing lead-in in close proximity of the set.
2. Set buzz control in the middle of its range. Adjust take off coil L201, top and bottom T101, Quadrature coil (L101) and buzz control for cleanest sound and minimum buzz. If any adjustment causes hiss to disappear reduce signal into set until hiss reappears and continue with adjustments.

Note: If difficulty is encountered either in reducing signal sufficiently or adjustments being very broad. The following procedure may be used.

STEP	EQUIPMENT	CONNECTION	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	Det. jig *	Input of jig to pin 2 of V2			Keep lead between 15K resistor and pin 2 as short as possible
2.	VTVM	out put of jig	Tune in available channel	L201-T101 (top and bottom) for max.	Adjust L201 on inner peak
3.		remove jig	Same	Quadrature coil (L101) for max. sound	Set buzz control in middle of its range before adjusting L101
4.			Same	Buzz control for minimum buzz	Correct adjustment of buzz control is approx. middle of its range
5.	Det. jig *	Junction L205 and L206			Connect VTVM to output of jig
6.	RF signal generator	Pin 9 (V8)	4.5 mc	Tune 4.5 mc trap (L205) for minimum	







CABINET ANTENNA (UHF-VHF)
This receiver has separate built-in antenna for UHF and VHF. This receiver is normally shipped with these built-in antennas connected. If an outdoor antenna is required, the built-in antenna which is being replaced with an outdoor antenna, must be disconnected. NOTE: If an all-channel (UHF - VHF) antenna is satisfactory for use in your area, it is possible to connect both the UHF and VHF terminals on the back of the television set to the antenna lead-in by the use of a MM 30 Mighty Match (Vee-D-X) or equivalent.

An Editorial Service of CALDWELL-CLEMENTS, INC. • 480 Lexington Avenue, New York 17, N.Y. • Plaza 9-7880

capacitor replacements

FOR SETS OF THE MONTH

CBS-COLUMBIA CHASSIS 750-3

Symbol No.	Rating Mf @ WVDC	CBS-Col. Part No.	Sprague Replacement
C106	1 @ 50	PA20138	TVA-1300
C129	50 @ 25	PA20182	TVA-1206
C203	40+40+20+20 @ 450	PA20144	TVA-2740 / TVA-2730
C216	5 @ 350NP	PA20174	*TVA1504
C310	10 @ 25	PA20137	TVA-1204
C317	25 @ 12	PA20147	TVA-1205

* Use two units in series with reversed polarity.

CROSLEY CHASSIS 411, 411-1

Symbol No.	Rating Mf @ WVDC	Crosley Part No.	Sprague Replacement
C125	5 @ 50	154103	TVA-1303
C140	10 @ 300/200+200 +30 @ 150	155910	TVL-4559
C142	10 @ 50	154104	TVA-1304
C147	200 @ 150	155911	TVL-1431
C148	200+5 @ 150	155426	TVL-2444
C164	10 @ 10	156054	TVA-1204
C176	20 @ 600	156021	TVA-1906

SYLVANIA CHASSIS 1-518-1, -2, -3

Symbol No.	Rating Mf @ WVDC	Sylvania Part No.	Sprague Replacement
C109	2 @ 50	161-1001	TVA-1301
C113	20+10 @ 400/20 @ 100/25 @ 25	161-4006	R-1303
C126	2 @ 50	161-1001	TVA-1301
C175	80+40 @ 400	161-2004	TVL-2675
C176	80+40 @ 200/100 @ 50	161-3012	**TVL-4700
C215	10 @ 500	161-1010	TVA-1802
C266	10 @ 450	161-1013	TVA-1705

** Omit 10 Mf. Section.

TRUETONE MODEL 2D1326A (Chassis 21T2A)

Symbol No.	Rating Mf @ WVDC	Truetone Part No.	Sprague Replacement
C70	100+10 @ 300/10 @ 75/100 @ 25	8C-20808	TVL-4638
C72	10+10 @ 300/10 @ 15	8C-20954	TVL-3580
C90	100 @ 150	8C-20709	TVL-1423
C91	100 @ 150	8C-20684	TVL-1423
C111	50 @ 300	8C-21274	TVA-1613

WESTINGHOUSE CHASSIS V-2243-1

Symbol No.	Rating Mf @ WVDC	Westing-house Part No.	Sprague Replacement
C213B, C409B, C410B, C411B	30+10 @ 450/150+20 @ 50	V-11535-1	TVL-3753 / TVA-1306
C216A, C436A, C502A, C503A	40+40 @ 450/30+30 @ 350	V-9891-1	TVL-4720
C320	10 @ 450	V-10293-1	TVA-1705

ARVIN CHASSIS TE359

Symbol No.	Rating Mf @ WVDC	Arvin Part No.	Sprague Replacement
C1	30 @ 400/60+20 @ 350/100 @ 50	22422-20	R-1457
C2	50 @ 400/60+40 @ 350/20 @ 25	22422-21	TVL-4707 / TVA-1712
C3	30 @ 400	22422-22	TVA-1720
C4	10 @ 350	41429	TVA-1604
C5	5 @ 250	40002	TVA-1501
C6	2 @ 150	41534	TVA-1701
C7	4 @ 150	25453	TVA-1402

Sprague makes more capacitors . . . in more types . . . in more ratings . . . than any other capacitor manufacturer. Send 10c for 44-page TV Replacement Capacitor Manual to Sprague Products Co., 65 Marshall St., North Adams, Mass., or get it FREE from your Sprague distributor.

DON'T BE VAGUE...INSIST ON

SPRAGUE

(Distributors' Div. of the Sprague Electric Co.)

Have you hung up

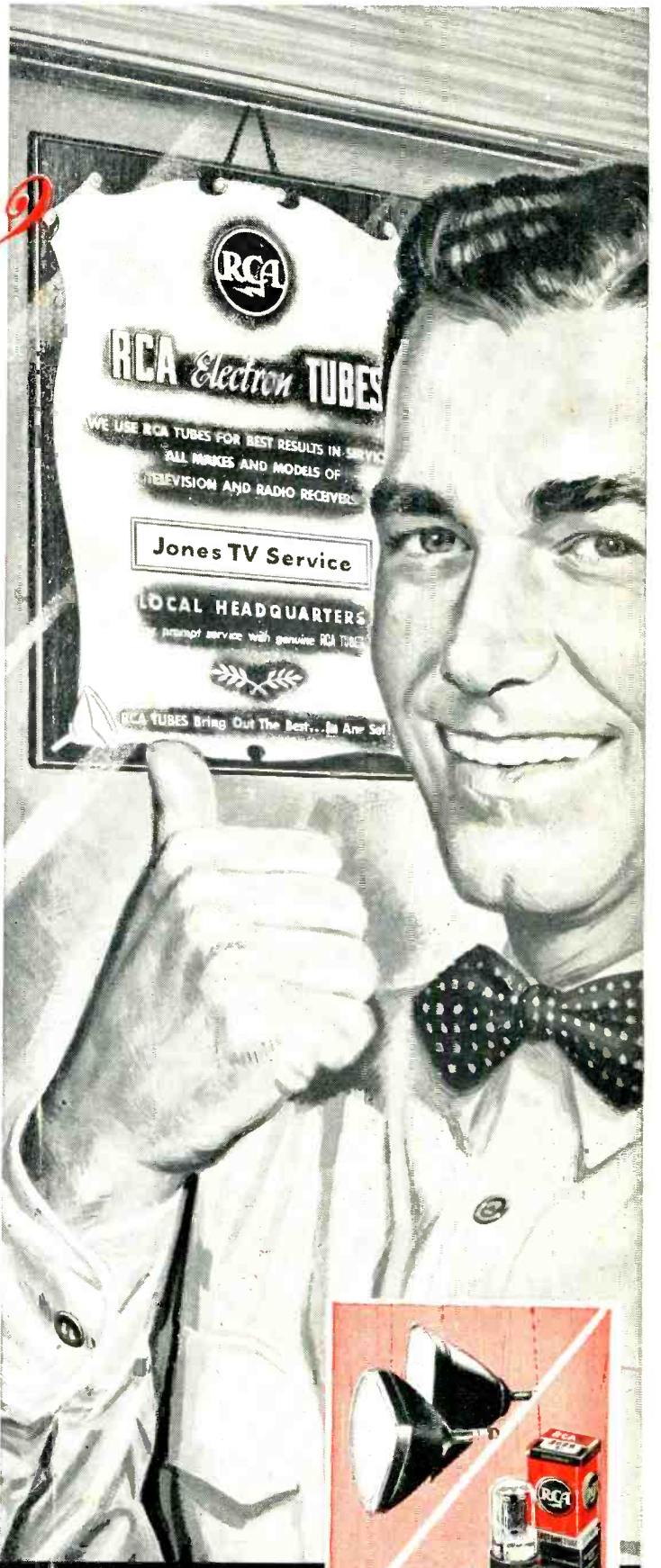
your shingle?

IT PAYS TO KEEP GOOD COMPANY . . . and it's good business to advertise the good company you keep.

Thousands of dealers and servicemen are using the sales-magic in the RCA name to instill confidence in their customers. Identifying *your* name with RCA pays off in dollars and cents.

And it's so easy to do . . . because RCA's new Dealer Identification Program provides you with a handsome "shingle" with your name on it, that you'll be proud to display in your shop. When a customer sees this Dealer Identification Plaque he *knows* you are using the best tube products available.

So, we ask . . . "Have you hung up *your* shingle yet?" If not, be sure to see your **RCA Tube Distributor** today and learn how *you* can qualify for a Registered Dealer Plaque at no extra cost.



Unlock the door to bigger profits

Here's *your* key to better business . . . RCA's dynamic Dealer Identification Program. Ask your *RCA Tube Distributor* for your copy of the colorful, 16-page booklet "A Magic Pass-Key to Customer Confidence." It tells you how — for the first time—you can become a Registered Dealer . . . and get *extra* sales benefits.

RCA® RADIO CORPORATION of AMERICA
ELECTRON TUBES HARRISON, N.J.