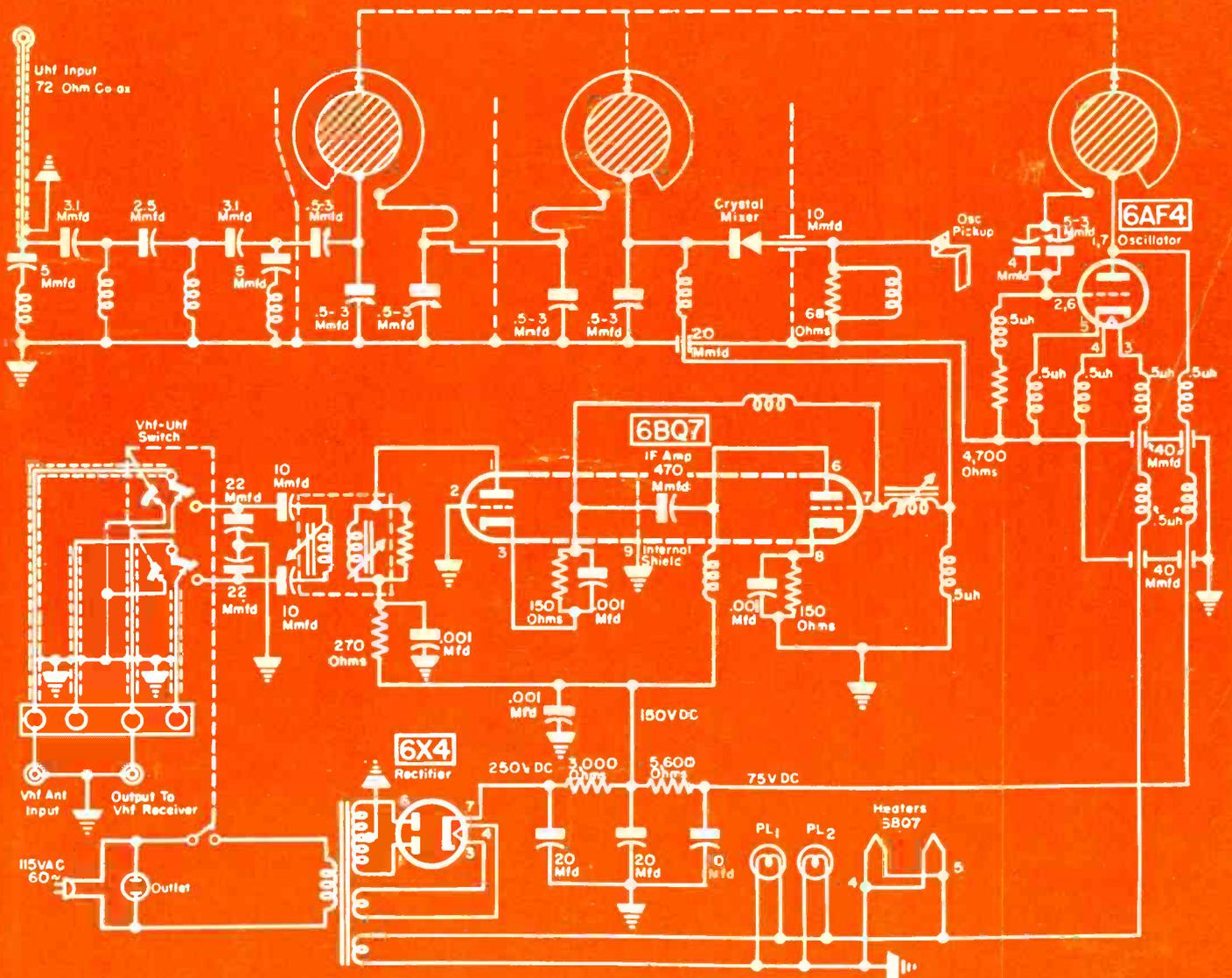


SERVICE

AUGUST
1952



Transmission-line tuned uhf TV converter circuitry.
[See page 2]



MAXIMUM STRENGTH

In the PARALLELOGRAM OF FORCES

featuring built-in thrust-bearing to take up down thrust

Sturdy

...to support any antenna array

Power

...more than you'll ever need

all yours in the **MODEL TR-12**

the C★D★R Rotor

All you could ask for in an antenna-turning device... the TR-12 CDR ROTOR is the last word in streamlined efficiency! It will support and turn with ease any antenna array—even 4-stack designs... you just can't beat it! Some of the features include: speedy installation, no loose parts to assemble—quick-mounting antenna mast collet—dependable, trouble-free, fool-proof operation!

MODEL TR-12 ... Complete rotor with handsome modern design plastic cabinet and meter control dial — fingertip lever — using 4-wire cable **\$47.95**

MODEL TA6 ... thrust-bearing accessory, separately **\$4.95**

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



SUBSIDIARY OF



THE RADIART CORPORATION CLEVELAND 13, OHIO

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

HERE YOU ARE, SERVICEMEN!

win \$5,000.00

in cash prizes!

Jensen
NEEDLE'S

"WIN
A GRAND"
CONTEST



\$1000 FIRST PRIZE!

187 WINNERS!

187
CASH PRIZES

1st Prize	\$1000.00
2nd Prize	500.00
3rd Prize	250.00
Nex: 10 Winners . . . each	100.00
Nex: 25 Winners . . . each	50.00
Nex: 50 Winners . . . each	10.00
Nex: 100 Winners . . . each	5.00
Total Prizes	\$5000.00

Contest Closes
DEC. 31, 1952

Special Prize
FOR EARLY BIRDS!

A precision quality, high powered Jensen Needle Microscope will be given to each of the first 500 servicemen to send in a completed Official Entry Blank. \$5.00 value. Handy pocket size to take on your service calls.

Start saving those packages . . . get your entry in soon!

RULES OF ENTRY

1. What You Have To Do . . . Jensen Phonograph Needles are packaged two ways—on a card or in a plastic box. Every time you sell or install a Jensen Needle during this contest, save the card or colored insert in the box (not the instruction sheet). Collect as many as you can during the contest period. Prizes will be awarded to the 187 servicemen sending in the most empty Jensen Needle packages.

2. When Is The Contest . . . The Jensen "Win a Grand" Contest opens September 1, 1952 and closes at midnight December 31, 1952.

3. Who Is Eligible . . . This contest is open to every bona fide radio-television serviceman in continental United States. This includes employees as well as employers, anyone who is actively engaged in this work during the period of the contest. No employee of Jensen Industries, Inc. or its advertising agency is eligible.

4. How To Enter . . . To be eligible for one of the 187 cash prizes, you must send in one completed Official Entry Blank (available at your regular Parts Distributor) together with all the empty Jensen Needle packages you have collected during the period of the contest. All Jensen Needle packages, EXCEPT the Jensen "Symphonette" and Jensen Coin Machine Needles, are acceptable.

5. 15-Word Statement . . . On the Official Entry Blank, you will find a sentence beginning, "I Sell Jensen Needles Because" Just complete this sentence in 15 words or less. As a suggestion, you might say, "I Sell Jensen Needles Because they are easier to install." (5 words).

6. Where To Send Entries . . . All entries to be considered for prizes must be sent, accompanied by a completed Official Entry Blank, direct to:

Jensen Contest Headquarters, 329 South Wood St., Chicago 12, Illinois

Do not send your entry to your Parts Distributor. You may hold your entry until the last day or send it in as often as you like, but be sure you have a suitable means of identification with each shipment (such as your original Official Entry Blank). REMEMBER: All entries must be postmarked before midnight, December 31, 1952, to be eligible.

7. Duplicate Prizes . . . In the event of a tie, duplicate cash prizes will be awarded to all tying contestants.

8. Judges' Decision Final . . . Decision of the judges, chosen by Jensen Industries, Inc., will be final. All entries become the property of Jensen Industries, Inc., and none will be returned.

9. Only Entry Itself Counts . . . Only the total number of empty Jensen Needle packages, together with the completed Official Entry Blank, counts toward the prizes. Neatness, spelling, grammar or packing of entry do not count.

10. Winners To Be Announced . . . Winners in the Jensen Contest will be notified as soon after the contest closes as possible.

HERE'S ALL YOU HAVE TO DO! . . .

It's Easy! Simply save the cards and colored inserts from all the Jensen Phonograph Needles you sell or install from now 'til the end of the year. Pick up an Official Entry Blank at your regular Parts Distributor, complete the sentence, "I Sell Jensen Needles Because . . ." and mail this with your packages direct to Jensen Contest Headquarters before Midnight December 31st. That's all there is to it . . . the radio-TV serviceman sending in the most Jensen packages wins \$1000 cash. It might be you!

WHY JENSEN SPONSORS THIS BIG CONTEST!

Every radio-television serviceman can get a lot more business for himself without additional tools, equipment or labor simply by just replacing worn-out phonograph needles. That's why Jensen sponsors this unique contest—to show you how easy it is . . . and profitable, too. And Jensen supplies every assistance you need, with a precision made needle for every type of record player and complete easy-to-follow instructions.

Jensen INDUSTRIES, INC.
331 South Wood Street, Chicago 12, Illinois

JENSEN . . . Oldest name in Sound Engineering

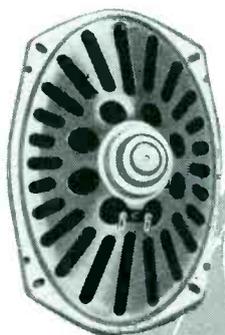
Sell a JENSEN NEEDLE on Every Service Call!

SERVICE, AUGUST, 1952 • 1



VIKING

speakers by
Jensen



For Automotive Replacement



Jensen

JENSEN MANUFACTURING COMPANY
DIVISION OF THE MUTER COMPANY
6607 S. LARAMIE AVE., CHICAGO 38, ILLINOIS
IN CANADA:
COPPER WIRE PRODUCTS, LTD., LICENSEE

Viking Speakers are ideal for automotive replacements. Designed and manufactured by Jensen, one of the world's largest suppliers of original automotive equipment speakers, they incorporate the fine engineering and production skills which go into every Jensen product.



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Editor

F. WALEN
Assistant Editor

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

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THE WORLD'S FIRST BROAD BAND YAGI!

CHANNEL MASTER'S
new **futuramic**

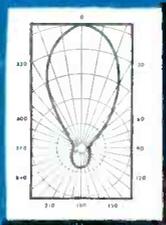


The first antenna ever built that combines . . .

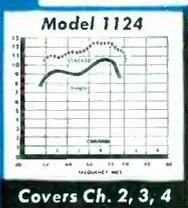
- ✧ Broad band coverage *with the*
- ✧ High gain and directivity of the Yagi

Designed for service TODAY and TOMORROW — in these 3 booming VHF markets:

Horizontal Polar Pattern



BOOM BRACED



- Areas in which the FCC has ordered VHF stations to change channels (on the same band).

When a channel-shift takes place, the thousands of single-channel Yagis in use will become obsolete overnight. Unless such antennas are all changed on the same day the shift takes place, the set owner will have to get along without television for a period of time. However, you can install the Futuramic NOW. It will provide better reception than conventional Yagis on the present channels — and when the shift occurs, this superior reception will continue on the new channel without interruption!

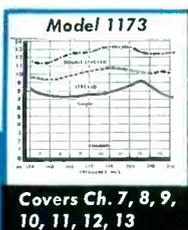
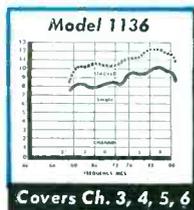
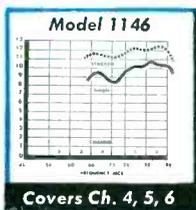
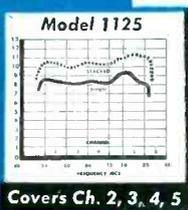
- Areas in which a new VHF station is being added to the present one.

The great number of single-channel Yagis

now in use will not bring in the new channel. If an additional Yagi is installed, it will have to be tied into the present installation with separate leads and a switching system. However, ONE Futuramic will do the job of BOTH antennas — at lower cost — with better results on both channels.

- Areas served at present by two or more VHF stations (on the same band).

In such areas, the installation man has had to compromise between conventional broad band antennas, and separate Yagis for each channel. Only the Futuramic will give you the full advantages of both. It combines highest gain and sharpest directivity with simple, economical installation.



Model No.	Channels Covered	List Price
1173	7, 8, 9, 10, 11, 12, and 13	\$20.83
1124	2, 3, and 4	\$40.97
1125	2, 3, 4, and 5	
1136	3, 4, 5, and 6	
1146	4, 5, and 6	

SHATTERS all performance records!

- Channel for channel, the Broad Band Futuramic will outperform any conventional SINGLE-CHANNEL Yagi.
- On each of its specified channels, one single Low Band Futuramic will outperform any 4-bay conical or fan array.
- A single High Band Futuramic will outperform any 2-bay conical or fan array on every channel from 7 to 13.
- A high-low Futuramic combination is the most sensitive array ever devised for all-channel VHF reception.
- And the Futuramic uses Channel Master's famous Z-Match system for maximum stacking gain.

Write for complete technical literature.

CHANNEL MASTER CORP.

ELLENVILLE, N. Y.



COMMON SENSE about easy tv servicing

Make your servicing job easier than you ever thought possible

Complete Servicing Facts Method Proved Outstanding Success

Tens of thousands of service technicians throughout the country have learned this key to fast, easy, profitable servicing: They *insist* on having the complete servicing facts for every receiver they repair! They know that by having the complete story . . . and only by having the complete story . . . can they spot trouble quickly and do an easy, permanent servicing job.

Here's an example: On Philco models 52-P-1810, 52-P-1812, 52-P-1840, 52-P-1842, 52-P-1844, 52-P-1882, 52-P-2110, 52-P-2142, codes 122 and 123, the manufacturer released 32 pages (8-1/2" x 11") of official service data. (That is what we published in Rider TV Manual Vol. 9 and in Rider TV Tek-File Pack 22.)

These models were made in a variety of production runs; using three different chassis . . . each with its own schematic. These chassis are identical in many respects . . . but the vital differences can make servicing a real headache. For instance, three types of power transformers are used. Each has different electrical constants—and a different part number. In the C2 deflection chassis, the power transformer has one high voltage winding of 635 volts, center-tapped, and four low voltage windings: one 5 volts, two 6.8 volts and one 6.4 volts. In the CP1 deflection chassis, the power transformer has one high voltage winding of 635 volts, center-tapped, but only three low voltage windings: one 5 volts, one 6.8 volts and one 6.4 volts. In the F2 chassis, the power transformer has one high voltage winding of 675 volts, center-tapped, and four low voltage windings: one 5 volts, two 6.8 volts and one 6.4 volts.

Suppose you were the service technician faced with one of these receivers. A single schematic showing just *one* of these chassis and *one* of these power transformers certainly would not be coverage for all production runs. If you were lucky, the single schematic might happen to match the receiver you had before you. But—and it's a very big but—you might also be unlucky and be faced with a receiver not described by the schematic! This is only one example in thousands of why you need *complete*, factory-prepared and factory-issued data for every set you service.

Here is how you can get this vital information. Insist on Rider Servicing Data. For 22 years Rider Servicing Data has been the *only* publishing source for the complete servicing facts: Exactly as issued by the manufacturer who made the set. Unabridged facts . . . everything is here to make your diagnosis and repair EASY. You get page after page of troubleshooting test patterns . . . large, easy-to-follow *complete* schematics . . . circuit explanations . . . stage by stage alignment curves . . . clear, enlarged chassis views . . . all circuit changes . . . and much, much more. For example: Rider tv servicing data has shown 'scope waveforms in tv receivers ever since the first tv receiver was made!

To meet your individual needs, Rider Servicing Data comes in two forms . . . both with these important, new features:

Manufacturers' Trouble Cures

These 3" x 5" standard index cards called Rider Handies contain vital manufacturer-issued permanent trouble cures plus production changes. Each Handy is identified with a manufacturer and a receiver model. With Rider Handies you save countless hours of diagnosis and repair time . . . because Handies contain the data you *must* have to make *permanent* repairs on many manufacturers' models. (Rider Handies information appears in Rider TV Tek-File packs, and Rider TV Manuals beginning with Vol. 9.)

Guaranteed Replacement Parts Listings

Beginning with Rider T.V. Manual 10 and Rider T.V. Tek-File Pack 57, replacement parts listings are included. All the replacement parts listed in Rider tv servicing data meet the physical and electrical performance ratings of the original equipment!

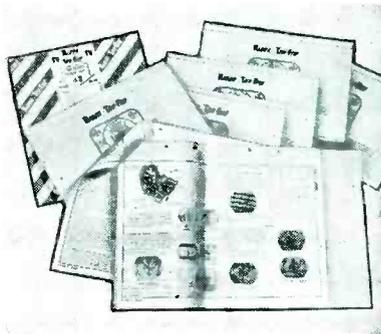
**Rider T.V. Manuals
Vols. 1 to 9
(covering more than
4,200 models)**



Each contains full data for manufacturers' receivers produced during a certain period. (The latest, T. V. 9, recently published, covers October 1951 through February 1952.) Each manual has over 2,000 (8-1/2" x 11") pages in permanent binder, with an index covering the contents of all manuals. Rider manuals are perfect for shop use and permanent reference. Price—\$24 each.

Rider T.V. Tek-Files (Packs now cover 2,200 models)

A typical T.V. Tek-File pack is shown below. In Rider Tek-File packs you buy complete Rider servicing data for whatever receivers you want . . . when you want it. You buy according to your needs with the assurance of getting the *complete servicing facts* for every repair. Notice that each pack consists of handy, standard file folders for easy use. Only \$2 each pack.



FREE Rider T.V. Tek-File indexes covering the contents of all published packs are at your jobber's. If he doesn't have them, write us.

DON'T BE SWITCHED!

Rider Tek-File is DEFINITELY NOT the same as any other publisher's service. If your jobber doesn't carry them, DON'T BE SWITCHED. Write us direct . . . we'll sell you. (Please include your jobber's name.)

TRY A PACK

Prove to yourself that Rider Tek-File makes tv servicing easy. Buy one pack for the next receiver you service. If you don't agree it's better than anything you ever used, return the pack to us within seven days . . . we'll send you a full refund.

Rider Radio Manuals. Vols. 1 to 22. Contain complete, factory-issued, official AM, FM radio servicing data . . . plus auto radios, record changers, tuners and recorders.

OUT SOON!

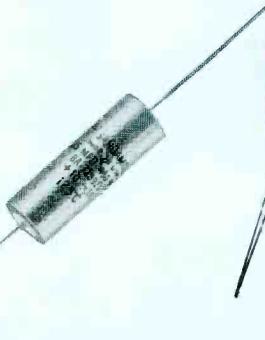
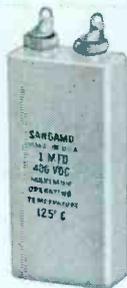
Rider RADIO Tek-Files! Same style as T.V. Tek-Files. Now, get your complete radio servicing data this easy economical package way. Ask your jobber.

**John F. Rider Publisher, Inc., 480 Canal St., New York 13, New York.
West Coast Office: 4216-20 W. Jefferson Blvd., Los Angeles, California.**

AMAZING *NEW* IMPREGNANT

***makes good capacitors better
by permitting higher
operating voltages***

E-therm impregnated capacitors are now available in production quantities. E-therm is a unique new impregnating material developed and compounded by Sangamo. E-therm impregnated capacitors far exceed the requirements of JAN Specifications. E-therm possesses exceptionally high thermal stability and superior electrical characteristics. E-therm impregnated capacitors mean—higher operating temperatures—lower power factor—higher resistance—longer life.



E-therm

DEVELOPED BY SANGAMO
Operating temperature 125°C

E-therm is another example of advanced Sangamo engineering. Continued research and development of new products enables Sangamo to meet the

existing and future needs of the electronic industry. For additional information about E-therm, write for Engineering Bulletin No. 104H.

Those who know



...choose Sangamo

SANGAMO ELECTRIC COMPANY

MARION, ILLINOIS

SC52-9

SERVICE, AUGUST, 1952 • 5

The Webcor[®] "106" recommended by servicemen

There's good reason why radio service dealers are installing thousands of Webcor "106" Diskchangers every week.

First of all, the simplicity of the Webcor design enables the servicemen to make quick, easy installations.

And second, once installed there is an absolute minimum of adjustment and repair.

And the customer recognizes that the name Webcor by Webster-Chicago means that he is buying a nationally advertised product.

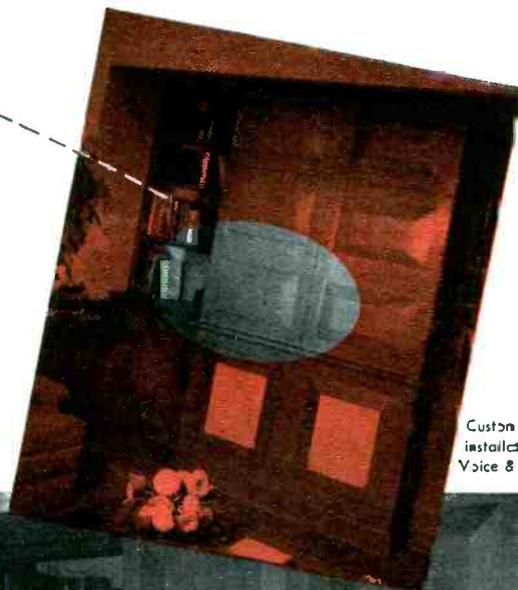
There's big promotion news on the Webcor Diskchangers—call your distributor today.

If it's made by Webster-Chicago,

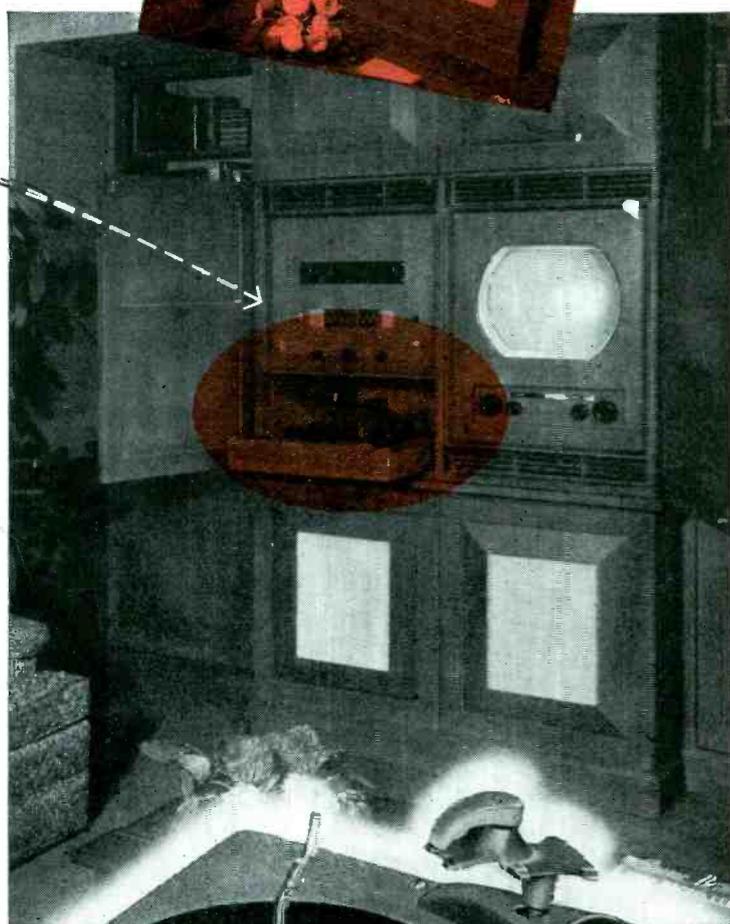
*it's **Webcor***

... and if it's Webcor

it is the finest



Custom installation by Voice & Vision, Inc.



*Webcor is a registered trade name for products manufactured by

WEBSTER-CHICAGO 

Rauland Tubes give you a prettier profit picture



Rauland picture tubes are first choice of an ever growing number of service dealers and men. First, because of the completeness of the Rauland replacement line.

Second, because you get the benefit of acknowledged leadership in picture tube engineering. Rauland research has developed more picture tube improvements since

the war than any other company.

You get quality you can count on, too. Rauland production employs machines unique in the industry—many of them designed by Rauland engineers and built in Rauland's own plant.

And finally, you get assurance of customer satisfaction beyond

what any other line can give you. Installation and adjustment of Rauland tubes is faster and better. The Indicator Ion Trap gives you the surest known protection against ion burn and shortened tube life.

Specify Rauland—deliver Rauland—and assure yourself of pleased picture tube customers.

THE RAULAND CORPORATION



Perfection Through Research

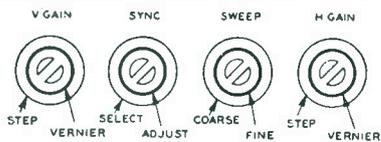
4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS



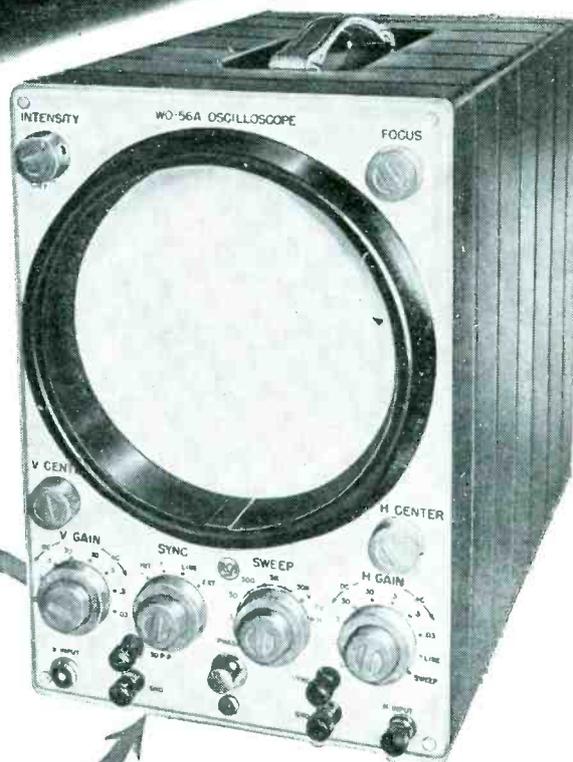
The 7" TV scope for professionals

RCA WO-56A

DUAL CONTROLS FOR "COARSE" AND "FINE" ADJUSTMENTS



No hunting or fumbling for controls when adjusting Vertical Amplifier Gain, Sweep Frequency, Sync Injection, and Horizontal Amplifier Gain.



FEATURING—

- Giant, 7-inch cathode-ray tube.
- Direct-coupled, 3-stage, push-pull, vertical and horizontal amplifiers.
- Frequency-compensated and voltage calibrated attenuators on both amplifiers.
- A set of matched probes and cables.
- Panel-source of 3 volts peak-to-peak calibrating voltage.
- Identical vertical and horizontal amplifiers with equal phase-shift characteristics.
- Retractable light shield for convenience and visibility.
- New green graph screen with finely ruled calibrations.
- Magnetic metal shield enclosing CR tube to minimize hum-pickup from stray fields.

SPECIFICATIONS—

- Deflection Sensitivity: 10 rms millivolts per inch.
- Frequency Response: Flat within -2 db from dc to 500 kc; within -6 db at 1 Mc useful response beyond 2 Mc.
- Input Resistance and Capacitance: 10 megohms and 9.5 uuf with low-capacitance probe.
- Square-Wave Response: Zero tilt and overshoot using dc input position. Less than 2% tilt and overshoot using ac input position.
- Linear Sweep: 3 to 30,000 cps with fast retrace.
- Trace Expansion: 3 times screen diameter in vertical and horizontal axis, with 3 times centering control.
- Size 13 $\frac{3}{8}$ " h, 9" w, 16 $\frac{3}{4}$ " d. Weight only 31 pounds (approx.).

ADVANCED SWEEP FACILITIES—

- Preset fixed sweep positions for vertical and horizontal television waveforms.
- Positive and negative syncing for easy lock-in of upright or inverted pulse waveforms.
- 60-cycle phase-controlled sweep and synchronizing.

**ONLY
\$217⁵⁰**

Suggested
User Price

Complete with direct probe, 10-megohm low-capacitance probe, and ground cable.

Built for laboratory, factory, or shop use, the WO-56A combines the advantages of high-sensitivity and wide-frequency range in a *very small* instrument with a *large* cathode-ray tube.

Designed with the user in mind, this new 'scope can be depended upon to provide sharp, bright, large, and accurate pictures of minute voltage waveforms over the entire useful surface of the CRT screen.

The direct-coupled amplifiers are provided with ac positions so that measurements can be made with or without the effects of any dc component.

Square-wave reproduction is excellent, whether the application is low-frequency TV sweep-alignment or observation of high-frequency steep-fronted sync and deflection waveforms.

The excellent linearity and fast retrace of the sweep or time base are functions of the Potter-type oscillator and the undistorted reproduction of the sawtooth by the wide-band horizontal amplifier. The preset fixed positions provide rapid switching between vertical and horizontal waveforms in TV circuits.

Truly, the WO-56A is a most useful and practical instrument for everyday work in the fields of television, radio, ultra-sonics, audio, and a wide array of industrial applications.

For details, see your **RCA Distributor**, or write RCA, Commercial Engineering, Section HX56, Harrison, N. J.



RADIO CORPORATION of AMERICA
TEST EQUIPMENT

HARRISON, N. J.

USE TUNG-SOL TUBES FOR TROUBLE-FREE SERVICE!

TUNG-SOL "QUALITY CONTROL" recognizes but one standard. All Tung-Sol Tubes meet the highest original equipment requirements of leading radio and tv set manufacturers.

TUNG-SOL ELECTRIC INC., Newark 4, N. J.
Sales Offices: Atlanta • Chicago • Culver City • Dallas
Denver • Detroit • Newark



No Call-Backs for me, pal

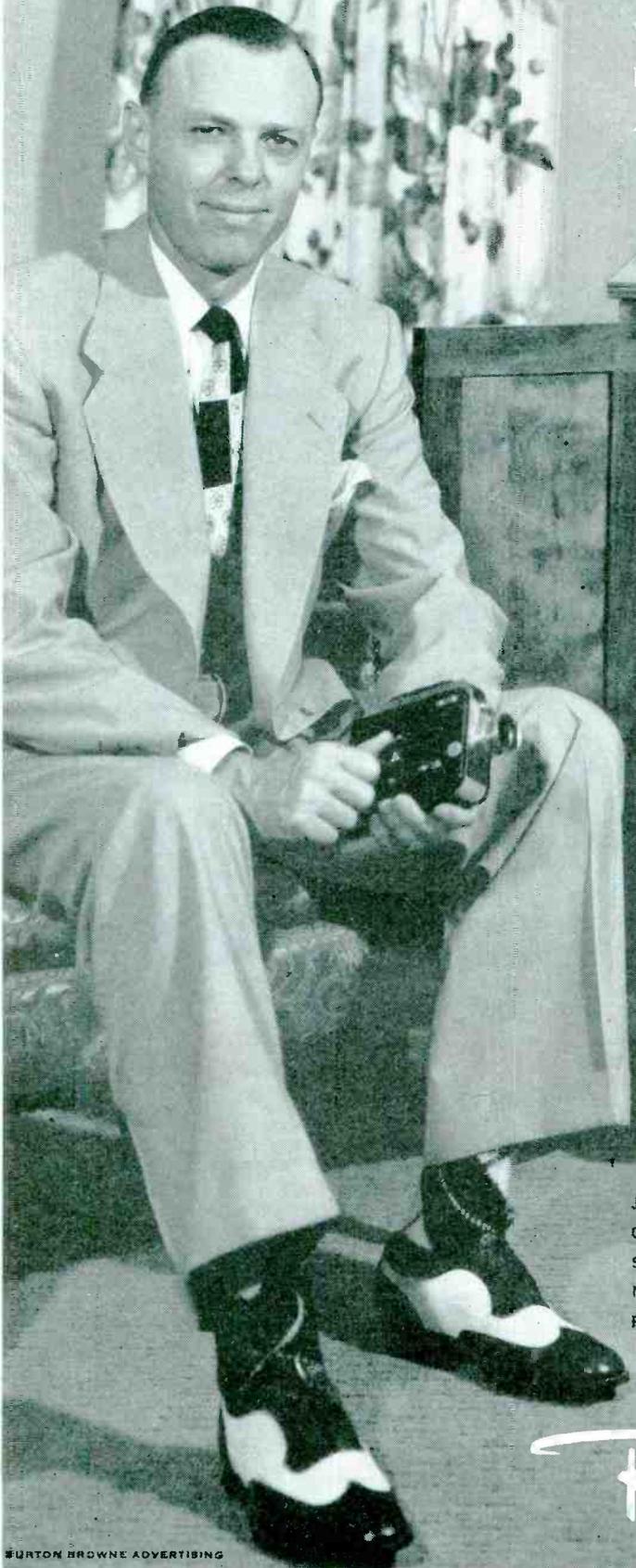
Here's a real lively "stopper" to attract attention to your place of business and emphasize the quality of your service. Colorful—bright red and two shades of blue. 15 inches high. Your jobber salesman will tell you how to get one.

TUNG-SOL MAKES ALL-GLASS SEALED BEAM LAMPS, MINIATURE LAMPS, SIGNAL FLASHERS, PICTURE TUBES, RADIO, TV AND SPECIAL PURPOSE ELECTRON TUBES

HIS CHOICE IS

Regency

LARGEST
SELLING
VHF
BOOSTER
AT ANY PRICE!



JOHN GILTNER TWIST, SALES MANAGER
CAPACITOR DIVISION
SANGAMO ELECTRIC COMPANY
MARION, ILLINOIS
PHOTOGRAPHED IN HIS HOME

ALSO MAKERS OF THE

Regency UHF CONVERTER

Turn to **BUSS**

THE ONE SOURCE FOR ANY

FUSE..

From 1/500 Amp. Up

BUSS offers the most complete line of fuses for Television...Radio...Radar... Instruments...Controls...Avionics... in standard types and dual-element (slow blowing) types.

By using BUSS as your one source for fuses you simplify your buying, stock handling and records.

Every BUSS Fuse is Electronically Tested...

in a sensitive device that rejects any fuse that is not correctly calibrated, properly constructed and right in all physical dimensions. This means every BUSS Fuse is a good one.

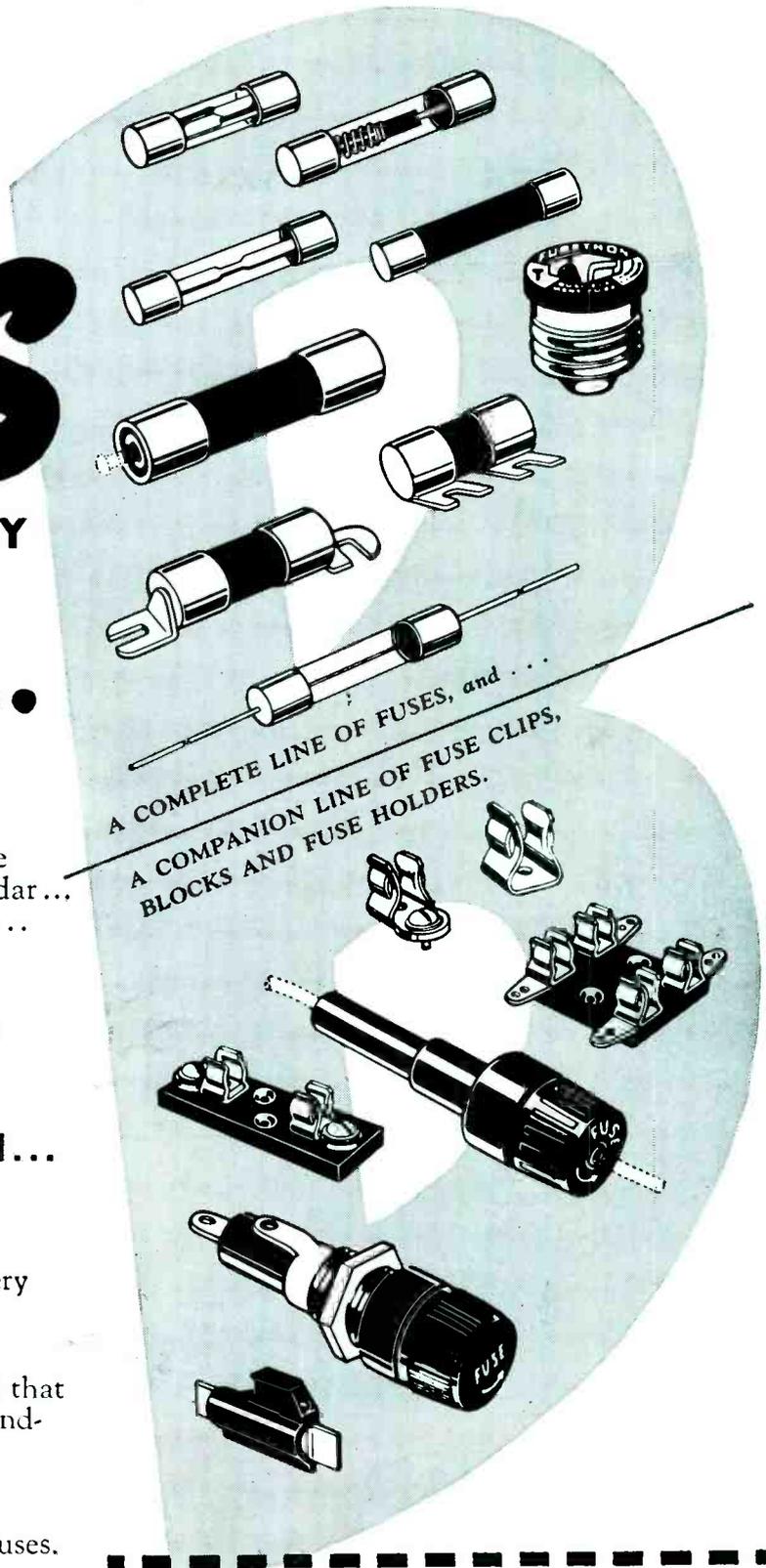
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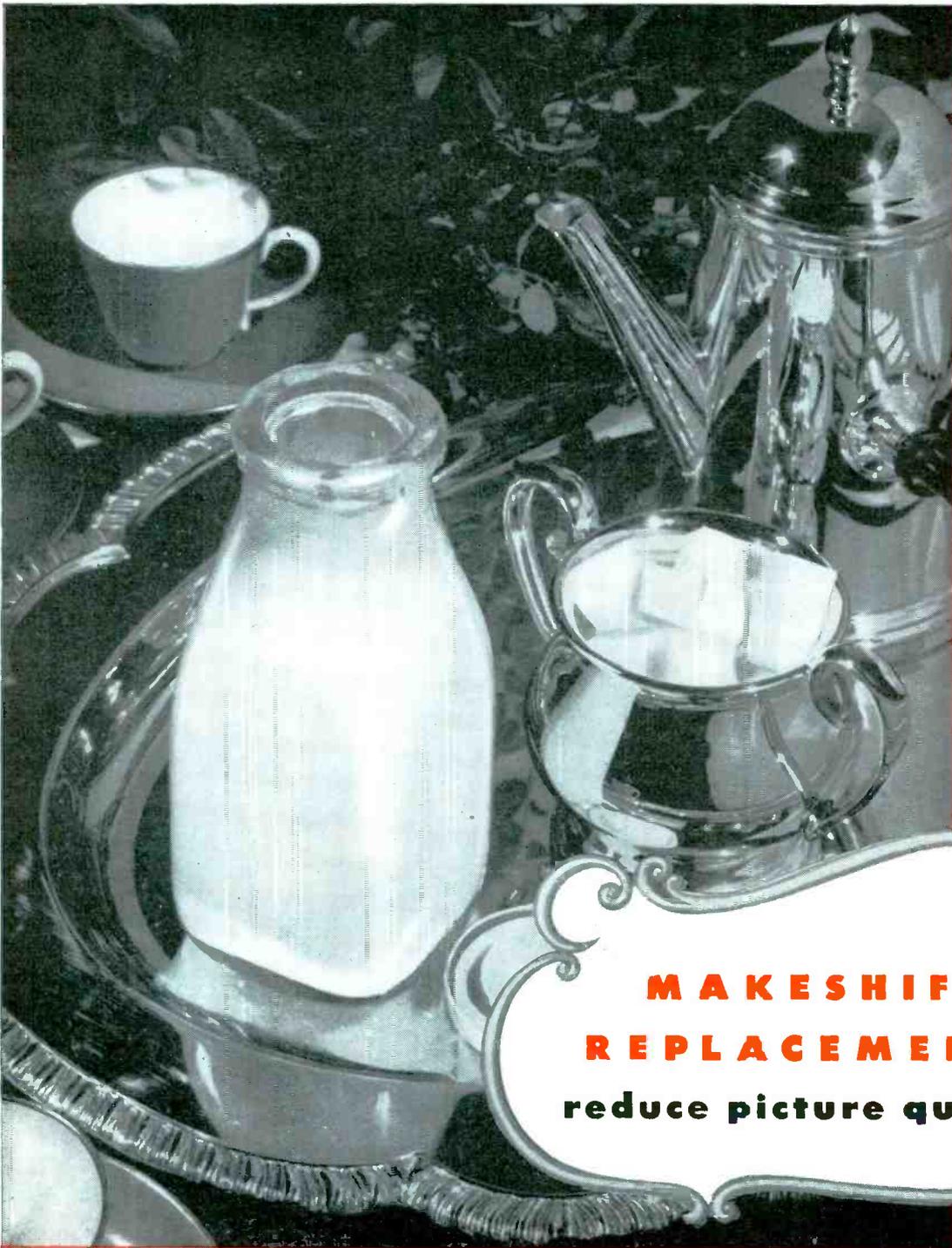
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RAYTHEON MANUFACTURING COMPANY

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

RADIO • TELEVISION • ELECTRONIC
SERVICE

Rich Rewards of Association Membership

FOR OVER A DECADE the mighty benefits—personal and industry-wide—afforded by association membership, has stirred many and prompted the formation of lively and resourceful groups throughout the country. Notwithstanding the exciting interest exhibited by the early association founders and its pioneering members, and the progressive programs initiated, membership was weak. And though, during the past few years, there has been an increase in the rosters, the membership rise has not been too impressive. The lack of enthusiasm has been a puzzling problem. For associations have offered a host of sparkling membership advantages. From some have come the blunt admission that they're just not sold on associations, claiming that actually little is offered for the dues which must be paid.

Plagued by these doubting Thomases, service associations have striven to develop strident convincing arguments to convert such disbelievers. The results have been enlightening. In one eloquent earthy essay, prepared by members* of the service group in New York City, an excellent series of reasons were evolved detailing why it pays to be an association member.

The dues were a minor item, the boys said. Actually, they noted, in return for the yearly dues of \$18, over a thousand dollars in benefits can be derived. Available, for instance, is a completely equipped clinic and a healthy library replete with all the latest manuals, catalogs and text books: two solid reasons why membership offered rich rewards. For through this clinic and the expert advice of members who have found field and shop solutions to a variety of problems, all members have at their disposal an invaluable guidance service; it is rare that solutions to stumbling time-consuming difficulties can not be supplied, the report pointed out.

To accent further the sincerity of the aid available, the boys struck out

and said that if after bringing the set down to the association clinic members can't find the problem and effect a repair, the yearly dues will be refunded. Often, it was noted, remedies can be supplied right on the phone, and at no charge.

In addition, it was said, all members receive a striking emblem for window display, and are invited to participate in group advertising in telephone directories. Community cooperation is another feature, the editorial noted, for through associations and their various committees it has become possible to standardize neighborhood rates, hours of operation, etc. There are many problems, common to all service shops, which only a concerted study can solve to provide an equitable solution for all, the association reps added.

Summarizing, the editorial posed the following question: "Don't you agree . . . that with all these wonderful features your return at the end of the year is worth more than \$1,000?"

Hundreds and hundreds of members have echoed a resounding *yes* to this question in New York, and many other locales throughout the land where fellow members are lending a hand, proferring all types of aid to daily problems.

Association membership actually represents one of the wisest investments any Service Man can make; joining your local group will prove to be a sparkling boon to your business!

Prospects in New TV Areas**

THE SUNNY REPORT from Washington that new powerful TV stations would soon be placed in operation in the northwest, southwest, south and east, in over a dozen cities, has been heralded everywhere. For this is only the beginning of a huge parade of new stations that will dot the whole country, bringing millions of new viewers on the scene; millions who will require new sets, converters, antennas, leads,

and the myriad of accessories needed in every installation.

Even the prospects in the few new areas are staggering, particularly for the installation of *uhf* converters and related equipment. A survey has disclosed that at present there are nearly a million sets now in areas within receiving range of the new *uhf* stations that will soon go on the air. During the next few months it has been forecast that nearly 200,000 more will become chassis owners in these areas.

In addition, there certainly will be a substantial sale of receivers to those in the cities where the stations will be placed in operation, introducing further opportunities for the sale of a host of antenna accessories, and their installation, too.

With the advent of these new stations has also come a renewed interest in fringe reception. An interesting illustration of this trend appears in Denver which has had no TV, and where two standard band and one *uhf* transmitter have been authorized by the Commission. With the high powers now permitted, and the increased sensitivity engineered into the new chassis, substantially increased receiving ranges will be available. Thus, viewers in areas that would a year ago have been way beyond the fringe zones, are today well within range. It is estimated that the power increases and the advanced receiver designs have nearly tripled the pickup possibilities of TV sets. And with the aid of high-gain boosters and antennas, the chassis DXing potentials are now at a new high!

The coax cable extensions, affording reception of the much sought national programs, has also served to propel interest and zoomed sales of chassis and accessories. Reports from many cities in the southwest have revealed that the coax has increased servicing demands by nearly 30 per cent, with a continuing increase even during the hot months.

With the establishment of these new markets, Service Men face a road ahead gilded with unparalleled opportunities in selling, installing and servicing.—L. W.

*Phil Goldfarb and John Wizemann, ARTS'NY.

**See *Service . . . The National Scene*, this issue, page 15.

NEVER BEFORE SUCH ANTENNA NEWS!

VHF-UHF AND FRINGE ANTENNAS for EVERY PURPOSE

WARD, the oldest, largest and leading manufacturer of antennas, has done it again. The new 1952-53 exciting WARD SIGNALINE will put you years ahead. Not 1 . . . not 2 . . . but 5 ingeniously designed, radically different and sensationally better TV antennas. Now, your WARD LINE is the only line that completely covers every application.

WARD THE ONLY COMPLETE LINE

Plus a brilliant promotion program to help you sell the complete WARD LINE of TV-Auto-Communication and FM Antennas.

HAVE YOUR WARD
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SHOW YOU
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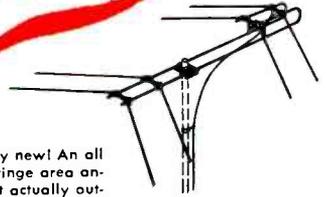
Lucky 4

5 Star

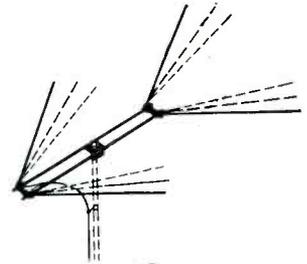
MUSKETEER

ZIP-HI

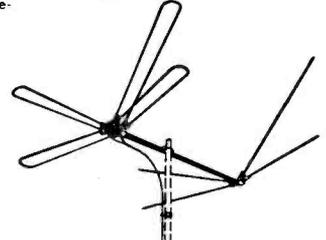
Completely new! An all channel fringe area antenna that actually outperforms Yagis on many channels! The 3-in-1 antenna for use on VHF, — VHF and UHF, — UHF. Opens up new markets with new ideas of good pictures! Light and rugged! Completely preassembled!



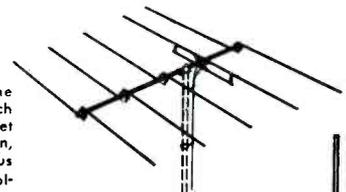
3-in-1 antenna — for UHF, VHF — UHF and VHF. Protects your customers on new UHF stations, while giving them the best in VHF today! High gain, all-channel, completely preassembled.



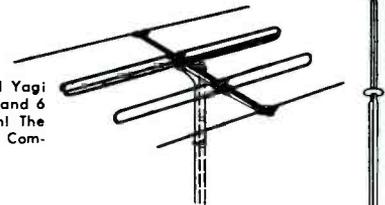
The first major advance in conicals! Higher gain! Better impedance match! Completely preassembled! With six extra features!



The Yagi with the radar-proved T match and exclusive offset elements! Extra gain, extra efficiency, plus rugged preassembled construction.



The first true broad-band Yagi — covers channels 3, 4, 5 and 6 with uniformly high gain! The first triple-driven Yagi. Completely preassembled!



The new WARD telescopic mast made from corrosion-proof PERMATUBE! Four different heights, all with exclusive anti-collapse feature. Can be erected by one man. Comes in 2, 3, 4, and 5 section models.



IN CANADA: Atlas Radio Corp., Toronto, Ontario

THE WARD PRODUCTS CORPORATION

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SERVICE... *The National Scene*

INDUSTRY BEAMS AS FCC AUTHORIZES 22 NEW STATIONS--Heartening news that within the next few months new stations will begin operations in Denver (Colorado), Portland (Oregon), Springfield-Holyoke and New Bedford (Massachusetts), Youngstown (Ohio), Flint, Michigan), Bridgeport and New Britain (Connecticut), York (Pennsylvania), Spokane (Washington), Austin and El Paso (Texas), Fort Lauderdale (Florida) and San Juan (Puerto Rico), has excited everyone, particularly the servicing fraternity. Contrary to all reports, both uhf and vhf transmitters will be placed on the air. Portland has received channel 27 (548-554 mc) with a power rating of 91 kw, and the Spokane stations will operate on channels 4 and 6 with 100-kw outputs. Channels 55 (716-722 mc) and 61 (752-758 mc) will obtain in Springfield-Holyoke, and the powers will be 65 and 115 kw, respectively. The New Bedford station will use channel 28 (554-560 mc) with a 200-kw output. In Youngstown, channels 27 (548-554 mc) and 73 (824-830 mc) will prevail, and the powers will be 200 and 175 kw. The Flint TV listeners will be able to tune in channel 28 (554-560 mc) and look in on pictures radiating from a 17.5-kw transmitter. In Connecticut, New Britain viewers will tune in on channel 30 (566-572 mc), and Bridgeport televiewers will have channel 43 (644-650 mc) to tune in. Powers here will be 180 and 81-kw, respectively. Channels 43 and 49 (680-686 mc) will be on the air in York, transmitting on 170 and 96 kw. The Denver stations will operate on channels 2, 9 and 26 (542-548) with 56, 240 and 105-kw output. In the southwest, three new stations have been approved for Austin and El Paso, operating on channels 7, 18 (494-500) and 4. Powers for these stations will be 110, 210 and 56 kw. Channels 17 (488-494) and 23 (524-530) will be used in Fort Lauderdale, and the powers will be 18.5 and 100 kw. The Puerto Rican station will operate on channel 2 with a 100-kw output. . . . It is reported that the veryhigh stations will go on the air very soon, and some of the ultrahigh operators will begin telecasting on or about the first of the year . . . To adjust inequities in the table of assignments, Washington has announced that several frequencies have been deleted and replaced by channels which it is felt will assure better results. Wilmington (Delaware) has been given channel 83 (884-890 mc) in place of 53 (704-710 mc); Elberton (Georgia) has been assigned 24 (530-536 mc) to replace 16 (482-488 mc); Fort Wayne (Indiana) 69 (800-806 mc) supplanting 21 (512-518 mc); Lexington (Kentucky) 64 (770-776) instead of 33 (584-590 mc); Fall River (Massachusetts) 68 (794-800 mc) replacing 40 (626-632 mc); North Adams (Massachusetts) 74 (830-836 mc) in place of 15 (476-482 mc); Lima (Ohio) 73 (824-830 mc) as a substitute for 41 (632-638 mc); Allentown (Pa.) 67 (788-794 mc) replacing 45 (656-662 mc) and Newberry (South Carolina) 70 (806-812 mc) in place of 37 (608-614 mc). Other changes are expected and will be reported in these columns. Watch for them.

TV REPLACEMENT CONTRACTS HELD ILLEGAL IN N. H.--Service contracts, guaranteeing replacement of parts, have been described as a violation of the New Hampshire laws since they constitute the sale of insurance, and do not comply with the insurance licensing laws of the state. According to the state's commissioner of licensing, any contract which agrees to replace certain parts. . . . "upon the happening of a contingency, can be construed as a contract of insurance." Warranty agreements do not fall into the category, but there are some service contracts that contain warranty statements with elements of insurance. . . . The view was noted as similar to one taken by the New York state attorney general last year, who also declared that service contracts constituted an insurance business, particularly the renewal contracts which provided an insurance for continued part replacements. . . . In New Hampshire, consumers were told to exercise caution in accepting service contracts, implying that only those servicing shops who are properly licensed should be approached for any contract business.

SERVICE... *The National Scene*

PENNA. GROUPS STUDY CO-OP AD CAMPAIGNS TO STIR UP SERVICE BUSINESS--In an effort to create radio-TV servicing work, distributors and FRSAP delegates have developed a co-op ad program. Commenting on the plan, the chairman of the Pennsylvania state association declared that the plan should solve many service and merchandising problems. For instance, he said, antenna producers would be asked to initiate a Replace Your Antenna drive. It was pointed out that over 50 per cent of service calls result from antenna difficulties, broken lead wires, and corroded elements. The consumer, it was said, should be made aware of this fact. There are hundreds of thousands of receivers that have defective volume controls, damaged speakers and worn tubes which have been sadly neglected, it was also pointed out during the ad program meeting. Messages urging consumers to have these components replaced should also be published, the group were told. According to the state federation chairman, a series of statewide meetings has already been scheduled to promote the replacement of defective components, and educate consumers on the value of the Service Man.

PLATED-CIRCUIT CHASSIS INTRODUCED--A striking new development, described as the placir or plated-circuit process, has been announced by a leading midwest setmaker. All leads to components are permanently copper plated on a 1/8-inch thick plastic panel, machine produced to assure uniformity in every chassis. Connections are made to regulation components, with every effort being made, of course, to use the smallest parts available at present. An exclusive analysis of the circuitry used in this novel process will appear in an early issue of SERVICE.

CHEYENNE (WYO.) TV ASSOCIATION BEGINS PUBLIC RELATION PROGRAM--To familiarize prospective set owners with the ethical procedures that will prevail in the installation of TV chassis, the Cheyenne Television Technicians Association has begun to publicize its stringent code of ethics which every member will be obliged to follow. According to the code, members will be bonded and insured against customer dissatisfaction and set damage, all parts and services will be guaranteed in accordance with national codes, estimates will be provided when requested, all charges for parts and labor will be in accordance with organization rates, and all working areas will be opened to public inspection at all times. Those who do not subscribe to the code, it is said, will be removed from membership and announcements of this move will appear in daily papers. . . . The interest in TV in this area has prompted the city council to review local ordinances with respect to the installation of TV antennas. It was pointed out that the present laws cover any construction which could apply to antenna installation, and thus it will be necessary to obtain an antenna permit from the building inspector's office. The fee, it was said, will be about \$2.00. . . . Enthusiasm in TV has been stimulated by the recent installation of the new Denver station, operating on channel 2, and the possibility that channel 9 will soon begin transmitting, and channel 26 will be on the air around the first of the year.

ELECTRONICS WEEK IN ATLANTIC CITY--The week of September 22-25 has been proclaimed as Electronics Week by Mayor Joseph Altman of Atlantic City, as a tribute to NEDA's annual convention. During that week, distributors, manufacturers, reps and guests will attend conferences and lectures, as well as demonstrations, at three hotels: Ambassador, Chelsea and Ritz Carlton.

CHASSIS MAKER APPLAUDS SERVICE--In a recent issue of the Capehart Service Bulletin, SERVICE was described as a . . . "Valuable trade magazine you should be reading . . . and a must that you subscribe to . . . to keep abreast of this fast moving industry." Our sincerest thanks, gentlemen, for your grand appraisal of our journal.--L. W.

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CATALOG IMP-1 describes Pyramid's new line of molded plastic tubular capacitors. "IMPS" are rugged — impervious to moisture and withstand a temperature of 100° C.

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CATALOG PG-1 lists miniature Glasseal capacitors. These tubular units perform at temperatures ranging from -55° C. to +125° C.

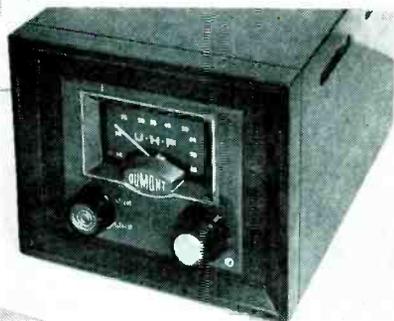
CATALOG J-7 is a 32-page compilation of paper, electrolytic, oil-paper and metallized paper capacitors. Complete data on eighteen different types, including construction variations, sizes and prices are listed.

Free copies of these colorful attractive publications are available on letterhead request to Dept. S2

**PYRAMID
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1445 Hudson Boulevard, North Bergen, New Jersey

Transmission-Line Tuned



[See Front Cover]

(Left)

Fig. 1. The *uhf* converter.

(Below)

Fig. 2. Block diagram of converter.

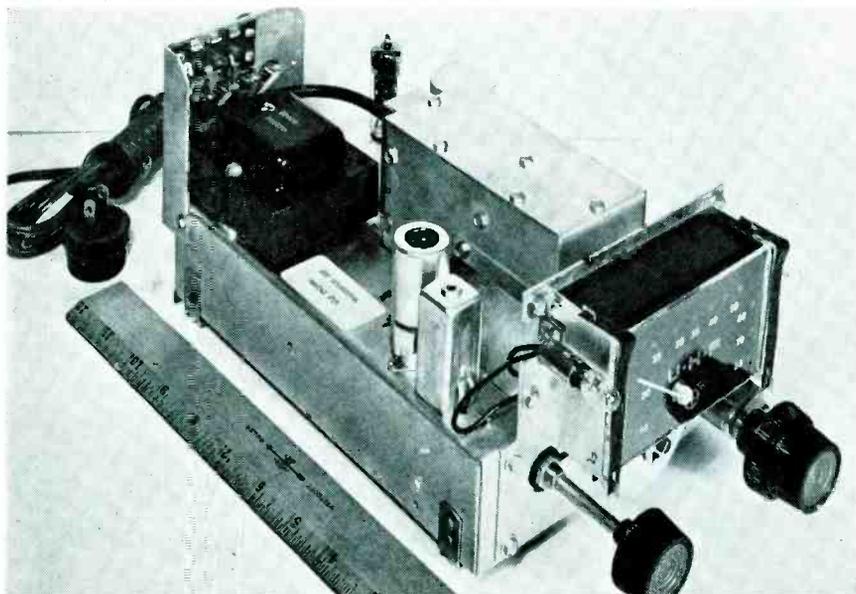
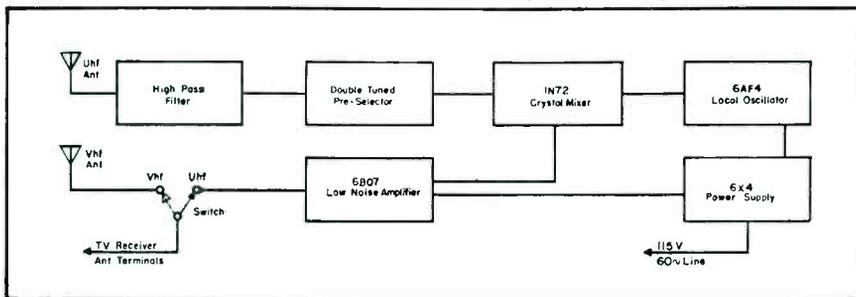
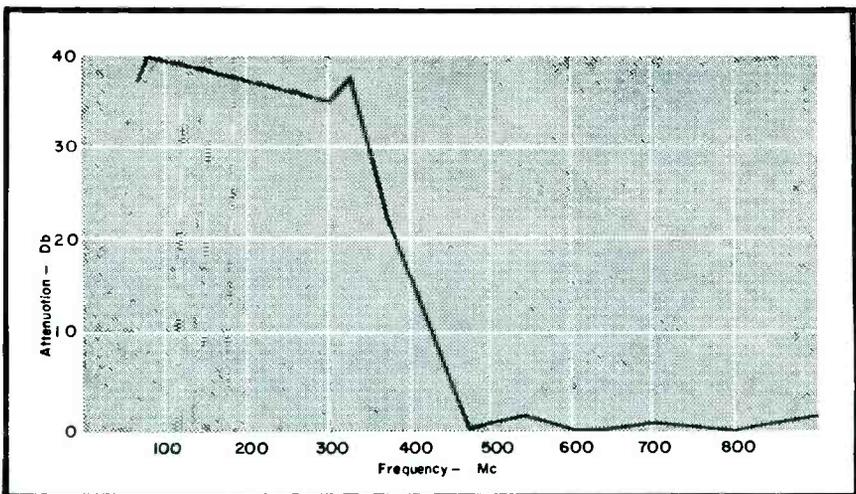


Fig. 3. View of converter chassis. The *rf* preselector and local oscillator are in the shielded box located just behind the dial. Attached to the rear of the shielded box is the input high-pass filter. The low-noise amplifier tube and output transformer are located on the left front corner of the chassis. The power transformer, rectifier, electrolytic capacitor and the terminal board for the *uhf* and *vhf* antenna and receiver connections are all located at the rear of the chassis.



(Left)

UHF TV is quite different from *vhf* TV because the maximum frequency of the *uhf* band is about four times higher than the corresponding maximum frequency of the *vhf* band. As a result of the higher frequency, the tuned circuit inductance and capacitance must be much smaller at *uhf*. The internal leads between the tube elements and the tube socket, together with the tube capacitance, set the maximum frequency limit of tube operation.

As the operating frequency has increased it has become increasingly important for tube and circuit engineers to collaborate to reduce lead inductance and stray capacitance. This collaboration is exemplified in the development of *uhf* oscillators from the acorn 955 to the acorn 6F4 and finally to the miniature 6AF4, the latter two tubes having dual grid and plate pins to reduce lead inductance. Similar collaboration between circuit and component engineers has developed better fixed and adjustable capacitors and tuning elements.

The foregoing remarks are intended to stress the importance to Service Men of lead inductance and stray capacitance effects in the operation of *uhf* circuits.

To be universally adaptable to any TV receiver, an ultrahigh converter must meet the following requirements: The converter output frequency must use one of the 12 regular television channels. The output impedance must be a 75-ohm coax, as well as 300-ohm balanced to match all TV receiver antenna impedances. The unit must be self-powered. The converter must be operable on both intercarrier and separate sound type television receivers. This is a very severe requirement for a converter used with a separate sound receiver with regard to microphonic howl and local oscillator frequency drift. Tuning of the converter should be as easy as tuning a television receiver even though the precision of tuning is increased four times.

On the cover appears the circuit of a *uhf* converter designed to cover the complete *uhf* band of 470 to 890 mc in a single continuous tuning operation. The ultrahigh signal is converted to an *if* between 76 and 88 mc. To operate, the converter is connected to the antenna terminals of any standard *vhf* television receiver tuned to either

Fig. 4. Curve illustrating attenuation of the high-pass filter.

UHF TV CONVERTER

by HENRY R. HESSE

Senior Engineer, TV Receiver Division
Allen B. DuMont Labs

channel 5 or 6. The input of the converter is designed for 75-ohm coax line RG/59U or equivalent, while the *vhf* output will match either 75 or 300-ohm *vhf* TV receiver antenna connections.

The converter features a coarse and fine tuning system, with the tuner drive reduction ratio 6.6/1 on coarse tuning, and 20/1 on fine tuning.

The *uhf* antenna is connected to a high-pass input filter which serves to attenuate *vhf* signals from the converter. Following the high-pass filter is a double tuned preselector circuit to provide maximum *uhf* selectivity. The preselector feeds a 1N72 crystal mixer which, together with a 6AF4 local oscillator, converts the signal to intermediate frequencies between 76 and 88 mc. The output of the mixer is amplified by a 6BQ7 cascode low-noise amplifier. The signal then goes to the antenna of a television receiver tuned to channel 5 or 6. A power supply provides heater and plate voltage to the low noise amplifier and the local oscillator.

The optional use of channel 5 or 6 on the TV receiver is provided to minimize interference from a local *vhf* television station that may be operating on one of these channels. The user may select the channel not occupied by a local TV station; that is, use channel 6 with the converter if there is a local channel 5 TV station or vice versa.

The 72-ohm coax cable is connected to a high-pass input filter with a cut-off frequency of 400 mc.

Preselector

Three ganged transmission-line tuning elements (shown in Fig. 5) are used to tune the double tuned preselector and local oscillator. These transmission-line tuning elements consist of two concentric flat strips with a movable shorting contact between the strips. The shorting contacts of each tuning element are coupled together on a common bakelite shaft to rotate in unison. Also illustrated are two separate tuner elements and a

(Continued on page 53)

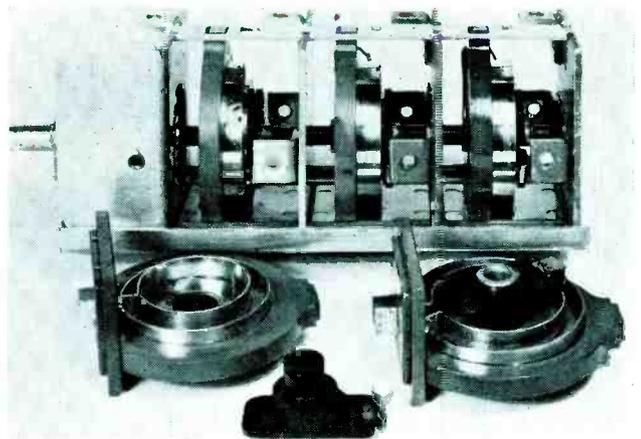


Fig. 5. Three-ganged tuning elements.

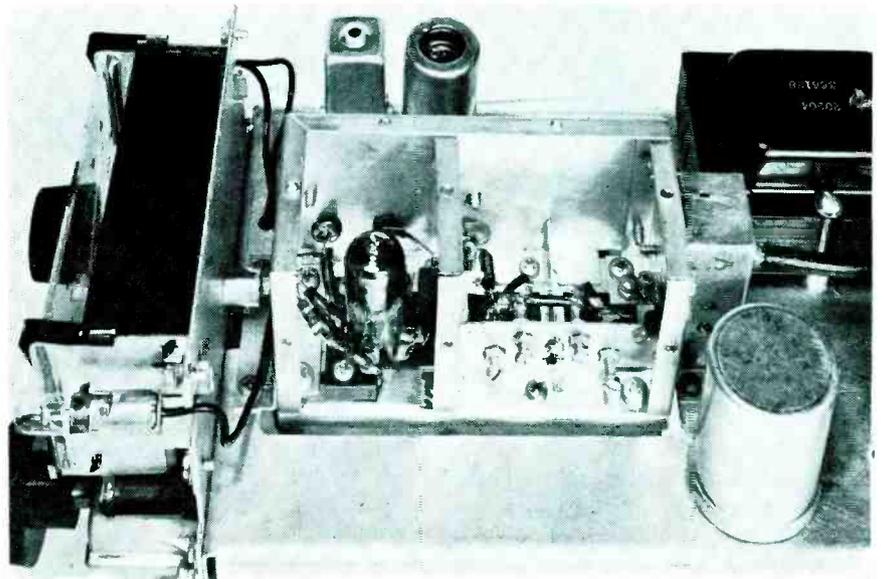
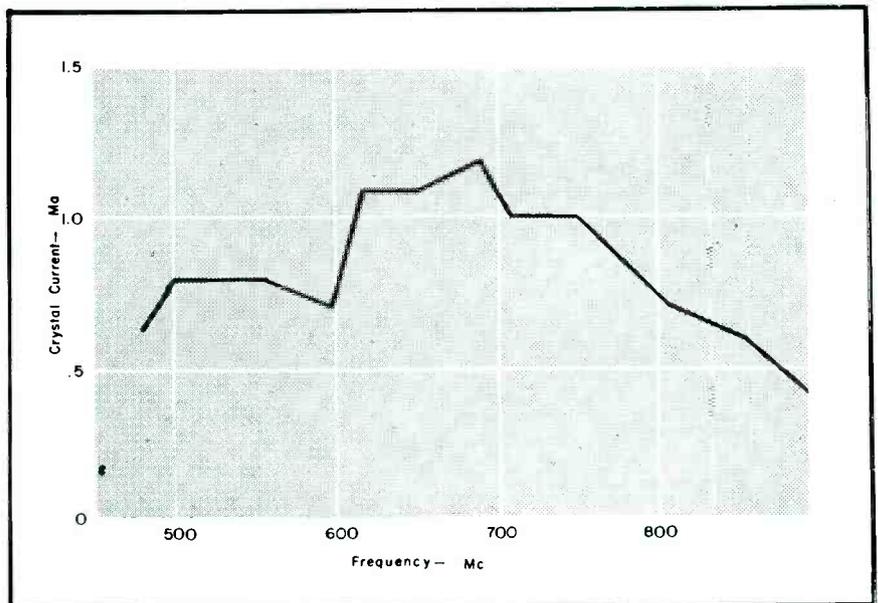


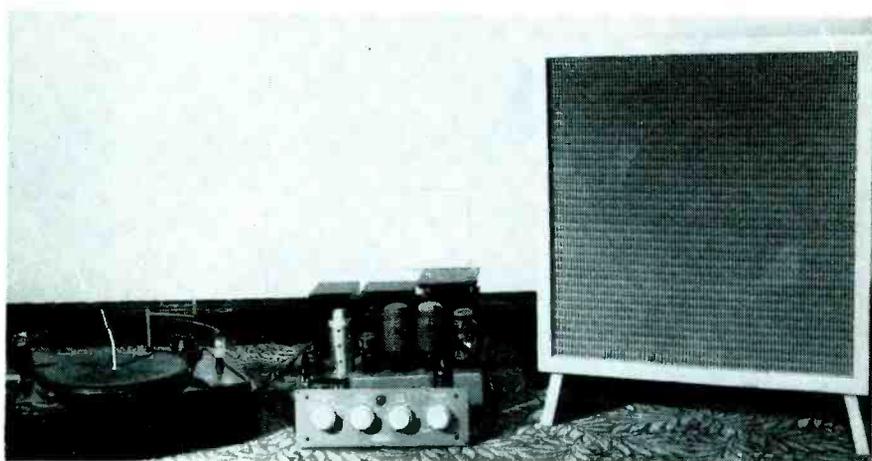
Fig. 6. Interior of the tuner housing.

Fig. 7. Curve showing results of oscillator developed grid bias.



Practical Servicing Procedures Which Should Be Used in the Installation of Remote Switches, Signal Cables and Allied Parts to Insure Maximum Efficiency

Interconnection of



Typical audio system setup; tuner, amplifier, speaker and changer. (Courtesy British Industries Corp.)

DURING THE PAST FEW YEARS the assembly of radio-phonos from separately purchased components has become very popular. Consumer organizations have pointed out that the quality obtainable from custom-built units is far superior to that of commercial combinations costing the same amount of money.

But certain misconceptions have become popular, too. Too many laymen have assumed that one has only to order an audio amplifier, tuner, record changer, and speaker of his choice, and then connect them together as he would screw a light bulb into its socket, to achieve perfect results. When the non-technical buyer receives unassembled equipment and is confronted with the realities of his problem he usually turns to the Service Man for help. A more frequent pro-

cedure, of course, is for the Service Man to be consulted about a custom installation from the beginning.

A bad assembly of good components may result in distortion, hum, poor frequency response, and speaker *hang-over*. It is, therefore, necessary that the person responsible for the assembly, not only be familiar with standard service techniques, but possess certain specialized knowledge about the audio field.

Electrical Assembly

There are two sets of interconnecting wires between the different components of a custom built radio-phonograph. One set consists of the signal carrying cables, and the other of power lines.

It is important to the consumer that his system have a single on-off switch; he should not have to operate three or

four controls to turn the set on or to close down for the night. Almost all tuners, amplifiers, and other such components, however, have their own input plugs and on-off switches. Therefore, all units except the one on which the main switch is to be located should receive their *ac* power from a multi-socket which is wired in after this main switch, as in Fig. 1. In some cases a tuner or amplifier will provide a receptacle on its chassis which is so wired.

Although the switch which has been delegated as the main *on-off* control now passes much more current than it did in its original circuit, this increase does not normally cause the circuit load to come anywhere near exceeding the switch rating. The changer must naturally keep its own switch, to allow the turntable motor to be turned off during radio operation, but none of the other units need independent *on-off* controls. These superfluous switches may be incapacitated, either by mechanical stops or by electrical shorting. Service Men sometimes prefer to leave them alone to be sure not to invalidate the manufacturer's guarantee.

Remote Switch

Occasionally an installation calls for an extra *on-off* switch remote from the equipment, as at a bedside, for example. The remote switch must be connected to the regular switch in a three-wire circuit, which allows full

Fig. 1. How power cables should be connected.

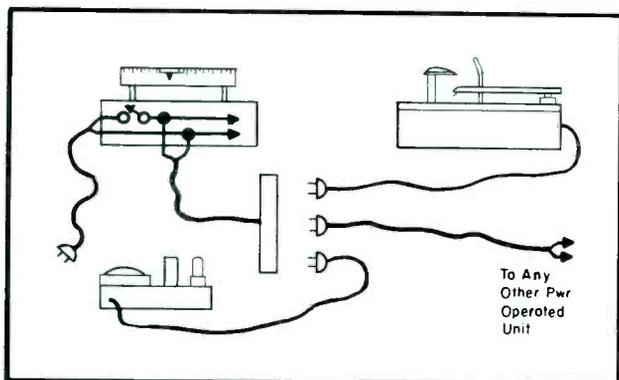
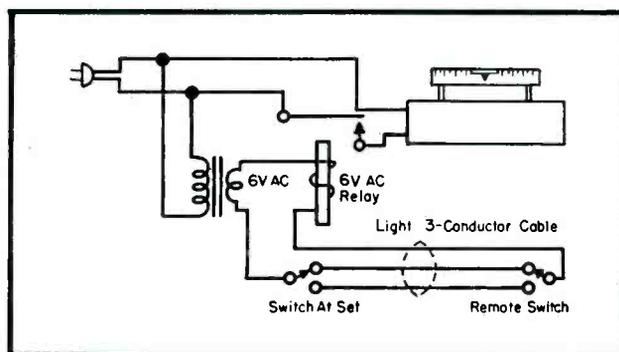


Fig. 2. Circuit for remote on-off switch.



AUDIO COMPONENTS

by **MARK VINO**

control for either position, like the circuit used for a pair of light switches at the top and bottom of a staircase. In addition, there are certain legal requirements which must be met. The cable leading to the remote position must either be regular armored house wiring installed by a licensed electrician, or it must be part of a relay system. The second method is entirely reliable, does not violate any electrical codes (because of the fact that the three-wire cable has only six volts across it), and is far less expensive. Fig. 2 illustrates the details of such a relay circuit. Since the main switch at the set has to be of the double-throw type, the simplest procedure is to disconnect the usual switch ganged to the volume control and install a separate single-pole double-throw unit.

Signal Cables

Fig. 3 illustrates a method for interconnecting signal cables in a typical custom assembly. Most modern tuners incorporate a channel selector switch with positions for phono AM, FM, TV, etc., and thus the tuner chassis becomes the center of the signal channel network, to which all signal inputs are connected. In the event that the tuner does not contain a selector switch, a separate multi-switch must be installed. This multi-switch can be mounted at an empty position on

the tuner or amplifier chassis, perhaps as a replacement for a superfluous volume control which has been removed. To eliminate leakage between the different input channels a low capacitance switch should be used, or a ganged section of the switch should be connected, as in Fig. 5 (p. 22), so that unused channels are grounded out at the same time that the desired channel is selected.

Ordinary shielded cable may be used for short runs, but if the length of cable is more than a few feet, low capacitance cable with special insulating material between the central conductor and the shield should be employed to prevent high-frequency losses. Shielded wire is rated in mmfd per foot; 25 mmfd per foot would be quite a low value.

The total cable capacitance that can be tolerated is not a fixed amount, but depends upon the value of load resistance (the load resistor and following grid resistor in parallel) with which it is effectively in parallel. The lower this resistance the higher the cable capacitance that can be allowed without shunting the higher frequencies.

¹When the length of speaker lead becomes excessive, on the order of several hundred feet, IR losses in the wire may be minimized by using a 500-ohm tap on the output transformer and matching the speaker impedance by a line-to-speaker step-down transformer located at the speaker.

Thus, when a shielded cable of 15' or more must be used, and when the load resistance is high, it is often desirable to connect a 50,000-ohm resistor in parallel with the input resistor to which the cable is connected. If this is to be done care must be taken to see that a high-impedance input has not been specified by the manufacturer of the components or is not otherwise required by the units involved. When the cable is extremely long, as might be the case when the interconnected components are in different rooms, a step-down transformer at the beginning and a step-up transformer at the end of the line are sometimes employed to prevent high-frequency losses.

The lead from the amplifier output transformer to the speaker is in a low-impedance circuit. Ordinary rubber covered lamp cord is suitable for any length which will be required in a normal installation.¹ Flat 300-ohm cable may also be used, and is especially useful for speaker leads when the connecting wire goes across the room or from one room to another.

Hum

Occasionally, audio components, each of which have an acceptably low hum level individually, produce a high hum level when connected together. The two most common causes of this trouble are inductive or capacitive coupling from ac carrying lines or

Fig. 3. Typical connections of signal-carrying cables.

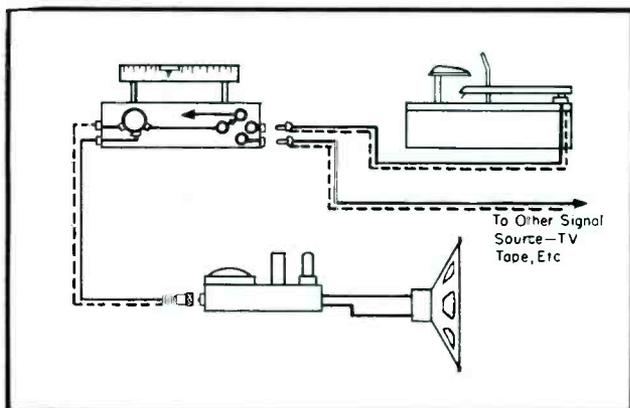
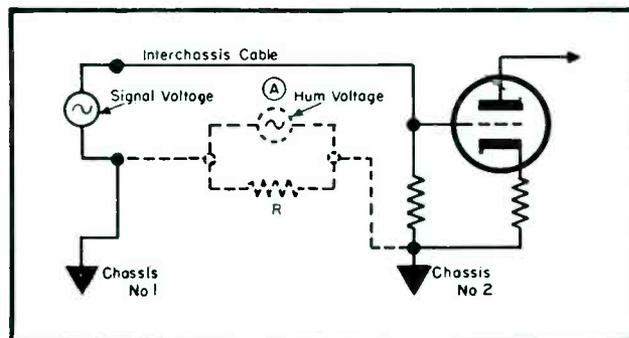


Fig. 4. Hum caused by differences of chassis potential with respect to the ac line: R is the resistance of the inter-chassis ground connection; A = hum voltage (IR drop across cable shield) in series with the signal-input voltage.



(Continued from page 21)



P9719

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117 VOLTS, 60 CPS. (2) BLACK
 350-350 VOLTS, 270 MA. (2) RED
 CENTER TAP (2) RED-YELLOW
 5 VOLTS, 2 AMPS. (2) BLUE
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components to signal leads, and ac currents in ground returns flowing in the chassis' and interconnecting shields.

All input leads, especially those associated directly with low-output pickups, must be physically laid out in such a way that no significant amount of ac is picked up from power components. Although these leads are shielded it must be remembered that the non-magnetic copper braid is only effective against electrostatic fields, and that electromagnetic induction can still take place. Low-level signal wires should never be laced or taped together with ac power leads into a single cable.

Low-level components themselves, such as preamps, record compensators, or magnetic pickups, are directly susceptible to hum from ac fields. If the installation is committed to an unfavorable layout, with respect to the tuner power supply, it may be necessary to have the tuner power turned off during phono operation by a ganged section of the selector switch.

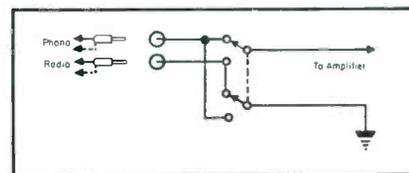
There is a rather obscure path of capacitive coupling between the signal channel and the ac power line, which includes the capacitance between the transformer primary and the case and the capacitance between various grids and the earth. The effects of this coupling are not in the least obscure, however, and a healthy hum may be created. The cure, fortunately, is quite simple. A good earth connection to the chassis (using cold water or waste pipes; not hot water pipes or radiators), and testing of power plug polarity for least hum will be found to eliminate this type of disturbance.

Chassis Currents

The second interchassis source of hum is illustrated in Fig. 4. Two chassis may have a different ac potential with respect to the power line due to different filament ground returns, different connection of line bypass capacitors, etc. When such chassis are connected together a small current will flow in the cable shield. The IR drop across this cable appears directly in series with the input grid circuit,

(Continued on page 51)

Fig. 5. Selector-switch circuit which prevents inter-channel leakage.



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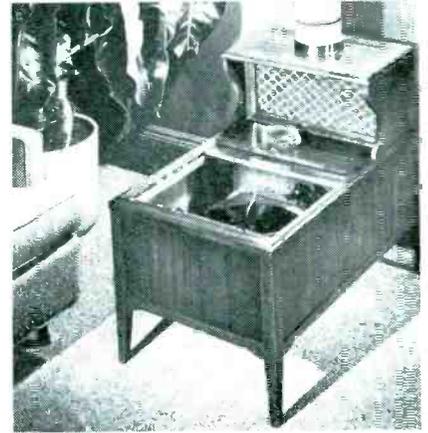


Replacement phono crystal cartridges in transparent plastic containers. Visible through the transparent top of the container, each cartridge is further identified by a stock number printed in black on white at both ends of the container.

(Courtesy RCA)



Dual concentric loudspeaker, manufactured in Great Britain, now available here. Has a high-frequency transducer inside the magnet system which is said to provide correct air column match to acoustical transformer. A center-pole machined, exponential low-frequency cone, which continues the expansion of the high frequency horn, is claimed to insure correct loading and impedance match. Available in 12" and 15" types handling 15 and 25 watts respectively. (Tannoy; distributed by Beam Instruments Corp., 350 Fifth Ave., New York 1.)



Provincial period styling phono which provides for the playing of 7, 10 and 12 inch records automatically at three speeds. Has a muting switch that automatically silences the unit during the record change; electrical outlet plug and a tuner jack for hookup to an outside tuner. (Model 129; Webster-Chicago Corp.)



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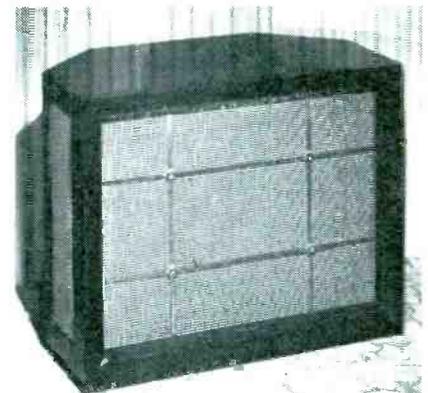
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Record cleaning cloth designed to remove harmful grit and static charges from record grooves. (Electro-Wipe; Duotone Company, Inc., Keyport, N. J.)



AUDIO *installation and service*

Phono-Tape-Wire-PA-Amplifiers-Speakers

by **KENNETH STEWART**

Comparison of Photographic and Magnetic Recording Processes*...Magnetic Film Frequency Response . . . Dual Concentric Speaker Design . . . Hi-Fi Speaker System Combinations

PHOTOGRAPHIC AND MAGNETIC recording, which have won starring roles on the audio scene during the past few years have achieved such success because of a striking cycle of notable developments. Today, with accurate control of film processing, it is possible to obtain extremely *hi-fi* results, employing either variable density or variable area methods. In the 35-mm field, the results have been more successful than with the lower cost 16-mm films. Since the introduction of photographic recording, there has appeared a substantial improvement in photographic emulsions suitable for both density and area application. As examples, recording devices and light modulating systems are nearly perfect now, and electronic improvements have contributed to practically distortion-free film and reproducing systems.

To reduce background noise in photographic recording, bias or noise-reduction recording is used; here the average transparency of the sound track varies with the envelope of the sound waveform, resulting in a minimum of film grain noise and photocell hiss for the low-level passages and automatically permitting a rise in these unwanted noises as the signal amplitude increases.

In early film recording, wow and flutter were very annoying, with disturbing rates varying all the way from 1 to 96 cps, the latter corresponding to the sprocket hole frequency of 35-mm film. Now, it is reported 35-mm photographic recorders with a total flutter content exceeding 0.1 per cent would have difficulty finding any mar-

ket. However, in 16-mm systems, due to the slower speeds, it is more difficult to secure good film movement, which is quite apparent in the reproduction of many 16-mm sound tracks heard over TV. Accordingly 16-mm film recorders must be built very carefully. Recently, due to the broad use of 16-mm film in TV, several manufacturers have produced professional 16-mm reproducers which tend to overcome the foregoing difficulty.

Film Speeds

In 35-mm recording the standard speed has been 18" per second, providing a practical upper frequency response limit of around 8 to 10 kc. This limit is said to be the result of recording and printing high frequency losses, as well as the losses introduced by the use of a finite scanning slit in reproduction. This condition has been recognized by the motion picture in-

dustries who have limited the frequency response of theatre systems to approximately 8 kc. In the 16-mm field, where the film speed is only 40 per cent that of 35 mm, it has been found more difficult to secure a wide frequency response. Through the application of considerable equalization in 16-mm operation a 6-kc response has been obtained; this problem is the cause of that familiar *chesty* nature of the sound.

It has been found that the limiting factor in the signal-to-noise ratio in film recording is the background noise produced by the graininess of the photographic image and also by the accumulated dirt and scratches on the film. This condition is said to limit, usually, photographic tracks to a usable signal-to-noise ratio of around 40 db; new tracks employing fine grain films and noise-reduction techniques have produced values of 50 db.

Magnetic Recording

In magnetic recording the uneven motion of magnetic tape or film in the recorder and reproducer, also introduces problems. Fortunately, the extreme flexibility of standard 1/4" tapes have been found to simplify tape pulling mechanism design and thus it is possible to obtain considerable freedom from very low flutter rates with relatively inexpensive drives. The capstan type drives do normally introduce low-frequency flutter rates. However, these flutters are considerably higher than those encountered in disc recording and are, therefore, not so objectionable. The irregular motion of the tape or film over the mag-

(Continued on page 55)



*Based on a discussion of the comparison of recording processes by John G. Frayne of the Westrex Corp. appearing in the May issue of The Transactions of the IRE Professional Group on Audio.

Troubleshooting OSCILLATING TV Chassis

by R. G. MIDDLETON*

Senior Engineer
Precision Apparatus Co., Inc.

Sectional Isolation Technique Used to Pinpoint Trouble Areas Permits Rapid and Successful Servicing

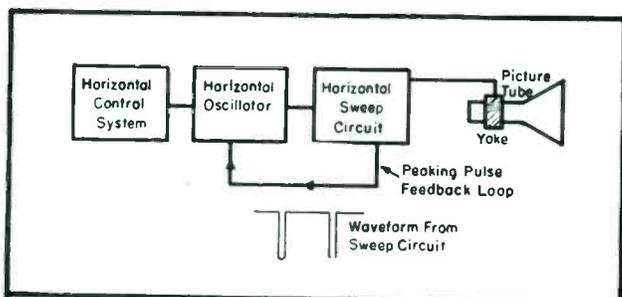


Fig. 1. Some receivers develop instability and *take off* because of defective components in the peaking-pulse feedback loop, which causes the horizontal oscillator and sweep system to motorboat or squeg. The squegging waveform backs up into the horizontal-control system, and accordingly the Service Man may be misled if he is not on guard.

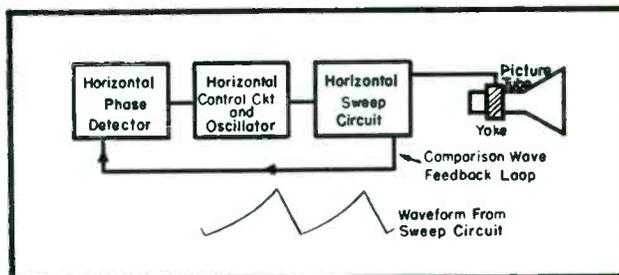


Fig. 2. Receivers also occasionally *take off* because of defective components in the comparison-wave feedback loop. The complete system from phase detector to yoke exhibits the squegging waveform with various changes in shape from one circuit to the next. Other circuits in the receiver also exhibit the squegging waveform due to crosstalk. Thus, the vertical-deflection circuits will usually show the squegging wave at considerably lower voltage than in the horizontal system.

THE SIMPLER TYPES OF RECEIVER trouble can usually be located by well-established methods. Thus, a dead or weak *if* stage can be found by tracing the signal through the *if* amplifier with a crystal probe and 'scope; a defective front end can be traced by applying a sweep-frequency signal to the antenna terminals and checking the output with a 'scope at the mixer grid and plate; the video amplifier can be tested by applying a sweep-frequency signal at the picture detector and checking the output at the grid of the picture tube with a crystal probe and 'scope. These general methods of lo-

calizing trouble in the high-frequency sections of the receiver have been developed to a rather high degree of refinement, and normally present no problem to the experienced Service Man.

Sync-Sweep Circuit Checks

Likewise, minor trouble in the sync and sweep circuits can be readily handled by checking the waveforms through the circuits for correct wave-shape and specified peak-to-peak voltages. Receiver manufacturers usually supply these data in their service manuals, and the Service Man can spot such faults as open capacitors rapidly.

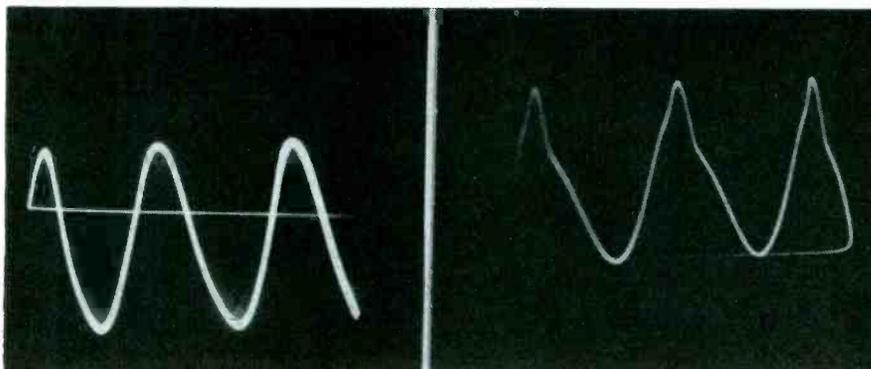
Open capacitors, of course, usually elude *dc* voltage and resistance checks.

Tough Problems

On the other hand, we are painfully aware of tough troubles which cannot be tackled by usual procedures. The *oscillating receiver*, for instance, may require several days to repair, using pure guesswork in a trial-and-error approach. Too often, after the receiver is finally off the bench, the time costs which have been run up often exceed the price of a new chassis, and the loss is charged up to ex-

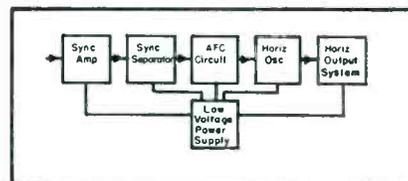
(Continued on page 48)

Fig. 3. 'Scope patterns showing spurious voltages in numerous sections of the TV receiver, when *take-off* occurs. These waveforms have high voltages which occasionally damage receiver components and tubes, and which back up into other circuits in the receiver, making routine waveform and peak-to-peak voltage checks of no avail.



*Author of *TV Troubleshooting and Repair Guide Book*, published by John F. Rider.

Fig. 4. Unless the internal impedance of the power supply is sufficiently low, this impedance develops feedback between the various receiver sections, which causes motorboating or squegging. Open or partially open filter capacitors are the usual offenders.



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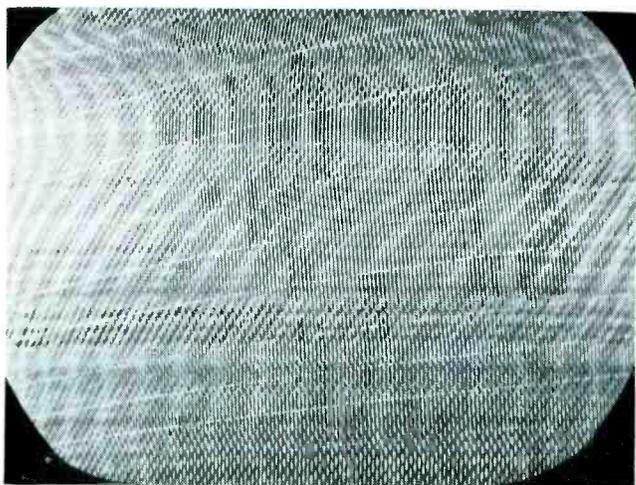
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SERVICE, AUGUST, 1952 • 27

Complete loss of picture due to receiver front end being overloaded by a nearby radio station, which can be cured by high-pass filter.



A Report on

TVI

by DONALD PHILLIPS

Part II . . . Nine Types of Amateur TVI and Cures . . . Solutions for Interference Caused by Harmonics, Horizontal Deflection Circuit Defects, Diathermy Equipment and Automobiles.

IN OUR INITIAL report on the P. S. Rand TVI clinic lecture, it was noted that 21-mc ham interference could be cured by the installation of a highpass filter or realigning the existing receivers, when necessary, to 21.9 mc.

For ham TVI checks, three chassis, each of which used a different *if*, were

studied. One receiver had the sound channel at 21.9, another at 21.75, and a third a 21.25-mc sound *if*. Although standard curb measures proved completely effective in many cases, it was found that there were some, when the receiver was quite close to the transmitter, where a complete cure could be

effected only by shifting the sound *if* to 21.9.

There appears to be six general classifications of amateur TVI:

(1) BCI type (fundamental overloads TV sets or gets into *if* amplifier.) (2) Harmonic type. (3) Spurious emissions (key clicks, side band

TVI Causes and Cures

Automobile ignition . . . Antenna should be moved as far from street as possible, and coax feeder tried.

Electric shaver . . . Filter should be built into the device (not at plug end of line cord).

Oil burner . . . Spark plug suppressor and line filter should be used. Motor, burner and furnace should be bonded.

Belt static . . . Machines should be bonded together and to ground, graphite applied to belt.

Defective neon signs . . . Insulation should be checked and tubes replaced.

Diathermy . . . Old style sets using arc or self-rectifying oscillators require shielded room and line filter. New styles may require adjustment to eliminate harmonic or other radiation. May require high-pass filter on TV set.

Commutating motors . . . Filter should be installed at motor, not at plug end of line cord.

Oscillating TV booster . . . Input and output leads should be separated. Shielding should be installed and unit should be neutralized.

Pickup from another TV receiver . . . Shielding should be provided. Front-end isolation should be improved. Booster should be used to isolate antenna at offending receiver.

Industrial heating . . . Can be temporarily cured by moving frequency as not to interfere with local channels; complete cure involves shielded rooms and line filters.

Aviation transmitter and mobile transmitter and amateur transmitter . . . Spurious emission can be reduced by lower drive, loose coupling, additional traps and low-pass filter.

Germicidal lamps . . . These should be replaced with 60-cycle type.

Arc welders using rf to strike arc . . . Complete shielding line filters are required.

Garage door opener (transmitter) . . . Power should be reduced and frequency shifted.

Garage door opener (receiver) . . . Superregen receiver should be replaced by non-radiating type.

Thermostatic devices . . . Capacitor filter should be placed as close to contacts as possible.

Defective doorbell transformers . . . These should be replaced.

Demand meters . . . Capacitor filter should be placed as close to contacts as possible.

Tungsten lamps . . . These should be replaced.

Loose antenna connections . . . Should be tightened.

Spot welders . . . Filter usually available from manufacturer of machine should be installed.

Electric fences . . . Newer type should be used.

Traffic lights . . . A filter should be installed in controller.

Blinker lights . . . Here a filter should also be installed in controller.

Fluorescent lights and starters . . . Those should be replaced.

Power Company Equipment: Bushings . . . Should be replaced. *Insulators, pin* . . . Should be replaced. *Insulators, dead-end* . . . Conducting grease should be applied to joints. Grease gun can be mounted on hot stick with bakelite shaft extension of screw.

Tree contact . . . Heavy insulating sleeve should be used on line wire; trees should be trimmed.

Lightning arrester . . . Defective models should be replaced.

splatter and parasites). (4) Audio rectification. (5) Hetrodyne type. (6) Local generation of harmonics external to the transmitter due to a non-linear detector in the area (often the TV receiver *rf* stage).

BCI Conditions

When the television receiver and amateur transmitter are quite close to each other, Rand said that the most serious cause of TVI may be simple overloading of the receiver's front end by the fundamental output of the transmitter. Nothing can be done about this at the transmitter, but something can be done at the receiver to prevent so much fundamental from getting into it. Normally, it was noted, trap circuits tuned to the fundamental, inserted in the antenna leads at the receiver, will do the trick. But since traps are selective devices they cease to be effective when operations are shifted to another band, or even to a new frequency in the same band.

A high-pass filter was described as a more generally-useful fundamental suppressor. The filter must be mounted very close to or on the receiver chassis and a very short connection must be used between the coil center-tap and the chassis of the set.

Filters, two-section arrangements designed for balanced 300-ohm input, are usually built in a box about 1½" square at the end and 3" long, formed from thin copper sheet, with the box divided into three sections by two 1½" square copper partitions. Each coil, it was said, is in a separate section, with its center-tap soldered to the copper wall. Capacitors, 20-mmfd ceramic units, are mounted in holes

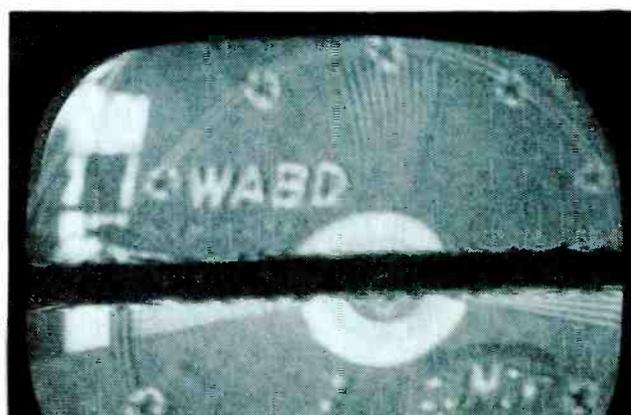
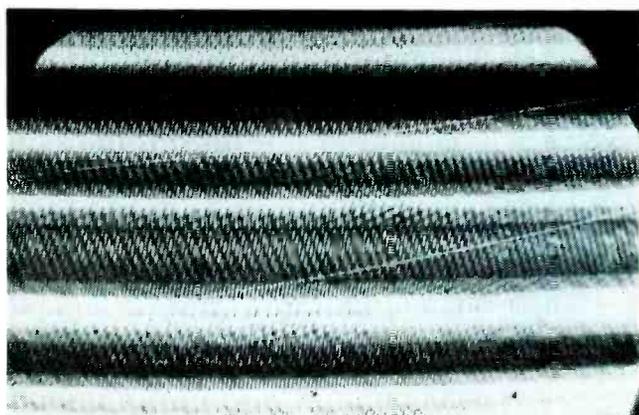
(Continued on page 30)

(Below)

Modulation bars from a nearby radio transmitter using amplitude modulation; bars flash on and off with music or speech. This trouble can be cured with a high-pass filter.

(Right)

TVI caused by an old style light bulb.



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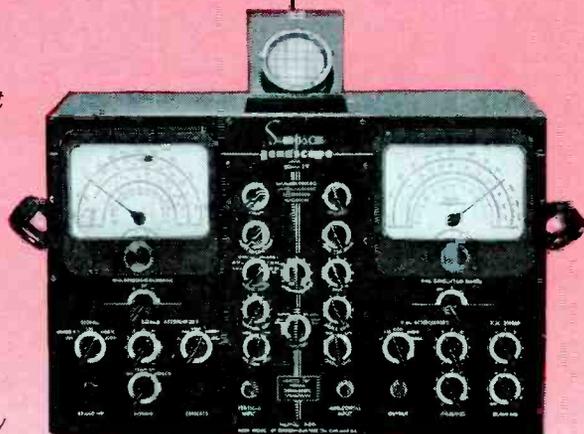
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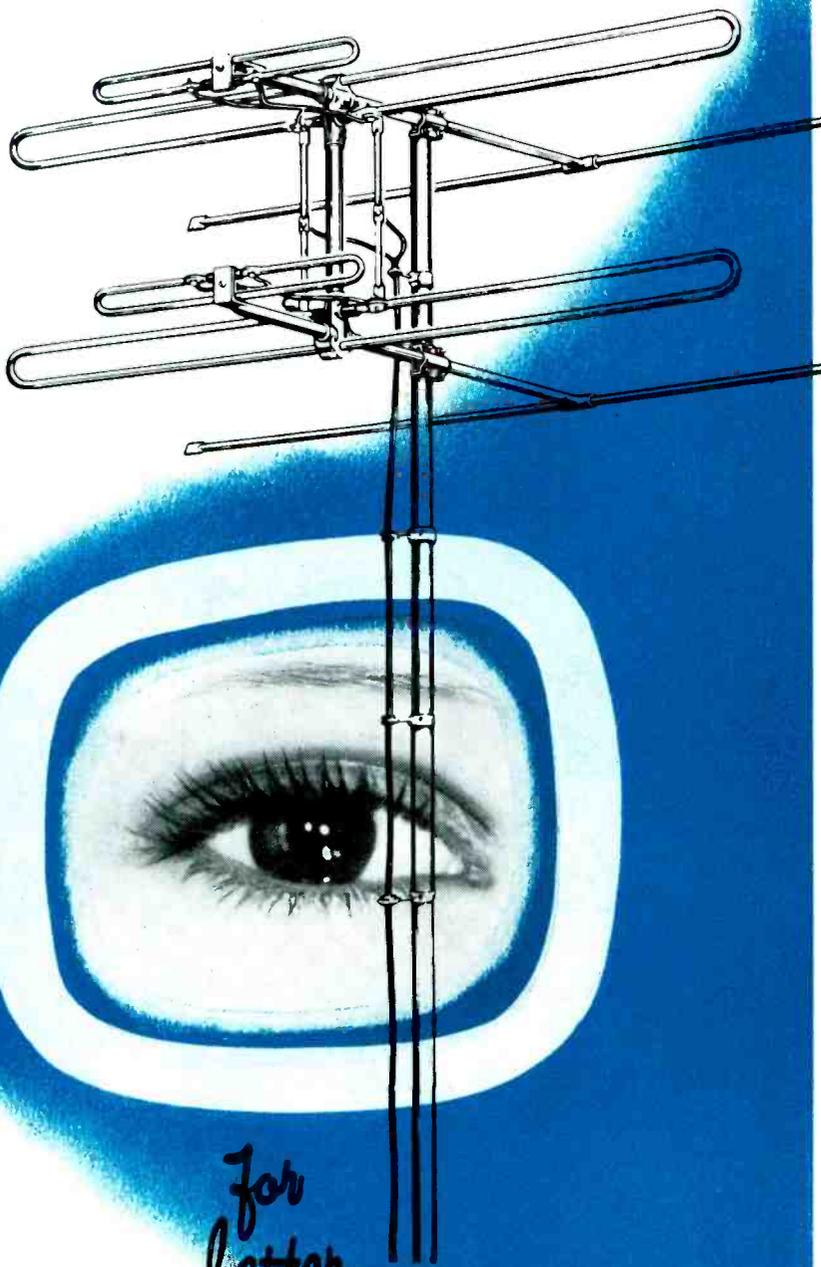
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(Continued from page 29)

of slightly larger diameter in each partition so that the leads at one end connect to the coil in one section and the leads at the other end connect to the coil in the next.

Not only do these filters reduce ham TVI, but they frequently improve TV reception. Such an improvement obtains because many models have rather poor *if* rejection, and a filter having a cut-off above 30 mc will prevent many signals, such as *hf* broadcasting in the 21-mc region and industrial heating and diathermy in the 27-mc band, from riding through the front end to the receiver *if*.

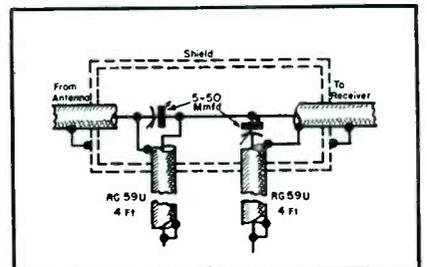
Harmonic TVI

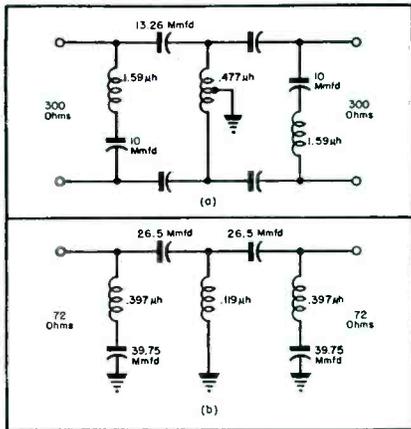
The harmonic type of TVI, caused by harmonics of the ham's main or fundamental signal, can cause trouble when the harmonics leak out unintentionally due to not enough shielding and filtering, landing right on a TV channel and generating interference. The amateurs can correct this condition. Precisely the same phenomenon can also happen in a TV receiver, namely the radiation of harmonics of the 15-kc horizontal sweep oscillator reaching out and smearing every nearby broadcast and shortwave receiver. This is a job for the Service Man using shielding and filtering.

Audio Rectification

This type of TVI, that must be cured at the TV receiver, very often happens in any improperly shielded and filtered audio amplifier, from a hearing aid to a *pa* amplifier. It is also quite common on small *ac/dc* midget broadcast receivers as well as TV consoles with long audio leads. A 75,000-ohm resistor placed in the first audio grid to form a filter with the tube input capacity, has been found

Circuitry of trap which can be used to eliminate diathermy interference. The trap consists of a pair of four-foot lengths of coax cable each wound in the form of a spiral and attached, one on top of the other to a piece of cardboard or similar material. Trimmers should be of the silvered ceramic type. (Courtesy DuMont)





Circuitry of highpass filters, found effective in eliminating ham and diathermy interference. (Courtesy R. L. Drake.)

effective. It may also be necessary to shield the audio leads.

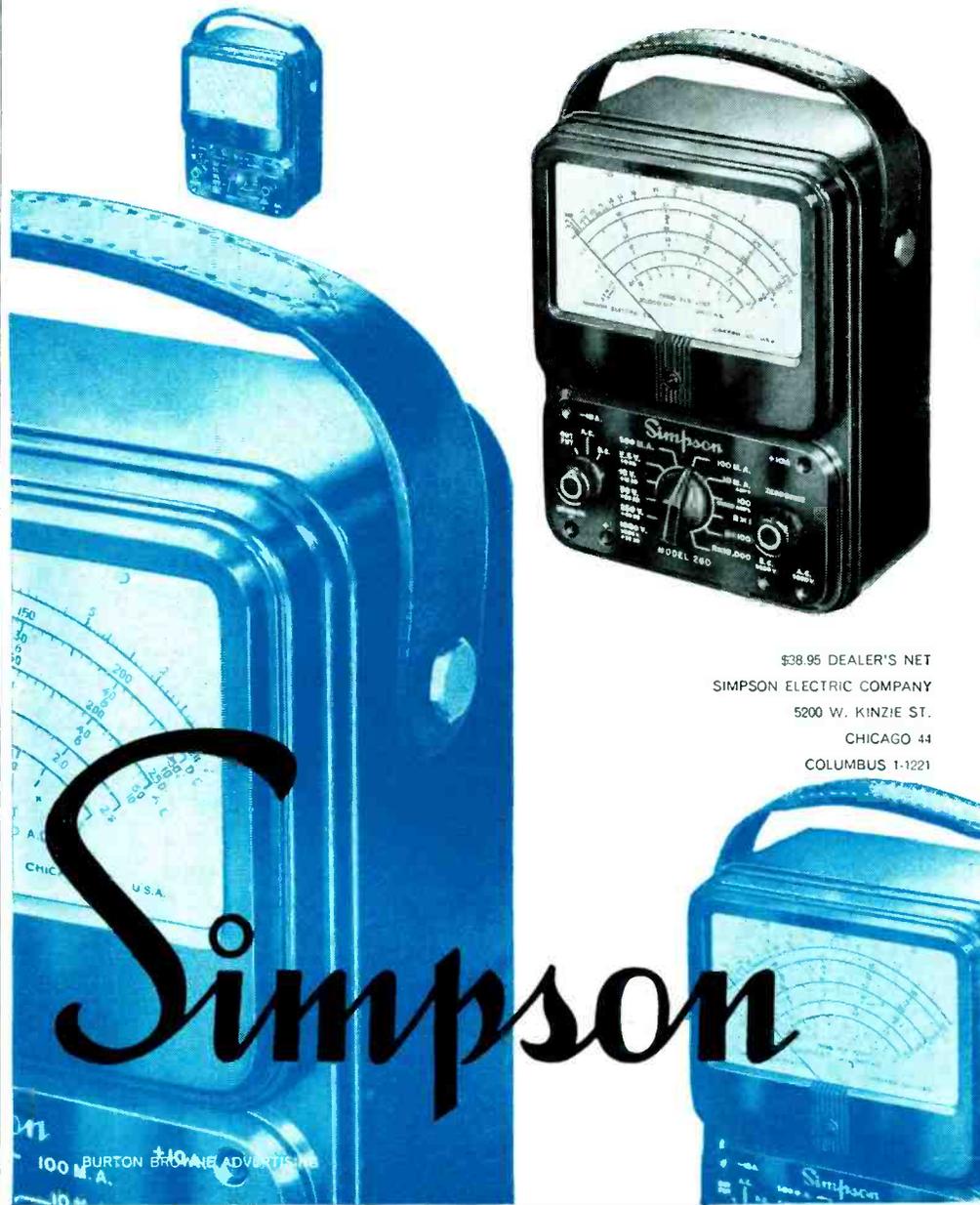
Locally Generated Harmonics

Any non-linear rectifying or detecting device, such as a corroded TV antenna, copper gutter, antenna mast, guy wire, or even the *rf* tube in the TV receiver front end can rectify the strong, harmonic free, fundamental signal of a transmitter and thus generate copious amounts of harmonics, enough at any rate to seriously interfere with that particular TV set, reported Rand. This type of interference does look like a transmitter generated harmonic, except that it only appears on one or two TV sets out of a group in this neighborhood: if it were coming from the transmitter, it probably would affect all the receivers. To cure, of course, it is necessary to locate the corroded connection and clean it and to prevent the overloading of the TV *rf* tube with a high pass filter.

There is one type of interference that may affect broadcast receivers; this results from the radiation of 15.75-kc harmonics from nearby TV receivers, and can be especially annoying as it causes garbled sound, squeals and howls.

Causing the trouble are the horizontal deflection circuits which operate at a frequency of 15,750 cps, where pulse voltages of several thousand volts occur. Noting that they are of complex wave shapes and rich in harmonics, Rand said that the 35th harmonic of 15.75 kc is 551.25 kc which falls at the lower end of the broadcast band, while the 100th harmonic is within the upper limits of the band. Interference, thus, is greater at the low end of the band than at the upper end, and can be observed by turning the broadcast tuning dial from the low to high limits of the band. The interfering signal gradually decreases as the higher frequencies are tuned in,

outsells all others combined MODEL 260 VOLT-OHM-MILLIAMMETER



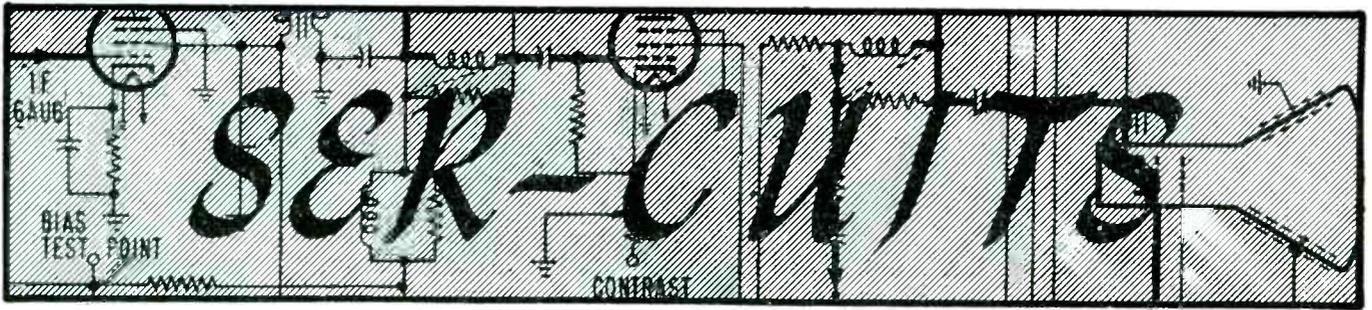
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although some TV sets cause interference well into the short waves.

It might appear that the 35th to 100th harmonic of a signal would be of such small magnitude as to be negligible. While the harmonic signals are weak, the signal strength of the interference present at the broadcast receiver may be equal to, or greater than the strength of the signal from a broadcast transmitter located several miles distant.

There are several solutions to the problem:

- (1) Horizontal deflection circuits can be shielded.
 - (2) Yoke leads can be dressed within supporting brackets.
 - (3) A shield or bottom plate can be placed on TV chassis.
 - (4) A shield can be installed inside TV cabinet.
 - (5) A filter can be installed on power leads to TV set.
 - (6) The TV chassis can be grounded to external ground except in some *ac/dc* type receivers.
 - (7) A high pass filter can be in-
- (Continued on page 62)



by M. W. PERCY

Analysis of Portables With Ferrite Core Antennas and Printed Circuit Coupling Assemblies . . . Concluding Installment of Newman Discussion on DuMont TV Dynamic Demonstrator.

PORTABLE RECEIVERS, which have become such stalwart members of the broadcast-set family, have won this acceptance because of the effective use of several new components and novel allied circuitry.

The most prominent item in the new carry sets has been the ferrite antenna, which has been cited as a feature in most chassis. In practically all instances, the antenna is a small tuning coil with a powdered iron core. Its small size has been found to facilitate mounting, without the necessity of flexible connections. In view of its construction, its signal pickup is basi-

cally electromagnetic, resulting in reduced electrostatic interference.

An interesting example of a ferrite antenna receiver appears in Fig. 1; G.E. 605 and 606. This is a 3-way model with a 1R5 converter, 1T4 *if* amplifier, 1U5 detector and first audio amplifier, 3V4 audio power output and selenium rectifier.

Portable With Printed-Circuit Units

Another feature of the new 3-way portables is the printed-circuit coupling unit. In the Truetone model D-3210A, for instance, (Fig.2), two

such assemblies are used in the *if* and audio coupling circuits. This receiver also uses a selenium rectifier.

Alignment Procedure

In aligning this model all measurements should be based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm 5-watt resistor across the secondary winding of the output transformer. A reading of .4 *v ac* across this resistor will be equivalent to a 50 milliwatt output with the speaker connected. The volume control should be set to maximum.

The signal source should be a calibrated signal generator capable of supplying the required frequencies for alignment, modulated 30 per cent with a 400-cycle audio signal. Variations in sensitivities of ± 25 per cent are permissible.

Battery Replacement

Since the receiver is quite small, not every A or B battery will fit in the space provided. There are five types of batteries that can be used for replacements:

	A	B
Wizard	3B-6160	3B-6260
RCA	VS-065	VS-090
General	31	132
Ray-O-Vac	P-751	4390
Eveready	717	490
Burgess	CS	N60

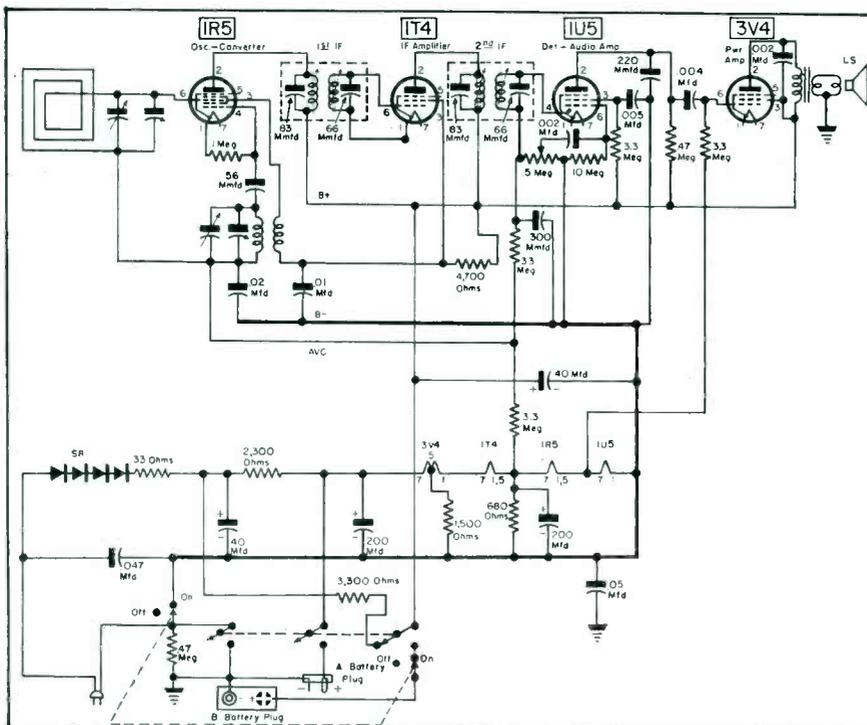
TV Dynamic Demonstrator*

In analyzing the circuitry of the chassis used in the DuMont demonstrator, it was noted that the video *if* amplifier employs an *if* of 45.75 mc.

All of the video *if* interstage transformers are of the double-tuned over-coupled type, assuring the wide band-

*Prepared by Daniel Newman of DuMont.

Fig. 1. G.E. portable (models 605 and 606) which features a ferrite antenna and selenium rectifier.



ted to the plate of the *agc* rectifier as an aid to rapid troubleshooting.

Horizontal and Vertical Sync Circuits

These circuits differ from those used in most TV receivers in that separate horizontal and vertical sync clipper chains are employed for maximum noise immunity and ability to reject sync misinformation. Here again, separate tubes were employed in reproducing these circuits on the *demonstrator*, although dual purpose tubes are used in the regular production chassis.

The horizontal sync clipper chain consists of a sync amplifier (V_{212A} - $\frac{1}{2}$ 12AT7) followed by a twin-triode 6SN7 used as first and second horizontal sync clippers (V_{214A} and V_{214B}). One of the important functions of the sync amplifier (V_{212A}) is to separate the horizontal sync pulses from the composite video signal which is taken from the output of the video amplifier and applied to its grid through the 18,000-ohm resistor, R_{227} . A 180,000-ohm cathode resistor, R_{200} , bypassed by C_{200} (.015), self-biases this stage so that the tube conducts only on the high-amplitude sync pulses. In addition, the time constant of this network is such that the long duration vertical sync pulses cause an even higher positive charge to build up across C_{200} , cutting off tube conduction for almost

the entire duration of the vertical serrated sync pulse.

In this manner, only the horizontal sync pulses appear in the output of the sync amplifier stage and are coupled to the first horizontal clipper through a .001 coupling capacitor, C_{207} . The operating points of the first and second horizontal sync clipper stages (V_{214A} and V_{214B}) are chosen so that any extraneous signals which may be super-imposed on the horizontal blanking pedestals or on the horizontal sync pulses will be removed. Such spurious signals may occur due to noise bursts, or in some instances by faulty transmitter operation, and can cause horizontal instability.

The second horizontal clipper also serves as a cathode-follower output stage. The output is taken across R_{201} , a 1500-ohm resistor, and fed to the horizontal oscillator control tube through the interconnecting chassis cable.

The vertical sync clipper chain consists of the first and second vertical sync clippers, V_{212B} and V_{213B} , each using $\frac{1}{2}$ of a 12AT7.

The composite video signal is applied to the grid of V_{212B} , the first vertical clipper, through a 150,000-ohm resistor, R_{210} . This resistor, in conjunction with the input capacity of V_{212B} , form a low-pass filter which attenuates the video and horizontal sync information. This network also helps

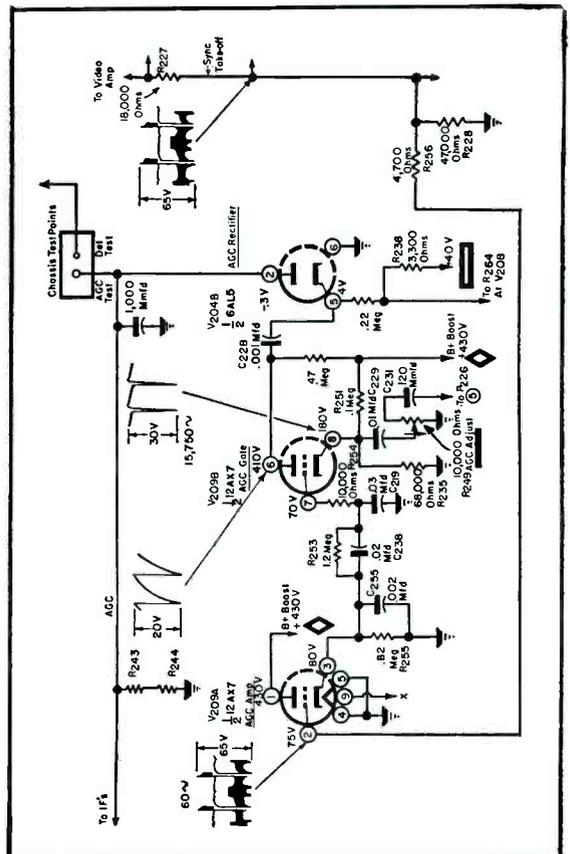
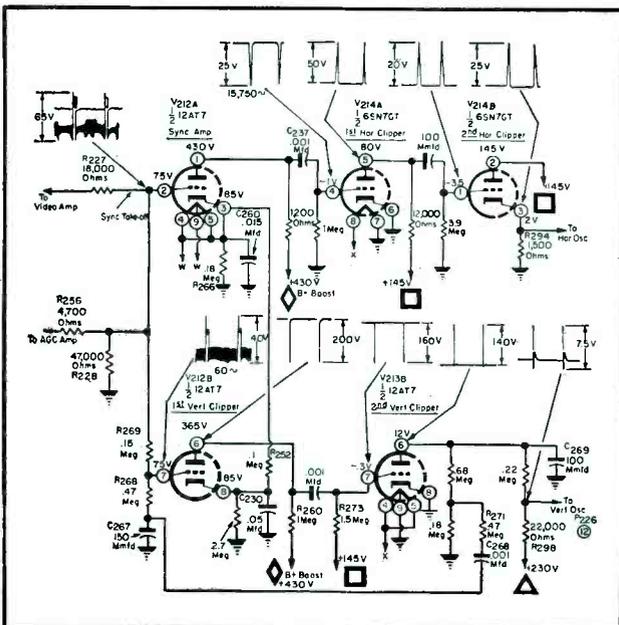
to integrate and sharpen the vertical pulse at this point. Vertical noise immunity is secured in this stage by biasing the tube beyond cutoff, so that only the sharp vertical pulses will cause tube conduction. To maintain the constant high-cathode bias, necessary to prevent the tube from conducting at any time except during the vertical pulse, the cathode of the first vertical clipper is tied to the cathode of the sync amplifier (V_{212A}) through R_{202} (100,000 ohms). (Referring to the foregoing discussion of the operation of the sync amplifier (V_{212A}) it was noted that the cathode of this stage was maintained at a high positive value at all times.) The sharp rise in voltage which takes place at the cathode of V_{212B} is not coupled to the cathode of V_{213B} due to the filtering action of C_{230} (.05 mfd).

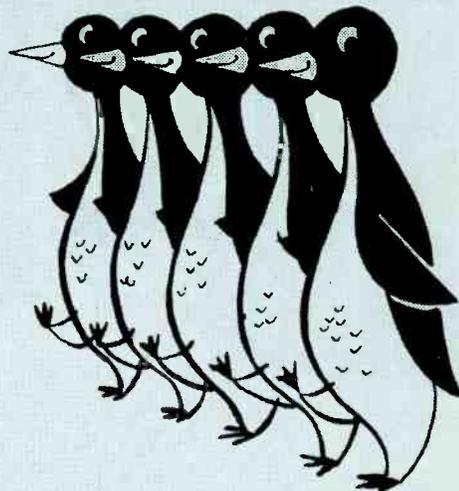
Both the upper and lower portions of the vertical pulse are clipped in the second vertical clipper stage, V_{213B} . This is accomplished by operating this tube with a very low plate voltage (12 v) and applying a high positive voltage (145 v) to its grid through R_{271} . The vertical sync pulse present at the grid of the first vertical clipper is reinforced by applying positive feedback from the plate of the second vertical clipper through R_{271} (470,000 ohms), C_{208} (.001) and R_{208} (470,000 ohms). This action has been found extremely

(Continued on page 51)

Fig. 3 (below). Horizontal and vertical sync circuits in DuMont chassis.

Fig. 4 (right). Circuit of the *agc* system which consists of an *agc* amp, *agc* gate and *agc* rectifier.





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TUBE News

by L. M. ALLEN

Ion-Trap Magnet Adjustment Procedures* . . .

THE PROPER ADJUSTMENT of the ion-trap magnet can insure maximum picture brightness and minimize the possibility of picture-tube damage. Misadjustment of the ion-trap magnet can cause imperfect centering of the electron beam and result in excessive bombardment of the masking aperture within the electron gun. As a result, ions may be formed beyond the control of the ion trap and produce an ion spot on the fluorescent screen. It has been found that picture tubes utilizing low-voltage electrostatic focus are more susceptible to this type of damage than tubes using magnetic focus, possibly because the converging effect of an electrostatic focusing field on the ions is greater than that of a magnetic focusing field.

There are seven steps which should be followed in the adjustment of the ion trap:

(1) The deflecting yoke should be centered on the tube neck and the mounting-bracket cushion pressed firmly against the glass funnel. If the tube uses magnetic focus, the focusing device should be spaced on the tube neck at least $\frac{1}{2}$ " from the end of the deflecting-coil windings. This spacing is necessary to reduce interaction between the focusing and deflecting fields. If the tube uses electrostatic focus, a small, adjustable centering magnet is usually required. It should be placed on the tube neck not more than $\frac{3}{4}$ " from the flared end of the tube.¹

(2) The ion-trap magnet is then placed on the tube neck. The initial

position of the magnet should be in accordance with the instructions given in the tube bulletin for the specific tube type. For such tubes as the 17CP4, 17TP4, 21AP4, and 21MP4,** the proper initial position of the ion-trap magnet is in line with or slightly below grid 2, or about $\frac{3}{4}$ " from the tube base. The south pole of the magnet should be adjacent to pin 2 and the north pole to vacant pin position 8.

(3) The brightness or background control of the television receiver should now be adjusted midway between its minimum and maximum positions and the picture or contrast control set to

its minimum position. The brightness-control adjustment will provide the picture tube with grid 1 voltage approximately midway between zero and cutoff; the picture-control adjustment will provide a blank raster on the screen for observation during subsequent adjustments. With some receivers incorporating *agc*, it may also be necessary to disable the *agc* circuit temporarily so that a blank raster will be obtained on the screen.

(4) With the controls set as indicated in (3), operating voltages can now be applied to the tube. As soon as the tube cathode reaches operating temperature, the position of the ion-trap magnet should be adjusted by moving it a short distance forward or backward, rotating it slightly until maximum brightness is obtained at the center of the raster. It is important that this adjustment be made with the brightness control set, as specified in (3), midway between the minimum and maximum positions, so as to keep the beam current low. It is equally important that the adjustment of the ion-trap magnet be completed quickly because operation of the picture tube with the ion-trap magnet improperly positioned may damage the tube. With certain picture tubes, particularly those utilizing electrostatic focus, two positions of the ion-trap magnet may be found in which maximum brightness is produced. The correct position is that which is nearer the base of the tube.

(5) Now the pattern should be focused and centered. These operations
(Continued on page 53)

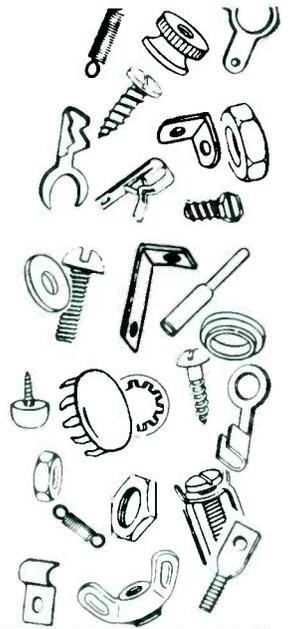
New 27-inch picture tube developed by Sylvania. Now in pilot production, limited quantities of the tube are being shipped to receiver manufacturers for experimental purposes. Limited production quantities are expected to be available later this year.



*Based on copyrighted notes prepared by the RCA tube department.

¹Normally referred to as reference line in tube dimensional outlines. **RCA.

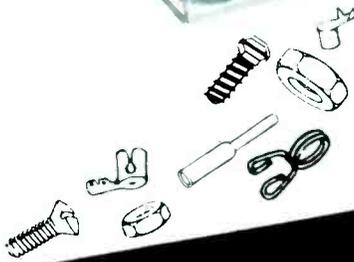
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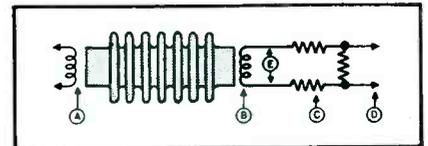
TV DESIGN ENGINEERS are very concerned with receiver sensitivity and constant checks are made during the design period with expensive laboratory equipment. And on the production line, spot checks are employed to be sure that the average receiver sensitivity is as good as competition. But, in most instances, when the receiver reaches the Service Man's shop for the first time, many fundamental rules are forgotten and less exact methods are employed.

In primary service areas when using an outdoor antenna, Service Men can afford to be a little less critical, since the signal is strong and most service work is done under ideal conditions. In weaker signal areas, in intermediate areas when operating on an inside antenna, or if the receiver is operating on a built-in antenna with strong signals, the situation is much different and it becomes necessary to resort to standards to obtain good results.

Fringe area Service Men know how difficult it is to convince a customer if the picture fades or exhibits excessive snow. With a given antenna installation, receivers with the most gain always have less snow and greater picture stability. Often, Service Men try to guess receiver gain by comparison methods. This always proves to be very inexact, as signals in fringe areas may fade from hour to hour and even from minute to minute. This means that the signal may have been caught on the upswing and the receiver has been thus pronounced satisfactory. This situation can be avoided with an instrument[‡] generating accurately controlled signals to determine *if* and *rf* gain. The unit can also be used to check video amplifier gain. A sine wave voltage, which simulates average detected video voltage, peak-to-peak, is present at two terminals of the instrument. If the video amplifier gain is satisfactory, a black bar will appear across the screen. A gray bar, or no bar at all, will indicate a defective video amplifier or picture tube.

Receiver sensitivity should be checked after aligning a receiver

TV Sensitivity Measurements . . . Increasing Life of 6BQ6GT Horizontal Output Tubes



Collapsible metal-bellows attenuator featured in sensitivity measurement unit. *A* = *rf* input; *B* = attenuated *rf* down to 5 microvolts with zero leakage; *C* = 300-ohm matching pad; *D* = input to TV receiver; *E* = coax cable.

(Left)
Sensitivity-measurement instrument connected to an Admiral chassis. (Courtesy Onthark Distributors, Des Moines, Ia.)

whether an approved alignment method has been used or the *if* slugs have been adjusted. The recommended alignment procedure should, of course, be used wherever possible. But, often many receivers, which display relatively good picture because someone has touched up slugs and widened the bandpass, have low sensitivity.

Sensitivity measurements can be used advantageously for trouble shooting on the bench. Troubles can be isolated to the video amplifier or picture tube if sensitivity checks are satisfactory. Or, as an expedient, a check on the video amplifier and picture tube will isolate the trouble to the tuner or *if* amplifiers.

In designing the sensitivity measurement device, it was necessary to consider the fact that the instrument must deliver voltages down to a few millionths of a volt accurately. To insure such output, a new type of *rf* (*bellosus*) attenuator, which operates as a wave-guide beyond cut-off was included. This attenuator has made it possible to employ a logarithmic microvolt dial, where the distance between 5 and 10 microvolts is about as great as the distance between 50

and 100, although one figure represents a change of 5 and the other represents a change of 50.

In operation, a sample voltage is taken from the oscillator and read on a meter in the center of the instrument. A variation in line voltage, causing the indicator on the meter to swing away from the center line, can be corrected by a knob directly below the meter. This changes the oscillator output so that it is then the same as when the instrument was calibrated.

To check receiver sensitivity with the sensitivity measuring instrument, the output cable of the device is connected to the antenna terminals of the receiver. Then a voltmeter (20,000 ohms per volt) or *vvm*, is connected across the video-detector load resistor. The *microvolt* dial is then adjusted for 1 volt *dc* on the voltmeter and the *channel* dial adjusted for maximum indication on channel 2. If 2 is in operation, 3 or 4 can be used. Since receiver sensitivity will vary slightly from channel to channel, channel 2 is used as a standard by most manufacturers. If a high channel is not up to par, reading on 2 will also be low. Finally receiver sensitivity can be read on the microvolt dial.

To assist the Service Man in determining whether or not the receiver

*Based on notes prepared by R. Frier, Service Instrument Co.

‡SensiMeter.

under test is acceptable, the *microvolt* dial has been divided into three sections: *very sensitive receiver*; *medium sensitivity*; and *insensitive receiver*. A receiver operating in a fringe area should have a reading somewhere in the *very sensitive receiver* division, which falls between 5 and 20 microvolts. The lower the figure, the higher the gain of the receiver.

Receivers that were manufactured two to four years ago may have sensitivity readings in the *medium sensitivity* division. Any reading over 100 microvolts in the *insensitive* receiver division will indicate a defective component. Many receivers built in '52 will read 10 microvolts and under, while in '48 it was common to read 100 microvolts and up.

Receivers of the '48 type can be improved by a few simple operations: When the sensitivity measuring instrument is connected to measure sensitivity, you can check and change tubes, one at a time, in the tuner, *if* amplifiers, video detector, and the *B+* rectifier. The voltmeter will swing above 1 volt if the tube has increased receiver gain. Plate voltage on *rf* and *if* amplifiers can be increased by paralleling dropping resistors. The *rf* amplifier can be realigned for maximum output.

If conventional diode *agc* is used, the *agc* filter should be connected to the video detector load resistor. The loading on the input transformer in the tuner should be decreased. Higher gain tubes might be used in the *if* or *rf* amplifier stage, such as 6CB6 in place of a 6AU6; be careful of oscillation.

Of course, it is necessary to check sensitivity after every change to be sure you have improved receiver gain.

The noise factor of a television receiver is also very important in weak signal areas. If receiver gain is satisfactory, and the receiver is to operate in a very weak signal area, the output cable of the sensitivity meter should be disconnected, and noise that is developed at the video detector read on the voltmeter. If the reading is .6 volt *dc* or over, the *rf* amplifier tube and video detector should be changed and then the remainder of the tubes in the tuner and *if* section changed until the reading is reduced. Sensitivity should be rechecked to be sure a defective tube has not been installed.

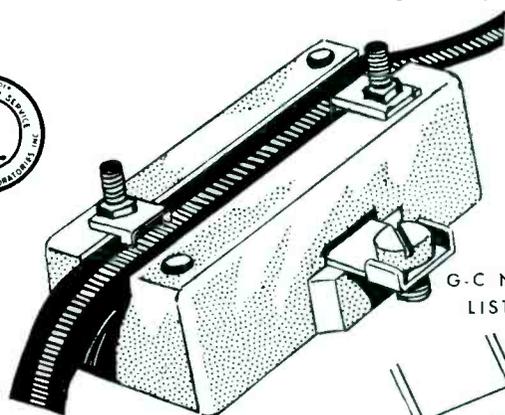
Increasing 6BQ6GT Life

SUBNORMAL LIFE of 6BQ6GT horizontal output tubes in Sentinel models has been found due to improper adjustment of the horizontal drive controls. This

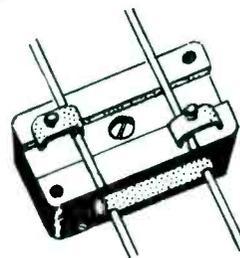
(Continued on page 55)

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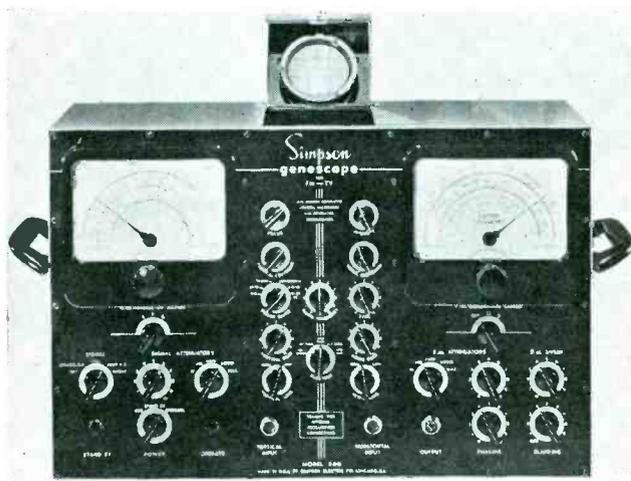


Fig. 1. Above, a combination TV signal generator and 'scope which can be used to align TV chassis; for instance, the video sections. Most receivers are aligned in two steps; front end and video *if*. The video *if* stages are usually aligned separately and an *if* bandwidth of 4 mc will yield best picture quality. The video *if* bandwidth is measured between points on each side of the curve (Fig. 2) at 50% amplitude. In Fig. 3 it will be noted that the curve must have a substantially flat top extending from the video carrier frequency to the sound center frequency. Since these signals are separated by 4.5 mc, the flat portion must be 4.5 mc wide. Most chassis now use the intercarrier principle where both the video and sound signals pass through the common *if* amplifiers. With this method the optimum bandwidth cannot be obtained, but bandwidths of the order of 3 to 3.7 mc can be had.

AFTER THE TV antenna has been installed, it must be connected to the set. If the leadin has been terminated in a wall outlet, a short piece of leadin, attached to the antenna terminals of the set, have to have a plug attached, which will fit into the wall outlet. Of course, this plug should be the same brand as the outlet and it will fit, just as the power outlet does. If, however, a wall outlet is not desirable, the leadin should be cut two or three feet from the termination in the set and a coupling, which will serve the same purpose, should be installed. When the owner wants to move the set away from its position for cleaning or decorating, or when it becomes necessary to take the set out for repair, the connections at the antenna terminals of the set need not be disturbed in any way to disconnect the antenna and free the set for movement.

After all antenna details have been taken care of, you are then in a position to test your workmanship. The receiver is now ready for reception. If the set was delivered from your shop, it is assumed that all tunable parts had been previously aligned. But the chassis has been

¹Simpson 479 or 480.

²Such as Variac or Powerstat.

Part Two: Making Final Tests During an Installation . . . Alignment Procedures.

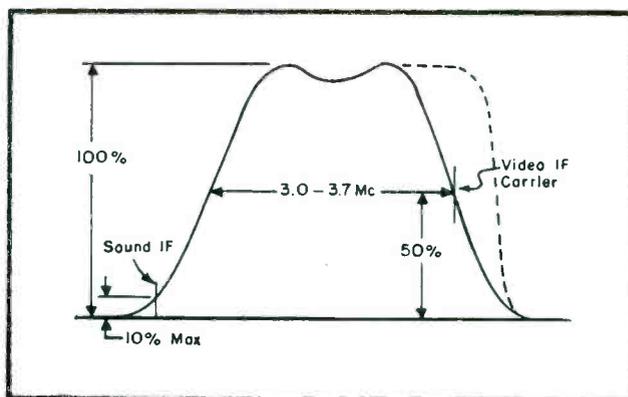


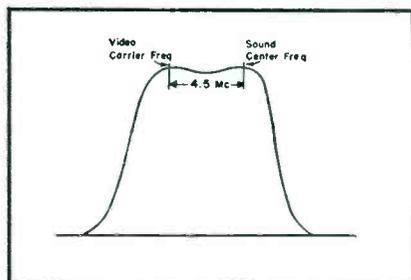
Fig. 2. In aligning chassis, it is important to remember that the video *if* carrier frequency must fall on the side of the response at 50% of the total amplitude of the response curve. This is necessary to obtain good low frequency response, which makes up the principal picture components. On low-frequency signals the station transmits a low and high frequency sideband; these signals are added together in the vicinity of the video *if* carrier, and in effect produce a response curve as shown by the dotted line. In the intercarrier system the sound signal must also pass through the common *if* stage so that this signal will fall on the opposite side of the response curve. Adjustments must be made to limit the amplitude of the point where the sound signal falls to a maximum of 10% of the total amplitude of the curve. Thus, it can be readily seen that an accurate marker generator is required. In weak signal areas, gain is of primary importance. In any tuned circuit the bandwidth times the gain is equal to a constant. Thus, additional gain can be had if the bandwidth is reduced. Reduced bandwidth, of course, will result in poorer picture definition, but in weak signal areas the increased gain will reduce snow and thus provide better overall results. The response curve for the front end, as shown in Fig. 3, must be preserved. However, in most receivers the *rf* stage bandwidth is more than adequate and usually increases on the higher channels. The principal method by which adequate bandwidth is obtained is by loading the coils. This loading consists in placing a fixed resistor across the tuned circuits. Thus, the front end bandwidth can usually be decreased and the gain increased by increasing the value of the resistor across the antenna coupling coil. Another important factor for optimum gain is the B+ voltage to the tuner. Many receivers using Standard Coil tuners are operated at voltages of about 105 volts. Substantial gain can be had by decreasing the series dropping resistor to increase the voltage to 125. Some additional gain can be had when aligning the *if* amplifiers by sacrificing bandwidth. Increased low-frequency gain can be had by aligning so that the video *if* carrier falls closer to the top of the curve. It must be remembered that as the video *if* carrier is moved up nearer the top of the curve the sound *if* signal will move down the opposite slope. Thus, the maximum amplitude point at which the video *if* carrier can appear is limited by how low the sound signal will fall on the opposite side of the curve. Increased *if* gain and also tuner gain can be accomplished by lowering the bias developed by the *agc* circuit. Some receivers provide a potentiometer adjustment for this. In other receivers the resistors in the *agc* circuit can be shunted so that the tube will operate at a lower negative bias and thus produce more gain. If a strong signal can also be received it may overload the receiver if the *agc* voltage has been lowered for increased gain. A switch can be installed at the rear of the chassis to control the shunting resistors in the *agc* circuit to provide ideal bias for reception of weak and strong signals. Trap adjustments are also important in fringe areas where reception of signals from adjacent channels is possible. Here again, an accurate signal generator is required for the correct adjustments of these circuits.

trucked and bounced around a little in the process. In addition, it is now connected to a different source of power and a new antenna. Therefore, it is now wise to test every channel on which there is a station to which the receiver may be tuned. If the station is on the air, a fairly good indication of its receptability is apparent when you tune it in. If it is not on the air, a signal generator¹ can be used to set up the frequency, so that the alignment of the receiver can be checked. If the set has been delivered direct from the warehouse or dealer's stock in a sealed carton, it is more important than ever to check channel pickup carefully.

A handy accessory to use, for your own assurance at this point, is a variable autotransformer.² Line voltages vary from time to time. Undoubtedly you will be installing the set and checking it during the day when the line voltage is relatively high, and not in the evening hours when the set will be used most, and voltage drops off due to increased use. If you want to avoid returning in the evening, you should try set operation at a reduced line voltage at the time you install it. Local power companies will normally advise the average expected conditions regarding line voltage fluctuation. Your own meter can be used to secure the information; it can be connected in the power circuit and a record made of line voltage fluctuations over the period of a telecast day.

As the final step in an efficient installation the new set owner should be told exactly how to use the front panel controls; he should be warned, too, of the inherent dangers which the inside of the set holds for him. All quality receivers are supplied with a set of instructions which are handy for reference, but the owner of a new set will be much happier if he receives expert help. Once again, it is necessary to remember the fact that the new owner has purchased entertainment and furniture, and you should make the use of it as painless as possible to him. Also, if you show him how, when, and where to make the necessary adjustments to obtain good results from his equipment, those annoying call backs will vanish.

Fig. 3. Typical TV rf amplifier response curve.



W 42 BH

78

This "Dual Voltage" cartridge is an excellent all-around replacement for old-style 78 r.p.m. cartridges. It guarantees improved performance in many cases. A unique "Slip-On" condenser harness provides choice of output voltage—1.5 with condenser harness installed and 3.75 without condenser. For fine quality at low cost your best bet is the Model W42BH at only \$4.95 list.



W 31 AR

WC 31 AR

33 1/3

45

This high output (2.1 volts!) "Direct Drive" cartridge was specifically designed for use with all fine-groove records. Universal mounting bracket provides quick, easy installation in RCA-type 45 r.p.m. changers. (Fits 1/2" and 5/8" mounting centers.) Has easy-to-replace needle. For maximum quality, highest output, and low cost, specify Model W31AR at the low list price of only \$6.50

33 1/3

45

Also available as ceramic cartridge (same price)—Model WC31AR. Highly recommended in areas where heat and humidity make use of conventional crystal cartridges impractical.



W 26 B

33 1/3

45

78

This "Vertical Drive" "all-purpose" cartridge provides superlative reproduction for all types of records. Low tracking pressure (only 6 grams) and high needle compliance guarantee faithful tracking and longer record life. Uses exclusive Shure "Unipoint" needle, scientifically designed for maximum performance and long life.



W 22 AB

33 1/3

45

78

This "Vertical Drive" "turnover-type" cartridge provides extended frequency response (50 to 10,000 c.p.s.) at extremely low needle point pressure—only 8 grams. One of the most popular, widely used cartridges in original equipment. Highly recommended as replacement in phonographs equipped with turnover mechanism. Individual needles—one for fine-groove and the other for standard records—guarantee maximum results.



W 22 AB-T

33 1/3

45

78

Offers all the advantages provided by the Model W22AB, plus a long-life turnover mechanism. Furnishes replacement of old, worn-out turnover mechanisms as well as cartridges. Also an excellent replacement for converting all-purpose phonographs into turnover type.

Patented by Shure Brothers, Inc., and Licensed under Patents of the Brush Development Co.



SHURE BROTHERS, Inc. ☆

225 W. HURON ST., CHICAGO 10, ILL.

Manufacturers of Microphones and Acoustic Devices

Cable Address: SHUREMICRO

SERVICE, AUGUST, 1952 • 41

WIRE-TAPE SERVICING

by JACK DARR

Ouachita Radio Service

Servicing Amplifiers and Bias Oscillators in Magnetic-Recording Systems.



Tape recorder which is said to have a *balanced-tone* control which coordinates amplifier and acoustic system response. Has an index counter which is claimed to provide complete selectivity and instant location of any part of a recorded reel. This enables the user to *catalog* anything recorded exactly. Features also a high-speed forward and rewind lever. (Model T-700; Revere Camera Co.)

Tape-disc recorder with FM Receiver and console cabinet. Records from tape to disc or vice versa. Also records from microphone, internal FM radio, external radio, or phono to either disc or tape. Can mix microphone with recorded disc to record on tape. Includes automatic *pm* erase, neon recording level indicator, fast forward and rewind, and 6" *pm* speaker. Tape speed $3\frac{1}{2}$ " per second, dual track. Takes 5" reels. Disc recorder cuts and plays back up to 10" discs, at 78 rpm. (Model 130; The Henry G. Dietz Co., 12-16 Astoria Boulevard, Long Island City 2, N. Y.)



TO MAKE A RECORDING upon a magnetic medium, all previously recorded material must be completely removed. This process, known as *erasing*, is what has brought magnetic recording to the front, as the wire or tape may be used over and over again. Due to the magnetic characteristics of wire, some sort of *bias* must be used, in addition to the voice or music *signal*. Direct-current bias was tried in the early days of magnetic recording, but due to excessive background noise, etc., it was abandoned in favor of the later development, an *ac* bias, usually in the *supersonic* range of about 40-50 kc. This voltage is used at a low level, for recording, and at a much higher level, for erasing. According to basic erasing theory, the rapidly changing flux causes a totally random rearrangement of the individual magnetic charges along the medium. The later imposition of the orderly magnetic flux of the recording signal causes them to assume magnetic characteristics in correspondence with the varying amplitudes of the signal.

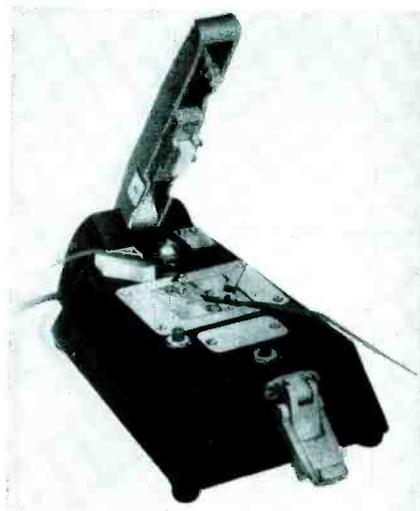
Modern recorders use a combination power-output-bias oscillator stage, in which the output pentode tube acts as a bias oscillator when recording, and as a power amplifier on playback. The recording signal is furnished by the driver triode, and the bias is mixed in the selector switch. The oscillator circuit is disabled in the playback position, to prevent erasure of the recording as it is played, and also in the rewind position, to prevent recording of the high-frequency bias on the tape as it is rewound. Since rewinding is done at three to four times playing speed, the slowing down of the *hf* bias would result in a very unpleasant howl, when played back. This happened occasionally, on the earlier machines, and the automatic disabling switch was added to the control levers, to prevent this occurrence.

A low tube in the output stage may fail to come up to standard in the oscillator circuit, while apparently still providing full output as an amplifier. The bias voltage must be checked



Console for magnetic recording which features all push-button control and built-in microphone preamp. (Two models are available; #02 with half-track heads and #03 for full width of standard quarter-inch tape. Ampex Electric Corp., Redwood City, Calif.)

Device which cuts and splices $\frac{1}{4}$ " magnetic recording tape. In operation, a combination of electrically produced heat and precise pressure is applied within an accurately controlled time cycle. Instead of being held together by conventionally used adhesives, a plastic weld is said to be obtained, without, however, adding to the thickness of the tape or using any of the tape material for the weld. Properties of the magnetic recording tape are said not to be affected and the splice is claimed to be inaudible even with playback amplifier at maximum gain. Equipment is self-timing, operates with automatic line voltage compensation. Each automatically controlled splice takes from 4 to 5 seconds with 5 seconds required after splice to permit tape to cool off. (MT-1 Presto-Splicer; Prestoseal Manufacturing Corp., 38-01 Queens Boulevard, Long Island City, New York.)



(Continued on page 54)

Business Aids . . .

[If you have a business-aid problem, send it to the editor, and every effort will be made to publish a solution in an early edition of SERVICE.]

Dear Don Kay:

What business opportunities are there in a small town for a Service Man?
—M. E.

Dear M. E.:

Business opportunities in the smaller communities are often better than in the large cities. You can make a good living, with a minimum of exertion, if you'll only be alert to take advantage of the opportunities as they arise.

The servicing of radio equipment will be the mainstay of your business, and with good test equipment and tools, you'll be able to make a pretty good go of it on this alone. However, there are many extra jobs which tie in with radio and electronic servicing that you can handle easily, if you will only get out and dig them up. An alert man can find many a dollar in these *off-trail* jobs.

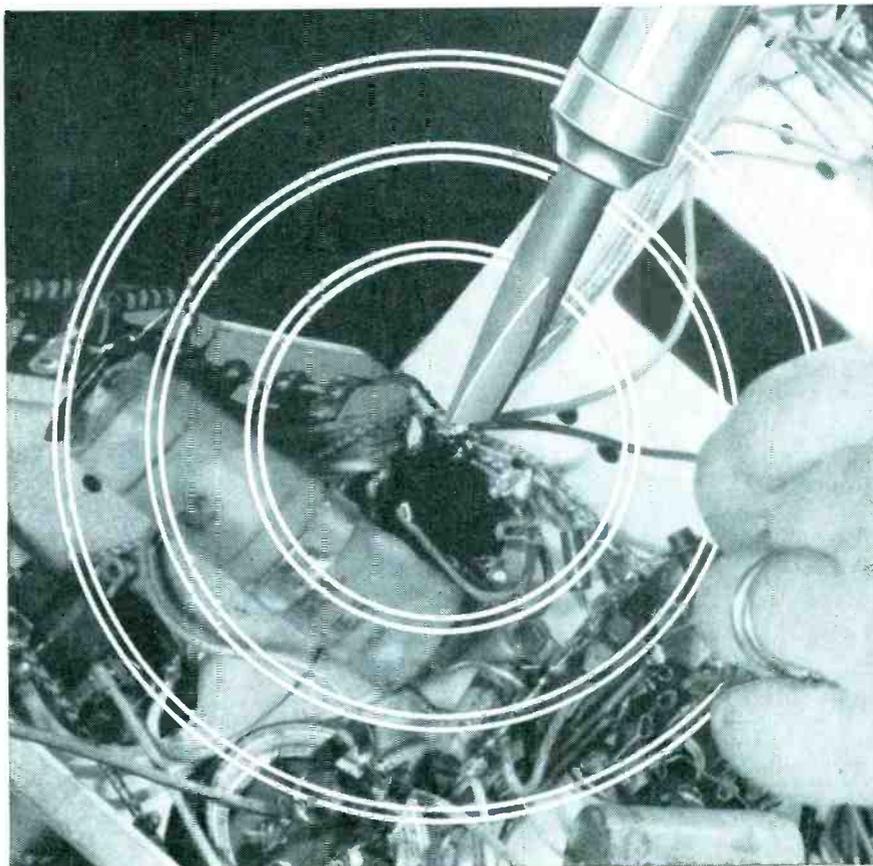
Audio will be found to be a particularly profitable and interesting activity in the small town. For instance, *pa* systems can be rented, sold or custom built. Amplifiers can be supplied to musical instrument fans. Every town in the land has at least five instrument prospects. The repair, construction and rental of amplifiers to these boys will be found to be quite a business, and if you do a good job for them, you'll find your business increase. They are wonderful advertisers. They'll tell one another about a good job.

Sales of microphones, mike-stands, extension cables and speakers are profitable, too. The amplifiers aren't too difficult to build.

Intercommunication systems are good for income, also. The installation, servicing or even construction will furnish you with several jobs per month. Prospects for this type of work are schools, football fields, lawyer's and doctor's offices, hospitals, churches, recreation areas such as boat landings, dance-halls, roller-skating rinks, mills and factories. Large stores, or any store with more than one building are also good prospects for intercoms. Incidentally, locations such as sawmills, planers, and very noisy factories will give you a chance to display your skill. You'll have to figure your noise level and then build the system to compete with it. This will call for a custom-made system, which you may have to make yourself to get it to do what you want. For this type of work, it will be best to use the small reentrant horns,

(Continued on page 50)

*Based on experiences of Jack Darr.



You can't beat a soldered connection for electrical conductivity and permanence!

SOLDERED connections eliminate loss of current, fire hazard, radio interference and excess heat which result from loose, corroded, arcing NON-SOLDERED connections.

For over 50 years experts have specified American Beauty Electric Soldering Irons. They know American Beauty Irons are built to LAST LONGER, OPERATE DEPENDABLY and BE SERVICED QUICKLY.

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Solder better with
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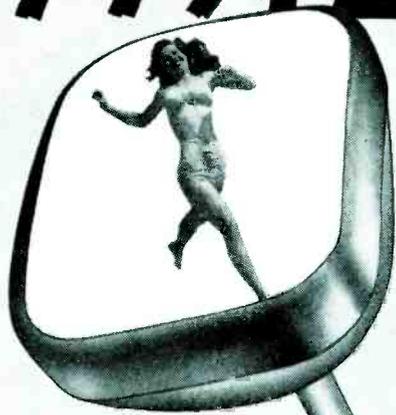
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AMERICAN ELECTRICAL HEATER COMPANY
DETROIT 2, MICHIGAN

A-100

SERVICE, AUGUST, 1952 • 43

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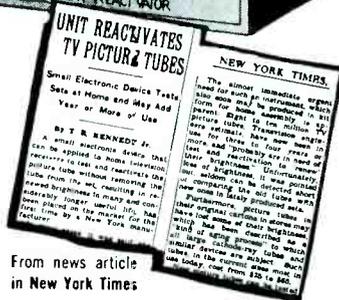
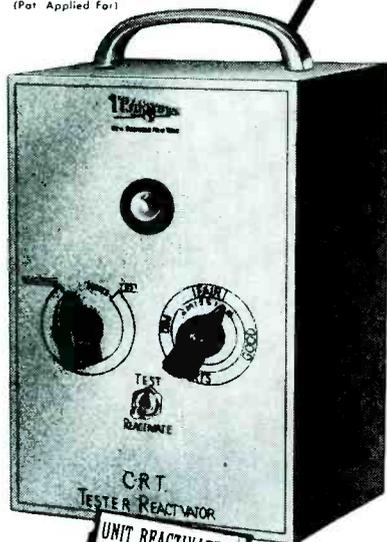
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City _____ State _____

(Pat. Applied For)



From news article
in New York Times

TRANSVISION, INC. • NEW ROCHELLE, N. Y.

CATALOGS, BULLETINS ETC.



Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y., has published an 8-page catalog describing 22 kits and 25 wired instruments, including *vtoms*, 'scopes, sweep generators, signal generators, tube testers, volt-ohm-milliammeters, battery eliminators, *lv* probes, *rf* probes and crystals.

Featured are detailed explanations of what each kit includes, and how a *make-good* guarantee operates.

* * *

Standard Transformer Corp., 3580 Elston Ave., Chicago, Ill., has released a revised 24-page catalog and replacement guide, listing 500 transformers and related components, including a separate TV component section.

Seventy classifications are indexed in the catalog. Also included is an output transformer chart, matched power-supply chart and data on the Stancor-Williamson amplifier.

* * *

Leotone Radio Corp., 65-67 Dey St., New York 7, N. Y., has issued a 4-page pamphlet listing a variety of available speaker cones and associated parts, and price data.

* * *

P. R. Mallory & Co., Inc., Indianapolis 6, Ind., has published a 60-page catalog, 552, describing capacitors, controls, resistors, switches, vibrators, rectifiers and power supplies and special components.

New products listed include *uhf* converter, noise filters, 2-watt wirewound front control sections, selector switch kit, line-voltage adjuster and isolation transformer, mercury *A* batteries and power supplies.

A TV replacement control guide, which lists parts on the basis of the original part number without regard for model or year, has also been published by Mallory. Items described include carbon volume controls, tapped carbon controls, etc.

TRAILER TRUCK ANTENNA SHIPMENT



A trailerload of Channel Master super fan antennas received by Certified Radio Supply, Middletown, N. Y., Channel Master distributors, which is operated by Frank Persico.

Sylvania Electric Products, Inc., Parts Division, Warren, Pa., has issued a 20-page leaflet describing manufacturing and engineering services in plastics, formed metal parts, wire, welds, mica and electric components.

* * *

Technical Appliance Corp., Sherburne, N. Y., has prepared a 20-page catalog, 38, containing technical data on 80 antennas. Included are details on accessories and hardware, and a section covering *uhf* antennas.

A 16-page catalog, 39, covering master TV antenna systems and associated equipment, has also been released by Taco. Catalog features block diagrams of typical installations and other units.

* * *

Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y., has released a 12-page catalog, T-752, describing a line of TV antennas, kits and accessories. Available free by writing to B. L. Cahn.

* * *

Ward Products Corp., Division of The Gabriel Co., 1523 E. 45th St., Cleveland 3, Ohio, has issued an FM antenna pamphlet, 54-187, entitled *Your Road to Better FM*.

A folder, *All Dressed Up*, describing auto antennas, has also been issued. Included is an installation chart.

* * *

Triad Transformer Manufacturing Co., P. O. Box 17813, Los Angeles 34, Calif., has published a 28-page catalog, TR-52, describing hermetically-sealed transformers, audio transformers, 400-cycle power transformers, miniatures, toroids and general purpose transformers, and amplifier kits.

A TV transformer replacement guide, TV-52, featuring replacement items for 77 different makes of radios and TV chassis, has also been published.

* * *

Jensen Industries, Inc., 329 S. Wood St., Chicago 12, Ill., has prepared a 16-page brochure, 52, which it is said describes every known type of needle replacement. Brochure is cross-referenced according to phono manufacturer, cartridge manufacturer, and competitive needle sources. Information is also supplied on magnetic recording tape.

SARNOFF HONORED

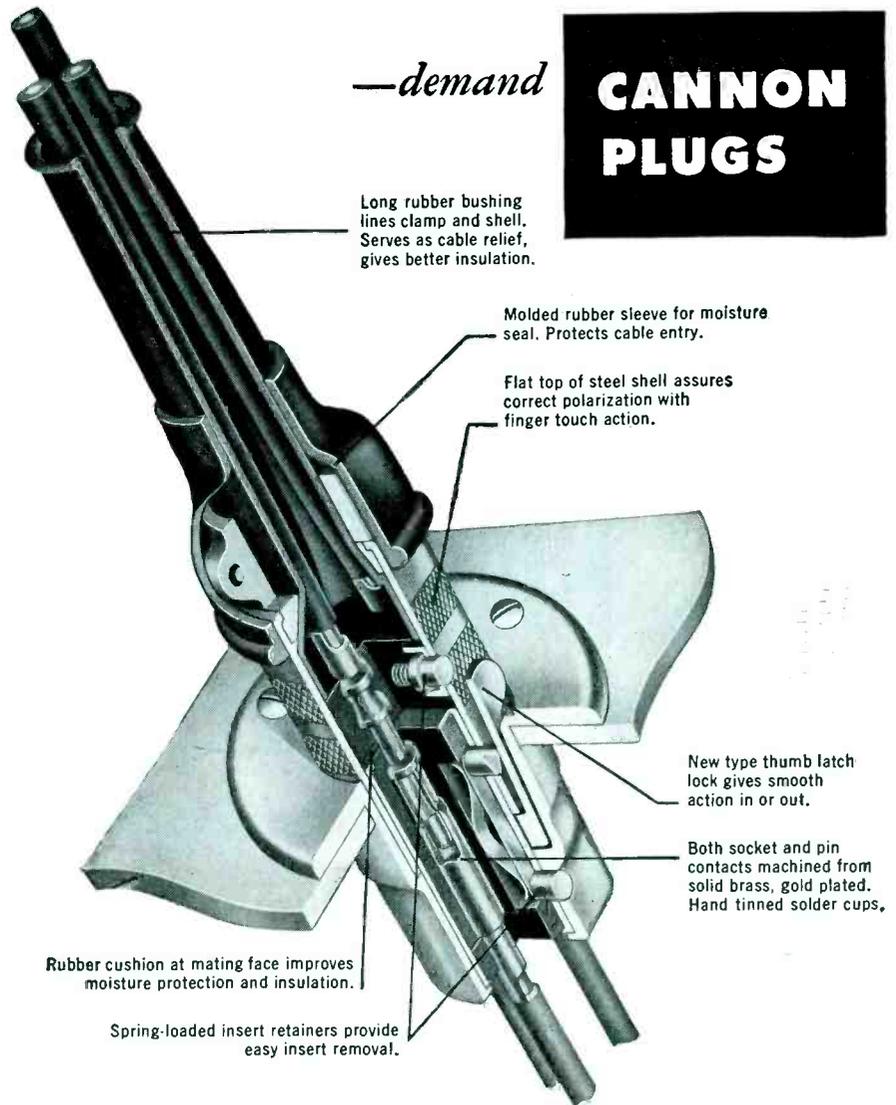


Brig. Gen. David Sarnoff, chairman of the board of RCA (left) receiving the RTMA Medal of Honor from Robert C. Sprague, Sprague Electric Co., past chairman of the board of the Radio-Television Manufacturers Association, at the industry banquet which concluded the 28th annual RTMA convention in Chicago. General Sarnoff was the first recipient of the annual award presented by the board of directors for his outstanding contributions.

Here's why those in the know

—demand

CANNON PLUGS



The Cannon Electric UA Plug was designed to answer the R. M. A. request for the ideal audio plug. It is the *ultimate* in a quick disconnect for low level sound and related circuits. Incorporating a wealth of design and construction know-how resulting from Cannon's many years of pioneering in this field, the Type "UA" Series typifies the close attention to important detail that distinguishes every type of Cannon Plug—the world's most complete line. The UA Series is sold through selected franchise distributors. Engineering bulletins sent free on request.



The Cannon UA Series consists of 2 plug types and 5 receptacles, all having 3 gold-plated contacts for 15 amp service. Socket contacts are full-floating. The "G" contact engages first, breaks last for "no noise" grounding or shielding purposes.

CANNON ELECTRIC

Since 1915

CANNON ELECTRIC COMPANY, LOS ANGELES 31, CALIFORNIA
Factories in Los Angeles, Toronto, New Haven. Representatives in principal cities. Address inquiries to Cannon Electric Company, Department H-135 P. O. Box 75, Lincoln Heights Station, Los Angeles 31, California.

Rep Talk



C-D's Blue Beaver

- The only electrolytic capacitor designed and built *specifically* for servicemen.
- 50% "safety factor"—makes allowance for changes in set caused by previous servicing, aging of components, etc.
- Eliminates costly comebacks. Millions in use!
- Write for Catalog 200C, Department S-82, Cornell-Dubilier Elec. Corp., South Plainfield, N. J. Your local Classified Phone Directory lists your nearest C-D jobber.

50% tougher

than the job calls for!



CONSISTENTLY DEPENDABLE
CORNELL-DUBILIER
CAPACITORS

PLANTS IN SO. PLAINFIELD, N. J. • NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS. • PROVIDENCE, R. I.
INDIANAPOLIS, IND. • FUQUAY SPRINGS, N. C. • SUBSIDIARY, RADIART CORPORATION, CLEVELAND, OHIO.



At the recent Erie Resistor rep meeting in Chicago

TIM COAKLEY, 11 Beacon St., Boston 8, Mass. (New England) and *The Morris Taylor Co.*, 8416 Georgia Ave., Silver Spring, Md. (South), have been appointed reps for Newcomb Audio Products Co. . . . *Richard L. Jandl* has been named sales rep in the western original equipment division of Tung-Sol Electric Inc. . . . *Fred A. Warren* will represent the eastern division of Tung-Sol. . . . *Nick Laub*, Minneapolis, Minn. (Minnesota, North and South Dakota and western Wisconsin), and *James H. Podolny*, Pittsburgh, Pa. (West Virginia, Ohio and western Pennsylvania), have been appointed reps for Instiline Corp. of America. . . . *George Pettitt Co.*, 549 W. Washington Blvd., Chicago 6, Ill., has been named rep for Electronic Instrument Co., in Illinois, Wisconsin and Minnesota. . . . *Bill Bartleson*, 4605 Blaisdell Ave., Minneapolis, Minn., has been appointed rep for Ward Products in Minnesota, North and South Dakota, and *Grant Shaffer*, 16267 James Couzens Hwy, Detroit 21, Mich., will cover Michigan. . . . Erie Resistor Corp. recently held a sales meeting of its distributor sales reps at the Conrad Hilton Hotel, Chicago, Ill. *G. Richard Fryling*, president; *Allen Shenk*, sales manager, electronics division; *Bill Klevans*, sales engineer, and *Jack Poff*, distributor sales department head acted as moderators in an open forum session. . . . *John Bain*, Toronto Ontario, Canada; *Harry Bittan*, metropolitan New York (jobber sales); *Edward Braddock*, Haddonfield, N. J.; *Jules Bressler*, metropolitan New York (industrial); *Jack Brown*, Tuckahoe, N. Y.; *John T. Butters*, Wilmington, N. C.; *Frank Dougherty*, Bedford, Ohio; *Genex Corp.*, New York City (export); *Jack Goss*, Arlington, Mass.; *Fred H. Haight Co.*, Seattle, Wash.; *Max Heidenreich*, Dallas, Texas; *Maydwell and Hartzell Co.*, San Francisco, Calif.; *Peyser and Co.*, Colorado Springs, Colo.; *Emilio Rodriguez*, Habana, Cuba; *Terwilliger Sales Co.*, Kansas City, Mo.; *John B. Turbergen Co.*, Los Angeles, Calif.; *Robert O. Whitesell Co.*, Indianapolis, Ind., and *Gerald Wilson Sales Co.*, have been appointed reps for Crest Laboratories Inc. . . . *Dayton L. Warner Co.*, 15423 Honore Ave., Harvey, Ill. (Wisconsin and northern Illinois), and *L. F. Waelterman Co.*, 8543 McKenzie Rd., St. Louis (Missouri, Kansas, Nebraska, Iowa and southern Illinois), have been named reps for T-V Products Co. . . . *Jack Brown*, *Benjamin W. Gelb* and *Frank Spellman* have been elected to senior membership in the New York chapter of the Reps. *Gerald M. Moch* was elected to associate membership. . . . *Rodgers Associates*, 104 Catalpa Terrace, Springfield, Mass. (New England) and *J. J. Backer Co.*, 2321 Second Ave., Seattle 1, Wash. (Washington, Oregon, Idaho, British Columbia and Alaska), have been named reps for IE Manufacturing Co.



Fred A. Warren

Associations

TETA, Texas

L. W. PEAY has been elected president of the Texas Electronic Technicians Association, Houston, Texas. Edward M. Grange is now vice president, and G. A. Brown, treasurer. A. J. Gaskie has been reelected secretary.

The association has received a charter and is now operating under the corporate laws of Texas. By-laws are being revised to meet more fully the requirements of the organization and at the same time comply with the new charter.

TSA, Michigan

A REPORT on the giant meeting of the Television Association of Michigan, held in Detroit, appeared in a recent issue of the group's journal.

Also featured in the issue were articles by Paul E. Thomas on *Credit in the Service Business*, and Robert G. Middleton of Precision Apparatus on *Shop Output*. The publication also contained comments on the evils of price cutting, the growing shortage of Service Men, and public relations.

TEN YEARS AGO

VIBRATOR REPAIRS were discussed by R. M. Ellis of P. R. Mallory and Co. Detailed was a new procedure for servicing vibrator-operated receivers. . . . Solving acute problems of replacement in power supplies caused by defense program shortages was the topic of a paper by Mark Glaser, DeWald's chief engineer. . . . Tricks of the trade for wartime servicing were analyzed by Alfred A. Ghirardi. . . . An *ac/dc* personal portable, Silvertone model 7189, was noted as featuring filaments that ran in parallel during battery operation, while on the line they were switched to a series connection. . . . A voltage regulator that could be used with a soldering iron, and providing two channels, each adjustable in steps of 5-25 *v* above or below normal line voltage, was described. A meter was provided plus a switch to cut in on any channel, or to connect directly to the *ac* line. Red and green pilot lights were provided to indicate normal or subnormal voltages, as well as those in excess of normal. . . . Modernization of auto radios, especially the PT6 Ford-Philco, was described. Chassis could be used with whip antennas, it was said, when the antenna coil was changed to a universal iron-core auto-radio type and adjusted carefully. The article revealed how to replace the type 39 *rf* and *if* tubes to metal type 6SK7s. . . . On the cover appeared the circuit of a G.E. model LB-673 6-tube battery-line portable, equipped with a single loop antenna, (*Beam-a-Scope*), a low-impedance item with about 15 turns having a 5- or 6-foot length. . . . FM Broadcasters, Inc., estimated that there were 500,000 FM sets in use in the United States.



THOUSANDS ARE RAPIDLY LEARNING ABOUT ITS OUTSTANDING FEATURES SUCH AS:
SHARP, CLEAN "SNOW-FREE" PICTURES
And

- Correct impedance for "ghost-free" reception. Nominal 300 ohms.
- Lower in cost than other leadlines purported to accomplish same results.
- Correct spacing for minimum radiation loss. Less than 1% of operating wave length.
- Fully insulated—approved by safety experts.
- Pure, unadulterated polyethylene insulation—specially treated by our chemists for extreme weather.
- High-efficiency conductors: Flexible, stranded—to insure long life.
- Easily installed—with standard insulators.
- Packaged in convenient lengths: 100', 250', 500', 1,000', 2,500'.
- AT YOUR DEALERS, or Write For Free Samples and Literature.

*Patent Pending *Trade Mark U.S. and Foreign Patents Pending
EXCLUSIVE LICENSEE AND SOLE MANUFACTURER

Don Good, INC.

1014 FAIR OAKS AVENUE
SOUTH PASADENA, CALIFORNIA

OTHER OUTSTANDING GOODLINE PRODUCTS:

VARIABLE TELETRAPS—2: Highly effective for *eliminating interference* from FM STATIONS, and DIATHERMY and AMATEUR SIGNALS within its tuning range.

HI-PASS FILTER: *Eliminates or greatly reduces interference* picked up by I. F. AMPLIFIER or TV RECEIVER—interference arising from strong, local low-frequency fields: X-Ray, Diathermy Equipment, Neon Lights, Etc., Etc.

Speakers, at a mass meeting of southeastern Michigan TV sales and Service Men, in Detroit, Mich., who praised associations for their work in correcting many unethical practices of dealers, policing themselves, educating the public to deal with reliable Service Men, and cooperating with one another to raise the level of servicing (left to right): H. W. Gilmore, OPS district enforcement director; Harry Gensler, G.E. Supply Corp.; Harold Chase, TSA prexy; G. Mennen Williams, Michigan's Governor; Herman Rosen, RTTM prexy; G. K. O'Brien, Wayne County's chief prosecuting attorney; Louis Wolfgang, TSA director; and Al Weiss, TSA planning and practices committee chairman.



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Your proven best
 source for PHONOGRAPH
 NEEDLES over the years—this newest
 and most modern needle factory assures you
 of continued dependable service for your
 Miller Replacement Needles and
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 Needles.

M. A.

Miller Manufacturing Co.

"Manufacturers of the world's largest line of long-life playback and recording needles"

New
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 • Illinois

Oscillating TV Chassis

(Continued from page 26)

perience. It is probably safe to say that such losses will never be entirely eliminated, but the situation can be greatly alleviated by a systematic and definitive approach to the problem.

First of all, let us review the reasons why it is so hard to *get at* the trouble in an oscillating receiver.

Take-off All-Over Trouble

The chief problem presented by *take-off* is that the symptoms appear over a large proportion of receiver circuits

which are not directly concerned with the fault, as outlined in Figs. 1 and 2. To illustrate, let us consider squegging which is caused by improper neutralization of the sync amplifier. Evidence of the squegging in this case appears as a howl from the speaker, and white streaks in the picture. The horizontal-output transformer in most cases will sing, due to acoustic radiation of the core. A 'scope test at various points in the receiver will show waveforms of the types seen in Fig. 3, but localization by signal-tracing methods fails utterly in this instance. The chief difficulty lies in the fact that

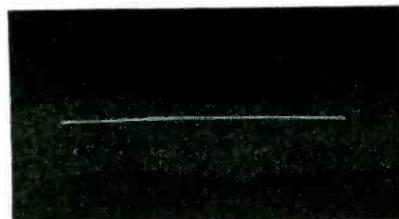


Fig. 5. Trace obtained on 'scope screen when bypassing of common bypass capacitor is complete.

the high oscillatory voltages (which may ruin the horizontal-output transformer), back up into circuits which have nothing to do with the actual trouble, thus serving to confuse the operator

The operator requires a troubleshooting method which will lead him to the fault, viz., the incorrect spacing of the leads. It is apparent that mere inspection of operating waveforms and measurement of peak-to-peak voltages are inadequate. However, *adequate approaches exist.*

Comparison-Wave Feedback Loop Defects

Receivers also *take off* because of defects in the comparison-wave feedback loop. Many receivers feed back a shaped wave from the output of the horizontal sweep circuit to the phase detector, and this feedback loop is a potential troublemaker, especially when replacement parts or conversion parts do not match the original specifications of the receiver manufacturer. Similar difficulties are encountered, on occasion, in the peaking-pulse feedback loop in receivers which utilize feedback peaking from the sweep circuit to the horizontal-oscillator circuit.

Practically all TV receivers *take off* when certain common bypass capacitors open up. Filter capacitors in the low-voltage power-supply section often serve also as common bypasses for various other sections such as the sweep system and sync amplifier. If such capacitors open up, or open up partially, the *ac* voltages from the various receiver sections feed back, and the Service Man has a difficult case of oscillation on his hands.

Section Isolation— The Proper Approach

Before a repair can be made, the Service Man must find out which portion of the receiver is actually at fault; for example, it might be supposed that a microphonic tube was causing the loud howl from the speaker, but tube substitution soon shows this surmise to be incorrect. As soon as it becomes apparent that the receiver has *taken off*, *B* batteries, or *line-*

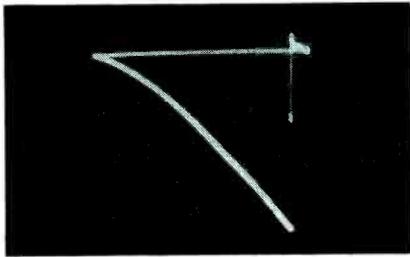


Fig. 6. Typical waveform found across a defective common bypass capacitor associated with the horizontal sweep circuit in a small receiver. In this case, the capacitor had opened up completely.

operated power supplies should be brought to the bench.

The screen and plate-supply leads should be disconnected from the sweep circuit, and the separate supply voltage substituted. Likewise, the sync circuit should be energized from a separate plate-supply voltage. The procedure should be continued until the oscillation stops, and in some cases the Service Man must utilize three or four individual plate-supply sources before the receiver returns to normal operation. The use of separate power supplies will be found to stop, usually, the oscillation, because they provide isolation between the receiver sections which otherwise feed back into each other.

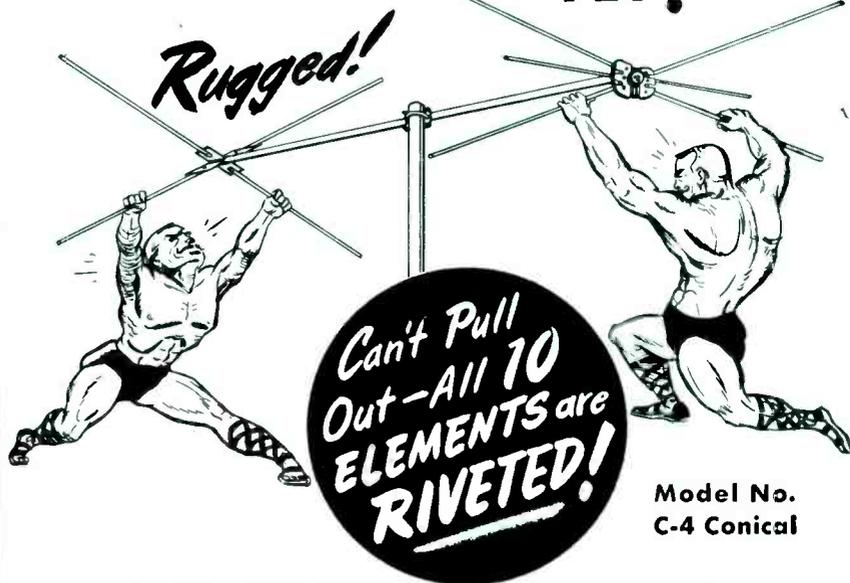
Even if the receiver does not stop oscillating when the separate power supplies are substituted for the central power supply of the receiver, the backing-up of the oscillatory voltage into other circuits is usually restricted by the separate supplies, so that the operator can close in more effectively on the fault. To localize the source of difficulty more closely, in case the receiver is still oscillating in the sync section, for example, the operator should systematically open the signal paths from one tube to the next, until the oscillation stops.

It should be observed that opening of signal paths does not necessarily involve the clipping of a grid lead or a plate lead. In many cases, this portion of the analysis can be made easily by unplugging the tubes progressively. In these localization procedures, the circuit diagram of the receiver should be kept close by, and referred to each time a change in the oscillatory condition is noted. Without a circuit diagram, the operator will be working in the dark.

By observing the modifications which result in the circuit arrangement when a tube is removed, and correlating this circuit modification with the change in oscillation which results, the Service Man can eventually identify the feedback loop in the circuit diagram.

Thus, the operator will soon arrive at a restricted section of the receiver

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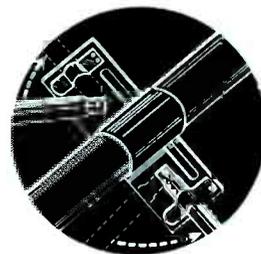
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involving two, or at the most, three tubes, which contain an oscillatory feedback loop. When the components in this offending circuit are restored to their proper values, and when the lead dress (in critical cases) is properly arranged, receiver operation will return to normal. It should be observed that such matters as critical lead dress cannot be recognized as such from the circuit diagram, on the basis of routine service knowledge; such matters fall into the classification of engineering know-how, which the Service Man rightfully expects to find

explained in the service data for the receiver.

Although the signal-tracing application of the 'scope is valueless in the case of an oscillating receiver, and although the waveshapes and peak-to-peak voltages shown in the service data have little meaning, the 'scope is nevertheless a useful tool. The 'scope can be applied across common bypass capacitors, to determine whether they are *hot* or *cool*. Fig. 5 shows the trace obtained when the common bypass capacitor does its job completely,

(Continued on page 50)

FAST

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MODEL 680

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EXCLUSIVE — Contains Magic Eye circuit for calibrating and crystal accuracy.

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- 2.5 MC crystal supplied — 2 other crystal holders provided.
- Permits adjustment of frequency of TV local oscillators to crystal accuracy.
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See the 680 at your jobber's today, or write for full details.

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Oscillating TV Chassis

(Continued from page 49)

while Fig. 6 shows a typical waveform found across a hot common bypass capacitor; in the latter case, the capacitor had opened up.

It should be observed that bypassing is very often somewhat incomplete, especially if tested with a sensitive scope, and the operator should make a comparative test on a good receiver, in case of doubt. Such waveforms and peak-to-peak voltages unfortunately are not supplied in receiver service data. Accordingly, the Service Man is thrown upon his own resources.

**Section Isolation
Versus Trial and Error**

The present-day tendency is to approach these problems on a trial-and-error basis; we guess that the trouble might be here, or there, and we start replacing parts at random. After the receiver has set on the bench for a week or two, and costs have run up to a point where they cannot be recovered from the customer, the cash value of a systematic approach by section isolation will become painfully evident.

Business Aids

(Continued from page 43)

known as *paging speakers*, which are made especially for the purpose.

Phono and music systems are also good business builders. You may find some business place or factory in your town that could use a system playing music into the working area. Such a setup could be built up from standard equipment, using a slow-speed changer and lp records.

Churches are good prospects for *pa* systems. The chimes can be amplified. Two to four 25-watt reentrant speakers, a good 25-50 watt amplifier, and a high-quality pickup and turntable are all that are needed. Special chime records may be obtained from several places, and the whole effect makes a wonderful addition to any church. The same amplifier may be hooked up through switches inside of the church, to provide hearing-aid pews, sound for the inside of the church, etc. Several churches have installed outside speakers, so that they may have *drive-in services*. This is especially true with the rural churches which aren't cramped for parking space. Sometimes mike-extensions are run outdoors to an outdoor pulpit, and the whole service held outdoors. If there are any trees, speakers can be installed in them, so that the leaves hide them. Several small horns can be used and installed so that sound is well-distributed over the parking area.

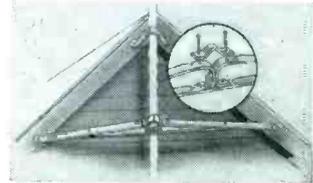
Will have more suggestions for you next month.

Sincerely,

DON KAY.

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- ★ No limit to tube size—10" to 30"
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Mfrs. of TV color equipment,
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LExington 2-7372

Audio Components

(Continued from page 22)

and the hum voltage is subject to the full amplification of the second unit.

Methods of reducing or eliminating this hum are:

(1) Testing relative power plug polarities for best connection.

(2) Connecting the chassis together with heavy copper braid, making good contact at each end over a large, scraped surface, or directly bolting the chassis to one another, making sure that the touching surfaces have been cleaned of paint and are in good electrical contact.

(3) Adding or removing line bypass capacitor from one of the chassis.

(4) Changing the physical ground point for the input grid resistor of the chassis receiving the signal, or of the shield of the input lead. Experimentation in changing the point or points, at which the shield of the pickup lead is grounded, for example, can mean the difference between quiet and noisy phono operation.

Hum Level

The hum rating of commercial audio components of quality usually exceeds the FCC requirement for FM broadcast stations; that of keeping hum output at least 60 db below the maximum signal level. The effect of amplifier hum is dependent upon various factors, including the efficiency of the speaker and mounting device (horn coupling can cause a normally low hum level to leap into prominence), the frequency components of the hum, and the acoustical conditions of the room. Therefore, one of the most effective methods of measuring hum, and certainly the simplest method, is a listening test conducted under the normal conditions at which the set is to operate. The volume control should be set for high but usable volume, with the selector switch on *phono* position. If, in a quiet room and with no record playing, there is no audible hum at a distance of half a dozen feet or so from the loudspeaker, the hum level can be considered very satisfactory.

Ser-Cuits

(Continued from page 34)

helpful in improving vertical sync stability when receiving weak signals.

A 150-mmfd capacitor, C_{267} , serves to bypass any video signals which might tend to go through this feedback network, and a 100-mmfd unit,



EXTRA! EXTRA!

PROFIT FOR YOU! V-M tri-o-matic® 956-GE RECORD CHANGER



More servicemen prefer the V-M 956-GE than *any* other record changer! It's fast and easy to install, saves valuable time — it's fool-proof and reliable in operation, saves call-back and service time — it's top quality in clear, faithful Hi-Fi sound reproduction — makes valuable, satisfied customers!

The V-M tri-o-matic 956-GE Record Changer features a constant-speed, hum-free four-pole motor, automatic muting switch for silent change cycle, GE Variable Reluctance "Turnabout" Cartridge for Hi-Fi reproduction across the *entire* tonal range. Has automatic shut-off, plays all size, all speed records automatically. Complete with 6' AC cord and 4' sound cord. Available without base, Model 951-GE, for use in combinations. Pre-cut mounting board, available at \$2.25 list, speeds installation. Get details from your V-M distributor!

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C_{269} , acts as an additional bypass to ground for any video information. The output of the second vertical clipper is taken across R_{210} (22,000 ohms).

Troubleshooting

In actual use, component failures can be easily simulated with the *dynamic demonstrator*. *Opens* are accomplished by unplugging one end of the resistor or capacitor under discussion. Transformers can be *opened* by unplugging the appropriate transformer lead. Shorts and leakages can be simulated by the use of a 0-10

megohm potentiometer which is clipped across the desired component. Varying the potentiometer produces any desired effect, ranging from slight leakage to direct short.

Typical AGC and Sync Troubles

(1) C_{210} (.03) shorts (grid circuit in the *agc* gate): *Symptoms* . . . Strong sync buzz will be heard. Picture tube will show a severely overloaded picture, or, in a strong signal area, the raster will go completely blank showing no trace of video information:



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incorporate a printed circuit
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Channel Separators

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Reason . . . Shorting of C_{210} will prevent the *agc* gate tube (V_{200B}) from conducting because the bias is increased to beyond the cut-off point. A *vtrm* connected at the *agc* test point will show that the *agc* voltage has dropped to zero. With no *agc* applied to the first and second video *if* stages, the *if* strip will overload, the degree depending upon the strength of the received signal. If the signal is sufficiently strong, enough bias will be developed at the grid of the video amplifier to cut off completely this stage, resulting in a blank raster.

(2) C_{255} (.002) shorts (cathode in the *agc* amplifier): *Symptoms . . .* Sync buzz. Picture tube will show overloaded pix or blank raster. Picture tube brightness decreases. Loss of vertical size, especially at bottom of raster.

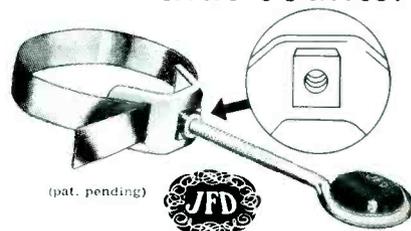
Reason . . . When this capacitor shorts, the *agc* amplifier will conduct very heavily, loading down the $B+$ boost supply. The value of $B+$ boost voltage may drop as much as 50%. Since the vertical oscillator is fed by $B+$ boost, loss of vertical size results. Reduction in $B+$ boost also decreases the output of the horizontal oscillator and the sawtooth gating pulses which are fed to the *agc* gate tube are decreased in amplitude. This reduces the amount of *agc* developed and causes overload of the video *if* strip. (Shorting of C_{237} or C_{200} (.001 or .015) will produce similar symptoms because excessive conduction of their respective stages will also load down the $B+$ boost supply. A quick check for this type of failure can be made by removing the 12AX7 (V_{200A}), 12AT7 (V_{212A}) or 6SN7GT (V_{214A}). If brightness and vertical size are restored by the removal of any of these tubes, the particular stage is conducting too heavily, loading down the $B+$ boost supply.)

The demonstrator has been used in many sections of the country with success. This method of presenting new circuitry has been welcomed with keen interest on the part of the service fraternity.

Credits

The author is grateful to Peter Buttacavoli, who with the author conceived and planned the basic design of the *dynamic demonstrator*; to William Whitacre, who designed the physical layout; to Kenneth Harf, who did most of the actual construction; and to the many other members of the DuMont Teleset Service Control Department, without whose cooperation this unit could not have been completed.

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Tube News

(Continued from page 36)

tions depend on the type of focusing and centering devices employed. If a shadow appears at the edge of the raster, the position of the deflecting yoke should be checked to make sure that it bears firmly against the glass funnel and is centered on the picture tube neck. If any shadow remains, it should be eliminated by adjusting the position of the magnetic-focusing device or the centering magnet. If this adjustment reduces maximum brightness at the center of the screen or disturbs centering and focus, steps (4) and (5) should be repeated. The ion-trap magnet should never be adjusted to center the pattern; neither should it be adjusted to eliminate neck shadow if such adjustment reduces the brightness at the center of the screen.

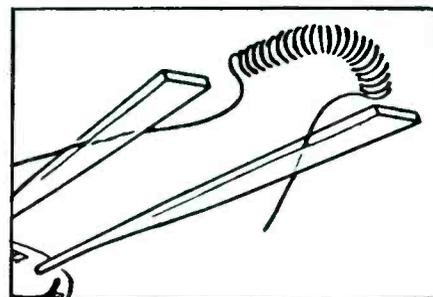
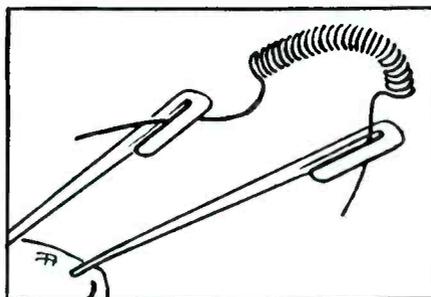
(6) With the picture control in its minimum position, the brightness control should be turned to its maximum setting and the ion-trap magnet readjusted as indicated in (4) until maximum light output at the center of the raster is again obtained. Bowing of opposite sides of the raster in the same direction may occur if the ion-trap magnet has improper rotational position. When magnetic focusing is used, bowing also may indicate that the focusing field is too close to the field of the ion-trap magnet. In this case, the relative positions of the focusing device and the ion-trap magnet should be readjusted and operations (4) through (6) repeated.

(7) In the final step the brightness and picture controls should be adjusted to obtain a picture of normal brightness, readjusting centering and focus if necessary. If this step requires any appreciable change in centering or focus, operation (6) should be repeated to recheck position of the ion-trap magnet.

UHF Converter

(Continued from page 19)

bakelite rotor carrying the shorting contact. The double tuned preselector uses two of the transmission line tuning elements described. The preselector consists of two tuned circuits coupled together through a small adjustable coupling capacitor of about .3 mmfd. The high pass input filter is matched to the first preselector circuit by means of .5 to 3 and .5 to 5-mmfd capacitors, while a .5 to 3-mmfd unit is used for tuning this preselector to resonance. The second preselector is matched to the crystal mixer by means of a .5 to 3-mmfd variable, while a

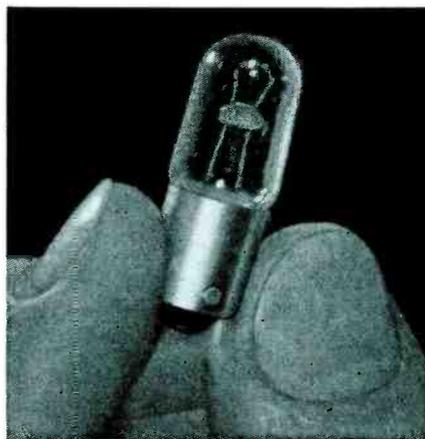


Why General Electric dial lamps don't cause static

SOME types of dial lamps can cause annoying radio interference. Old-type clamp joints in the bulb (diagram above, left) often permitted changes in resistance or tiny arcs that caused the lamp to radiate bothersome static.

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lamps. To prevent their being noisy, General Electric engineers developed a better joint . . . one with tungsten filament legs pressed firmly into the softer metal of the lead-in wire. It's another reason why G-E dial lamps insure customer satisfaction!



G-E dial lamps offer these advantages:

1. Dependable, trouble-free performance
2. High level of maintained light output
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4. Long life
5. Top customer acceptance

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similar value variable is used to tune this preselector to resonance. All capacitors are ceramic trimmers.

The crystal mixer is a 1N72 germanium diode. The *uhf* input signal appearing across a ceramic trimmer is applied to one side of the crystal mixer. An *rf* choke is part of a low-pass filter to pass the *if* output of the mixer, to prevent loss of *rf* signal, and to reduce oscillator radiation. The other side of the crystal is connected to an oscillator injection network and a pickup tab. The oscillator injection network is inside the oscillator com-

partment to reduce oscillator radiation.

A uniform crystal current is important to maintain a constant crystal impedance at *rf* and *if*, and also to obtain a low noise figure. The injection network was designed to obtain a relatively uniform crystal current characteristic over the band. Because the pickup is capacitive, the injection will increase with frequency. The capacitor and inductance in this circuit are resonant near the minimum oscillator frequency and help to increase the injection at the low frequencies.

[To Be Continued]

Wire-Tape Servicing

(Continued from page 42)

while the machine is in *record* position. The average voltage developed across the recording head's bias and erase coils should be enough to light a No. 47 pilot lamp, or about 15-17 volts, no load, on a *vism.*

Recording heads are very similar, in principle, for both wire and tape, although they naturally differ in physical structure. Each contains two small coils, in series, the bias and erase coils, and another coil used for recording. The *dc* resistance of each of these is about the same: 15-20 ohms.

Amplifiers used in these recorders are often conventional three-stage affairs, generally using a pentode pre-amp, a triode driver, and a power-pentode output-oscillator. Tubes like 6V6 and 6AR5 appear in the output; 6SJ7, 6AU6, etc., in the input; and triode-connected drivers are common. The 6-volt rectifiers, such as the 6X5 and 6X4 are used, to save the extra winding of the power transformer.

High-voltage runs around 250-300 volts. Resistor-capacitance filters with an occasional choke are found.

Complaints of low volume and distortion can sometimes be traced to open or shifted value resistors in the plate and screen circuits of the preamp tube. Leaky coupling capacitors will cause distortion, as will heater cathode leakage in the power tubes.

Many recorders use small neon lamps, arranged in a peak-flasher circuit, to indicate proper recording volume. Changes in these resistors will cause erroneous readings and bad recordings.

If a wire or tape has been too heavily recorded, at too high a level, erasure will be incomplete, and the previous program will still be heard in the background. The best cure for this is to re-run the tape or wire through the machine, with the microphone out, and in *Record* position. This will erase the wire again, without recording any new material on it.

Wire, as indicated earlier,¹ may be spliced by tying a square knot in it; tape can be spliced by clipping the end smoothly, preferably at an angle, and applying a patch of Scotch tape, about an inch long. Tape should be trimmed off on the sides, so that it is no wider than the tape. It is important to test patch on the *shiny* (uncoated) side of the tape; to patch on the bottom side, next to the head, will cause a *whump* as it goes through the head. Cutting and splicing can also be completed with semi-automatic gear of the type illustrated on page 42.

¹SERVICE; June, 1952.

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Takes the Guesswork Out of TV Service—
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- Sensitivity testing is accepted by servicemen as the best method of determining the cause of bad pictures in fringe areas.



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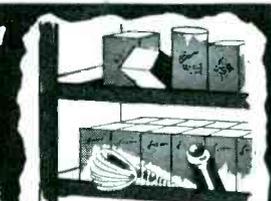
TYPICAL ASSEMBLY

Use end to end as shown or back to back for maximum storage in small space. Shelves may be adjusted on any one unit on 1 1/2" centers without adjusting shelves on any other unit.



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Closed Type Shelving 8" x 3' x 7' high. Single or starting unit; equipped with backs and sides. Ideal for dope storage.

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View of typical 8" deep shelf showing flange down.

The fast, labor saving shelf clip used to make all shelves instantly adjustable on 1 1/2" center.

← View of typical 8" deep shelf inverted showing flange up.

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Servicing Helps

(Continued from page 39)

can result when the negative bias voltage applied to the grid of the 6BQ6GT is too low. When the grid bias voltage is too low, the 6BQ6GT draws excessive current resulting in short tube life.

To remedy this situation, the drive control should always be checked when a chassis is installed in the home, and when a 6BQ6GT is replaced. In Sentinel models 423-4-9, 430-1-8-9, 440-1-3-4-6-7-8-9, 450-1, the correct procedure for drive control setting is as follows: To provide access to the grid of the 6BQ6GT without removing the chassis, a tie lug or green lead is located at the rear of the chassis below the neck of the picture tube. A *wtm* should be connected between the tie lug or green lead and ground. The horizontal drive control should then be adjusted so that the 6BQ6GT grid voltage reads -28 v . If drive lines (vertical squeezing) appear on the picture tube, the drive control should be set just below where drive lines appear, but in no case should it be below -22 v .

(Horizontal linearity or horizontal size may be affected by the horizontal drive setting. The horizontal drive control should always be rechecked if the horizontal linearity control or the horizontal size control have been reset.)

If -22 to -28 v grid-bias voltage cannot be obtained, the following component parts may be defective and may be the source of low grid bias voltage: weak 6SN7GT horizontal oscillator tube; 5,600-ohm 5-per cent horizontal-oscillator plate-load resistor; 1,500-ohm horizontal oscillator cathode-bias resistor; .05-mfd 600-v feedback capacitor; 27,000-ohm or 100,000-ohm phase-detector cathode-bias resistor depending on model; .002 or .005-mfd phase-detector cathode capacitor, depending on model; and two, 470,000- or a 330,000- and 390,000-ohm, in parallel, horizontal discharge plate-load resistors, depending on model. (Weak or critical horizontal sync may be an indication that any or all the parts listed here may be defective.)

In models 412-3-4-5, 421-2, the horizontal-drive control should be set just where drive lines disappear on the picture tube. The 6BQ6GT screen resistor, R_{110} , a 47,000-ohm 2-watt resistor, being low in value may cause the 6BQ6GT to draw excessive current.

Correction

THE FREQUENCY RANGE of the all-channel TV chassis described in the July issue of SERVICE should have been noted as 54 to 890 mc for channels 2 to 83.

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are all talking about . . .

KENMAST

TRADE MARK

• Servicemen, Dealers, Distributors and Jobbers are all talking about Kenmast. Talking about Kenmast because of its neat appearance—its light weight—its telescoping feature—and its low cost.

The square tubing on the lower section of Kenmast is a new development in T-V masts; additional strength is gained and it gives Kenmast clean, trim, lines that will appeal to home owners. Kenmast comes in a light gray paint-plated finish.

Kenmast is easily and quickly installed by one man. The ease of handling and installation cuts installation costs. All work is done on the ground—no dangerous work on roofs or ladders.

The telescoping feature of Kenmast with its hand-crank appeals to all. After the mast with the antenna are raised into position alongside the house, Kenmast is cranked to its full height of 50 feet. The owner can easily crank it down in high winds or for servicing the antenna.

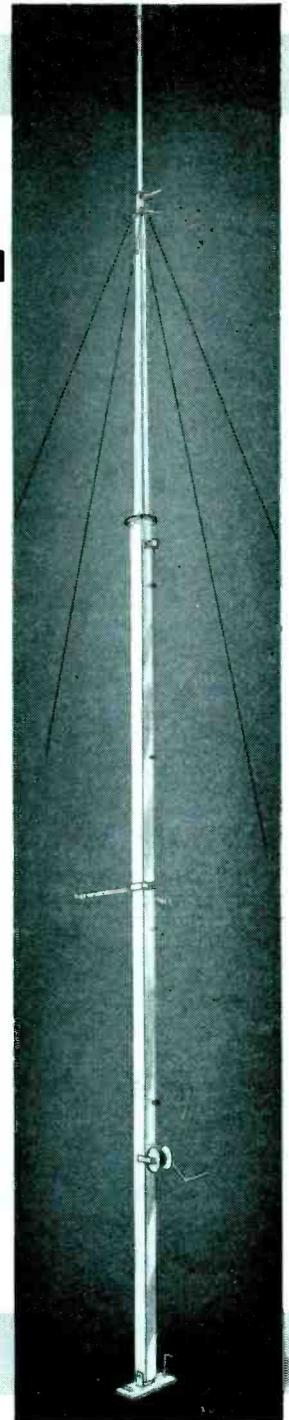
Get your order in now for your stock of Kenmasts.

\$6450

(List Price)

THE TENNA-TRAILER COMPANY
321 North Plum Street • Pontiac, Illinois

Do you have a
TENNA-TRAILER?
Over 3000 in daily use.



Audio

(Continued from page 25)

netic head does introduce a considerable amount of high frequency flutter of a somewhat random nature. Fortunately, it has been found, these rates are sufficiently high, so that their effect on the ear is negligible except at the higher audio frequencies, such as some of the higher overtones from string instruments. This irregular tape motion has also been found to introduce substantial amplitude distortion which produces an effect almost indistinguishable from that of the *hf* flutter.

[To Be Continued]

**FREE VACATIONS OFFERED TO
CELEBRATE 1,500,000TH ANTENNA**



Walter L. Schott (left) president of Walsco, supervising deposit of four free vacation certificates in carton of 1,500,000th TV antenna. Vacation certificates will provide two all-expense vacations for the dealer or installer who buys the lucky antenna, and for the jobber or jobber salesman who sells it. The lucky buyer and seller of Walsco's 1½ millionth antenna will be allowed to select any vacation spot in America for a full week, all expenses paid by Walsco. Jack Carter, Walsco sales manager, is at right.

SERVICE, AUGUST, 1952 • 55

COMPLETE MOBILE TV SERVICE SHOP finds immediate customer acceptance.



After 6 months' trial, I can honestly recommend this logical approach to TV servicing to TV students and service men who want a first-class one-man shop of their own; without payroll and high overhead and without sweating out a long period of short grass. Your customers will recognize a service man who is trying to give them a break by operating economically and efficiently.

Poll your friends and customers and get their reaction to the mobile shop idea. It's easy to combine your shop, sales room and transportation into one relatively inexpensive unit which will delight both you and your customers.

My mobile shop is equipped with compressed air for brakes, cleaning sets, and raising the 30' antenna; a complete work bench with revolving steel platform, large mirror, and shock mounted instruments; a slide-away tube checker; well designed parts bins; storage table; desk and file; reference library; display platform for new sets; seats; power cord reel. The interior is well lighted and ventilated.

Results of months of planning, selection of suitable equipment, building and removing the "bugs," and my experience in the operation of a successful mobile unit can be yours. Detailed drawings, photos, and the description of how to build and operate it will be furnished for \$20.00.

Write to:

MORGAN MOBILE TELEVISION SERVICE

204 ALBERTA PLACE

P.O. BOX 263

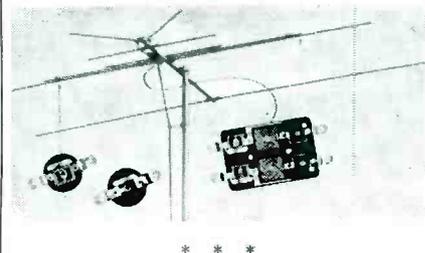
FULLERTON, CALIF.

TV Parts . . . Accessories

VEE-D-X VHF-UHF ANTENNA

A *vhf-uhf* combination antenna, *Ultra Q-Tec*, covering the entire TV spectrum from *vhf* channel 2 to *uhf* channel 83, has been developed by the La Pointe Plascomold Corp., 155 W. Main St., Rockville, Conn. Antenna may be installed singly, two-stacked or four-stacked.

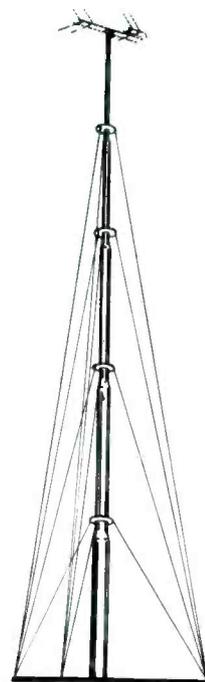
It employs printed circuits to separate the various segments of the TV range. For the addition of the *uhf* portion of this antenna, a six circuit filter is employed between the common *vhf* and *uhf* transmission line feed points. (Patent numbers 2,422,458-2,282,292, others pending.)



WARD TELESCOPIC MAST

A telescopic mast, *Zip-Hi*, constructed from 16 gauge electric-welded steel with a corrosion-proof vinylnite plastic coating, has been developed by Ward Products Corp., Division of The Gabriel Co., 1523 East 45th St., Cleveland 3, Ohio. Reverse swedging is said to assure positive locking and prevent the mast from coming apart during erection. Collapse during erection is claimed to be prevented by a double guying arrangement.

Available in 2, 3, 4 and 5-section models, complete with guy rings and hardware. Top section is 1 1/4" and bases range from 1 3/4" on the two section model to 2 1/4" on the five-section unit.



Build YOUR OWN **Heathkit TEST EQUIPMENT**

Heathkit AUDIO GEN. KIT
\$34.50

Heathkit TUBE CHECKER KIT
\$29.50

Heathkit TELEVISION GENERATOR KIT
\$39.50

Heathkit PUSH PULL . . . 5" OSCILLOSCOPE KIT
\$43.50

Heathkit SIGNAL TRACER KIT
\$19.50

Heathkit ELECTRONIC SWITCH KIT
\$19.50

Heathkit CONDENSER CHECKER KIT
\$19.50

Heathkit BATTERY ELIMINATOR KIT
\$24.50

Heathkit IMPEDANCE BRIDGE KIT
\$39.50

Heathkit R.F. SIGNAL GEN. KIT
\$19.50

Heathkit VACUUM TUBE VOLTMETER KIT
\$24.50

Heathkit HANCI TESTER KIT . . .
\$13.50

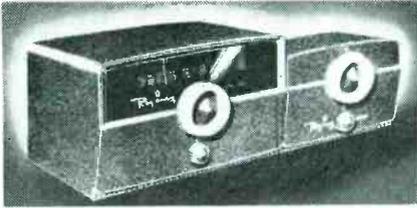
HEATH COMPANY
BENTON HARBOR 11, MICHIGAN

EXPORT AGENT:
ROCKE INTERNATIONAL CORP.
13 E. 40th ST.
NEW YORK CITY (16)

REGENCY UHF CONVERTER

A converter for adding *uhf* reception to any TV set, will be introduced soon by The Regency Division of I.D.E.A., Inc., Indianapolis, Ind. Cabinet has been designed by the firm of Painter, Teague and Petertil, Chicago.

Cabinet, a companion in style to the Regency TV signal booster, complements either period or contemporary television cabinets.



* * *

DON GOOD TV LEADIN

TV leadin, 100, 120, 803 and 823, featuring a protective tubing of polyethylene and 7-strand inner wire, has been introduced by Don Good Co., 1014 Fair Oaks Ave., S. Pasadena, Calif.

Leadin is available in a standard brown color, 100, for 300-ohm use, in 750' reels, with shorter lengths available; silvery-gray color, 120, for 300-ohm use; standard brown *Airlead* sheathed in a polyethylene brown tube, 803, for 300-ohm use, in 1,000' reels, with shorter lengths available; and clear *Airlead* sheathed in silvery-gray polyethylene tube, 823, for 300-ohm use.

Samples of the four products and other products, together with literature, catalog sheets, specification information, are available.

* * *

CHANNEL MASTER 5-ELEMENT YAGI

A 5-element yagi antenna, *Challenger*, series 550, has been announced by Channel Master Corp., Ellenville, N. Y.

Antenna is said to provide over 7-db gain on the single bay, matches 300 ohm line, has a 5:1 front-to-back ratio, and features a *uni-fold* dipole, a transformer-type folded dipole made in one single assembly. Director and reflectors, made of aluminum, are completely preassembled, and the 1" cross arm has plugged ends.



* * *

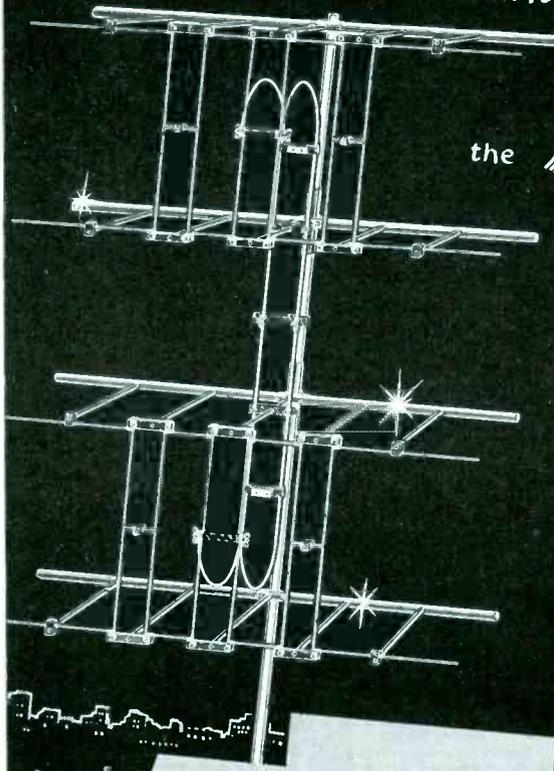
GONSET ALL-CHANNEL VHF ANTENNA

An all-channel *vhf* antenna, *Rocket*, that functions as a resonant unterminated rhombic antenna on the high channels and a folded dipole with reflector on the low channels, has been introduced by the Gonset Co., 801 S. Main St., Burbank, Calif.

By making the legs an odd number of quarter waves long ($\frac{3}{4}$ wave) on the high channels, a good front-to-back ratio is said to be obtained without a terminating resistor. Impedance match is 300 ohms; antenna may be stacked.

The finest all-channel antenna ever made!

the SKYLINE



- ★ 28 fewer element connections
- ★ 8 integral elements VS. 40
- ★ Pre-assembled
- ★ Quick rigtime
- ★ Extra heavy—all aluminum
- ★ Amazing reception up to 150 miles

Patented

The Skyline foldable colinear antenna possesses higher gain with respect to signal strength because the elements are integral!

No loss of signal strength through a multiplicity of mechanical connections.

Only the Skyline continues to maintain high gain with respect to signal strength over an indefinite period of time.

The Skyline colinear antenna, with its new engineering developments, is fast replacing all other types in fringe areas.

Request further information from your local dealer

SKYLINE MFG. CO. 1458 B2 E. 17 St., Cleveland 14, Ohio

TACO DUAL-CHANNEL YAGIS

A line of yagi antennas, 1410 *Dual-Channel*, providing reception of two channels with a single antenna, has been introduced by the Technical Appliance Corp., Sherburne, N. Y.

Antenna is a 5-element design with three directors, antenna element, and one reflector. A folded-dipole tuning element is connected across the terminals of the antenna element. Channel combinations now available are 3-6, 4-5.

* * *

GRAYBURNE TVI FILTER

A TV interference filter, *CPH*, for 21-mc ham interference, has been introduced by the Grayburne Corp., 103 Lafayette St., New York 13, N. Y.

JFD REVISED TENNA-PAK LINE

A revision in the *Tenna-Pak* line of TV antennas has been announced by the JFD Manufacturing Co., Inc., 6101 16th Ave., Brooklyn, N. Y.

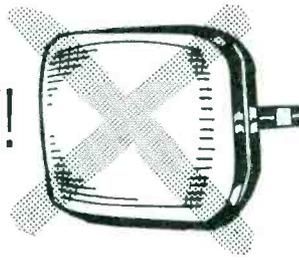
Included now are fan-front conicals, single and stacked 8-element conicals, folded dipoles, hi-lo folded dipoles, single and stacked hi-lo, and vee-beam antennas.

TEMPO TOWER

A tower, *Mi-T-Tower*, that can be used in conjunction with telescopic masts, has been developed by Tempo T-V Products, 2450 Ramona Blvd., Los Angeles 33, Calif.

Featured is a base that is said to fit any roof, and a *Saf-T-Clamp* that enables a mast to be extended to any height up to 90', up to 3" in diameter.

don't throw it away...
weak picture tubes can be saved!

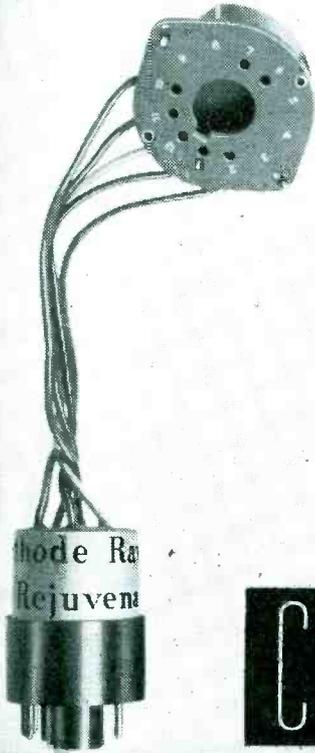


use a

Picture Tube REJUVENATOR

- ✓ Simple Plug-in Unit
- ✓ Permanent Hook-up
- ✓ No Exposed Wires
- ✓ Usable on All Size Tubes
- ✓ Automatically Operated
- ✓ Only \$2.79 Dealer Net

Model "C"



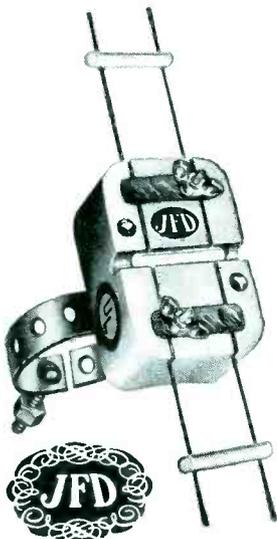
CREST

Available at Local Jobbers

LABORATORIES, INC.

Whitehall Building
Far Rockaway, New York

THE ONLY ONE OF ITS KIND!



APPROVED



PAT. PEND. NO. D17505

"Open Wire" Lightning Arrester

The perfect lightning arrester for use with all TV installations using open wire transmission lines such as JFD "Super-Gain" Open Line. Eliminates picture-smearing static charges as well as protecting against lightning hazards. Individually boxed, complete with four foot ductile aluminum ground wire plus perforated stainless steel strap for Universal Mounting. No. AT-107 \$3.50 List. FOR ADDITIONAL INFORMATION ON JFD "OPEN LINE" ARRESTERS AND INSTALLATIONS WRITE FOR FORM NO. 129.

JFD MFG. CO., BROOKLYN 4, N.Y.

World's Largest Manufacturer of TV Antennas and Accessories



Model T-6 Cabinet

This cabinet is used to house a 6" speaker for a portable speaker station in truck and railroad terminal central checking systems. Made of heavy steel with a hard baked on black crinkle finish it will stand plenty of abuse. The handle is made large so as to accommodate the big gloves worn by truckers in the winter.

Cabinet only.....List price \$15.00

Complete with switch and speaker to operate into Master Station with annunciators or lights. List price **\$2400**

Write for literature.

WRIGHT, INC.

2237 University Ave., St. Paul 4, Minn.

Tools . . . Instruments Parts . . .

CENTRALAB SWITCH KITS

Complete switch kits, 414 and 419, included in a metal cabinet 17" wide and 11 15/16" deep have been developed by Centralab, Milwaukee, Wis.

Both the 414 (phenolic switch parts) and the 419 kits (steatite switch parts) contain *Deluxe* or *DD* section and index construction, a one piece construction of knob shaft, index, and rotor shaft. The 414 kit contains 111 phenolic switch sections, 31 index assemblies, and complete hardware, brackets, knobs, and dial plates. The 419 kit contains 81 steatite-ceramic switch sections, 27 index assemblies, and complete hardware, etc.

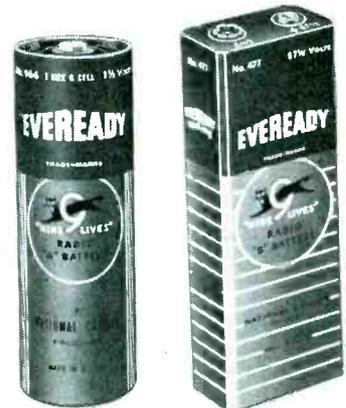


* * *

EVEREADY PERSONAL BATTERIES

Two *Eveready* portable radio batteries for the personal type portable radios, 477 *Mini-Max*, 67½ volt B, and 964 1½ volt A, have been announced by the National Carbon Co.

In this particular battery complement, two of the 964 A batteries are connected in parallel and are said to deliver many times more life than those single cells formerly used in personal type sets and which required frequent replacement during the life of their B battery companion in the complement. Type 477 measures 1 29/32" x 63/64" x 5 7/16", and 964, 1 3/8" diameter by 4 11/64" high.



for SERVICEMEN . . .

From the earliest days of Radio . . . to the present era of Television . . .

The symbol of **QUALITY and PERFORMANCE**



WIRES

are preferred for their

ABSOLUTE UNIFORMITY

SUPERIOR QUALITIES

and

ULTIMATE ECONOMY

CORNISH WIRE CO., Inc.
50 Church St., N. Y. C. 7

NEW! MOSLEY WALL-THRU



Cat. No. 625
List Price \$1.95
Cat. No. 625-PK
WALL-THRU, complete with MOSLEY Universal TV Lead-in Socket and Plug. List Price \$3.00

- For TV, FM and Amateur Transmission Line
- Fits Any Wall Up to 1 3/4" Thick!
 - Completely Weather-Proof!
 - For Standard Flat 300 Ohm Line or RG-59/U Co-ax Cable!
 - MOSLEY Lead-In Socket Can Be Mounted Direct to Inside Plate!
 - Precision Molded Polystyrene End Plates!
 - Easily, Quickly Installed!

MOSLEY ELECTRONICS
2125 Lackland Road • Overland 14, Missouri

EICO VTVM

A vacuum tube voltmeter, 214, that incorporates a 7 1/2" meter movement constructed in a horizontal-type layout, is now available in kit or factory-wired form from Electronic Instruments Co., Inc., 84 Withers St., Brooklyn 11, N. Y.

Model features multiplier resistors of 1 per cent accuracy; ac/dc ranges—0-5, 10, 100, 500, 1000 v (30 kv with the HVP-1 hv probe); up to 200-mc range with P-75 rf probe; 5 ohm ranges from 0.2 ohm to 1000 megohms, and 26 megohms dc input impedance. Employs a 6SN7, 6H6 and a 6X5.



INSULINE TEST LEADS

Two test leads, 316-317, designed to fit the RCA vtvm and others equipped with screw-on microphone type connectors, have been announced by the Insuline Corp. of America, 36-02 35th Ave., Long Island City, N. Y.

Lead 316 contains an isolating resistor in its probe and is intended for dc measurements; 317 is a straight-through lead for utility applications. Both are 6' long, made of heavy, shielded wire, and have insulated handles.

BLONDE TAPE SOLDER

A tape solder, that features 40/60 tin-lead solder, containing rosin flux, and packaged in strips approximately 2 1/2" in length by 3/8" in width, that is said to be capable of 100 connections, has been developed by the Blonde Oil Co. (Solder Div.), 464 Woodward Ave., Brooklyn, N. Y.

ALLEN-BRADLEY CERAMIC CAPACITORS

A line of disc-type ceramic capacitors, ranging from .001 to .01 mfd, has been introduced by Allen-Bradley Co., Milwaukee, Wisconsin.



YOU BUILD EICO KITS IN ONE EVENING-

but they last a lifetime... and you save 50%!

22 Kits and 24 Instruments — the industry's most complete line of MATCHED TEST INSTRUMENTS!

Over 1/4-million EICO Instruments are now in use the world over! That's the proof of EICO's leadership in Value to the Serviceman!

For latest precision engineering, finest components, smart professional appearance, lifetime performance and rock-bottom economy — see and compare the EICO line at your jobber's today before you buy any higher-priced equipment! You'll agree with over 100,000 others that only EICO Kits and Instruments — no other — give you the industry's greatest values at lowest cost.

Write NOW for FREE latest Catalog S-8.



625K Tube Tester Kit \$34.95. Wired \$49.95.



221N VTVM Kit \$25.95. Wired \$49.95.



565K Multimeter Kit \$24.95. Wired \$29.95. 20,000 ohms/volt.



320K Sig. Gen. Kit \$19.95. Wired \$29.95.



360K Sweep Gen. Kit \$34.95. Wired \$49.95.



1040K Battery Elim. Kit \$25.95. Wired \$34.95.

Laboratory Precision at Lowest Cost

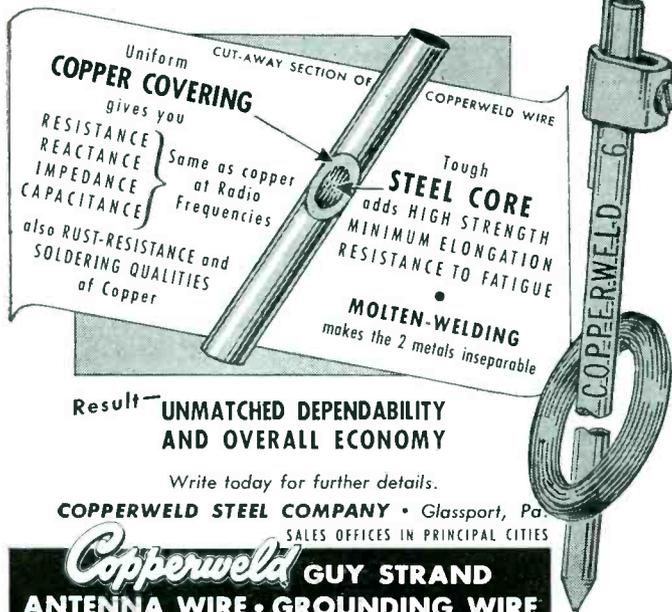
Prices 5% higher at West Coast.



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ELECTRONIC INSTRUMENT CO., Inc.
84 Withers Street, Brooklyn 11, N. Y.

ONLY *Copperweld* RADIO and TV PRODUCTS

Offer the **EXCLUSIVE ADVANTAGES** of Copperweld's Molten-Welded Construction



Result—**UNMATCHED DEPENDABILITY AND OVERALL ECONOMY**

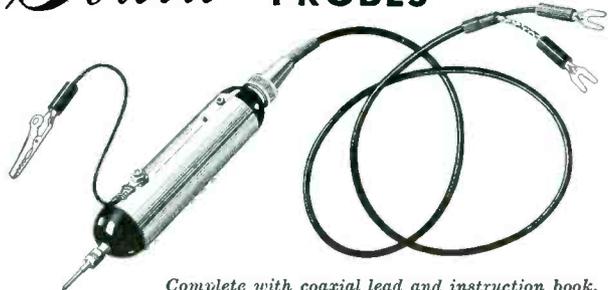
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COPPERWELD STEEL COMPANY • Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES

Copperweld **GUY STRAND
ANTENNA WIRE • GROUNDING WIRE
GROUND RODS AND CLAMPS . .**

also **HOOK-UP WIRE, TWIN-LEAD AND COAXIAL CABLES,
AND MANY OTHER ELECTRONIC WIRE PRODUCTS**

Scala OSCILLOGRAPH PROBES



Complete with coaxial lead and instruction book.

**A NEW TOOL TO MAKE TV SERVICING Easier,
Faster, More Accurate AND MORE PROFITABLE**

No probes made anywhere do the job of SCALA oscillograph probes so efficiently, so easily. Use with your present scope . . . low cost will be paid ten times over in a month. Check your local distributor or write factory and specify model number:

BZ-1 SIGNAL TRACING PROBE . . . locates dead I.F. stages, marks ratio detector curve, calibrates marker generator, adjusts video amplifiers, checks output of sweep generator, views response of single I.F. stage, traces buzz pulse in sound I.F. strip. Can be used with V.T.V.M. Contains demodulator of low-capacitance, high-impedance design, useful to 225 MC.

BZ-2 LOW CAPACITY PROBE . . . makes it possible to trace video, sync or sweep waveforms through high-impedance circuits without causing waveform distortion due to circuit loading. Cuts the effective input capacitance of scope by a factor of 10 and gives an attenuation of 10 to 1.

BZ-3 100:1 VOLTAGE DIVIDER PROBE . . . is very useful in trouble-shooting horizontal sweep circuits. It may be applied directly to plate of horizontal output tube or at the plate of the damper tube to check the operation waveforms and to measure their peak to peak voltages without impairing the wave shape or incurring danger to the oscillograph.

SCALA RADIO CO., 2814 - 19th St., San Francisco 10, Cal.

KEN BURCAW OPENS SALES OFFICES

Ken Burcaw, formerly distribution sales manager of Radiart and C-D, has announced the formation of his own sales organization, with offices at 246 Madison Ave., Detroit, and 116 Wood St., East Palestine, Ohio.



Ken Burcaw



A. C. Bryan

NATIONAL CARBON APPOINTS A.C. BRYAN V-P

Arthur C. Bryan has been appointed vice-president in charge of sales for National Carbon Company. Bryan has been with the company in various sales activities since '35.

* * *

MILLER TV TO EXPAND

Miller Television Company, 2840 N. Naomi Avenue, Burbank, Calif., has embarked on a \$50,000 expansion program which will be completed very shortly.

Experimental laboratory facilities, which are being operated in conjunction with the International Research Corporation of Santa Monica, and production facilities and assembly lines will be enlarged in new plant.



TRANSVISION TECHNICAL NOTES

An issue of *Television Notes*, devoted to a variety of TV servicing data, has been released by Transvision, Inc., New Rochelle, N. Y.

Featured are notes on picture-tubes, test indicators and reactivators, and an electronic remote control assembly. Monthly issues available for fifty cents to cover cost of mailing; write to David Gnessin, editor.

* * *

NEW JSC PLANT

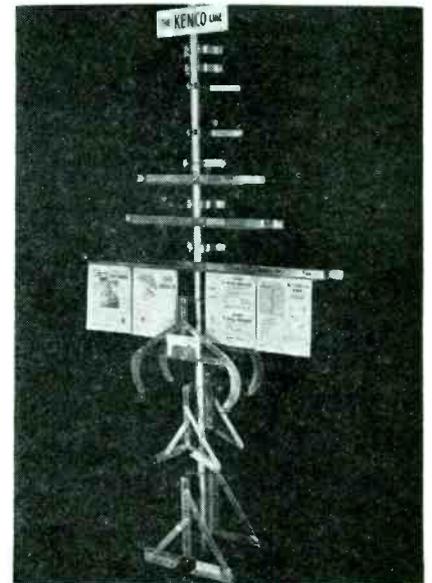
The opening of a new plant on Route 23, Mountainview, N. J., for the expanded manufacture of TV leadin and power cords, for September occupancy, has been announced by the Jersey Specialty Co.



KENWOOD MOUNT DISPLAY

A merchandise display, *Totem Pole*, has been announced by Kenwood Engineering Co., Inc., Kenilworth, N. J.

Display consists of a standard mast supported by an *All-Position* TV mount, and shows the entire line.

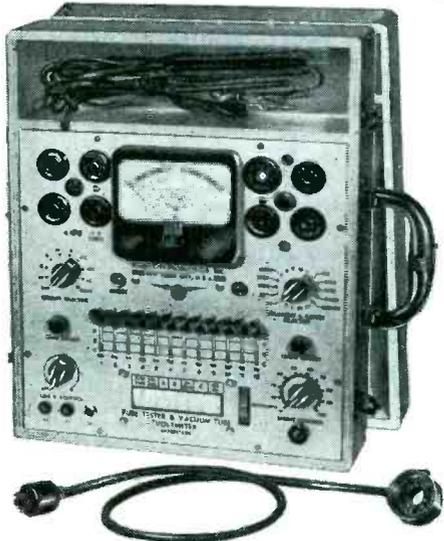


* * *

TREADWAY JOINS VEE-D-X

Graham R. Treadway, former president of Horton-Bristol Manufacturing Co., Bristol, Conn., has joined La Pointe-Plascomold as assistant to the president, Jerome E. Respass.

RCP is **FIRST** again
with this . . .
"DO-ALL"
TV Set and Tube Tester
(Includes VT Voltmeter and Reactivator)



MODEL 808
TV • RADIO • CR-TUBE
TESTER and VT VOLTMETER

All in One Unit:

- A TUBE TESTER
- A CATHODE RAY TUBE TESTER
- A CATHODE RAY TUBE REACTIVATOR
- A VACUUM TUBE VOLTMETER (AC-DC)
- AN OHMMETER

Housed in handsome hand-rubbed oak carrying case with test leads, isolation probe, batteries, etc. Size 12½" x 12¾" x 4¾", weight 12½ lbs.

MODEL 808 — complete, \$99.95
ready to operate NET

High Voltage Multiplier Probe for Model 808 Extends Range of VTVM to 30,000 volts. **\$8.95**
NET

MODEL No. HVMP-1
Write for our latest RCP catalog to Dept. SM-8

RADIO CITY PRODUCTS CO., INC.

152 West 25th St.  New York 1, N. Y.

NEW EDITION OF RCA TV PICT-O-GUIDE

Volume III of the TV *Pict-O-Guide*, an illustrated guide to the solution of everyday TV service problems by screen-image analysis, has been released by the tube department of RCA Victor, Harrison, N. J.

Volume, prepared by John R. Meagher, is available to Service Men as a bonus with each order for 75 receiving tubes or three picture tubes placed with tube and parts distributors. Program will continue until August 31. Volumes I and II of the *Pict-O-Guide* series will be available on the same basis, as alternatives to volume III. In addition, purchasers of the specified numbers of tubes will receive a bonus copy of *TV Servicing Supplement*, a booklet by Meagher on television troubleshooting.



PATENT ISSUED ON TACO TWIN-DRIVEN PRINCIPLE

A patent on the twin-driven principle as applied to TV receiving antennas, has been issued to *Kendrick Lippitt*, chief engineer of Technical Appliance Corporation, Sherburne, N. Y.

DUMONT TUBE WARRANTY POLICY

A warranty policy on replacement picture tubes, extending the warranty period from six to twelve months, from the date of installation in the consumers home receiver, has been announced by the picture-tube division, Allen B. DuMont Labs., Inc., Clifton, N. J.

Formation of replacement sales department has also been announced. *Edwin B. Hinck*, previously manager of electronics parts sales, has been named to head the department, headquartered at 750 Bloomfield Ave., Clifton, N. J.

PHOTOFACT Users
Write Our Best ADS!

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Ray Kristchke
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"Thanks for Sam's PHOTOFACT—the best service in electronics."



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165 Sherman Ave.
New York 34, N. Y.

"Since purchasing Volume 16 with the voltages at the pins and the wave forms, there is no question in my mind as to which manuals I should get. The information on the schematics saves a lot of time, and I want to thank you."



L. G. Patrick
Patrick Electro Serv.
1509 W. Hillsboro Ave.
Tampa 3, Florida

"We have all your Folders to date and would like to state they are worth every cent we have paid for them."

NOW! GET THE PROOF FOR YOURSELF!

FREE We'll send you a Free Photofact Folder on any receiver listed in "PF Index & Technical Digest."

Learn for yourself—at our expense—how PHOTOFACT pays for itself by earning bigger repair profits for you! Select any Folder from the PF Index (if you haven't an Index, get a free copy from your distributor). When you write us for your Free Folder, be sure to state Photofact Set and Folder Number as shown in the Index. Get your Free Folder now. Examine, use, compare—see why you can't afford to be without PHOTOFACT!

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2201 East 46th Street • Indianapolis 5, Indiana

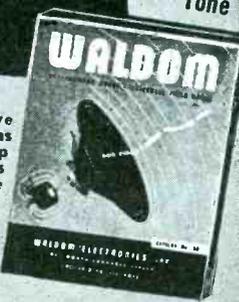
SPEAKERS NEED REPAIRING



RECONE WITH A WALDOM CONE

Quicker, less expensive speaker servicing means greater profits. Speed up your speaker repair jobs . . . **FREE** Waldom 24-page Replacement Cone Manual . . . covers 250 different TV, FM and AM receivers.

WRITE FOR YOUR FREE COPY TODAY. THERE IS NO OBLIGATION



A Waldom Cone for the Finest Tone

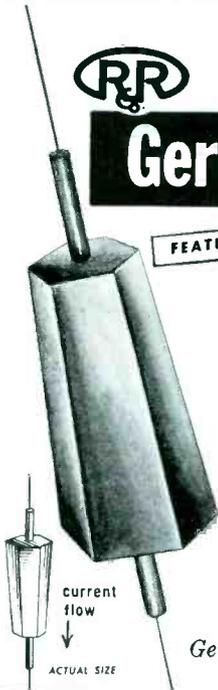
WALDOM ELECTRONICS INC., 911 N. LARRABEE ST., CHICAGO 10, ILLINOIS

Announcing Radio Receptor's new range of



Germanium Diodes

FEATURING POLARITY AT A GLANCE!



Keynoting sound design features and simplicity in construction, the new Radio Receptor Germanium Diodes will give a maximum of trouble-free operation even under the most adverse conditions.

Normally in diodes such as these, one side of the germanium wafer is plated so that it may be soldered to the base... but Radio Receptor's improved production methods make it possible to omit plating, thus eliminating possible flaking and improving quality.

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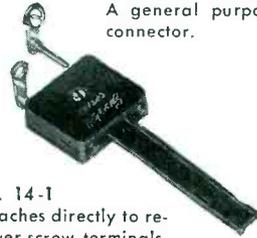


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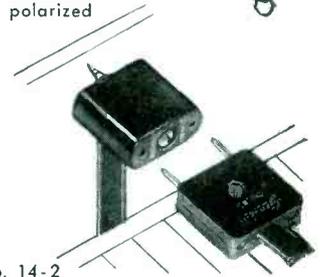
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TVI Report

(Continued from page 31)

stalled in TV antenna lead-in.

(8) Horizontal oscillator control should be adjusted correctly.

(9) A line filter can be used on the power leads to the broadcast receiver.

(10) An external antenna and shielded lead-in can be applied to the broadcast receiver.

In poorly designed TV receivers, radiation of the *if* amplifier on 21-mc and its associated harmonics, and radi-

ation of the high frequency oscillator and its harmonics, can also cause trouble. Fortunately, these latter types of ITV respond to shielding and filtering. In stubborn cases it might be necessary to secure added isolation between the TV set and the antenna through the use of a TV booster.

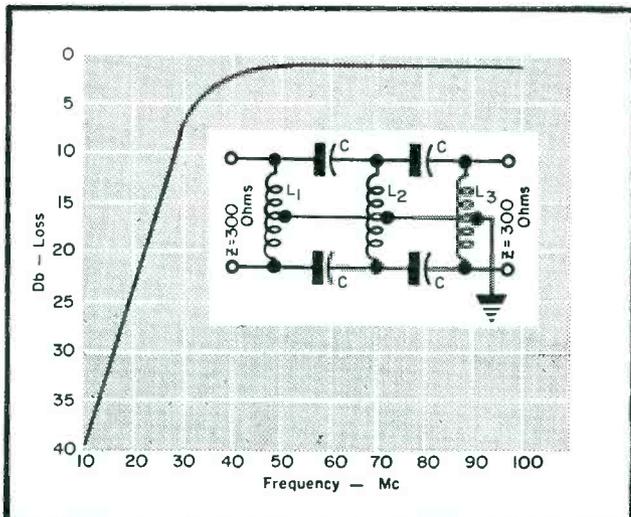
To trace TVI portable receiving gear, that will not only tune the TV signal frequencies but also the *if* and image frequencies, should be used; all-wave battery powered receivers (.55 to 30 mc) equipped with a con-

verter to receive 30 to 50 and 50 to 200 mc would be suitable. The receiver should have a meter to read signal strength and one to read audio.

Automobile Ignition Systems

Old models of some makes of cars are bad offenders Rand noted, and heavy trucks are especially bad. The effect on the TV screen is to produce broken horizontal lines across the picture; often the sync is upset.

Ordinary distributor-type suppressors were said to materially reduce this

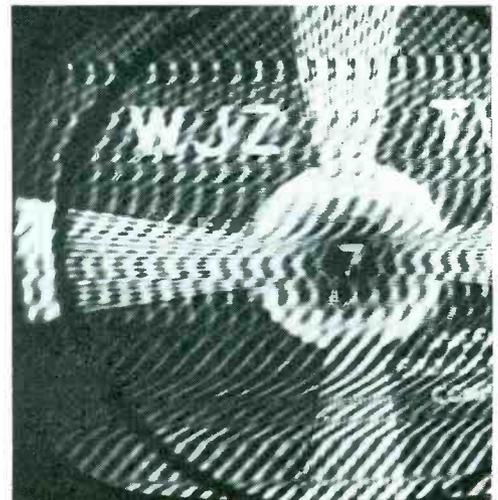


(Left)

Circuit of a 300-ohm balanced line high-pass filter and plot of its effectiveness. In areas where channel 2 is not used, the capacities can be reduced slightly, extending attenuation to 40 mc. $C = 20$ mmfd; L_1 and $L_3 = 1.54$ uh, 32 turns; $L_2 = .77$ uh, 18 turns, using No. 29 enameled wire, closely wound on a $1/8$ " form.
(Courtesy RCA)

(Right)

Interference from a high order harmonic of *rf* generating device such as industrial heater, radio transmitter or FM receiver oscillator.



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interference. Resistor-type spark plugs have been found to eliminate practically the interference and simultaneously improve gasoline-engine performance, especially in smoother idling on high-compression motors.

Diathermy Equipment

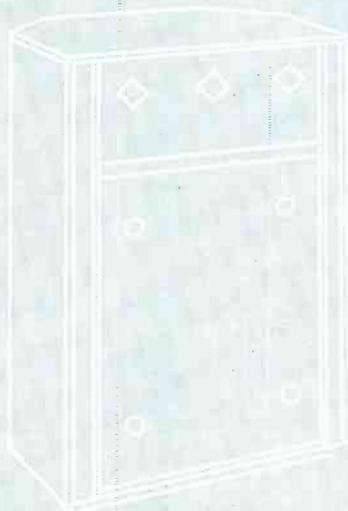
Old-type self-excited self-rectified diathermy equipment operating at random in the *rf* spectrum was described a serious cause of interference because of its fairly high power radiation, or strong harmonics. Severe interference from this source can produce a heavy-black band across the picture, which changes to a light irregular S-shaped vertical pattern when the interference has less intensity.

Some new diathermy equipment produced since the issuance of an FCC ruling* has been crystal-controlled, has a filtered *dc* power supply, and is assigned specific operating channels. Often this equipment, operating in the 27-mc diathermy band has caused severe TV *if* interference, which usually can be cured with a high-pass filter on the TV set.

Rand noted that diathermy interference has been effectively reduced by two methods: *a*) Shielding the equipment and the treating areas; *b*) where certain treatments produce interference, those specific frequencies are altered by spreading or compressing the turns in the tank circuit. Shielding a portion of the treating leads has also been effective in lowering the output frequency when it is impossible to spread or compress the tank-circuit turns. This provides additional capacity across the self-excited tank circuit. The second remedy (altering frequency) was found necessary in several cases before the advent of television, to avoid interference to other services.

*SERVICE, *National Scene*; April, 1952.

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JOTS AND FLASHES

SERVICE MEN will be obliged to become familiar with quite a new family of terms when the '53 TV chassis appear officially, recent previews have indicated. In a line of one manufacturer there is being featured a *super noise guard* which is claimed to guard the receiver from electrical noise and exclude interference from vital receiving circuits; a *static eraser*; a built-in *contrast booster* which is noted as increasing the usual picture contrast by suppressing white retrace lines, and a *low-noise cascode* click-type tuner. . . . In another series of models, one of which is called the *Stratopower* line, there also appears a noise-eliminating circuit which picks external or internal interference noise off the video amplifier, audio amplifier and control circuits, reverses its direction, and feeds it back into the control circuit. This operation, it is said, tends to cancel out the original noise impulses and provides a steady picture, even in the fringe and outer fringe areas where noisy or weak signals will prevail. Complete analyses of the circuits used in these and other chassis will appear in SERVICE soon. Watch for them! . . . The U. S. Patent Office has granted a patent to *Arie Liberman*, prexy of Talk-A-Phone, on a selector device which makes possible multiple selection of stations on intercom systems within a compact unit. . . . An educational discount plan, permitting schools and colleges to purchase rotators direct from the factory at cost, has been announced by Crown Controls Co., Inc. . . . *Jay M. Allen* has been named manager of manufacturing, and *Ricardo Muniz* has been appointed superintendent of manufacturing at the Westinghouse TV-radio division plant in Sunbury, Pa. Allen will be responsible for production, industrial engineering, order service, quality control, inspection and maintenance. Muniz, formerly vice president and operations manager of Trad TV Corp., and with DuMont, Radio Navigational Instrument Corp. and Munston Manufacturing and Service Co., will have direct responsibility for assembly, production engineering and test. . . . *Earl Steiker* is now general manager of the rectifier division of Galvanic Products Corp. . . . *Joseph V. Fisher*, prexy of Fretco, Inc., recently married LaVerne Zeber of Pittsburgh, Pa. . . . *Burton Browne* married Mrs. Jean Taft Campbell recently. . . . Pace Electronics and Co., parts distributors, have opened a new store at 10 Broadway, Amityville, L. I.

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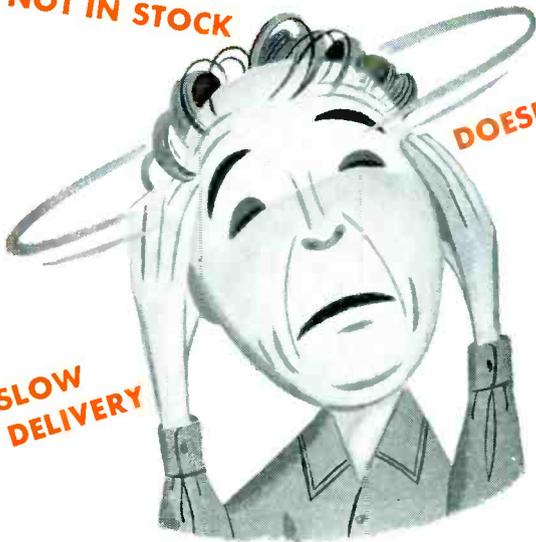
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