

This sign belongs on your door...



Customers "call again" for two reasons: they are either pleased with your service or displeased. Because the workings of an auto radio are quite intricate, no car owner can figure out for himself just who is at fault when a vibrator kicks up.

not on the Vibrators you use

Nevertheless, call backs on installations are costly affairs to you—both in time and reputation. The parts you choose must be as dependable as your own service. So stick with a name you know you can trust:

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Here's why C-D Vibrators are *reliable, quiet and last longer*



1. Exclusive C-D pole piece design and armature weight result in a perfectly-balanced unit with less vibration, minimum mechanical hum and maximum life.



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2. Exclusive C-D base mounting results in a full floating unit.



4. Unit completely enclosed in new, exclusive C-D super-soft, pure sponge rubber floatingsack. Eliminates usual difficulties found in other vibrators.



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For the best in Vibrators insist on C-D's. Now at your local C-D distributor. Or write for full details to Cornell-Dubilier Electric Corporation, Dept. S 79, South Plainfield, N. J. Other plants in New Bedford, Worcester and Brookline, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, Ohio.

For your nearest C-D distributor, consult your local Classified Telephone Directory.



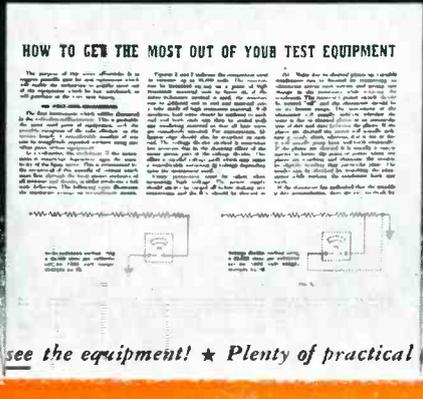
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CORNELL-DUBILIER
CONSISTENTLY DEPENDABLE
★ CAPACITORS
★ VIBRATORS
★ ANTENNAS
★ CONVERTERS

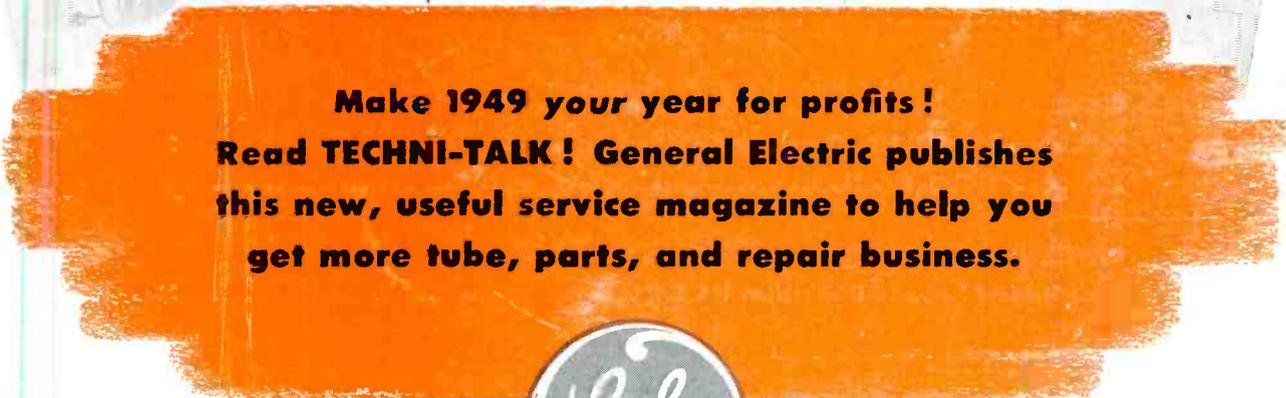
A GREAT NAME IN CAPACITORS - A GREAT NAME IN VIBRATORS

In Radio and Television Tube Sales

1949 IS A G-E YEAR



Clearly illustrated. You see the equipment! ★ Plenty of practical aid with your problems!



**Make 1949 your year for profits!
Read TECHNI-TALK! General Electric publishes
this new, useful service magazine to help you
get more tube, parts, and repair business.**



YOU'RE in a fast-moving profession, as radio-TV serviceman. Every day, new situations arise where you must know *what to do* to bring console-model radio, television receiver, or other sets up to par. Only by greater knowledge of methods, can you increase your repair volume . . . make your phone number the one owners dial when trouble occurs.

TECHNI-TALK is G.E.'s helpful answer to your need. Here's a bi-monthly service magazine edited *by practical men for practical men*—concise, down-to-earth, with just enough theory to give you the "why" of proved methods and time-saving short cuts. Read

every issue! Chances are, some problem awaiting you on your next round of service calls has been discussed, and solved for you, recently in TECHNI-TALK.

Your General Electric tube distributor will be glad to send you the latest TECHNI-TALK, and put you on his list for future issues. Phone or write him for your registration card! And don't forget: this expertly prepared magazine comes from a leading manufacturer of radio-TV equipment, in touch with service sources nationally. *You* benefit from the sum total of G-E experience on any problem! *Electronics Department, General Electric Company, Schenectady 5, New York.*

You can put your confidence in—

GENERAL  ELECTRIC

161-MAS

SERVICE, JULY, 1949 • 1



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YOU DON'T NEED THESE TUBES ...Yet!

As a serviceman, you don't need the brand new Hytron 1X2, 6BQ6GT, and 25BQ6GT immediately. **But you will soon.** They are first of a new line of Hytron originals for lower-cost TV sets. Designed for the mass market in collaboration with leading TV set manufacturers.

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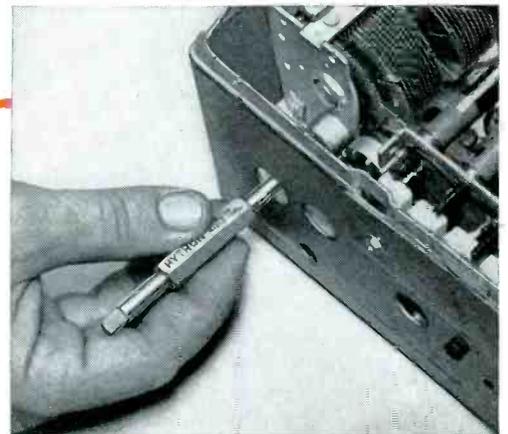
SPEED UP AUTO-RADIO SERVICING

After disconnecting control cables from a universal auto radio, how do you tune it? Screw driver? Here's a better way. Try the new Hytron Auto Radio Tool. A contest first-prize winner, this double-ender fits most sets. Helps you work faster with less effort, yet more precisely... to make more money. Only 24c. One job pays for it. Get your Auto Radio Tool from your Hytron jobber today.

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Detach cables from universal auto radio. Slip Hytron Auto Radio Tool into control fittings. Turn set on/off, tune, adjust volume and tone, realign to dial... smoothly, exactly. Square tip also fits splines. Slotted tip is V-shaped for different thicknesses of spade and similar key fittings. Tool fits over 90% of universal sets with minimum backlash.

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RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS



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Latest addition to IRC's big family of metal kits. Pocket-size case ideal for service calls. 10 compartments, resistors can't mix. Ranges stamped on resistors. 2 assortments: 45 half watt or 30 one watt resistors—popular ranges, widely found in television.



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Perfect way to buy and stock resistors. 4 drawers with 28 range identified compartments. 3 fast-moving assortments: 100 half watt, 83 one watt, or Combination Assortment of 91 resistors (includes close tolerance IRC Precision).



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Wherever the Circuit Says 

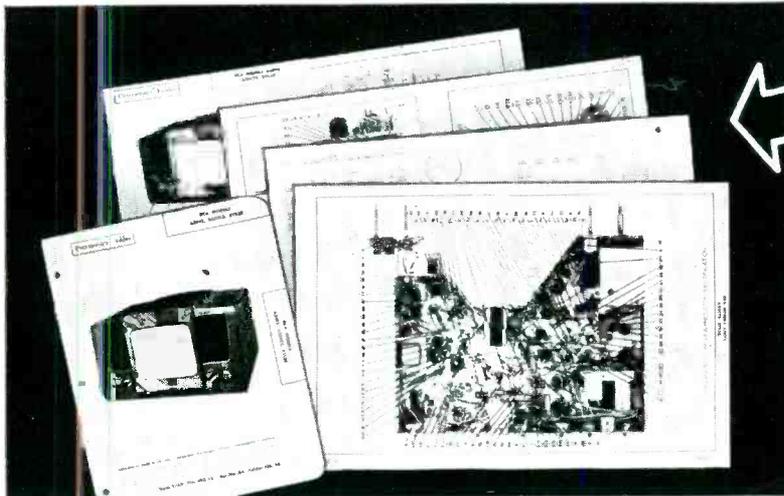


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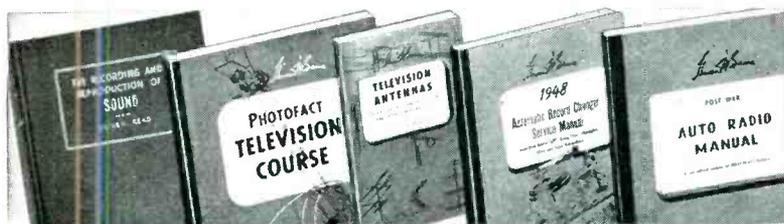


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- ★ 1500 Point Vernier Scale. Engraved lucite hair-line indicator. Positive readings free from parallax.
- ★ High Output and Accuracy via use of selected and true VHF components and circuits. Voltage regulated oscillators. Crystal calibrated plus crystal control.
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- ★ Wide Range Phasing Control.
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- ★ Double-Pi Line Filter plus multi-section, copper-plate shielding of entire instrument.
- ★ Tube Complement: 3 each 6J6 & 6C4. 1 each VR-105 & 6X5.
- ★ Fully Licensed under W.E., A.T.&T and Remco patents.
- ★ PLUS many other new "Precision" developments and improvements too lengthy to list at this time.

YOU MUST SEE the Series E-400!

SUMMARY OF IMPORTANT FEATURES

- ★ Extended Range, Voltage Regulated Vertical Amplifier. Response to 1 MC. 2 Meg. input resistance. Approx. 20 mmfd. input capacity.
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- ★ Extended Range Horizontal Amplifier. Response to 5MC. 1/2 meg. input resistance. Approx. 25 mmfd. input capacity.
- ★ Linear Multi-Vibrator Sweep Circuit. 10 cycles to 30 KC. Improved circuits assure unusual linearity thruout range.
- ★ Amplitude Controlled Synchron Selection.
- ★ "Z" Axis Modulation terminals for blanking, timing, etc.
- ★ Phasing Control for line sweep operations.
- ★ Audio Monitoring phone jacks provided at rear of cabinet plus direct access to H and V deflection plates.
- ★ Light Shield and Calibrating Screen removable and rotatable for varied applications and light conditions.
- ★ Tube Complement: 1 each type 6J5, 6AK5, 6SN7, 6X5, 2X2, VR-150. 2 each type 7W7. 5CP1/A CR tube.
- ★ Fully Licensed under patents of Western Electric and A.T.&T. companies.
- ★ PLUS a lengthy list of "Precision" refinements and facilities that must be seen to be appreciated.

Order Now from your nearest authorized "Precision" distributor to assure earliest possible delivery.

See the new Series E-400, ES-500 and the complete "Precision" line of A.M., F.M. and Television instruments.

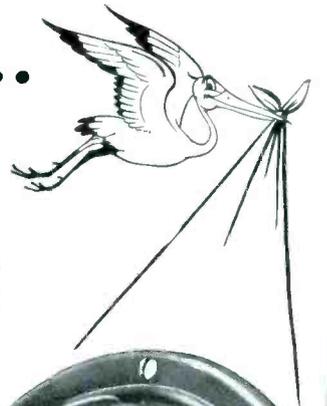
Ask to view the inside of any instrument and know why "Precision" is the Standard of Workmanship, Performance and Accuracy.

PRECISION APPARATUS COMPANY, INC.

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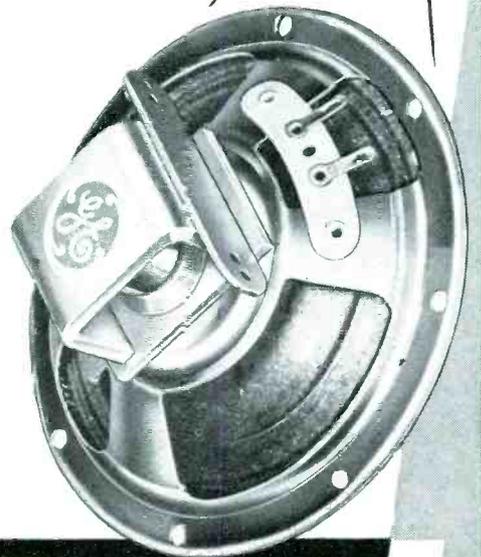
New baby in a proud family...



5" ROUND PM LOUDSPEAKER

THERE'S always something new and better in the G-E Speaker Line—Now it's the G-E 5" Round—*specifically designed for service replacement!*

Naturally it has the quality you expect of a General Electric Speaker—sturdy all-weld construction, rock-steady G-E Alnico 5 magnet—plenty of power, sensitivity, fidelity! Give your customers the best—that G.E. gives you! See your G-E parts distributor and stock up today.



Of course it has the famous G-E Aluminum Foil Base Coil! Not subject to warping resulting from high humidity. Provides much higher power handling capacity. P. S. All G-E Speakers have this Metal Base Voice Coil—don't forget that!

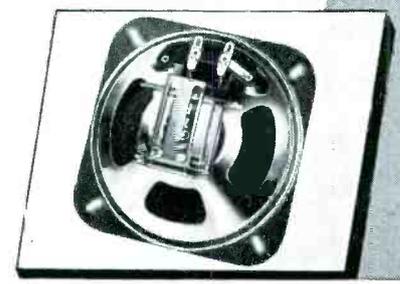
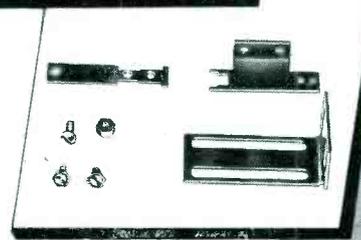
FREE—with all 4", 5" and 5¼" G-E Speakers!

Chassis Mounting Brackets

Save time, money and materials for the hard-working serviceman!

Well, now, here's the story. With the serviceman in mind, G. E. has cooked up these neat little mounting kits to save your temper and please your customers. They're adjustable—up, down or

sideways, for simplified mounting of speakers in small working areas. Less work for you—and a cleaner job for that important fellow—your customer. The brackets are FREE with every 4", 5" and 5¼" G-E speaker you get from your G-E distributor or jobber. *General Electric Company, Parts Section, Electronics Park, Syracuse, New York.*

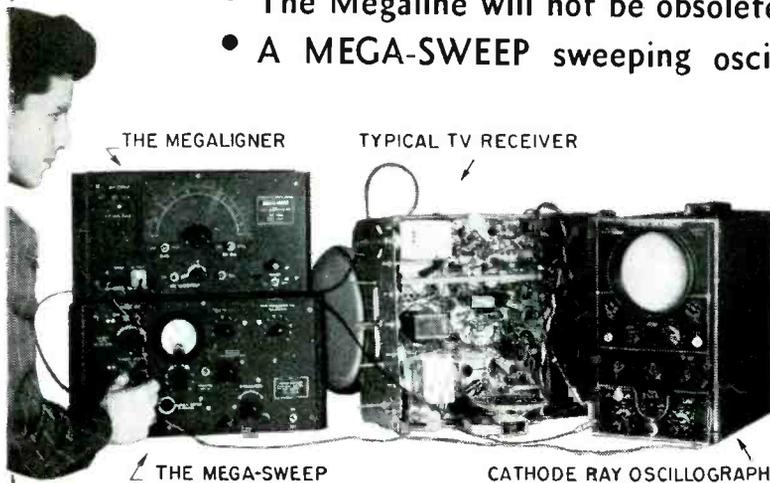


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GENERAL  ELECTRIC

ARE YOU READY *for* UHF?

- The Megaline will not be obsolete when new bands are announced.
- A MEGA-SWEEP sweeping oscillator with single dial continuous tuning from 50 kc to 1000 mc.



- An accurate marking device (MEGALIGNER) 19-49 mc pip type mark which cannot overload receiver or disappear in traps.

- RF Marker with crystal accuracy for sound carrier of each TV channel.

- Engineering Service Divisions throughout the United States.

A modern test set-up is shown here in operation. . . . With these Megaline instruments you service VHF and are ready for UHF (to be announced this fall.)

With Megaline instruments you are always ahead in the TV business. Our engineers are constantly working to keep you ahead. This actually saves you money because if you buy Megaline test equipment you will not have to replace it with completely new instruments whenever a new band is announced.



The CALIBRATED MEGA-SWEEP

Cover all bands with only ONE tuning dial. . . . That means ALL VHF and UHF bands. . . . This permits faster and surer re-alignment of receivers. . . .

You get a visual picture of *all* lower channels with *one* setting of instrument . . . turn single tuning control for visual picture of all higher channels.

Frequency carriage 50 kc to 1000 mc. Sweep width at least 30 mc. Sweep voltage for instrument and scope is variable frequency sawtooth can be locked at 60 cps. This feature allows indication of amount of receiver hum.

Present Mega-Sweeps converted to Calibrated model, Price \$50.00. Price of Calibrated Mega-Sweep \$425.00 F.O.B. factory.



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This pip type marker generator covers all present and proposed I.F. frequencies. Covers 19 to 49 mc. Produces a pip type mark connected directly to the oscilloscope. This mark cannot overload the receiver nor disappear in traps. The instrument also provides CW output over its frequency range and may be used as a signal source. Separate amplitude controls are included for the pip and the CW output. The MEGALIGNER contains a 4.5 mc oscillator which can be used for adjusting video traps, intercarrier pickoff transformers and for calibrating two frequencies on each band of the variable oscillator in the MEGALIGNER. Price: \$150.00 F.O.B. Factory.

Write for catalog . . . Prices outside U. S. A. and Canada 10% higher.

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Manufacturers also of: The MEGA MARKER, MEGA MARKER SR., MEGA-PIPPER

Sound Advice From One Serviceman To Another!



MAC'S Radio REPAIR

Choteau, Montana PHONE 7:1
BOX 638

John F. Rider Publisher, Inc.
480 Canal Street
New York 13, N. Y.

Rumors are running around financial circles to the effect that a good many ex G.I. radiomen who have gone into business for themselves are practically starving to death. I can well believe such rumors since I am an ex G.I., and after a year and a half I am just beginning to pull away from the deep part of that red ink pool. I think Dun & Bradstreet, Inc. still list me as a good cash-on-the-line customer. Since the above-mentioned rumors are probably true, I would like to take advantage of your advertising department to pass on some tips to ex G.I.'s who are now in or who contemplate entering the radio repair business.

A man entering radio repair must have some working capital, a good working knowledge of radio, adequate test equipment, and a GOOD REFERENCE LIBRARY. That good reference library cannot be stressed too much, because the big jobs, the mean jobs, and the tough jobs are dependent on that library.

Unfortunately there are quite a few radio wreckers operating, and the only complete key that I have found for setting those radios right is the use of Rider's manuals. If the manufacturer has made changes in the set, those changes are included in Rider's. In most cases all other changes should be discarded and the radio re-assembled according to schematic.

The SPEED with which repair work is completed has much to do with income. In the interest of speedy repair I recommend Rider's. A customer who is PLEASED with the work done on his radio doesn't mind paying a good price for it. Rider's manuals give you the information on nearly every radio made and if used will mean pleased customers. REPEAT BUSINESS and word-of-mouth advertising means extra money in your pocket. By doing conscientious work that proves satisfactory you will get both repeat business and good advertising.

There are many shops operating without Rider manuals, and that is especially true of newcomers to the business. I am sure that many of the newcomers will find that an investment in a complete set of Rider's manuals will mean the difference between success and failure in their business.

I have written this with the hope that it will help some of the boys who are busy pulling out what little hair is left in their heads, and also with the hope that it will serve to help a lot of men improve their work and thus give a better name to our business.

Yours truly,

A. E. McCorkle

A. E. McCORKLE

"HIWYNI"

This is not a code. It is simply an abbreviation of a very important condition in the operating life of a service shop. HIWYNI means HAVE IT WHEN YOU NEED IT. It applies to many things, but especially to RIDER MANUALS. Make sure that you have a complete library of RIDER MANUALS on hand at all times.

These RIDER books are the result of twenty years of specialized publishing for the Radio Servicing Industry

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NOTE: Are you receiving your copy of "Successful Servicing"? It's Rider's own publication of interest to every serviceman. In it you will find all of the circuit changes in sets . . . as soon as they are released. It's FREE!

NOTE: The Mallory Radio Service Encyclopedia, 6th edition, makes reference to only one source of radio receiver schematics—Rider Manuals. ANOTHER NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 edition No. 4, makes reference to only one source of receiver schematics—Rider Manuals.

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Famous Sylvania Polymer now available with new plus features for complete television service!

- Shielded ac probe lead—reduces stray field effect.
- Microphone type panel connectors on probe leads insure firm, long life connections.
- RF probe features ground clip and detachable extension tip—extremely flexible in application.

CHECK THESE OTHER OUTSTANDING FEATURES:

The essentially flat frequency response of 20 cycles to 300 mc. and useful range to 500 mc. gives this complete vacuum tube voltmeter a range low enough to test high fidelity amplifiers, yet high enough to accommodate all television frequencies.

The instrument has seven current scales—six of them reading in milliamperes and one reading in amperes. The specially engineered Sylvania Subminiature Tube contained in the RF Probe permits the exceptionally high frequency range of this instrument at a high input impedance and an unusually low input capacitance.

The large 4½" meter affords maximum readability, while careful design minimizes error introduced by line voltage variation, tube variations and stray fields.

Be sure to send your coupon today to receive full particulars on the new Sylvania Polymer Type 221!



RANGES

DC volts	0-3, 10, 30, 100, 300, 1000, 10,000*
AC volts	0-3, 10, 30, 100, 300, 1000
RF volts	0-3, 10, 30, 100, 300
Resistance Ohms	0-1000, 10,000, 100,000, 1 meg., 10 meg., 1000 meg.
Current Mo	0-3, 10, 30, 100, 300, 1000
Current Amps	0-10

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FREQUENCY

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WITH ADVANCEMENTS in all phases of the radio, electronic and TV art racing ahead at an unprecedented pace and the interests of Mr. and Mrs. Consumer keener than ever, one becomes quite bewildered at the sigh of despair echoed by many Service Men, who claim that the bottom has just dropped out, with the blame being hoisted on everything in the book, but one item—themselves.

There is no denying that conditions have changed. Business is not pouring in, people are not clamoring for that service call and the phone has, on many fronts, lost its sweet ring. The cycle has changed . . . the buyer is now on the throne and he has found the turnabout quite intriguing. He is enjoying the rapt attention of the seller and the lively respect for his requirements, critical as they might be. He is no longer the seeker, as many Service Men have found out, and as the recent preventive maintenance program in Harrisburg proved so strongly.

The business was there, in this active community in Pennsylvania, and in AM, too, the association boys found, but they had to go after it, tell their story and do a job. They had to do a good job that was a tribute to their talent. Their thirty-day record proved that the effort was not in vain. The boys made friends, won customers and best of all, made money, dollars that were apparently waiting for the right caller. Those ailing volume controls, dying tubes and those frayed contacts on resistors and capacitors were just begging for replacement in these Harrisburg sets, as they are in thousands, yes, many, many thousands of receivers throughout the country. And yet this golden opportunity is being bypassed and so casually, that it is truly disheartening. And we repeat, this is only AM business, a piece of the pie which many Service Men appear to have forgotten about.

Recently several enterprising Service Men, when told about the servicing possibilities which exist, particularly in large apartment areas, decided to make a survey using postal cards, phone calls and doorbells. The results staggered them. In practically every apartment there was at least one set

requiring attention, which owners were agreeable to have repaired, provided there were the normal performance assurances. Armed with a reputable record and ability to repair rapidly to keep costs low, the boys found little difficulty in consummating more new business than they ever thought possible, particularly these days!

There are countless heavily populated areas with large apartments, developments and even business establishments, including stores and office buildings, which offer similar opportunities for the Service Man if he'll only write, call and ring doorbells.

The Fall Campaign

This fall will see a vigorous application of a program, following the Harrisburg preventive maintenance pattern to dig up business in New York and Pennsylvania. Associations in the federations of both states will co-sponsor the effort in October, and as in Harrisburg many manufacturers, broadcasters and distributors are expected to cooperate. Plans call for a dynamic drive by way of newspapers, magazines, radio and TV stations, posters, direct mail and personal calls to arouse set owners to the need for preventive maintenance. The campaign will not only be directed to AM set owners, but to those with FM, TV, phono combinations, auto receivers, etc. Suggested during this all-out effort will be the repair and also replacement of such items as speakers suffering from withered paper cones or off-center spiders or defective cartridges which are causing needle scratch, needle talk, distortion and many other irritating sound results. Many Service Men have already found out how simple it is to sell a new cartridge with a demonstration of the newer types. Manufacturers have studied rapid replacement possibilities and provided cartridges which can be installed in most standard tone arms in the home with little trouble. And not only can new cartridges be sold, but often a preamp or perhaps a new amplifier to add brilliance to the reproduction.

The preventive maintenance program will be a concerted drive to drum

up business and will, we are sure, prove eminently successful.

Complete details on the program will appear in the next and successive issues of SERVICE. Every Service Man is urged to read about these plans very carefully, for they'll provide the nucleus for a new-business deal, no matter where you live, but particularly if you operate in the Keystone and Empire states.

This round-up campaign will prove, as it has in the past, that there is business, good business around, if you'll only look for it.

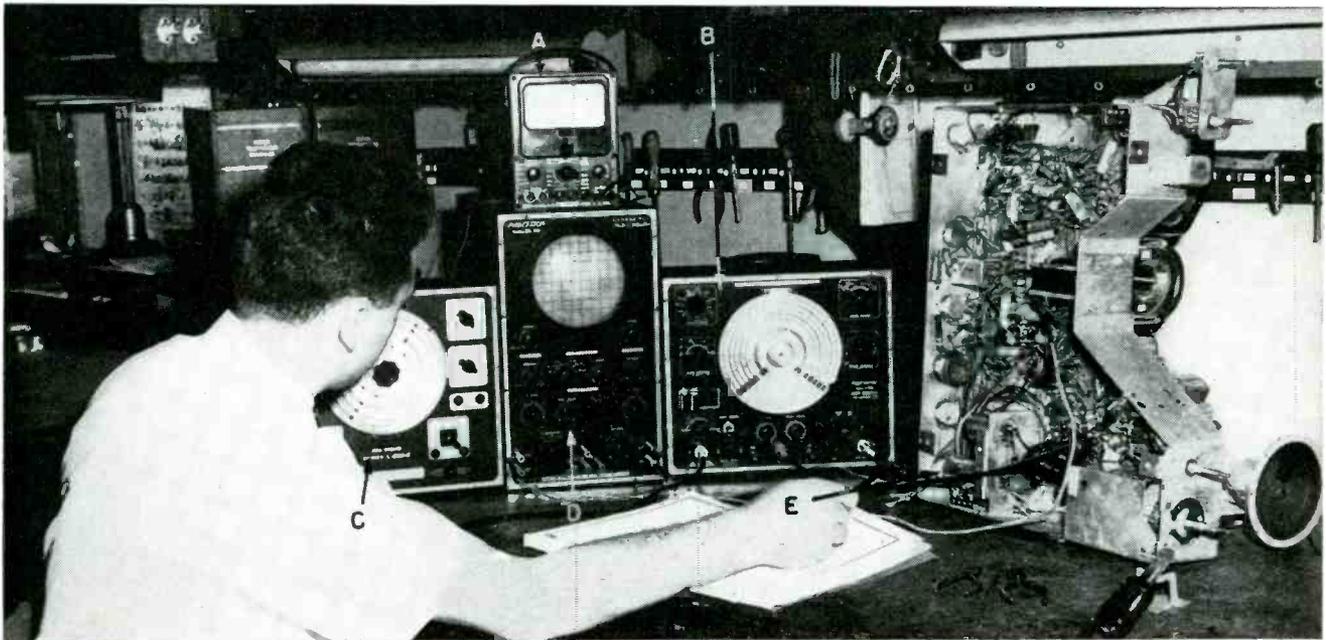
Broadcasters and Service Men

ON SEVERAL OCCASIONS, we have commented on the deep respect broadcasters have for the Service Man. A few weeks ago this fact was accented quite sharply when the National Association of Broadcasters prevented the passing of a law in San Francisco which would have bogged down TV installations. The law, in its original form, required that a \$2.50 permit be obtained from the Electrical and Fire Departments before installation, which would have meant a seventeen-day delay from the time of filing application for a permit. Action by the NAB not only eliminated the permit fee, but the application and inspection requirements.

In its appeal to the San Francisco authorities, NAB said: "The television industry is one of rapid and continuous technical progress. It is impossible to predict what effect new technological developments will have on methods and techniques of television installation. To inhibit this progress by sporadic and piecemeal regulation, promulgated by local governments without national uniformity, is to jeopardize the future of television. Radio-television manufacturers, in designing their equipment and antennas, and in prescribing installation techniques for their personnel, should not have to cope with the differing rules and regulations of the various states and communities affecting television installation, unless there is a clear need for such local regulation."

Everyone is grateful to the boys in Washington for their prompt and thorough participation in this extremely important problem.—L. W.

Visual TV Alignment



Visual TV alignment setup. At *A* is a high sensitivity test set (20,000 ohms per volt dc); *B*, sweep signal generator; *C*, AM signal generator being used as a variable frequency marker or *pip* generator; *D*, high sensitivity 'scope and *E*, TV receiver chassis.

AN EXAMINATION of various manufacturer's instructions for alignment of TV receivers reveals a considerable variation in recommended techniques. Preferred procedures vary from only the observation of a TV station test pattern and the use of an audible sound check as trimmer and slug adjustments are made, to a complete sweep alignment employing a sweep generator, AM signal generator, oscillograph, *vtvm* and associated equipment.

Although an experienced Service Man can occasionally obtain a moderate degree of success using only the TV station test pattern and an alignment tool, it has been found that maximum efficiency of set operation only can be obtained by a true visual alignment, this technique assuring the Service Man that the response characteristics of all broad-band circuits have been adjusted for recommended configuration and maximum sensitivity. Once the Service Man has become familiar with the basically simple visual alignment techniques involved, he can align TV receivers in an orderly and efficient fashion, and far more satisfactorily than the *cut and try* screw-driver-test-pattern method.

What the Response Curve Shapes Mean

A video *if* response characteristic, plotted on a graph of frequency versus

relative amplitude, appears in Fig. 1.

Points *A*, *B* and *C* indicate that if an *unmodulated rf signal* at, for example, 19.75 mc, is fed into the *if* amplifier, little or no output from the *if* amplifier will be obtained. The same condition exists at *B* and *C*, if signals of 21.25 and 27.25 mc, respectively, are fed into the amplifier. However, should we feed an unmodulated fixed frequency *rf* signal into the *if* system at 22.3 mc, for example, the response of this *if* amplifier is such as to pass this signal at a relative amplitude of about 7* as noted at *D*. In addition, *rf* signals of 23.5 and 24 mc will also produce an output of 7 on the graph, because of the flat characteristic of the *if* amplifier in this region. Finally, if an *rf* signal at 25.75 mc is fed into the amplifier, an output of approximately 3.5 will be obtained, indicating that the response of the *if* system is 1/2 maximum at 25.75 mc.

It is obvious, therefore, that the response characteristic of a broad-band amplifier could be plotted, point by point, using an unmodulated *rf* signal source, by progressively setting the *rf* signal source (AM generator¹) to about 10 or 15 frequency points (constant generator output) between 19 and 29 mc, and noting the relative out-

put of the *if* system, on a *vtvm*² at each frequency point.

If instead of this laborious method we apply to the input of the *if* system an *rf* signal, whose frequency rapidly and continuously sweeps back and forth between 19 and 29 mc, we find that there is no need to set the output of an AM *rf* generator to a multiplicity of individual points within the range of 19 to 29 mc.

Therefore, if this *swept rf* signal is used (from a sweep signal generator³) and instead of a *vtvm* we connect an oscillograph⁴ to the output of the *if* system, we can instantaneously analyze the response characteristic on the 'scope screen, instead of following the time consuming point-by-point graphical method.

A very important point to remember in the sweep generator analysis is that the output of most modern sweep generators sweeps through a wide frequency range (19 to 29 mc, for example) at the *low frequency rate* of the power line, which is usually 60 cps. Therefore, under these conditions the output of the *if* system also varies in amplitude (in accordance with the shape of the *if* response characteristic) 60 times per second. The *rate* of frequency change using a sweep generator is *low* (60 cps) while the actual frequency change of the generator itself is *high* (up to approximately 10 mc sweep).

*Arbitrary unit.

¹Such as Precision, Series E-200C.

²Such as Precision, Series EV-10.

Procedures

Thorough Analysis, Using 630TS as a Model Chassis, Discloses Specific Steps Which Must Be Followed in 'Scope-Type Alignment of Such Portions of the Circuit as the Video IF Traps, Video IF Transformers, Sound IF Transformers, RF and Converter, etc., and How to Interpret the Visual Results Obtained.

Assuming that the Service Man already owns standard AM servicing equipment, including a stable and accurate AM signal generator, and a *vtvm*, he will require, as the minimum of additional equipment, a wide-range sweep generator³ and a sensitive cathode-ray oscillograph,⁴ for comprehensive TV servicing.

Performance Features of Instruments

Research in our lab has disclosed that there are six minimum requirements which sweep generators should meet:

- (1) Frequency range approximately 2 to 240 mc, complete coverage, preferably with direct reading tuning dial within $\pm 1\%$ accuracy.
- (2) Sweep range or deviation continuously variable up to at least 10 mc. A low sweep range to 1 mc maximum has also been found desirable for efficient sound *if* and FM receiving alignment.
- (3) Output, preferably terminated, with output up to .5 volt.
- (4) Marker facilities, with a built-in crystal-controlled marker oscillator for accurate marker placement or for accurate calibration of the external standard

by VICTOR I. ROBINSON

Senior Engineer
Precision Apparatus Co., Inc.

AM generator to be used, as a *variable* marker generator. For maximum convenience, facility should be available for simultaneous insertion of about four crystals, rotary selectable.

- (5) Shielding, with double shielding of *rf* units and adequate line filter, to minimize leakage radiation.
- (6) Facilities for synchronizing and phasing the sweep generator and oscillograph with each other.

There are three basic features which we have found desirable in an oscillograph:

- (1) A 3" or 5" crt, dependent upon degree of visual efficiency desired.
- (2) Sensitivity of at least 50 millivolts per inch, to assure reasonable response pattern size for single *rf* stage alignment of TV sets.
- (C) Response good to at least 500 kc in both horizontal and vertical

³Such as Precision, Series E-400.

⁴Such as Precision, Series ES-500.

amplifiers, to assure good square wave and saw-tooth response over generally applicable input frequencies encountered in service.

In preparing for the application of the instruments the Service Man should digest thoroughly the contents of the instrument's instruction manuals. This is extremely important since most instruments are accompanied by extremely informative instructive literature. These data are usually prepared for the express purpose of *assisting* the Service Man in properly applying these instruments. Many of the pitfalls, which beset the TV Service Man can be avoided by assimilation of the complete contents of his test equipment instruction booklets. It should never be assumed that experience alone is an adequate substitute for reading instruction manuals.

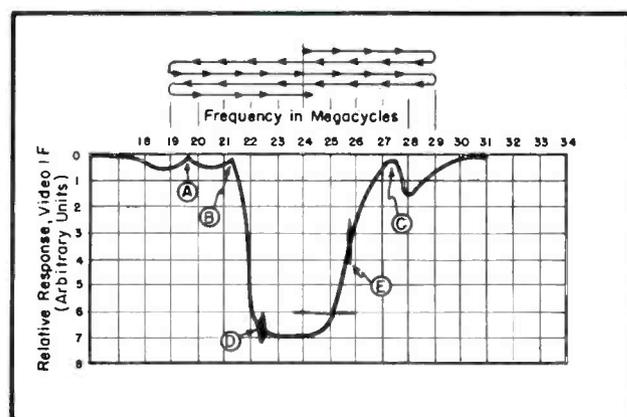
Alignment of RCA 630TS

To illustrate the actual application of the visual alignment technique, a typical alignment procedure for the well known RCA 630TS TV set will be analyzed.

There are six steps in this alignment procedure: (1) Video *if* traps; (2) video *if* transformers; (3) sound dis-

(Continued on page 25)

Fig. 1. Video *if* response characteristic plotted on a graph of frequency versus relative amplitude. At *A* is the 19.75-mc picture trap (adjacent channel). *B* indicates the 21.25 mc sound trap. At *C* we have the 27.25 mc adjacent sound trap. Point *D* illustrates the check point on the marker at 22.3 mc and the marker pip at 25.75 mc is indicated at point *E* (video carrier 50% down point). The output of the video *if* system at each frequency point depends upon the response of the system at each of these frequency points. It will be noted that if the dial of the sweep generator is set to 28 mc, for example, the sweep signal will encompass only that portion of the response curve between 23 and 33 mc, and only that portion will appear on the 'scope. (As indicated in the flow pattern above the plot, the output of the sweep generator—with the dial set to approximately 24 mc—sweeps back and forth about the 24-mc point sixty times per second).

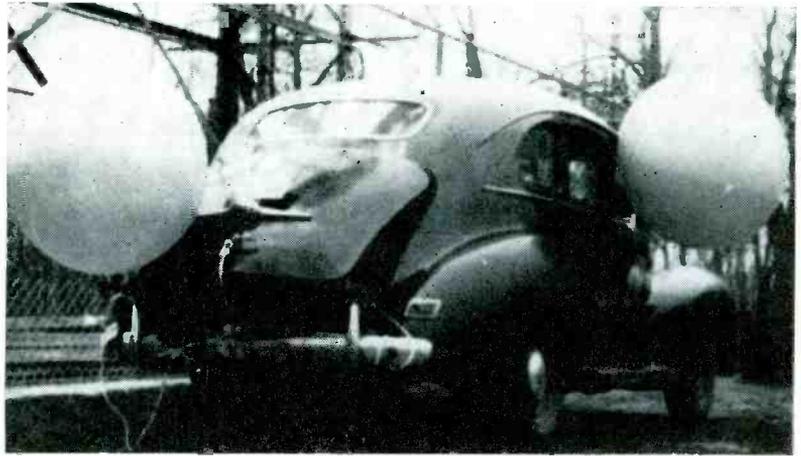




Inflating weather site-search balloon with compressed helium gas.

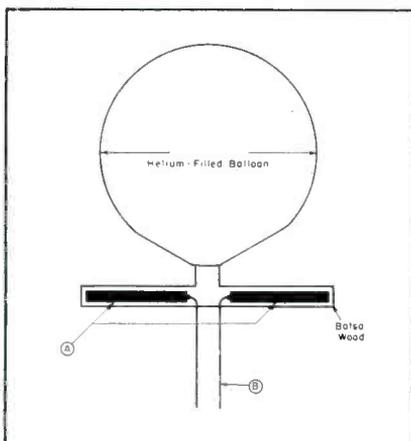
Right: Test balloons on their way to a test site.

(Photos by Anthony Candopoulos)



Preparing the balloon for flight. Balloons are connected to dipole strips, cut for a specific channel, which are fastened to balsa wood. When it is desired to survey a height of more than 50' or when the velocity of the winds exceed five miles an hour, two or more balloons, as shown here, are required. The balloons illustrated have been inflated to a 4' diameter. To avoid strain on the balloon and thus permit reuse of the balloon it is wise not to inflate beyond this 4' diameter.

Fig. 1. Assembly of search balloons to determine signal-to-noise ratio at some effective tower height: A, aluminum strip cut to resonant length and fastened or cemented to balsa wood; B, 300-ohm transmission line used to guide balloon.



TV Antenna

IN TV FRINGE AREAS, the tower is a particularly important item, serving to raise the antenna to a suitable height required for adequate signal pickup. The exact height and position of the mount must be determined carefully, with a preinstallation analysis of several area factors. For instance, there is the problem of predicting receiving possibilities at practical tower heights.

Fundamentally the transmission of TV signals is limited to optical horizons except for some bending effects which have been calculated mathematically and appear in the formula:

$$D = 1.41 \sqrt{H_T} + 1.41 \sqrt{H_R}$$

Where:

D = Maximum distance in miles

H_T = Effective height in feet of the TV transmitter antenna

H_R = Effective height in feet of the TV receiver antenna

As an example, suppose the height of a transmitting antenna were 1600' and the maximum height at which the receiving antenna could be assembled on a tower were 144', and we had to determine the maximum distance at which the receiving antenna could be installed from the TV transmitter for regular TV reception. From the foregoing formula we find that:

$$\begin{aligned} \text{Maximum distance} &= 1.41 \sqrt{1600} \\ &\quad + 1.41 \sqrt{144} ; \\ \text{Maximum distance} &= 1.41 (40) \\ &\quad + 1.41 (12) ; \\ \text{Maximum distance} &= 56.40 + 16.92 ; \end{aligned}$$

and thus

$$\text{Maximum distance} = 73.32 \text{ miles.}$$

Now this formula will be correct unless there are hills or buildings between the TV transmitting and receiving antennas, which block the line-of-sight transmission. Reference to a topographical map will indicate whether there are any intervening hills. The maps should not be used

for final judgment of the problem, but rather as a pertinent guide as to whether line-of-sight conditions exist between the transmitter and receiver.

If the maps do not confirm a clear optical path, reception will then be on a variable basis predicated on seasonal weather conditions, and reliable reception cannot be assured.

Balloon Pretests

The safest way to determine in advance whether or not an antenna will work at some tower height is to engage in a bit of balloon flying, floating the balloon to the height at which it is expected to install the antenna.

Weather Bureau balloons can be purchased for this work for less than a dollar and inflated with helium to a diameter of almost ten feet. An aluminum strip can be cut to the length of the desired channel and fastened or cemented to a piece of balsa wood, which is sufficiently light so that it can be mounted at the base of the balloon without impeding its flight. A 300-ohm balanced transmission line then may be harnessed to the balloon and used as a *kite line* to float the balloon. When the aluminum-strip dipole on the balsa wood is floated to the height of the proposed tower, the quality of the signal can be measured. If the simple dipole develops a signal-to-noise ratio that appears to be adequate, it is reasonable to assume that when a high-gain complex array is installed on the top of a tower, raised to the balloon height, that a vastly improved signal-to-noise ratio will provide extremely satisfactory picture signals.

When it has been decided that a tower will be erected, a careful procedure should be established as a basis

Fundamental Installation Considerations . . . Balloon Pretesting . . . Tower Planning . . . Erecting the Tower . . . Transmission Line Problems and Solutions . . . Lighting

by **IRA KAMEN**

Manager, Antenaplex and TV Dept.
Commercial Radio Sound Corp.

Tower Installations*

of operations. To illustrate tower erection procedure, let us take an average installation of a 100' tower. The first steps involve careful planning:

Six Planning Steps

(1) The property owner's permission to erect the tower must be first obtained.

(2) The local engineers in the city or town should then be consulted to ascertain the local code rules and regulations which must be followed. If a proposed tower is within a range of a few miles from an airport or emergency landing strip it is necessary for the installer to file a form furnished by the Civil Aeronautics Authority (CAA). After this form is submitted a CAA inspector will visit the tower site to determine whether or not the tower must be illuminated with blinker and beacon lights or painted with international orange and white bands. Compliance with the CAA rules is mandatory. Violation is subject to severe Federal penalties.

(3) The next step involves the selection of a site for the tower and guy wire anchors, which is reasonably level, so that all the guy wires may be adjusted for approximately the same tension.

(4) Then it is necessary to locate the tower center and the anchor points for the guy wire, which are measured equi-distant from the base of the tower, spaced 120° radially.

(5) Planning the reinforcement of the tower installation is the next, the most important step in the planning program. It is necessary to consider the type of installation to be made (*rooftop* or *ground*) and the conditions which prevail during installation.

Rooftop Installation: The base of the tower should be on a structure or reinforced roof strong enough to handle the combined total weight of the tower and guy wires, and also the downward force which is developed by the combined tension (which may reach several thousand tons to the square foot) of all the guy wires. Failure to reinforce properly the base of the tower may cause the roof to buckle and break. The anchor points for the guy wires should be extremely rigid and firmly attached to a brick or masonry or solid timber structure, which will withstand the static loading of the guy wire tension and the dynamic loading caused by wind storms, ice loading, etc.

Ground Installation: It is necessary to sink into the ground concrete pylons of a cross-sectional area which the weight of the concrete (usually a 1-2-4 mix reinforced with scrap steel) will withstand the upward and downward pressures exerted in a tower installation.

Guying Rooftop and Ground In-

stallations: The distance from each guy wire anchor point to the base of the tower should be not less than the height of the tower to which the guy wire is affixed. To illustrate, a 100' tower height would indicate that the top guy wire anchor point should be located 100' from the base of the tower. If the secondary or lower set of guys are connected 50' down the tower, these secondary guy wire anchor points should be 50' from the base of the tower.

Reinforcing: To insure the permanency of the guy wire adjustment at the anchor point only forged turn-buckles or completed eyes should be used.

(6) In this, the final step, it is necessary to plan the assembly of the tower so that the ladder side is facing the prevailing winds in the locality. This provides for extra rigidity

(Continued on page 32)

Fig. 2 Fictitious analysis of line-of-sight transmission and reception formula:

$$D = 1.41 \sqrt{H_T} + 1.41 \sqrt{H_R}$$

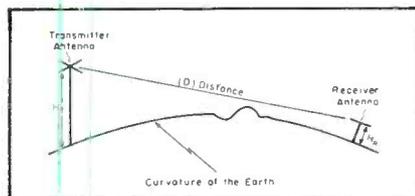
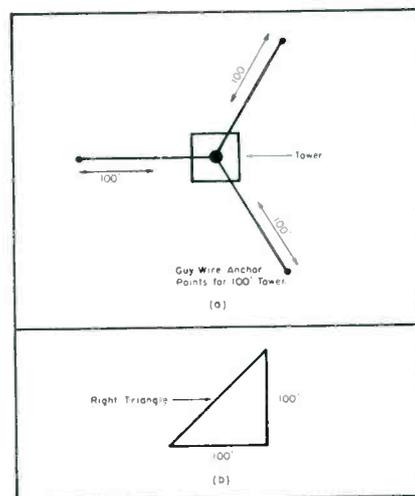
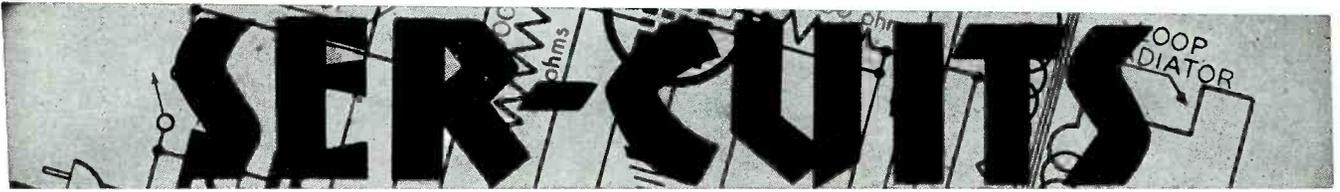


Fig. 3. View of guy wires at top section of tower.



*From the Ira Kamen-Lewis Winner book *TV-FM Antenna Installation*.



The RCA 16" Metal Picture-Tube Receiver . . . TV RF Amplifier Circuits.

TV RECEIVERS, using the sixteen-inch 16AP4 picture tubes¹ feature many innovations, particularly in the picture-tube circuit.

In the RCA models 8T270, 8TC270 and 8TC271, for instance, which have twenty-two tubes plus four rectifiers and the 16-inch tube, we find a picture *agc* system, *afc* horizontal hold; stabilized vertical hold; two stages of video amplification, and noise saturation circuits.

The *cathode* of the 16AP4 is connected to base pin 11 to which the grid-No. 1, grid-No. 2, and anode circuit returns are made.

Grid 2 is incorporated in the design of the 16AP4 to prevent interaction between the fields produced by grid 1 and anode.

The fluorescent screen, utilizing phosphor No. 4, provides white fluorescence with a color temperature of 6500°K.

The structural features of the 16AP4 require the use of new techniques for supporting the tube, masking the picture face, and insulating the metal cone.

The support has been designed to provide proper positioning of the tube and adequate insulation of the metal cone for a voltage which may be as high as 15,500 volts (absolute maximum rating) above ground. In one type of mounting arrangement the insulators are slotted to provide adjustment for the cone end of the tube in directions perpendicular to its axis. Motion of the tube in either axial direction can be controlled by suitable positioning of the deflecting yoke and mask. The total force exerted on the face plate by the mask must be just sufficient to maintain contact between the deflecting yoke and the flared portion of the glass neck. The deflecting yoke and focusing coil should be axially aligned with the tube neck so that little effort is required to slide the neck through these components when the tube is placed in position.

Grounding Considerations

When the receiver is in operation, static electricity may collect on the

electrically isolated mounting screws and other metallic objects which touch the mask or support insulators or which are close (within a few inches) to the cone. If any of these metallic parts is touched, the static charge may cause a shock which, although not dangerous, is annoying. Should any of these parts discharge by arc-over to ground, noise, evidenced by clicks in the sound and *snow* or bright spots in the picture, may be produced. To prevent the accumulation of these static charges, metallic parts, including screws, ornaments and the loudspeaker, which touch the mask or insulators or are located near the metal cone are connected to ground through a relatively low resistance.

Corona and arc-over may occur in high-voltage systems in spite of design precautions to prevent such discharges. To minimize the interference produced should corona or arcing develop, the antenna leadin and input terminals are located as far away from high-voltage components including the cone as the chassis arrangement will permit. The high-gain amplifier in the *rf*, *if* or video circuits are also placed as far away from the high-voltage circuit as possible. This requirement is especially important for those amplifier stages which operate at a low signal level.

Servicing Precautions

It is desirable that some means be provided to prevent contact with the cone when the receiver chassis is operated outside the cabinet for factory or service adjustments. A sheet of polyethylene with a minimum thickness of .01" can be wrapped around the cone to protect most of the exposed area, leaving only the formed section at the large end of the tube, to which the high-voltage contact is made, exposed. The glass at the small end of the cone should be covered for a distance of 1 to 1½".

TV Receiver RF Amplifier Circuits²

Most of the gain in a TV receiver is obtained in the *if* amplifier stages. However, the use of a stage of *rf* am-

plification improves the signal-to-noise ratio considerably, and in areas on the fringe of regular service areas, an *rf* amplifier may mean the difference between a satisfactory picture and one that is full of *snow* and noise. Also, the use of a properly designed *rf* amplifier will greatly reduce radiation of the local oscillator signal through the antenna which might cause considerable interference with other TV receivers in the vicinity.

Many of the early TV sets did not employ an *rf* amplifier, and the output of the antenna coupling circuits was connected to the grid of the converter tube, with the bandpass characteristic of the antenna coupling circuit providing the necessary *rf* selectivity for image rejection and some adjacent channel attenuation. A few of the higher-priced receivers, however, did employ a stage of *rf* amplification.

An interesting example of antenna coupling and *rf* design appears in the G. E. 90. The antenna coupling consists of a double-tuned circuit preceded by a high-pass filter circuit. Individual band-pass filters are provided to couple the grid of the converter tube to plate of a 6AC7 *rf* amplifier. The grid coils are tuned to the center frequency of the particular channel being received, while the bandwidth of the filter circuit is adjusted by a common coupling provided. The input of the band-pass filter is shunt-fed through a plate resistor.

To obtain the maximum possible gain at the wide bandwidths employed in the *rf* section, it is necessary to use a tube having a high G_m (mutual conductance) and low grid and plate capacities. To keep tube noise at a minimum, the plate current of an *rf* amplifier tube should be as low as possible.

If a triode is used as an *rf* amplifier, the tube noise generated in the *rf* stage can be kept at a minimum,

¹Tube data based on copyrighted information supplied by the tube department of RCA.

²From copyrighted data prepared by K. Fowler and H. Lippert of the G.E. technical service section.

with a resultant improved signal-to-noise ratio. However, a triode cannot be used as an *rf* amplifier at high frequencies, if the input signal is applied to its grid in the conventional manner unless some form of neutralization is employed.

To make use of a triode for best signal-to-noise ratio and to eliminate the necessity for neutralization, the control grid may be grounded, with the input signal applied between cathode and ground (instead of between control grid and ground as in the conventional manner) and the tube operated as a grounded-grid amplifier. With this arrangement the capacity from grid to plate, which would cause regeneration in the conventional amplifier, is placed at ground potential and there is practically no interaction between the input and output circuits as a result of the grid-plate tube capacity. Since the grid-to-cathode potential will still vary according to the input signal, the tube acts, as far as the output voltage is concerned, essentially the same as though it were connected in the conventional manner.

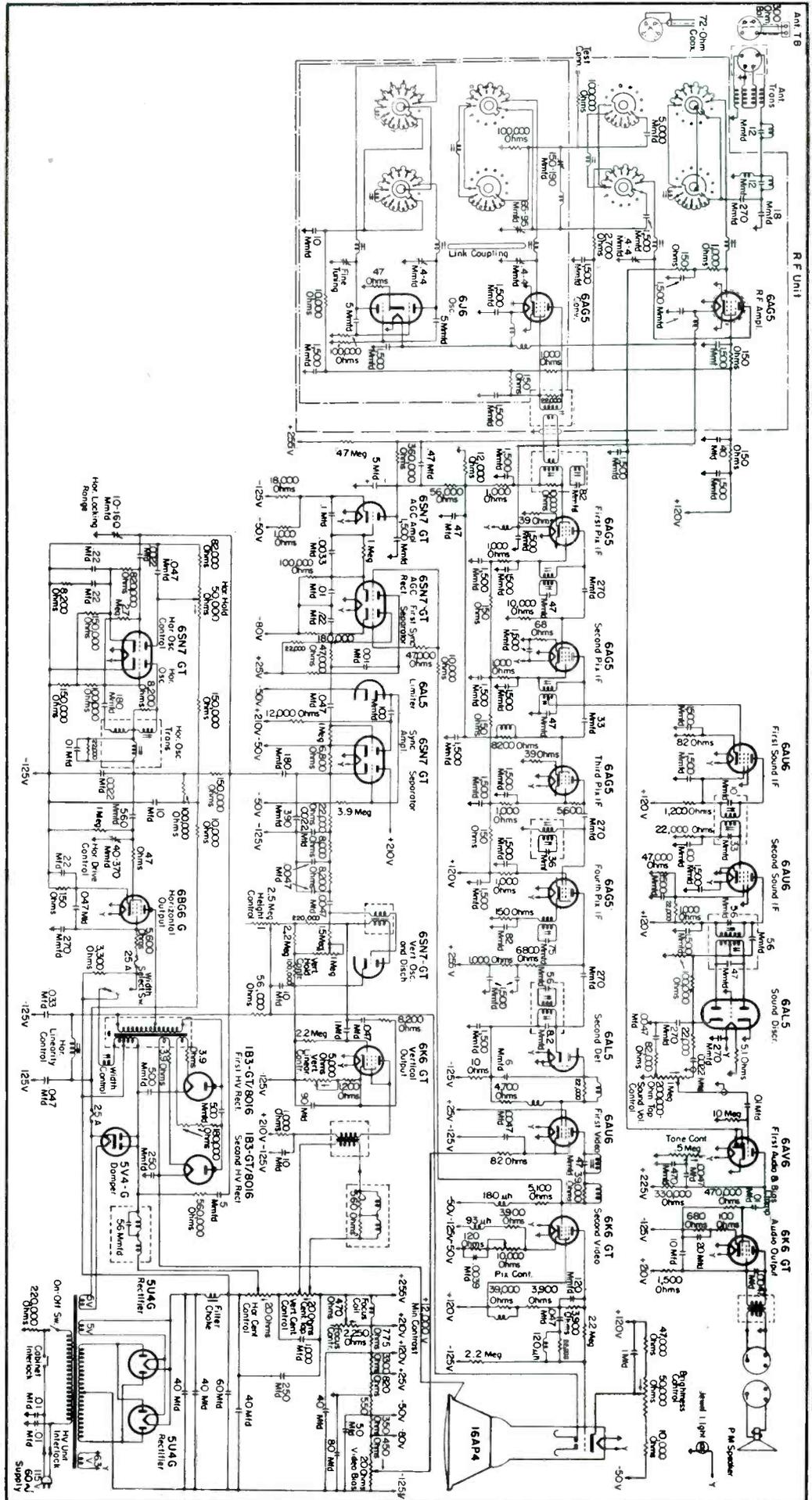
Grounded-Grid Circuits

The *rf* amplifier used in all post-war G. E. TV receivers is of the grounded-grid type, using a 6AU6. Although this tube is a pentode, it is triode connected with the suppressor and screen grid tied to the plate which goes to approximately 220 *v* through a plate resistor. The control grid goes directly to ground and the cathode is returned to ground through an *rf* choke and bias resistor. A high-pass filter is connected between the antenna terminal board and the *rf* amplifier, with the output of the high-pass filter applied directly between cathode and ground. In some receivers a balanced antenna transformer is used in place of the high-pass filter. Since the input signal is applied between cathode and ground, the dynamic cathode-to-ground impedance of the tube can be used to provide a substantially constant input impedance over a wide range of frequencies. The operating conditions of the tube are so chosen that this dynamic impedance is approximately 300 ohms.

A grounded-grid amplifier requires bias just as in the case of most other amplifiers and, therefore, a bias resistor properly bypassed is placed in series with the cathode and is on the order of 200 ohms. This bias resistor

(Continued on page 31)

Fig. 1. Schematic of the RCA 16 TV receiver; models 8T270, 8TC270 and 8TC271.





(Courtesy RMA)

THE PROPER handling of the TV picture tube, not only during its installation in the receiver but when it may have to be discarded, is a particularly important factor, serving to avoid accidents which might be caused by tube breakage and resultant flying glass from the large highly evacuated envelope.

In an effort to minimize these serious incidents, a special committee of the RMA began studying, about a year ago, the possibilities of setting up a series of precautionary safety rules, not only for the Service Man, but for the consumer, too.

A few weeks ago a safety report and these rules were released,² and in two categories, one for the Service Man and dealer, and the other for the set owner.

The RMA Service Man Report

In presenting its rules, RMA declared that TV Service Men have a great responsibility both to the public and to the industry, as well as a personal interest, in seeing to it that no accident due to carelessness or negligence will occur to arouse fear of this new instrument of home entertainment.

The TV receiver, largely because of the presence of the picture tube, contains certain potential hazards that are not in the standard set. But these hazards need not cause anyone apprehension providing a few simple precautionary rules are observed by the Service Man. *The picture tube is not dangerous if properly handled.*

There are two ways in which injury can occur if a picture tube is care-

TV Picture Tube SAFETY RULES

lessly handled either in a service shop or at a set owner's home. One is from the breakage of the picture tube possibly resulting in flying glass, and the other is from high voltage shock. Most trained Service Men know how to guard against shocks, but the breakage of picture tubes can result from carelessness, regardless of the Service Man's experience.

Any Service Man can be sure that he will neither injure himself nor cause injury to someone else by following these seven rules:

- (1) Don't expose picture tube until you are ready to use it.
- (2) Always wear goggles when handling a naked tube.
- (3) Keep people away at a safe distance when a picture tube is exposed.
- (4) Place the used tube in the carton which contained the new tube and *take it away.*
- (5) Always keep the picture tube in the protective container whenever possible. And place an exposed tube on some sort of clean soft padding when necessary to set it down.
- (6) Don't leave any picture tubes lying around. There are two safe ways of disposing used tubes:
 - (a) Place the old tube in a shipping carton properly sealed and then drive a crowbar or similar instrument through the closed top of the container.
 - (b) An alternative method, in the disposing of more than one tube, is to use a metal ash can with a plunger operated through the closed top.
- (7) Don't use regular picture tubes for displaying purposes. Contact your supplier for special display tubes.

The Consumer Report

(In preparing their report for the consumer, RMA decided to include information which the Service Man could use to explain not only the pressing need for caution in TV receiver handling, but the

exact role every TV Service Man plays in the installation and servicing of the receiver. Service Men are therefore urged to read this part of the report carefully and refer to it, often.)

The introduction of new mechanical services into the home is often accompanied by new potential hazards for the careless or negligent user. But the hazard is in the improper use, rather than in the device itself.

The gaslight of another generation was no more dangerous than an oil lamp, unless the householder tried to blow out the flame instead of turning a valve. The electric light and the many electrical appliances which followed it, the householder soon learned, were harmless so long as one didn't tamper with a live wire.

Television is bringing a new electronic device into the home. Like the refrigerator or the old burner, it functions best and without danger to its owner, so long as he doesn't tamper with some of the components which are encased in a protective cabinet and behind a safety glass.

While similar to the standard receiver that has become so commonplace in the American home, the television set is considerably more complex and contains one element, in particular, which can become hazardous if improperly handled. *That is the picture tube.*

This picture tube is harmless so long as it is left intact in the receiver and not tampered with. It becomes hazardous when removed from the set or when an untrained person attempts to repair his TV receiver. Consequently, it is always essential for a television receiver owner to call a competent Service Man whenever trouble develops and never to attempt repairs or interior adjustments himself.

The glass envelope of the picture tube contains a high vacuum; thus any action which might break or crack this glass accidentally should be carefully avoided.

The Underwriters' Laboratories have established safety standards for television receivers and their label on the instrument indicates compliance with those standards.

¹Headed by R. E. Carlson, vice president, Tung-Sol Lamp Works, Inc.

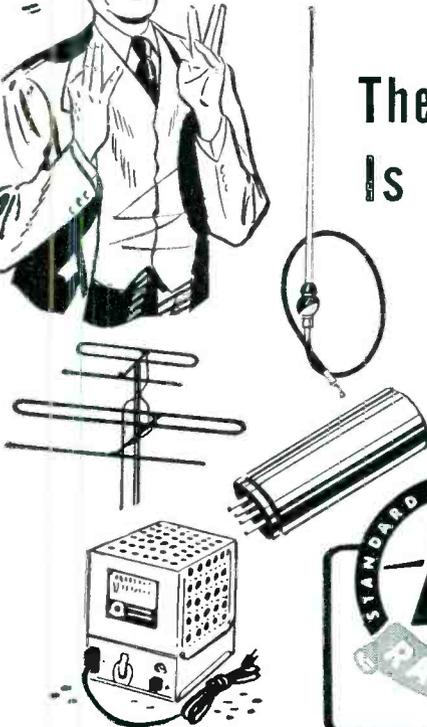
²See editorial, SERVICE, June, 1949.



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Radiart is proud of its many loyal and faithful jobbers. In recognition of jobbers throughout the nation who have handled Radiart products for five years or more, we are presenting them these plaque awards with a gold star for each five years of service. *The jobber who features Radiart is the serviceman's best friend... because he is offering the serviceman the BEST electronic products of their kind.* We thank our jobbers for their continued loyalty... and to all our jobbers... to every serviceman who depends on RADIART... this is our pledge for continued highest standards of manufacture that have made Radiart...

THE STANDARD OF COMPARISON



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MANUFACTURERS OF THE FAMOUS RED SEAL VIBRATORS

PHONO *installation and service*

Checking 3-Speed Changers . . . How to Remove Crystal Cartridges . . . Remedies for Too Slow or Too Fast Turntable Speeds . . . Stylus Pressure Gauge Design and Operation.

IN SERVICING automatic record changers, particularly the three-speed type, there are many unusual operational checks which must be made.

For instance, in checking a unit like the V-M 802, when the changer does not cycle after the record has been played, there are some 24 points to probe. As an example, if the changer does not trip, it may be necessary to push the trip rod back, by hand, and see if the hook on the trip link is pulled back sufficiently to release the worm follower.

If the changer continues to trip, it will be necessary to check for too much clearance between the hook on the trip link and the follower. This can be corrected by bending the tail of the trip link assembly away from the side of the fulcrum. This will cause the hook end of the trip link to engage the follower more closely.

If the needle jumps out of the eccentric groove on the record, then trip pressure requires checking. The lateral pressure should not exceed 6 grams. To check this, the pickup arm should be suspended approximately 2" above the turntable by means of a long length of heavy sewing thread attached to an overhead bracket approximately 2' to 5' above the record changer. Using a gram scale the amount of horizontal pull on the pickup arm can be measured after the arm has become engaged with the ratchet trip assembly. If the trip pressure is too high, five checks will be required:

- (1) For binding.
 - (2) Spring too strong; may be weakened by carefully stretching out one of the center loops.
 - (3) Record may be defective. The trip grooves are often too shallow. Check with a record known to be good.
 - (4) Needle point may be worn.
 - (5) Hinge bearing may be binding.
- All standard records made today

by KENNETH STEWART

have an eccentric trip groove, but some records made in the past did not have this groove. When records of this type are being played, the control knob must be turned to a *reject* point at the end of the record.

The ratchet pawl may also require a bit of checking since it must press against the ratchet sector forcing it back when the motion of the pickup arm is reversed. If the pawl does not contact the ratchet sector or slides over it, you'll have to check the pawl for burrs around the hole, and be sure the pawl is free to turn on the bearing. If the drive pin is driven down too far causing binding, the pin may be relieved by tapping up on the shank. The pawl spring will also have to be checked for insufficient tension.

The point on the pawl should be sharp to enable it to dig into the ratchet teeth. Sharpen with stone if necessary.

If the needle jumps out of eccentric groove in record, trip pressure will require a check. The record may be defective. The trip groove is often too shallow. Check with a record which is known to be good. The needle point may be damaged or affected by an excessive accumulation of dust, lint, etc.

This model uses a Shure P77 cartridge. In removing it, seven steps must be followed:

- (1) Remove the plastic cartridge control lever.
- (2) Carefully pull the cartridge lead up from the rear section of the arm until adequate slack is obtained.
- (3) Remove the two screws that are used to attach pickup cartridge to the pickup cartridge mounting bracket.
- (4) Disconnect the pickup leads and remove cartridge.

(5) Replace cartridge and connect pickup leads.

(6) Secure pickup cartridge to pickup cartridge mounting bracket.

(7) Push excess pickup lead into rear section of pickup arm and reinstall plastic cartridge control lever.

To remove the needle, the cartridge control lever should be rotated to correspond with needle to be removed. Then the knurled thumb nut that secures needle to the cartridge must be loosened. The needle can then be removed and replaced with a new needle of the same part number. It is important that the colored needle is used on the side of the pickup cartridge having the corresponding color spot. The replacement needle will have to be adjusted before it is tightened in the pickup cartridge to assure that the needle shank is securely held by the knurled thumb nut. Pliers must not be used on the knurled thumb nut; tighten with fingers only.

To remove the needle from a Webster cartridge, the cartridge control knob is removed, and then the set screw holding needle in place is loosened. The needle is turned 180° and removed. Replacement should be only with identical type of needle.

Needles may be removed from the Astatic cartridge by merely pulling them from the cartridge, being careful not to damage the cartridge in any way.

Turntable Speed Too Slow

There are four items to probe when this problem occurs:

- (1) The turntable bearing should be tested for freedom. This can be done by holding the motor idler wheel out of engagement with the turntable and spinning the turntable, by hand, to see if it turns readily and coasts for a

(Continued on page 31)



3 New Time-Saving, Profit-Building
G-E TELEVISION LABORATORY INSTRUMENTS



Now — with this new G-E equipment — you can check TV receivers under conditions varying from fringe areas to "under the tower" and predict operation of the sets anywhere in the service area — at a glance!

VARIABLE Permeability Sweep Generator! Crystal Controlled Marker Generator! Cathode Ray Oscilloscope! Put them all together in one group and you have what manufacturers and servicing dealers have acclaimed the fastest, most accurate answer to television receiver testing problems ever offered!

Here's why—

- Variable Permeability Sweep Generator can be set quickly to any desired frequency, supplying high output and exceptionally wide linear sweep—

- Because of low leakage, complete over-all response from antenna terminals to picture detector can be viewed with contrast at maximum settings.

- All desired markers for complete alignment are obtained by one initial setting of the master dial on the marker generator.

- High quality general purpose oscilloscope presents accurate picture of wide range of phenomena from response curves to composite signal.



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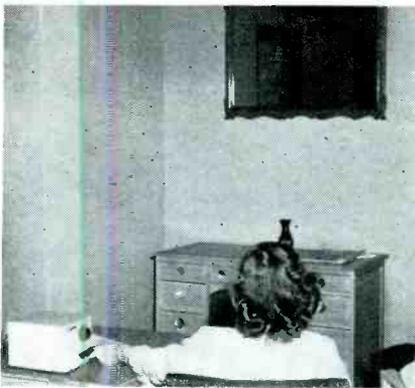
Custom TV Installations

TV REMOTE CONTROL has become quite a factor in custom installations, providing not only multiple set operation, but unusual decorative receiver-installation treatments.

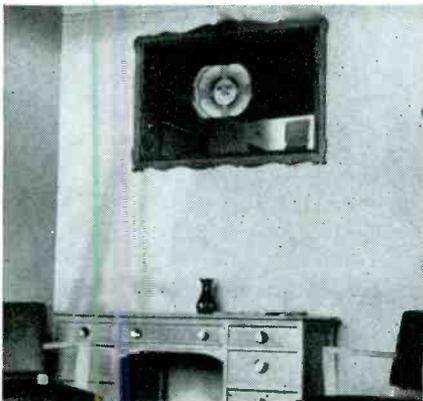
One system, recently developed, permits the use of a large mirror¹, in front of the entire receiver and picture tube, which serves as a viewing screen. It is thus possible to introduce many interesting wall effects by either framing the mirror or working the mirror into an entire wall pattern. Two views of a setup of this type are shown below.

The mirror principle can be used with 10", 12", 15" and 20" tubes and can be installed in new or existing construction. For instance, in new construction the amount of space required would be about 24" x 16½" x 5¼". In existing construction the opening required would be about 22" deep and 19" high. The size of the mirror is 20" x 30", but the shape is optional and can be square, round or oval.

¹Sightmirror, developed by Sightmaster Corp.



Above: Adjusting remote control for TV receiver with mirror-type screen, attractively framed and mounted in wall. Below: View of image on viewing mirror.



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This new CHICAGO stock line fills the serviceman's long-standing need for *exact replacement* Vibrator Transformers designed for application in a wide range of popular makes and models of auto radios. Exact replacement units in the line provide mountings and characteristics identical to those of the original transformers. For many other sets, CHICAGO Vibrator Transformers are available with electrical characteristics equivalent to the original parts, and readily adaptable for quick, easy mounting. The typical units listed below incorporate famous CHICAGO engineering and quality manufacture—your assurance of top performance. Available *now* at leading jobbers.

CAT. NO.	A-C Sec. Volts	D-C Load Current	LIST PRICE
VT-1	250-0-250	50 MA	\$7.00
VT-2	265-0-265	50 MA	7.25
VT-3	270-0-270	60 MA	7.50
VT-4	300-0-300	60 MA	7.75
VT-5	295-0-295	70 MA	8.00
VT-6	280-0-280	80 MA	8.50

Write for descriptive catalog folder

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4. The original quality performance you achieve in your finished installation means satisfied customers and repeat business.

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ASSOCIATIONS



FRSAP

EXTENSIVE PLANS are now being made by the Federation of Radio Servicemen's Association of Pennsylvania for a preventive maintenance month campaign¹ during October. Letters describing the proposed campaign and asking their cooperation have been mailed to the leading trade associations.

It is expected that the Empire State federation will serve as a co-sponsor of this extremely important event.

Correspondence regarding the program should be addressed to John G. Rader, 104 Walnut Street, Reading, Penna., or Max Leibowitz, Associated Radio-Television Servicemen of New York, Inc., 545 Fifth Avenue, New York 19, N. Y.

ARTSNY

IN AN EFFORT to determine the types

¹See editorial, this issue.



Ira Kamen (above) and the editor at a recent YMCA Trade and Technical School lecture on TV and FM antennas, presented at the Y Little Theatre in New York City, during which an assortment of antennas and accessories were displayed; see view below, right. These talks, which have been presented before the PRSMA, Philadelphia, the AR-TSNY, New York, and the recent Town Meeting in Toronto, have been scheduled for association and other Y meetings in Baltimore, Boston, Hartford, etc., this fall.



of antennas being used by Service Men, as well as the performances of associated antenna equipment, the Associated Radio-Television Servicemen of N. Y. released recently a seven-point questionnaire and circulated it among Service Men in their area.

Typical questions asked include the types of antennas used, the types of antenna rotating devices employed and the extent to which lenses and filters are sold and installed. Service Men are also being asked to disclose if they are receiving sufficient information from the manufacturers to enable them to service television receivers properly.

PRSMA

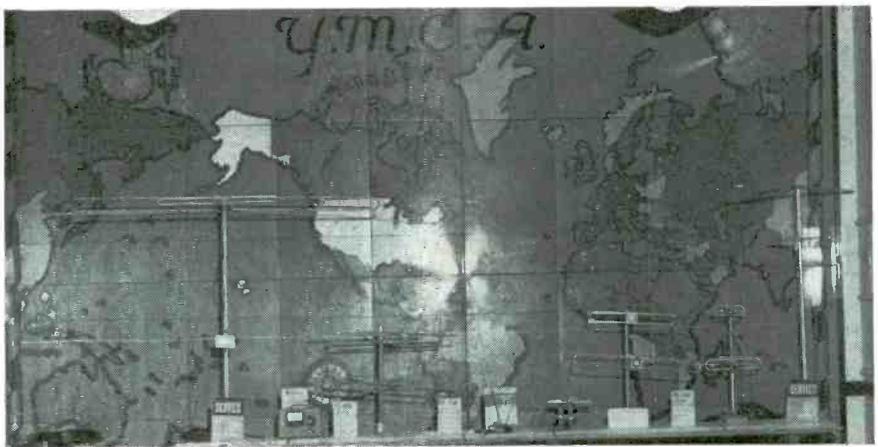
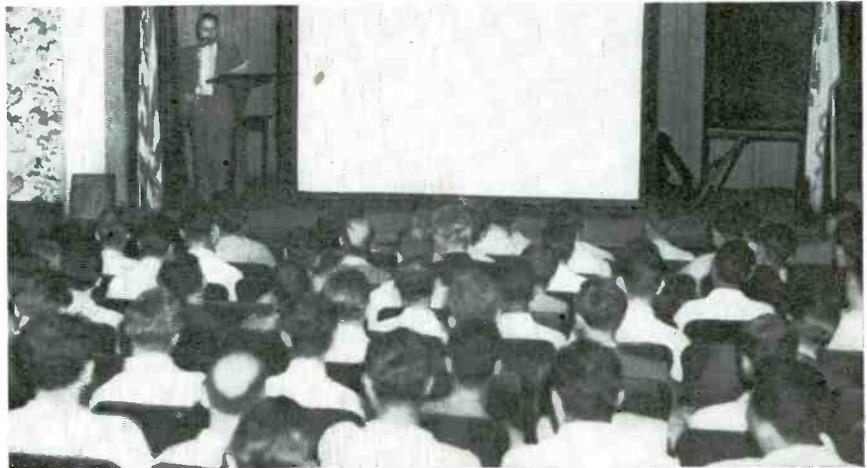
THE PHILADELPHIA Radio Servicemen's Association recently mailed out a questionnaire to the dealers and

(Continued on page 25)

TEN YEARS AGO

From the Association News page of SERVICE, July, 1939

GEORGE F. DUVALL was elected president of RSA and presented his inaugural address at the RSA convention in Chicago. Kenneth A. Vaughan, Johnstown, Penna., was named vice-president for '39-'40, and Donald H. Stone, Freeport, Ill., and Lee Taylor, Chicago, were reelected secretary and treasurer of RSA. . . . New RSA directors seated during the meeting were: Frank L. Clark, Nashville, Tenn.; Winston B. Jones, Washington, D. C.; Fred Olsen, Green Bay, Wisc.; Ingvar Paulsen, Roxbury, Mass.; Norman W. Smith, Jamestown, New York; Carl Williams, Phillipsburg, N. J., and George Wooley, Rock Island, Ill. . . . The Danville, Illinois, Chapter won the convention prize for being the chapter within three hundred miles of Chicago with the best record of attendance at the annual conference. . . . Wayne Shaw of the Binghamton Chapter demonstrated a capacitor checker at one of the meetings. . . . Ed Tarbox was named chairman of the Fremont, Ohio, Chapter. H. C. Russell was named vice chairman and Donald Bruns, secretary-treasurer.



TV Alignment

(Continued from page 13)

crimator; (4) sound if transformers; (5) local oscillator adjustment; and (6) rf and converter alignment.

Trap Adjustment

Video and sound traps merely consist of tuned circuits which absorb or attenuate signals of certain unwanted frequencies. In this case they are noted at points A, B and C on Fig. 1. If these traps were not included in the circuit, or were badly detuned, the sharp dips caused by the traps in the response characteristic would not, of course, exist. The amplifier would then pass these undesired frequencies with resultant interference between sound and video signals, as well as adjacent channel interference.

To see oscillographically the effects of trap adjustments it is necessary to obtain the overall response characteristic of the video if system on the 'scope.

To secure these 'scope views, the output of the sweep generator is connected to the converter by means of a small loop placed around the converter tube. The vertical terminals of the

(Continued on page 26)

Association News

(Continued from page 24)

Service Men of Philadelphia requesting fair-charge information.

The query, involving five basic points, refers to charges for checking and testing in the shop and in the home, hourly rate for labor charges, and television service charges in the shop or home. Also requested is an opinion on tube-testing charges.

Dave Krantz, president PRSMA, believes that this questionnaire will provide information which will be valuable not only to the Service Man, but the industry at large.

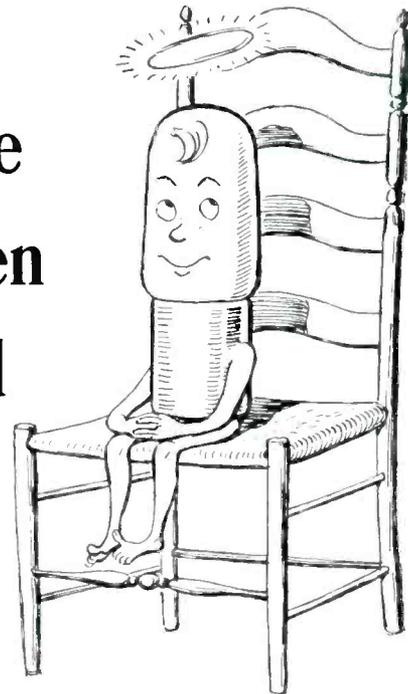
WESTCHESTER ASSOCIATION

A SERVICE MEN'S association was recently formed at Westchester, New York. Name of group is Independent Radio and TV Technicians of Westchester County.

Officers include: Harry Wiegand, president; Thomas M. Olsen, vice president; Niles Michaelson, treasurer.

The temporary address of the group is P. O. Box 161, Mount Vernon, New York.

The good little lamp that's seen but not heard

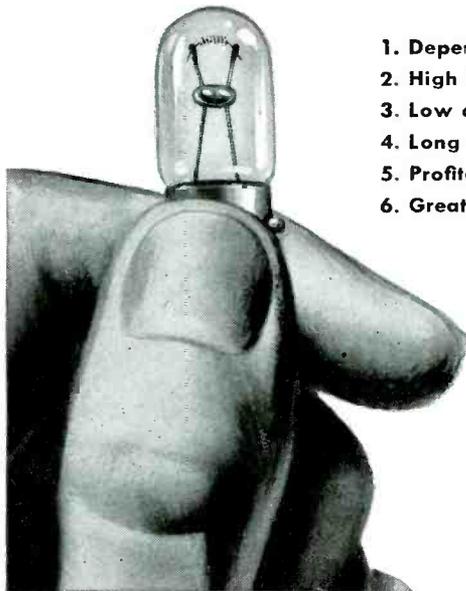


INTERFERENCE with radio reception is not part of the job of a properly designed radio dial lamp. Yet some lamps *do* interfere, when vibration and poor contact between the filament and lead-in wires cause tiny arcs and minute changes in resistance.

That can't happen in G-E radio dial lamps because the tungsten fila-

ment legs are pressed firmly right into the softer metal of the lead-in wires—a vibration-proof joint.

Features like this assure customer satisfaction. For information on prices and types of G-E miniature lamps, see your nearby G-E Lamp Office. Or write to General Electric Company, Div. 166S-7, Nela Park, Cleveland 12, Ohio.



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3. Low current consumption.
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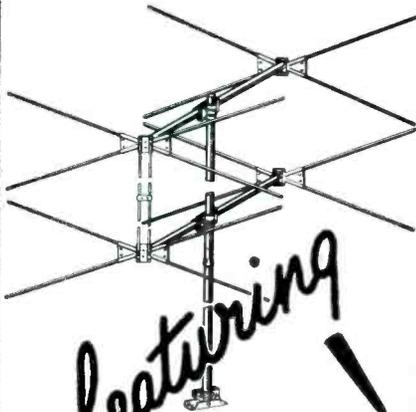


G-E LAMPS

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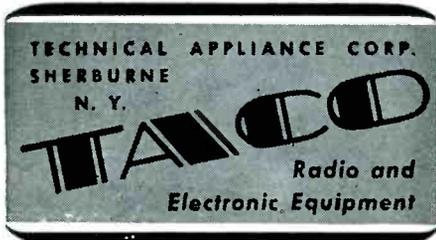
•First introduced by TACO in 1940 as the Double Vee, the new TACO Lazy X incorporates all the outstanding features that have made TACO antennas the leaders in the field.

An all-band antenna, available in single or stacked arrays, the TACO Lazy X gives very flat response over the entire TV band. All-aluminum construction assures long service life. A twist of the wrist, a few nuts to tighten, and the antenna is ready for use without sacrificing any mechanical or electrical characteristics due to the TACO JIFFY-RIG construction.

TACO INDOOR ANTENNA

•An indoor antenna that works! Engineered as only TACO engineers. Beautiful appearance. Mounting feet for attic installations. Low cost.

AT ALL LIVE-WIRE JOBBERS... SEE YOUR JOBBER TODAY!



IN CANADA: Stromberg-Carlson Co., Ltd., Toronto 4, Ont.

(Continued from page 25)

oscillograph must be connected across the video second detector load resistor (through a 50,000-ohm series isolating resistor).

The overall video *if* pattern will appear on the 'scope when the sweep generator is set to prescribed frequency. The TV receiver contrast control must be set for approximately -3 volts as measured with a *vum* at the junction of R_{180} and R_{100} on the 630TS. The channel selector switch must be rotated to a channel which does not produce an interfering additional response shape (or as an alternative, the local oscillator tube must be removed from its socket).

A travelling *pip* or marker is now necessary to ascertain the position of the trap dip. This traveling *pip* is readily provided by an external well-calibrated standard type of AM generator.¹ The output of this generator can be connected (for a maximum size *pip*) across the output leads of the sweep generator. Slight distortion of the response curve, which may result from this parallel connection (relatively unimportant in trap alignment), can also be minimized by connecting an isolating resistor in series with the marker generator *hot* lead.

Then the external AM generator can be set to the *unmodulated RF* terminal. The tuning dial of the AM marker generator should then be rotated until the *pip* approaches the trap point on the response curve. As the *pip* approaches the trap frequency it will diminish in size and will practically disappear at the trap points *A*, *B*, and *C*. (Fig. 1.)

The transformers, T_{104} (19.75 mc); T_2 , top (21.25 mc); T_{305} , top (21.25 mc); and T_{103} , top (27.25 mc) can be checked and adjusted, if necessary, for disappearance of the *pip* of proper frequency at the trap or dip points *A*, *B*, and *C*.

The traps can also be aligned by injecting the output of the AM generator alone, at the frequencies noted, and then tuning the traps for minimum indication on a *vum* connected in the circuit, instead of the oscillograph. However, the visual method is recommended as a final check of proper trap alignment.

With the video *if* response curve still on the 'scope screen, the *ifs* themselves can now be checked or aligned. To minimize distortion of the response characteristics, which can be caused by the connection of the external AM

¹Precision, Series E-400, employs electronic marker mixing.

FIELD TESTED Installation Information on



**TV
and
FM**

RECEIVING ANTENNAS

TV... FM Antenna Installation

by Ira Kamen

Manager, Antenaplex and TV Dept.
Commercial Radio Sound Corp.

and Lewis Winner

Editorial Director,
Bryan Davis Pub. Co., Inc.;
Editor, *Service and Communications*

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CITY AND STATE

marker generator, the output of the marker generator can be connected directly into the sweep generator³, providing electronic marker injection, if such facilities are provided on the particular sweep generator being used.

With the video *if* response curve still appearing on the 'scope, after trap alignment, the settings of the TV receiver contrast control and the output controls of the sweep generator should be checked to insure that no distortion of the 'scope pattern exists, as a result of excessive output from the sweep generator in conjunction with a high setting of the contrast control. If the output of the sweep generator is first reduced to minimum and then gradually increased, the amplitude of the 'scope pattern will first *uniformly* increase and will then flatten out and distort as the output of the sweep generator becomes excessive. The proper settings are below the point where flattening and distortion of the curve occurs.

The marker generator should first be set to the frequency of T_2 (converter output), 21.8 mc. The bottom slug of T_2 is then adjusted until the 21.8 mc pip reaches *maximum vertical height* on the 'scope screen. *Configuration changes at any other point on the curve should be disregarded.* The same procedure should then be repeated for T_{103} (bottom) 25.3 mc marker; T_{104} (bottom) 22.3 mc marker; L_{183} (top of chassis) 25.2 mc marker; and L_{184} (top of chassis) 25.2 mc marker. In each case the adjustment should be made *only* for maximum vertical height of the *respective pip* only. As the last adjustment is reached, the overall curve should approach the ideal shape of Fig. 1. *Slight* readjustments of each trimmer can then be made to obtain the best response characteristic possible for the particular set.

As an aid to better visibility along any selected segment of the total response characteristic, the operator may considerably reduce the setting of the *sweep width* or deviation control of the sweep generator and readjust the sweep generator main tuning dial to bring only the *expanded* portion of the curve on the 'scope screen.

Many manufacturers' instructions call for alignment of the video *ij* stages using an unmodulated signal from an AM generator, adjusting for peak indications on a *vtrm*. Under these conditions, after the peaking procedure has been completed, the configuration of the resultant overall response characteristic must be examined using the sweep generator and 'scope. Slight readjustments can then be made to obtain the most satisfactory configuration.

[To Be Continued]

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WITH

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Eliminate callbacks and dissatisfied customers—get a bigger share of the profitable television service business with Stancor *Exact Duplicate* Replacement Transformers. These units are *exact* physical and electrical duplicates of original equipment used in popular receivers—they're precisely what is needed for "new set" performance!

Don't take a chance with replacements that are "almost exact"; use Stancor *Exact Duplicate* Replacement Transformers. Representative types listed below.



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Stancor Part No. A-8117. *Exact duplicate* of RCA type 211T1. For use with direct viewing kinescopes such as RCA types 7DP4 and 10BP4.



FILTER CHOKE

Stancor Part No. C-2326. *Exact duplicate* of filter choke used in RCA models 630TS, 630TCS and 8TS30 receivers.



PLATE AND FILAMENT TRANSFORMER

Stancor Part No. P-8157. *Exact duplicate* of Motorola part No. 25C484095 used in models VK106, VT105 and VT107.



HORIZONTAL BLOCKING- OSCILLATOR TRANSFORMER

Stancor Part No. A-8120. *Exact duplicate* of RCA type 208T1. Generates 15,750 cps. pulse required to drive grids of horizontal discharge tubes.



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Stancor Part No. A-8115. *Exact duplicate* of RCA type 204T2. Used with kinescopes such as types 10BP4, 7DP4 and 5TP4.

SEE YOUR STANCOR distributor or write for Catalog DD337, listing complete specifications and prices of Stancor Television Components.

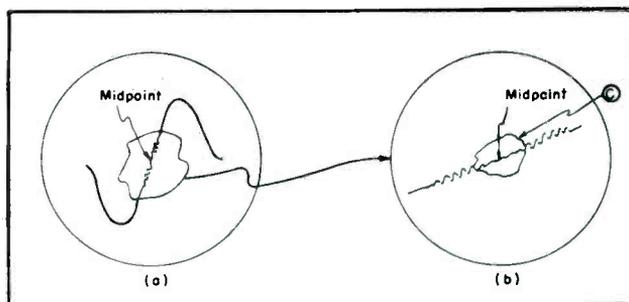


JUST PUBLISHED! Write for the New Stancor Transformer Catalog listing over 400 replacement transformers, reactors and related components for radio and television.

STANDARD TRANSFORMER CORPORATION

ELSTON, KEDZIE & ADDISON • CHICAGO 18, ILLINOIS

Fig. 2. An *S* curve. At *a* is the discriminator response curve with a mid-frequency marker. At *b* appears the center portion of the curve and marker expanded on the 'scope screen by reducing the *sweep width* control setting on the sweep generator. At *c* we note that the central portion of the marker is not visible because of the absence of vertical amplitude at that point.



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List Price with Tubes and Cover **\$7950**

The Newcomb Model PM-10 delivers a full clear 10 watts. Includes bass boost and treble boost or attenuation controls. Selective paging switch saves hours of installation time. With Micro-Groove changer provides lowest cost good music for commercial use PLUS desirable paging feature.

Look to the complete Newcomb line of amplifiers for more easy-selling features, more models to choose from, wider price range, greater quality at any price... all combined to help you make more repeat sales, more profit.

See your Newcomb distributor or write for specifications of the PM-10. It's another example of Newcomb leadership in the sound equipment field.

NEWCOMB

AUDIO PRODUCTS CO.

DEPT. E, 6824 LEXINGTON AVE.
HOLLYWOOD 38, CALIFORNIA

New TV Parts ... Accessories

RADIART TV ANTENNAS

Two antennas, an all-channel type, 85X and T85X, and a stacked unidirectional high band array, 84HTV and T84HTV, has been announced by the Radiart Corp., Cleveland, Ohio. All channel antennas are specifically designed for installations using an antenna rotator or in locations where all signals are received from one general direction. The high and low band antennas are permanently mounted on a common boom. For low band reception the low band folded dipole and reflector are utilized. For high band reception the low band folded dipole acts as the reflector for the high band folded dipole.

Radiart has also developed a *Tele-Rotor* antenna rotator.

Some of the features of the rotor are: 375° rotation in either direction at 1 rpm, positive electrical stop at the end of the rotation, instant reversing motor, and a no-coasting electric brake. Power consumption is 20 watts.



Radiart Tele-Rotor

REGENCY BOOSTER

A booster, model DB-213, featuring two push-pull neutralized 6J6 triode circuits with iron core tuning on both inputs and outputs, has been developed by Idea, Inc., Regency Division, 75 North New Jersey, Indianapolis, Ind. Either 72 ohm coax or 300 ohm parallel-wire lines may be used to connect input or output. A gain of 24 db is said to be provided on the low channels and 12 db on the high channels, with a 6 db improvement in noise factor on all channels. When the booster is turned off, the antenna line is switched direct to the receiver.

A companion model, the DB-69, for the low channels only, has also been announced.



JERROLD MATCH-A-TRAN

A variable step-impedance transformer, *Match-A-Tran*, that is said to help provide a perfect match between the booster output and any TV receiver, for all channels, has been announced by the Jerrold Electronics Corp., 121 N. Broad St., Philadelphia 7, Pa.

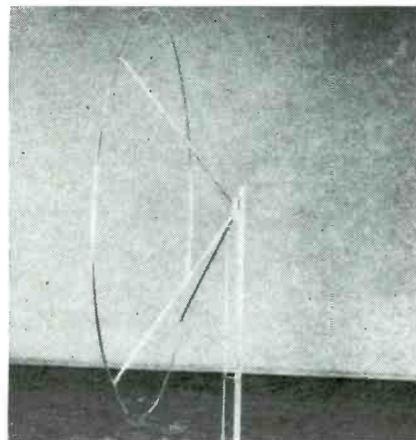
The *Match-A-Tran* is said to afford peak signal voltage at the receiver, for each channel, eliminating losses due to standing waves.



WELIN CIRCLE TV ANTENNA

A circle type television antenna, which is said to cover all channels, has been announced by the Welin Division of the Continental Copper and Steel Industries, Inc., 500 Market St., Perth Amboy, N. J.

Said not to require reflectors. Weighs 1½ pounds.



TEC TV ANTENNA MULTICOUPLER

A TV antenna *multicoupler*, which is said to provide connection of up to 24 television sets to an antenna, has been developed by Television Equipment Corp., 238 William St., New York 7, N. Y.

Multicoupler contains 8 tubes in a circuit which is said to provide a very high degree of isolation between operating sets.

Further information available from William Brown.

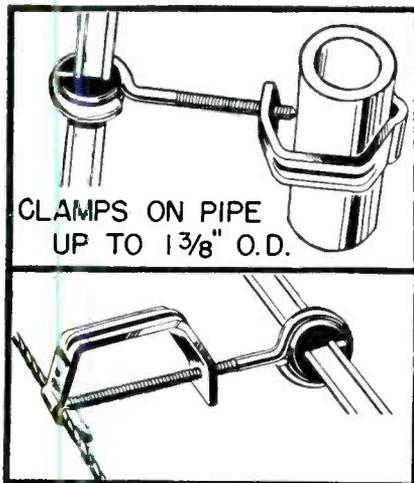
RAULAND 16" TV TUBES

A 16" metal-glass picture tube, 16EP4, has been announced by the Rauland Corp., 4245 N. Knox Ave., Chicago 41, Ill. Overall length is 19½". Because of the shorter length of tube, the deflection angle is said to have been increased to 60°. The tube requires the use of an external ion magnet.

MUELLER TENNA CLAMPS

A line of *Tenna-Clamps*, stand-off insulators designed to clamp onto masts, cross-arms, gutters and guy-wires for supporting TV lead-ins, has been announced by the Mueller Electric Co., 1583 E. 31 St., Cleveland 14, Ohio.

All metal parts are weatherproofed and the insert is of polyethylene. The screw has a dull point to provide a solid grip on a mast.



* * *

RCA TV ANTENNAS

A line of TV antennas has been introduced by the RCA Tube Department. Feature of the line is reversible beam antenna array. Line also includes two basic antenna types to meet every-day installation needs, and two basic stacking kits for fringe-area reception.

The reversible beam antenna array has a *diplexer network*, which is said to permit the beam to be reversed for reception from either direction, while eliminating interference from the opposite direction.

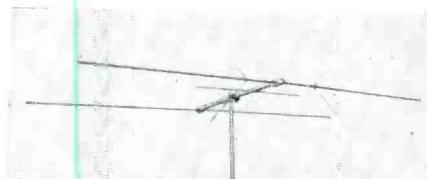
Consisting of four dipoles arranged in the form of a square and interconnected through the diplexing network to the television receiver, the reversible beam antenna array features *V* attachments which provide uni-directional reception on all channels.

The new line includes a 12-channel antenna, type 204A1, a uni-directional type antenna for use in locations where both high and low-frequency stations are in the same general direction. Also features the *V* attachments for uni-directional reception on all channels.

The *stacking kit*, type 208A1, is designed to be easily mounted on top of the all-channel antenna.

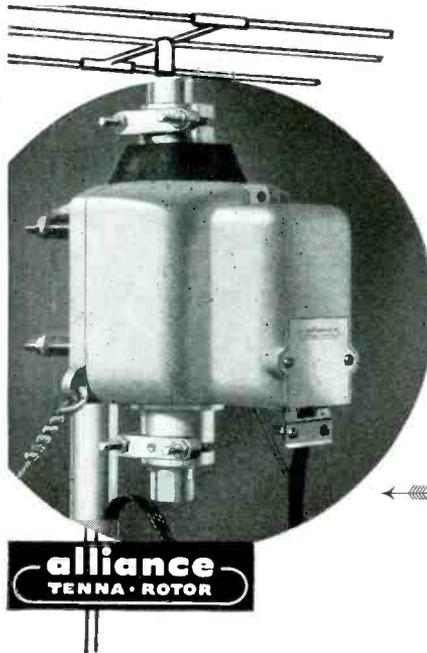
Additional high-band gain for fringe-area installations is said to be provided by a *high-frequency stacking kit*, type 205A1.

Type 204A1



TELEVISION Service Shops... End 'Fixed' Antenna Troubles!

alliance tenna-rotor



- **Faster Installations!**
- **Fewer Call-Backs!**
- **Bigger Profits!**
- **Happier Customers!**

Rotator unit—
metal enclosed
—moisture
sealed. Size
7" x 8".

Plastic control case
plugs into 110 volts.
Size 5" x 5".



- Tenna-Rotor speeds TV installations—saves man-hours on the job because it eliminates critical antenna orientation! Now, *one man* does all the work—easily and quickly! In fringe or multi-station areas, your customers get "peak" reception, selectivity and wider range! And it overcomes "ghosts" and variable reflection factors!

Foolproof, weatherproof, built for long life, Tenna-Rotor comes individually boxed—complete assembly (rotator and control case)—weighs 12 lbs.—retails at \$39.95 (slightly higher west of Rockies). Be sure to ask for genuine **Alliance 4-conductor cable** with each unit! Join the trend to Tenna-Rotor! It pays off with **more sales and faster service!** Order from your jobber—**NOW!**

ALLIANCE MANUFACTURING COMPANY

ALLIANCE, OHIO

Export Department: 401 Broadway, New York, N. Y., U.S.A.

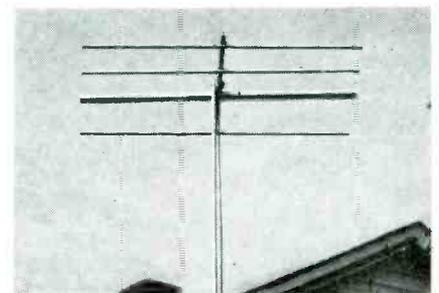
VEE-D-X YAGI ARRAY

A four element Yagi array, featuring a stepped-up driven element, has been announced by La Pointe-Plascomold Corporation, Unionville, Conn. Said to have exceptionally high front to back ratio. Parasitic elements are 1" diameter on the low channel arrays and 1/2" on the high channel.

An all-angle mount has also been announced by the company. Designed to clear the overhang of the eaves and may be ordered with either a 6", 12", 18" or 24" offset. Can be used for mounting a mast on a flat or pitched roof.

Mount will accommodate masts up to 1 3/8" o.d.

Vee-D-X Yagi Array



Regency TELEVISION Signal Booster



Model
DB-213

\$ **29**⁹⁵ LIST

Internal impedance matching at input and output accommodates either 300 ohm twin lead or 75 ohm coax. Push pull triode design gives maximum gain, and maximum improvement in noise factor. Proper bandwidth guarantees full enjoyment of both video and audio on all channels.

U. L. APPROVED—110 VOLTS AC
See your radio supplier.

Regency Division, I D E A. Inc.
55 N. New Jersey St. — Indianapolis 4, Indiana

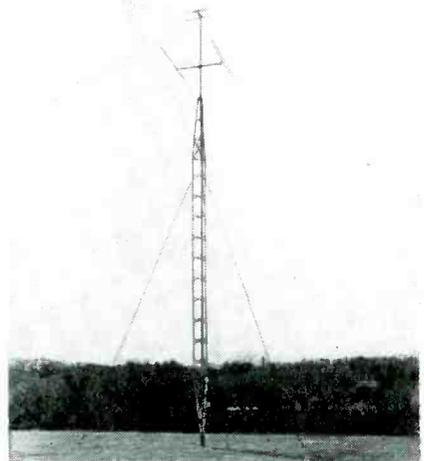
BAKER TV TOWERS

A line of *monitor towers* has been announced by the Baker Manufacturing Co., Evansville, Wis. Models include guyed ground and roof mounting towers and a three post self-supporting tower.

Model TV, the self-supporting tower, is available in heights up to 88'. Graduated corner angles are said to insure balanced design. Tower has permanently mounted ladder.

Guyed ground mounting, model TX, and guyed roof model TQ embody in their design a tapered top section. Tapered bottom section ends in a universal joint.

All towers are furnished with mast castings mounted 20" apart affording two-point support.



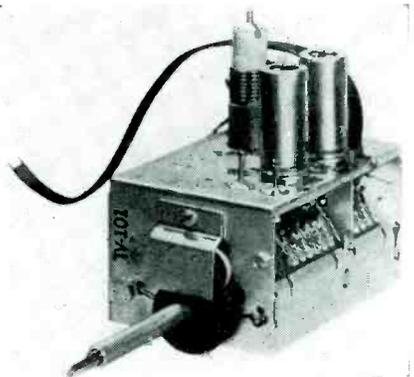
Roof mounting model TQ

* * *

STANDARD COIL TV TUNER

A 12-channel TV tuner, featuring interchangeability of channel inductors, individual oscillator adjustment screw for each channel, and one control shaft for fine tuning and channel selection, has been announced by Standard Coil Products Co., Inc., 2329 North Pulaski Road, Chicago 39, Ill.

Standard Tuners are available to Service Men through local jobbers or by writing to the Standard Coil Products Co.

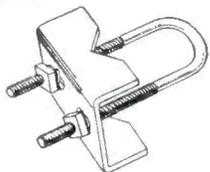


* * *

KESTER SOLDER

Resin-Five core solder has been announced by Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.

Solder is said to be non-corrosive and non-conductive, and solders such metals as zinc, brass, nickel-plate, copper, and ferrous alloys. Supplied in the usual diameters of .092" (3/32") and .062" (1/16") on 1-, 5-, and 20-pound spools.



DON'T OVERLOOK THE SMALLER TYPES OF MOUNTING EQUIPMENT

Each product is designed to solve a different problem . . . to make the job of antenna installation a simpler and speedier one. Each product, though small and inexpensive, is equally as important as any of the 24 different models which now constitute our full line. Don't overlook such time-savers as these (in order shown):

U-BOLT EXTENDER—4" long with 1 3/8" opening for joining masts, adding Hi-Freq. mounting antenna elements or attaching a mast to any small diameter pipe, pole or angle iron. MODEL UB-4 . . . 50¢ list.

MAST EXTENDER—to hold any two masts of equal or unequal diameter with 4" bite on each mast. Six guying points. MODEL ME-8 . . . \$1.45 list.

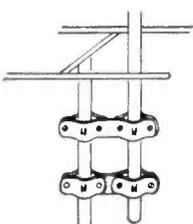
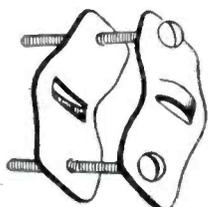
GUYING CLAMP—for fastening guy wires at any point on a mast. MODEL GC-4 . . . 55¢ list.

MAST JOINER—for joining masts of equal or unequal diameter or adding Hi-Freq. With four guying points. MODEL MJ-2 . . . 90¢ list.

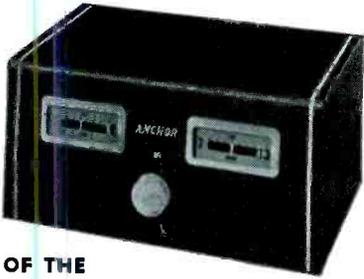
Write for New Folder Showing All 24 Models

Metalace CORP.

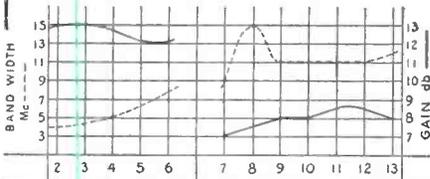
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OF THE ANCHOR TV-PRE-AMPLIFIER



HAZELTEEN REPORT No 2801-17

The ANCHOR PRE-AMPLIFIER is engineered to *amplify the signal only*, not the noise. Furthermore, the inherent noise of this unit is not measurable.

The ANCHOR Booster provides maximum gains possible from the 6AK5 tube with excellent band widths.

It increases signal strength without loss of picture detail.

The outstanding acceptance of the ANCHOR TV-PRE-AMPLIFIER by Service Engineers and Dealers is the best testimonial to its quality.

Engineered for modern and the best TV reception. Priced right for profits. Get details now.

See your jobber or write us.



Phono Installation

(Continued from page 20)

long time. If binding occurs, turntable must be removed, foreign matter extracted, and lubrication provided with light mineral oil.

(2) Motor drive shaft may be too small in diameter. The motor or spring bushing should be replaced with one having a greater diameter.

(3) Line voltage too low. The line voltage should not be less than 100 volts or the turntable may be too slow.

(4) Operating temperature too low. If the machine has been stored in a

cold place or operated in surroundings at a temperature of less than 60° F, the turntable speed may be too slow.

Turntable Speed Too Fast

Motor drive shaft or spring bushing may be too large in diameter. The motor should be replaced with one having a smaller diameter shaft or spring bushing.

Stylus Pressure Checks

The measurement of stylus force is becoming quite a factor in phono servicing, disclosing the proper pressures required for standard and long-playing records. As indicated, in the foregoing notes and in earlier articles, home-made type gauges can be used, but specially processed gauges are normally much more accurate. One such type, produced by a development group¹, is said to be accurate to fractional grams.

The importance of weight is also being stressed in cartridge data. One type, called the vertical drive² series, provides a tracking force on fine-groove records of 5 grams and on the 78 rpm recordings, of 7 grams.

The cartridge uses the *muted stylus* needles, which rotate on a vertical axis.

The cartridges are available in three models: one for standard records, another for fine-groove, and a third is an all-purpose turnover model having individually replaceable needles, for use in playing both standard and fine-groove recordings with the same pickup head.

¹Gray Research and Development Co., Inc.
²Shure Brothers, Inc.

Ser-Cuits

(Continued from page 17)

is not connected directly between cathode and ground since it would then shunt the dynamic cathode-to-ground impedance and the input impedance would be something less than 200 ohms instead of the desired 300 ohms. Therefore, the bias resistor is isolated from the cathode by connecting it in series with the cold end of the cathode inductance. A bypass capacitor in parallel with this resistor is essentially a short circuit at *rf*. For this reason the effect of the resistor is eliminated as far as *rf* is concerned. The *dc* plate current flows through the resistor and develops a bias voltage in the normal manner.



OHMITE Little Devil

INSULATED
COMPOSITION RESISTORS

In critical television applications, Little Devil Resistors can be depended on for longer, trouble-free service. These tiny, rugged units give quiet performance and are ideal for sensitive RF circuits. Moreover, they are available in $\pm 5\%$ as well as $\pm 10\%$ tolerances — in $\frac{1}{2}$, 1, and 2-watt sizes; standard RMA values.



NOISE-FREE
TYPE AB POTENTIOMETER

Continued use has little effect on the resistance of this unit because the resistance material is solid-molded—not sprayed or painted on. In fact, the noise level often becomes less with use. The unit has a 2-watt rating with a good safety factor.

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To help sell, service, maintain
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● You pay only for the Astatic Cartridges contained—and included in these new kits are only those types you are regularly called upon to furnish. You receive, at no additional cost, important new facilities. Astatic Utility Kit No. 3 is a sturdy, handsome wood cabinet. Inside, individual compartments house 24 boxed and labeled cartridges. Each compartment is also labeled to show what cartridge should be replaced in it. Other compartments hold six Astatic matched needles; pen-size needle pressure scale; an assortment of cartridge mounting screws, needle screws, terminal clips. Inside the lid is a chart showing cartridges which may be replaced by those in the kit. One of the handiest items a serviceman can carry . . . to sell and service 95 percent of cartridge replacement jobs.

Kit No. 2 is a heavy cardboard carton, holding 12 Astatic Cartridges and corresponding replacement charts, and will fill at least 85 percent of all replacement needs. Kit No. 1 contains six cartridges and replacement chart, and will fill a majority of phonograph requirements.



Write for literature including complete details on contents of each kit.

KIT No. 1

Astatic Crystal Devices
manufactured under
Brush Development Co. patents

TV Towers

(Continued from page 15)

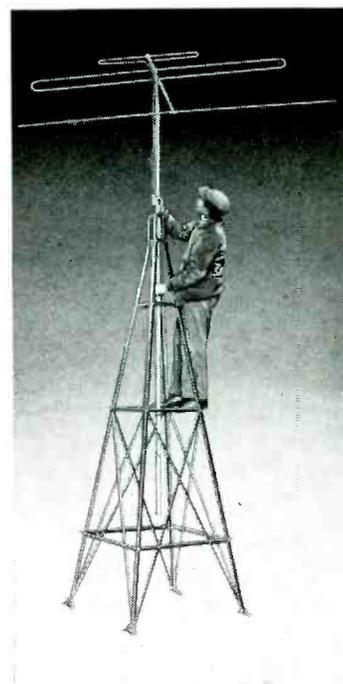
against the strains developed by prevailing winds.

Erecting the Tower

The erection of the tower is the second major step to be considered in tower installation work. All towers are furnished in dismantled form and must be bolted together on the job. The assembly procedure may be on a piece-by-piece basis, with the material being passed on to the installer by means of a small rope, or the sections may be entirely assembled, squared and tightened on the ground, and then erected in sections by means of a gin pole. Regardless of the method used to erect the tower the installer will require several types of installation garments and working tools: (1) Carpenter's apron which has handy pockets, in which can be carried tools, miscellaneous nuts and bolts, etc.; (2) telephone linesman's type of safety belt which permits the installer free use of both hands and immeasurably increases the safety factor; (3) non-corrosive hardware, an extremely important item; and (4) a soldering tool¹ which does not require the use of ac power. This is another extremely handy piece of equipment to have to make transmission line connections on top of the tower. This tool uses a cartridge which when exploded by a spring action plunger instantaneously heats solder and affords

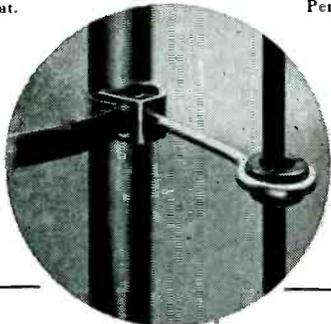
¹Kemode.

Fig. 4. Self-supporting antenna mount tower. (Courtesy Wincharger)



Pat.

Pend.



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19c list

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WALDOM ELECTRONICS, INC., Dept. 8
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six to eight minutes of high temperature, which is well above the melting point of 50-50 solder.

Assembly of Antenna to Tower

The majority of TV antennas cannot be mounted on top of a tower without a special adapter or coupling plate. This adapter should be designed so that the antenna can be freely rotated for optimum adjustments and then locked in position with a rigidly positioned pin.

There is one type of tower, a self-supporting antenna mount, which is a basic 5' unit, and can be extended to about 20'.

The mount is delivered with accessories including an extension pipe holder and antenna mast coupling. When used with a 5' length of 1/4" pipe, the antenna can be raised to a total height of approximately 14' from the roof. Using a 5' tower extension, with a 10' pipe, antennas can be raised to 20' above the roof.

The common 300-ohm twin lead transmission line should not be used in tower installations unless it can be supported at least a foot away from the tower. Coax cable, of course, can be strapped to the tower without impairing its effectiveness. A special twisted 300-ohm transmission line has been designed for conduit installation. This line has a negligible attenuation at the TV frequencies and a higher signal-to-noise ratio than coax cable.

Lighting

Where required, for obstruction and beacon lights, super-service type of electrical cable may be circuited up the tower to provide the ac power. In certain areas such as New York City, the local codes insist that all electrical cables must be run in conduit, in which case both types of lights may be served with No. 12 lead-covered pipe wire run in 3/4" conduit. The beacon lights, according to CAA rules, must be connected to a flasher unit. The ac voltage in more elaborate installations may be applied to the beacon light through a photoelectric cell relay unit, in which the pe cell operates the contactor of the flasher as soon as it becomes dark enough to merit the use of a beacon. The obstruction lights on the side of the tower may also be circuited to the pe relay, so that they are on whenever illumination is required.

Grounding

When the anchor points of the tower are connected to ground-

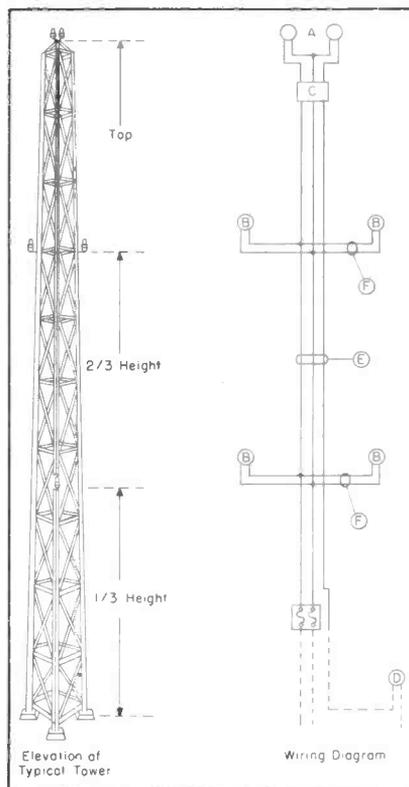
insulated structures, it is necessary to provide a separate ground for the tower to remove the static electricity (which is enough to provide a burn) present on the metal parts of the tower. This ground connection may be effected by connecting one end of a No. 6 copper wire to the antenna tower and the other end to an eight-foot 3/4" copper ground rod which is driven into the earth ground.

Estimating Costs of Installation

In preparing estimates on the costs of installing a tower, there are many basic factors to consider:

- (1)—Public and personal liability insurance.
- (2)—Workman's compensation.
- (3)—Property damage.
- (4)—Weather conditions which might halt work during process of erection.
- (5)—Higher compensation requested by personnel engaged in tower erection activities.
- (6)—Maintenance, where lighting is installed. This service must be provided for the replacement of any lights or fixtures which become inoperative.

Fig. 5. Tower lighting setup for heights of 100' to 150': A, double obstruction light (usually 100-watt clear traffic signal lamps); B, single obstruction light (100 watt); C, relay cabinet; D, pilot light (6-watt lamp); E and F, No. 12 cable. (Courtesy Crouse-Hinds)



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Research Worker

Video I.F. Amplifier Design

AEROVOX
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"The Transistor - An Amplifying Crystal"

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A Television Booster Amplifier
Part I (Design)

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Adjust-A-Cone SPEAKERS

There's a jack-pot of *satisfied customers* waiting for the serviceman who uses Quam Adjust-A-Cone Speakers. Here's why!

First, there's the unsurpassed performance and efficiency of Quam Adjust-A-Cone Speakers. They will make any receiver sound as good or better than it did with the original equipment.

Second, you can be sure of trouble-free service. With the construction of the Quam Adjust-A-Cone Speaker, because it permits accurate centering of the voice coil after assembly, a rubbing voice coil is practically unheard of.

Third, by replacing a defective speaker with a Quam Adjust-A-Cone, the serviceman makes a larger margin of profit, ensures a satisfactory job and a satisfied customer.

You can hit the jackpot with Quam Speakers.

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R. N. BAGGS NOW SALES MANAGER OF RCA SERVICE CO. CONSUMER PRODUCTS DIVISION

Robert N. Baggs has been named sales manager of Consumer Products Service for the RCA Service Co., Inc.

Baggs joined RCA in 1930 as a student engineer, progressing through the advertising and promotion divisions of the company's home instruments department to become advertising and sales promotion manager of the RCA Tube Department in 1942. In 1947, he served as chairman of the subcommittee on merchandising of the RMA Parts Industry Coordinating Committee.



R. N. Baggs

* * *

G. M. DETERS JOINS HYTRON

George M. Deters is now with the sales department of the Hytron Radio and Electronics Corporation, and making his headquarters in the Hytron Chicago office, 4000 West North Avenue.

Deters was formerly with the Crosley division of Avco.

NEDA BOARD OF DIRECTORS AND CHAPTER OFFICERS

(Left to right, seated, first row): Al Steinberg, president, Keystone Chapter; Thomas H. Brown, director, Southern New England Chapter; A. W. Greeson, Jr., acting second vice president and temporary director, Carolina Chapter; Al Cramer, president, Yankee Chapter; Roger Fjellstad, alternate director, Northwest Chapter; Frank H. Lingnor, director, Wisconsin Chapter; M. E. Schifino, director, Empire State Chapter; Harry Stark, director, Minnesota Chapter; R. C. Hall, director, South Texas Chapter; Max Epstein, director, New York Metropolitan Chapter; W. L. Obenchain, director, Florida Chapter; Gordon M. Fulton, director, Michigan Chapter; George W. Bauman, president, Minnesota Chapter; Sam Machtinger, director, St. Louis Chapter; William A. Wilson, director, Ohio-Indiana-Kentucky Chapter.

(Second row, seated, left to right): J. Howard Klein, president, North Texas Chapter; Martin Brotherson, director, Missouri Valley Chapter; James Prestwood, director, South Atlantic Chapter; Henry Morrison, director, Tri-State Chapter; Mace Levin, president, Tri-State Chapter; Thomas A. Lynch, director, Southern California Chapter.

(Standing, left to right): George E. Wedemeyer, chairman, Industry Relations Committee; Dahl W. Mack, director, Keystone Chapter; John G. Bowman, director, Chicago Chapter; Arthur W. Mayer, director, Yankee Chapter; Louis B. Calamaras, executive secretary, NEDA; Arthur C. Stallman, national first vice president; Lealis L. Hale, national secretary; Louis W. Hatry, president; W. D. Jenkins, chairman of the board and director, Old Dominion Chapter; Aaron Lippman, national treasurer; Leslie C. Rucker, chairman, Convention Committee and president, Old Dominion Chapter; William O. Schoning, NEDA director on Show Corporation Board; F. H. Schneider, Jr., president, Louisiana-Mississippi Chapter; C. E. Philpott, Michigan Chapter; Randall Lassaux, alternate director, Iowa-Nebraska Chapter; Frank Hawley, president, Tri-State Chapter; Lewis J. Bonn, Convention Committee member; Hoyt C. Crabtree, director, North Texas Chapter.



RIDER TO PUBLISH LYTEL TV PROJECTION BOOK

TV Picture Projection and Enlargement by Allan Lytel, lecturer in electronics at Temple University Technical Institute and consultant to the Trylon Radio Laboratories, will be published by John F. Rider Publisher, Inc., 480 Canal St., N. Y. 13, N. Y. Will sell for \$3.30.

Chapter headings include: Properties of Light . . . Refraction and Lenses . . . The TV Picture . . . Modifications of Schmidt Projection System . . . Refractive Projection . . . TV versus Motion Pictures.

* * *

PHILCO COMPONENT HANDBOOK

A 200-page handbook on components and with practical information for Servicemen, has been published by Philco Corp.

Contains data tables, charts, curves on transformers of all kinds; electrolytic, variable and fixed capacitors; insulating materials and components; speakers, switches, tubes and metallic rectifiers.

Book is priced at \$2.50.

* * *

JOHN O. OLSEN BECOMES INSULINE REPRESENTATIVE

John O. Olsen Co. has been named Insuline Corp. of America sale rep to cover the West Virginia and Western Pennsylvania areas.

* * *

ALTEC PA BROCHURE

A 4-page brochure, *Altec Speech and Music Reinforcement Systems*, detailing engineering analytical concepts and components for pa systems engineered for sound reinforcement situations, from a 250-seat church to a 90,000-seat stadium, has been published by Altec Lansing Corporation, 161 Sixth Ave., New York 13, N. Y.; 1161 N. Vine St., Hollywood 38, Calif.

NOTICE

Telrex, Inc., manufacturer of Telrex Conical V-Beam Antennas, announces that it is exclusively licensed under the Conical V-Beam patent applications which have been filed on these antennas.

We have been advised that action is shortly expected from the United States Patent Office. The trade is cautioned that we will immediately enforce our rights to this antenna design when the patents issue and will prosecute any imitators or infringers to the full extent of the law.

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ASBURY PARK, NEW JERSEY

SYLVANIA TV TUBE COMPLEMENT CHART

A TV receiver tube complement chart has been prepared by the commercial engineering department of the Radio Division of Sylvania Electric Products, Inc.

Listed are the total tube complement, viewing tube type and number of tubes by type in 110 TV receiver models produced by 44 manufacturers.

Data are arranged in chart form in three pages folded and punched for filing in standard 8½x11 three-ring binder.

Copies may be obtained on request to the advertising department, Sylvania Electric Products, Inc., Emporium, Pennsylvania

SPRAGUE SALES AID BOOKLET FOR THE SERVICE MAN

A 16-page booklet¹ entitled *Your Money's Worth in Good Radio and TV Service*, presenting the story of the Service Man and his qualifications, so that the set owners might have a keener appreciation of what the Service Man offers today, has been prepared by the Sprague Products Co., North Adams, Mass.

With the aid of lively illustrations and text, this unusual booklet details the complicated structure of modern receivers, the variety of components used, test equipment necessary and particularly the extensive training required to service properly receivers now being made, especially FM and TV models.

Booklets, available gratis from distributors, can be imprinted with name of Service Man and distributed prior to or during calls.

¹SERVICE editorial, June, 1949.

KNIFE AND NEIL JOIN UTAH SPEAKERS

Bill Knife has become president of Utah Speakers, Huntington, Indiana.

Marshall E. Neil has been appointed general sales manager for Utah Speakers.

Neil is a registered professional engineer, a member of the National Federation of Sales Executives and of the Sales Executives Club of Chicago.



M. E. Neil

JENSEN BUYS RADIO SPEAKERS, INC.

Emerson Radio & Phonograph Corp. has sold its wholly owned subsidiary, Radio Speakers, Inc., Chicago, to Jensen Manufacturing Co., a subsidiary of The Muter Co.

SAMS NOW RMA ASSOCIATE MEMBER

Howard W. Sams & Company, Inc., with offices and plant at 2924 E. Washington Street and 955 N. Rural Street, Indianapolis, Ind., has become an associate member of the RMA.

ONE-MILLIONTH PICTURE TUBE



RCA's one-millionth television picture tube being examined by (left to right) Frank M. Folsom, president of RCA, L. W. Teegarden, vice president in charge of technical products, and J. G. Wilson, executive vice president in charge of the RCA Victor Division.



SPRAGUE DISC

CERAMIC BYPASS AND COUPLING CAPACITORS

These new ceramic units—no bigger than a dime—find dozens of bypass and coupling uses in both standard and FM as well as television equipment. They have higher self-resonant frequencies than conventional capacitors and fit neatly across miniature tube sockets. They're covered with a tough, protective coating which guards against moisture and heat. Sprague Disc ceramics are available in both single and money-saving dual capacitors.

Use Sprague Disc ceramics whenever circuits call for ultra-compact, bypass or coupling capacitors. Each unit is clearly stamped with capacitance. All capacitors are rated at 1000 v. test, 500 w.v.d.c.

See these remarkable new capacitors at your Sprague distributor today! Write for bulletin M 431.

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Distributors' Division
of the Sprague Electric Company
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JOTS AND FLASHES



TYPE "O"

Type "O" Series—shown at right is the 03-11 Plug, with three 30-amp. contacts, fits certain quality types, notably Western Electric.

TYPE "P"

Type "P" Series—P3-CG-12S Plug shown at right, is standard with most broadcast stations and used with RCA and other equipment. . . . 7 interchangeable inserts.

TYPE "XL"

Type "XL" Series—XL-3-11 Plug shown at right, is standard on certain RCA, Electro-Voice and Turner microphones. Two inserts: XL-3, XL-4.

Used on many types of sound and communication equipment in addition to microphone, Cannon Plugs are recognized by engineers, sound men and hams as the quality fittings in the field. Over a period of years various improvements have been made in insulating materials, shell design, material and clamp construction.

Available through many parts jobbers in the U. S. A. . . . In *Louisville*: Peerless Electronic Equipment Co. In *Flint*: Shand Radio Specialties. In *Syracuse*: Morris Dist. Co. In *Toledo*: Warren Radio. In *Norfolk*: Radio Supply Co.

Bulletin PO-248 covers all the engineering data on the above 3 series; RJC-2 the prices; CED-8 Sheet lists jobbers. For copies address Department G-268.

A SCHEDULE OF TOWN MEETINGS for 1949-50 will soon be set up by the recently appointed RMA Town Meeting Committee, of which Robert C. Sprague, president of the Sprague Electric Company, has been named chairman. Other members of the committee include: Benjamin Abrams, Emerson Radio; A. T. Alexander, Motorola; W. R. G. Baker, G. E.; H. C. Bonfig, Zenith Radio; Leonard F. Cramer, DuMont Labs; Harry A. Ehle, IRC; J. B. Elliott, RCA; G. M. Gardner, Wells-Gardner; Larry F. Hardy, Philco; H. L. Hoffman, Hoffman Radio; J. J. Kahn, Standard Transformer; Stanley Manson, Stromberg-Carlson; Leslie F. Muter, The Muter Co.; and A. D. Plamondon, Jr., The Indiana Steel Products Co. . . . One of the most novel and unusual sound installations has been planned for the Warren J. Lockwood Village development in Roselle, New Jersey, with 310 RCA 45 rpm phonos scheduled to be built into a specially designed corner of the living room of each apartment. The equipment will be installed and maintained by the Jersey Music and Appliance Division of the Jersey Tire Company, who will also supply an introductory album of records with each of the installations. . . . Workshop Associates have recently developed a TV distribution system for dealers providing a connection of one antenna system to over twenty outlets. . . . A 5" scope kit is now available from the Feiler Engineering Company, 945 George Street, Chicago, Illinois. . . . B. C. Landis, 81-11 Roosevelt Ave., Jackson Heights, New York, has become a Taco rep, covering metropolitan New York, Westchester County, Long Island and Northern New Jersey. . . . Milton J. Strehle is now assistant manager for replacement of tubes division of G. E. . . . John F. Rider has acquired the Electronic Research Publishing Company, publishers of the Electronic Engineering Patent Index and the Electronic Engineering Master Index, and has set up a new company known as the Electronic Research Publishing Company, Inc., to publish these and other works. . . . The Federal Telephone and Radio Corp., 900 Passaic Avenue, East Newark, New Jersey, have published a 48-page handbook devoted to miniature selenium rectifiers and providing complete data on design and application. . . . Sylvania Electric Products, Inc., will soon enter the TV set market and produce 10" and 12½" table models, consolettes and console combinations with three-speed record changers. Plans are also being made to produce a 16" consolette. . . . Ten reps have been appointed by Anchor Radio Corporation, 2215 S. St. Louis Avenue, Chicago 23, Illinois: Robert Szymanski, Calif.; Joe Rose, Northern Ind. and Ill., South-Eastern Wisc.; Dale G. Weber, Wash., Ore., Mont., Wyo.; Art Cerf, Me., Mass., Conn., N. Y., R. I., N. J., Va., Vt., N. H., Del., Eastern Penn.; John Olsen, Ohio, W. Va., Western Penn.; Fred Ahrbecker, Ky., Southern Ind.; Gerald Wilson, Mich.; Ward Paden, Ia., Mo., Southern Ill., Nebr., Kans., Okla., Ark.; Jim Lacey, Tenn., N. C., S. C., Ga., Fla., Ala. and H. A. Gilliam, Tex.

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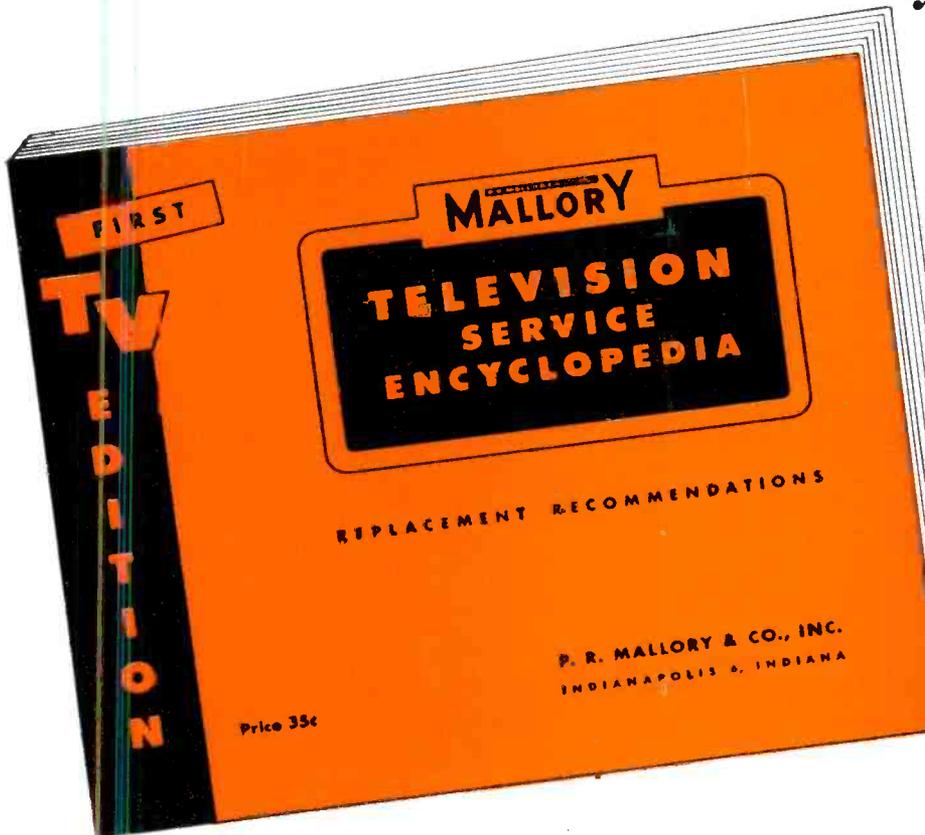
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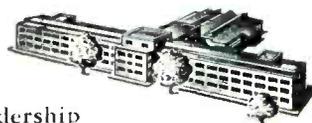
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