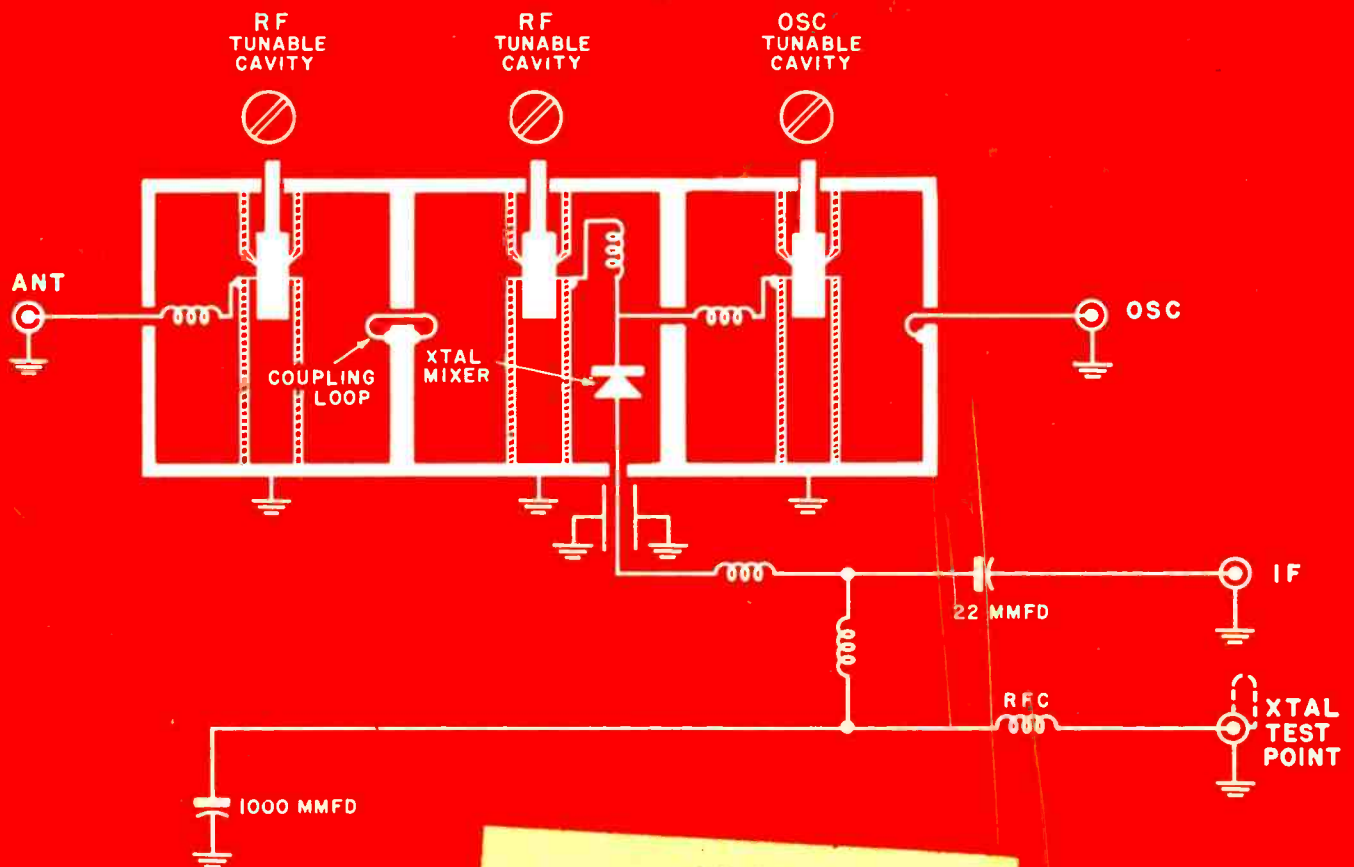


SERVICE

VOL. 23

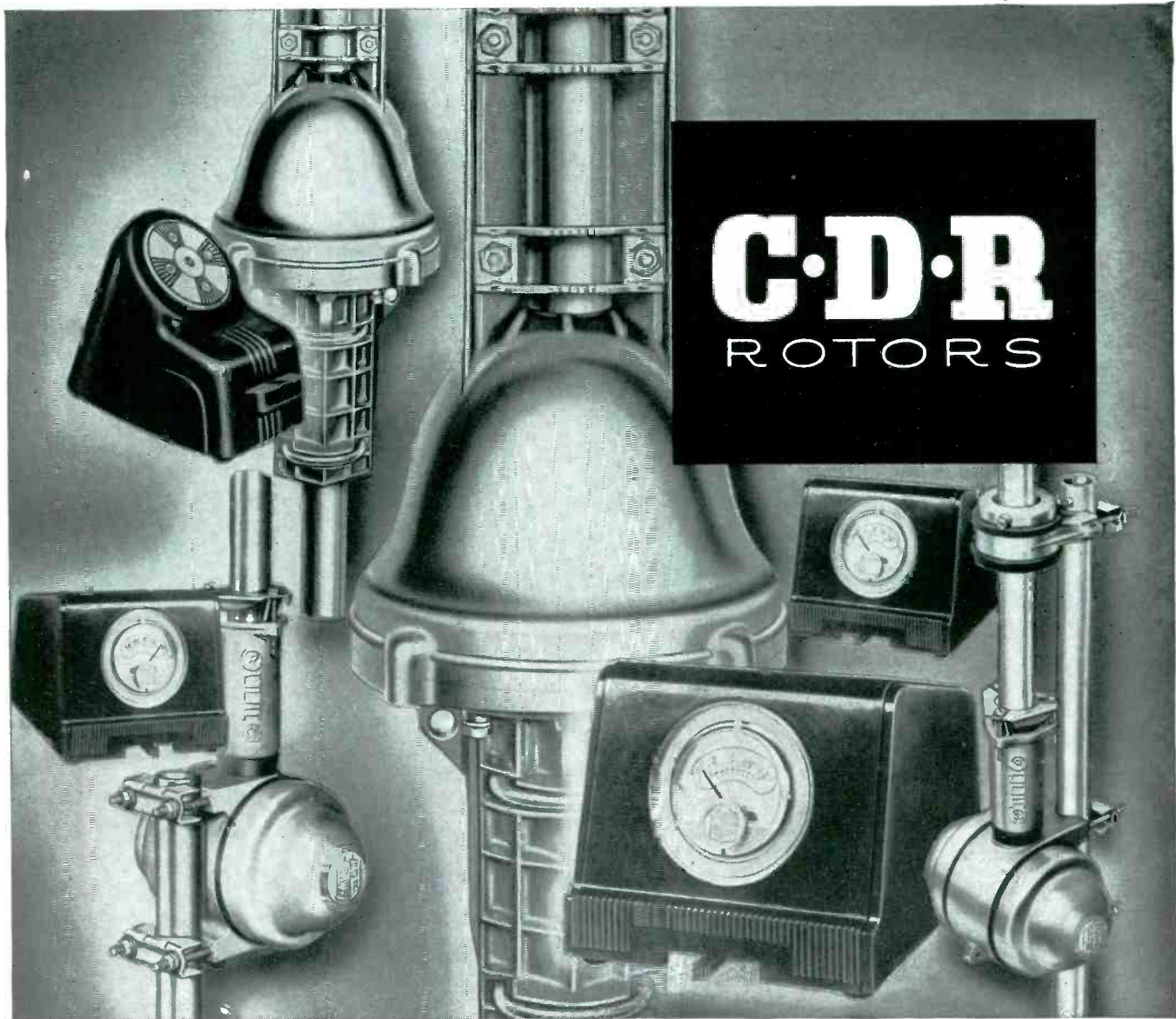
THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

MAY
1954



PEARSON RADIO-TV 2-59
3062 E 65 ST
CLEVELAND 27, OHIO
SU 8 3-5-54 GR

Ultrahigh antenna-mounted converter with double cavity-tuned input system.
[See circuit analysis, this issue]



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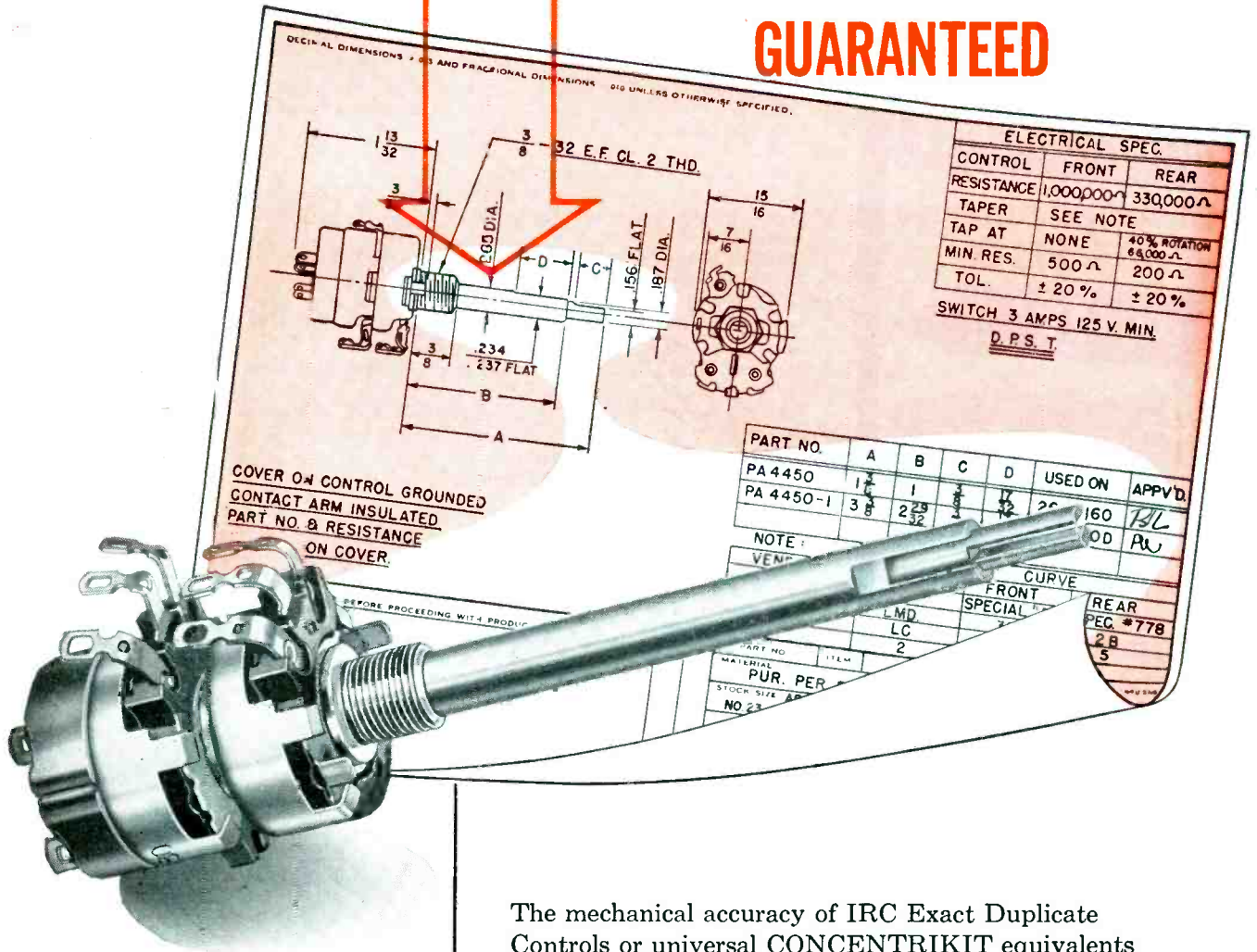
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THE RADIART CORPORATION
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**ONLY IRC GUARANTEES
SATISFACTORY MECHANICAL FIT
AND ELECTRICAL OPERATION
OR DOUBLE-YOUR-MONEY-BACK**

The typical manufacturer's specifications shown here are exactly duplicated by IRC QJ-180 control. CONCENTRIKIT assembly includes P1-229 and R1-312 shafts with B11-137 and B18-132X Base Elements, and 76-2 Switch.



Wherever the Circuit Says ~~~

The mechanical accuracy of IRC Exact Duplicate Controls or universal CONCENTRIKIT equivalents is based on set manufacturers' procurement prints. Specifications on those prints are closely followed.

Shaft lengths are *never less* than the set manufacturer's nominal length—*never more* than $\frac{3}{32}$ " longer.

Shaft ends are precisely tooled for solid fit.

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For Exact Duplicate Controls, specify IRC. Most Service Technicians do.

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FOR TESTING AND SERVICING**

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MODEL 120: complete with internal ohmmeter batteries, banana-plug test leads and operating manual. Over-all case dimensions: 5 3/8" x 7" x 3 1/8".....Net Price: **\$39.95**

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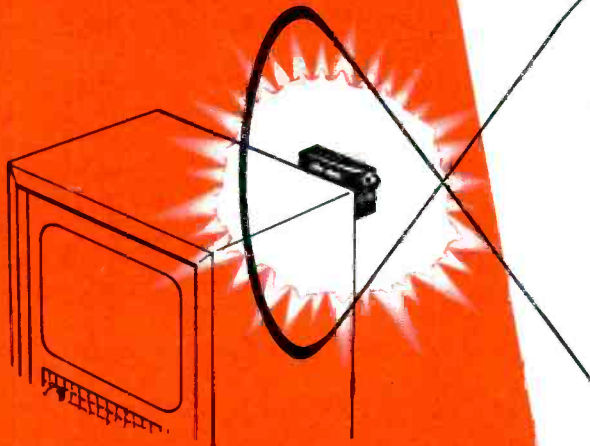
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- On-the-button high-ratio tuning. Easy to operate.
- Preselection for clean, interference-free pictures. A "must" in areas with two or more UHF or VHF channels.
- High amplification means satisfactory operation with indoor UHF antenna in most locations.
- Actually costs less and is more efficient than usual UHF strips. What's more, it provides continuous tuning over entire UHF band, eliminating need for additional strips.
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- HT-2, self-powered, \$18.95 list.
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*Patent Pending

Granco

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1 "Perfect 36" Display Rack — WJD Series

Ward jobbers, and dealers carrying a larger stock, will find this sturdy, compact, wrought iron display rack a real silent salesman, as well as a convenient means of storage. It's attention-getting in three colors — yellow, black and white. Holds 36 Ward aerials, with provision for mounting three aerials for demonstration.

2 "Super-6" Display Rack — WDD Series

Here's the modern way to store as well as display Ward auto aerials. Striking in appearance . . . similar to the big "Perfect 36" jobber display rack . . . the "Super-6" holds six Ward auto aerials. For convincing "see it" demonstration, the sixth aerial can be easily mounted on the side of the display. This sturdy wrought iron beauty, in yellow, black and white, will prove a real sales aid.

3 Booklet — "How to Sell Replacement Aerials"

Explains how to sell replacement Automotive Aerials. It is a dealer's booklet 100 per cent, with tips and new slants on how to tap this tremendous replacement market . . . how important are the teen-agers and the "hot rod" enthusiasts . . . what service stations and car washers can mean . . . and many other valuable ideas.

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3



2



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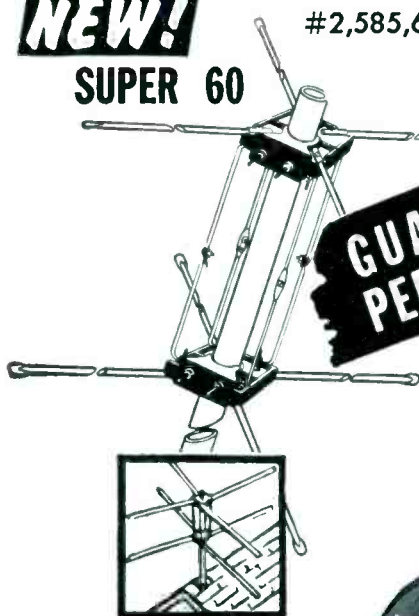
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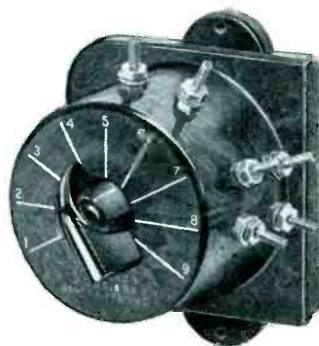
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- ★ **GUARANTEED to positively give you the CLEARST, SHARPEST, most PERFECT GHOST-FREE pictures possible in both COLOR and black-white.**

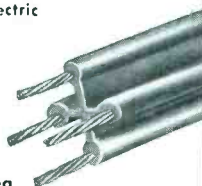
MONEY BACK GUARANTEED TO RECEIVE *All* CHANNELS 2-83 FROM *All* DIRECTIONS AND POSITIVELY OUTPERFORM *All* OTHER ANTENNAS WITH OR WITHOUT A ROTORMOTOR

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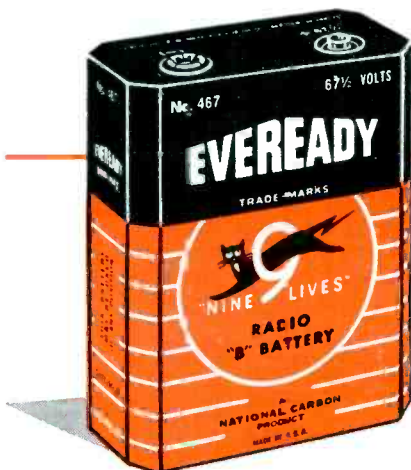
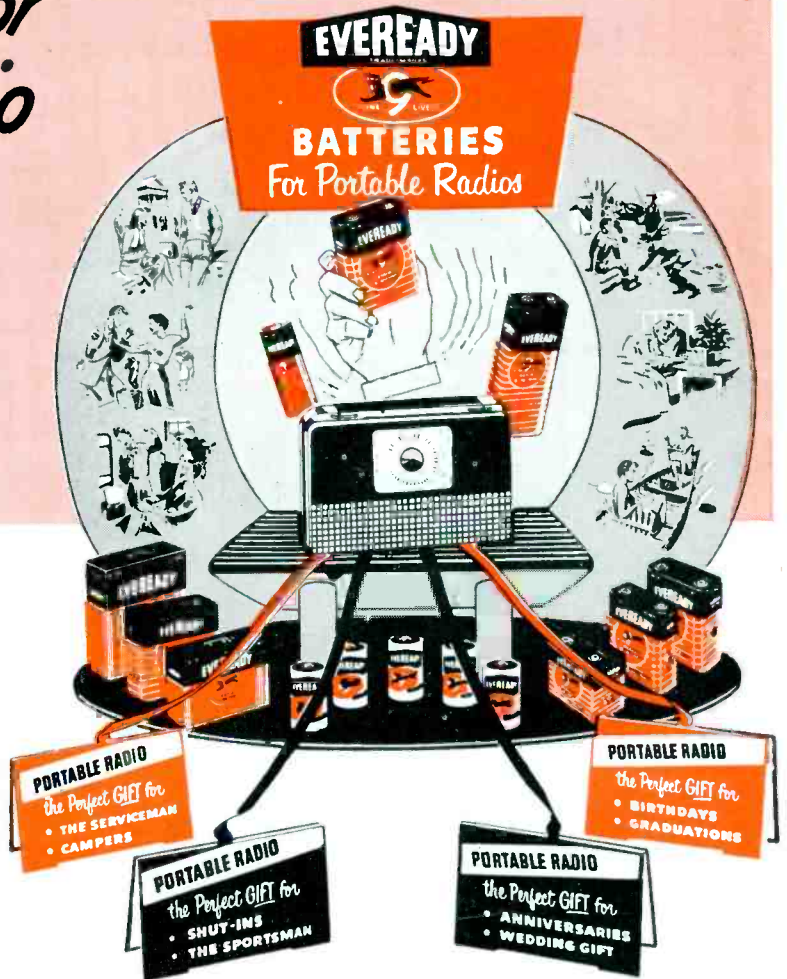
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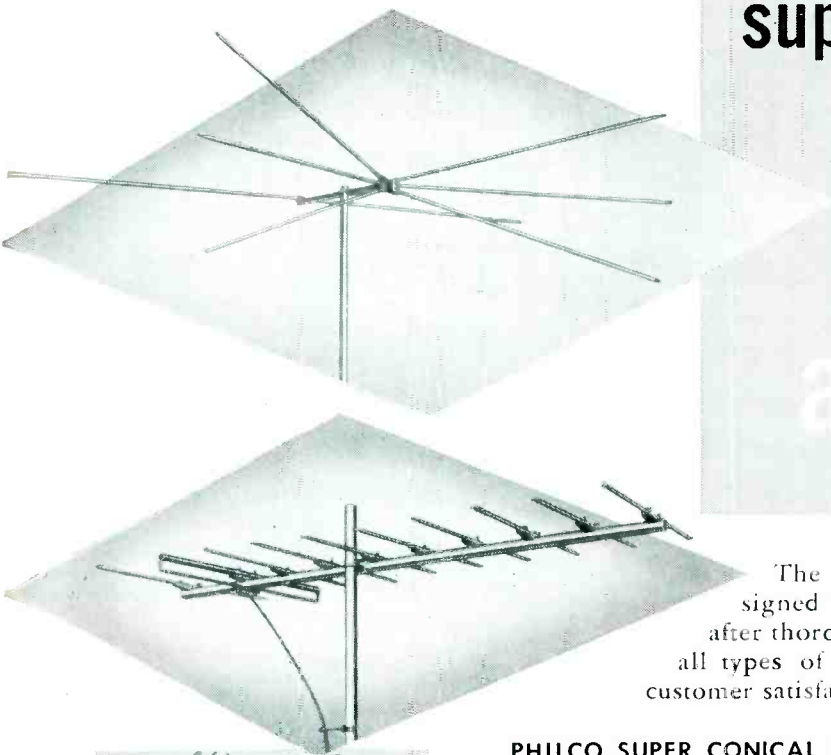
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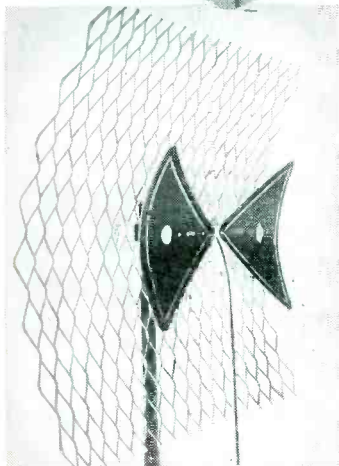
announces 3 new super-performance



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The finest TV antennas in their class... designed by the world famous Philco Laboratories after thorough research into receiver requirements in all types of locations... designed to give complete customer satisfaction... to meet competition on any level!



PHILCO SUPER CONICAL UHF-VHF ALL-CHANNEL ANTENNA

Full 45" dowelled aluminum antenna elements and full 53" dowelled aluminum reflector assure strong signal pickup on VHF channels 2 through 13... top quality performance on UHF channels 14 to 83.

Single or stacked array Super Conicals produce new balanced performance... super picture quality plus high gain. All-aluminum construction in the Super Conical... it's easy to erect: Part No. 45-3096.

PHILCO SUPER YAGI VHF ANTENNAS

Quick-rig model with ten elements gives top fringe-performance on VHF channels 2 through 13. Excellent front to back ratio (6 to 1). This Super Yagi eliminates ghosts in strong signal areas... selects signals

from adjacent weak area channels or co-channel stations. 10 db to 12 db gain depending on channel. Strong, all-aluminum: Part No. 45-3112. (Single channel 2 thru 13 and broadband 2 thru 6; 7 thru 13; 4, 5, 6).

PHILCO PARAFLECTOR ALL-CHANNEL UHF ANTENNA

Light weight pre-assembled all-channel UHF antenna. Outstanding performance in far-fringe areas. High gain... 8 to 10 db. Exceeds gain of corner reflector of like dimensions. Impedance matched to 300

ohm line. Completely assembled, all-aluminum construction... can be mounted on existing masts for immediate use... all-channel paraflector weighs only 1 1/2 lbs: Part No. 45-3071.

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NEW! G-E SERVICE-DESIGNED TUBES OUT-PERFORM ALL OTHERS!

Specially developed for the TV service industry. Cost the same as types they replace.

Here's what G.E.'s new SERVICE-DESIGNED Tubes mean to you:

- ✓ They cut callbacks on TV repairwork, by doing a far more dependable job than their prototypes.
- ✓ Your tube-inventory requirements are lower. SERVICE-DESIGNED Tubes give top performance in all chassis.
- ✓ Your customers get more hours of trouble-free TV enjoyment . . . because SERVICE-DESIGNED Tubes have longer average life.
- ✓ They cost the same as their prototypes, despite improved performance and long life. You get higher tube value than ever before!

FOR the first time anywhere, a line of tubes has been developed specially for TV servicing—G.E.'s new SERVICE-DESIGNED Tubes. Six types are described on this page. They will soon be followed by others, designed from the ground up to meet the practical requirements of your work.

You can install SERVICE-DESIGNED Tubes in any circuit with confidence, knowing they have the sturdiness, the voltage capacity to stand up. See your G-E tube distributor today! Ask him to show you the new SERVICE-DESIGNED types—explain how they will save you time, trouble, and costs, and increase your list of satisfied television customers! *Tube Department, General Electric Company, Schenectady 5, New York.*

SERVICE-DESIGNED 5U4-GA

The 5U4-G prototype was a tube that did a good electrical job, but was subject to damage from shocks and vibration. In the new SERVICE-DESIGNED 5U4-GA, you have a rectifier that can withstand hard usage. Here are the reasons why:

- (1) Substantial mica supports brace the tube structure at both top and bottom, instead of at the top only. Also, double-fin plate construction gives better heat dissipation.
- (2) Glass bulb now is straight-side, compact, and strong. It is specially

"necked down" at bottom, so the base can be the same diameter as the 5U4-G—enabling the same ring-clamps to be used when installing the tube.

(3) Base construction has been changed to button-stem, with the leads passing through widely spaced individual seals at the bottom of the glass envelope, the same as with miniature tubes. This gives greater strength, also shorter leads and better lead separation. Another advantage of button-stem construction is improved heat conduction, which in turn reduces the chance of electrolysis and air-leakage.

SERVICE-DESIGNED 6BQ6-GA

"Running hot" shortened the life of many prototype 6BQ6-GT's. G-E designers went to the heart of the problem, and—while retaining the same basing layout for interchangeability—gave this tube a king-size bulb that means cooler operation under all normal conditions.

Also, because of special mica design and new processing techniques, the new SERVICE-DESIGNED 6BQ6-GA will handle higher pulse plate voltages than

its predecessor. Internal tube arcing is cut 'way down.

In many TV chassis, Type 6BQ6-GT now is pushed to the limit. Replacing with 6BQ6-GA's means far fewer service callbacks due to early tube failures.

A further important improvement in the SERVICE-DESIGNED 6BQ6-GA, is use of a special high-melting-point solder for the plate cap-terminal. This prevents loosening of the terminal when the tube is removed for testing.

SERVICE-DESIGNED 6SN7-GTA

Type 6SN7-GTA has been redesigned to give top performance in all synchro-guide and other TV circuits. Among measures taken to assure this result, is a special factory "chopper" pulse test. The test is made at voltages equal to the lowest line voltages that will be en-

countered in TV chassis of any make.

In all respects and in all circuits, the SERVICE-DESIGNED 6SN7-GTA now will replace Type 6SN7-GT. Capacity of the new tube is much superior to the old. This is proved by the following cross-tabulation of ratings:

	Old 6SN7-GT	New 6SN7-GTA
Max plate voltage	300 v	500 v
Max plate dissip., per plate	2½ w	5 w
Max heater-cathode voltage	90 v	200 v

ALSO READY: 3 MORE G-E SERVICE-DESIGNED TUBES THAT DO OUTSTANDING JOBS . . . AND WHY!

SERVICE-DESIGNED 5Y3-GT

A sturdier tube, with longer life! Mica supports now brace the tube structure both top and bottom . . . new button-stem base adds strength, separates the leads . . . double-fin plate construction gives the SERVICE-DESIGNED 5Y3-GT much improved heat dissipation.

SERVICE-DESIGNED 25BQ6-GA

Cut callbacks with this new tube that runs cooler than its prototype! All the improved features of the 6BQ6-GA. Larger bulb gives ample cooling. Tube handles higher pulse plate voltages. High-melting-point solder protects plate cap-terminal.

SERVICE-DESIGNED 1B3-GT

Install and forget! This new tube does a superior job far longer! Special lead glass wards off electrolysis and air-leakage. There is a new ring around the filament which stops "bowing" and the filament burn-outs that frequently result.

GENERAL  ELECTRIC
161-144

62

SIXTY-TWO INDIVIDUAL ELECTRONIC RANGE MEASUREMENTS

RCP

Electronic "DO-ALL" MODEL 657

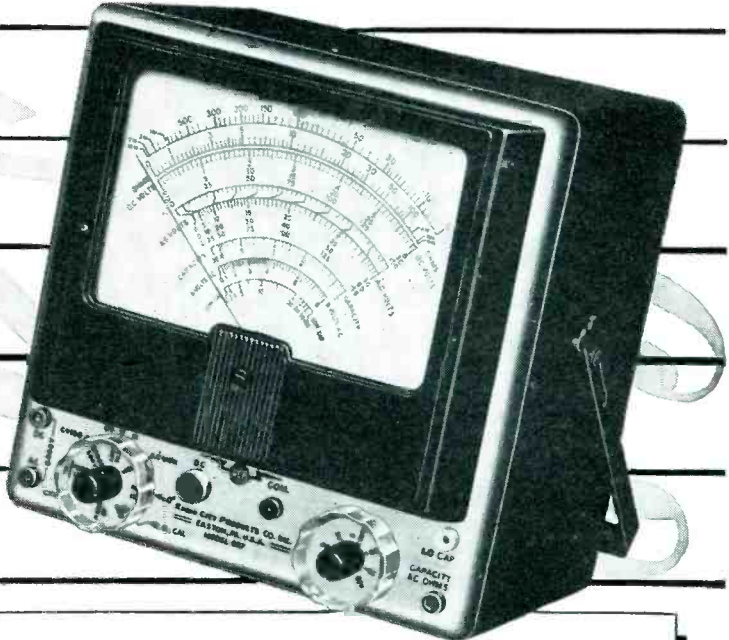
—||— CAPACITY METER

⚡ HIGH RANGE OHMMETER

~ R.M.S. V.T. VOLTMETER

⌋ P-P PEAK-TO-PEAK V.T. VOLTMETER

⌚ INDUCTANCE METER
(By Reference To Charts)



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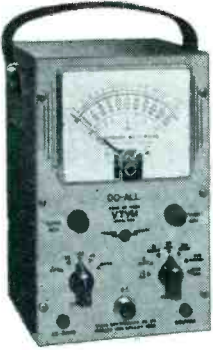
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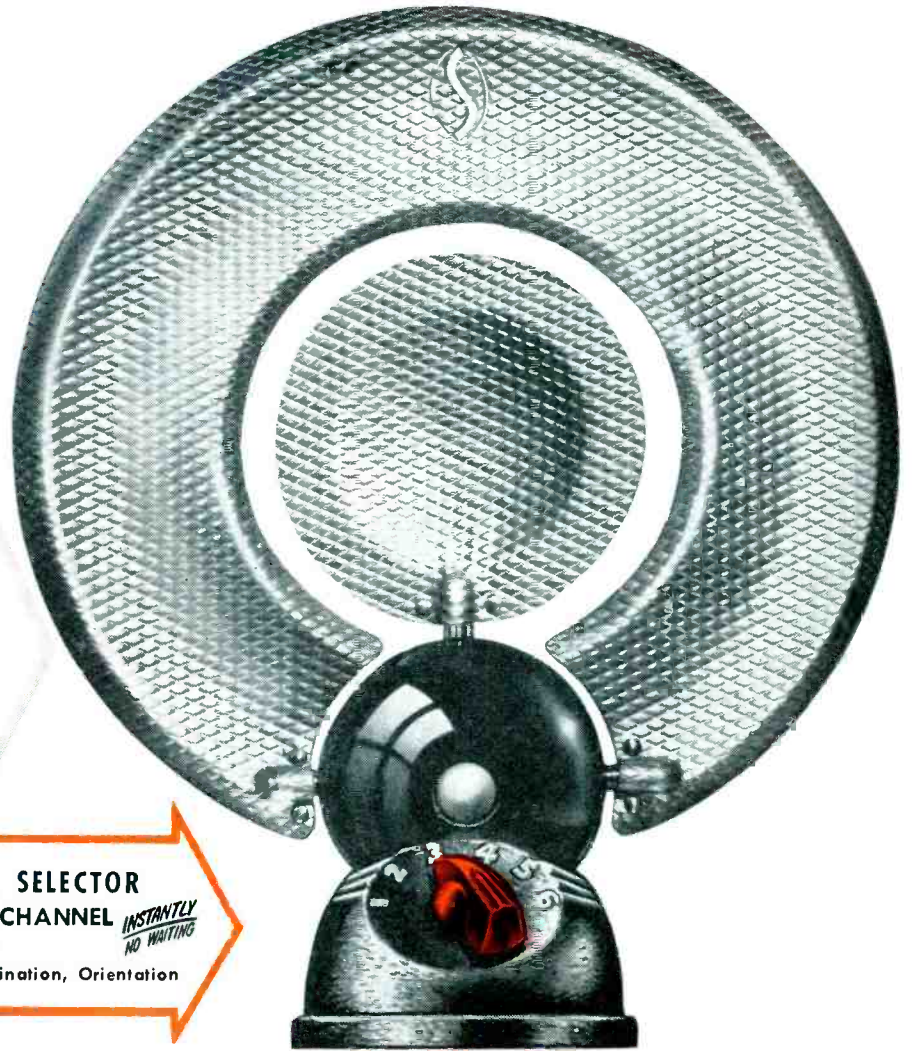
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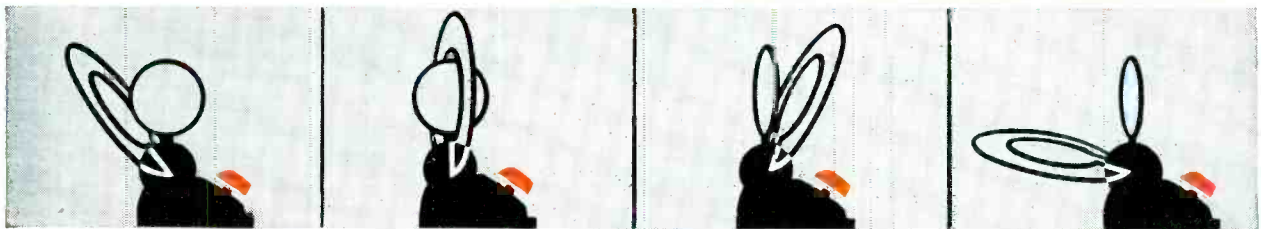


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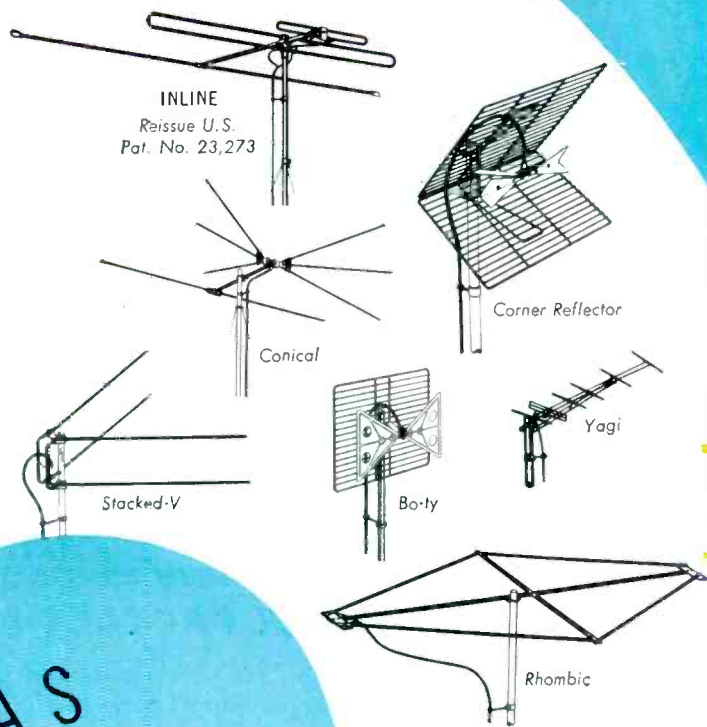


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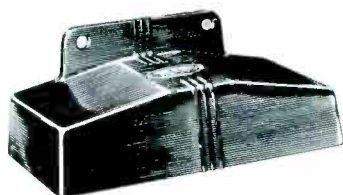
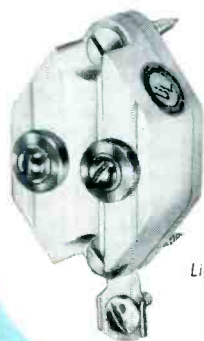
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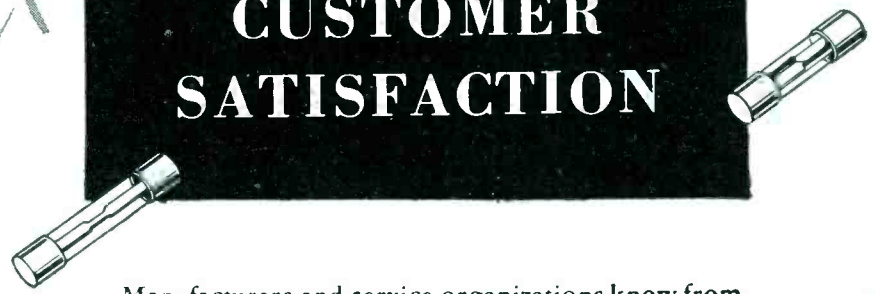
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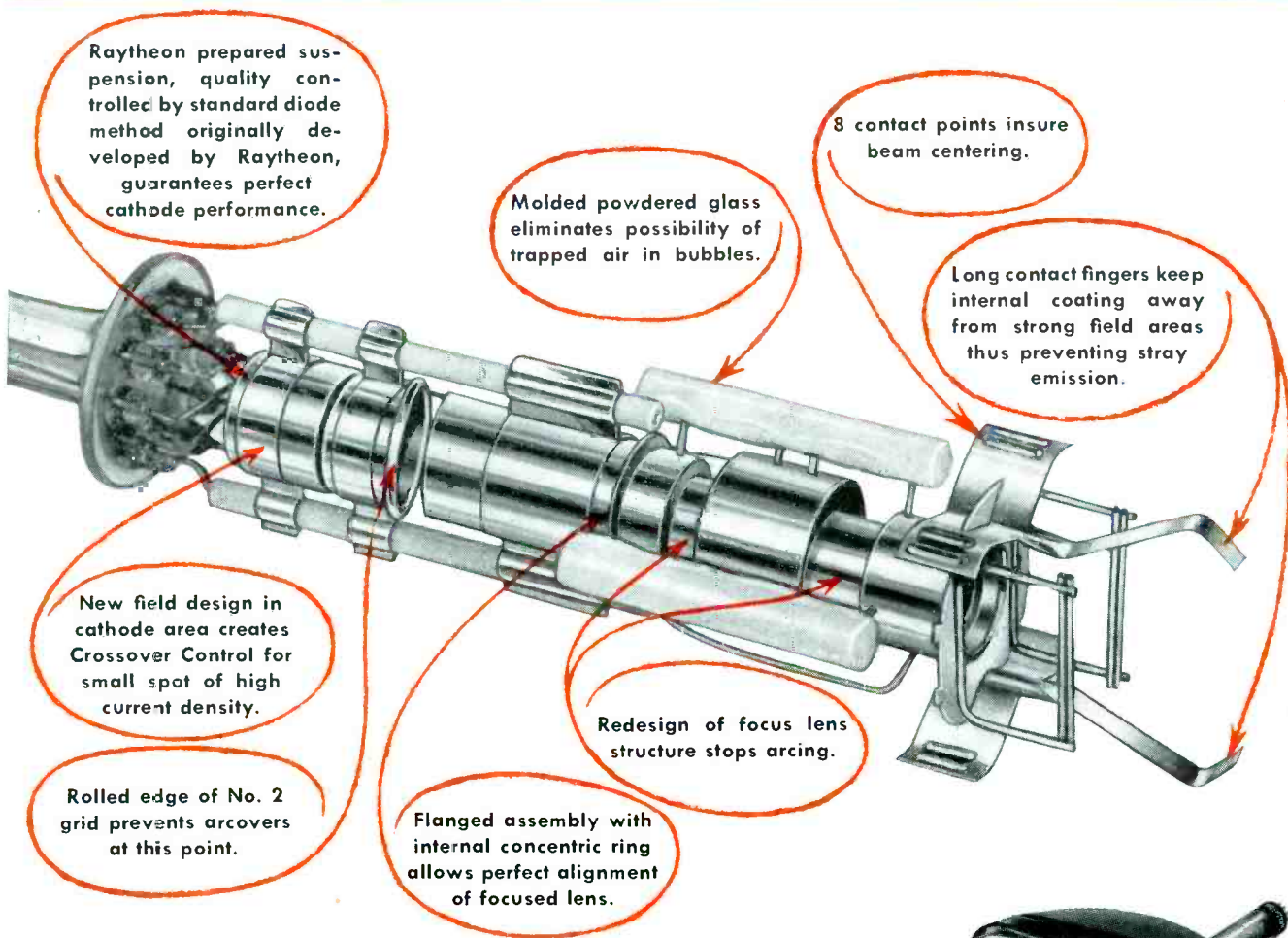
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Keen Competition

FEW INDUSTRIES have had so charmed a life as ours. Since the epic moments of the sprawling breadboards and gleaming galenas, the record of progress has intrigued the world of business and science. On all fronts—research, production, sales and service—we have seen a succession of smashing successes, year in and year out.

Yet, notwithstanding this outstanding achievement and the continuing opportunities that prevail, there have been a number who have found themselves unable to reap the rich rewards tendered. Competition is too keen, too rugged, has been their bleat.

For those who are capable, willing to work hard, discount the clock, and really drive, competition never has been or never will be a frightening specter. Instead, competition has served to fire their spirit and urge to find out how a better job can be done. Often, this has meant working far into the night, perhaps sending out postcards and letters reminding customers that their receivers or antennas or audio systems are due for a check up. Perhaps, too, it might be necessary to pound the pavements, ring doorbells, and visit with the folks in the community to reacquaint them with services now available. But these earthy tactics have always proved effective; they have won business and friendship, and scored success for thousands and thousands of shop owners.

And many—operating in concert—in a city or community, have also found that they can swing along in campaigns to keep the shops busy. Some years ago, a group in the East proved that such a plan was a dynamic approach. Their procedure was through a *preventive maintenance* program involving a state-wide promotion. The results were terrific, not only for the boys in the shops, but for the distributors, with skyrocketing sales scored for capacitors, controls, assorted components and tubes.

Set owners were bombarded with post cards, local newspaper advertisements, bulletins, and on-the-air announcements, telling consumers that: Wise folks don't wait until they're flat on their back to see a doctor. Show the same wisdom with your radios—call your Service Man today. . . . A timely call to an expert Service Man will save money in the long run. . . . Don't neglect small symptoms; serious trouble can develop.

Today, the *pm* plan has particular merit, too, especially for audio and the new packaged hi-fi phonos. Owners of the new modern phonos are more quality conscious than ever, and insistent on consistent flawless performance. The wide-range phonos, now being marketed, bristle with components that are ripe for a preventive maintenance program. Changer mechanisms, speaker cones, tone arms, needles, variable controls, tubes, and even the fixed items,

whose efficiency can begin to dip as operating conditions affect their tolerances and values, all require attention. Yesterday, the phono was a wheezing antique; today, it has become a glorious source of fine music, with millions in use, and millions more to come.

Elsewhere, the *pm* idea, coupled with installation and service, can also be applied very effectively. Auto radio and particularly TV, for instance, are still quite alive.

The old and extended fringe areas¹ are now a mighty busy place for Service Men. Powers are still being upped; channel shifts are still being made; transmitting towers are being moved, and new stations are going on the air. There's plenty to be done and many problems (as co-channel and adjacent-channel interference)² to solve, in these areas to insure top-notch results; required are new antennas, new leads, boosters, converters, traps, stubs, and assorted mounting hardware.

The American resorts are also bustling with opportunities for TV *pm*, service and installation. It has been reported that half of the country's winter and summer sport and rest hotels now provide TV for their guests, and that within the year the proportion will rise to six out of ten. Currently, sixteen per cent of all of the resorts have TV sets in individual guest rooms. While provision for receivers increases with proximity to transmitters, it has been found that even in the case of hotels more than 60 miles from the nearest telecaster, three out of ten now have TV in private rooms or community centers.

Commenting on today's prospects for Service Men, who might want to specialize in preventive maintenance, or general servicing and installation, one association spokesman declared recently that their records show that more and more enterprising men are still going into business, and doing a good job of it. Associations are playing a major role in helping these newcomers, he commented, as well as the veterans. Today, one should keep pace with the rapid developments of industry. Associations offer that opportunity through sales and service clinics.

In another expression on the value of the association, particularly today, the prexy of one group said that an association is a little democracy in operation, and a democracy is everybody's business. The time spent in association work is well worth while; more net dollars can be earned because of the increased technical and business knowledge gained at conventions and roundtable discussions. Men who belong to associations are men of action, this prexy emphasized, and their ledgers show this very effectively year in and year out.

Those who are alert to the problems of the day, are aware of the solutions that obtain, and how they can best be applied—through skill, tenacity, and especially the will to serve one's community conscientiously. These men thrive on keen competition. — L. W.

^{1, 2}See reports on fringe installation practices and the use of stubs and traps to curb interference, this issue, pages 18 and 38.

Installing High Masts and Towers In Fringe Areas

by JACK DARR

In-The-Field Report on Techniques Found Most Practical To Insure Substantial Year-Round Durability

THE ADVENT of *super-power* from many new and pre-freeze TV stations, providing usable signals for towns and cities previously considered completely beyond a pickup zone introduced a sparkling antenna era for Service Men. Now, it became possible to install antenna systems with profound assurance that very satisfactory results would obtain.

Towers, high-gain antennas and boosters became the answer to problems in shadow areas, valleys, and low spots.

It was found that properly-installed towers played a key role in these fringe assignments. In view of the importance of towers and the time consumed in their installation, pre-testing was found to be invaluable. As a result, *test-towers* have become popular items in the fringe-kit; they are essential in deciding definitely on the actual height necessary for good signal in any given location. With a rig of this type, the height of an antenna may be varied and the actual signal level checked at various heights. A field-strength meter must be used for this test, for the eye is not quite accurate enough to judge picture variations. If the location chosen is somewhat noisy, a TV receiver should be used to differentiate between noise and signal.

There are certain basic principles which must be observed if an installation is to withstand adverse weather conditions, high winds, icing, etc.

Perhaps the most important point in

fringe area antenna installation is material selection. The antenna itself, of course, must be chosen with care; it must not only be of a high-gain type, but its physical construction must be such that it will be able to stand the strains put upon it. Broad-band yagis have given good results in the southwest. Where two antennas are required for more complete coverage, *piggy-back* arrangements have been very effective. When a rotator is used, both antennas are lined up in the same direction; if they are fixed, each antenna is aligned to the individual station.

Because of the height and inaccessibility of the taller antennas, every installation precaution must be taken. To illustrate, the leadin selected should be installed with extreme care so that it provides trouble-free performance. The line itself should be extremely tough, capable of withstanding mechanical, electrical and physical roughage. Standoff insulators, mounting bolts, guy wires and every piece of hardware, no matter how small, must be very carefully chosen not for cost first, but for high quality. All metal parts used in the installation, such as bolts, lag screws, mounting plates, turnbuckles, etc., should be heavily cadmium plated to enable them to withstand rust. Mast stock should be of the weatherproof type, either

zinc-coated or plastic weatherproofed. Guy wires used should be heavily galvanized.

In many fringe areas, using multi-element yagis, rotators are also used, to enable reception of more than one station. These should also be very carefully selected for durability and serviceability, as rotator failure can necessitate complete removal of the entire installation.

The extra load imposed upon the mast and entire installation by the antennas and rotators have made it necessary to use much heavier stock in the structure. For instance, it has been found that telescoping 30' or 40' towers, using 1" stock as the top section, are too light. Because of the heavy load, there is always the possibility of a tower buckling under high winds. It has been found that three-cornered aluminum towers are preferable for any installation over ten feet high. These towers not only provide the added strength, but one can climb them with ease, and make any repairs and adjustments. Usually these towers are built in six-foot sections, and as many as needed can be bolted together to obtain the desired height. Bases, top sections, etc., are furnished with them, to simplify mounting on any type roof or on the ground.

If necessary, a two or three-section telescoping mast can be mounted within the tower, to give added height. This practice is not recommended for heights of over thirty feet, due to the difficulty of servicing. It is much

Above: Dual fixed antenna installation on 30' tower, using high and low-band yagis. Note safety rope around waist of installer leaning out to adjust antenna elements.

Right: Crankup tower developed for demonstration application. Tower is telescopic, and can be raised from base height of 20' to a maximum of 40', for checking signal strengths at various levels. (Crank is just below left window.) It can be set up in less than a half-hour using temporary guying with ropes.

Below: Close-up of antenna shown at right; a piggy-back model used with rotator for test and demonstration work. Low-band antenna covers channels 4, 5, 6; high-band unit covers from 7 through 13.



better—safer and stronger—when the antenna and other equipment are mounted on the tower-top itself, on a mast as short as possible. If this must be done, however, one should obtain a thirty-foot telescoping mast, remove the small inner section, and use the center section of 1½" stock, as the top section. This will make the installation much stronger.

Guy Fittings

Special guy-fittings (*rings*), provided for these towers, should be used. These rings slip into place when the tower is being assembled, and serve to strengthen the guying. Guy-wire *thimbles* should be used over the rings, to prevent excessive flexing. The towers should be guyed approximately every twelve feet; to illustrate, a tower 24' tall should be guyed at the top and at the center. If the guy-anchorage is strong enough, both guys on a side may be anchored to the same one. If there is any doubt as to guy strength, separate anchorages should be used. Guys on these, as on all others, should make a 120° angle from the mast, vertically, so that the strain is equally distributed in all directions.

Prevailing winds must always be taken into consideration in installation. In most localities, prevailing winds blow from one direction. One guy wire set so that it points directly into the wind, giving it a straight pull, has been found to be stronger than a pair of guys mounted so that the wind could blow into the open angle between the two guys. An example of what happened when the angle of the guy wires was improperly chosen, was strikingly illustrated in one installation. Here a 30-footer was fastened with *ten* guy wires, not one of which broke, but the incorrect angle of the guy wires caused the tower's downfall. The installation simply did not have enough guys in the right place!

In anchoring guy-wires, an anchor-plate, with three holes, and an attachment for the turnbuckle has been found very satisfactory. These should be fastened to the roof with lag-screws, heavily cadmium-plated to withstand rust. The screws should be mounted at the eaves of the house, to avoid leaks, and set so that at least one or more screws go through into

a roof-rafter. One method, for locating rafters under the roof, found very effective, involves first the measurement, at the edge of the roof of the back to the house-wall. This measurement is then transferred to the rooftop, adding about two inches. This will put you approximately over the plate, or upper 2 x 4 framing member. And, with the spread of the holes in the plate, it will be found that at least one of the lagscrews will go into the rafter. Although most modern roofs are covered with a solid *decking* of 1" lumber, the anchors will hold better if they go into the heavier frame-members. If the ends of the roof-rafters are exposed, this job will be much easier.

Mast Bases

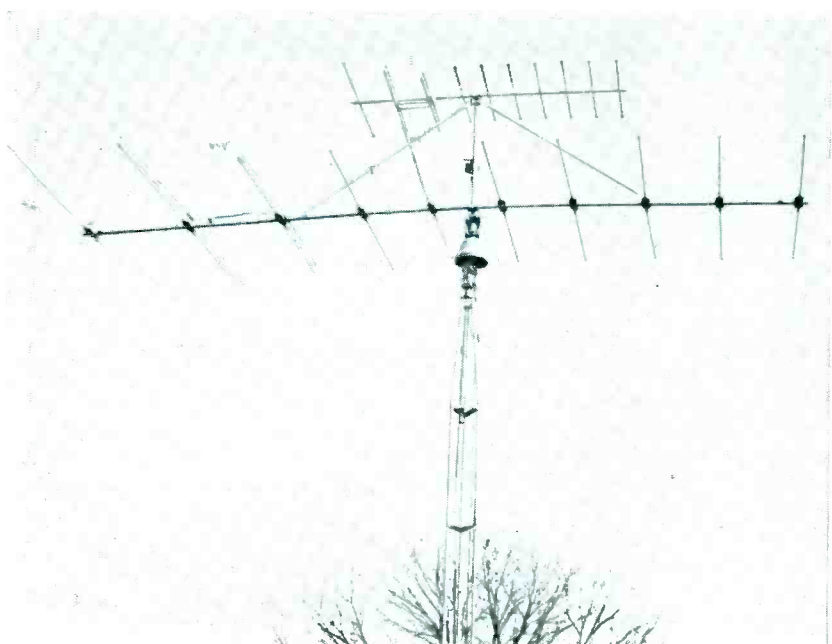
The mast-bases used for supporting the bottom of the tubular masts are generally mounted across the ridge or peak of the roof, although they are so built that they can be mounted on a flat or sloping surface. Brass wood-screws (1" or 1½", No. 10) can be used to secure the bases to the rooftop. The short screws will not go completely through the decking (to avoid leaks), but are heavy enough to hold the base in place. A small can of plastic roofing cement is helpful; the

cement can be used to cover the screw-heads after installation.

The leadin wires can be run down the roof to the eaves, down the wall, then through a frame wall into the house, using a polyethylene *wall-thru* unit made for this purpose.

If the house is of rock or brick construction, penetration of the wall becomes somewhat more difficult. If it is absolutely essential, a hole may be bored through the wall with one of the masonry bits, and a longer *wall-thru* used. Easier still, the leadin may be taken under the house, through a ventilation opening, run under the floor to a point behind the TV set, and brought up there. This will make a very neat installation, although it is harder to complete. Depending upon the interior arrangement of the house, the leadin may be brought in through

(Continued on page 60)

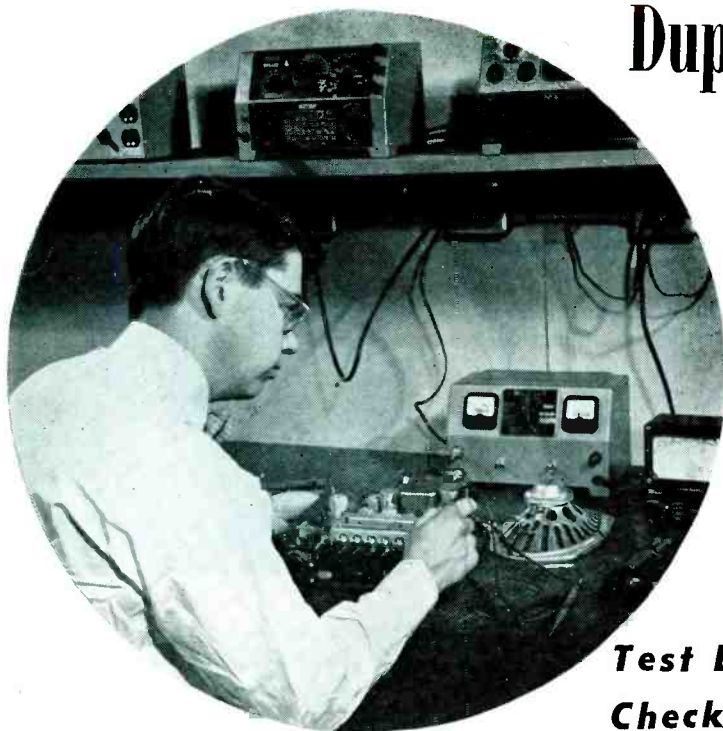


Duplicating Field Operating Conditions At The Auto-Radio Bench

by J. A. VITT

P. R. Mallory and Company, Inc.

Test Equipment Required. Receiver Checking. Typical Problems and Cures



ONE OF THE MOST DIFFICULT of the many problems facing those who service auto radios involves the duplication, at the test bench, of the fluctuating input voltage condition encountered when the receiver is being operated by the car's electrical system. Motor-off to motor-on conditions can result in a voltage variation of as much as 25% from the nominal input to the receiver; the actual input voltage depends upon such things as condition of the battery, adjustment of the voltage regulator, and contact resistances of the various connection points in the electrical system, among other allied factors.

The importance of duplicating actual operating conditions at the service bench cannot be stressed too much, because frequently troubles such as no-start vibrators, oscillator failure, regeneration in *rf* and *if* circuits, high-voltage breakdowns, and audio circuit arcovers show up only when the equipment is operated under these extreme voltage conditions. In the case of a receiver which operates normally with an input voltage of 6.3, with its power supply designed to provide an output voltage of 250, the output will drop sharply to about 200 *v* if the input voltage to the receiver should fall to 5.2, a decrease of only 1.1 *v*. At the other extreme, the power supply output voltage will surge to about 300, if the input voltage to the receiver should rise from 6.3 to 8 *v*. Receivers operated from 12-*v* electrical systems are affected similarly.

On the basis of these facts, it is obvious that the Service Man whose

bench is equipped only with a fixed source of low voltage *dc*, such as that obtainable from the common storage battery, will not be able to duplicate voltage conditions found in his customer's car. As a result, he will be severely handicapped in locating various troubles.

To service auto chassis with a maximum of convenience and efficiency, the bench should be equipped with a variable low voltage *dc* power supply, which is not only capable of duplicating actual operating voltage conditions, but which can, as well, be used to service the newer 12-*v* receivers.

Such a power supply should have: A panel control permitting adjustment of output voltage at least from 4 to 16; a continuous load current rating of at least 5 amperes at any voltage below 16; a continuous load current rating of at least 10 amperes at any voltage below 8; an intermittent current rating sufficient to allow actuation of the largest tuning mechanism likely to be encountered; and a separate voltmeter and ammeter to permit simultaneous measurement of both output voltage and current.

The circuitry of a supply designed to meet these requirements is shown in Fig. 2. Equipped with a full-wave selenium rectifier stack, this supply has a nominal load current rating of 10 amperes at any voltage from 0 to

approximately 8 volts, and a load current rating of 6 amperes at any voltage from 0 to 16. Intermittently, this unit will furnish 20 amperes on the low-voltage range and 12 amperes on the high-voltage range; these intermittent ratings are necessary to provide sufficient output to drive high-current tuning mechanisms encountered. Separate volt and current meters are included, as well as an automatic self-resetting circuit-breaker; replacement of a secondary fuse is thus unnecessary if the output leads become shorted together accidentally, or if some malfunction of the receiver under test should cause an excessive current drain on the power supply.

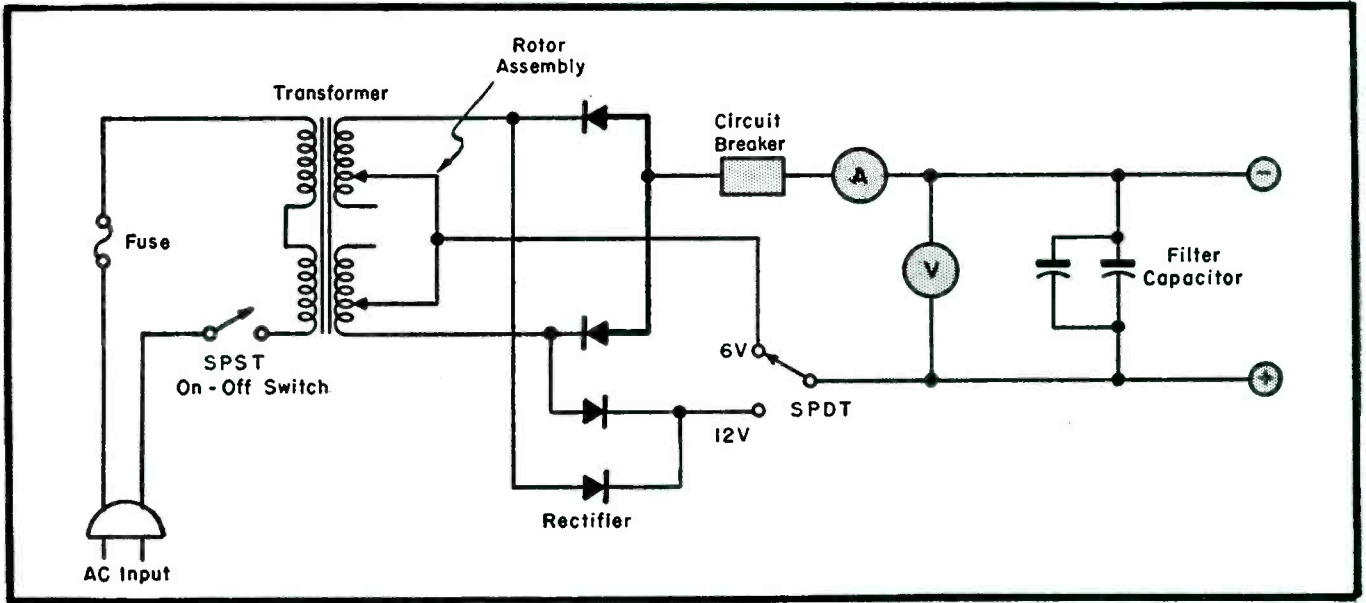
When setting up a receiver for test, the power supply should be connected to the receiver in the same polarity as that which exists in the automobile electrical system. This is important in those cases where a self-rectifying vibrator is used, because, with this type of vibrator, the wrong input polarity will cause a reversal in polarity of the high voltage which exists across the filter capacitors in the power supply. To avoid improper connection, many Service Men follow a listing of the battery grounds encountered in the various makes of automobiles and trucks; such a chart is shown in Fig. 3.

For all normal tests, such as sensitivity and output measurements, calibration, etc., the input voltage to the receiver should be its nominal operating voltage, 6.3 or 12.6 *v*, because, usually, the original engineering per-

(Continued on page 60)

Above: Checking an auto radio with a variable low-voltage *dc* power supply, designed to duplicate actual operating 6 and 12-*v* conditions.

(Ground chart, schematic and photo, courtesy Mallory)



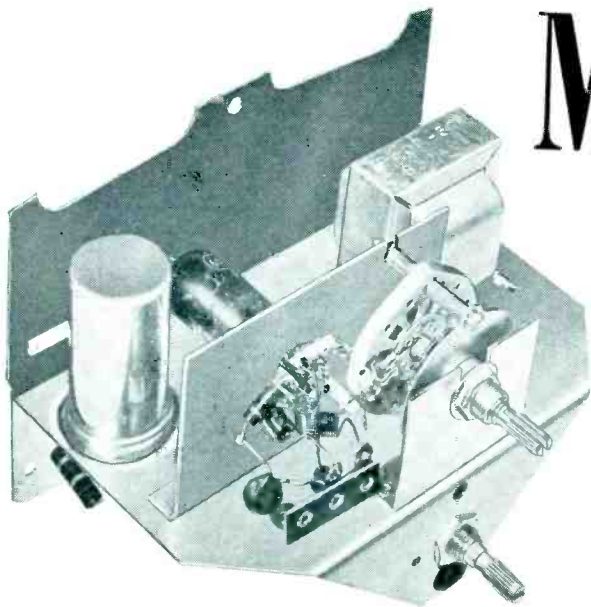
(Above)

Fig. 2. Circuit diagram of variable dc power supply.

(Below)

Fig. 3. Automobile and truck battery ground chart.

Year	1936	1937	1938	1939	1940	1941	1942	1946	1947	1948	1949	1950	1951	1952	1953
Auburn	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Austin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Autocar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brockway	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Buick	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Cadillac	Pos.	Neg.	Pos.	Pos.	Pos.	Pos.	Pos.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Chevrolet	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Chrysler	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Cord	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crosley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
DeSoto	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Diamond T	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dodge	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Duesenberg	Neg.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ford	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Ford (English)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Frazer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
GMC	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Graham	Pos.	Pos.	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Henry J.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hillman	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hudson	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Hupmobile	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
International	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jaguar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kaiser	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lafayette	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....
LaSalle	Pos.	Neg.	Pos.	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lincoln	Neg.	Neg.	Neg.	Neg.	Neg.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Lincoln Zephyr	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mack	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mercury	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
MG	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nash	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Oldsmobile	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Packard	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Pierce-Arrow	Pos.	Pos.	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plymouth	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Pontiac	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Renault	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Reo	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Studebaker	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.
Terraplane	Pos.	Pos.	Pos.	Pos.	Pos.	Pos.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Willys	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.



Modified Tuned Line UHF CONVERTER

by **RAY A. MORRIS**, Chief Engineer, Regency Division, I.D.E.A., Inc.

THERE IS A universally-accepted design axiom that satisfactory *uhf* reception is only possible when the entire system in a converter has a low noise figure, or in other words, a high signal-to-noise ratio. One must, of course, also consider equipment size and economy factors, too, in the end-product. With these views as a basis of planning, a program calling for the design of an ultrahigh converter was initiated recently, resulting in the evolution of a compact unit,¹ featuring modified tuned lines, and simplified circuitry.

The converter serves not only to permit the reception of new *uhf* stations, but also acts as a complete control device for the TV receiver. Its control knob serves a triple function of *off-on* switch for the receiver, selector for *vhf* reception, and in its third position, conversion of *uhf* to *vhf*, employing the TV set as an *if* amplifier. It employs a transformer in its power supply, which isolates the circuit from the power line.²

An analysis of the input, crystal diode mixer and output circuits with the switch in its third or clockwise position, shows that the *uhf* signal from either a separate *uhf* antenna or from the matching network of an *u/v* antenna, are fed through a filter (F_1) to the diode where it is mixed with oscillator energy to produce an *if* signal which is then fed to the receiver.

The input filter (F_1) is of the symmetrical *T* design and provides high attenuation of all signals at frequencies lower than the *uhf* spectrum. The cutoff frequency of this filter is ap-

proximately 400 mc; thus any transmission below 450 mc will be rejected, and little interference will be experienced from local TV stations in the *vhf* band or from FM broadcast or other transmissions. The crystal (X_1) is a low-noise type similar to the 1N72, which is suitable should replacement ever be required.

Oscillator energy, coupled to the crystal through a .33-mmfd capacitor (C_2) provides a heterodyne action which creates a signal across inductors L_3 and L_4 , of such a frequency that any channel (2 to 13) of the *vhf* receiver may be chosen by the user. In many converters, the inclusion of a tuned output stage limits reception to a single channel on the receiver or at most, to one of two adjacent channels.

Oscillator Circuit Tuning Element

The oscillator circuit features a simple tuning element. It employs a 6AF4 miniature triode in a modified Colpitts circuit. Cathode and heater are raised above ground potential by the heater chokes, L_1 and L_2 ; thus the interelectrode capacitance network between grid, plate and cathode, provides a positive feedback link to sustain oscillation. By proper choice of circuit constants and component characteristics, this oscillator system exhibits the desirable and necessary features of short warmup drift, low-frequency shift with line voltage change and a high order of long time frequency stability.

The tuning element, at first inspection, would appear to be a ceramic

wave change switch. Indeed, it does employ all of the elements of such a switch except the usual indexing feature, rotation being continuous except for a stop at the ends of the tuning range. Its similarity to a range change switch ends at this point, however, since the rotor shoe assemblies, together with the contact terminal clips, constitute a high Q tuned line. The silver shoes on either side of the ceramic rotor are approximately 330° in length and are connected together at one end by a rivet through the rotor which is soldered to both shoes. Terminal contact clips located at adjacent positions on either side of the stator engage the rotor shoes. As the shaft is rotated, the effective length of the tuned line is altered to change the frequency of the oscillator.

Ultrahigh converters, which change the *uhf* frequency with its video and sound information to a *vhf* channel, must employ the lower frequency side beat between oscillator and carrier. This is necessary in order that the placement of the picture carrier be on the correct side of the video *if* band pass characteristic. This is especially true in dual channel type of TV receivers which employ a separate sound channel. On such receivers, unless the converter oscillator is operating on the low frequency side, no sound can be heard due to the placement of sound takeoff traps. In an intercarrier type receiver, it is possible to obtain a spurious picture if the converter oscillator is tuned to the high-side difference point. In this case, however, the picture carrier is placed at what would

¹Regency RC-53.

²Unit is listed by Underwriters Lab.

Analysis of Unit With Crystal Mixer and 6AF4 Oscillator Which Permits Use of VHF Channels 2 to 13 in Conversion



[Left and Right]

Fig. 1. Front and internal views of uhf converter.

normally be the sound end of the video *if* pass band and the sound carrier then occurs near the position which is occupied by the video or picture carrier in normal operation. If the video pass band of such a set is, by accident or intent, perfectly symmetrical, very little difference in picture quality will be observed. Such, however, is seldom the case since a symmetrical pass band of this shape would place the sound carrier too high on the characteristic and thus result in an objectional *buzz* due to white-level picture content. In this converter, which allows any *vhf* channel to be used as the *if*, it is possible to adjust the tuning knob in such a manner as to ob-

tain these *spurious* responses. This will not occur, however, if the tuning dial is set to the correct channel number, since the other response point will be found at a spot far removed from the correct channel number on the dial.

To employ any channel from 2 to 13 as *if*, the oscillator must cover a range of approximately 380 to 700 mc, in order to accomplish conversion of *uhf* carrier frequencies from channels 14 (471 mc) to 83 (885 mc).

The oscillator in this unit has a warmup time to final frequency of less than five minutes and has a long time

frequency stability in the neighborhood of 200 kc.

Most converters, now available, employ a germanium crystal detector or mixer. There are a number of factors which influence optimum conversion of *uhf* to *vhf* with minimum noise production, with these crystals in the circuit:

(1) The noise produced in the conductors of the antenna due to thermal agitation.

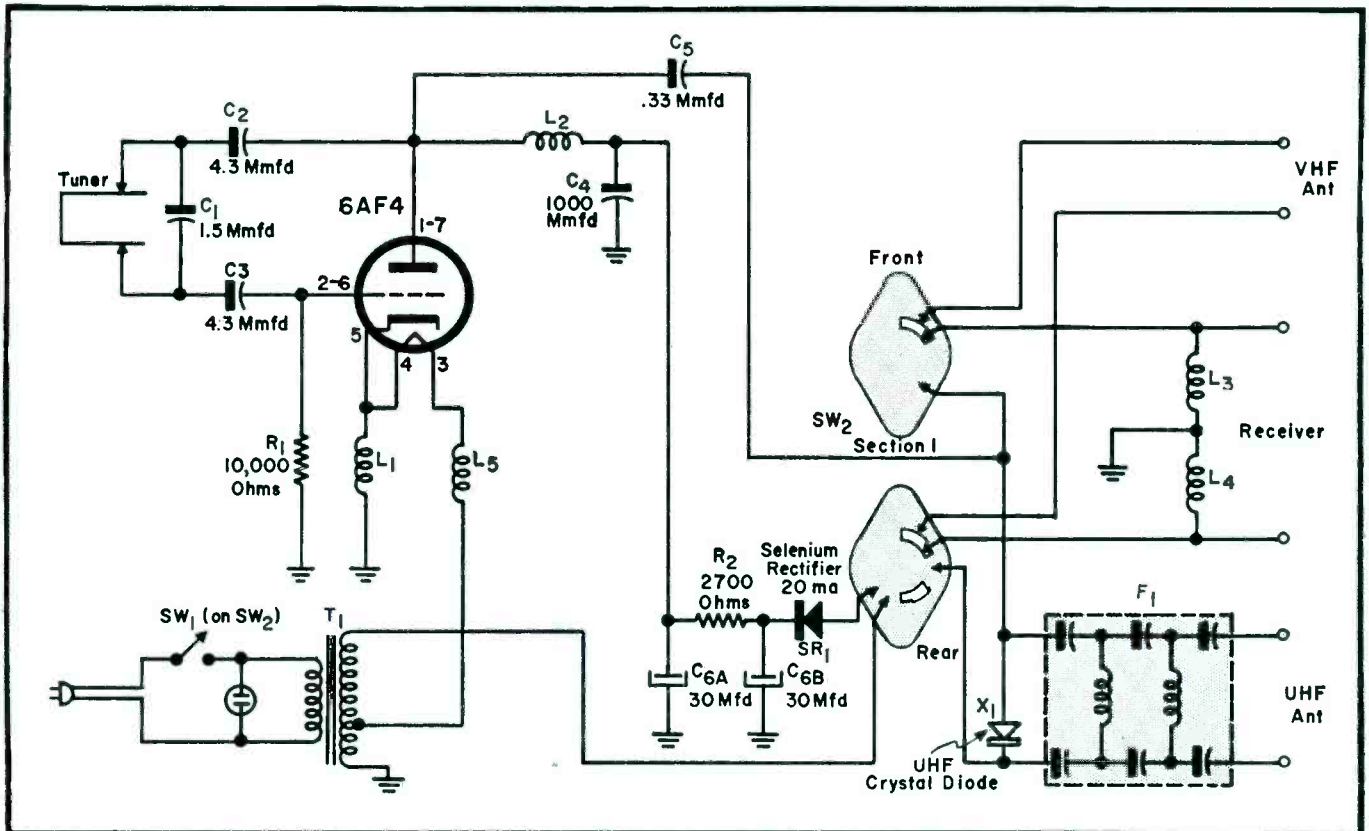
(2) Losses in input tuning circuits, tuned lines or cavities.

(3) Efficiency of match between the antenna and the crystal detector.

In the case of tuned inputs, this in-

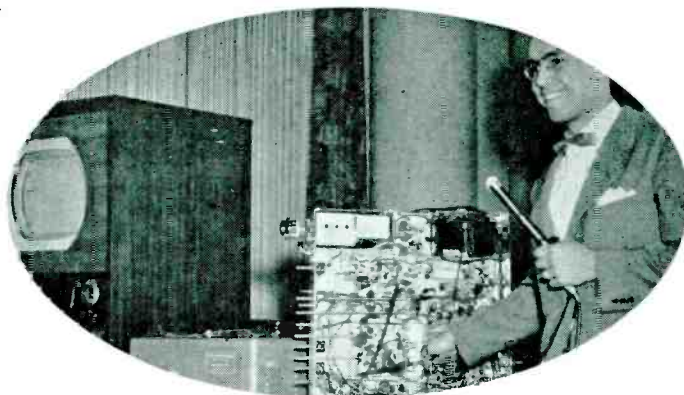
(Continued on page 62)

Fig. 2. Circuit of the hi-Q modified tuned-line uhf converter.

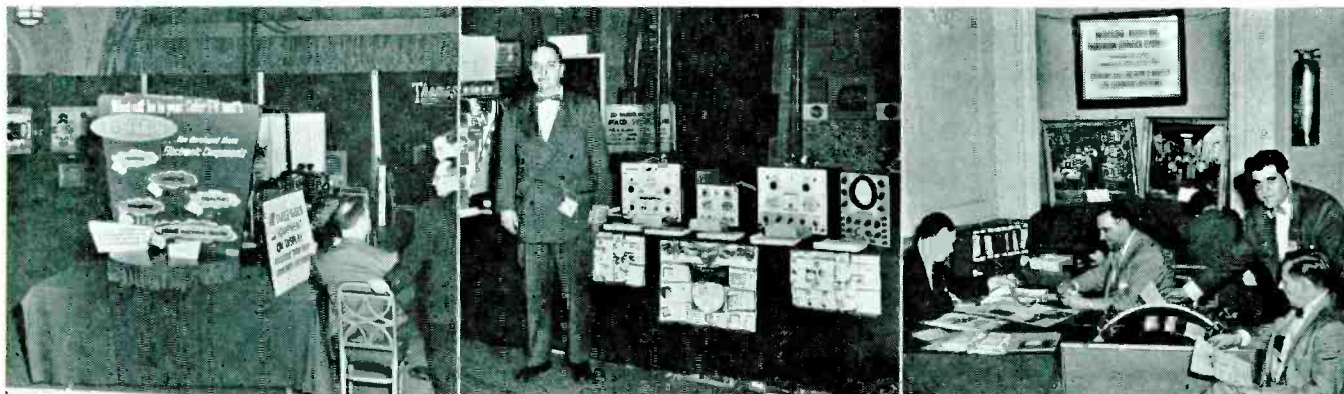


CRTSA COLOR TV SYMPOSIUM*

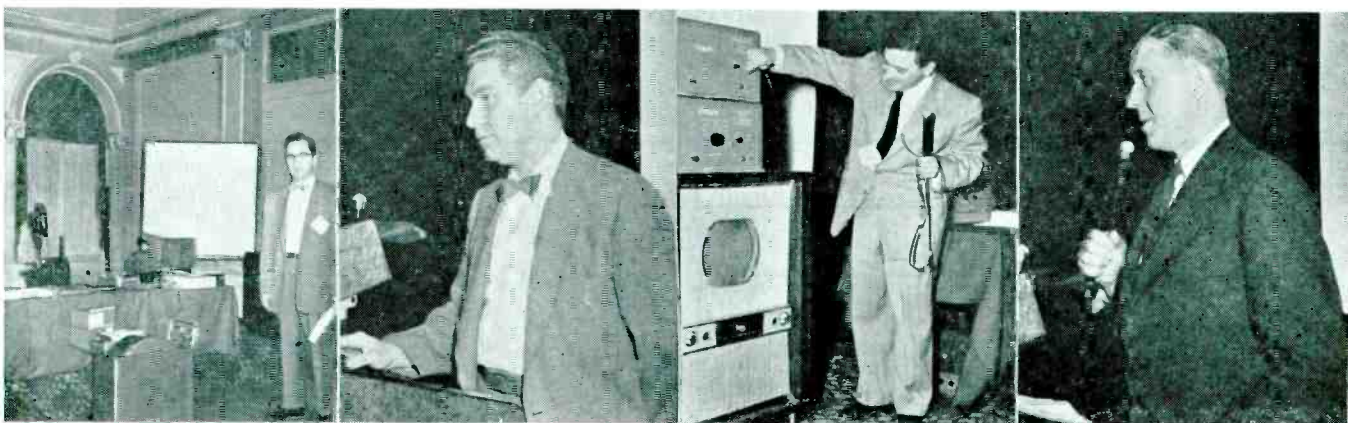
[See p. 40, 54, 55 for more photos plus report]



Right: William Nelson (Sylvania), discussing color-chassis troubleshooting techniques at symposium, using two receivers and test gear.



Left: General view of exhibition hall, where over twenty receiver, component and instrument manufacturers displayed assortment of color equipment. Center: John Stinson (Hickok), with lineup of test equipment. Right: In booth of Markem with display of business files and records designed for color and b-w TV service shops. At right (standing), Laurence Kanover, who discussed systems during symposium.



Left to right: Abraham B. Cohen (University Loudspeaker), Robert Dressler (Chromatic Television Laboratories), John Gilmore (Kay Electric), and Fred Miller (G.E.), who discussed audio systems, single-gun tubes, color-test instrumentation and color chassis circuitry, respectively. Below, left: Frank Bolnick (left) and Morton S. Klein (right) (CBS-Columbia), with color receiver and CBS-Hytron color picture tube. Center: Burt Levy with lineup of test gear, analyzed by chief engineer Robert Ricketts. Right: Display of receivers and instruments in Sylvania booth.



*Three-day conference, held in conjunction with Eastern Conference; co-sponsored by Council of Radio and Television Associations of Philadelphia, and distributors and industry associations. Technical program-exhibits were under direction of ye editor.

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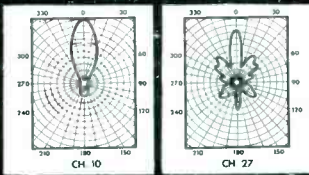
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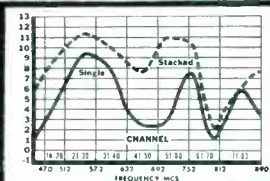
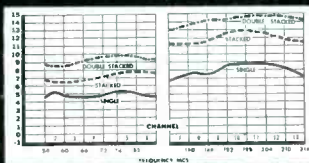


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PA for Stadiums

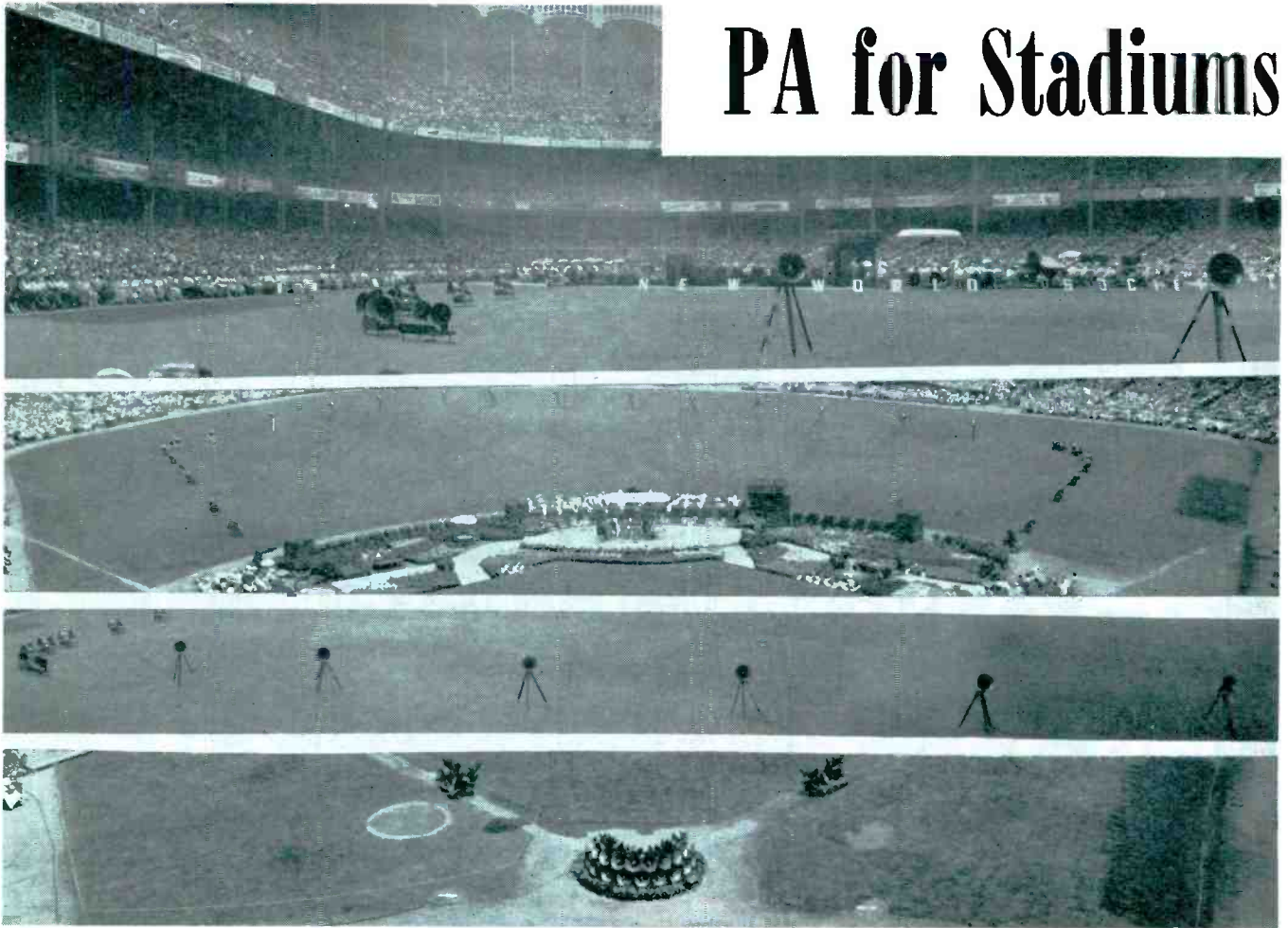
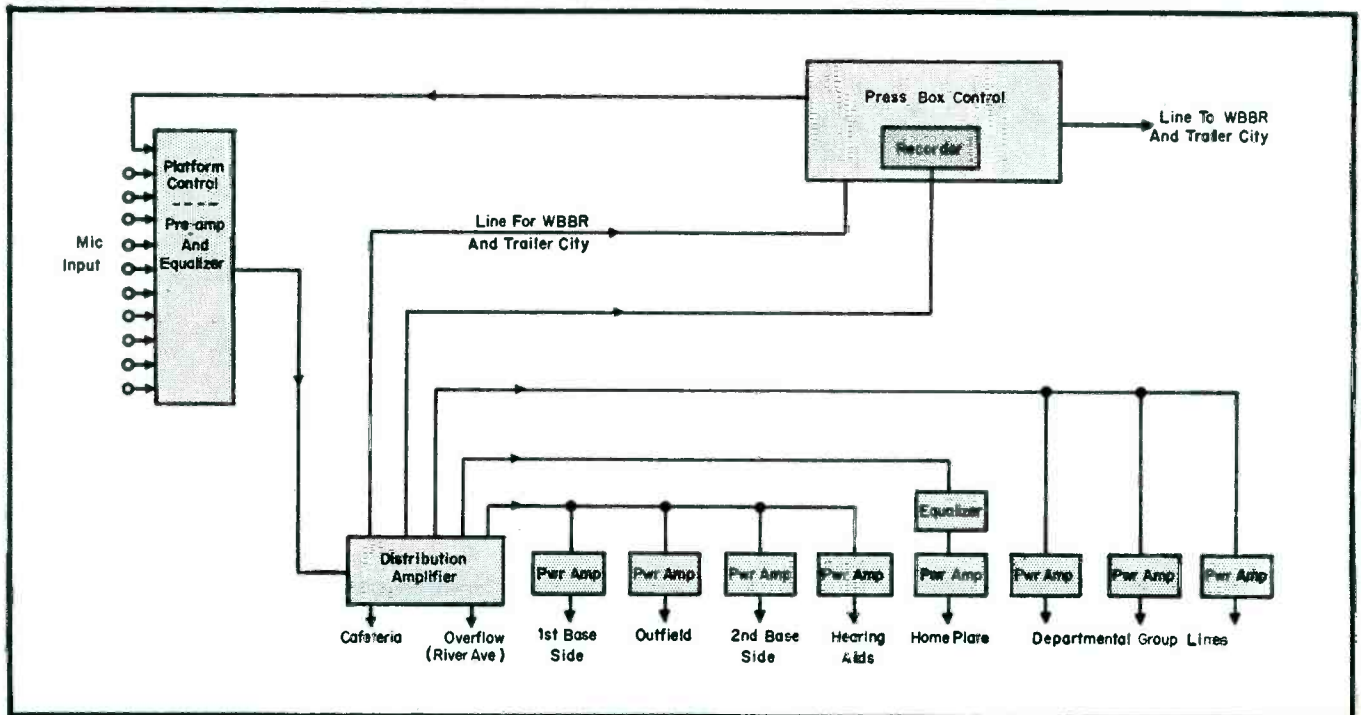


Fig. 1. A composite view of pa speaker clusters and individual reentrants at Yankee Stadium in New York City during recent convention.

(Below)

Fig. 2. Control arrangement for public-address feeds and air-program lines from stadium in New York City.



Design and Installation Account of Huge Public-Address Setup Developed to Feed 81 Reentrant Horns Supplying Audio to 120,000 Persons

by **NORMAN CROWHURST**

PROVIDING UPWARD of 120,000 persons with audio, via a *pa* network is bound to pose many problems. For a recent convention¹ at the Yankee Stadium, in New York City, it was evident that the existing equipment, good as it is for the normal requirements, would be quite inadequate. In normal usage, the *pa* system is supplementary to the program, which all the spectators can see for themselves. For this specific program *pa* was needed as a vital link, and it was essential that every person present, inside and outside the stadium, hear every word clearly.

Program Requirements

The programs consisted sometimes of talks presented from the platform centered on second base, and often extended to pick-up conversations, group singing, and orchestral music, distributed over a considerable area of the in-field. The stadium's own high-level system, with loudspeakers back of the bleachers, was found to be inadequate.

Acoustic-Echo Problems

Apart from acoustic feedback problems, it was essential to avoid excessive echo effects, which can be due either to actual reflection of sound from wall and other surfaces, or to an area being served by two speaker units in such a way that appreciable phase difference occurs.

Reentrant Horn Arrays

To insure complete trouble-free performance, first a nest of 21 high-pressure reentrant horn units² was centered on home plate, arranged to resemble an outsize multicellular unit. These units served sections of a stand around home plate, and well into the straight parts, covering all three decks with

uniform sound level. From here units mounted in pairs were spaced out along straight lines parallel with the stand configuration, one of each pair being directed to the upper stand, while the other served the lower and mezzanine floors. This installation involved 48 more units.

Finally a group of 12 units, mounted on tripods, were arranged around the outfield to serve the bleachers and those who were allowed to sit on the outfield itself during the latter part of the assembly.

Ring Source of Sound

This complete array of 81 units thus formed a large outward-facing ring source of sound, quite free of undesirable phase differences. The ring was close enough to its audience to allow the level from individual units to be kept fairly low, so that natural echo effects were nowhere sufficient to cause any confusion of sound, even when listening to speakers with *difficult* voices.

Control Arrangements

The control arrangement for the stadium installation is shown in Fig. 2. Input from various microphones, distributed over the program area, were mixed and equalized by means of a multi-channel preamp located in a small tower camouflaged as part of a scenic display. Up to thirteen microphones were used for some program items.

Mixer Feed

This mixer also received a program line from WBBR for relaying programs from the broadcast studios over the stadium installation at certain times. A line from this control point led the program to a distribution am-

plifier located in the dugout control point. This provided independent program outlets to feed various lines and power amplifier groups.

Audio Distribution

Two lines fed programs for tape recording and the link to the WBBR transmitter, the control point for these being located in one of the press boxes. Power amplifiers in the dugout control took care of distribution to various sections of the stadium system already described, to hearing aids for persons hard-of-hearing in one of the mezzanine sections, and to loudspeakers located in the various departments around the building.

Receiving End Controls

Further control points were necessary, of course, at the receiving ends of these lines, to take care of program level there, and to provide facilities for local announcements, when necessary. The various control points were linked by intercom telephone.

Foreign-Language Assembly

In addition to all this equipment for the main programs, it was necessary to install foreign-language assembly setups in sections of the stadium; thus at certain times eight separate *pa* systems were in operation simultaneously. Other supplementary *pa* systems served for local announcements at strategic points.

Assortment of Equipment Needed

The installation required upwards of three miles of wire, besides the lines rented. The vast amount of equipment (amplifiers, microphones, loudspeakers, and specialized control equipment) actually belonged to various groups who were attending the convention.

Since several kinds of units were used, variation in program quality was avoided by grouping units of the same type together on the same distribution outlet, and providing equalization where necessary to minimize quality differences.

¹Jehovah's Witnesses International Meeting.
²University types.

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SER-CUITS

[See Front Cover]

Analysis of Antenna-Top

UHF Converter

TV MASTER ANTENNA and community TV systems almost universally use antenna or roof-mounted equipment to achieve greatest gain. In *uhf* installations the antenna-mounted approach has been found to be particularly effective in view of the low-db signals available in many areas and inherent system noise problems. The need has prompted the development of special gear, such as dual-section *uhf* converters with antenna-mounted *uhf* heads and separately-mounted local-oscillators and power supplies.

The circuits employed in one system¹ (diagrammed in Fig. 1 and on the cover) feature a double-cavity-tuned *uhf* input, crystal mixer stage, and a crystal-controlled *uhf* oscillator. The converter was designed to produce a specified *uhf* channel from any specified *uhf* channel.

The head is weatherproof constructed and mounts on the antenna

mast near the *uhf* antenna terminals.

Tube complement includes a 5654 crystal oscillator tripler, 5654 buffer, 6AF4 doubler or tripler, 6AF4 doubler, and a CK710 mixer crystal.

There are three tunable cavities in the head, all similar in size and shape, being cut from rectangular brass and spot welded together. A tubular brass shaft is mounted through the center of each cavity. A conductive tuning slug inside each shaft is insulated from the conductive shaft by a thin wall of Teflon dielectric. Cavity tuning is by means of a screwdriver adjustment at the top of each cavity.

Ultrahigh signals introduced into the coax type cavities cause current flow along the inner conductive surfaces, resulting in the setting up of magnetic fields; a field effect which can be compared to the action of an inductor. An electrostatic field is set up between the shafts in the cavities

¹Jerrold 453-H and 450-H.

and their Teflon-insulated conductive slugs, creating an adjustable capacity. Thus each cavity can be considered as an ordinary *lc* tank circuit.

Signal Flow

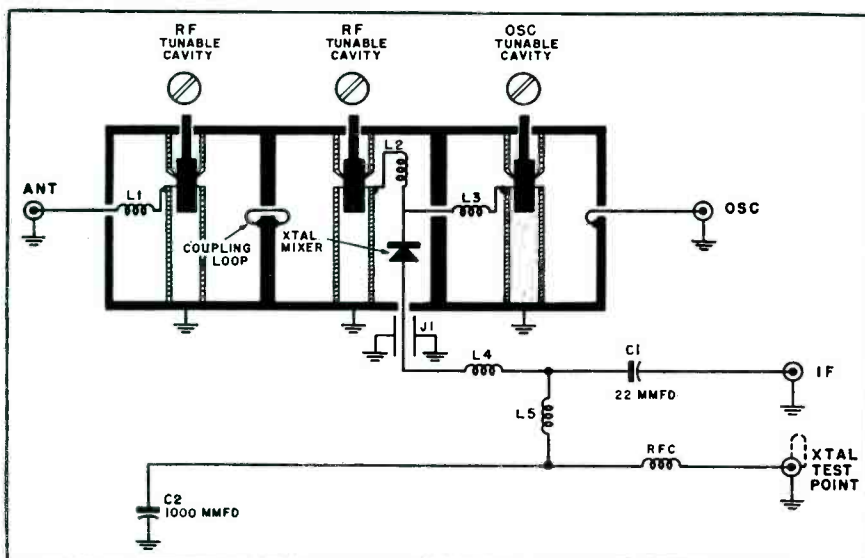
The *uhf* signals are fed to the cavity by a coupling inductance, L_1 , which also matches the low-impedance transmission line to the high impedance cavity. The coupling inductor therefore prevents excessive loading down of the cavity, which has an unloaded Q of about 800. Inductor L_1 has a self-resonant point below the *uhf* band which gives it the characteristics of a parallel *lc* circuit operating above resonance. Thus, the *uhf* coupling property of L_1 is capacitive, providing good response with little choking effect on the input signal.

The first tuned cavity resonates sharply over the desired channel. Resonating *rf* energy is induced into the coupling loop, mutually coupling the signal into the second *rf* cavity, which is also tuned to resonate over the desired channel. Together, the cavities are a double-tuned circuit that produce a 10-mc bandwidth enclosing the selected channel.

Coupling inductor L_2 feeds the *uhf* channel to the crystal mixer. Also, at this point in the circuit, the local oscillator frequency is injected from the oscillator cavity into the crystal mixer through inductor L_3 . The output of the mixer is the difference frequencies between the local oscillator frequency and the inclusive frequencies of the *uhf* channel. (The local oscillator frequency is lower than the lowest frequency of the *uhf* channel, to maintain picture and sound carriers in their proper relationship at the mixer output.) The resulting frequencies at the mixer output are *if* to

(Continued on page 32)

Fig. 1. Schematic of antenna-mounted coax converter for *uhf*; see cover.





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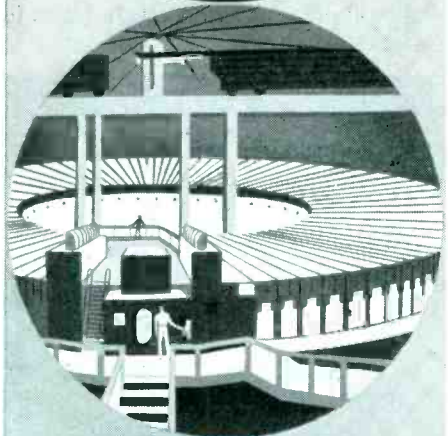
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(Continued from page 30)

the *uhf* band, but appear as normal *vlf* to any *vlf* preamp or amplifier.

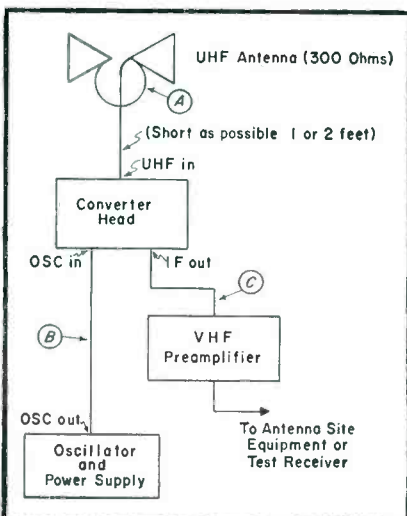
The mixer output is applied to a *vlf* bandpass network via a feed through jack *J*, whose capacity is an integral part of the network. This output network acts as a *uhf* filter, rejecting any *uhf* or oscillator signals that pass through the crystal. The *vlf* output is obtained at the *if* terminal of the head. (A test point is provided for metering crystal current. Network *C*₂ and *r/c* filters *rf* from the test point.)

All *uhf* circuit elements are physically placed inside cavities. The resultant shielding effectively has been found to confine the field around each element, reducing oscillator and spurious signal radiation.

The oscillator is controlled by an overtone crystal. A frequency is multiplied through three stages of amplification, two of which utilize a 6AF4 in grounded-grid circuits. All stages are protected by cathode bias, in case of crystal failure which would remove grid drive and grid leak bias.

The oscillator output is delivered to the *osc* connection on the head through a length of coax transmission line. The oscillator cavity in the head is single tuned to the *osc* frequency. No coupling inductor or critical matching is necessary in feeding the oscillator cavity because of the isolation afforded by the transmission line. The oscillator is said to have sufficient output to drive through 100' of RG59/U coax.

Fig. 2. Block diagram illustrating typical installation of *uhf* converter and oscillator. At A is a balun; 1/2 wavelength coax—3897/line. (To determine the mid-frequency of any *uhf* channel, the following formula can be used. From channel number subtract 14; multiply result by 6 and add 473. As an example, to find the mid-frequency (f) of channel 61: 61 - 14 = 47; 47 × 6 = 282; 282 + 473 = 755). At B is 100' of RG59/U or equivalent length of RG11/U at *uhf*. Preamp may be located at top or base of tower, depending on signal strength and line loss; C.



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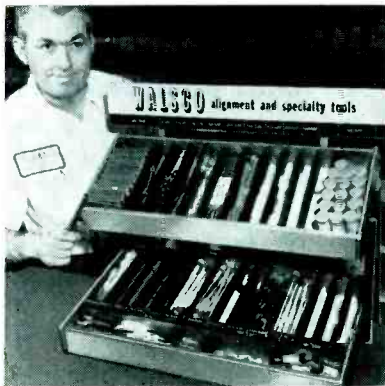
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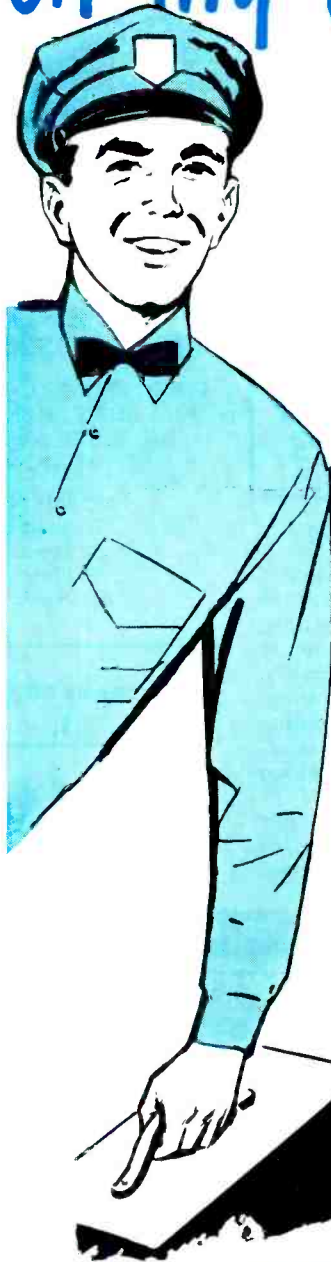
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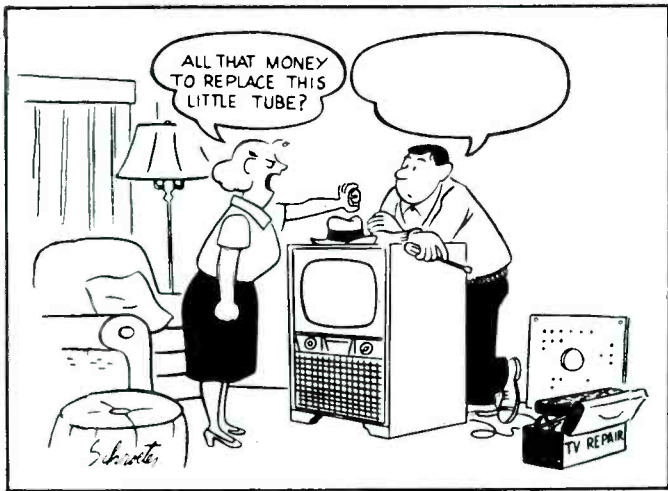
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 20 Sixth Prizes of \$70 Each in Merchandise
 30 Seventh Prizes of \$35 Each in Merchandise
 50 Eighth Prizes of \$20 Each in Merchandise
 100 Ninth Prizes of \$15 Each in Merchandise



How Would YOU Answer This Service Customer?

Your solution to this cartoon—and your careful selection of American and National League Leaders, as of August 1, 1953—can win \$1000.00 CASH for you. Send in your entry now, for one of the 209 big, valuable prizes in the Westinghouse League Leaders and Dealer Aid Contest. It's easy to qualify.

Just buy 25 Westinghouse Receiving Tubes or 1 Westinghouse Picture Tube for each entry you submit. Winning entries will be judged on the basis of correctness of team selection, and aptness, originality and effectiveness of cartoon solution.

Your Westinghouse distributor salesman will certify your Entry Blank when he takes your tube order. Ask him for additional Entry Blanks. ET-95051

YOU CAN BE SURE...IF IT'S **Westinghouse**

RELIATRON® TUBES
 WESTINGHOUSE ELECTRIC CORPORATION

Electronic Tube Division Box 284 Elmira, N. Y.

USE THIS OFFICIAL LEAGUE LEADERS ENTRY BLANK

1. League Leaders on August 1st, 1953 were:

AMERICAN LEAGUE

NATIONAL LEAGUE

2. Here is what I would say to the Lady in the Cartoon:

(Attach additional sheet of paper if necessary. 100 words maximum.)

THIS SPACE FOR DISTRIBUTOR'S SALESMAN'S CERTIFICATION

I certify this Entry Blank has been qualified by the purchase of (25 Westinghouse Receiving Tubes) (1 Westinghouse Picture Tube)

Salesman's Signature.....
 Company Name.....
 City..... State.....

SEND ALL ENTRIES TO:
WESTINGHOUSE TUBE CONTEST

P. O. Box 610, Grand Central Station New York 17, New York

SERVICE... *The National Scene*

PICTURE TUBE DEVELOPMENTS CONTINUE TO DOMINATE B-W/COLOR DESIGN ROW--Wider angles, shorter lengths, and increased screen areas of picture tubes, subjects of intense research ever since the early b-w days, have now entered a new development-design cycle. The greater picture-size-to-tube-length ratio of the 90° tubes (originated over a year ago) are now beginning to impress scores of setmakers, who feel that the tube offers the all-important feature of compactness in chassis and cabinet design. . . . One manufacturer has indicated that the 90° tube, it plans to use, provides over a dozen more square inches of picture area than the 70° type now being used. And, another firm is planning to promote a 90° tube as a 270-square inch model. . . . The disadvantage of higher-cost components required to drive the wider-angle tube is being discounted by many, who say that the cost is a negligible factor when compared to the smaller chassis and cabinet size features that obtain.

IN COLOR TV, the use of photographic techniques to process dots on the picture-tube screen, has again come to the forefront as a solution to the production of larger tubes. . . . A leading picture-tube manufacturer has developed a 1,300,000 color-dot electrostatic-convergence 19" model, which is said to provide 185 square inches of viewing area, with the color phosphors applied directly (through a photo method) to a curved faceplate. The size of each phosphor-dot in this tube is claimed to be approximately twelve one-thousandths of an inch. Positioned immediately behind the faceplate is an electron shadow mask featuring a curvature identical to that of the faceplate. . . . The length of the tube has been shortened by the use of a 60° deflection angle; size of the tube is 12-9/16" by 16-9/16". . . . Three beams are used, but the beams have been spaced closer, permitting the use of a common convergence control. . . . The beam-to-beam spacing in this new tube is said to be 70% of that used in current 15" models, a design made possible by the use of an electron gun utilizing grid parts of smaller diameter than the half-inch size common to b-w TV. By making use of a high resolution G₁-G₂ design, company engineers said that it was possible to shorten the electron gun and utilize the same proportion of the lens diameter as used in the older, larger-diameter gun design. . . . Comparing the available pix area of the newly-developed tube with other types, the company's prexy said that the planar-mask 19" model, now coming off the line, offers 160 square inches, while the single-gun 21" and 22" rectangular models offer 155 square inches. The 15" tricolor tube, featured in current models, provides 88.5 square inches of viewing area. . . . The new tube, it was said, will appear in a line of color sets scheduled for late fall release.

100 STATIONS SCHEDULED TO CARRY COLOR THIS FALL--Discussing the present status and immediate prospects of color TV, the prexy of a network said recently that by fall of this year at least 100, and perhaps more, stations will be equipped and ready to carry polychrome programs on a consistent weekly basis. . . . And, within a year, it was reported, up to 200 stations will be equipped to transmit network color, and about a dozen or so will be able to originate local color programs at that time.

14 MILLION MORE WILL HAVE TV IN THREE YEARS--Approximately \$5-billion worth of TV receivers will be sold within the next three years to about 14 million now without TV, the vice prexy of a setmaker forecast recently. There is no doubt, he said, that of the four-million families living in electrified homes, 95% will have TV within three years. This means, he added, that over 42-million families will eventually have sets, compared with today's 28-million, not counting the new families being formed at the rate of 800,000 a year. . . . In a review of replacement requirements, it was pointed out that within the next three years, set owners will purchase nearly seven million new sets, and the annual replacement business, when TV reaches its final penetration of 97 or 98%, will total at least 6-7 million sets a year.

SERVICE... The National Scene

BOOSTER TO IMPROVE UHF COVERAGE TO BE TESTED--Experimental field tests of a method designed to extend coverage of ultrahigh broadcasting to shadowed areas will soon be launched in Jackson, Miss., in cooperation with WJTV, operating on channel 25. . . . The system, utilizing a low-power auxiliary transmitter, will be installed near Vicksburg, about 37 miles from the main transmitter. Use of the booster is expected to provide grade A service for the station's signal in that area, where because of geographic elevation problems reception now is completely shadowed.

AMERICAN STANDARD ON LETTER SYMBOLS ON ACOUSTICS RELEASED--A new standard, listing more than 100 symbols for terms used in the measurement of acoustics, is now available. . . . The new symbols, which will soon appear in text books and most technical publications, including SERVICE, cover such factors as acoustical power and response; antiresonant frequency; mechanical and rotational compliance; decay constant; flare coefficient in a horn; linear displacement; magnetic field strength, flux, flux density and leakage coefficient; acoustical, electrical, mechanical and rotational power; sound pressure (average, excess, instantaneous, maximum and peak); reluctance; resonant frequency; acoustical, electrical, mechanical and rotational response; total acoustical absorption in a room; and velocity potential. . . . Preparation of this important standard was begun in '49 by a group chairmaned by Harry F. Olson.

ST. LOUIS SERVICE ASSOCIATION REELECTS PREXY--Vincent J. Lutz was recently reelected president of the Association of Television Service Companies of Greater St. Louis. Others named were: Laverre Grimm, first vice president; Barney Lewis, second vice president; Clyde Goodwin, treasurer; Morton Singer, secretary, and Buck Gaynor, sergeant-at-arms.

COMMISSION EXPECTS TO INTRODUCE RADIATION REGULATION--RETMA's drive to stop interference, detailed last month in these columns, may soon have the official support of the FCC, who are now taking steps to amend the present rules to regulate all radiation. . . . Manufacturers had been warned earlier that if they did not take voluntary steps to provide shielding in sets that would stop radiation, government action would obtain. Now, the Commission proposes to follow the certification plant outlined by RETMA, with the actual work of certifying to be done, it is hoped, by manufacturers. The regulation, it was said, will probably be placed into effect in the early summer. . . . Two categories of radiation were described by the the Commission---incidental and restricted. Incidental-radiation units were catalogued as those in which the production of radiation was unintentional, such as in electric power lighting or ignition devices. In the restricted-radiation class were included carrier-current communication systems, laboratory signal generators, beat-frequency oscillators and oscillators in receivers, low-power rf generators, and remote-control gear using radio energy, such as garage-door openers and record players. Incidentally TV and FM sets have always been bluntly described by the FCC as little transmitters, requiring design control. The Commission also reported that it was concerned about interference caused by coax-cable distribution lines of some community-TV systems, where radiation has been smearing pictures in the homes of non-subscribers. . . . The edict will not only affect those who make apparatus, but those who use it. To illustrate, it will be up to those who use electronic systems for control to see to it that their equipment does not play havoc with any local sets. Prompt remedial action will be imperative, here, too, the Commission warns. So, it appears as if everyone will have to be on guard to the peril of radiation.--L.W.



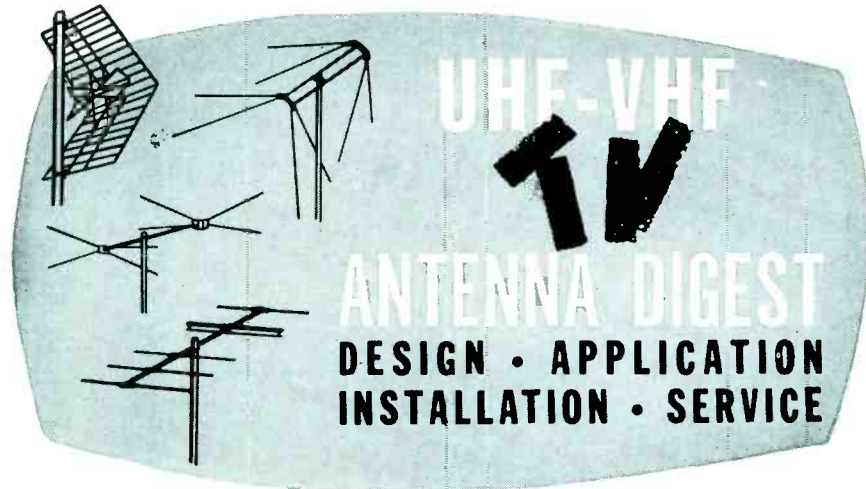
Daddy says the New

Jensen 1-A-DAY SALES PLAN

*(with that cute little Needle Caddy Kit)
has turned the Service Business upside down!*

P.S. *He's making lots of sugar now—
sellin' needles on every service call!*

Cures for Adjacent-Channel Interference Via Antenna Orientation, Transmission Line Traps, Hi-lo Channel Stubs



Transmission Line Traps Hi-lo Channel Stubs

by

RALPH G. PETERS

AS PRIMARY SIGNALS become available in areas that were formerly fringe, and those who had sets installed for DX pickup continue to look for this extra coverage, receivers may be required to reject the adjacent local channel signals which, in extreme cases, may exceed the *distant* signal by 50 or more times.

Adjacent channel interference is usually most bothersome when the undesired station is on the *lower* channel. Here, the interference is due principally to the lower channel sound carrier, resulting in a visible changing beat in the picture. Adjacent channel interference from the *higher* channel rarely affects the desired FM sound channel, while such picture interference as may exist may often be reduced, or eliminated by careful ad-

justment of the fine tuning control (intercarrier sets).

Many remedies may be applied to reduce or eliminate this type of interference. One method, found to reduce interfering channel signal strength at the receiver, requires orientation of antenna for weakest signal from the undesired adjacent channel. An excess of signal strength is available so that the undesired adjacent channel signal may be attenuated considerably without affecting reception. An increase in the height or location of the receiving antenna may also be of advantage in obtaining a stronger signal from the desired station. This will reduce the ratio of the interfering signal to the desired signal, thus reducing the interference.

An antenna with good front-to-back and front-to-side ratio must be selected so that orientation or rotation of the antenna effectively nulls out the undesired signal.

Transmission-Line Traps

Transmission line traps¹ taped to the 300-ohm leadin and tuned to the interfering adjacent channel should be used. These traps consist of a $4\frac{3}{8}$ " piece of 300-ohm line shorted at one end and a 10-160 mmfd variable ceramic capacitor connected across the open end. These traps, because of their narrow bandwidth and high attenuation, are particularly effective in reducing adjacent channel sound interference.

A similar trap for the high *vhf* channels may be made by using a 2.5-13 mmfd variable ceramic capacitor and the same line length as mentioned. If the desired picture carrier is affected,

a $\frac{3}{8}$ " or $\frac{1}{8}$ " piece of cardboard may be inserted between the trap and the transmission line to reduce the coupling, which will improve trap selectivity.

Care should be taken in tuning this trap as it is easy to pass by the correct tuning point.

Strong Signal Area Problems

In very strong signal areas, cross modulation of the two channels may exist in the *rf* tuner, exhibiting a condition that appears as adjacent channel interference. In this case, the use of a stub may prove effective. Caution should be exercised if a number of channels are to be received, as the stub may affect reception on these other channels. Provision may then be

(Continued on page 64)

Fig. 1. Illustration of stub constructed of 300-ohm twin lead, cut to frequency of undesired signal. An open quarter-wave stub on low channels and a shorted half-wave stub on high channels will provide maximum attenuation. For channel to be attenuated (pix), L=88.5" (channel 2); 80" (channel 3); $72\frac{7}{8}$ " (channel 4); $63\frac{1}{2}$ " (channel 5); $58\frac{7}{8}$ " (channel 6); $27\frac{3}{4}$ " (channel 7); 27" (channel 8); $26\frac{1}{4}$ " (channel 9); $25\frac{3}{8}$ " (channel 10); $24\frac{3}{8}$ " (channel 11); $23\frac{7}{8}$ " (channel 12), and $24\frac{1}{4}$ " (channel 13). Resistor is a 47-ohm composition type which has been found to result in a 2.5:1 reduction; a small value resistor results in greater attenuation. With the ends shorted, an 8:1 attenuation can be obtained on the high channels. Stub lengths can also be determined from the following formulas: For a half-wave stub, $l = 4900/fmc$; for a quarter-wave stub, $l = 2450/fmc$.

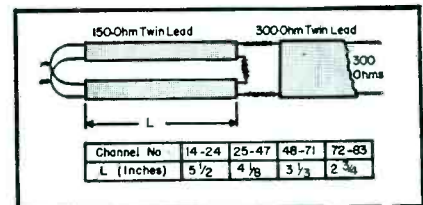
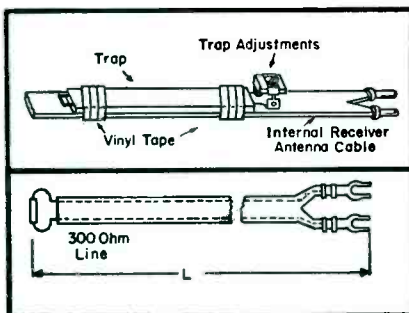
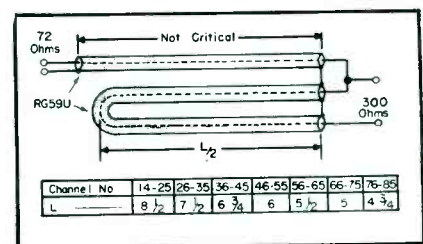


Fig. 2. Twin-lead balun makeup and length chart.

(Below)

Fig. 3. Construction of coax balun and length chart (in inches).



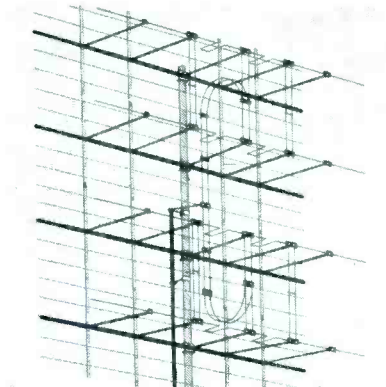
¹From notes prepared by RCA Service Company.

²Such as RCA 78818.

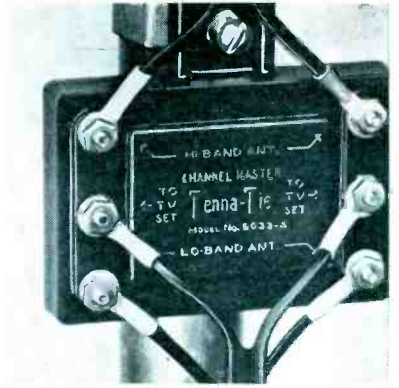
Review of New Tuners, Converters, Antennas, Arresters and Hardware



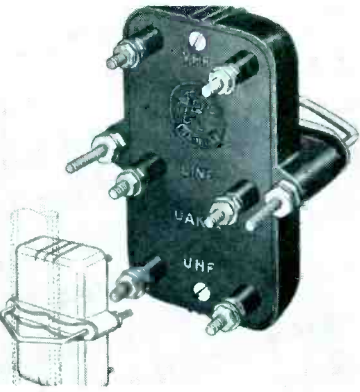
Concealed uhf all-channel converter designed to fit completely inside a TV set. All that can be seen of finished installation is a plastic selector dial and switch. Converter also offers a choice of mounting positions; at left, right or top of cabinet. (Model 188; P. R. Mallory and Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.)



Fringe-area antenna with a Fro-Bac screen designed, it is said, to deliver a high front-to-back ratio. Field tests disclosed, it is claimed, that screen almost completely eliminates venetian blinds. Screen comes preassembled with antenna. Is of all-aluminum construction. (Model 400-SA; Finney Co., 4612 St. Clair Ave., Cleveland, O.)



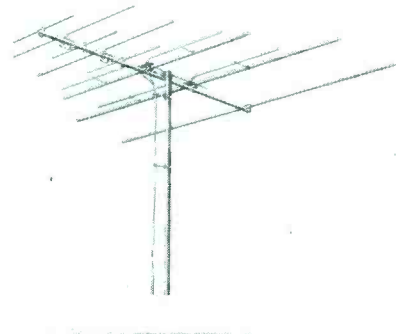
Inter-action filter designed to join high and low band vhf antennas for use with a single transmission line. Incorporates separate high and low pass filters, replacing the parallel resonant circuit previously used, so that lead lengths, it is said are no longer critical. Designed with a cut-off frequency of approximately 125 mc. (Model 9033-A; Channel Master Corp., Ellenville, N. Y.)



Filter network said to function as a low loss filter. Has a polystyrene case with molded standoffs, and positive gripping to fit almost any mast. For segregating vhf and uhf at the set. (Model UAK-4; Radiart Corp., 3455 Vega Ave., Cleveland, O.)

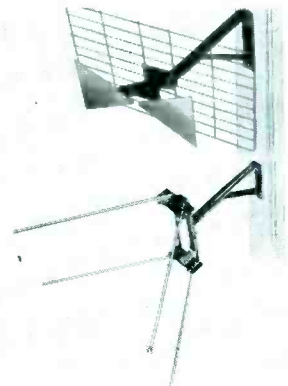


UHF booster with two 6AN4s in a push-pull grounded grid, neutralized circuit. Booster covers approximately one third of band. Capacity tuning. (Senco; Service Instruments Co., 422 S. Dearborn St., Chicago 5, Ill.)



VHF antenna featuring a multi-resonant dipole with electro-lens focusing (consisting of first five elements) which it is said serves to focus signal on the driven or collector elements. (Interceptor; The John Winegard Co., 3000 Scotten Boulevard, Burlington, Iowa.)

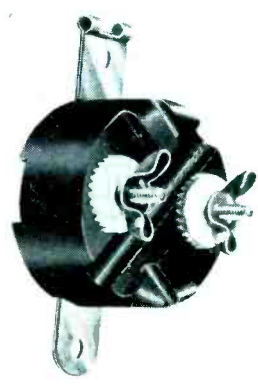
TV window-mounted antennas for uhf and vhf. Bow tie style (top), for uhf reception, features wishbone free air insulator. Antenna will swing in any direction. Stacked V-antenna (bottom) can be used for uhf and vhf. Adjustable approximately 120° (vhf) to 160° (uhf) when mounted against a wall or flat surface. (Models 9056 and 9057; Telco Window-Tennas; Television Hardware Mfg. Co. (Division of General Cement Mfg. Co.), 919 Taylor Avenue, Rockford, Ill.)



A uhf tuner developed for concealed installations; metal-cased tuner mounts at rear of TV set, and slide-rule tuning dial protrudes slightly above top, while tuning knob and selector switch are accessible at right rear. Unit incorporates coax-cavity continuous tuning over the entire uhf band and preselection. (Hiway models HT-1, HT-2 and HT-3; Granco Products, Inc., 36-17 20th Ave., L. I. C. 5, N. Y.)



Arrester which handles all types of lead-in; open, flat, jumbo, oval or perforated. Mounting strap is an integral part of unit. No separate strap or bracket is required. Can be mounted on wall or any pipe up to 1 1/2". One end of mounting strap is designed to grip No. 8 ground wire generally used. Other features are flame-proof mahogany phenolic bodies and all brass hardware. (Mark VII, LA-75; Radion Corp., 1130 W. Wisconsin Ave., Chicago, Ill.)



3 in 1

LIGHTNING ARRESTER

JFD MANUFACTURING CO.
BROOKLYN 4, NEW YORK



① For all UHF or VHF tubular twin leads

ULTRA LOW LOSS DESIGNED FOR HIGHEST UHF GAIN

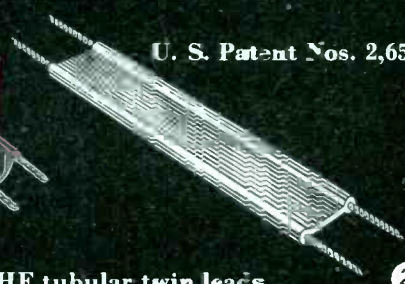
DON'T RUIN your installation with a lightning arrester of high insertion loss. Install the arrester that's an asset instead of a liability to your UHF or VHF installation—the JFD "3-IN-1" with the ultra low loss compensating coil circuit. Thousands of installations prove the "3-IN-1" gives the lowest insertion loss of any arrester in use today. Patented strain-relief lips and patented saw-tooth washers are exclusive JFD extras at no extra cost.

Write for Form 210.

No. AT110 with hardware for wall or window sill.....\$1.50 list

No. AT110S with UL approved stainless steel mounting strap\$1.75 list

U. S. Patent Nos. 2,654,857; D-159,330



② For VHF flat twin leads



③ For UHF-VHF open wire

At COLOR TV SYMPOSIUM

(Continued from page 24)



Members of the information-please forum of symposium, left to right: John A. Hickey, Raytheon; J. A. Milling of Howard W. Sams, who served as a moderator during a session; the editor, Harry Ehle, IRC; Al Haas, CRTSA; Everett Boise, CBS-Hytron; and Max Baum, Brook Electronics. Others on the panel included J. Popkin-Churman and Robert Dressler. Among problems reviewed were standardization of picture tubes, color TV test patterns, hi-fi standards, warranty standards and TVI.

Left to right: W. L. Roberts (Westinghouse), Robert K. Hunsicker (Wicks Engineering), Edward M. Noll and John F. Rider, who were also featured speakers at symposium, and covered the following subjects: luminance signal in the color set, testing and monitoring of color signals, color-set frequency considerations and fundamentals of color, respectively.



Rep Talk

MESSAGE CENTER to be manned by The Reps at the Parts Show, May 17-20, will be located on the fifth floor lobby of the Conrad Hilton Hotel. Extra telephones in the information booth, direct-call services, and a complete file of show registrants will also be available at the center. Phone extensions for service are 870 and 871. A hospitality suite in room 14 on the fourth floor will also be maintained for the convenience of out-of-town visitors. . . . Nine members will now serve on the national board of governors of the Reps, each to serve three years successively. . . . *Meyer Zykoofsky*, Mexico City, is now a member of the Reps, bringing total of members-at-large to six seniors and three associates. . . . *R. M. Campion, Jr.*, has been elected president of the southwestern chapter. Others elected include: *Lloyd S. Lund*, vice president; *Hal F. Corry*, secretary; and *John B. Buenther*, treasurer. . . . *Russ Diethert* has moved to larger quarters at 2030 W. Montrose Ave., Chicago 18. . . . *Frank C. Nickerson Co.* is now at 901 Bernina Ave., N.E., Atlanta 6, Ga. . . . *Wayne Beitel* has a new address: 139 W. Maple, Birmingham, Mich. . . . Other reps who have moved include: *Robert H. Vermilya*, to 1258 Fitzgerald Ave., San Francisco 24, Calif.; *Norman Kathrinus*, now at 4356 Duncan Ave., St. Louis 10, Mo.; *Ted Felleisen*, to 5839 Montrose Ave., Chicago 34; and *Kaelber and Mack*, now located at 1 Park Ave., Manhasset, N. Y. . . . *A. H. Patton Co.*, 709 Walton Ave., Atlanta, Ga., has been appointed rep for Synder Manufacturing Co., in Tennessee, Georgia and Alabama. . . . *Frederick I. Kantor*, 4010 Saxon Ave., New York 63, N. Y., has been named rep for Brooks Laboratories. *Leonard Zlowe*, formerly associated with The Burndy Engineering Co., has been appointed a sales engineer for the firm. . . . *Don Sullivan*, formerly with the publicity department of Furness Lines, has joined Art Cerf and Co., 744 Broad St., Newark, N. J., as dealer contact man in the metropolitan New York area. . . . *Franklin Y. Gates Co.*, 200 S. Main St., Salt Lake City, Utah (Colorado, eastern Idaho, New Mexico, Utah and Wyoming), and *J. P. Sukup and Co.*, (Michigan), are now reps for the Hall-dorson Transformer Co. . . . *Jack F. McKinney Co.* (Texas, Oklahoma, Arkansas, Louisiana and Mississippi), and *Land-C-Air Sales Corp.*, (Upstate New York, eastern Pennsylvania, Maryland, Delaware, Washington, D. C., and Virginia), have been appointed reps for Berlant Associates. . . . *Electro Sales Co.*, Syracuse, N. Y., has been named rep for National Electric Products Corp., in New York, excepting metropolitan New York City and Westchester county.

A. H. Patton

Don Sullivan



Outperforms them all..!

- in moisture resistance
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- in long troublefree life



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Telechief®

MOLDED PAPER TUBULAR CAPACITOR

The Telechief will outlast all other tubulars! MIL-C-91A tests prove that Telechiefs have a final insulation resistance value 10 to 15 times greater than paper tubulars molded in any other material. That's because they're molded in HUMIDITITE!

YOU GET EXTRA VALUE AT NO EXTRA COST! This amazing new capacitor—that meets specifications so tough that no previously existing paper tubular could approach them—is a *premium* tubular at the price of an ordinary one. See your Sangamo Distributor today!

VISIT BOOTH 776 AT THE MAY PARTS SHOW



SANGAMO ELECTRIC COMPANY

MARION, ILLINOIS

SC54-B



AUDIO

INSTALLATION AND SERVICE

Hi-Fi - Phono - Tape - P A
Amplifiers - Speakers

Survey of New Products

by **KEN STEWART**
and **PAUL EDWARDS**

Powering Tape Recorders in Autos With Inverters †

THE USE OF TAPE or wire recorders in cars, while en route, for spot reporting or aural filing of sales information, once considered a pure novelty, has been found to be a very practical and sensible approach. Dictating on the roll, has become so sound an idea, because of the development of sturdy, highly-efficient magnetic recording and power conversion equipment.

One setup, evolved by a roving reporter, features use of a multiple-speed tape recorder,¹ capable of accepting up to two hours of dictation on a single reel of plastic tape. This sits securely in place in the center of the front seat, on a plywood wedge, to keep it level. To prevent the recorder from plunging to the floor, in the event a sudden stop is needed, a leather belt around the machine passes between the folding seat backs and is secured to the frame of the seat below. The microphone, on an 8' cord, is simply suspended from a sun visor above the steering wheel, where it swings a few inches away from the lips of the driver-writer. When some one else is driving on more extended

trips, the microphone can be held in one's hand. In either case, the recorder has been found to operate smoothly over any sort of road, and can be simply lifted out of the car whenever necessary.

Power is supplied by a special tape-recorder inverter,² which mounts under the dash. Supply cords from the inverter to the battery pass through a half-inch hole, already present in the firewall of the car, which in this case, is a '53 Olds 88. One cord is grounded to the engine block, and the other permanently attached to the positive plug of the battery, by means of a clamp pin and a hole drilled through the lead battery post. The car features a 12-v battery system, which has been found to put more *muscle* in the electrical service, and which is recommended highly for meeting the extra load of hours of dictation.

A switch on the inverter itself provides the necessary 110-v output to operate the recorder, while a four-position knob varies the output as required, for dictating when the engine

is off, or when in transit. The power system has been found to provide a smooth supply, at 100 watts or better, more than adequate to keep the recorder turning at the lowest power output setting.

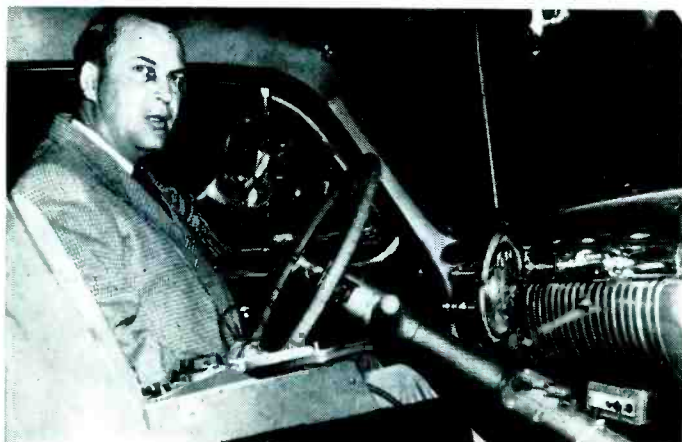
Not only has the tape recorder and the inverter been found to do away with note-taking, but it is ideal for the preparation of *question and answer* articles. To write such a story, the subject is asked to step into the car, where the questions and answers can be recorded *on the spot*. Where it is not possible to conduct the interview in the car a portable mike with a 50' extension has been used, and the conversation recorded on the tape unit.

This tape-inverter-equipped *rolling office* has played an important role in many news beats. During the recent Greenlease kidnap-murder case, the car setup was used to record the events as rapidly as they occurred. A 24-hour vigil was put in at the police station, and reels of tapes were prepared. To save delay, tapes were air-expressed to newspapers and magazines.

Perhaps the most important application of the inverter-recorder combination to on-the-spot reporting was the devastating tornado which laid Waco, Texas, flat in seven minutes last May. The flying rubble missed the recording car, fortunately, and it was possible to keep the recorder available for use. While rescue teams cleared away brick and stone piled five feet deep in the middle of the street, the engine was kept running for hours at a time to provide power for the inverter. Once again, shipping

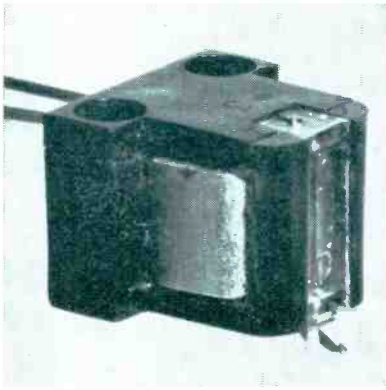
(Continued on page 70)

†From notes prepared by **Robert A. Latimer**.



Roving reporter Robert Latimer in his tape-recorder/inverter equipped rolling office. (Courtesy ATR)

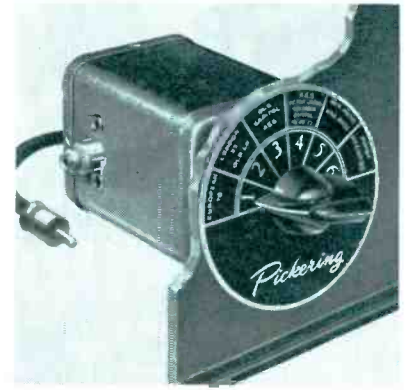
for Audio: Pickups . . . Coax Speakers . . . Compensators . . . PC Preamps



Phono pickup of the electrodynamic type, said to be built like a D'Arsonval meter movement. Tiny loop of fine wire, wound on a Permalloy armature, is mounted between pole pieces of an Alnico magnet. To one end of supporting shaft is attached a light arm about 3/16" long, the free end of which holds a sapphire or diamond stylus. As the latter rides grooves of record, it moves from side to side, causing armature to move radially within the field of the magnet, and inducing varying voltage in the coil. (Electro-Sonic Labs, Inc., 3215 36th Ave., L. I. City 1, N. Y.)



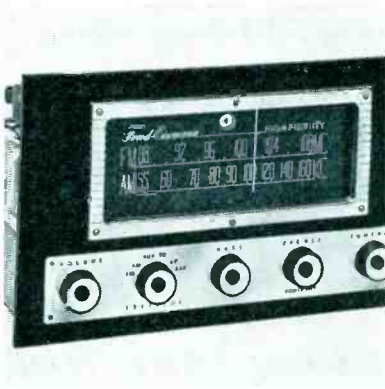
Wireless microphone whose output on 2-mc is picked up on a 9-tube FM set, and then fed to standard amp and speaker system. Mike weight is 16 ounces; diameter 1 3/8" and length 12". Transmitter tubes include three CK526AX (rf) and two CK512AX (af). Operating area said to be 500 to 5,000 square feet, depending on signal-to-noise requirements. Can be in form of a circle, rectangle, square, etc. In installation, copper wire is strung around operating area, and fastened to the molding, ceiling, wall or baseboard. Copper wire, No. 30 or heavier, can be used. (Vagabond 88; Shure Brothers, Inc., 225 W. Huron St., Chicago 10, Ill.)



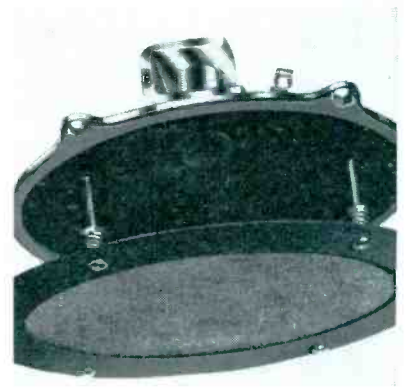
Record compensator with a new position designed to match the orthophonic-AES recording curve recently adopted by RCA-Victor, Columbia, Capitol and Decca. Other positions are: European 78; London 33-old LP (for most makes of 33 1/2 records made before June '53); Capitol-old AES; maximum highs-maximum bass; and noisy records. (Model 132 E Compensator; Pickering Co., Oceanside, L. I., N. Y.)



A 12" coax speaker, with a 2" voice coil operating 12" diaphragm from an enclosed magnet structure using 1 1/2 pounds of Alnico V. Coupled through a 5900-cps high pass filter network are a Dural diaphragm and a 1" voice coil. Has a nominal impedance of 12 ohms. Power capacity is 20 watts. (Model 122AX, Stephens Manufacturing Corp., Culver City, Calif.)



AM-FM chassis, which incorporates a 10-watt amplifier. FM unit features afc and a Foster-Seely limiter-discriminator. Multi-purpose tubes are used throughout. Additional features include a preamp for variable reluctance phono pickups; treble and bass controls; jack for a tape recorder and an electronic tuning eye. (Model P-717; Freed Electronics and Controls Corp., 200 Hudson St., N. Y. 13)



Rear-seat auto speaker kit, with a 5" x 7" speaker using a 1.47 ounce Alnico V magnet, and a 3/4" voice coil. Can be used in Ford, Chrysler, Studebaker and Hudson cars. (AS-3; Quam-Nichols Co., Chicago, Ill.)

At recent high fidelity fair in Washington, D. C., where plastic model of two-way speaker system was displayed and demonstrated. (Duetts Du-201; Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 38, Ill.)

Unidirectional studio microphone featuring use of patented Uniphase system. (Concert

Line 333; Shure Brothers, Inc.)

Tape recorder featuring printed circuit preamp. A push button model, recorder is a 2-speed type, and includes a 10-watt amplifier. (Crestwood 303; Daystrom Electric Corp., Poughkeepsie, N. Y.)



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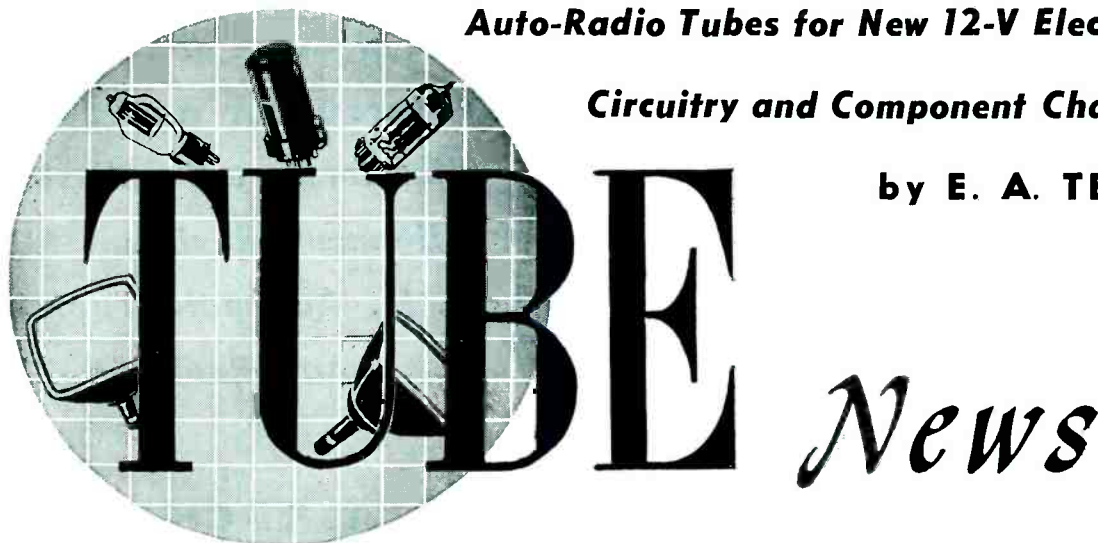
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Auto-Radio Tubes for New 12-V Electrical Systems:

Circuitry and Component Changes Involved

by E. A. TEVERSON



THE TREND TO ELECTRICAL refinements (headlight dimming, window control, polarized lights, air-conditioning, etc.) on modern cars and their attendant increase in power demand from the automobile's electrical source, has prompted automotive design engineers to turn to the 12-v system to reduce copper losses in the interconnecting wires.

One might suspect that the simplest way to reduce copper losses would be merely to increase the size of the wires connecting the loads to the power source instead of increasing the voltage level of the system. There are several reasons why a wire-size increase does not represent a practical solution. In the first place with increased wire sizes, cables connecting electrical devices to the power source would become very bulky. Second, since copper is an expensive material, the attendant increase in cost of the wiring would become high. Third, copper has not always been plentiful, because of military requirements; thus manufacturers of civilian products have had to restrict the use of copper. Fourth, the effects of contact resis-

tance at connectors is reduced with a higher voltage, lower current system.

To clarify why an increase in the voltage level of a system results in less copper losses, let us study a typical installation, where we have a load requiring 210 watts at 6 v. The current required would be 35 amperes. Let us further assume that the total resistance of the wires connecting the load to the power source is .02 ohm. The voltage drop in the wire would be (35) (.02) or .7 v. Now if we increase the voltage level at which the 210 watts of power is produced, the current would be reduced; 210 watts of power at 12 v requires a current of only 17.5 amperes and the voltage drop in the wires is reduced to .35.

It is apparent that if the current in a circuit increases, due to increased loads for instance, the voltage drop in the interconnecting wires will increase. Although these voltage drops might seem insignificant, they represent a reduction in the voltage

actually applied to the various electrical devices; the result is decreased operating efficiency.

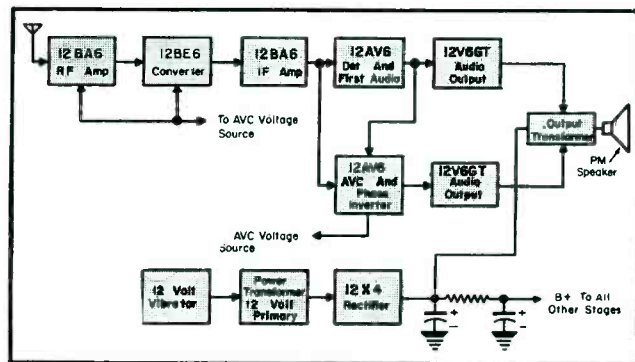
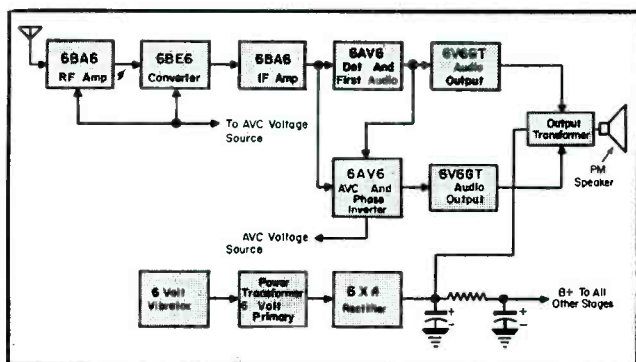
6 to 12-V Conversion Changes

The changes necessary to operate a present design 6-v auto radio from a 12-v source manifest themselves in the vibrator, power transformer, the heater characteristics of the tube lineup, and perhaps the input filter (hash suppressor) from the battery. The vibrator will have to be changed because it will now be *breaking* 12-v instead of 6. The power transformer will have to have a 12-v primary winding instead of the 6-v winding. The hash choke in the hot A lead could be wound with more turns on it for the 12-v system. The added resistance would keep the heater voltage in the same proportion as with the 6-v system. As far as tube lineups are concerned, complete lines of 12-v tubes are now available to replace the 6BA6 rf amplifier, 6BE6 converter, 6BA6 if amplifier, 6AV6 duo-diode triodes serving as second detector/first audio

(Continued on page 66)

‡From report prepared exclusively for SERVICE by G. L. Quint, technical publications section, Sylvania Electric Products, Inc.

Figs. 1 and 2. At left is a block diagram of a typical auto-radio using 6-v tubes. Same receiver using 12-v tubes is diagramed at right.





Use of 'Scope in Checking Interrupter and Sync Vibrator Power Supplies†... Alignment Revisions for G. M. Automatic-Tuning Auto-Radios

by T. L. GILFORD

RELIANCE ON THE 'SCOPE, permitting accurate judgment of vibrator-powered equipment performance, is rapidly becoming accepted as a sound auto-radio service practice.

Through the 'scope and waveform analyses, it is possible to anticipate the remaining life of a vibrator in service; ascertain the cause of excessive *hash* noise in the receiver; examine new vibrators for proper operation; detect bad buffers or shorted transformers; observe excessive secondary or load

currents; and determine the cause for poor output voltage.

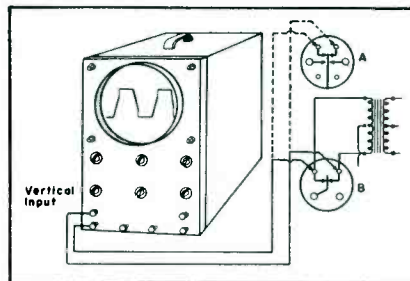
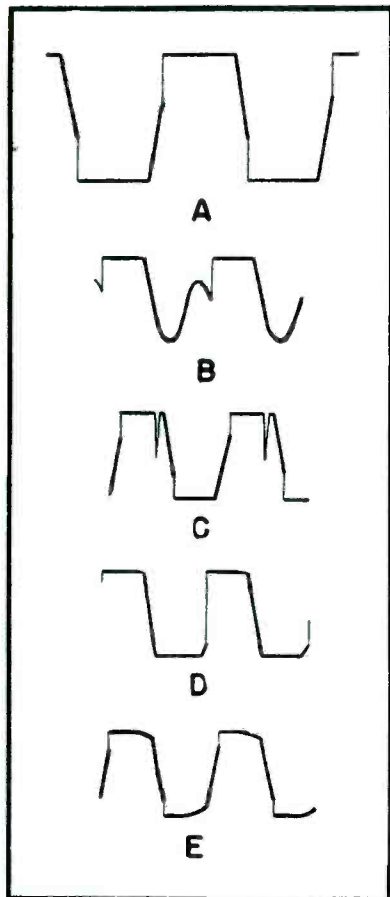
One must remember, of course, that vibrators are electromechanical devices of considerable complexity, and each unit in proper operation will show some variation in waveform. This fact must be kept in mind when interpreting waveforms.

Vibrators designed for six-volt equipment are normally designed and tested for a low-voltage starting (5 v or better); good waveform at nominal 6 v, which results in high voltage

output and low generated hash level; and operation at overvoltage for normal mechanical performance, and in sync units, absence of arcing.

New vibrators can be tested for good performance before insertion. Contact dirt, from shelf life and oxidation, can be observed and run off before placing the component in service.

Vibrators should be marked with *date in service* for a correct measure of performance. With these data on the unit, hours of service can be read.
(Continued on page 67)



(Above)

Fig. 1. Typical connections of 'scope to check reversible sync (A) and interrupter (B) vibrators. Primary contact connections will vary for different types of vibrators; correct connections usually appear in vibrator replacement manuals. One must not ground 'scope to equipment under test.

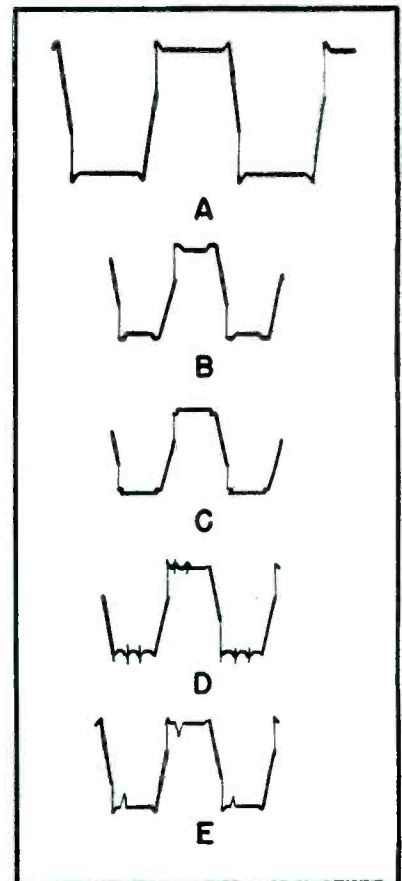
(Right)

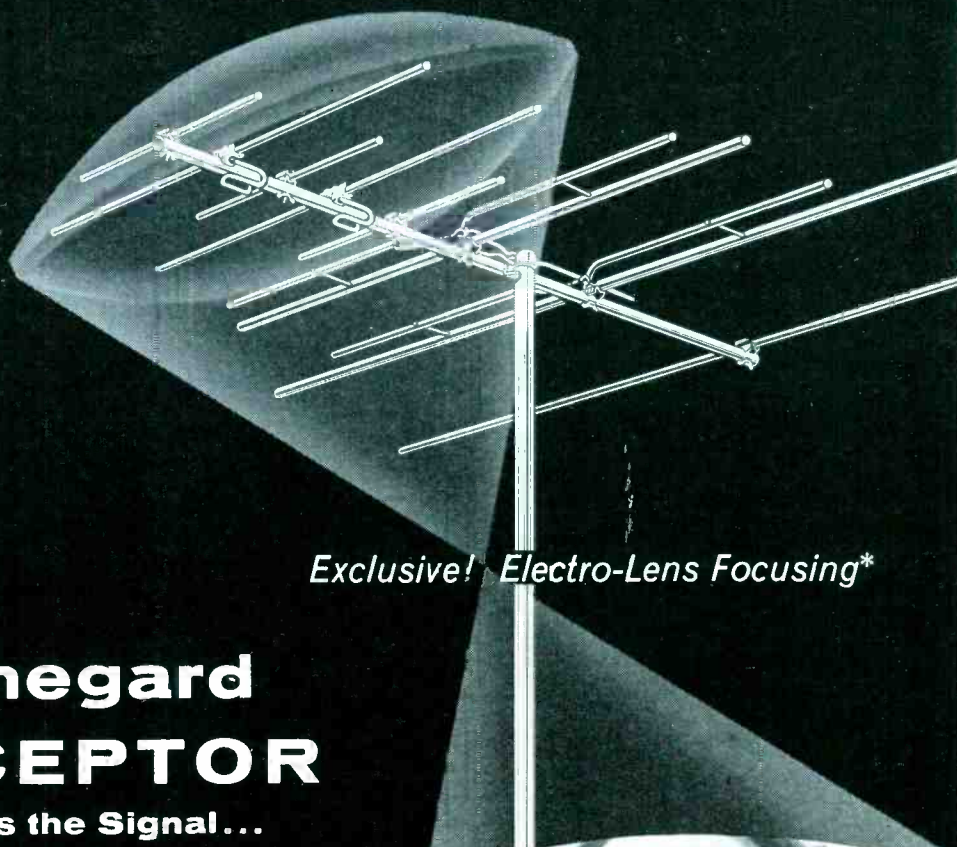
Fig. 2. Vibrator (interrupter-type) waveforms. An ideal waveform is illustrated in A; single-stepping in B; contact bounce, C; unbalanced closure, D; and arcing at contacts, E.

(Left)

Fig. 3. Sync vibrator waveforms. Ideal pattern is shown in A; wide-secondary spacing, B; too close secondary spacing, C; secondary contact bounce, D; and primary bounce, E.

†From vibrator maintenance notes prepared by John A. Kennedy, James Vibrapower Company. Figs. 1, 2 and 3, courtesy James Vibrapower.





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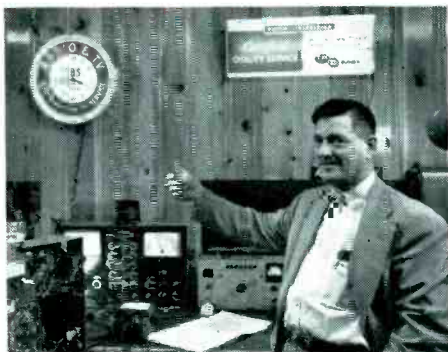
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Service Engineering field and shop notes

by

THOMAS K. BEAMER

ELECTRONIC PHOTOFLASH equipment, which has zoomed to popularity during the past months, is destined to become quite a factor on the calendar of the Service Man. For these guns feature circuits and assorted components, familiar to every Service Man, which he can readily service and maintain.

Transformer Units

To illustrate, rectification of *ac* voltages in this equipment is generally accomplished through the use of a vibrator or tube. In most cases, a high-voltage transformer is used, and the *dc* voltages obtained, charge a large capacitor to the required high voltages. These voltages are then discharged through an electronic flash-tube.

Application of Selenium Cells

Selenium rectifiers have been used to replace the vibrator or vacuum-tube rectifiers. Recent lab designs and tests have indicated that *transformerless* power supplies are feasible. A voltage quadrupler circuit incorporat-

ing selenium rectifiers makes it possible to charge a large-energy-storage capacitance efficiently. In such a setup, four selenium rectifiers rated at 35 milliamperes, 130 *v ac* can be utilized.¹

The rectifier cells, encapsulated in a plastic case, offer insulation insurance. Embedding the assembly in plastic or wax has made it possible to miniaturize the size and weight of the power supply and provide safety from shock hazard and protection against adverse atmospheres. It has also been found that the power supply output can be shorted indefinitely without injury to the components.

Typical Design

In Fig. 1 appears a typical transformerless 400 to 600 *v dc* power supply designed for photoflash equipment use.

If 250 *v dc* are required the circuit shown in Fig. 2 can be used. As indi-

[†]From notes prepared for SERVICE by Alfred M. D'Urso, rectifier division, Sarkes Tarzian, Inc.

cated in both of these schematics the charging time of the photoflash capacitor C_1 can be varied within large limits. The charging time is a function of the capacitance of C_1 and C_2 .

The curve in Fig. 4 (p. 52) allows rapid calculation for values of C_2 when the value of C_1 has been determined.

Charging Values

The curve in Fig 5 (p. 52) indicates the typical charging time for values of C_1 .

When the *dc* voltages required are in the order of 1,000 *v* and up, it becomes more economical, because of the cost of the capacitors used in C_1 and C_2 , to employ selenium rectifiers in a half-wave transformer type circuit.

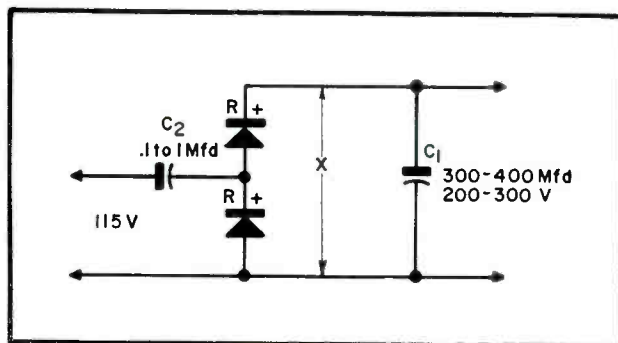
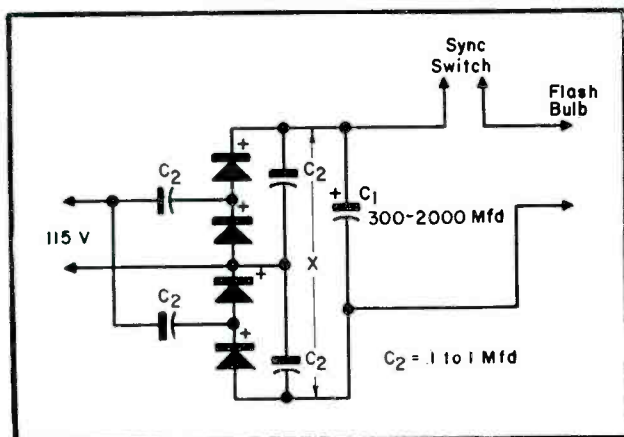
The cost of the transformer, in this case, has been found to be offset by the would-be cost of the capacitors necessary to obtain very high voltages.

Fig. 6 (p. 52) illustrates an example of a half-wave transformer type circuit (Continued on page 52)

¹Sarkes Tarzian model 35 rectifiers.

(Right)

Fig. 5. Plot illustrating typical charging time for values of C_1 .



(Left)

Fig. 1. Circuit of photoflash power supply, providing 400 to 600 *v dc*. To vary the output voltage, C_2 can be changed, or a small resistance can be added at X; value here can be 5000 ohms, 1-watt. To decrease charging time, C_2 should be increased. Both sides of the supply are off ground; they should not be connected to the chassis.

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Selenium Cell Photoflash Power Supplies

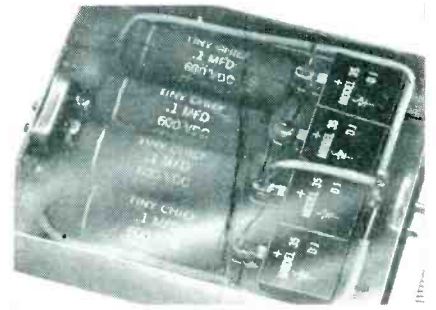


Fig. 3. Embedded selenium-cell power supply, featuring use of epoxy resin, which is said to moisture-proof complete assembly.

employing a selenium rectifier rated at 5 ma, 1,700 v ac.²

Conversion Possibilities

Expensive modern portable photoflash power-supply units incorporate selenium rectifiers to change the high voltage ac to dc, but many of the older portable units contain gaseous tubes, which are fragile, sometimes unreliable, require a longer charging time and have a relatively short life. Conversion of these older portable photoflash power supplies can be accomplished through the substitution of selenium rectifiers in place of the gaseous rectifiers.

Fig. 7 illustrates a typical tube replacement circuit employing a selenium rectifier³ rated at 5 ma, 1,300 v ac⁴.

Manufacturing Trend

The recent trend among photoflash-equipment manufacturers has been towards a power supply voltage ranging from 400 to 600 v dc, based on consideration of capacitor design and circuit simplification.

²Sarkes Tarzian model 026-130 H-Q.

³Sarkes Tarzian model 026-100 H-Q.

⁴For varying output voltages the following Sarkes Tarzian selenium rectifier models may be substituted in place of R_1 ;

Volts	Type
500	126-25 H-Q
1,000	026-50 H-Q
1,500	026-75 H-Q
2,000	026-100 H-Q

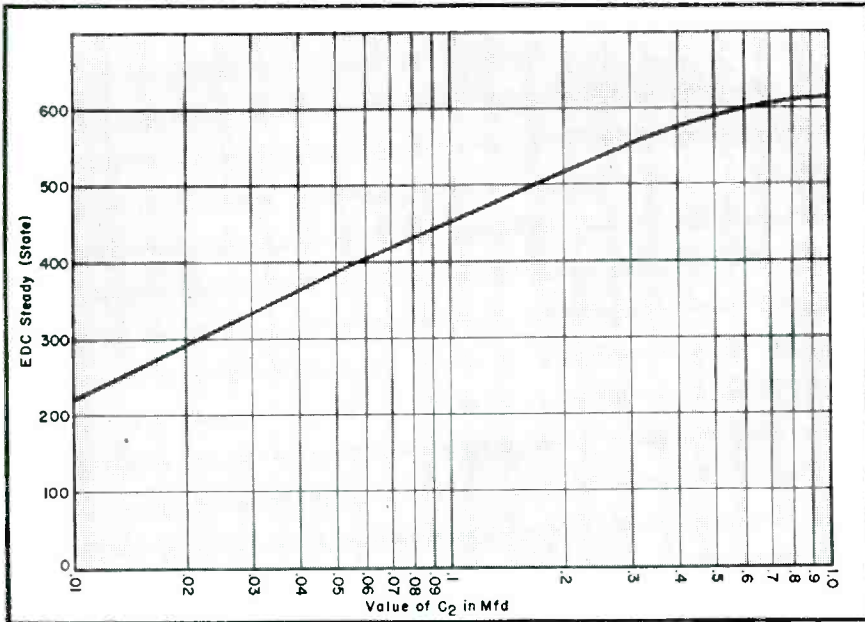
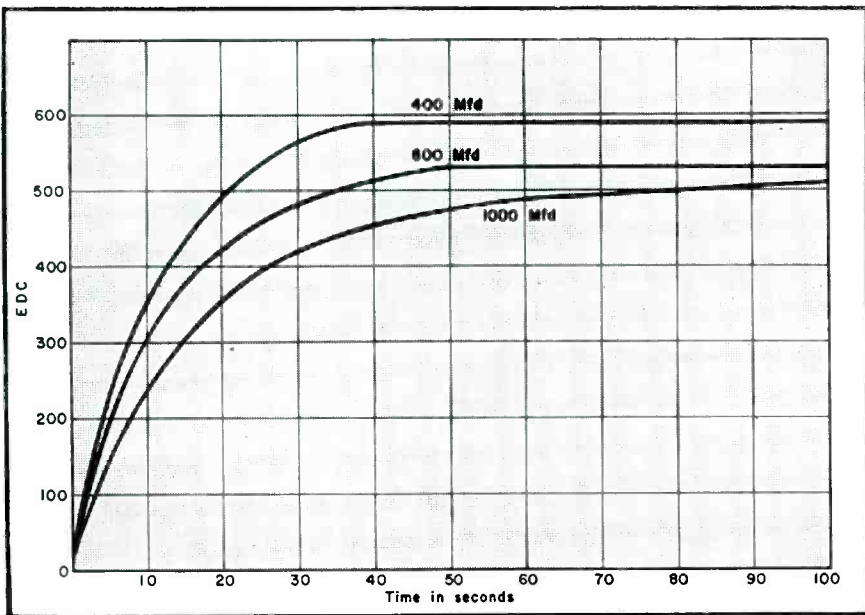


Fig. 4. Curve permitting rapid calculation of value of C_2 , when value of C_1 has been determined.

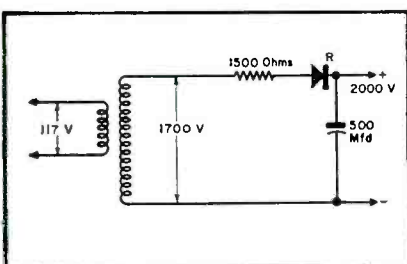
(Below)

Fig. 5. Plot illustrating typical charging time for values of C_1 .



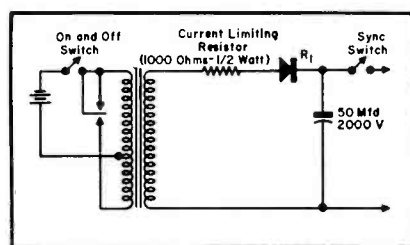
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Fig. 6. Half-wave selenium-cell power supply using a transformer.



(Below)

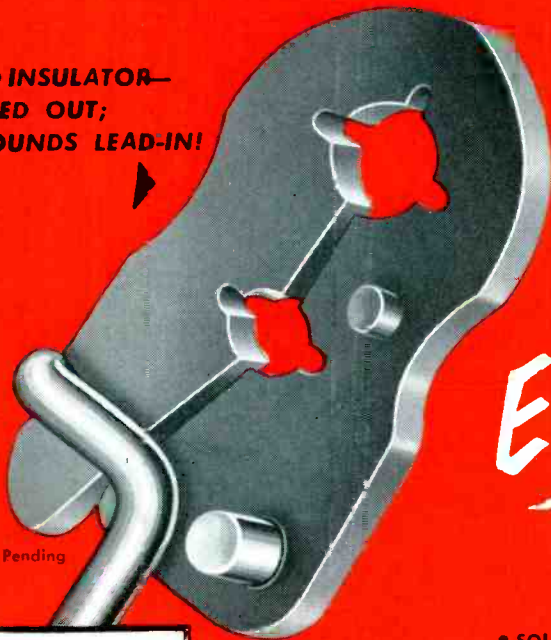
Fig. 7. Selenium-cell power supply circuit which can be used as a replacement for tube system in an electronic photoflash.



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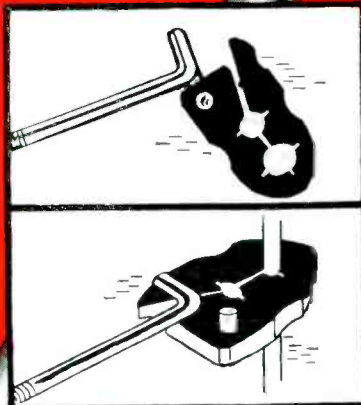
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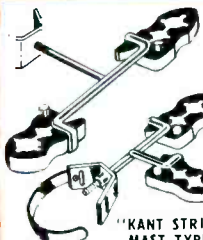

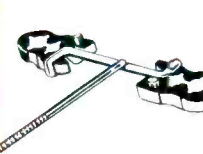


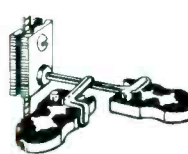
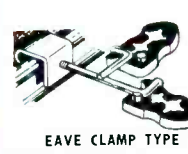
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 <p>DOUBLE T TYPE</p> <p>EZ8809 . . . 7 1/2" Wood Screw EZ8810 . . . 7 1/2" Machine Screw</p>	 <p>TRIPLE TYPE</p> <p>EZ8397 . . . 7 1/2" Wood Screw EZ8398 . . . 7 1/2" Machine Screw</p>	 <p>MAST SNAP-ON TYPE</p> <p>EZ8798 . . . 3 1/2" for 1 1/4" Mast EZ8795 . . . 7 1/2" for 1 1/4" Mast EZ8796 . . . 7 1/2" Dble. Snap-On Inline for 1 1/4" Mast</p>	 <p>GUY WIRE CLAMP TYPE</p> <p>EZ8255 . . . 3 1/2" Single EZ8256 . . . 7 1/2" Duplex Inline</p>	 <p>EAVE CLAMP TYPE</p> <p>EZ8811 . . . 3 1/2" Single EZ8813 . . . 7 1/2" Single EZ8812 . . . 7 1/2" Double Inline EZ8815 . . . 7 1/2" Double T-Type</p>



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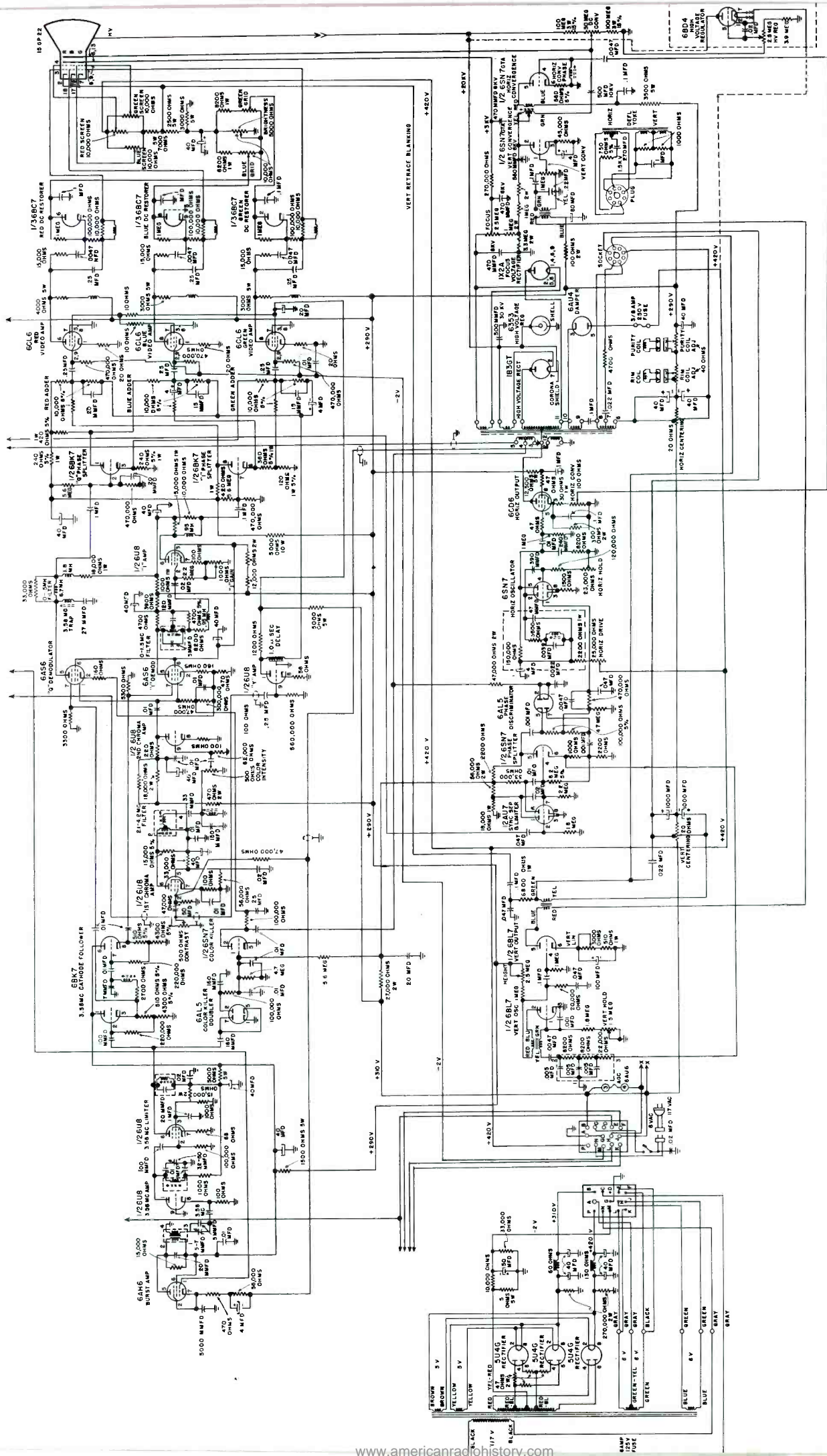
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Complete schematic of color section of first production-line Admiral chassis (model 38A1A) displayed and described at color symposium in Philadelphia. Alternate hv regulator circuit is enclosed in dotted-line area. When this circuit is used, the ground connection at bottom of the 100-megohm resistor is deleted.

The CRTSA Color TV Symposium: First of a Series of Reports on Lecture-Demonstrations Featured at Service Association Conference in Philadelphia ‡

COLOR TV developments

SINCE COLOR-TV RECEIVERS contain a number of special circuits in addition to those conventionally found in b-w receivers, many more operating controls are required. To illustrate, on the front panel of the Admiral color chassis, there are two sets of controls. One, known as the main operating controls, visible at all times, include the channel selector, fine tuning, on off, volume, contrast and color intensity.

A second set of controls accessible from the front panel, concealed behind a decorative door, include the horizontal hold, vertical hold, brightness and color fidelity.

For the tri-gun color picture tube there are a special group of controls for purity, focus, vertical centering, horizontal centering, *dc* convergence, horizontal and vertical dynamic convergence, rim coil (or field neutralizing), blue, green and red screens, and green and blue grids.

In adjusting these controls one must consider many factors. For instance, once the station is selected, fine tuning controls are normally rotated until the signal is properly tuned in. But color receivers have a special problem in this respect. If the usual b-w instructions of tuning for best picture are followed, then it is possible that when the viewer reaches what the operator considers to be the best picture, no color will be present on a known color broadcast. This is so because many think of good pictures in terms of contrast, and in striving for high contrast, they will adjust the fine tuning control until the video carrier is on the flat portion of the response curve and not at the 50 per cent point. With this condition, the high end of the signal spectrum where the color information exists, is

[See photo-story on symposium, this issue, pages 24 and 40.]

by D. J. MARISEN

pushed down the opposite side of the response curve. This will usually attenuate the color signals to such an extent that not enough will get through to activate the color killer and the other associated color circuits. As a result, no colors are produced.

Set users must receive some definite, easily recognized indication of when a color set is correctly tuned. This would be the point at which the visible 920-kc beat pattern (between the 4.5-mc sound carrier and the 3.58-mc color subcarrier) on the picture-tube screen is minimized.

The contrast control performs the same job in a color receiver that it does in a b-w set. That is, it increases the intensity of the picture elements, both color and b-w, as the control is rotated clockwise. It should be set for a pleasing picture, being neither too low where the picture appears watery

and washed out, nor too high, where the colors will appear too intense.

The *color-intensity* control is really the first new control, and it is concerned only with color. Sometimes it is referred to as a *saturation* control because clockwise rotation will cause all of the colors in the image to become brighter and more intense. Conversely, turning the color-intensity control to the left will gradually reduce the saturation of the colors, leading eventually to the complete loss of all color when the control is completely counterclockwise. The proper setting of this control is as much a matter of personal taste as the contrast-control setting is in b-w receivers. However, too low a setting will result in a picture which contains an overly intense set of colors. The horizontal and vertical hold controls perform the same function in color receivers that they do in b-w chassis. The brightness control governs the over-all picture brightness or illumination and should be set for good visibility in a particular room illumination level. At present, color-TV receivers require a lower room illumination level than we are accustomed to with b-w receivers, because of the lower light output obtainable from current color picture tubes. There is generally a certain amount of interplay between brightness and contrast controls and frequently when one control is varied, the other must be adjusted, too.

The *color-fidelity* adjustment is for color-correction. That is, if it is found that the proper colors are not being reproduced, rotation of the color-fidelity control in a normal receiver will remedy the situation by altering the colors to the correct hues. The need for such a control stems from the fact that the proper colors are developed only when the phase of the

(Continued on page 84)



‡Based in part on information appearing in *Admiral manual*, Introduction to Color Television, and *talk on color circuitry* presented by **Frank F. Hadrick** (above), director of Admiral color-TV service training, during Philadelphia color-TV symposium conducted by *ye editor* and co-sponsored by the Council of Radio and TV Associations of Philadelphia.

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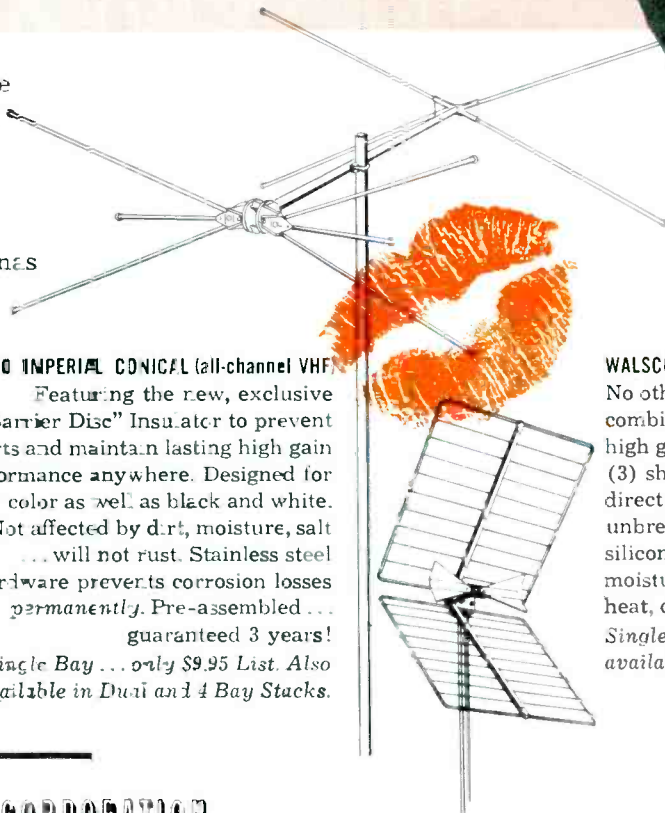
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ASSOCIATIONS



UARTS, Salt Lake City, Utah

IN THE CURRENT issue of the bulletin of the Utah Association of Radio and Television Servicemen, Inc., appears a sparkling editorial on a plan to create confidence in the TV set owner.

The boys point out that independent service must march together, and to do this each city must have its own service association which in turn will join other similar groups to form state groups. Every service operator, be he big or small, wherever he may be located, it is noted, will have representation at every level . . . and he must be willing to work with his local and national group . . . spend a few dollars for dues . . . and pitch in and help.

The association's annual convention will be held August 13 and 14, and the annual picnic will be held on July 11 at Spruce Picnic area.

Wilfried Rossburg delivered a series of color TV lectures recently to all UARTS chapters. . . . Evan Stevens has been appointed to the board of directors.

* * *

FTTG, Miami

H. R. MARIEN, JR., executive director of the Television Service Association of Michigan, Inc., and editor of the organization's TSA News, has resigned. He is now executive director of the Florida Television and Technicians Guild, Miami.

* * *

TSG, Dayton

THE Television Service Guild, Dayton, Ohio, recently celebrated its second anniversary.

Nominations for officers for '54-'55 have been made, and include: Stan Copp and George Buchard, for president; Harold Sampson and Albert Houser, for vice president; Verlyn Baily and Alfred Redolfi, for second vice president; and Louis Schmit and Ralph Snyder, for treasurer. Office of secretary is by appointment.

TEN YEARS AGO

PRICE CEILING ruling, listing specific prices for tubes, based on prices that prevailed during March, '42, was issued. Ruling also stipulated maximum service charges for tube testing; no charge for tubes brought to shop; \$.50 charge for tubes tested when a portable, table model radio or phono was brought in; and \$1.00 if chassis had to be removed to test or replace tubes. . . . Sprague Specialties Co., North Adams, Mass., changed its name to Sprague Electric Co. . . . Andrew G. Nelsen was named manager of lamp sales in the middle-western district for Westinghouse. . . . Leon L. Adelman was named rep for Solar Capacitor Sales Corp. in metropolitan New York City. . . . Ricardo Muniz was appointed engineering director of Espey Manufacturing Co. . . . John M. Smith, former manager of manufacturing for RCA, was named vice president in charge of manufacturing of P. R. Mallory and Co., Inc. . . . C. L. Pugh was appointed rep for Sprague Products Co. in Ohio, West Virginia and Pittsburgh, Pa. . . . Edward R. Place joined the information staff of RCA. Place was a former assistant to the director general of the War Production Drive. . . . Charles H. Goddard was appointed product manager of fluorescent fixture sales for Sylvania Electric.

Right: During meeting of association delegates at Eastern Conference, left to right: Max Leibowitz, representing ARTSNY and NETSDA; J. Palmer Murphy and Harold Rhodes of the Radio and TV Servicemen of N. J., Inc., who served as secretary and chairman of the conference.

THE COUNCIL OF RADIO & TELEVISION SERVICE ASSOCIATION

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Color Symposium

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(Fight)

Color symposium sign displayed in shops, showrooms and offices of distributors, reps and Service Men.



Officers of recently-formed permanent Eastern TV Service Conference, left to right: John Rader, treasurer; Harold B. Rhodes, chairman; Bert Bregenzler, vice chairman, and Ferdinand J. Lynn, secretary.



Largest delegation, from Pittsburgh, who attended recent Eastern Conference and color-TV symposium in Philadelphia: members of the Radio and Television Servicemen's Association of Pittsburgh, Inc. First row, left to right: Philip J. Polito; Mrs. John Cochran; Mrs. Philip J. Polito; Mrs. Kenneth E. Biggs, and Stephen Mykita. Second row, standing, left to right: J. A. Shafer; William L. Mitchell; John F. Cochran, president; B. A. Bregenzler, newly-elected chairman of Eastern TV Service Conference; J. Aubrecht, and G. C. Biggs. Third row, standing left to right: C. McKelvey; F. P. Skolnik; T. Gina; T. D. Flannery, and T. Krasinski.



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Detroit, Newark, Seattle.

Catalogs and Bulletins

ASTRON CORP., 255 Grant Ave., E. Newark, N. J., has released a 48-page catalog, *AC-1*, listing electrolytic, paper-foil and metallized-paper capacitors. Components are described and arranged according to operating temperature and performance characteristics, as well as by case types. Application and engineering data are also presented.

* * *

SARKES TARZIAN, INC., Rectifier Division, 415 N. College Ave., Bloomington, Ind., has published a 72-page *Selenium Rectifier Handbook*, which describes different types of selenium units and their application. Types covered include: power, *hv*, radio and TV, and embedded seleniums. A revised replacement guide is also included. Priced at \$1.00.

* * *

WARD PRODUCTS CORP., 1148 Euclid Ave., Cleveland, Ohio, has prepared a catalog describing automotive antennas, designed for installation from the outside.

* * *

JOHN F. RIDER PUBLISHER, INC., 480 Canal St., New York 13, N. Y., has released a 32-page Spring book catalog, listing books, Tek-Files and manuals. Included are pages reprinted from four different books.

* * *

P. R. MALLORY AND CO., INC., Distributor Division, P. O. Box 1558, Indianapolis, Ind., has prepared a cross-reference guide, covering radio and TV components, which includes the use of manufacturers' part numbers. Arranged alphabetically, parts detailed are: dry-electrolytics; TV and radio controls, including carbon and wire-wound single-section types, universal-section and preassembled dual units, and L and T pads; radio and TV selenium-rectifier stacks, and communications and auto-radio vibrators.

* * *

RADIO RECEPTOR CO., 251 W. 19th St., New York 11, N. Y., has released a 24-page catalog, *177*, describing selenium rectifiers. Illustrated with voltage curves, circuitry, and product applications, catalog features tabulation of power rectifiers up to 260 *v* input and 30 *a*, magnetic amplifier applications, and hermetically sealed, high-temperature and embedded stacks.

* * *

SHURE BROTHERS, INC., 225 W. Huron St., Chicago 10, Ill., has issued a magnetic recording head replacement chart, which lists replacement for tape heads used in original equipment. Chart includes illustrations of recording heads, dimensions, technical data, and numerical listings.

* * *

THORDARSON-MEISSNER, Seventh and Belmont, Mt. Carmel, Ill., has prepared a catalog, *400-L*, covering a line of transformers and reactors, and featuring a TV replacement section, and output transformer chart.

* * *

COLUMBIA WIRE AND SUPPLY CO., 2850 Irving Park Rd., Chicago 18, Ill., has published a 36-page catalog, describing various types of wires now available.

* * *

BELLEVUE TUBE MILL, INC., P. O. Box 4465, Philadelphia 40, Pa., has released a revised catalog, which describes electro-welded TV antenna masts, and butt and lock seam tubing.

* * *

JONES AND LAUGHLIN STEEL CORP., 3 Gateway Center, Pittsburgh 30, Pa., has issued a 16-page booklet, describing TV masts made of *electricwelded* steel tubing. Strength, corrosion-resistance and assembly of these masts are discussed, with several case histories of Service Men cited.

On Book Row

TELEVISION SIMPLIFIED (4TH EDITION). . . . BY MILTON S. KIVER: A revised edition, featuring analyses of *uhf*-TV circuits and operating fundamentals, repair and trouble-shooting, and two chapters on *uhf* and color TV. Additional material included covers TV tuners, keyed-*age* systems, *dc* video and cascode amplifiers, 40-mc video *if* as well as older 20-mc *if* circuits.—533 pages, 6" x 9", priced at \$6.75; D. Van Nostrand Co., Inc., 250 4th Ave., New York 3, N. Y.

* * *

ELECTRONICS: A TEXTBOOK FOR STUDENTS IN SCIENCE AND ENGINEERING. . . . BY THOMAS BENJAMIN BROWN: Designed primarily to help one grasp the fundamental principles and concepts in electronics, emphasis in this book is placed on the physical analysis of electron tubes and circuits, rather than on a detailed study of many types. Featuring graphical methods of presentation, text offers analyses of negative-feedback and cathode-follower circuits, and multi-stage amplifiers, as well as Eccles-Jordan (flip-flop) circuits. Consideration is also given to non-linear functions performed by electronic circuits. The modulation processes, which include detection and frequency conversion, are treated so as to highlight common relationships. One chapter, devoted to *uhf* electronics, covers special tubes, such as klystrons, magnetrons and traveling-wave tubes.—545 pages, 6" x 9", priced at \$7.50; John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

* * *

ELEMENTS OF MATHEMATICS FOR RADIO, TELEVISION AND ELECTRONICS. . . . BY BERNHARD FISCHER AND HERBERT JACOBS: A simplified book, covering basic mathematics, with step-by-step reasoning, and practical exercises. Material arranged so that one can learn how to calculate plate supply, grid voltages, inductive reactances, voltage drops, frequency resolutions, and many other problems encountered daily. There is also an explanation of the slide rule, of powers of 10, and its many uses. In addition to technical problems, there are included examples of the use of mathematics in selecting and ordering radio-TV hardware and in the ordinary operation of a business.—569 pages, 5½" x 8", priced at \$7.20; The Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

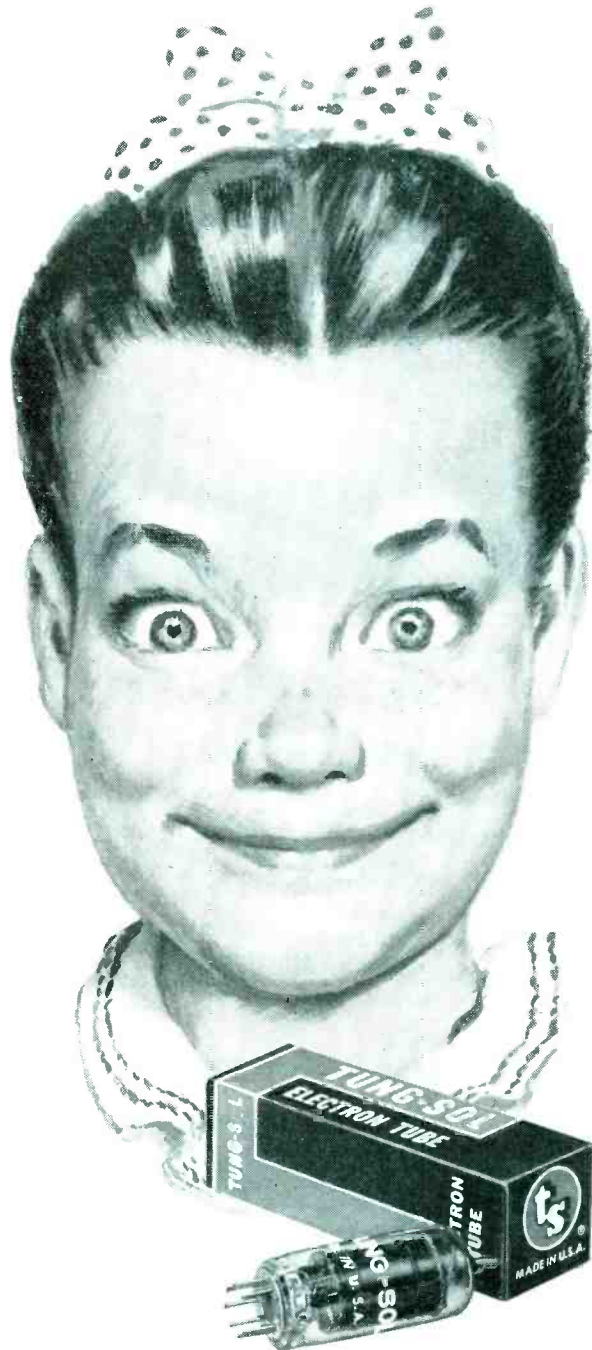
* * *

HIGHLIGHTS OF COLOR TELEVISION. . . . BY JOHN R. LOCKE, JR.: Purpose of this booklet is to provide a quick review of color television at a level understandable to those who are familiar with b-w TV. Includes an explanation of colorimetry, the NTSC color signal, transmitting systems, and the color receiver, including the color bar test pattern, matrixing, color subcarrier generation and sync detection.—44 pages, 5½" x 8½", paper bound, priced at \$.99; John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.

* * *

INTRODUCTION TO COLOR TV. . . . BY MILTON KAUFMAN AND J. THOMAS: A thorough report on color-TV is offered in this book; from the organization of the color committee (NTSC) through color transmitting and color receiving systems. Detailed explanations cover different color processing circuits in receivers, *I-Q* and color-difference signals, and the functioning of matrixing and synchronous detection. Also included are descriptions of the adjustments on the receiver, and two schematics of different color-TV chassis.—140 pages, 5½" x 8½", paper bound, priced at \$2.10; John F. Rider, Publisher, Inc.

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Auto Radio

(Continued from page 20)

formance specifications were arrived at using these voltages. Once the receiver has been thoroughly tested at its nominal input voltage, it should be tested at 20% less and 25% more than the nominal voltage. With reduced input voltage, the power supply should be switched off and on several times to make certain the vibrator will start properly.

Of the two meters with which the power supply should be equipped, the voltmeter will probably be used more. However, when properly employed, the ammeter can be of considerable value in helping to locate certain troubles in the receiver.

For example, let us assume that a receiver brought into a shop has been found to have a blown fuse, but appears to function satisfactorily once the fuse has been replaced. When this condition is encountered, future trouble will probably occur if further investigation is not made, because a blown fuse is an excellent barometer that there is something wrong with the set. In this case, the proper procedure is to adjust the input voltage to the receiver to its nominal value and, using the power supply ammeter, observe the amount of input current being drawn by the receiver. If the current exceeds by more than one ampere the value established by the set manufacturer as normal, additional tests should be conducted before the receiver can be considered repaired.

The receiver should not be allowed to operate for any considerable length of time at excessive input current, because the vibrator would gradually reach a temperature which would cause its contact arms to lose temper, and the contacts would very probably stick. The result would not only be further damage to the vibrator but another blown fuse as well.

A few checks which can be made to determine the reason for a blown fuse are:

- (1) Power supply filter capacitors for short circuits.
- (2) Bypass capacitors, especially those in screen grid circuits, for leakage or shorts.
- (3) Rectifier tube, if used, for short circuit.
- (4) Secondary buffer capacitors for opens or shorts.
- (5) Hash suppression capacitors connected in the secondary circuit.
- (6) Tubes: Output tubes are especially likely to develop short circuits. Bias voltage of the output tube should also be checked. Low bias will cause abnormally high *B* current, the end result being shortened vibrator life.

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Mast-Tower Installation

(Continued from page 19)

the roof itself, near the mast base, using a *roof-through* fitting. The leadin may be brought from the attic to the set by coming through the ceiling of a closet, down the wall, and then through the wall behind the TV set. Small sockets are available for mounting on the wall; these make a very neat installation, and offer the added feature that they may be unplugged by the housewife, and the set moved for sweeping behind it.

[To Be Continued]



Aluminum TV antenna guy cable (left) and ground wire available in No. 18 stranded and No. 8 sizes, respectively. (Nichols Wire and Aluminum Co., 1725 Rockingham Road, Davenport, Ia.)

In addition to blowing fuses, another common ill of the auto receiver is lack of *B* voltage. This condition can be caused by several things, but at least the difficulty can be localized without any loss of time. If the vibrator is operating, the *B* lead should be disconnected at the output filter and the voltage measured from that filter to *B*. If there is still no voltage, then obviously the trouble is in the power supply itself. Possible causes of this condition are: (1) Shorted filter capacitor. (2) Shorted buffer capacitor. (3) Shorted rectifier tube. (4) Shorted *B* voltage bypass. (5) Grounded filter choke. (6) Shorted transformer secondary. (7) Ground in wiring.

If the *B* voltage should be low, some possible causes could be: (1) Low battery voltage. (2) Corroded fuse clips. (3) Weak rectifier tube. (4) Defective buffer capacitor. (5) Defective filter capacitor. (6) Worn vibrator. (7) Miscellaneous causes such as shorted cathode resistors and bypass capacitors, defective tubes, etc.

One of the most severe problems with which the Service Man must cope is that of intermittent receiver operation. This can be caused by defective antenna connection or insulation, defective wiring, defective tubes, loose power supply connections, etc.

Unusual mechanical noises can sometimes be of considerable irritation to the set owner. Among the most usual causes of this difficulty are: Vibrator is too close to another power supply component; vibrator is nearing the end of its useful life; loose case screws or loose parts in the receiver proper. Electrical hum, on the other hand, could be caused by defective filter capacitors; microphonic tubes, microphonic variable capacitors, loose chassis screws, or poor grounds.

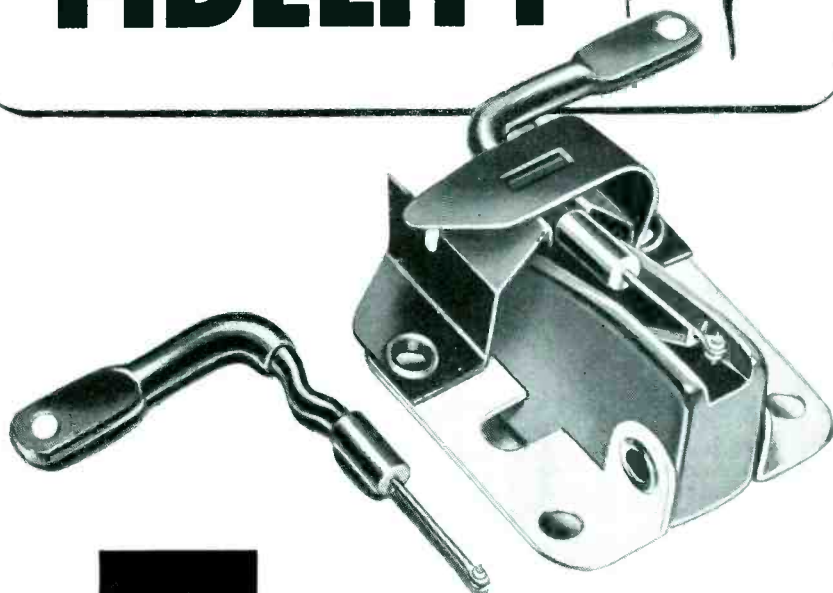
When replacing defective components in the auto receiver, it is important to adhere to the characteristics of the original part as closely as practical. If this is not done, the results can sometimes be rather unfavorable. This is especially important when replacing buffer capacitors, except where the vibrator supplier states that a capacitance value different than the original should be used. As a matter of fact, the importance of using the correct value of buffer capacitance cannot be over-emphasized because the wrong value can reduce the life of a vibrator by as much as 50%.

Regardless of what trouble the Service Man may locate in the radio set, or how quickly he may locate it, the service job cannot be considered complete unless high quality replacement

(Continued on page 62)

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SERVICE, MAY, 1954 • 61

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match of the crystal to its intermediate frequency load.

Reviewing the foregoing points, with respect to their application to this converter, one finds:

(1) Thermal agitation noise in the antenna system is an all-present evil independent of the type or efficiency of the receiver and is determined only by the antenna resistance and the temperature. This noise can be minimized by using a high gain antenna.

(2) Input tuning circuits, in many cases of the cavity or tuned-line type, provide adjacent channel selectivity, but introduce signal losses depending upon:

(a) Circuit Q or efficiency.

(b) Accuracy of tracking of cascading circuits.

(c) Efficiency of coupling to the antenna and to the detector load. Even with high Q circuits and with coupling systems which are optimum, a loss of at least 6 db per circuit is experienced. Since these losses occur before the detector, they reduce the signal and thus effectively increase the system noise since the important thing is to maintain a high ratio of signal to noise. In the Regency converter, losses encountered between the *uhf* antenna terminals and the detector have been minimized.

(3) The antenna impedance of 300 ohms, which remains sensibly constant over the *uhf* band, is an ideal source impedance for driving the crystal (a low impedance device). In other converters employing tuned-input circuits, it is often difficult to maintain optimum coupling of the low impedance antenna to the high-impedance tuned circuit over the entire range.

(4) The noise produced by the crystal itself is the major problem in any converter. This is true not only in the initial selection of type and supplier but also in individual differences between crystals. The crystal chosen for this converter has a low noise characteristic. To keep the noise level at its lowest value, it is important that the energy injected from the oscillator biases the crystal to a proper point of operation. This occurs when the injection current is between .5 and 3 ma.

(5) In the Regency circuit, the output load on the crystal at intermediate frequency, is that of the antenna circuit of the TV receiver on the particular channel chosen for operation. Input tuners are designed to work from a 300-ohm *vhf* antenna. This constitutes an efficient output load for the crystal.

Absolute noise figures have been found to be somewhat meaningless in view of the extreme difficulty of correlating measurements between labora-

(Continued from page 61)

parts have been used. Of course, it would be foolish to replace a standard commercial filter capacitor with one designed for rugged military service, for example, but the Service Man should definitely choose his replacement parts with care. Callbacks are embarrassing, and result in a loss of time and money. And what's more important, when the customer brings his set in for a repair-because-you-didn't-do-it-right-the-first-time job, he leaves his good will at home.

UHF Converter

(Continued from page 23)

volves match of antenna to the tuned circuit and match of the tuned circuit to the crystal.

(4) Noise produced by the crystal itself. This is influenced by the type of crystal, its individual noise characteristic and the point of operation on its input-output characteristic as determined by the level of local oscillator energy injection.

(5) The efficiency of impedance

ories. On this model noise has been measured to be in the range of crystal noise itself or 14 to 18 db.

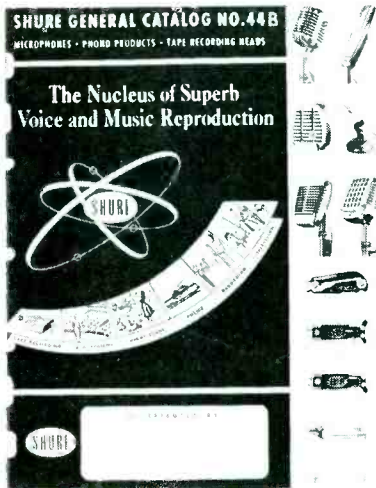
Service Notes

Failure to cover the entire frequency range would probably indicate a defective 6AF4 oscillator tube.

Weak or noisy performance might be due to a defective crystal or insufficient oscillator injection. A method of checking oscillator injection and crystal performance is to unsolder the center tap of chokes L_3 and L_4 from the chassis ground and insert a 0-10 milliammeter bypass with a 1,000-mmfd mica or ceramic capacitor. The injection current should be between .25 and 5 ma.

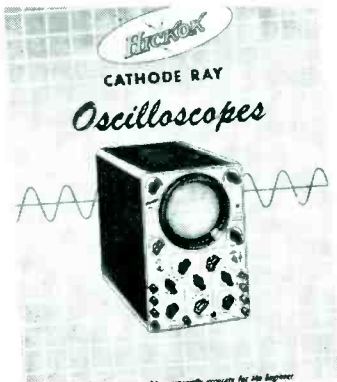
Continuity and voltage tests will be sufficient to determine any other operating defects.

AUDIO-SCOPE CATALOGS



Recently issued revised general catalog with illustrations and data on microphones and accessories; magnetic tape and wire recording heads (with replacement chart); crystal and ceramic pickup cartridges (with replacement chart); and crystal phono pickups and needles. (Catalog 44B, Shure Brothers, Inc., 225 W. Huron St., Chicago, Ill.)

Handbook (24-pages) containing explanation and illustration of the basic characteristics of the 'scope, how it works and tips on its more general uses. Also lists technical features and performance specifications of models ranging from 3" portable 'scopes up to large bench models. (The Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 8, O.)



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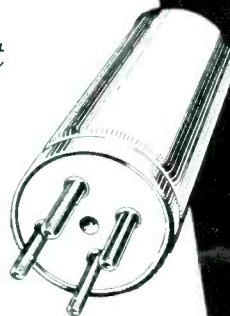
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TV Antennas

(Continued from page 38)

necessary for switching the stub in or out of the circuit.

UHF Baluns

For some installations, a 300-ohm balanced input or output impedance must be transformed to 72 ohms unbalanced, or a 72-ohm unbalanced impedance to 300 ohms balanced. This can be accomplished by means of a balun. As an example, if a coax line is used in an installation, a balun can be employed at the antenna terminals to effect a match to the transmission

line. A balun can also be employed at the receiver input if the 72-ohm line impedance is to be matched to the 300-ohm receiver input impedance.

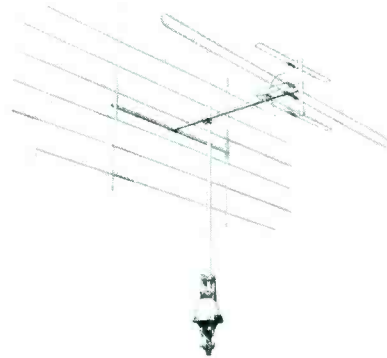
A twin lead balun can be made from 150-ohm twin lead. Two equal lengths are required with dimensions as shown in Fig. 2 (p. 38). It is best used indoors, unless sufficient weather protection is afforded.

For many *uhf* uses, the coax balun (Fig. 3—p. 38) is widely used because of the availability of RG11/U or RG 59/U coax cable. The loss is about 1.3 db at channels above or below the chan-

(Continued on page 66)

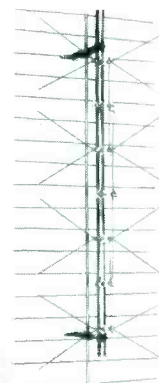


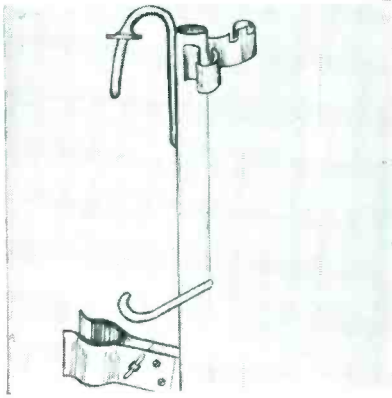
Antenna rotator with a cartridge type removable drive unit. In-line mast collar construction, 390° traverse and finger-tip piano-control console. Unit is said to provide stop-watch tuning accuracy. Optimum stall torque has been balanced with an accumulative end stop. Housing is constructed of die-cast aluminum, as is the drive unit's housing. Antenna installation is left operative in one direction when the motor is removed. Control console operates on the two-tap system; one tap indicates present direction of the antenna and second tap of small rocker arm turns mast to the desired position. (Rotenna; JFD)



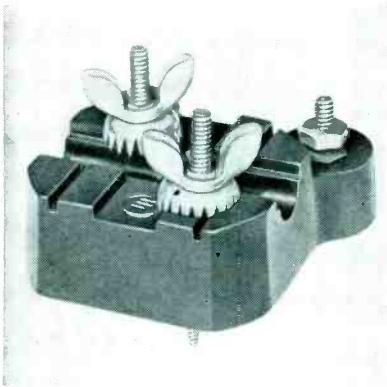
All-channel antenna with an aluminum fold-out design screen reflector. Dipole and boom assembly are of seamless tubing. Dipoles fold out and are supported and reinforced to minimize sag and sway. (Ultramatic; Cornell-Dubilier Electric Corp., 333 Hamilton Blvd., South Plainfield, N. J.)

Four stack bowtie/reflector *uhf* antenna, pre-assembled except for tightening four wing nuts. Has a swingout lock-tite reflector assembly which uses support brackets, as an integral part of the mast clamp assembly. Bossed phenolic terminal blocks. Available in single and two-stack styles. (UBT series; Trio Manufacturing Co., Griggsville, Ill.)



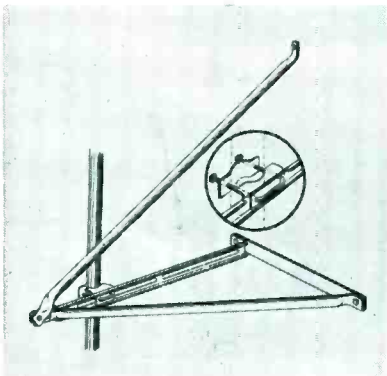


Antenna installation tool designed to permit addition of uhf and yagi antennas to a previously-installed antenna without taking down, climbing or placing a ladder along side of the main mast. From base of the main mast, it is said, installer can raise the tool and attach the additional antenna at any point desired up to 28'. Antenna can be attached either with a slotted extension mast for top mounting, or an auxiliary clamp which can be attached to any portion of the pole. Leadin is supported by push-on-lock stand-offs, which are attached remotely with the tool. (Broth Manufacturing Co., 612 Penn Ave., West Reading, Penna.)



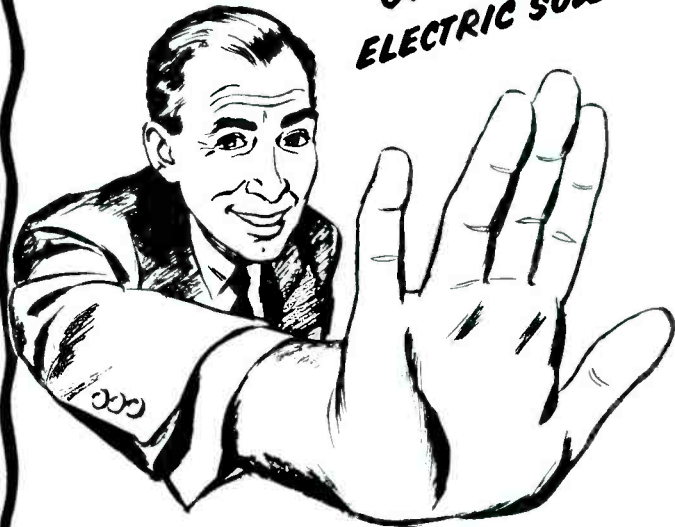
Lightning arrester designed to accommodate either uhf or vhf transmission lines. Features a self-tapping screw as part of the unit. Piercing type contacts are utilized. All electrical circuits use solid brass components. Has UL approval. (UL-5; RMS, 2016 Bronxdale Ave., New York 62.)

Adjustable 18" wall bracket made of embossed steel and hot-dip galvanized mounting consists of two 18" brackets with slotted, embossed tracks. Embossed steel back supports said to lend strength to combat horizontal stress caused by wind resistance of antenna; embossed steel support legs lend strength in a vertical direction. (ST-18A; South River Metal Products Co., Inc., 377-379 Turnpike, South River, N. J.)



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TV Antennas

(Continued from page 64)

nel to which the line is cut, and about .6 db at the resonant frequency. The coax balun is especially suitable for outdoor installations, because of its reduced susceptibility to weather and atmospheric conditions.

Tube News

(Continued from page 45)

amplifier, and phase inverter/*avc*, 6V6GTs as push-pull audio output stages, and a 6X4 rectifier. The total heater current requirements of such a lineup would be in the order of 3 amperes. The same receiver, after appropriate changes in the input (hash) filter, vibrator, and power transformer, would take as direct replacements the following 12-*v* equivalents: 12BA6 *rf* amplifier, 12BE6 converter, 12BA6 *if* amplifier, a 12AV6 as second detector and first audio amplifier, a second 12AV6 as a phase inverter and *avc*, two 12V6GTs as push-pull audio output stages and a 12X4 as a rectifier. The total current drain of this lineup is in the order of 1.5 amperes.

Cadillac, in their Synchro-Matic models 7263525 and 7263545, use the tube lineup indicated, except that in the rectifier system is an OZ4 cold-cathode tube and a 12AU7 is used as a trigger tube to operate a signal-seeking tuner. By using the OZ4 as the rectifier, a heater-power current saving is achieved, since the normal 300 to 600 *ma* or so that is needed to heat the cathode in the heater-type rectifiers is eliminated. The 12AU7 trigger tube heater requires only 150 *ma* in the 12-*v* system, and thus, the addition of this tube does not increase the heater current requirements.

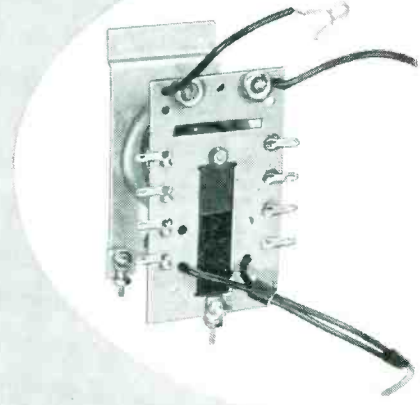
The Oldsmobile 12-*v* auto radio model 1982990 uses a 12BA6 *rf* amplifier, 12BE6 converter, 12BA6 *if* amplifier, 12BF6 detector, *avc*, audio amplifier/split-load phase inverter, two 12V6GTs as push-pull audio output stages and an OZ4 rectifier.

All of the 12-*v* types mentioned are electrically identical with their 6-*v* prototype, except for heater voltage and current requirements, and will function in the same manner in identical circuits for which the 6-*v* version was used.

Other 12-*v* types which may be used are the 12BD6, a remote cut-off *rf* pentode for use as an *rf* or *if* amplifier, and 12AQ5,* for use as an audio power amplifier. The 12AQ5 is a

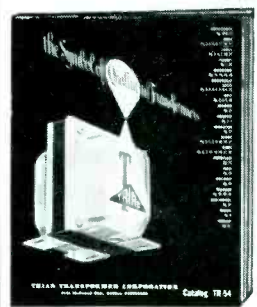
*Sylvania.

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miniature type similar to the 6V6GT. The 12CM6,* a 9-pin miniature, also similar to the 6V6GT, is especially suited for audio power-output applications. Two types, which could serve the function of the first audio amplifier or phase inverter, are the 12G4, a miniature type similar to one-half of a 6SN7GT, except for bulb size and heater characteristics, and the 12H4,* which is identical to the 12G4 except for a center-tapped heater, making it suitable for use in 6 or 12-*v* systems.

Serviceing Helps

(Continued from page 46)

ily calculated. It is possible to anticipate vibrator failure from normal wearing through service life data and waveform analyses.

Any standard type 'scope having an internal sweep circuit can be used for checking.

Vibrator waveforms are best observed across the primary contacts of the vibrator. This connection applies to both general types of vibrators, the interrupter (non-sync) and the sync. These primary vibrator contacts should be connected to the vertical input of the 'scope.

In a typical 'scope setup, the vibrator contact connections should be made to the vertical input of the 'scope and the vibrator power supply turned on. Then the sync selector circuit should be set to internal. The sweep frequency range should then be set in the range of approximately 30-100 cps. Initially, the *sync* control should be off. The fine sweep-frequency control should be adjusted until two full square waveforms are stopped on the screen. The *sync* control should be now increased until the waveform is stationary on the screen; this normally is set at a low level.

Variation of all other controls to center and focus the picture can be made to suit the Service Man.

Interrupter (Non-Sync) Waveforms

The non-sync type of vibrator has contacts operating at the primary low voltage only. Rectification is by other means; the waveform is indicative of steady load conditions.

An ideal wave (shown in *A*, Fig. 2 —p. 46) will show no bounce during the contact closures. Broken lines on the diagonal are indicative of good buffer action. A new vibrator with proper buffer will show these breaks. As contacts wear the contact closure is

(Continued on page 68)

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(Continued from page 67)

reduced and the buffer closure will increase toward a solid line.

Single stepping (*B*, Fig. 2—p. 46) is a normal condition of poor starting. A vibrator that will show single stepping on starting voltages of 5.5 *v* or more is either defective or worn. In service it will fail in a short period through fuse blowing or poor output. Proper vibrator operation requires full reed-contact operation.

Contact bounce (*C*, Fig. 2), is indicative of a worn vibrator, or if a new component, one with poor adjustment. Result will be lower output voltage and a very high *hash* level. An extreme bounce as shown should not be construed with a dirty contact condition, as occasionally found in a new component. Dirty contacts show as very small amplitude bounces in the contact waveform. A short period of operation will normally correct this new vibrator condition.

Unbalance closure (*D*, Fig. 2), is the result of poor adjustment or in some instances, a bad buffer. Circuit should be checked with another vibrator. If the trouble is the vibrator it may give partial service, but would normally be a poor emergency risk. This is the typical vibrator which will *stick* after short service.

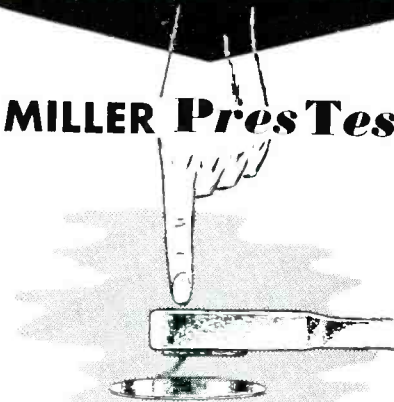
Arcing at contacts (*E*, Fig. 2), can be due to either the vibrator or circuit. This can be ascertained by a second vibrator observed in the circuit. When a circuit problem, the buffer should be checked first; then the rectifier, filter or external circuit should be checked. When the cause is the vibrator component, it should be discarded.

Sync Waveforms

The sync vibrator has both a primary contact at low voltage, and secondary contacts at high voltage. The second set of contacts close slightly after the primary, and provide output rectification. The 'scope picture observed across the primary contacts

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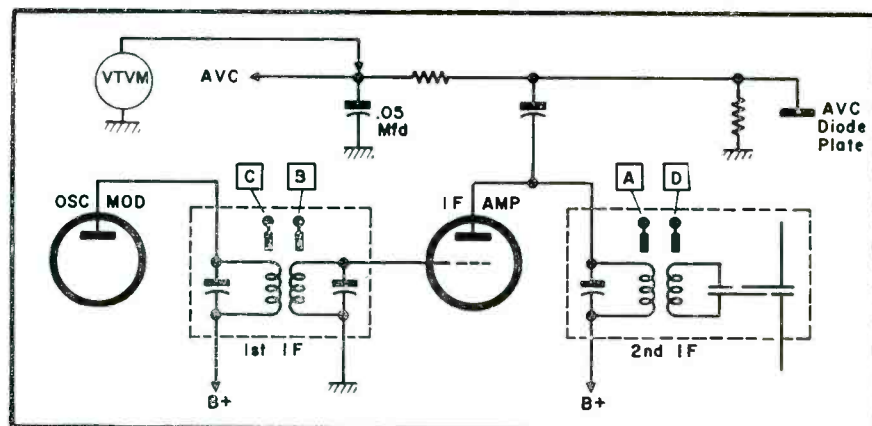
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Fig. 4. The if circuitry of the G.M. automatic-tuning auto radio, illustrating sequence of slug and if adjustments (A, B, C and D). AVC represents indicator voltage.



show this secondary contact operation in the form of a small voltage drop when the contacts connect the load.

An ideal wave (A, Fig. 3—p. 46) will show no bounce during contact closure. The peaks or horns at the beginning and end of each closure are the secondary rectifier contacts closing later and opening sooner than the associated primary contacts. Here too we have the broken buffer closure line noted for interrupter vibrators. As the vibrator wears, this line becomes longer with decreasing break. This ideal waveform shows perfect timing of contacts which results in high output and low hash level.

Wide secondary spacing (B, Fig. 3), will result in a lowered voltage output and a higher level of hash. This normally will not result in service failure. The lower voltage output and hash level should be measured for acceptability.

Close secondary spacing (C, Fig. 3), will result in contact arcing and fuse blowing in operation. A vibrator with this lack of horns or tips should be removed from service. Care should be taken when this waveform appears for a sync vibrator. If the secondary load is off (i.e. the set is not warmed up) or there are other circuit troubles, the waveform will appear as an interrupter vibrator. This can be detected by checking with a vibrator of known good condition.

Secondary contact bounce (D, Fig. 3), will result in lower voltage output and high hash level. In a vibrator in for service, this is an indication of imminent failure due to too low-voltage output. It is normally caused by reduced secondary contact pressure from wear. One should be careful not to interpret dirty contacts, as found on some new units, with small amplitude ripple as a true contact bounce.

Primary contact bounce (E, Fig. 3), will result in same operating problems as secondary bounce.

53 SST And FST Alignment Revisions*

The recommended procedure for aligning the four *if* slugs in the '53 G. M. automatic tuning radios, has been modified and three changes included. The first change involves the sequence of the slug adjustments. The second revision indicates that now one should not peak the secondary of the second *if* to maximum, but to minimum. The third change calls for a different connection of the output meter or *vtvm*; it should be connected to the filtered side of the *avc*.

The reason that the secondary of the second *if* must be peaked to minimum, (Continued on page 70)

*From TESTING TIPS, prepared by the DELCO RADIO DIVISION.

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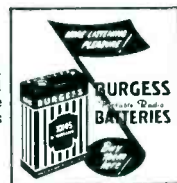
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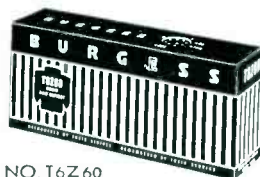
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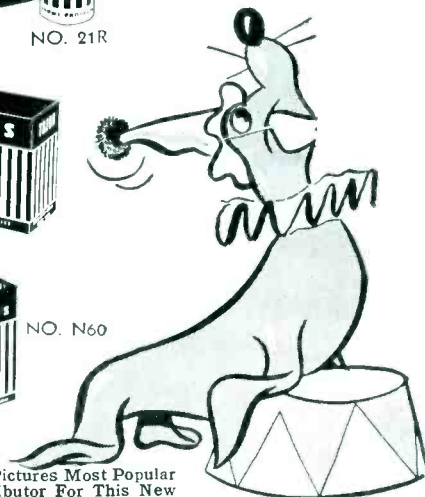
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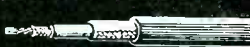
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Servicing Helps

(Continued from page 69)

not maximum, is illustrated in Fig. 4 (p. 68). The *v₁* indicates the rectified *if* voltage, taken off of the primary of the second *if*. As the second *if* secondary is peaked to the *if* frequency, more energy is coupled to the secondary and less voltage will be indicated at the primary. The *ifs* are aligned to get maximum voltage at the detector.

Since the maximum voltage at the detector is reached when the secondary (adjustment *D* in Fig. 4) is adjusted to resonance, the *v₁* reading will dip showing maximum transfer of energy from the primary.

Audio

(Continued from page 42)

the spool of recorder tape, rather than waiting for it to be transcribed, eliminated waste time and delays in getting the material into print.

COUNTER AND FLOOR DISPLAYS



Counter display, which incorporates actual picture tube electron gun, designed to promote use of high quality components in TV repair service. It was prepared for use by distributors handling Du Mont teletron replacement picture tubes. Card also includes a labeled cut-away illustration showing detail of construction in the picture tube gun.

Display rack for spring promotion of auto antennas. Two types available: One with 24 TCF-3B and 12 TCF-3C antennas, and another with 36 TCF-3C models. (Warr)



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JENSEN OPENS IOWA SPEAKER PLANT

A plant in Guttenberg, Iowa, to manufacture a standardized line of speakers, in sizes 6" and smaller, has been opened by the Jensen Manufacturing Co., 6601 South Laramie Ave., Chicago 38, Ill.

Guttenberg plant, which encompasses 25,000 square feet of space located on a 15-acre plot, was recently acquired by Muter Company, of which Jensen is a division. Speaker production is under the supervision of T. L. Pierce, formerly of Jensen's Chicago plant.

* * *

ORRADIO EXPANDS WAREHOUSING

An enlarged southern California warehouse, at 4217 West Jefferson Blvd, Los Angeles, has been opened by ORRadio Industries, Inc., Opelika, Ala.

Los Angeles reps for company are Paul and Claude Erlanger, Erlanger Sales Co.

* * *

GHIRARDI AND MIDDLETON SIGN WITH RIDER

Alfred A. Ghirardi and Robert G. Middleton will coauthor a series of books on radio and TV test equipment, which will be published by John F. Rider Publisher, Inc., 480 Canal St., N. Y. 13, N. Y.

First manuscript on test probes, delivered for processing, covers applications of test probes in all fields—radio and TV servicing, lab and engineering applications, etc. Book will be approximately 192 pages, and will appear as a 5½"x8½" paper-back in about three months.

* * *

AEROVOX OPENS TWO CALIF. PLANTS

Two plants, housing divisions and a subsidiary unit, have been opened by the Aerovox Co., New Bedford, Mass. One unit, the Cinema Eng. Co. (a division), is at 1100 Chestnut St., Burbank, and both Acme Electronics, Inc., a subsidiary, and the Pacific Coast division, are at 2724 South Peck Road, Monrovia.

At the Cinema Engineering plant, James L. Fouch is general manager and Arthur C. Davis, divisional director. Hugh P. Moore, as president of Acme, is in charge of the Monrovia plant. A. E. Quick is west coast sales manager for Aerovox, and Morgan Harris Acme sales manager.

* * *

JAVEX COUNTER MERCHANDISER

A wall-outlet plate counter-display merchandiser, 11"x14", is now available from Javex, P. O. Box 646, Redlands, Calif.

Merchandiser, which also may be used on the wall, features an ivory plate, complete with plug and lead.

* * *

TELREX RECEIVES CANADIAN CONICAL PATENT

A basic patent application on conical antennas has been granted by the Patent Office of Canada to Telrex, Inc., Asbury Park, N. J. Early in '53 patent application had been granted in England.



All Ohmite Wire-Wound Resistors have

Welded Terminals

Provide Even **GREATER** DEPENDABILITY

WELDED RESISTANCE WIRE

WELDED TERMINAL LUG

A PERFECT PERMANENT CONNECTION BETWEEN RESISTANCE WIRE AND TERMINAL

When you install an Ohmite wire-wound resistor, you can be sure of a job that will last. These vitreous-enameled resistors have permanent, welded electrical connections which cannot cause noise in audio circuits or instability in picture tube circuits.

Ohmite's patented welding process, which produces perfect welds, was developed over ten years ago. Since then, millions of these resistors have proved their reliability under the toughest kind of service. Use them on your next job.

OHMITE MANUFACTURING COMPANY
3642 Howard St., Skokie, Illinois
(Suburb of Chicago)

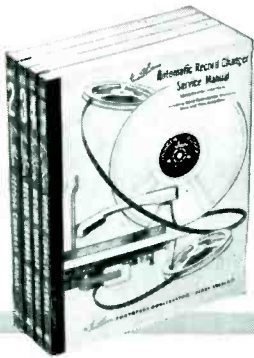


Write for Stock Catalog

Be Right with

OHMITE®

dependable resistance units



**be an expert on
RECORD CHANGER
SERVICING**

with the **HOWARD W. SAMS**
"AUTOMATIC RECORD CHANGER
SERVICE MANUALS"

Get the only authoritative compilation of its kind—complete coverage of virtually all Automatic Record Changers produced since 1948—in 4 great PHOTOFACT Manuals. All data complete, accurate, uniform—based on first-hand lab analysis of the actual changers. Helps you service any model quicker, easier—for greater profits. Own and use the complete Library!

NEW VOLUME 5. Complete electrical and mechanical data on 22 record changers and tape recorders produced in 1952 and 1953. Features exclusive "exploded view" diagrams, "all-view" photos, full change cycle data, adjustments, service hints, complete replacement parts lists. Shows methods used for record support, record selection, pickup arm handling, needle setdown point determination, tripping, etc. Tape recorder coverage includes full head-adjustment, cleaning and operation details. All data is authoritative and accurate, obtained directly from lab analysis of the actual equipment. Makes you an expert on changer and recorder repairs. 288 pages, 8½ x 11".

ORDER CM-5. Only.....\$3.00

VOLUME 4. Covers 38 changers and recorders produced during 1951.

ORDER CM-4. Only.....\$3.00

VOLUME 3. Covers 44 changers and recorders produced during 1949 and 1950.

ORDER CM-3. Only.....\$3.00

VOLUME 2. Covers 45 changers and recorders produced in 1948 and early 1949.

ORDER CM-2. Only.....\$4.95

Get into profitable Changer Repair work—
ORDER THE COMPLETE "CHANGER LIBRARY"

HOWARD W. SAMS & CO. INC.

Order from your Parts Jobber today,
or write to Howard W. Sams & Co., Inc.,
2207 East 46th St., Indianapolis 5, Ind.

My (check) (money order) for \$.....
enclosed. Send the following books:

- CM-5 (\$3.00) CM-3 (\$3.00)
- CM-4 (\$3.00) CM-2 (\$4.95)

Name.....

Address.....

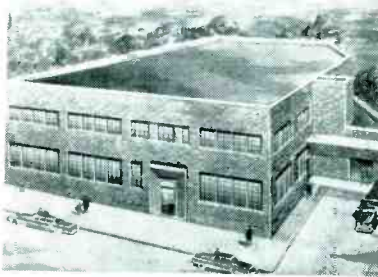
City..... Zone..... State.....

(outside U. S. A. priced slightly higher)

PRECISION TO MOVE TO NEW PLANT

Precision Apparatus Co., Inc., presently located in Elmhurst, L. I., will move its manufacturing, engineering and administrative facilities to a new plant in Glendale, L. I., N. Y., by mid-summer of '54.

Plant, which will occupy a plot of ground running through from 84th to 88th Sts., south of Cooper Ave., will provide expanded facilities for Precision, as well as Pace Electrical Instruments Co., Inc., wholly-owned meter manufacturing subsidiary. Building is a 2-story, air-conditioned structure with a 48' set-back shipping and receiving dock.



* * *

BUXTON INDUSTRIES EXPANDS

Buxton Industries, Pasadena, Calif., has moved into a new plant at 88 North Fair Oaks Ave., where it is said they will have more than triple their old plant area.

* * *

**SHURE MIKE-SENSITIVITY
CONVERSION CHART**

A microphone sensitivity conversion chart, which shows relationship between open-circuit voltage response, open-circuit power response and RETMA sensitivity rating, is now available from Shure Brothers, Inc., 225 W. Huron St., Chicago 10, Ill.

Chart serves as an aid in the interchange of values of the three most commonly used systems. Change in open-circuit voltage sensitivity during impedance transformation can also be determined.

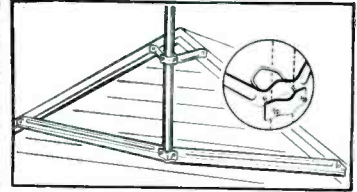
* * *

**BURGESS FLASHLIGHT-BATTERY
DISPLAY**

An N-size (flashlight) battery, in a new display package, has been introduced by Burgess Battery Co., Freeport, Ill. Battery designed for use in toys and miniature novelty lights is said to have a nine-month shelf life. Uses an airtight polythene seal.



South River
★★ NEWS ★★



EAVE MOUNT Model EM-48

One piece of construction of heavy gauge, embossed steel, hot-dip galvanized to prevent corrosion. Unique design of lower bracket gives extra strength and rigidity. Extended lip supports mast during installation. 48" spread permits generous spacing between brackets for excellent mechanical mast support. Both 3" embossed steel upper bracket and lower bracket have new "reversed" U bolt and clamp feature for Spintite fastening.

Also available with 60" spread: EM-60.

IN CANADA:

A. T. R. ARMSTRONG LTD., TORONTO

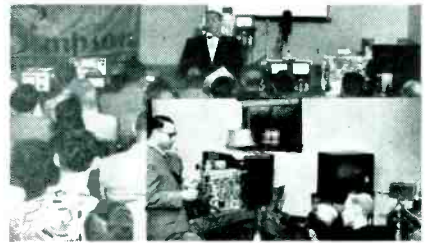
**AT CHICAGO PARTS SHOW:
Booth #774 & Room #652-A**

**SOUTH RIVER METAL
PRODUCTS CO., INC.**

SOUTH RIVER, N. J.

PIONEER AND OUTSTANDING PRODUCER
OF FINEST LINE OF ANTENNA MOUNTS

**CLOSED-CIRCUIT INSTRUMENT
CLINIC**



Doug McRae, Simpson rep, introducing Bob Middleton, field engineer for Simpson, at Wichita Falls, Texas, TV service meeting sponsored by Mooney Radio Supply. Middleton (insert) demonstrated a traveling injector, a new invention designed to facilitate checking of antenna impedance with sweep generator and 'scope. Demonstrations were made via closed-circuit TV, and 'scopes placed at intervals in meeting hall. Traveling injector is said to scan a simple delay line for hot spots and cold spots, providing an accurate test of impedance relations at either end of the delay line. In case of mismatch, the device provides information concerning whether terminating impedance is high or low.

TRIO PURCHASES FALCON

Falcon Electronics Co., Quincy, Ill., has been purchased by the Trio Manufacturing Co., Griggsville, Ill.

Entire Falcon operations in Quincy will be moved to Trio plant in Griggsville.

Roy Wade, formerly Falcon general manager, has been appointed general sales manager for Trio.

* * *

DUKANE SOUND-SYSTEM KIT

A photo paste-up kit, to help visualize the many possible arrangements of console and panel assemblies of a school sound system, has been announced by the DuKane Corp., Commercial Sound Division, St. Charles, Ill.

Kit contains 220 modular illustrations of panels for intercom, automatic record changer assembly, radio and all other units commonly assembled in control consoles. Photographs and cut-outs are pre-glued.

* * *

CARTER DYNAMOTOR CALCULATOR

A 3"x6" slide-chart calculator, that may be used to compute efficiency and regulation of dynamotor power supplies, has been released by the Carter Motor Co., Dept. 23, 2644 N. Maplewood Ave., Chicago 47, Ill.

Chart indicates the input watts when the input amps and input voltage are known; knowing the input watts and output amps and voltage, the percentage of efficiency can be deduced. No-load output voltage may also be learned, if the full load voltage and per cent regulation are known. A Fahrenheit-Centigrade conversion scale is also included. Priced at 25¢.

* * *

CBS-HYTRON SOLDER DISPENSER

A solder dispenser loaded with 20 refills, and a plastic tube of 80 additional refills is being given free to Service Men, with each CBS-Hytron tube order for 75 receiving or 3 picture tubes, up through May 31.

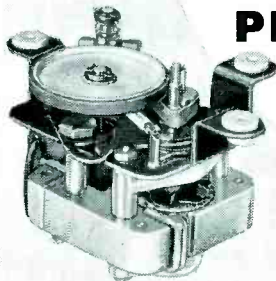
Unit, a one-hand tool, holds 72" of solder.

In operating, unit is pointed vertically downward, a length of solder is placed into position and a knurled wheel rotated to begin feed. Then an inch of solder can be rolled out. When through, wheel is turned away from operator, drawing unused solder back into dispenser.

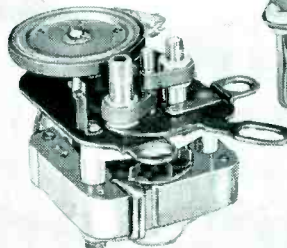


3-speed

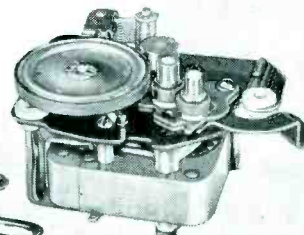
PHONOMOTORS



Single belt-type 3-speed record-changer phonomotor



Double belt-type 3-speed record-changer phonomotor



Turret-type 3-speed record-changer phonomotor

FIRST CHOICE of America's Leading Record-Changer Makers

There are good reasons why America's leading record-changer manufacturers rely on General Industries to furnish their phonomotor requirements. Engineering . . . design . . . manufacturing skill . . . dependable, trouble-free performance . . . all contribute to the high quality of GI *Smooth Power* products.

Each of the above 3-speed record-changer phonomotors was designed and engineered by General Industries to meet the specific requirements of a leading national manufacturer.

For complete information about General Industries phonomotors—for both record-changer and manual application—write to:



THE GENERAL INDUSTRIES CO.
DEPARTMENT MF • ELYRIA, OHIO

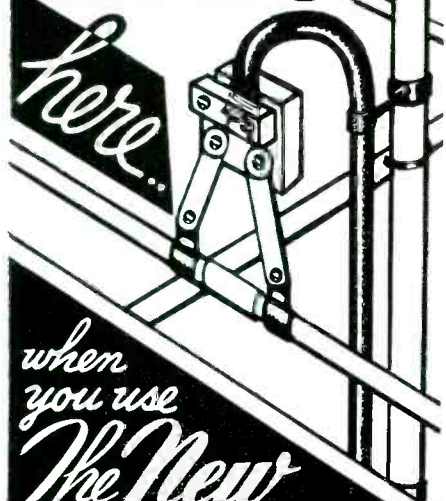
STREAMLINED GUY-STRAND PACKAGE

Octagon-shaped package containing No. 18 guy strand for radio and TV masts. On one side of carton is a removable, perforated, circular panel, 6" in diameter, through which strand pays out. Each carton contains a 500' or 1000' coil of wire. (Special Products Department, Copperweld Steel Co., Glassport, Pa.)

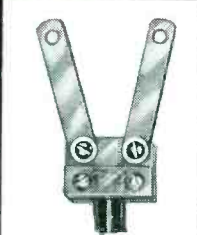


Right: Guy Strand Package

NO BROKEN LEADS



when you use
The New MOSLEY
"Y-TY"



LIST PRICE \$.80

PATENT APPLIED FOR

- Low Loss, Permanent Connections Of Transmission Line and Phasing Strips To TV Antenna Elements!
- For UHF and VHF Antennas!
- For All Types Transmission Line!
- Eliminates Roof-top Soldering Jobs!
- Quick — Easy to Install!
- Available In Two Sizes To Fit All Antennas!

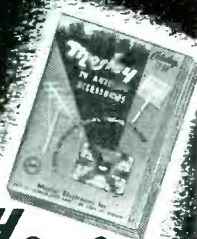
CATALOG 263-S For all UHF Antennas and most VHF Yagis, Conicals, Inline, and other type antennas where distance between terminals is 4" or less.

CATALOG 263-L For TRIO Zig-Zag, and other antennas where distance between terminals is 6" or less.

Your reputation hangs on fine threads of copper. Use the MOSLEY "Y-TY" on Every Installation Job To Stop Antenna Call-backs!

The NEW MOSLEY "Y-TY" now available at Radio and Television Parts Distributors — Coast-to-Coast!

WRITE FOR FREE COPY OF THIS CATALOG



Mosley Electronics, Inc.

8622 ST. CHARLES ROCK ROAD
ST. LOUIS 14, MISSOURI

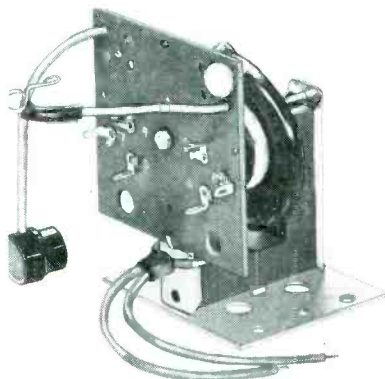
TV Parts... Accessories

HALLDORSON WIDTH-LINEARITY COIL AND EMERSON FLYBACKS

A dual-winding, permeability-tuned coil, *RF800*, has been announced by the Halldorson Transformer Co., 4500 N. Ravenswood Ave., Chicago 40, Ill.

Unit, with one winding with a range of 3.5-31 mh and another with 2-8.5 mh. center-tapped, combines in one unit width control and *age*, or horizontal phase detection functions. In addition, it is said, other simple horizontal width or linearity-control applications can be satisfied by one or the other of the two inductance ranges (further augmented by the tap on one winding). Coil is insulated for 5000 v.

Two flybacks, *FB414* and *FB415*, for over a 100 Emerson TV chassis, are also available. Units are described in bulletin 117 which lists all Emerson models and chassis covered.



Halldorson FB-414/415

VIDAIRE LINE-VOLTAGE BOOSTER

A line-voltage booster, *LU-10 Line-Up*, designed to boost ac line 10 volts, has been announced by Vidaire Electronics Manufacturing Co., 576 W. Merrick Rd., Lynbrook, N. Y.

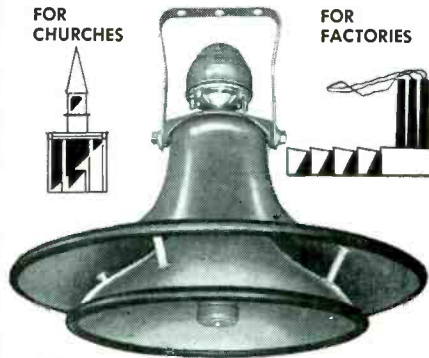
Unit is rated at 350 watts. Has a single switch for 10 v boost or normal.



ATLAS RADIALS

FOR CHURCHES

FOR FACTORIES



FOR TERMINALS

FOR CARNIVALS

With uniform 360° coverage, non-resonant construction, and 100% storm-proofing, ATLAS Radial Driver Unit Projectors often solve the most difficult sound problems—are excellent for reproduction of speech, chimes and music. For complete details on Radials and the famous ATLAS line of Public Address and Microphone Stand Equipment...

WRITE NOW for FREE Catalog 553



ATLAS SOUND CORP.

1442 39th St., Brooklyn 18, N. Y.
In Canada: Atlas Radio Corp., Ltd., Toronto, Ont.

RCA COLOR-TV TEST INSTRUMENTS

Three types of test equipment, for color-TV receivers, have been announced by the RCA tube division, Harrison, N. J.

Equipment includes: service-type color-bar generator *WR-61A*, which produces a multiple-color test pattern of ten color bars for adjusting color phasing and matrixing circuits; portable dot-bar generator, *WR-36A*, designed specifically for making convergence adjustments in color receivers and live-inch dual-bandwidth scope, *WO-78A*, for observing color-burst signal and for checking operation of color-burst circuit.

Also available soon will be an accessory piece of test equipment, a video multi-marker, *WG-295A*, designed for use with a video sweep generator. Unit is said to facilitate pin-point alignment of color receivers by providing five simultaneous absorption-type markers accurately pre-set to color-TV frequencies.

Dot-bar generator produces a pattern of white dots on the screen face when convergence is accurate, and an overlapping pattern of red-green-blue dots when convergence adjustments are required. Instrument also provides a choice of horizontal bars, vertical bars, or a cross-hatch pattern for guiding linearity adjustments in color and b-w receivers.

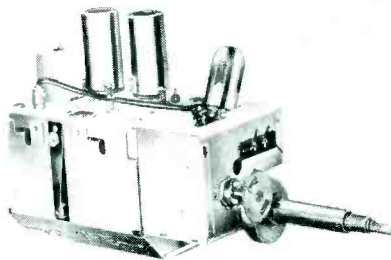
Scope is said to feature a flat response to 4.5 mc. Video multimarker will provide five simultaneous absorption markers pre-set to color frequencies for Q, I and band-pass filters, color subcarrier, and sound-trap alignment.

GI UHF-VHF TUNER

A combination all-channel *vhf-uhf* tuner, 80, featuring a 13-position turret-type *vhf* tuner, model 78, and a continuously-tuned *uhf* unit, model 79, is now available from the General Instrument Corp., 839 Newark Ave., Elizabeth, N. J.

Unit is said to be designed so that the *vhf* section can be purchased and installed separately in sets; the *uhf* section can be added later in the field. Tuning mechanism consists of a tri-concentric shaft arrangement: innermost shaft tunes channels 2-13 by turret-detent action, as in conventional *vhf* sets; middle shaft operates the *vhf* fine tuning and all *uhf* tuning; and the outside shaft operates the dial. In the 13th position, mechanism is switched internally and automatically to *uhf*, and channels 14-83 can be tuned continuously on vernier section of knob. Tuner also features *over-travel* for coverage of *uhf* stations at both ends of dial, detent action with lower torque for channel resetability on the *vhf* section, and a dual-speed drive mechanism for simplification of tuning of the *uhf* section.

Tuner, less than 7" long and 3½" wide, was designed especially for smaller cabinets and larger picture tubes. All power, antenna and *if* connections are made through terminals.



GI Uhf/Vhf Tuner

* * *

ANCHOR PICTURE-TUBE BRIGHTENERS

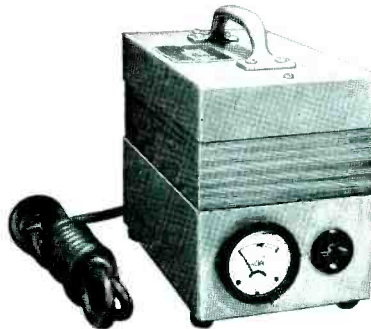
A line of picture-tube brighteners has been introduced by Anchor Wire Products, 2712 W. Montrose Ave., Chicago 18, Ill.

Featured in the line is a universal brightener, *UB 160*, that is claimed to increase voltage up to 7.8 *v* in either series or parallel-wired (filament) chassis. Unit incorporates an isolation-type transformer, which when set to 6.3 *v*, will it is said, relieve internal cathode to filament shorts of picture tubes.

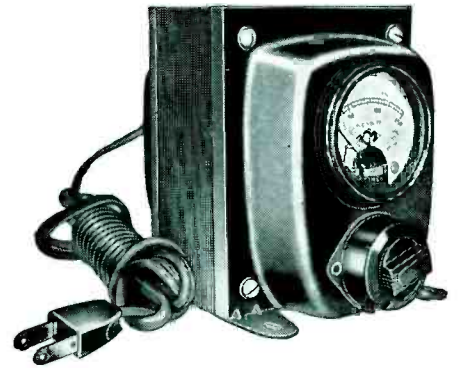


2 PROFITABLE TOOLS FOR EVERY SERVICEMAN

EASY TO USE...



VOLTROL—AUTOMATIC VOLTAGE CONTROL



MANUAL VOLTAGE ADJUSTOR

...EASY TO SELL

to control voltage for top TV reception

Here are two instruments that every serviceman should have to detect and correct the effects of low voltage on television receivers. They are easy to use — just plug them into any convenient outlet. They are easy to sell for extra profit — a simple demonstration on a service call easily convinces the set owner that proper voltage is essential to good TV reception.

T-8394M Manual Voltage Adjustor

Where low voltage is causing flicker or shrinking of the television image, the serviceman can detect the condition immediately with an Acme Electric T-8394M Manual Voltage Adjustor. To determine actual line voltage, set the tap switch at 115 volts and the meter reading will show exact line voltage.

Reproducing Complaint Conditions

Complaints of poor reception often indicate a voltage drop at certain times. But by regulat-

ing the tap switch over the low voltage range, reception difficulties can be reproduced. The simple demonstration of this fact convinces the set owner that voltage control is necessary. An easy sale is made for the T-8394M Manual Voltage Adjustor to correct the fluctuating voltage conditions. This low cost, quality instrument adjusts voltage over a range from 95 to 125 volts and can be set at the exact voltage for top TV reception. Write for Acme Electric Bulletin VVA-190.

VOLTROL — Automatic Voltage Control

This instrument is completely automatic, requires no adjustment and corrects fluctuation of voltage over a 95 to 130 range. Compact and portable. Just plug it into a convenient outlet, no tools necessary. Built-in relay automatically disconnects the circuit when the set is turned off. Write for Acme Electric Bulletin AV-189.

ACME ELECTRIC CORPORATION

MAIN PLANT: 475 WATER ST., CUBA, NEW YORK



West Coast Engineering Laboratories:
1375 W. Jefferson Blvd. • Los Angeles, Calif.
In Canada: Acme Electric Corp. Ltd.
50 Northline Road • Toronto, Ontario

EICO PROBES

Five probes, three for 'scopes and two for *vtvms*, in kit or wired form, have been developed by Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, N. Y.

'Scope probes include: model *PD*, a direct probe, for TV waveform tracing in low-Z or low-frequency circuits, which it is said eliminates stray pickup and signal reradiation; *PLC*, low-capacity probe, for TV waveform tracing in high Z, high-frequency or wideband circuits, that is claimed to eliminate distortion from overloading or frequency discrimination; and *PSD*, a demodulator probe.

VTVM *rf* probes, *PRF-11* or *25*, for use with 11 or 25-megohm *vtvms*, respectively, can be used in *rf* measurements up to 250 mc.



Preferred FOR FIELD REPLACEMENT BY RELIABLE SERVICEMEN FROM COAST TO COAST

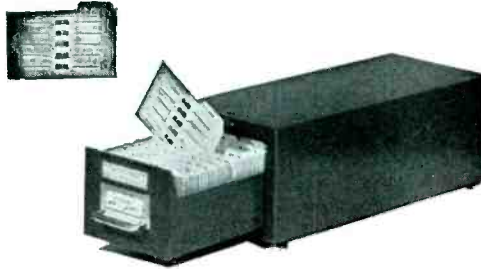
"CARBOMITE" COMPOSITION RESISTORS

TYPE M RESISTORS are fully insulated and can be mounted side by side without shorting. Recommended where space is at a premium. They meet MIL-R-11 specifications and characteristic G for 70° operating temperature. Available in ½ watt, 1 watt and 2 watt ratings. Resistance range 10 ohms through 22 megohms. Tolerances ± 5% and ± 10%.



RESIST-O-FILE CABINETS TYPE MC

For radio and television servicing. Type M "Carbomite" resistors are mounted 5 to a 3x5 index card and filed in resistance sequence. Three assortments are ordered as MC½, MC1 or MC2. Cabinet holds 40 cards of ½ watt, or 1 watt; or 30 cards of 2 watt. Selections include most popular resistance values. All 10% tolerance.



ATTRACTIVE KITS TYPE MK

Arranged in a sturdy carton with 50 type M "Carbomite" resistors of the most popular resistance values. Available in three assortments: MK½, MK1 or MK2.

Visit our booth No. 6 at Electronic Parts Chicago Show

CONTINENTAL CARBON, INC.



13900 LORAIN AVE. CLEVELAND 11, OHIO CLEARWATER 1-6500

PERSONNEL



C. CHANDLER COLE is now general manager of the Ward Products Division of The Gabriel Co., Cleveland, Ohio.



C. Chandler Cole



Harold J. Schulman

HAROLD J. SCHULMAN has been named director of service for CBS-Columbia, 3400 47th Ave., Long Island City, N. Y. Schulman, formerly director of service for Allen B. DuMont Labs, will have supervision of all service and field engineering activities. He is also chairman of the RETMA service committee.

* * *

FRANCIS D. EDES has been elected assistant secretary and assistant treasurer of the Raytheon Manufacturing Co., and will headquarter in the TV and radio division plant in Chicago.

* * *

JOHN BENTIA has been promoted from vice president to executive vice president of the Alliance Manufacturing Co., Alliance, Ohio.

* * *

MIRYAM SIMPSON, of Masco, has been appointed president of Music Artists Inc., a group which will present a series of ten pop concerts in Carnegie Hall. High-fidelity equipment will be placed in the lobby of Carnegie Hall to demonstrate reproduction of the concerts being played in auditorium.



Miryam Simpson



John D. Vickrey

JOHN D. VICKREY, formerly assistant manager for Lee Electric, has joined the engineering department of the International Rectifier Corp., El Segundo, Calif., as sales and application engineer for selenium rectifiers. . . . ALLEN S. NELSON, recently parts department manager of Admiral's Los Angeles distributor, has been appointed manager of distributor sales.

* * *

SAUL KOTCHEVER is now with the Parkside Wire Co., Chicago, Ill., in a sales capacity.

* * *

GEORGE S. BOND has been named ad manager of P. R. Mallory and Co., Inc., Indianapolis, Ind. Bond has been with Mallory since '37.

Convenient to Buy . . . Convenient to Use . . .

LYNN Lightning Solderless Terminals

by **VACO**



Vari-Board Display

- The clean, modern way to apply terminals to wire
- No soldering necessary
- Choice of all popular numbers in handy \$ Paks
- Plastic service kit contains crimping tool and complete selection of terminals for on-the-job use

3 Ways to Buy Supplies of "Refills"



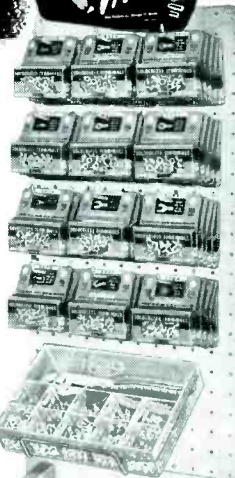
New \$ Pak with life size terminal illustration for easy identification



New "100" Pak contains 100 terminals per box at quantity lot prices



"250" Pak contains 250 terminals per box at volume lot prices



V 51R Display

Look for the Convenient Lynn Lightning Display on Your Jobber's Counter

VACO PRODUCTS COMPANY

In Canada: Vaco-Lynn Products Co., Ltd.

317 E. Ontario St.
Chicago 11, Illinois

there's always
something
new
being developed
by *Perma-Power*



- NORMAL LINE VOLTS
 - 10 VOLTS INCREASE
 - 10 VOLTS DECREASE
- 300 WATTS**

List Price
\$6⁷⁵

Sold Through
Better Jobbers

manufactured by
Perma-Power COMPANY
Chicago 25, Ill.
Manufacturers of Electronic Equipment Since 1928

HODGE C. MORGAN has been named general sales manager of the television and broadcast receiver division of the Bendix Aviation Corp., Baltimore, Md. Morgan will be responsible for all merchandising activities of the division.

* * *

CURTIS F. FALLDINE and CARL J. ANDERSON were elected treasurer and secretary, respectively, of the Acme Electric Corp.



Carl J. Anderson



Curtis F. Falldine

* * *

CLARENCE FELIX, general manager of government products, has been named vice president of the Crosley division, Avco Manufacturing Co., Cincinnati, Ohio. Felix will continue to manage government products.



Clarence Felix



Lynn C. Wimmer

LYNN C. WIMMER has been appointed director of public relations of Burton Browne Advertising, Chicago, Ill.

* * *

GORDON LE MAY, formerly assistant sales manager for Telematic Industries, has been appointed assistant sales manager for Radio Merchandise Sales, New York, N. Y.



Gordon Le May



John M. Kellie

JOHN M. KELLIE has been elected treasurer of the National Union Radio Corp., Hatboro, Pa.

* * *

PATRICK CALOBRISI and CARL FINZER are serving as instructors at the color school for distributor personnel set up by Motorola, Inc., Chicago, Ill. Calobrisi and Finzer helped to equip the school and edit the courses. School has a complete color experimental lab, flying-spot scanners and color transmitters.

* * *

LOUIS W. SELSOR is now distributor sales manager for the Jensen Manufacturing Co., Chicago, Ill.

* * *

ABRAHAM HYMAN has been named head of the TV antenna development section of the Brach Manufacturing Corp., Newark, N. J.

SAVE 2-WAYS
WITH
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DRIVER UNITS & TRUMPETS

1. Higher Conversion Efficiency
Lowers Amplifier Costs
2. Highest Quality Eliminates
Maintenance Expense



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UNIVERSITY trumpets are built to the highest standards in the industry—by the pioneers of the reflex trumpet. They are completely weather-proof, super conditioned for any locale or climate. Achievement of highest attainable conversion efficiencies reduce amplifier requirements. Get the facts.

* Less Driver Unit

MODEL	GH	LH	PH	SMH
Low Frequency Cutoff	85 cps.	120 cps.	150 cps.	200 cps.
Sound Distribution	65°	75°	85°	95°
Air Column Length	6 1/2 ft.	4 1/2 ft.	3 1/2 ft.	2 1/2 ft.
Bell Diameter	30 7/8"	25 3/8"	20 1/4"	16 1/4"
*Horn Length	27 7/8"	19"	15 3/8"	12"
*Shipping Weight	25 lbs.	20 lbs.	11 lbs.	9 lbs.

HIGH EFFICIENCY DRIVER UNITS



MODEL SA-HF — Workhorse of the sound industry for general PA and industrial use. Very high efficiency delivers extra punch to cut through heavy noise. Response to 10,000 cps.—ideal for both speech and music. Tropically and hermetically sealed for trouble-free service anywhere.

MODEL MA-25 — A low cost unit for use where response to 6000 cps. meets requirements. No compromise in quality — incorporates all the famous UNIVERSITY quality features — high efficiency magnet structure, tropicallized full size 2" voice coil, rim-centered break-down proof bakelite diaphragm, etc.



MODEL PA-30 — A "de-luxe" unit incorporating every advance design feature including famous University W Alnico 5 Magnet and built-in transformer with terminals available thru housing base. For all amplifiers including 70 volt systems. Response 80-10,000 cps. with 30 watt cont. power.

MODEL SA-30 — Similar to the SA-HF in response and efficiency but includes a multi-impedance line matching transformer with taps accessible through water-tight cover. Taps designated in impedance values and watts for "constant voltage" lines. Die-cast aluminum housing affords lasting protection.



Write for catalog describing the complete line of University HI-FI and PA reproducer equipment, including Radial Type Projectors. Address Desk 17-E

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For the name of your C-D distributor, see the yellow pages of your phone book. Write for Catalog to: Dept. S54, Cornell-Dubilier Electric Corp., South Plainfield, N. J.

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Tools . . . Instruments Parts . . .

G-C CLEANER-LUBRICANT

A noise-preventing chemical, *Spra-Kleen 8666*, developed as a two-in-one electrical contact cleaner and lubricant, has been introduced by the General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill.

Available for use in contacts, relays, switches, controls and other moving parts; chemical is released under pressure and has a directional nozzle. Packed in a six-ounce spray-type container.



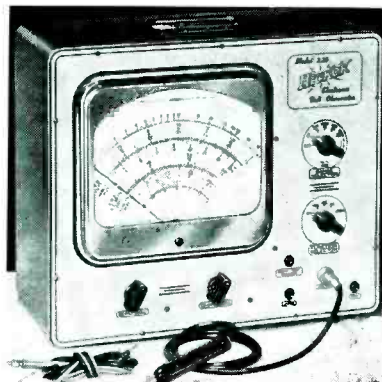
G-C Spra-Kleen

HICKOK VOLT-OHMMETER

A multi-range volt-ohmmeter, 225, designed around a 9" internal pivot meter, has been introduced by the Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 8, Ohio.

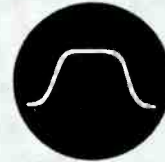
Instrument features a built-in audio tone for continuity checks, peak-to-peak scales, *dc* zero center scale, and a single probe for both *ac* and *dc* measurements through use of a slide switch.

As a *dc* voltmeter it measures negative and positive *dc* volts from 0-1.5, 3, 12, 30, 120, 300, 1200; and input resistance up to 10 megohms. As an ohmmeter, it has a readability of from .2 ohm to 1000 megohms, and ranges x1, x100, x1000, x10,000, x100,000 and x1 megohm.

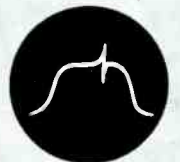


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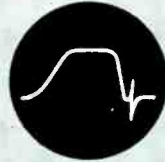
INVEST in KAY INSTRUMENTS THAT SAVE YOU TIME AND INCREASE YOUR PROFITS



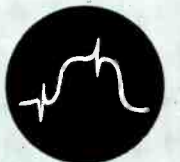
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- Traces TV Signals and Voltages
- Locates Defective Components
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This sensationally new piece of test equipment is ideal for troubleshooting television sets in the home or in the shop. The "DYNATRACER" will outperform more expensive testers and should pay for itself on first repair.

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SPECIFICATIONS: The "DYNATRACER" is a self-powered quality test instrument designed to trace TV signals through any Video, Sound, Sync, AFC, Horizontal or Vertical Sweep Circuit—will isolate trouble to a stage or component.

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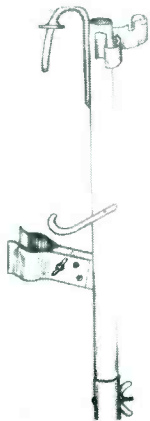
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- REPS.

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612 Penn Avenue, West Reading, Pa.
*Patents Pending

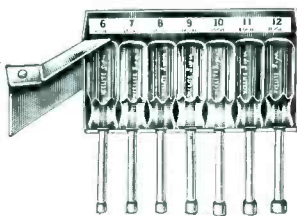
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NOT Making Hay While the Sun Shines!



When you spend valuable job time looking for tools that hide like the famous needle in a haystack—you're losing money! With this XCELITE No. 127 Lockable Wall Set, you've got 3/16" thru 3/8" regular nut drivers right where you want 'em! Tamper-proof! "Borrow"-proof! Color-Coded handles (now on ALL XCELITE nut drivers)!

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LOOK TO **XCELITE**

SIMPSON ADJUST-A-VUE HANDLE

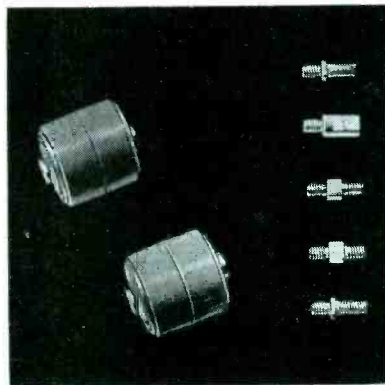
A utility handle, *Adjust-A-Vue*, that permits placement of the 260 volt-ohm-milliammeter tester at a convenient viewing angle while servicing, has been introduced by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

Handle is constructed of steel, coated with Durez plastic.

CENTRALAB HV CAPACITORS

High voltage capacitors, *Hi-Vo-Kaps*, designed so terminals will not twist out or break off, have been developed by Centralab, 900 East Keefe Ave., Dept. E8, Milwaukee 1, Wis. Capacitors are available in 20,000 *vdco*, 500 mmfd. Heavy 8-32 threads on both terminal and capacitor lock the terminal into the unit. Internal corona is prevented by seating terminal at bottom of capacitor tap, avoiding any air gap.

Also available are kits of complete capacitor and terminal assortments; bulletins 28-2 and 42-201 provide complete details.



Centralab Hi-Vo-Kaps

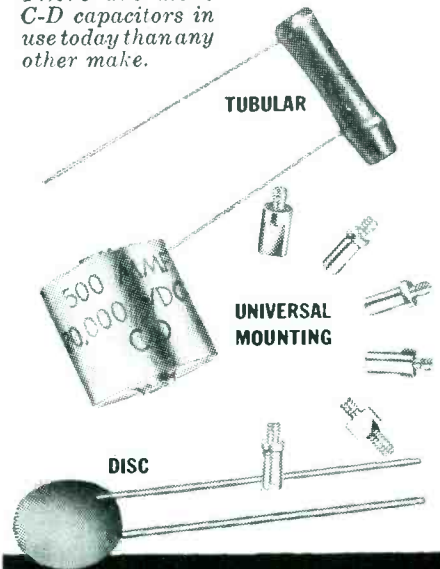
DELCO AUTO-RADIO ANTENNA

Two universal auto-radio antennas designed for one-man installation, are now available from United Motors Service, GM Building, Detroit 2, Mich.

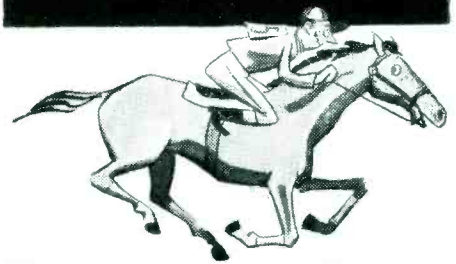
Antennas are said to insure elimination of rod rattle through the use of nylon plastic inserts. Masts are made of Admiralty brass, triple chrome plated, with top sections of stainless steel, and plastic bases which allow adjustment to any desired angle and contour. Base construction, which is corrosion resistant and waterproof, is claimed to eliminate rough road flutter.



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A line of the most popular, fast-moving sizes, in both general purposes and temperature compensating types. Ask your C-D jobber about them today! He's listed in your local Classified Telephone Directory. For catalog write to Dept. S54, Cornell-Dubilier Electric Corp., South Plainfield, New Jersey

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER
CAPACITORS

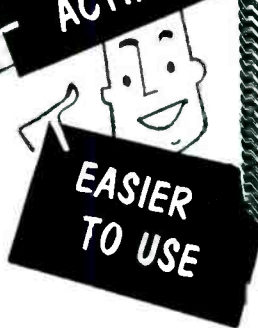


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C-D CAPACITOR-RESISTOR BRIDGE

A capacitor-resistor bridge, *BF-60*, that measures, and detects opens, shorts and intermittents of capacitors and resistors, has been announced by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Instrument also measures the capacity between wires and shieldings, transformer windings, wires in cables, etc.; makes it possible to measure insulation resistance of paper, mica and ceramic dielectric capacitors. Amplified bridge circuit is employed.

Measures capacity range of .00001 to 1000 mfd in four scales; power factor from 0 to 50%; leakage in electrolytics, and insulation-resistance. Measures resistance from 100 to 5,000,000 ohms.



C-D BF-60
* * *

ERIE TEMPERATURE-COMPENSATING TUBULAR CAPACITORS

A line of temperature-compensating ceramics (NPO, N330, and N750), covering a broad range of values in three temperature coefficients, have been introduced by the Distributor Division, Erie Resistor Corp., Erie, Pa.

* * *

WALL SOLDERING IRONS

An instant-heat, gun-type soldering iron, *214LT*, claimed to feature a thermostatic brain that it is said will automatically reduce or increase wattage as work requires it, has been developed by the P. Wall Manufacturing Co., P. O. Box 71, Grove City, Pa.

Unit uses no transformer or moving parts. Includes a built-in spotlight. Available with 1/4" and 1/2" steel-clad tips. Has a 6" reach, and a 400-800 maximum watt input.

An industrial, continuous-use soldering iron, *18T*, with the thermostatic brain, is also available. Tip sizes from 1/8" to 1 3/4", in varying sizes and wattage ranges. Pencil-type irons are available in 1/8" and 1/4"-tip sizes.



Wall 214LT (top) and 18T (bottom) Irons

THE NEW MODEL TV-11

TUBE TESTER



- Uses the new self-cleaning Lever Action Switches for individual element testing.
- Because all elements are numbered according to pin number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TV-11 as any of the pins may be placed in the neutral position when necessary.
- Uses no combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket.
- Free-moving, built-in roll chart provides complete data for all tubes.
- Phono jack on front panel for plugging in either phones or external amplifier detects microphonic tubes or noise due to faulty elements and loose external connections.

EXTRA SERVICE—The Model TV-11 may be used as an extremely sensitive Condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute.

Operates on 105-130 Volt 60 Cycles A.C. Hand rubbed oak cabinet complete with portable cover. **\$47.50**

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Northern California Electrical Bureau

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by IRA REMER

A picture tube servicing guide for the television installation repair man. Covers the care, methods of handling, replacement maintenance and repair of the picture tube. It is written for the technician who desires basic and specific information on the picture tube and its accessories (including conversion) without wading through reams of technical data and complicated circuit explanations.

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by LEONARD KRUGMAN

The transistor is now evolved to a point where it is suitable for many applications, both as a direct replacement and as a supplement to electron tubes. An expert has consolidated in practical form for the repair man, the engineer, the hobbyist and the engineering student the explanation and application of the transistor. Basic transistor operation, characteristics, performance and application are explained.

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POMONA TEST SOCKET ADAPTERS

Socket adapters, to facilitate making measurements of voltage, resistance, audio and video from the top of the chassis while the set is in full operation, have been developed by Pomona Electronics Co., 524 W. Fifth Ave., Pomona, Calif.

Units are available for 7- and 9-pin miniature, and 8-pin octal sockets. Adapters feature extended test tabs for use with either alligator clips or test prods. Rf-loss power factor is said to be less than .010 at 10 mc. Mica-filled phenolic construction.



Pomona Socket Adapters

* * *

LINDGREN BRONZE SCREEN ROOMS

A line of bronze screen rooms, that have an attenuation rating of 126-128 db, has been developed by Lindgren and Associates, 4515 Ravenswood Ave., Chicago 40, Ill.

Rooms, available in standard sizes, 8' in height, 5' or 10' wide, and in lengths from 5' to 42', have a spacing of 1⅝" between the inner and outer shields which are physically and electrically isolated except at the power entrance. Floors, walls and ceilings are assembled from pre-fabricated interchangeable sections.

Attenuation at 50-200 kc is above 80 db; 112 db between 200-600 kc; 126 db between 1 and 800 mc; and about 100 db at 3000 mc.

* * *

FURBLO TURNTABLE

A turntable, *Role-A-Tune*, that accommodates table-size radios and TV boosters and converters, has been announced by the Furblo Co., Hermsville, Mich.

Rotating plate, 12" by 8" (16 gauge), takes loads up to 50 pounds. Features rubber-tipped feet, neutral finish, and patented bearings that are said to require no oiling.



Furblo Role-A-Tune

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Here is the complete story about color television—all types of receivers—all types of picture tubes—all types of circuits—written in a clear, understandable language without mathematics. The most complete book on the subject. Easy to understand! A "must" for all technicians, engineers and students.

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HOW TO INSTALL AND SERVICE AUTO RADIO RECEIVERS

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The finest practical data service for in-home servicing. Tube layouts; picture tube adjustments; rear and front controls; tube complement; tuner and horizontal oscillator adjustments; tube complement; key voltages; tuner dial stringing; trouble symptoms; chart with tubes and parts to check; series filament wiring. Book lies flat, spiral binding. Covers 1947 through 1953.

Volume 1 covers: Admiral, Affiliated Retailers (Artone), Aimee (AMC), Air King, Air Marshall, Allied Purchasing, Andrea, Arvin and Automatic.

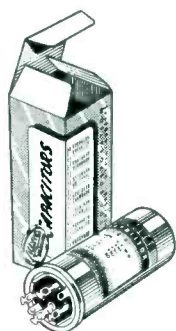
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AEROVOX CAPACITORS

WORKMAN CONTACT-TUNER CLEANER

An electronic contact, tuner cleaner and lubricant, *Wissah*, that is said to eliminate noise and scratch due to bad contacts, is now available from Workman TV Inc., 309 Queen Anne Rd., Teaneck, N. J.

Two refill bottles, a squeeze-type dispenser and a glass bottle with brush, both holding 2 ounces of chemical, are given with each purchase of a one quart refill can. Quart can is equipped with a refill spout. Plastic squeeze bottle dispenser is equipped with a refill top with a hinge cap. Glass bottle dispenser has a brush attached to the cap.



* * *

STURDI-BILT WORK BENCHES

A line of work benches, either stationary or portable, are now available from Sturdi-Bilt Steel Products, Inc., 624 S. Michigan Ave., Chicago 5, Ill.

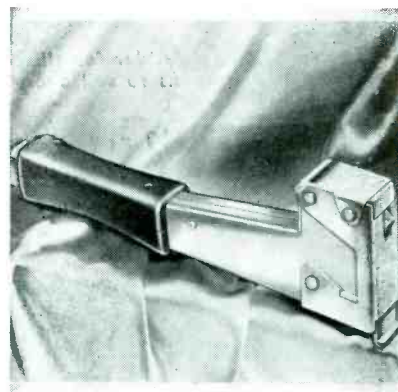
Mobile bench features two steel trays 20 3/16" x 20 3/16" with all around steel flange, and adjustable height control in 9 positions from 21 1/2" to 33 1/2"; 2' square top, sealed, lacquered and waxed in natural finish that is said to be resistant to oils and greases; 3" d rubber wheels; swivel casters, and a steel drawer.

* * *

ARROW HAMMER-TACKER

A one-hand nailing machine, *HT-50*, that drives .050 carbon steel wire staples, has been introduced by the Arrow Fastener Co., Inc., 1 Junius St., Brooklyn 12, N. Y.

Unit is constructed of heavy steel, with hardened steel working parts and handle. Designed for 1/2", 3/4" and 5/8" leg length staples; loads 100 at a time.



NEW MULTIMETER KIT \$26.50

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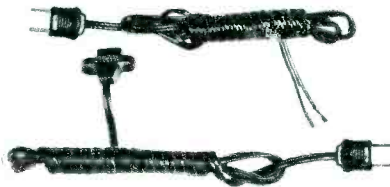
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U. S. WIRE THERMOPLASTIC CORD SETS

A line of ac line cords and molded plastic line cords, *US-YR-CORD*, supplied with molded or attached plugs, molded and attached connectors, molded croches, harnesses, and other special types of construction, are now available from the U. S. Wire and Cable Corp., Progress and Monroe Sts., Union, N. J. Cords are thermoplastic insulated and U.L. approved.



TIME SAVER BORING TOOLS

Industrial boring tools, that bore holes through wood or plastic from 5/8" to 2 9/16" with 1/4" or 1/2" electric drills, have been announced by Time Saver Tools, Inc., Meunlelein, Ill.

Featuring a *magic circle* steel bit that has a front rake design, tool can be used with pipe thread connections.

WARD COWL ANTENNA

A three-section, top cowl auto-radio antenna, *Majorette*, that it is claimed can be completely installed from the outside, has been introduced by the Ward Products Corp., 1148 Euclid Ave., Cleveland 15, Ohio.

Full 56" antenna is available in two versions: *TA-3*, with a 36" lead, and *TB-3*, with a 54" lead.



Ward Majorette

STAR WIRING PLUG-TUBE PIN STRAIGHTENER

A miniature socket wiring plug, and a miniature tube pin straightener, have been developed by the Star Expansion Products Co., Inc., 147 Cedar St., New York 6, N. Y.

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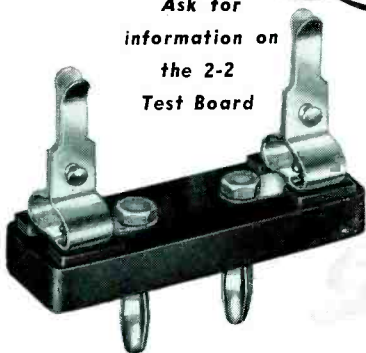
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Color TV Developments

(Continued from page 55)

reinserted color subcarrier is identical with that used in the transmitter. While the color system does contain an automatic-control system to maintain the frequency and phase of the generated 3.58-mc color subcarrier at the proper point, there is enough phase variation present so that a manual adjustment control, such as the color-fidelity control, is desirable. Phase shifts can occur before the color burst reaches the automatic-control system, or after the generated 3.58-mc color subcarrier leaves its oscillator, or before it reaches the I and Q demodulators. Any phase shift of this nature will result in the wrong colors being developed on the screen. It is the purpose of the color fidelity control to compensate for such changes.

The purity control is a pot which governs the amount of current flowing through the purity coil, which was designed to insure that each electron beam strikes only one type of color dot. Thus, the beam from the red gun should strike only red phosphor dots; the beam from the green gun should hit only green phosphor dots, etc.

The focus control accomplishes what its name indicates, i.e., helps to focus

the three beams on the phosphor-dot screen. Focus in the tri-gun color tube now being used is achieved electrostatically. Hence, the focus control varies the voltage applied to grid 3 of the picture tube.

Vertical and horizontal centering controls enable one to orient properly the picture on the screen. Each control achieves its purpose by altering the

flow of dc through its respective windings of the deflection yoke.

For dc convergence another pot is used; this varies the dc component of the voltage applied to grid 4 of the picture tube. It is the function of the convergence electrode to cause all three beams to pass through the same hole in the shadow mask at the same time. This action is achieved by de-

AT CAPACITOR AD-PLANNING SESSION



J. Frank (center), vice president in charge of sales, and Irving Ser (left), assistant sales manager, Astron Corp., East Newark, N. J., discussing new ad program on capacitors and filters with Ed Conti, Conti Advertising, recently named to handle account.

veloping the proper electrostatic field between grid 4 and the aquadag coating on the inner surface of the glass bulb. The *dc* convergence control is rotated until the proper convergence is achieved, principally in the center of the screen. The next two controls, horizontal and vertical dynamic convergence, then serve to apply sufficient parabolic voltage to grid 4 of the color tube to provide the proper beam convergence for areas away from the center of the screen.

The rim coil control, also a pot, varies the current through the rim coil until the distorting effect of any earth and stray magnetic fields on purity has been neutralized. The effect of these magnetic fields or that of the coils is not too strong and, in some instances, the rim coil is not employed.

Color-TV Receiver Servicing

The next five color controls serve in one fashion or another to regulate the number of electrons in each beam and therefore enable the Service Man to proportion each beam current density so that when a b-w signal is being received, a b-w image is developed on the screen.

The first step in the servicing of a

typical b-w TV receiver consists of an examination of information on the picture tube screen and, at the same time, noting what is heard from the loudspeaker. If both sound and video are affected, then it can reasonably be certain that some component common to both signal circuits is at fault. In an intercarrier receiver, this would include the *rf* section, video *if* stages, second detector, and sometimes one or more video amps. At all these points, both signals travel side by side through the same circuits.

On the other hand, if just one of the signals is affected, while the other appears to be normal, chances are the trouble is situated in one of those stages through which the affected signal travels alone. For the sound signal, this would include the sound *if* amps, FM detector, or the audio voltages and power amps. For the video signal, this would include video amps, vertical or horizontal sweep systems, sync separator section, *hw* power supply, or the picture tube itself.

This analysis can be carried over to a color-TV receiver. From the antenna to the point in the video *if* system, where the sound signal is diverted to its system, all signals travel together and what affects one will, in general,

affect both. Thus, distorted sound (or no sound) coupled with a distorted picture (or no picture) should be investigated by working between the sound separation point and the antenna. This would include the *rf* and video *if* sections.

Beyond the separation point, the video signal containing both monochrome and color components continues onto the video second detector where the *if* is removed and only the video frequencies, 0-4 mc, remain. At this point, or shortly thereafter, the color portion of the signal is separated from the rest of the signal and directed into its channel; the chrominance circuits.

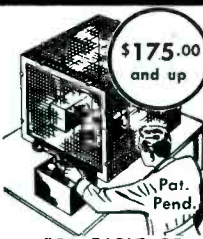
Here, then, is a second separation point and one which is new in color-TV receivers. If a color signal is being received, then what happens in the color section of the receiver is important. On the other hand, if the telecast is in black-and-white, then only the monochrome signal will be important. This signal goes on to the matrix. From here, and in the absence of any color signal, each of the red, green and blue circuits leading to the picture tube contains the same signal, and thus each electron beam is

(Continued on page 86)

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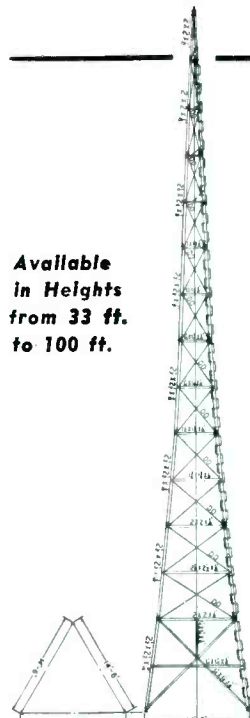
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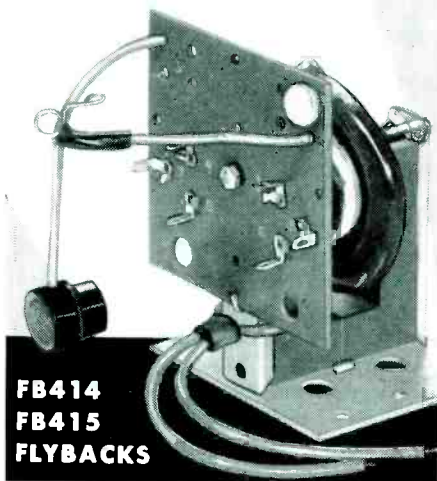


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(Continued from page 85)

similarly active, resulting in a b-w picture.

Suppose the picture is not fully black-and-white? What could cause this condition to exist?

If the purity coil or the convergence (*dc* and dynamic) controls are misadjusted in any way, then the three beams will not be passing through each shadow mask hole together and at the proper angle. As a result, any one beam may either be striking the wrong color dot or it may be approaching at such an angle that more than one color dot is hit. In either event, the wrong colors will be produced and colors will be seen on the screen.

A second reason for the appearance of colors on a b-w picture may stem from the chrominance section. Ordinarily, this section is rendered inoperative when a b-w signal is being received. This is achieved in most instances by cutting off one or more tubes in the chrominance section through the application of a highly negative voltage from a special color killer network. However, if something should cause the color-killer circuit to become defective, the chrominance channel will pass signals (spurious or black-and-white) and this will lead to color appearing on the picture screen. The color specks will be random, giving the picture a mottled appearance.

Electron Gun Trouble

There is still another condition that may lead to the appearance of color on a picture tube screen when a b-w broadcast is being received. This will occur when one of the electron guns in the picture tube is defective, or the circuits directly associated with that gun are not operating normally. Under b-w conditions, the matrix is receiving voltages only from the *Y* or brightness path. The *Y* voltage, in this network, is fed in equal measure to separate amps entitled green, red and blue amps. Each path also contains a *dc* restorer. Should anything happen to prevent either an amp or the *dc* restorer of any path from operating normally, the visual effect will be a change in the amount of voltage which that system is supplying to its electron gun. Since the appearance of white on the color screen depends upon each electron beam striking its dots with a certain intensity, any change that disrupts this condition will produce a coloring of the picture tube on the screen.

[To Be Continued]

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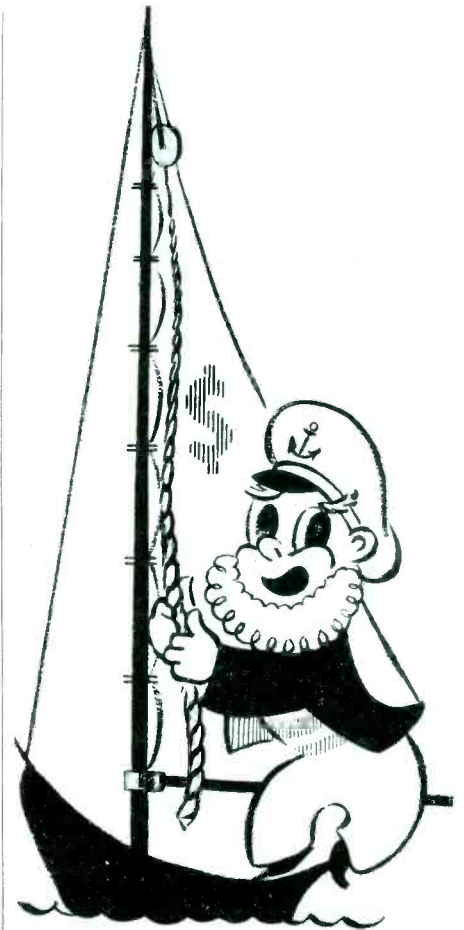
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JOTS AND FLASHES

CAMPAIGNS to alert TV set owners to the need for installing lightning arresters and periodic checks of antenna installations are now in full swing. RCA has instituted a program called *Operation Checkup*, centering around a four-point installation checkup. Window posters and direct mail literature are being used. . . . The '55 West Coast Audio Fair advisory committee now includes: *Gramer Yarbrough*, American Microphone Co.; *Bert Berlant*, Berlant Associates; *Bill Thomas*, James B. Lansing Sound Co.; and *Bob Newcomb*, Newcomb Audio Products Co. . . . A series of technical forums in Wisconsin, Iowa, Nebraska, and the upper Mississippi River Valley, was completed recently by *Ken Lippitt*, vice president in charge of engineering of Taco. . . . Clarostat recently celebrated its fifth anniversary in Dover, N. H. Plant now employs over 1,500. . . . A special terrace-like amphitheater will be constructed in the grand ballroom of the Sheraton Hotel, Chicago, to accommodate approximately 400 distributors and their sales execs from all parts of the country who will attend the 7th annual Webcor national sales conference on May 21. . . . Phonograph Manufacturers Association, Inc., is now located at

562 Fifth Ave., New York 36, N. Y. A. D. Adams is secretary. . . . *Jerome J. Kahn* has been retained by John H. Chatz, principal trustee of Crescent Industries, Inc., to spearhead reorganization of the company and to establish sales, production and promotion policies. . . . Some 150 Service Men and dealers, coming from a radius of 50 miles (in the Saratoga-Schenenady-Pittsfield area), gathered recently in the auditorium of the Fort Orange Radio Distributing Co. to listen to *Harold Kahn*, field engineer of Granco Products, Inc., lecture on *uhf* propagation and reception. . . . A poster-size folder, describing the CBS-Hytron *certified quality service* program, has been released. Folder contains description of national-magazine ad program, multi-use tags, window posters, sales aids, catalogs, and decals. . . . The west coast is doing an annual volume of \$700,000,000 in TV, radio and special-purpose electronic manufacturing, according to *Lawrence M. Perrish*, president of Pioneer Electronics Corp. A recent survey by the Los Angeles chamber of commerce disclosed that the number of electronic manufacturers in the L. A. area alone has increased 900% since '52.



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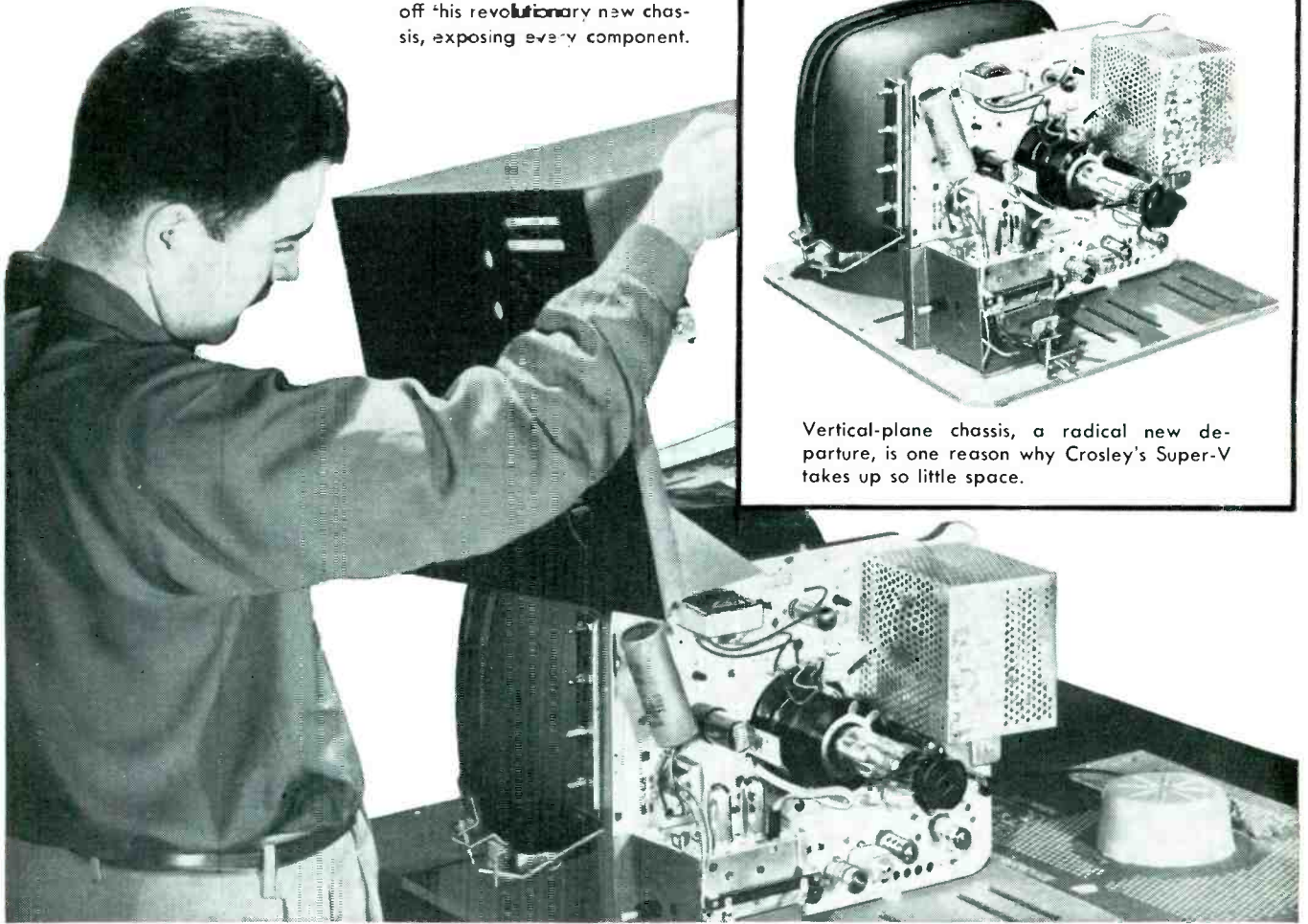
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