

Radio
**SERVICE
DEALER**

OCTOBER, 1949



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P.A. Techniques For The Coming Elections

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TV Quiz No. 5

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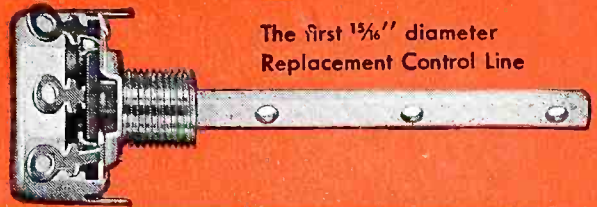
AM-FM-TV-SOUND

The Professional Radioman's Magazine

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The first $\frac{15}{16}$ " diameter Replacement Control Line

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NEW SWITCH
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 NEW TWO-POINT SUSPENSION

NEW CONTACT
 NEW TERMINAL

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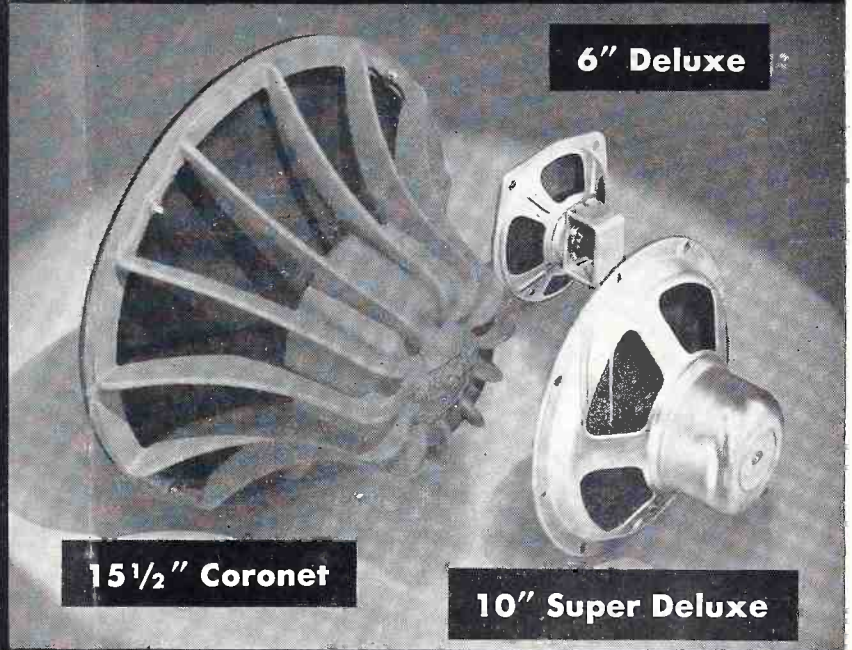
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SERVICEMEN — DEALERS

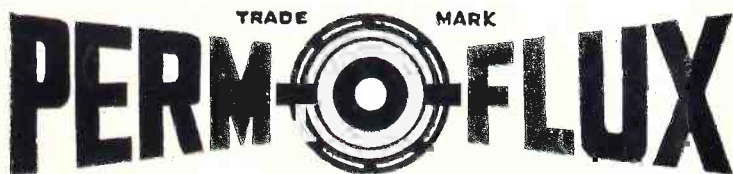
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SIZE	MODEL NO. OR CODE	MAGNET DATA FLUX GAUSS	VOICE DIA-METER	COIL DATA IMPE-DANCE	WATTS
6"	6L-1	10000	3/4"	3.2	5
8"	8T-8-1	10000	1"	8.0	8
10"	10T-8-1	10000	1"	8.0	9
12"	12T-8-1	10000	1"	8.0	10
Super Deluxe High Fidelity Models—Extra Heavy Magnets—With Pot Covers					
8"	8WP-8-1	10000	1 1/4"	8.0	10
10"	10WP-8-1	10000	1 1/4"	8.0	11
12"	12WP-8-1	10000	1 1/4"	8.0	12
15"	15WP-8-1	10000	1 1/4"	8.0	15
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12 1/2"	125Z-16	15000	2"	16 ohms	20
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EDITORIAL

by S. R. COWAN

Long Beach RTA in News

Long Beach California's Radio Technician's Association has a spark-plug member named Harry E. Ward. I've known and worked with Harry for years. He is dynamic, sincere, and successful. That in itself commends him, but in addition, Harry has been "association conscious" and in my humble opinion the West Coast's servicing profession owes him a debt of gratitude for his many contributions to the art. Now we congratulate Harry for having won the Archie J. Mooney Award because the technicians apprenticeship committee voted him the "most outstanding, aggressive member" in connection with his efforts to improve service quality and labor standards in his part of the country. In every key city of the country it would be well if an aggressive Service Dealer would step out and dominantly, yet judiciously, attempt to organize his fellow technicians into a local association so they can progress in unity towards the goal of improving our profession's status in that particular community.

AM Versus TV Potential

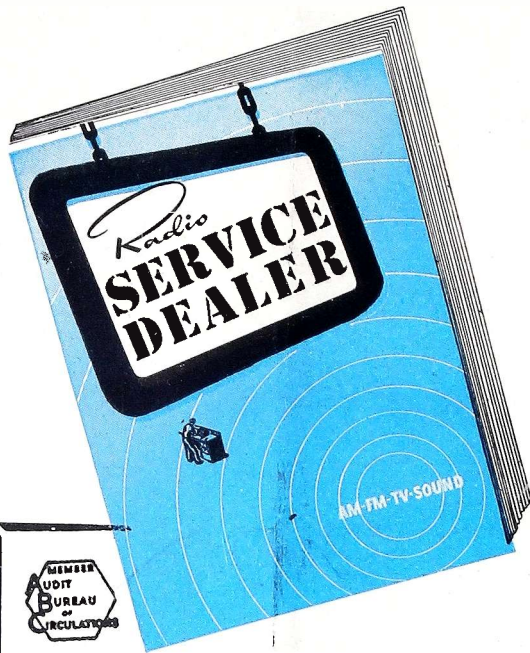
Over 3 million TV sets are now in use in but a few highly populated areas while over 80 million home and auto radios are in use in the country as a whole. By 1953 it is estimated that half the country's homes will have TV sets, and of course, it is likely that the number of AM sets in use will not diminish. However, receivers break down in direct proportion to the amount of usage they get, and statistics already show that where there is TV the number of service jobs on AM sets is falling off alarmingly.

An average TV set is equivalent to 7 AM sets in breakdown potential, number of replacement components, etc. The labor time required to repair a TV set, as compared to an AM set, runs upwards of 10 to 1. So, while the servicing profession can anticipate being kept busy handling AM maintenance work for many years, we can not discount the much greater money-making potential TV offers to technicians who are competent enough to service the complex TV circuits.

Never lose sight of the fact that "Time is Money" to a repair profession. Wasted time is money lost, and never regainable. No matter how long it may be before TV reaches your community, take advantage of that very fact by learning NOW all there is to know about this new Art.

Servicemen Winning Recognition

From all branches of the radio industry, manufacturing and broadcasting included, at last is coming the rightful recognition so long overdue the servicing profession. Now, if both the manufacturers' and broadcasters' associations would utilize their strong prestige and publicity dissemination positions in educational campaigns to teach the set owning public that it can have confidence in established and reputable Service Dealers, all parties would benefit.



Sanford R. Cowan
EDITOR & PUBLISHER

Samuel L. Marshall
MANAGING EDITOR

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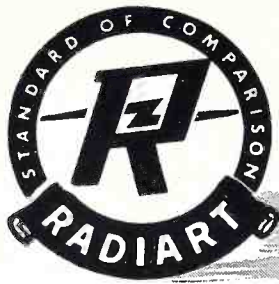
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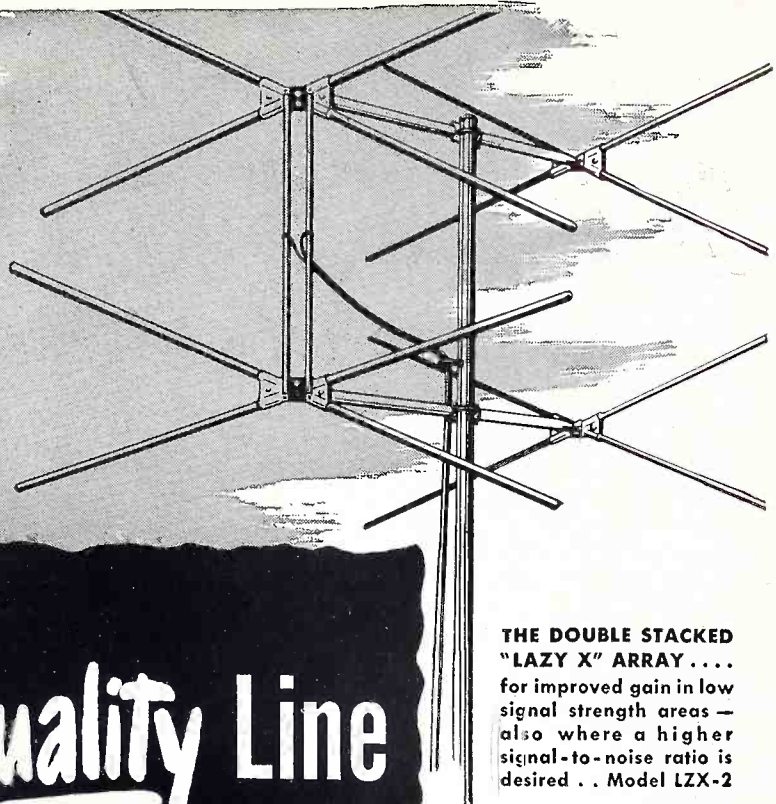
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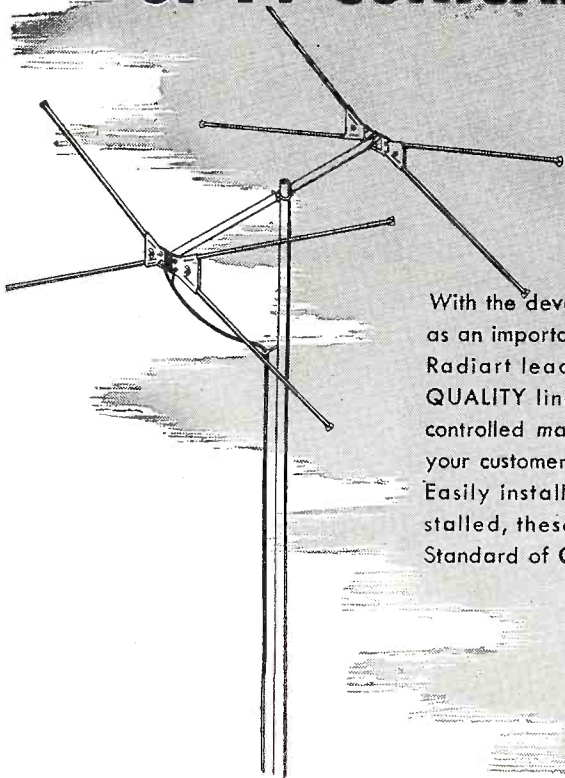
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features



THE DOUBLE STACKED "LAZY X" ARRAY . . .
for improved gain in low signal strength areas — also where a higher signal-to-noise ratio is desired . . . Model LZX-2

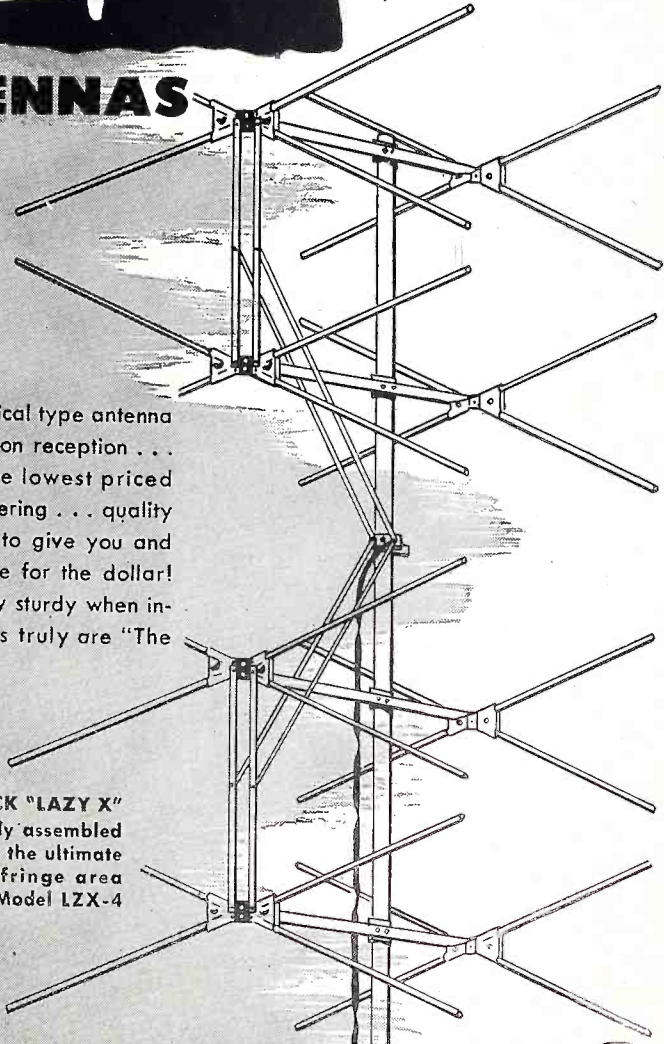
THE
Lowest Priced Quality Line

OF TV CONICAL ANTENNAS



THE SINGLE BAY "LAZY X"
... for primary service areas
..... Model LZX

With the development of the conical type antenna as an important factor in television reception . . . Radiart leads the way with the lowest priced **QUALITY** line. Precision engineering . . . quality controlled manufacture combine to give you and your customers the greatest value for the dollar! Easily installed . . . and rigidly sturdy when installed, these Radiart products truly are "The Standard of Comparison."



The QUAD-STACK "LAZY X" Array . . . easily assembled and installed for the ultimate in all channel fringe area reception Model LZX-4

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Manufacturers of the Famous Red Seal Vibrators

Field Findings

A resume of Industry happenings here, there and everywhere

THIS month "Field Findings" will be reported in reverse chronological order, starting with last minute doings, then going back step by step to the point where I left off in the August issue.

Telecasters Educational Campaign

TBA (TV Broadcasters Assn.) and RMA have jointly released a series of 20 TV movie shorts. These run from 20 seconds to 1 minute and will be furnished gratis to all of the 81 TV stations now in operation so they may run them during available "station breaks".

Each movie short tells the viewer how to properly operate his set for maximum enjoyment. The basic purpose behind each is to try to reduce the number of unjustified "callbacks" which have plagued TV installation and maintenance firms. Having seen the previews of the series of educational shorts, I would say that most are very effective and in the main will help the servicing fraternity. I particularly liked those "shorts" which warned TV set owners not to fiddle with alignment controls; not to try to install their own antennas, etc., and instead to call their local Service Dealer. If nothing else, the very fact that RMA and TBA are going ahead with the project proves that at long last the service technicians are being recognized as being an integral part of this industry.

However, as a passing thought, I would also urge RMA to work with AM broadcasters in lining up a series of station break announcements for AM listeners whereby AM audiences would be reminded to have their radio sets checked periodically by the local Service Dealer. After all, there are well over 80 million AM receivers in use, and a large percentage of them are not in good operating order but could easily be put in good condition if serviced for a nominal fee.

RCA Tune-Up Campaign

Taking a leaf from our recent editorial suggestion, RCA has come up with a fine campaign intended to help

by S. R. COWAN



Shown above are some of the Radio Service Dealers who attended the PRSMA Service Convention at Town Hall in Philadelphia, on Sept. 18, 19, and 20. Almost 5,000 were there. The Radio Service Dealer Magazine Booth can be seen in the top picture at the extreme right.

Service Dealers get more repair jobs. RCA estimated that well over 10 million radio sets in homes require repairs. Accordingly a complete "kit" has been made available to provide Service Dealers with sales and merchandising aids so they can go after the potential business. There are window and store displays, direct-mail and other advertising pieces, even plastic price stands. All the material has the theme of teaching set owners that it will not cost them much to have their sets repaired. Nice going, RCA. Let's hope that other manufac-

turers will afford Service Dealers with aids of various types that will help them keep hammering at the set owning public to have their sets checked regularly. Most Service Dealer organizations are small, one or two-man establishments, that cannot afford to pay for expert advertising guidance. The big manufacturers can and should make such material available—and the servicing fraternity would be wise in utilizing it.

PRSMA Service Convention a Smash Success

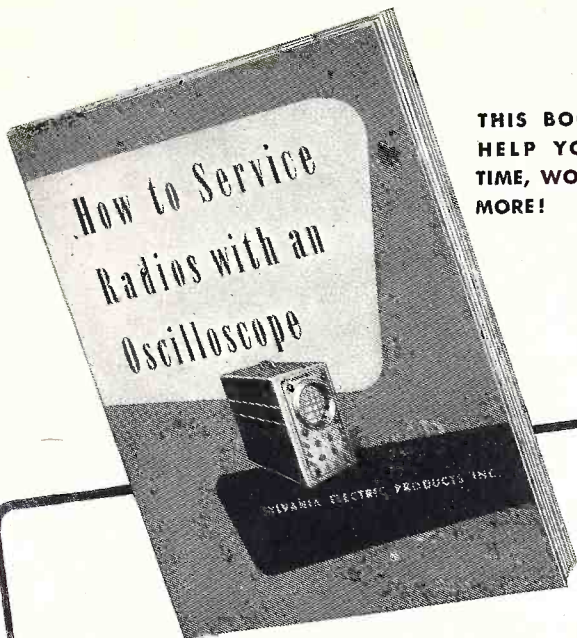
Sept. 18, 19 and 20 were banner days in Philadelphia, Pa. The Phila. Servicemen's Assn. put on a 3-day technical clinic as a fore-runner to "Preventive Radio Maintenance Month" which runs all of October in both the Keystone and Empire (New York) States.

The Convention, held at Philadelphia's Town Hall, opened at 5 p.m. Sunday the 18th. Addresses of non-technical nature were given that night by key figures from the Jobbing, Manufacturing and Broadcasting fields; all pointed out that the important position of radio-TV technicians is finally recognized. Then, the real business got under way at 10 a.m. on Monday the 19th when the technical lectures began.

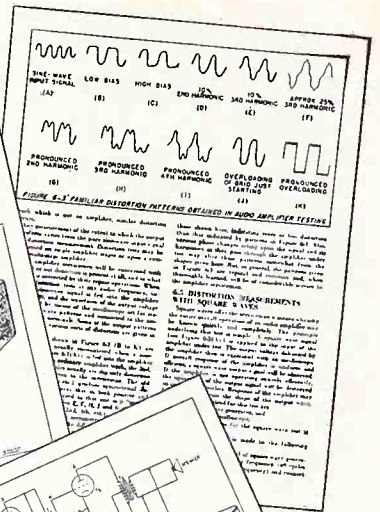
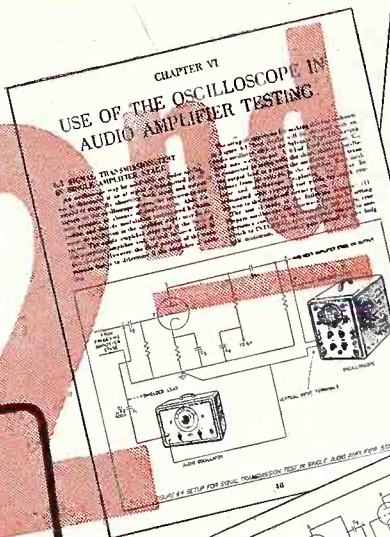
It happened that I was designated to act as Master of Ceremonies for the two days of technical sessions. What a job it was! The attendance figures prove my point. There were almost 500 seats available in the lecture hall, and at every session all seats were filled with hundreds standing in the jammed packed place. Also, hundreds of others were milling around in the Exhibit Booths, looking at the new items being shown. Imagine, during the two and a half day "show" 4443 men registered in attendance, and of these over 2200 were servicemen and technicians, some coming from cities over 200 miles distant from Philadelphia.

The "show's" success can be credited to Dave Krantz, prexy of PRSMA

[Continued on page 6]



THIS BOOK WILL HELP YOU SAVE TIME, WORK EARN MORE!

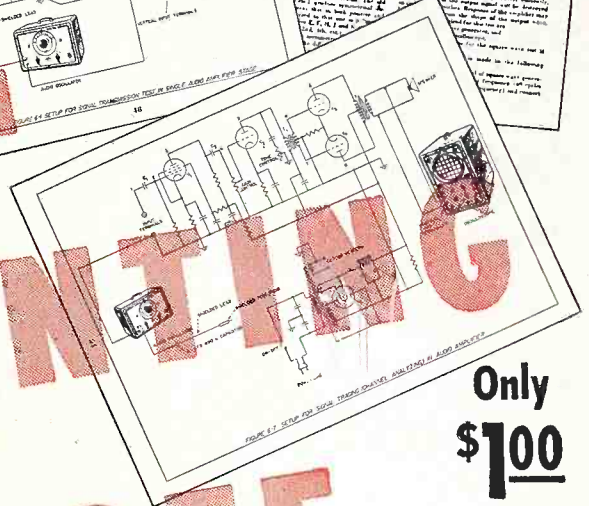


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HOW TO SERVICE RADIOS WITH AN OSCILLOSCOPE

Here's a big, complete book that gives you step-by-step instructions for using the oscilloscope in testing and servicing radio receivers, audio amplifiers and transmitters.

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Gentlemen:
Send me "How To Service Radios with an Oscilloscope." Enclosed is \$1.00.

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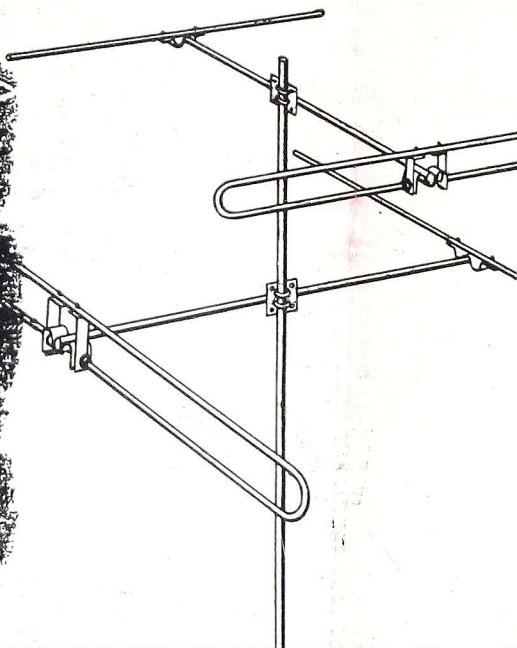
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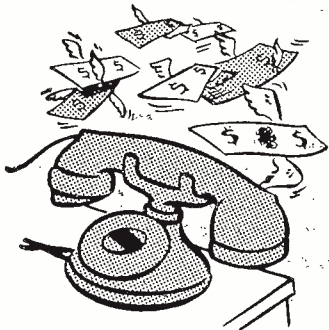
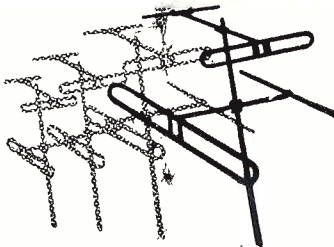
BRACH

TV ANTENNAS

build your PROFITS these 3 ways

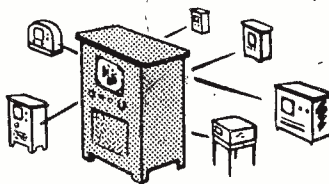


1. SAVE INSTALLATION TIME. Actually save enough for additional installations each week. Simplicity of Brach Antenna design, together with maximum pre-assembly at the factory, take whole hours of "time-on-the-roof" off your installation costs. And, for easier, quicker, on-the-job handling, Brach TV Antenna Kits are individually packaged, complete with all necessary hardware. Brach Universal Base Mount is a real time saver.



2. ELIMINATE EXPENSIVE CALL-BACKS. Brach quality engineering and bulldog ruggedness combine to help make your initial installation completely satisfactory. Developed by a name as old as radio itself, Brach TV Antennas are products of the manufacturer's own laboratory. From the rugged structural steel base mount to the tip of the sturdy mast, they're designed to stand up and shrug off the worst the weather has to offer—and deliver superior reception—longer. Factory pre-tuned and matched for 300-ohm transmission line, all Brach Antennas feature large-diameter aluminum elements for better signal pick-up.

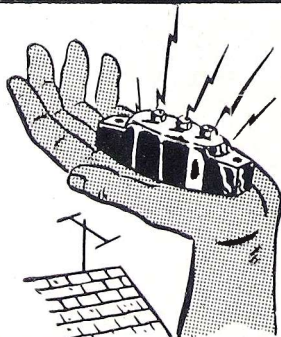
3. MAKE PURCHASERS YOUR BEST SALES-MEN. The future success of your television line depends upon the success of your past installations. There's a Brach TV Antenna to meet every television problem better. Each Brach array you install puts you further ahead of your competition performance-wise.



A NECESSARY EXTRA BRACH LIGHTNING & STATIC ARRESTER #4004

Helps keep the buck and jump out of the image when due to static discharge. Protects certain delicate receiver parts. Complete with all necessary hardware, the Brach Rare Gas Arrester is easily attached to any downlead. Constructed of porcelain and non-corrosive metal parts. Tested and listed by Underwriters' Laboratories.

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WORLD'S OLDEST AND LARGEST MANUFACTURERS OF RADIO ANTENNAS AND ACCESSORIES

FIELD FINDINGS

[from page 4]

and the Program Committee, Messrs Lau, Rincoe and Vogelsang who were able to obtain as lecturers men who are outstanding authorities in their respective fields, and whose subjects, in each and every case, were geared right down to present day requirements of technicians in the radio and TV fields. Here's the program:

Monday, Sept. 19th.

"Modern Servicing & Alignment"

by George Devine of G. E. Co.

"National Servicing Problems" by A. T.

Alexander, Service Committee of RMA and Service Manager of Motorola, Inc.

"Scopes, How To Use Them," by Carl

Quirk, Allen B. DuMont Labs.

"TV Alignment" by A. G. Petrascek,

RCA-Victor.

"TV Servicing by Dynamic Demonstrator,"

by John Meagher, RCA.

"TV Front Ends," by F. W. Edwards,

Standard Coil Products Co.

"Fan Type Antenna Development"

by Harold Harris, Channel Master Co.

"Servicemen's Organizations" by Sandy

Cowan, Radio Service Dealer Magazine.

"Electronics—Your Future In It," by John

F. Rider, Manual Publisher

Tuesday, Sept. 20th.

"Electronic Antennae," by Caywood

Cooley, Philco

"Multiple TV Reception," by Milton Shapp

"Test Equipment," by Wm. Hensler,

Howard W. Sams Co.

"Indoor vs Outdoor Antennas" by I. Kamen,

RCA Com'l Sound Div.

To a man, the several thousand technicians, students and others who are interested in radio and TV who were fortunate enough to attend, agreed that PRSMA has set an example that other servicemen's associations (and RMA's Town Meeting's Committees) might well follow.

There are now 81 TV stations on the air, 34 more having CPs and trying to get on the air quickly, and 350 other station applicants who are "frozen". Should, after the Sept. 26th FCC hearings, the proposed 42 new "upstairs" frequencies in UHF be opened, there could logically be 2200 telestations instead of the 440 now possible with VHF alone. Recognizing this situation RMA's Town Meeting Committee Chairman, R.C. Sprague, opines that by 1956 there will be 24 million TV sets in use, 80 million AM sets, and that 40 thousand AM technicians and 50 thousand TV technicians will be needed to handle the maintenance problem.

Modern TV receivers contain approximately 5 to 7 times as many [Continued on page 8]

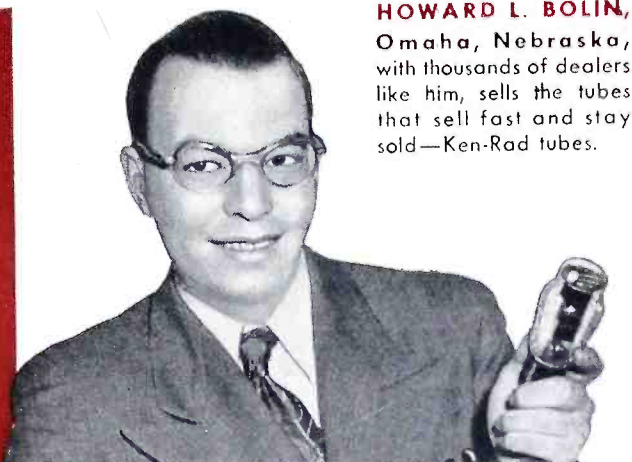
"MY SALES PROVE KEN-RAD TUBES HAVE WHAT IT TAKES!"

"I tell you, businesses aren't built on promises. They're built on performance—performance that brings customers back for more.

"And it takes good quality to guarantee good performance!

"Take Ken-Rad tubes. Why, they've been the quality leader for years—backed by one of the country's biggest, finest companies with plenty of engineering know-how.

"Result is, Ken-Rad tubes have paid me a steady dividend of increased business. For turnover and profit, they have what it takes!"



HOWARD L. BOLIN,
Omaha, Nebraska,
with thousands of dealers
like him, sells the tubes
that sell fast and stay
sold—Ken-Rad tubes.



RALPH L. CLARK, Foreman, Miniature Mounting Section, is one of the many experts who carefully supervise the manufacture of Ken-Rad tubes. These men build quality into the tubes at the very beginning; *test out trouble* at every stage of production.



"MY TESTS PROVE KEN-RAD TUBES HAVE WHAT IT TAKES!"

"Here at the plant we put Ken-Rad tubes through one test after another to prove their quality is unsurpassed.

"The 'short' test, shown on the left, is given tubes before the characteristics test. It enables us to spot tubes that are not up to Ken-Rad standards.

"Ken-Rad tubes also are tested for noise, microphonics, life, appearance, gas, air and hum.

"We don't guess. The Ken-Rad tubes we make and ship have proved themselves over and over again!"

THE SERVICEMEN'S TUBE
... backed by profit-making sales aids which your Ken-Rad distributor gladly will show you. Phone or write him!

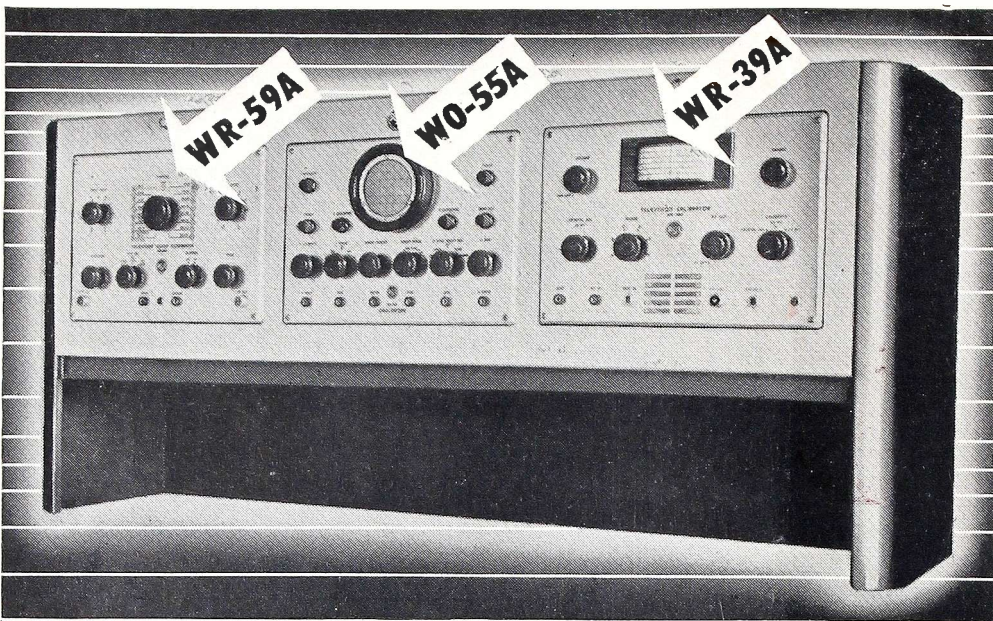


KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

102-HA6



The WR-39A and WR-59A combined with the WO-55A Oscilloscope in RCA's new WS-17A Rack, provide a modern, self-contained set-up for the efficient and profitable alignment of television receivers.

YOUR ANSWER to accurate television alignment

- ✓ The RCA WR-59A Television Sweep Generator
- ✓ The RCA WO-55A Oscilloscope
- ✓ The RCA WR-39A Television Calibrator

● Designed by RCA engineers at "television headquarters"—these companion units furnish *all basic signals* necessary for the rapid, accurate alignment of television receivers. Flexibility, dependability, and accuracy are outstanding characteristics of these instruments.

For alignment, the WR-59A Television Sweep Generator and WR-39A Television Calibrator can be used with the RCA WO-55A General Purpose Oscilloscope matching unit—as illustrated—or with any good oscilloscope.

The WR-59A Television Sweep Generator covers all television frequencies. All ranges develop 0.1 volt rms or more on *fundamentals* and can be quickly selected by means of a band-switch. Excellent shielding plus a piston attenuator allow the output to be re-

duced to the noise level. Unusually flat output is provided with amplitude variation on all ranges of less than 1 db. Phasing and retrace-blanking controls are incorporated.

The RCA WR-39A Television Calibrator is a variable-frequency oscillator, dual-crystal frequency standard, and heterodyne detector with audio amplifier and speaker. The VFO puts markers of fundamental frequency and crystal accuracy on TV-FM traces from 19 to 110 Mc and 170 to 240 Mc. Dual-crystal standard is used to calibrate VFO or other signal generators with 250-kc and 0.25-Mc check points from 250-kc to 240 Mc.

See your RCA Test Equipment Distributor today for further technical details or write RCA, Commercial Engineering, Section 55JX, Harrison, N.J.

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FIELD FINDINGS

[from page 6]

components and tubes as a conventional AM set. The breakdown potential of TV compared to AM is almost 10 to 1. Thus a million TV sets in use are comparable to 10 million AM sets insofar as repair and replacements needs potential are concerned, and the radio technician who fails to get the intricate "know-how" required for TV servicing is simply inviting his own elimination from the field because the new-comers who have really learned TV service techniques are becoming more strongly entrenched hourly. You can't say I didn't warn you old-timers.

My June-July Tours

During the hot summer months yours truly was busily engaged in keeping speaking engagements throughout upper Pennsylvania cities where I was the guest of the several associations. My technical lectures on "Video Detectors & Amplifiers" were well received despite the mid-90 degree temperatures. I lost ten pounds but the fellows who heard me admitted that they got some pointers about phases of TV that are not too well understood. Incidentally, business conditions in upper Pennsylvania are better than in many spots around the country, and mainly because the type of Service Dealer situated in the Quaker State is above par. They function in a businesslike manner, dress and act like professional men, command and receive high living standard fees.

The Slump Is Waning

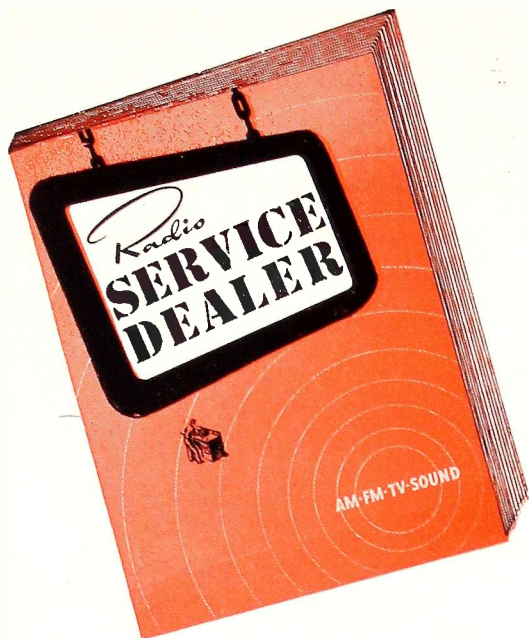
The chaotic conditions due to price-cutting by TV dealers, price-reducing by TV manufacturers, and confusion caused by the questionable legality of so-called TV service "policies" and the unknown position of FCC regarding UHF and color TV have all been dissipated and now the field has returned to a semblance of normalcy. The public knows color TV is a long way off and that should it come, or should UHF bands be opened, they will not cause obsolescence of present-day TV models for they can be "converted" at moderate cost. The only cause for worry, insofar as technicians are concerned, is the ever present threat that Unions, or Guilds, or License bills might find their way into this industry. The time is not yet ripe for consideration of any of these innovations which might restrict free enterprise.

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Profusely illustrated, finely lithographed in two colors, the booklet will help you win customers, justify fair service prices and meet "cut throat" competition that is springing up on all sides. It tells set owners about the complexities of today's radio and television equipment and about the extensive service facilities needed to keep receivers in first class working order.

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TRADE FLASHES

A "press-time" digest of production, distribution & merchandising activities

RCA Announces Insurance Plan

Owners of television receivers in New York State are assured replacement of parts and tubes, including the kinescope picture tube, under a plan announced Oct. 7 by the RCA Service Company and approved by the Insurance Department of New York State.

The plan provides for the replacement of parts and tubes during the one-year period of a Renewal Service Contract under an insurance policy issued by Massachusetts Bonding and Insurance Company, it was disclosed by the RCA Service Company. The insurance plan may be applied to all renewal contracts purchased in New York State.

The plan has been developed as a protection for RCA Victor television set owners after a recent ruling by the New York State Attorney General declared inclusion of provisions for replacement of parts and tubes in a renewal contract a violation of the state's insurance laws. In seeking to make provision for replacement of parts and tubes during the term of the television owners renewal service contract and to comply with the ruling, the insurance plan was formulated.

"The insurance plan serves two purposes", A. E. Spottke, Vice President of Massachusetts Bonding and Insurance Company stated. "It serves not only to give added protection to television set owners purchasing renewal service contracts, but also helps the entire television industry operating in New York State in finding a solution to the problem previously faced by television organizations desiring to offer an important service in a consumer's renewal service contract which would be in compliance with the state's insurance laws. The insurance plan accomplishes this."

Color TV Years Off

The Radio Manufacturers Association recently told the Federal Communications Commission that even if the Commission were to authorize commercial color television after its

forthcoming television hearings it will take manufacturers "several years" to develop and distribute the necessary equipment for public use.

Sylvania Launches TV Line

Sylvania executives were on hand on September 7th at Sylvania Center, Bayside, Long Island, N. Y., when the company held a press preview of the new Sylvania television sets. Left to right are: Donovan H. Tyson, controller; Walter E. Poor, chairman of the board; H. W. Zimmer, vice-



president of operations; G. R. Holden, vice-president and assistant to the president; R. H. Bishop, vice-president in charge of sales; J. S. Learoyd, secretary; Larry Bagg, sales manager, Colonial Radio Corp., wholly-owned Sylvania subsidiary which manufactures the Sylvania Television sets; H. R. Shaw, chief engineer, television design, Colonial Radio Corp.; Joe Quick, executive vice-president, Colonial Radio Corp., and Dr. R. M. Bowie, manager of the Sylvania Physics Laboratory.

Alliance Using Spot Films

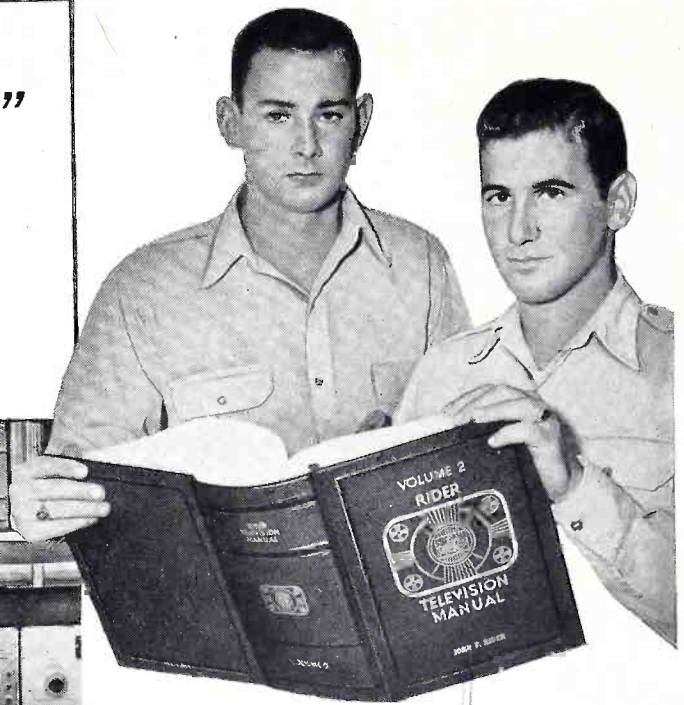
Using television to sell their Alliance Tenna-Rotor—a television antenna rotating device—the Alliance Manufacturing Company is appearing with a regularly scheduled series of six television sound films over most of the major television stations.

The Alliance films made their first appearance on the air in New York over WNBT and in Cleveland over WEWS and WNBK, back in the early

[Continued on page 12]

"Of Vital Importance to Every Progressive Servicing Establishment"

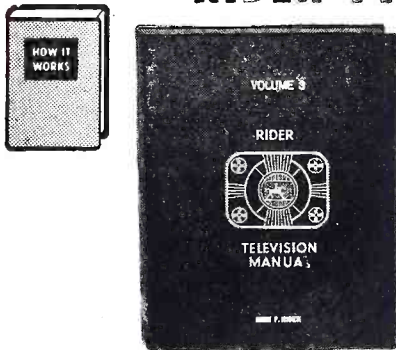
"Here in Mt. Vernon we have, what we sincerely believe to be, one of the finest servicing organizations of its kind. Our equipment and facilities are the most modern to be found anywhere. Rider Manuals are an integral part of our equipment. We have a complete library on hand, and we find them to be essential to tracing the trouble and correcting faulty receivers of all makes and models. In our opinion, Rider Manuals are of vital importance to every progressive servicing establishment."



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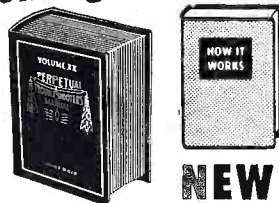
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FREE! Eye-Stopper for Service Shop Windows

A new Display, 14x17 inches, captioned "Which One is the Phony". It shows two greatly enlarged photos of stamps, one genuine, one a known counterfeit, with identifying characteristics and means of recognizing the forgery. Over 10,000,000 people in the U.S.A. are stamp collectors. This display will be of interest to young and old, and will attract attention to your windows and, consequently, business to your shop. 2 displays will be issued each month, and you can get them FREE OF CHARGE from your Jobber.

NOTE: Are you receiving your copy of "Successful Servicing"? It's Rider's own publication of interest to every Serviceman. Write for it... it's FREE!

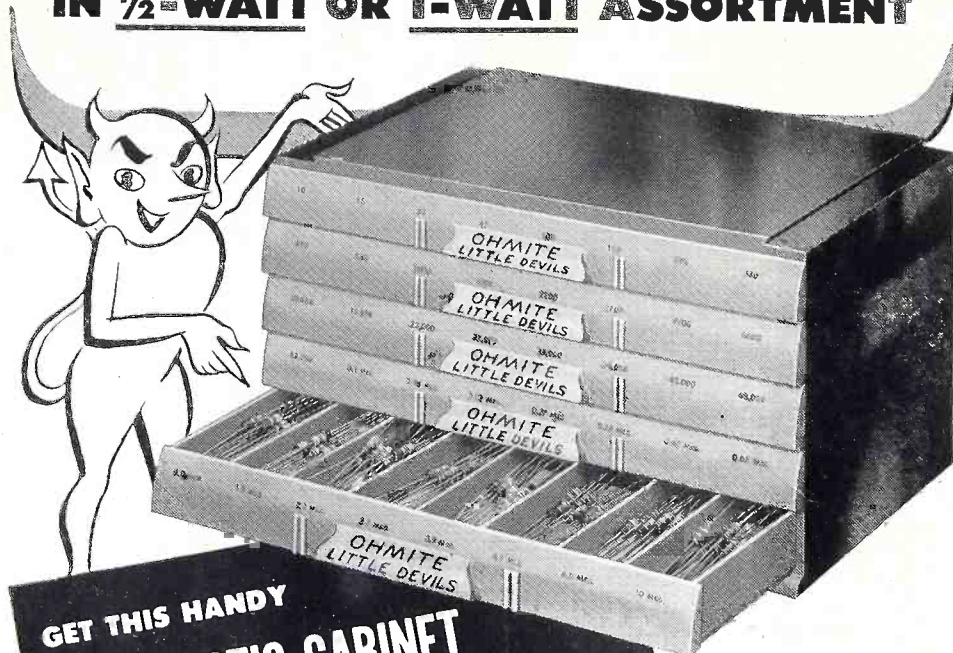
ANOTHER NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 edition No. 4, makes reference to only one source of receiver schematics — Rider Manuals.

JOHN F. RIDER PUBLISHER, Inc.,
480 Canal Street, New York 13, N. Y.
Export Agent: Rocke International Corp., 13 E. 40th St., N.Y.C.
Cables, ARLAB.

NOTE: The Mallory Radio Service Encyclopedia, 6th edition makes reference to only one source of radio receiver schematics — Rider Manuals.

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Packed with 125 "Little Devil" Resistors
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\$12.50

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LITTLE DEVIL COMPOSITION RESISTORS

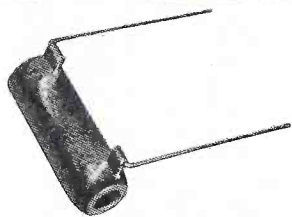
Guesswork's gone . . . when you use individually marked Ohmite "Little Devils." These tiny but rugged resistors are available in standard RMA values, 1/2, 1, and 2-watt sizes . . . 10 ohms to 22 megohms. Tol. $\pm 10\%$ and $\pm 5\%$. Values to 2.7 ohms available in 1-watt size, $\pm 10\%$ tol.

Each assortment, either 1/2-watt or 1-watt, is packed in its own rugged cabinet . . . and you pay only the regular price of the resistors, *nothing* extra for the cabinet!

Factory packed in each cabinet's 40 separate compartments are 125 carefully selected "Little Devils" (tol. $\pm 10\%$) . . . in the 40 values from 10 ohms to 10 megohms most frequently used by servicemen. It's no trouble to find the resistor you need . . . *fast!*

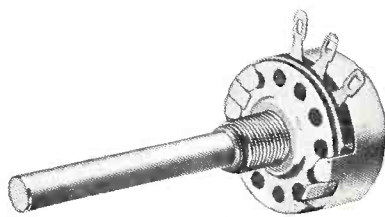
Molded of strong, lustrous plastic, and extremely compact—only 9" x 4 3/4" x 5 1/4"—Ohmite cabinets protect your resistors, too, and help you check inventory at a glance. You'll want to order both assortments, today.

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A favorite with servicemen, these dependable, wire-wound, vitreous-enameled resistors are easily mounted by their tinned wire leads. Tol. $\pm 10\%$. In 5, 10, and 20-watt sizes.



MOLDED COMPOSITION POTENTIOMETER

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RHEOSTATS • RESISTORS • TAP SWITCHES

TRADE FLASHES

[from page 10]

part of June. At present more than 22 television stations in most of the major Metropolitan centers east of the Mississippi have regular schedules going well into the fall and into 1950 on Alliance Tenna-Rotor.

R.C.A. Introduces New Antenna

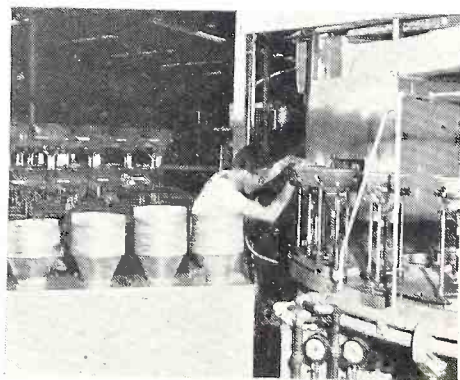
A new television antenna array, engineered specifically for use in fringe reception areas lying between stations occupying the same or adjacent channels, when the signals are being introduced by the RCA Tube Department. Called the RCA Reversible-Beam Television Antenna Array, it is designed to prevent the signal of one station from interfering with the signal of a station lying in the opposite direction.

Air King Allocates TV

R. D. Payne, Manager of Sales, Air King Products Company, Inc., Brooklyn 32, New York, Manufacturers of Radio, Television and Wire Recorders, announced that all television production is now on allocation. The tremendous increase in Air King television orders has literally swamped the Sales Office.

G.E. Produces 8 1/2 Tube

First production of television picture tubes at Electronics Park, General Electric's TV production and engineering plant at Syracuse, N. Y. The tube being made in this picture is the new 8 1/2-inch metal electromag-



netic type, the first to be produced in the industry, G. E. claims. It gives 50 per cent more picture area than the seven-inch tube now used in low-priced receivers and costs no more to build. Larger size TV picture tubes will be made at Syracuse later in the year.

General Electric is spending over a million dollars to provide the most

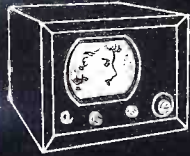
[Continued on page 33]

Fastest

moving 1950 line!

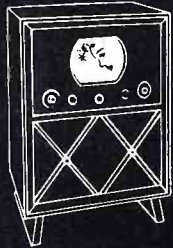


A-2010
10" - \$189⁹⁵

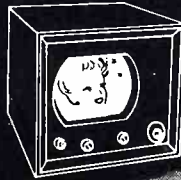


A-2000
10" - \$199⁹⁵

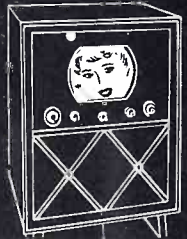
A-1001A
10" - \$239⁹⁵



A-2001
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A-2002
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A-1016
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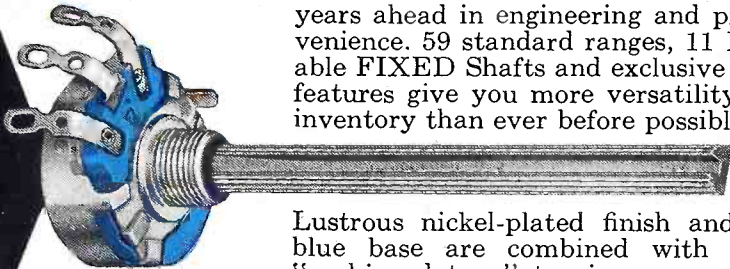
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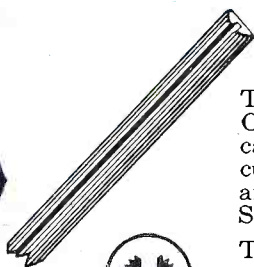
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Gives You these Advanced Features for Modern AM, FM and TV Servicing



Here's a control for Radio Technicians that's years ahead in engineering and practical convenience. 59 standard ranges, 11 Interchangeable FIXED Shafts and exclusive convenience features give you more versatility with lower inventory than ever before possible.

Lustrous nickel-plated finish and distinctive blue base are combined with a smoother "cushioned turn" to give you a control that looks, "feels" and performs better than any you've ever used.



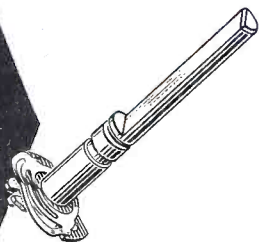
enlarged cross-section

KNOB MASTER FIXED SHAFT

This 3" long fixed shaft is standard on the Q Control. 90% of all AM, FM and TV 1/4" knobs can be accommodated without alteration, except cutting to length. It is knurled, flatted and slotted, and ends spread easily for worn or oversize knobs. Shaft inserts are no longer needed.

The Knob Master Fixed Shaft combines with compact 13/16" design and 1/4" long bushing to provide the industry's most adaptable small control.

11 INTERCHANGEABLE FIXED SHAFTS



Now it's easy to adapt standard controls to "specials". Resilient Retainer Ring, an outstanding control design advancement, permits ready adaptability to any of 11 special FIXED shafts in less than a minute—using only a knife or screwdriver. Shafts are FIXED and permanent! They will not wobble.

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REVOLUTIONARY
TYPE Q CONTROL
LEADS THE FIELD IN
CONVENIENCE FEATURES

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VERSATILE KNOB MASTER SHAFT
INTERCHANGEABLE FIXED SHAFTS
MODERN SMALL SIZE
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Resilient Retainer Ring provides cushioned turn—a new sensation in operation

PRE-EMINENT ELECTRICAL FEATURES

1/2 watt rating—wider coverage

Famous IRC resistance element

Identical electrical rotation with or without switch

Wider range—500 ohms to 10 megohms

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Molded base accurately aligns parts

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P. A. TECHNIQUES

For the coming Elections

by C. A. TUTHILL

CONGRESSIONAL elections this fall mean extra business for P. A. or Sound Service Men. Preparation by the *Wide-a-woke* will be followed up by a greater *Take*. Don't be stymied by a mere routine test of your equipment then lean back and await a phone call. To begin with you have to go out after the business. Many politicians have friends in the game. Competition will be keen from all angles. So,—prepare yourself for lucrative returns. It is the aim of this article to be of aid in technical preparation for those who do not already possess a seasoned *Know How*.

There will be indoor and outdoor assignments presenting problems widely diverse. There will be one night stands and semi-permanent setups. To gain the most from the space limits of this article, only practical P. A. angles, heretofore uncovered in previous issues of *Radio Service Dealer*, will be discussed. Much repetition can be avoided here yet the subject thoroughly detailed if the reader will revert back to his files of RSD for the following:

- PA Fundamentals & Complexities* Oct. 1947
- 70 Volt Loudspeaker Line* Jan. 1948
- Bad Acoustics Cured Electrically* July 1948
- 155 Loudspeakers Voltage Fed* Nov. 1948

In the electioneering jobs soon to be handled there will be problems of: Purchase of new equipment; modification or addition to present equipment; sound truck mechanical & electrical overhaul; power supply available; rectifiers or converters needed; power consumption and distribution; generators and fusing; local and temporary wiring; unusual requirements to be met; musical fill-in facilities; testing and maintenance; best location for equipment; loudspeaker efficiency, distribution and coverage; wattage ratings and impedance matching; microphone placement and

We are holding over for next month the second installment of, "High Quality Analysis Series," in order to present to our readers this timely article on P. A.

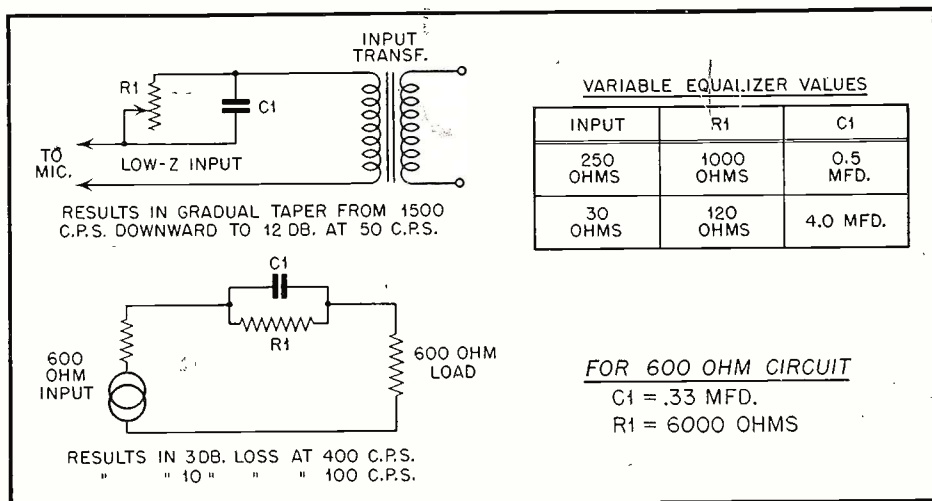


Fig. 1—Two inexpensive equalizers for speech P.A.

cable runs; feedback and acoustics; smart equalization and many lesser subjects. All of these should be studied and solved, in so far as possible, well in advance of curtain time.

Spectrum Equipment

In the electioneering field the sound system operator does get one break. Excepting the rare requirement for *high quality* musical fill-ins, his system need only be capable of projecting a high grade of intelligibility throughout the narrower spectrum required for speech. This should save him headaches and dollars as well as weight in portable equipment. Where speech alone is handled there is absolutely no need for reproduction of the lower *lows*. In fact unintelligibility and acoustic feedback will result under high gain operation if the lower end of the frequency spectrum is not either rolled off or chopped through sensible equalization of an otherwise *flat* channel. Two simple inexpensive

equalizers, easily constructed for this purpose, will, be found in *Fig. 1*. In the electioneering business we have no demand for high quality audio projection. More than ample spread embraces the region between 250 cps and 5000 cps. A cut-off somewhat above 250 cps will not affect intelligibility, merely tend to thin out a voice basso in character. But, don't forget, seldom will the electioneer project any low tones vocally. His enthusiasm and emphasis will automatically carry his mean average of delivery up the scale. Research has proved that there is considerable of speech energy present at 3000 cps for the average orator. Therefore the top end of the sound system should be at least maintained to 4000 cps or better. Another good argument is that listening acuity in the upper register falls off with age. Your political audience will include many elderly voters.

It must be remembered that an amplifier qualifying between 250 and 4000 cps is not in itself enough. Every

component within the system from the microphone through the loudspeaker should be capable of a reasonably flat response through the speech spectrum. Some may argue that the maximum energy of speech lies below 400 cps. That is true but, for understandibility, frequencies from 400 cps downward are not as important as are the higher frequencies. In reverberant rooms the *lows* will of necessity be rolled off through equalization or there will be no intelligibility whatsoever, just guttural gibberish. In truly high powered exterior systems, where intelligibility is the only requirement, the sound spectrum may be held between 400 and 4000 cps yet the results will prove highly satisfactory.

For an extreme condition seldom encountered, except under such conditions as during battle aboard ship, it has been found that better results are obtained through either cutting off sharply at 500 cycles or through engineering an emphasized characteristic having an upward slope of 6 db per octave. In commercial practice the latter method can be used to *out-shout* a noisy mob in convention.

Power Requirement

Reference to the curve and table of Fig. 2 will save much wordage herein. They are drawn up from wide experience. The curve is based upon the use of an exponential trumpet type horn of average efficiency having a 30 degree angle of coverage. It shows the amplifier power needed per distance for clear audition. This curve applies where the background noise level is reasonable. On exterior work similar conditions may obtain. When, however, there is a disturbing noise level such as from constant nearby heavy traffic, it will be found best to employ a sound system whose capacity is sufficient to project a single frequency at a level 10 db higher than that of the noise through which speech is to be understood. This margin will allow for losses due to masking caused by the noise. Speech is used for reference since exterior music is in this case incidental and indeed not be so loud except when used as an attention-getter.

The total power capacity of a driving amplifier in a sound system is determined by the sum of the powers required by all loudspeakers driven. The amplifier output must be equal to or greater than the sum of the wattage for all horns used. It is well to use two amplifiers where several horns are required. Distribution can be so

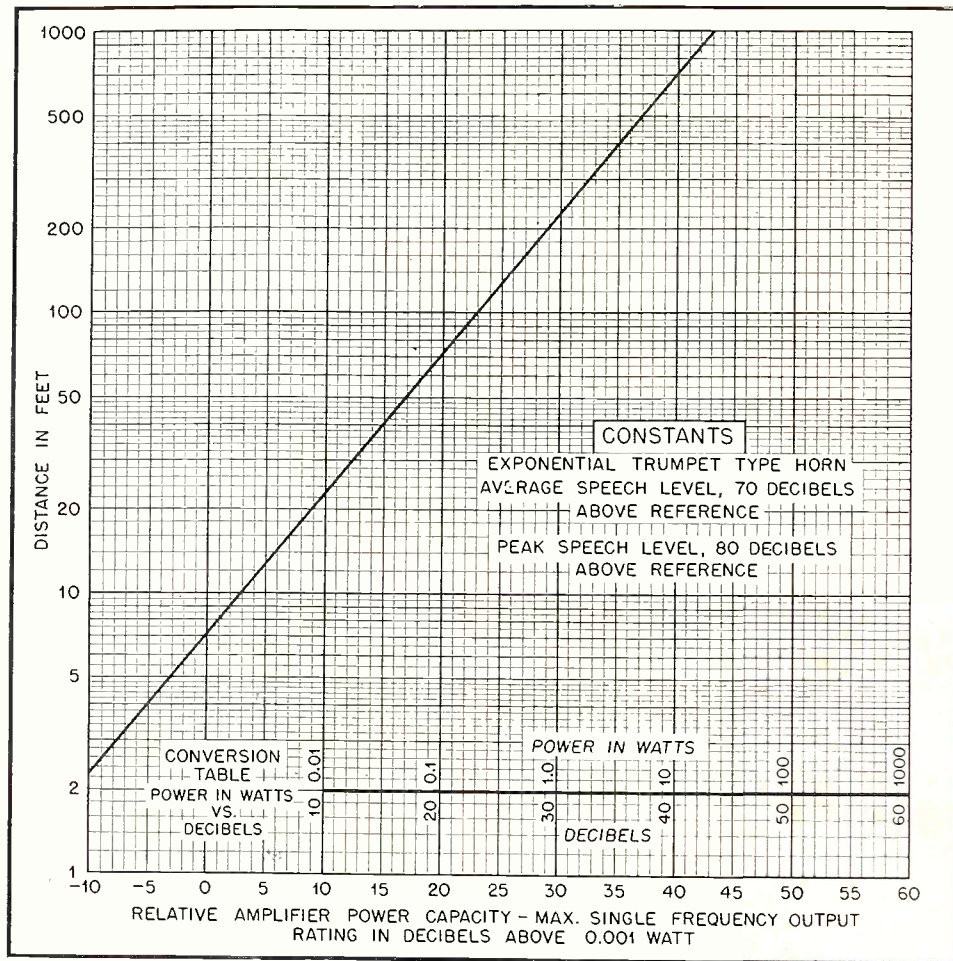


Fig. 2—Amplifier power needed for various distances.

staggered that should one amplifier fail, the other would still radiate a fair coverage during repairs to the faulty unit. Non-linear distortion possibly as great as 10% may be tolerated in channels set up strictly for electioneering purpose whereas in high quality channels this factor should be held to limits of 1% or 2% harmonic distortion. Half of the battle lies in the avoidance of microphone blasting. Wire guards similar to a dogs muzzle can be fashioned and clamped to microphones to keep orators at a reasonable distance when this obnoxious becomes out of hand.

When loudspeakers loads are reduced, and several of the paralleled horns simultaneously removed from the line, it is well to reduce the driving gain so as to minimize non-linear distortion. Properly handled this will not reduce the normal output of the horns still in use. Overload checks should be made when the system is working at maximum capacity so as to hold distortion to a minimum.

The maximum gain required of a sound system, for a delivery which should over-ride ambient noise by about 10 db, is determined by the weakest pickup device. This is often the phono-pickup and attendant equal-

izer for vertically cut records. There should be sufficient gain to peak your levels from such a device to the maximum single frequency power output required of the system. To be sure that an adequate source of supply of power is available, total power requirements of the total system should be predetermined prior to installation. Then a survey of the job-site will determine whether adequate power is available or whether boosting devices are necessary.

Unusual Requirement

Very often during election assignments, even though your contract may call for a semi-permanent setup, special features present themselves which must be taken in stride. For example: a rally within a hall may be recessed at 5 p.m. or 6 p.m.; the hall may be rapidly converted to serve a banquet at 8 p.m.; the following morning the rally may be in session again. The alert sound operator will have his plans laid to handily cope with these rapid changes. His microphone and loudspeaker cable runs should never be so interlaced with structure or equipment that they cannot be quickly unshipped, coiled, and made ready for a quick roll back into their orig-

Table 1.

Wire Size A.W.G. (B&S)	Load Impedance in Ohms							
	2	4	6	8	10	16	32	50
No. 10	150'	300'	450'	600'	750'	1200'	2400'	3750'
12	95'	190'	285'	380'	475'	760'	1520'	2360'
14	60'	120'	180'	240'	300'	475'	950'	1500'
16	38'	75'	113'	150'	190'	300'	600'	950'
18	23'	47'	70'	95'	118'	190'	380'	590'
20	15'	30'	45'	60'	75'	118'	236'	375'
22	9'	18'	28'	37'	47'	75'	150'	230'

Maximum length of line for 15% power loss in range of common voice coil impedances. Length from amplifier to load.

(Courtesy Jensen Radio Mfg. Co.)

inal displacement. Plugs, jacks and connector blocks, guarded with cable clamps, are big time savers. Direct tie-ins take too long to disconnect and reconnect.

On exterior assignments a dual facility (duplicate system) may in the end save money and reputation. If a dignitary is serviced making a speech in the suburbs following which he is rushed under police escort to present another speech in the city, it pays well to have a second sound channel ready, tested and awaiting his arrival. No attempt should be made to cover the two assignments with one mobile truck unless there is a luncheon to take place between the two pickups. See the November 1948 issue of *Radio Service Dealer* (page 40). It details how 155 low level loudspeakers were removed following a 5.30 p.m. session clearing decks for an 8 p.m. banquet. All 155 units were serving the session the following day at 9 a.m.

Indoor vs. Outdoor

With the same equipment there is a great difference between the handling of interior or exterior pickup and reinforcement of sound. In free space outdoors sound waves move directly from their source to the listener, there seldom is a reverberation factor always present indoors. Since the human ear is a pressure actuated device, it is necessary generally to project sound at a greater level outdoors for a given result. Sound overprojected however will, when reflected from nearby structures, cause flareback or echoes sometimes unbearable in content to an audience near them. A change of horn tilt or angle or lower powered projection will overcome such conditions.

Many benefits are derived from the use of directional horns on long-throw exteriors. Cellular horns will readily control directional projection to predetermined angles vertically and horizontally. Wind and ambient background noises are factors to be reckoned with here. The further off the beam the greater the loss of highs. This again points out the fact originally established that the top end of the sound spectrum should be retained to at least 4000 cps. For exterior work it is well to retain even higher frequencies because of their dissipation into free space. Intelligibility and crispness of speech falls off as the azimuth from dead center horn axis increases. This is only true above 200 cps but pertains to the most usable sector of the response range.

The average re-entrant horn, inversely folded for length and weather protection, is highly satisfactory for less directional radiation to an immediate audience often serviced by sound trucks. But when distant throws of sound must be beamed deeply into a remote audience directional horns are definitely required. Tangible research has found that a horn's directional pattern is determined by the form of sound emerging from the horn mouth together with the manner in which the amplitude and phase of pressure vary over the wave front. It is also known that intensity falls off inversely as the square of the distance. If distance is doubled, response is lowered 6 db whereas when distance of projection is halved, response is increased 6 db.

For a given power consumed exponential cellular horns are the simplest answer to directional projection. From them a gain in pressure on the

directional axis is derived as compared to the broad spread from non-directional radiators. Configuration of horn mouth is a determining factor. The lateral and vertical spread can be clearly defined to requirement by the number of horn cells clustered together vertically and laterally. Such treatment is used behind screens in theaters so to adequately serve balconies along with orchestra seats. It is quite possible to radiate a narrow beam laterally and a wide beam vertically if the horn cluster mouth is made asymmetrical so that its width is slight and its height is large in terms of wavelength. Manufacturers will supply actual facts on coverage for their various products. Such data should be studied before horns are purchased or installed indoors or out.

Loudspeaker Efficiency

Load carrying capacity and efficiency are of great concern to the sound system operator. An efficient horn or horns can save much in initial driving amplifier cost where it hurts the most. Load carrying capacity means the maximum power which can or should be applied to a loudspeaker driving unit. This power is limited by heating, mechanical or structural limitations, driving amplifier limitations, and by non-linear distortion caused by just too much diaphragm amplitude; directly the result of overdriving a unit.

Efficiency in a loudspeaker is not merely a question of load carrying capacity. We are concerned about the loudness of sound obtainable not only at one point but throughout its spread of coverage. The financial importance to the sound operator is just this,—a high powered hence highly

[Continued on page 38]

The KAY MEGALINER

by ALLEN LYTEL

*Author of TV Picture
Projection & Enlargement*

Front view of Kay Megaliner

WIDE band television sweep generators of the Megasweep variety do not ordinarily contain markers. Separate outside sources are used to generate these precise marker frequencies which are used to point out exact frequencies in the alignment of television video i-f and sound amplifiers. While the sweep generator is able to supply the wide frequency excursion needed for visual alignment, some other source is necessary to establish particular exact points along the visual alignment oscilloscope trace. These markers are of two general varieties; the separate signal or pip, and the absorption type.

The pip marker appears as a sharp pulse along the base line and as its frequency is changed, the pip moves to the right or left along the oscilloscope trace. The absorption type marker consists of a resonant circuit which absorbs energy at the exact frequency to be measured and appears as a break in the response curve displayed on the oscilloscope. There are television sweep generators on the market which use either or both types of markers built in to the generator itself. With the Megasweep system however, a separate external marker is used because of the wide band coverage of the original Megasweep generator.

This marker generator is known as the Megaligner and it supercedes the Megamarker which is produced by the same company. The Megaligner is a calibrated variable frequency marker pip generator. Its frequency range is from 19 to 49 mc in two bands. The first band is 19 to 30 mc and the second band is from 30 to 49 mc. The output may be either a marker pip, a

The Megaligner is a calibrated frequency marker pip generator for use with the Megasweep described in last month's RSD. The marker pip may be fed directly to the oscilloscope used in the test without feeding it to the circuit.

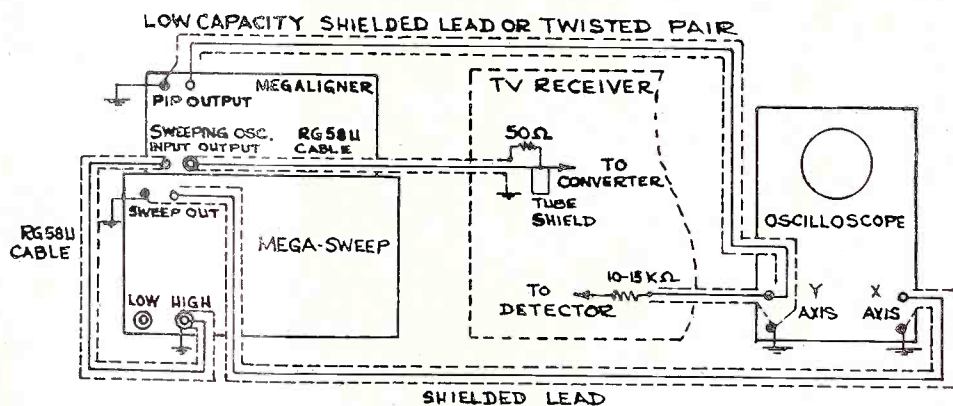


Fig. 2—Connections between Megaligner, Megasweep oscilloscope and receiver. Leads should be as short as possible.

variable frequency CW signal source or a 4.5 mc crystal oscillator.

Megaligner Features

The pip output provides approximately 10 volts peak to peak and as a signal generator, the output is 4000 microvolts across 50 ohms. When used as a crystal oscillator operating at 4.5 mc, the voltage output is 0.3 maximum across 50 ohms. One outstanding feature of the Megaligner is its provision for the marker pip to be fed directly to the oscilloscope used in the test procedure. The marker is not fed through the circuit under test, hence

it cannot overload the video amplifier. The serviceman who has had experience with conventional markers, is undoubtedly acquainted with the fact that some types cause an overload since they must be fed through the i-f amplifier. By means of the Megaligner the marker is by-passed around the circuit and fed directly into the oscilloscope Y axis amplifier.

When being used with visual alignment, a variable frequency pip is provided which remains visible at any point along the trace including the traps and the discriminator characteristic. The variable frequency CW signal which is provided, can be used in

alignment procedures where the VTVM is used as the indicating device. A 4.5 mc crystal controlled signal is very important in the alignment of intercarrier sound television receivers.

Figure 1 is the schematic of the Megaligner. A self-contained power supply using a 5Y3 provides a 300 volt positive output. The 3 amp. fuse, F-1 is replaceable from the front panel. Other tubes used are the 6AG5 Radio Frequency Buffer Amplifier, the 6AK5 Variable Frequency Oscillator and Detector, the 6J6 Audio Frequency Amplifier and the 6AG5 Crystal Oscillator.

Circuit Description

A brief circuit description is necessary to understand the function of the Megaligner controls. S-1 is the power Off-On switch; S-5 is a B supply switch which provides high voltage for either the variable frequency oscillator or the crystal oscillator. With this Single Pole Double Throw Switch, in the Crystal position, B plus is supplied to the crystal oscillator. This tube, V-4, oscillates at a frequency of 4.5 megacycles controlled by the crystal X-1. With this switch in the Variable Oscillator Position,

the Variable Frequency Oscillator Tube operates at a frequency determined by the band switch and resonant circuit tuning. The frequency of this oscillator V-2 is the frequency at which the dial calibration is set.

The band switch for the variable oscillator is a Double Pole Double Throw switch arranged to utilize either of two tuned circuits. L-1 and C-20 are used on the low band and L-2 and C-24 are used on the high band. The tuned circuit which is chosen by the Band Selector Switch also operates as the plate load impedance of V-1. This plate load is shunt connected to the plate of the Radio Frequency Amplifier by the coupling capacitor C-5. In order to isolate the variable oscillator from the circuit under test, the radio frequency amplifier is placed between the variable frequency oscillator and the input.

To provide a pip, the sweeping oscillator signal from the Megasweep is fed through the buffer amplifier and to the variable frequency oscillator which also functions as a detector. The tank circuit of the variable frequency oscillator is connected between the control grid and cathode, and two different signals are fed to the control grid simultaneously. One of these

signals is the sweeping oscillator signal from the Megasweep and the other is the signal frequency of the variable oscillator itself. A pip is formed from the resultant beat note which is the difference between these two signals. This pip or beat note is passed through the tuned circuit network to the grid of the 6J6 audio frequency amplifier. This tube, V-3, is resistance coupled as an amplifier and provides a signal output between its plate at pin 1 and ground. P-2 is a variable control used to adjust the relative level of the Pip Output.

It is important to see that no actual pip or marker is generated in the Megaligner itself. The external sweeping signal from the Megasweep is necessary in order to produce a pip output. The variable frequency oscillator V-2 is tuned to the exact frequency of the output desired. Since the desired pip output must be somewhere in the frequency range which is being swept by the master generator, at some point the Megasweep output and the variable oscillator V-2 will be at the same frequency. Just before this frequency is reached, a beat note is obtained which is the dif-

[Continued on page 37]

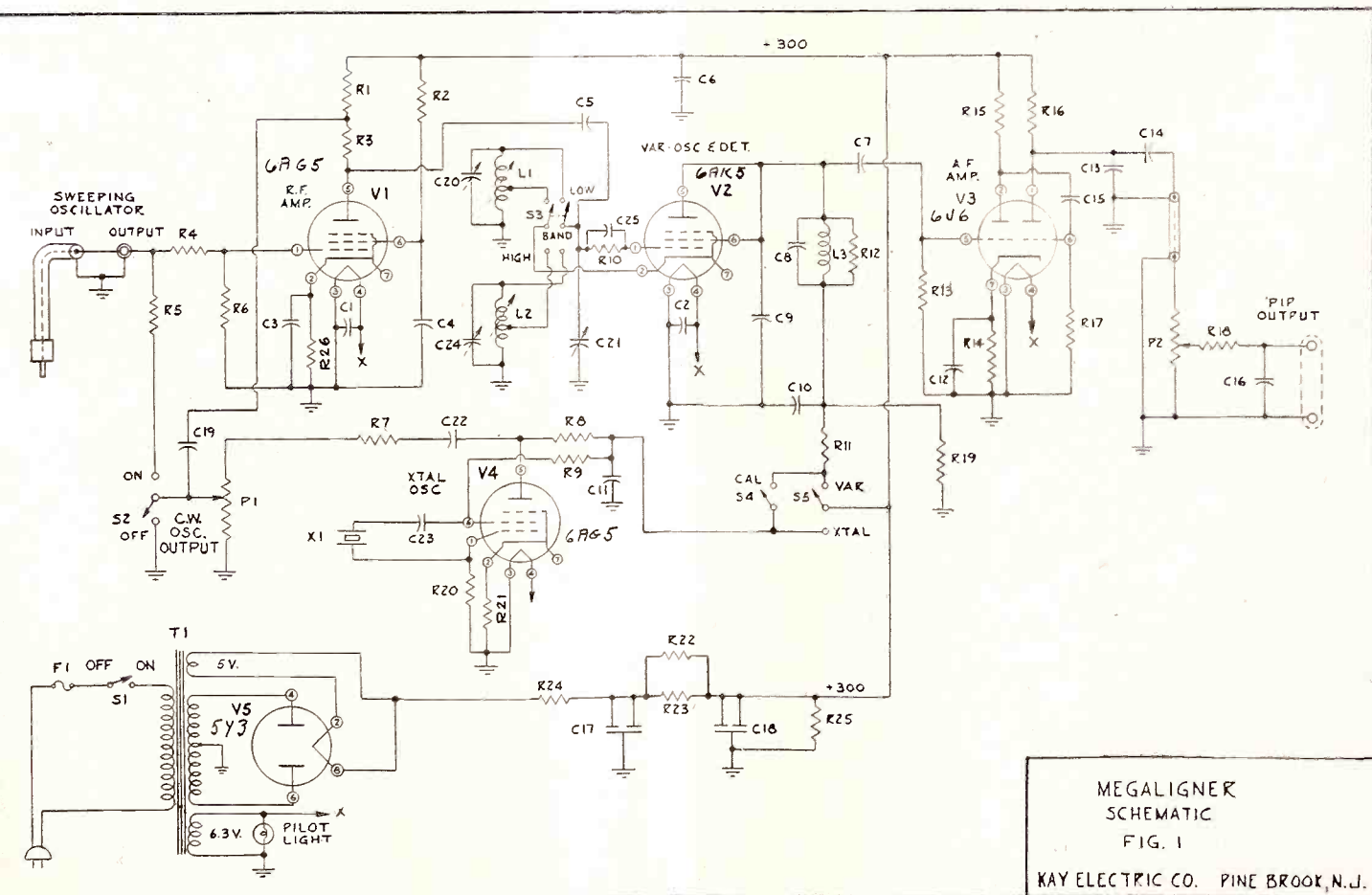


Fig. 1. Circuit Diagram of Kay Megaligner

TV QUIZ NO. 5

by DAVID GNESSIN

BEFORE ANSWERING THE QUESTIONS — READ THESE RULES:

This quiz, based upon information made available by courtesy of the Howard W. Sams Photofact Television Course will prove of value to all radiomen interested in reviewing TELEVISION. For those who possess the Sams course a reference to the page involved is given in parenthesis after each question number. Readers should write

out the answers, *copy* the diagrams for practice, and circle correct answer if multiple choice is given.

After quiz is completed, compare with correct answers given on page 31 of this issue. Another TV quiz is now being prepared for early release.

1. (p 13) Note Fig. 1. Under the "direction of electrons = direction of current" theory, the left hand rule determines the direction of magnetic lines of force created by flow of electrons along a conductor. In the diagram the circular magnetic lines of force are shown, but their direction

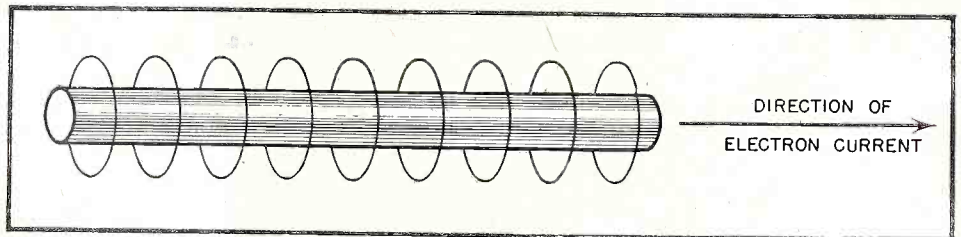


Fig. 1. Direction of electron stream through a conductor

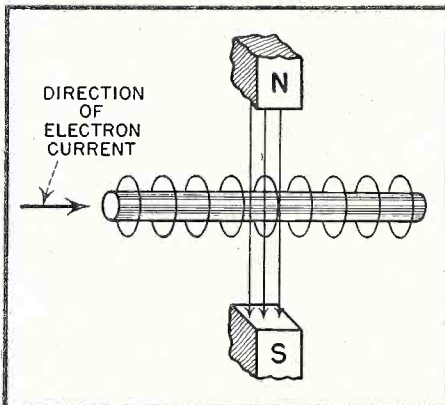


Fig. 2. Magnetic field influencing stream

arrow is missing. Copy the diagram, inserting arrows for direction.

2. (p 13) What changes would you make in the drawing of Fig. 1 if the solid wire conductor were replaced with an electron beam operating in a vacuum? Re-draw Fig. 1 showing this new condition.

3. (p 13) Consider Fig. 2. This is the same as Fig. 1, except that a horseshoe magnet has been placed in such fashion that its end poles set up vertical magnetic lines of force as shown. How does this new field affect the electron beam? Would it move the beam itself, or only the beam's magnetic field? Whatever it does move—which direction does it move it:

- (a) Up
- (b) Down
- (c) Left
- (d) Right
- (e) None of the directions described above

4. (p 13) Note Fig. 3. The horseshoe magnetic field is no longer at right angles to the electron stream. The exact angle is not given, since

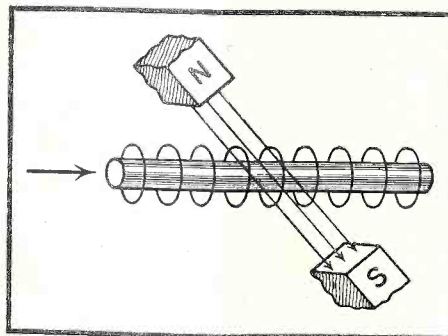


Fig. 3. Field at angle to electron stream

except for one angle other than the right angle, the effect on the electron stream will be similar to that shown in Fig. 3. Discuss the effect of the horseshoe magnetic field upon the electron beam as shown in Fig. 3.

5. (p 13) In question 4 it was noted that except for 90° and an angular difference similar to that of Fig. 3,

there was one angle in which the magnetic interaction was radically different.

- (a) What is this one special angle?
- (b) Discuss the magnetic interaction between electron beam and deflecting voltage at this special angle.

6. (p 14) In magnetic focusing a focus coil is placed about the neck of the C-R tube at the proper point for operation. (See Fig. 4.) The proper placement point is indicated by:

- (a) A silver metallic band around the neck of the tube installed during manufacture, placed by instrument check. This

[Continued on page 31]

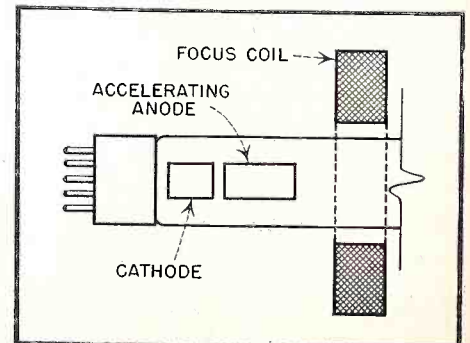


Fig. 4. Position of focus coil on CRT

Servicing

PHOTO-ELECTRIC

Equipment

by WILLIAM R. WELLMAN

PART I

LIGHT-operated devices are finding increasingly wide application in industrial plants for counting, sorting and grading a wide variety of articles, mass-gauging of machined products, etc.; in offices for elevator control and automatic operation of doors and drinking fountains; and even in homes, for automatic control of garage doors and lighting control. With this in mind, the serviceman will naturally make an effort to capture some of the business available through maintenance and repair of such equipment.

Servicing photoelectric equipment is not at all difficult, and the circuits used are less complicated than those found in even the smaller radio receivers. There are, however, considerable differences in the basic principles, and we shall, therefore, discuss these principles briefly before proceeding into a discussion of the actual service techniques employed.

Basic Principles of Phototube Equipment

A phototube consists of two electrodes—cathode and anode (or plate). The cathode is generally a half-cylinder of metal which has been coated with a substance which emits electrons when subjected to light. Some of the light-sensitive materials used are the oxides of caesium, potassium and rubidium. The composition of the material used determines the sensitivity of the tube to various light colors or frequencies.

The anode or plate often consists of a vertical wire or rod located in the center of the semi-cylindrical cathode. The electrodes are placed inside a glass envelope which is either exhausted to a high degree and then

Beginning a two part article on the theory, applications, and servicing of photo-electric equipment. This branch of electronics is easily mastered by the serviceman, and can result in a substantial source of income.

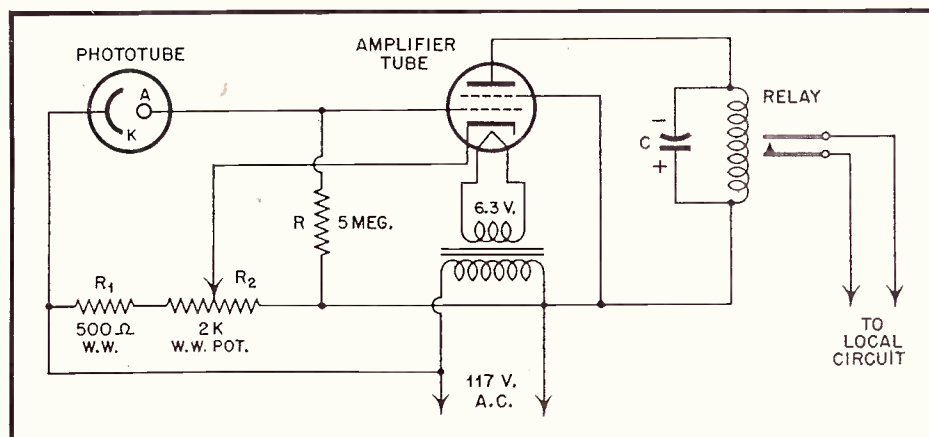


Fig. 1. Reverse type of phototube relay circuit

sealed (vacuum-type phototube) or into which a small quantity of gas is injected after pumping (gas-type phototube). The vacuum type is less sensitive, but is more stable in operation than the gas type. The increased sensitivity of the gas type is due to ionization of the gas with consequent increase in electron flow. Ordinary phototubes have a conventional glass envelope, but those types which are designed to respond to ultra-violet light may use specially treated glass or may have a thin, indrawn window to permit passage of the light rays.

In operation, the tube is positioned so that light strikes the inner, concave surface of the cathode. When this occurs, the cathode emits electrons and if the plate is then made

positive a small current will flow from cathode to anode. The current will depend upon the intensity of the light, the voltage applied to the plate, and the type of tube (whether it is a high-vacuum or gas type). In any case the current is small, generally being measured in microamperes.

Since the output of a phototube is small it must be amplified to be of value in most applications. Very often a single stage amplifier will serve, any of the beam power or pentode output tubes being suitable. When a two-stage amplifier is required, twin triodes such as the 6N7 or 6SN7 are frequently used. In some equipment, the final tube is a thyratron. This is because such tubes will pass a heavy plate current; also, because

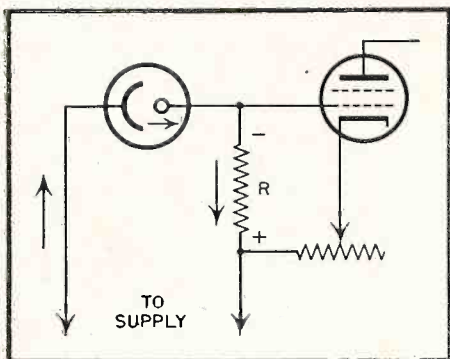


Fig. 2. Reverse type phototube current

in some applications a "lock-in" type of device is wanted. This means that once the unit has been set into operation it will continue to operate until reset manually.

For our purposes it will be sufficient to divide phototube amplifiers under two classifications. In the first category we consider amplifiers from the viewpoint of the type of B supply used; that is, whether the current in such supply is a.c. or d.c. A large majority of the equipment manufactured is operated from an a-c supply, but there are a few special cases in which d.c. is essential. Among these are high-speed photoelectric relays which will not operate successfully from an a-c supply.

The second classification takes into account the method of connecting the phototube with regard to the direction of current flow and its effect upon the plate current of the amplifier tube. An inspection of *Fig. 1* will clear this point up for you. In this diagram we see what is often referred to as a reverse type phototube relay. The term relay is used loosely here and in industry to refer to the entire unit consisting of phototube, amplifier and the electromagnetic relay, rather than to the relay itself. The action of the device is as follows: as long as the phototube is illuminated the amplifier grid voltage is relatively high and the amplifier plate current correspondingly low. The relay therefore is not energized and the contacts which control the local or external circuit remain open. Once the light is reduced or cut off, the grid voltage is reduced, the plate current rises and the relay is energized, closing the contacts.

Figure 2 shows the path of the phototube current upon which the operation of the circuit depends. The phototube current (as in any other tube), flows from cathode to plate as shown by the arrows, and as a result must flow in a downward direction through

the grid resistor, R . We are aware that electrons always flow from minus to plus; consequently the top end of the resistor becomes negative and the lower end positive. This places a comparatively high bias on the amplifier tube and keeps its plate current at a minimum. If light is entirely cut off from the phototube, no current flows through R and its upper end is therefore less negative. This makes the grid of the amplifier tube also less negative thereby increasing its plate current.

Before leaving the reverse circuit, your attention is directed again to *Fig. 1*. In the previous paragraph, the statement was made that cutting off light to the phototube made the amplifier grid less negative. It is important to note that under this condition there will still be a negative bias on the grid; this is supplied through the voltage divider consisting of R_1 and R_2 . R_2 is adjustable, and varying the setting of this potentiometer changes the sensitivity of the unit. Another important point is that the unit is operated from the a-c supply line; this means that it will be able to function only on alternate half-cycles of supply line voltage, or when the plate is positive. This does not effect the usefulness of the device, except in applications where it is required to operate in a period of time shorter than $1/120$ second (assuming a 60-cycle supply. In such cases a rectifier power supply would be used. This type of relay would be useful in many applications) an example being the automatic control of drinking fountains. Normally, the relay which controls the water supply valve is held inoperative by the light beam focused on the phototube. When the user approaches the fountain, his or her body interrupts the light, allowing the relay to close and turning on the water.

The forward type of unit operates in a manner just the opposite from that of the reverse type discussed above. The difference lies in the method of connecting the phototube electrodes so that the phototube current, as illustrated by the arrows in *Fig. 3*, flows in an upward direction through R . Then, with the phototube darkened, the grid bias applied to the amplifier tube reduces the plate current to the point where the relay cannot operate. When the phototube is illuminated, current flows as shown, making the grid of the amplifier less negative, which increases the plate current and causes the relay to close. Such a device would be used to automatically garage doors which are

actuated by the headlight beams of a car.

Installing and Adjusting Equipment

Photoelectric equipment intended for indoor use consists of at least two, possibly three, distinct units. The light source unit comprises the lamp, lamp housing and usually a lens. In some cases the phototube will be located within the amplifier housing, but in a few devices a separate housing is used for this tube. Where this is done, a shielded cable is frequently used between phototube and amplifier, especially if the distance between the two is considerable.

When setting up the equipment, the manufacturer's instructions regarding the allowable distance between the light source and the phototube must be rigidly observed. Mount the lamp housing in the position it will occupy during normal usage. If the light source is equipped with means for focusing or concentrating the light, this detail is to be taken care of next. Place a piece of white cardboard or similar material at the exact distance from the light source that the phototube is to be. Turn on the lamp and adjust the focus until the image on the cardboard screen is as bright and sharp as is possible to obtain. In some cases the focusing is accomplished by sliding the lens tube in or out in the housing. In some models this adjustment may be obtained by rotating the lens tube.

The next step is the adjustment of the unit for desired sensitivity. This procedure will depend upon whether the unit is of the forward or the reverse type. Furthermore, the arrangement of the sensitivity control differs somewhat in units produced by various manufacturers. In the examples used in our discussion in *Section 1* of this article, the sensitivity control consisted of a wire wound potentiometer which was used to vary the cathode voltage of the amplifier tube. Another variation of this system is

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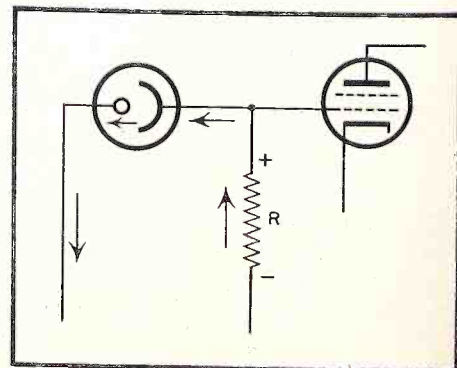


Fig. 3. Forward type phototube current

16 inch Conversion Kit

by **WALTER H. BUCHSBAUM**

Development Engineer Techmaster Products Co.

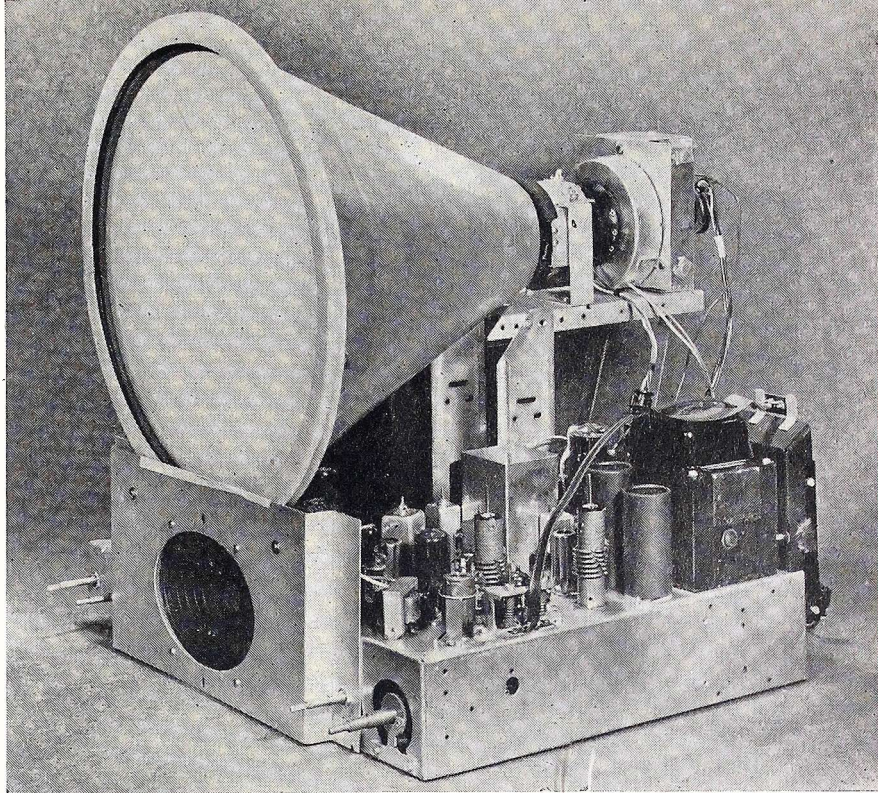


Fig. 1. Completed view of receiver converted to 16 inch tube

A relatively simple kit for converting 10 inch TV receivers for use with the new 16 inch tube is described in this article. This opens up a new field of revenue.

ALMOST 75% of all the television receivers sold in 1947 and '48 used a 10" picture tube. Since the advent of the 16" tube and the new large screen sets, many customers feel that they are losing out in the enjoyment of their television receivers by not having a screen as large as the new models. There is a great clamor for some way to adapt their receivers for larger pictures without going through too great an expense. In many cases, the audience in the home has been increased because better programs are now available and more people in each family have become television fans. But the main reason for the demand for larger pictures is the added comfort in viewing and the greater detail possible. Whatever the reason, it is

up to the servicemen to satisfy this demand and the easiest, most profitable way of doing it, is by converting the receiver to a 16" tube as shown in this article.

A good way to get conversion jobs is to advertise for them. Many dealers send descriptive literature on conversions to all their previous customers having a 10" or 12" receiver. Local newspaper advertising offering conversions to a 16" picture tube also are very helpful. And finally, every service call concerning a small screen receiver is an opportunity to interest the customer in a conversion job. Occasionally, a dealer may find it profitable to convert old receivers previously accepted as trade-ins for adaptation in custom installations. Whatever the individual circumstances are, every serviceman will find that the conversion business not only brings in additional revenue, but also helps expand the volume of his business and create more and better satisfied customers.

Items Needed

In converting a standard 10" receiver for use with the new 16AP4, two different approaches are possible. Using a standard high voltage power supply, it will be found that the brilliance and sweep width are not quite as good as they were on the 10" tube. Most new 16" receivers are

designed to operate on 12 to 15 KV second anode voltage. To achieve this, a voltage doubler is used and certain changes are made in the horizontal fly-back circuit.

With these changes, it is possible to achieve full sweep from edge to edge and brilliance equal to or better than anything found with 10" sets. The main items needed for such a conversion are, of course, the 16AP4, a special high voltage fly-back transformer, additional rectifier, and associated components. The total cost of the components and parts used in the conversion kit described below, is far less than the price difference between a 10" and a new 16" receiver.

The Tech-Master 16" Conversion Kit

The photograph in *Fig. 1* shows a completed conversion. While the kit was especially designed for use on RCA 630 type chassis, it can easily be adapted to convert almost every set for use with a 16" picture tube. Two separate types of changes are required and will now be taken up in detail.

Mechanical changes include the removal of brackets holding the small screen tube and substitution of the special adjustable brackets shown in *Fig. 1*. In addition, the following parts must be exchanged:

1. Horizontal output transformer.
2. Focus coil.



Fig. 2. High voltage assembly

3. High Voltage assembly.
4. Width control coil.
5. Horizontal peaking control.

The high voltage assembly used for the doubler circuit is shown in *Fig. 2*. Note the two high voltage rectifiers, 3 high voltage condensers, a special two megohm, bleeder resistor and the type 211T5 horizontal output transformer. To mount the high voltage rectifiers and condensers a special bakelite assembly is supplied as shown in *Fig. 2*.

The electrical changes are found in the schematic diagrams of *Fig. 3*. The 250,000 ohm horizontal peaking control is substituted for the previously used 20,000 ohm potentiometer, and put in series with *R1* and *R4* as shown. No changes are made in the vertical output except that *R17* is connected to the horizontal linearity control.

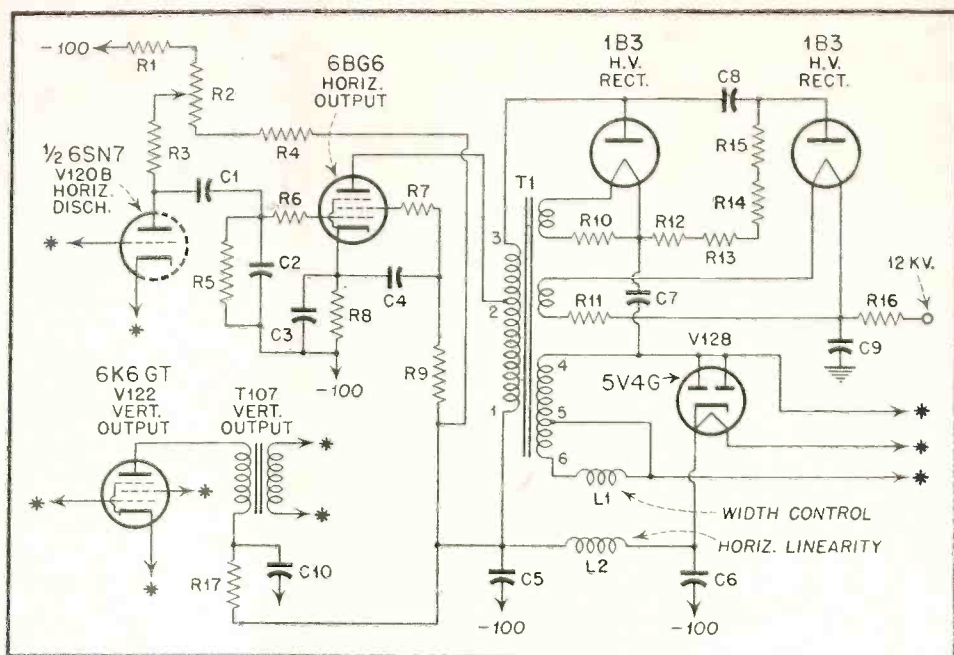
The other major changes are made in the high voltage section. The voltage doubler circuit is conventional, except for the use of a 2 megohm bleeder resistor. This resistor can either be a special 2 megohm 10,000 volt type as shown in *Fig. 2* or else can be made up of four, 470,000 ohm, 1 watt resistors in series. In the latter case, the connection between resistors must be a smoothly soldered joint. All connections in the high voltage section must be made so that no sharp points are left, otherwise corona or arcing may appear. Before finally mounting the high voltage assembly, be sure that all parts are clean and free from dirt, grime, or finger prints, since this might, in time, cause corona trouble.

When adjusting the picture on the 16" tube, after the conversion has been completed, a number of precautions should be observed. It is advisable to use a plastic shield and mounting ring for the 16AP4 which can be obtained together with the tube. This plastic shield is very good protection against high voltage shock caused by coming too close to the metal portions of the 16AP4 which are at the high potential.

In many cases, it will be necessary to lengthen some of the leads to the picture tubes, and in so doing, 15,000 volt test insulated wire should be used for the second anode lead. If a plastic shield is used, this lead goes to the clip provided on it; otherwise it is connected to the metal rim of the 16AP4.

Adjustments

To obtain proper sweep width, brightness and linearity, adjust the horizontal peaking control first. It



- *R1* 100K ohms, ½ watt
- *R3* 220K ohms, ½ watt
- *R4* 22K ohms, ½ watt
- *R5* 330K ohms, ½ watt
- *R6* 100 ohms, ½ watt
- *R7* 100 ohms, ½ watt
- *R8* 100 ohms, 2 watt
- *R9* 14,500 ohms, 5 watt WW or (30,000 ohms, 2 watt) in parallel (27,000 ohms, 2 watt) allel
- *R2**250,000 ohms Carbon Control Horizontal Peaking Control
*Used in place of 20K control
- *R10*, *R11* 3.3 ohms, ½ watt
- *R12*, *R13*
- *R14*, *R15* 470K ohms, 1 watt
- *R16* 1 Megohm, 1 watt
- *R17* 10K ohms, 1 watt
- *L1* 1R4 Width Control
- *L2* 1R3 Horiz. Linearity Control
- *T1* **11T5 Horiz. Deflection Output & High Voltage Transformer
**Used in place of 11T1 transformer
- *C1* .01 mfd, 600 V
- *C2* 680 mmf, 1000 V Mica
- *C3* 0.1 mfd, 400 V
- *C4* .05 mfd, 600 V
- *C5* .035 mfd, 1000 V
- *C6* .05 mfd, 1000 V
- *C7* 500 mmf, 10,000 V
- *C8* 500 mmf, 10,000 V
- *C9* 500 mmf, 15,000 V
- *C10* 10 mfd, 450 V

Fig. 3. (*) Wiring indicated thus goes to same points as in original 630-TK
→ Parts indicated thus are additions to the original 630-TK circuit.

will be noted that this control goes through a point of optimum width and linearity. It should be left there. To compensate for any non-linearity still present, adjust the horizontal linearity control. If insufficient sweep width is encountered which cannot be adjusted by the width control coil, several different methods are available. Disconnect the width control coil entirely. If that does not work, reconnect it and shunt it with a .01 mfd condenser. As a last measure to increase the sweep, connect a .003 mfd condenser from the cathode of the 5V4 damper tube to ground. The new focusing coil type (2D2) supplied with the kit is capable of providing good focus over the entire face of the 16AP4. This tube also requires an ion trap as used with the 10BP4 and the 12LP4.

When converting a set which did not previously use an ion trap, it will be necessary to purchase this part separately. For simplicity, it is recommended that a permanent magnet type ion trap or beam bender be used.

Conclusion

To many TV owners it will be more economical to convert a small screen receiver rather than trade it in and buy a new 16" model. This is especially true in the case of a sensitive and well-aligned set, such as the 630, which in most cases has given very satisfactory service. Intelligent salesmanship and honest, professionally done conversion jobs often constitute a real improvement in the service business from the point of view of the serviceman as well as the satisfied customer.

CIRCUIT COURT



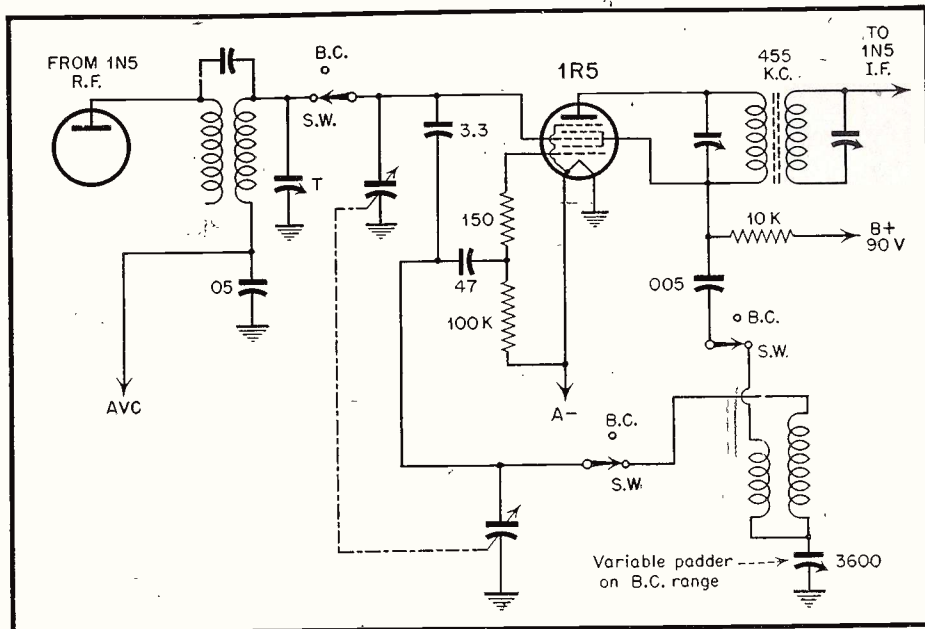
Detrola Model 611-A

Most unusual feature of this instrument is the performance on short wave stations in the band between 5.8 and 18.3 mc. The use of dry-battery tubes at such frequencies demands the use of special techniques. The set is designed for use where power line supply is not available. Five tubes are employed in a super-heterodyne circuit. Two bands are covered; conventional broadcast and one short wave range.

The set is designed for use with an external antenna feeding the 1N5 tuned r-f stage. This is followed by a 1R5 pentagrid converter, with both the signal and oscillator circuits tuned. Of particular interest is the use of neutralization in the circuits connected with this tube. The partial schematic can be referred to for details. Coils for only one band are shown.

Operation of the stage is as follows: The #1 grid is the oscillator grid. It has a 150 ohm resistor in series to suppress any spurious generation. The 100K resistor returns to negative filament and serves as grid leak. A 47 μ fd. capacitor couples the grid to the tuned circuit, coils being switched for range change. The trimmer across the grid coil has a series resistor also. Feedback is provided by a plate coil and the plate (actually #2 grid) is shunt fed via a 10K resistor. The .005 μ fd capacitor completes the feedback circuit.

The signal is coupled to the #3 grid directly from the range switch and tuning condenser. Neutralization of the space charge which tends to develop around this signal grid is provided by the insertion of a 3.3 μ fd



Neutralization in 1R5 of Detrola Model 611-A

capacitor between grids #1 and #3. Without this component the conversion gain of the tube would be seriously decreased by displacement current at high frequencies.

Crosley Model 9-102

This a-c powered, broadcast-band table type receiver employs five tubes plus rectifier. A tuned r-f stage is used, a three gang condenser tuning the r-f, mixer and oscillator circuits. In the partial diagram is shown the details of the r-f amplifier and mixer portion of the schematic.

The first item of note is the use of a low impedance loop and series coil to resonate the input circuit, along with the associated variable condenser and parallel trimmer. The

control grid of the 7A7 amplifier tube is coupled to the tuned circuit by a .001 μ fd coupling capacitor.

In the plate circuit of the r-f stage there is a transformer for transferring the signal voltage to the mixer. The primary of the transformer is broadened by the use of a 27K ohm shunt resistor. The transformer secondary is tuned by another section of the gang condenser. Signal is coupled to the 7Q7 mixer grid by a variable trimmer capacitor. This unit serves to resonate the circuit at the high frequency end of the band.

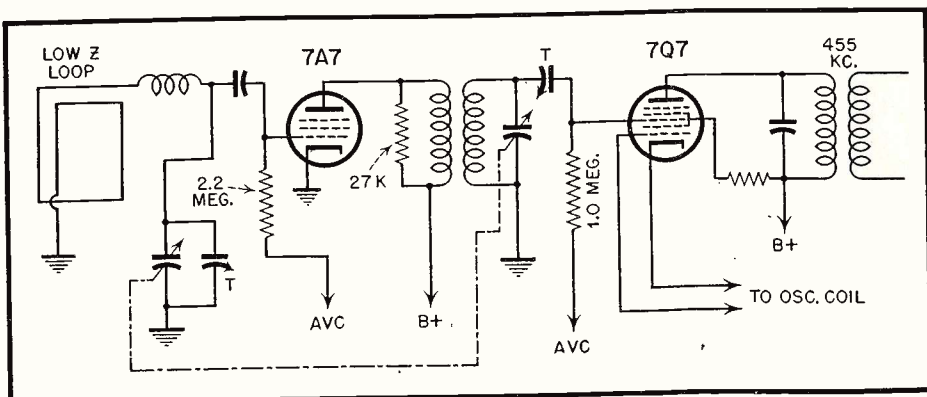
AVC potential is supplied to both the r-f and mixer circuits via shunt resistors of large value.

Hoffman Model C-503

This elaborate instrument provides radio reception on three bands, phono reproduction and recording on discs. Twelve tubes plus rectifier are employed. Four 6K6 tubes are used in the output stage. Of particular interest is the tone control stage. A 6J5 tube is biased in such a manner that its gain averages just over unity. Adequate amplification is provided in the previous 6SQ7 and following 6J5 stages. Refer to the partial schematic for details.

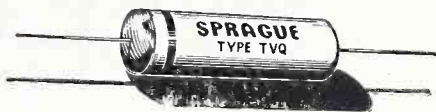
A high impedance is provided in the cathode to ground circuit by use

[Continued on page 36]



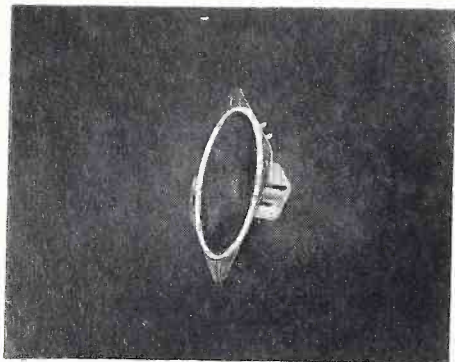
Front end details of Crosley Model 9-102

NEW PRODUCTS



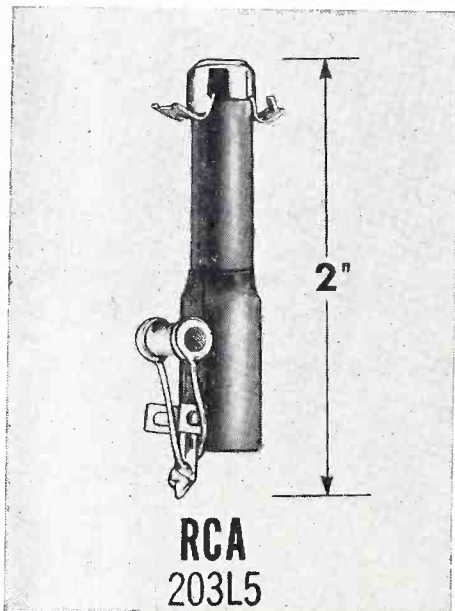
TV CAPACITORS

Television service needs for small, yet dependable, 6000 volt capacitors for 85°C high humidity operation are now filled by the new Type TVQ capacitors announced by Sprague Products Company, North Adams, Mass.



REPLACEMENT SPEAKER

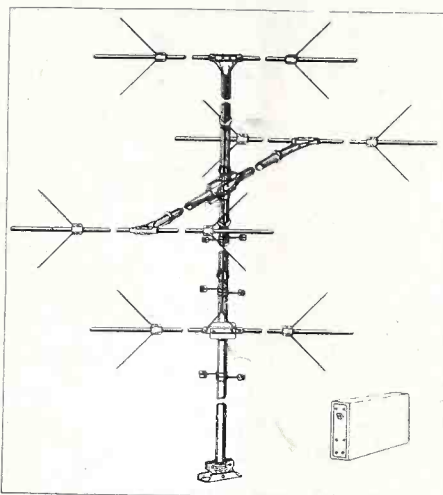
The Receiver Division of the General Electric Company is now offering its specially designed outdoor type speaker to all its franchised parts distributors for replacement sale to drive-in theaters. This outdoor speaker features a cork gasket, specially treated cone and impregnated terminal board in addition to the standard G-E metal foil base voice coil.



VIDEO TRAP

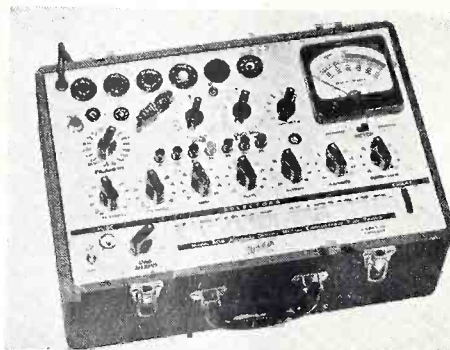
The new video-circuit trap 203L5 is designed for use in the plate circuit of the 1st video amplifier of television receivers to attenuate the 4.5 megacycle intercarrier beat frequency. The design utilizes a fixed, ceramic capacitor shunting a low-Q inductance tuned by an adjustable iron core.

For further information write: Tube Department, Radio Corporation of America, Harrison, N. J.



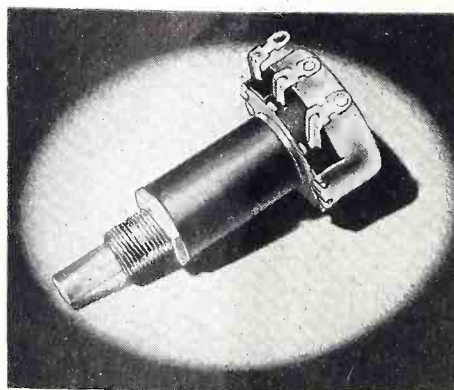
TV ANTENNA

A new antenna design for the elimination of co-channel interference is announced by Technical Appliance Corporation, Sherburne, N. Y., pioneer manufacturers of TV, FM and AM antenna systems.



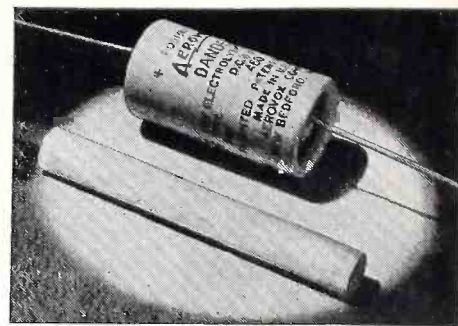
TUBE TESTER

The Hickok Electrical Instrument Co. announces a new, lightweight portable tube tester, Model 600. This instrument contains the Dynamic Mutual Conductance circuit and provides accurate testing of AM, FM, or TV tubes.



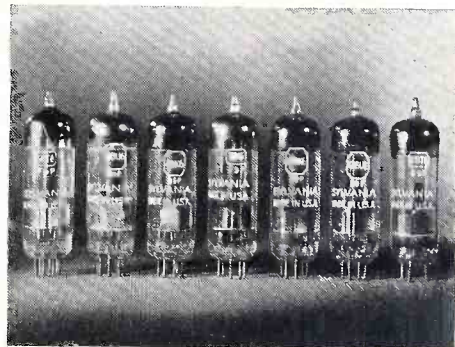
HIGH VOLTAGE CONTROL

To provide that safe insulation factor required of controls used in TV, oscillograph and other high-voltage circuits, Clarostat Mfg. Co., Inc., Dover, N. H., announces an improved high-voltage-coupler feature, type 56-125, in conjunction with most types of Clarostat controls on special order.



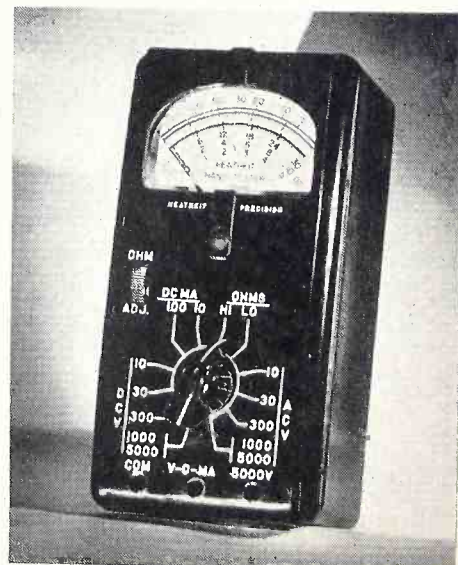
MIDGET-CAN ELECTROLYTICS

In keeping with the trend towards still more compact radio-electronic assemblies, Aerovox Corp. of New Bedford, Mass., now comes up with the latest Type PRS midget-can electrolytic capacitors in new reduced sizes. This fact is dramatized in the accompanying illustration showing an Aerovox Type PRS 450 volt 8 mfd. Dandee alongside a regular size cigarette. This new Dandee measures only 13/16" in diameter by 1 1/2" long!



NEW MINIATURE TUBES

Seven new miniature double diode-triode radio tubes providing improved rectification of weak signals and better minimum volume control operation have been announced by Sylvania. In the new miniature tube group are types 6BT6 and 12BT6 with operating voltages identical with older types 6AT6 and 12AT6; types 6BK6 and 12BK6 to replace types 6AV6 and 12AV6; types 6BU6 and 12BU6 to replace types 6BF6 and 12BF6; and a new miniature, type 26BK6, having no complementary type but operated at the same voltages as others in the group with the exception of its 26.5 volt, 70 milliamperes heater.



METER KIT

Heath Company, Benton Harbor, Michigan announces the new Heathkit Handitester Kit

"An inferior set with a good antenna will always outperform a better set with a poor antenna." From FM-TV Magazine, June 1949.



SELL A TV PICTURE
... for Customer Satisfaction!

FOR CUSTOMERS.....

An inadequate antenna sacrifices more than 10% of the TV picture quality. The customer wants the best TV picture reception. He depends on the TV dealer for a TV set at the price he can afford and for an antenna that is the best on the market.

FOR SALES.....

SEE-ABILITY IS SELL-ABILITY and the better the TV picture, the more satisfied the set owner will be. "When you sell a picture, you build customer satisfaction." And customer satisfaction sells more TV sets.

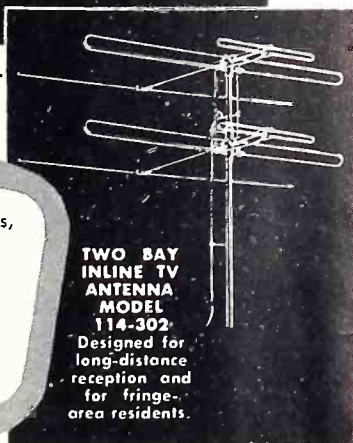
FOR INFORMATION.....

It takes selling punch and selling knowledge to put the most into a selling talk that will sell the potential TV viewer. American Phenolic Corporation has prepared "Sell a TV PICTURE", a comprehensive 16 page sales manual to help you sell TV.



**SINGLE BAY
 INLINE TV ANTENNA
 MODEL 114-005**

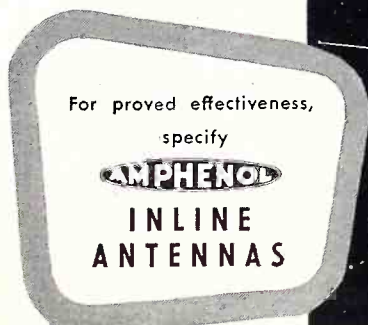
Operates over all channels and covers both high and low bands.



**TWO BAY
 INLINE TV ANTENNA
 MODEL 114-302**
 Designed for long-distance reception and for fringe-area residents.

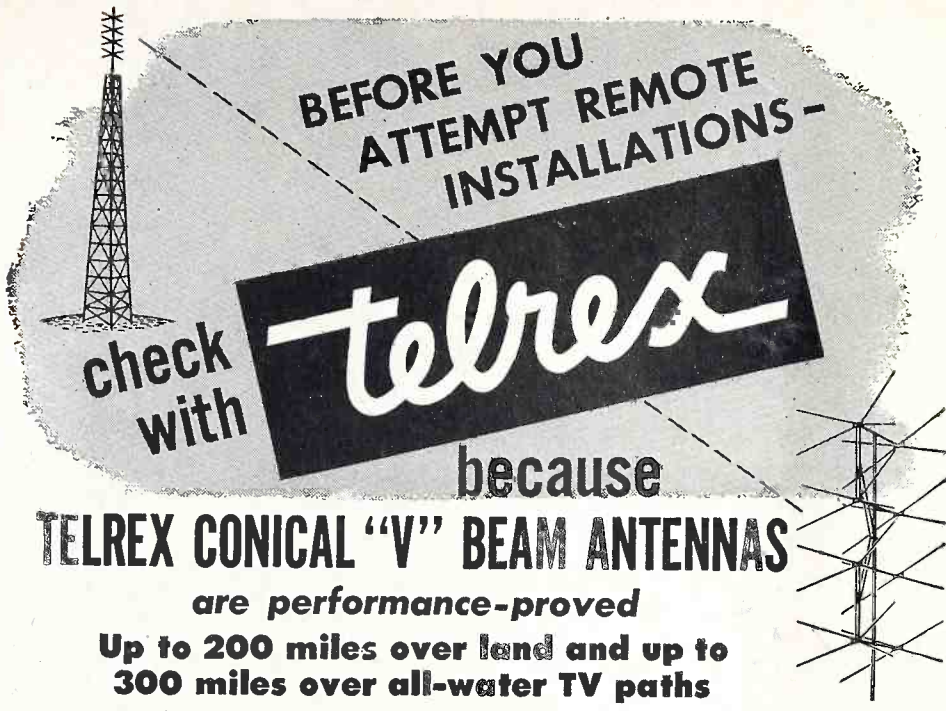
--- THIS BOOK IS FOR YOU

"Sell a TV PICTURE" gives exact, scientific TV data in carefully chosen terms that are easily understood. Write today and ask for your free copy of "Sell a TV PICTURE": AMERICAN PHENOLIC CORPORATION, 1830 SO. 54TH AVENUE, CHICAGO 50, ILL.



**AMPHENOL
 -INLINE-
 ANTENNAS**

AMERICAN PHENOLIC CORPORATION 1830 SO. 54TH AVENUE • CHICAGO 50, ILLINOIS



BEFORE YOU ATTEMPT REMOTE INSTALLATIONS -

check with **telrex** because

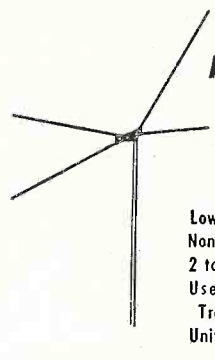
TELREX CONICAL "V" BEAM ANTENNAS

are performance-proved

Up to 200 miles over land and up to 300 miles over all-water TV paths

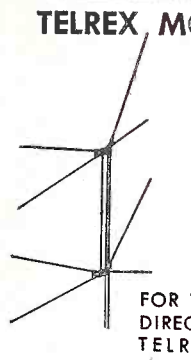
For both remote or high signal areas, Telrex Conical Window Mounts, Stacked Bi-Directionals and Stacked Arrays are the antennas dealers and service men can depend upon for consistently good results. Each type is thoroughly engineered in the laboratory, service-tested in the field and built for long service life. Using Telrex Conical Antennas on every installation is one sure way to better, brighter pictures and a minimum of service call backs. Ask your distributor for catalog or write direct outlining your antenna problems.

TELREX ANTENNAS COVER CHANNELS 2 TO 13 AND FM—NO HIGH FREQUENCY HEAD NEEDED



TELREX MODEL 1X-BD

Bi-Directional Hi-Gain Conical "V" Beam
Broad Band Full Audio and Video Band Pass
Low Vertical Angle
Non-Varying Center Impedance
2 to 1 Front to Back Ratio
Uses 72, 150 or 300 Ohm Transmission Lines
Universal Mounting Clamp

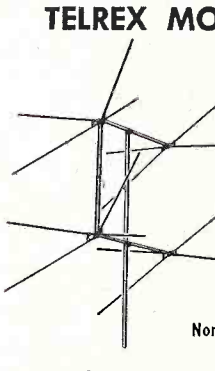


TELREX MODEL 2X-BD

Bi-Directional Stacked Conical "V" Beam
Low Vertical Angle
Extremely High Signal to Noise Ratio
Constant Center Impedance
Uses 72, 150 or 300 Ohm Transmission Lines
Universal Mounting Clamp

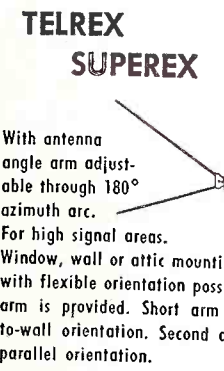
FOR THE ULTIMATE IN BI-DIRECTIONAL GAIN, USE TELREX MODEL 4X BD.

PATENT PENDING



TELREX MODEL 4X-TV

2 Bay Uni-Directional Conical "V" Beam
Broad Band—Full Audio and Video Band Pass
Low Vertical Angle, Minimum Reflections
Maximum Signal to Noise Ratio
4 to 1 Front to Back Ratio All Frequencies
Non-Varying Center Impedance
Universal Mounting Clamp



TELREX SUPEREX

With antenna angle arm adjustable through 180° azimuth arc.
For high signal areas. Window, wall or attic mounting with flexible orientation possible. 2-piece arm is provided. Short arm is useful for parallel-to-wall orientation. Second arm permits other than parallel orientation.

ALL TELREX ELEMENTS ARE MADE OF LASTING DURAL

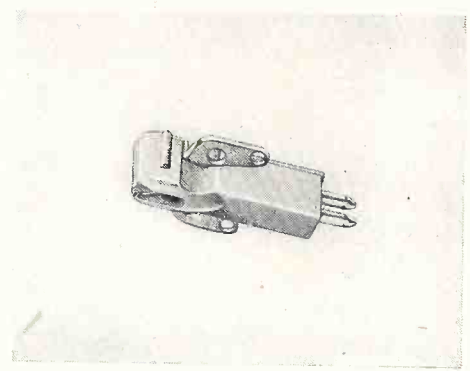
telrex INC

ASBURY PARK 5, NEW JERSEY

AMERICA'S OUTSTANDING TELEVISION BEAM

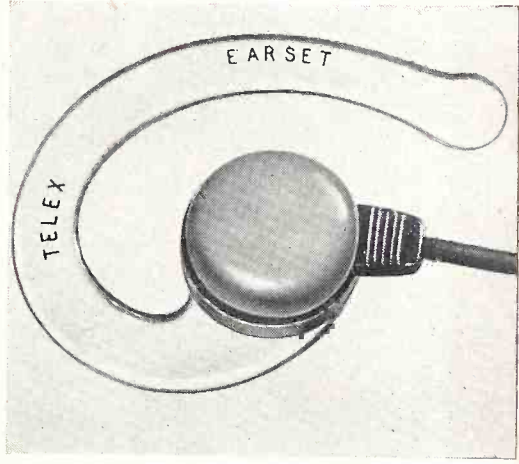
NEW PRODUCTS

[from page 26]
featuring a large quality 3" built-in meter. 1% precision ceramic divider resistors are used. 400 microampere meter movement comes already mounted in the case protected from dust during assembly.



PHONO CARTRIDGE

A new Series 34 Orthogonal (vertical-type) Torque Drive crystal phono cartridge—with 5/8" and 1/2" hole spacing—has been designed as replacement in RCA 45 rpm changers, by Electro-Voice, Inc., Buchanan, Michigan.



MINIATURE HEADSET

The Telex Earset, a single-phone headset that slips onto the ear and weighs only 1/2 an ounce, was recently released by Telex, Inc., Minneapolis, manufacturers of electro-acoustic equipment and hearing aids.



NEW ISOLATION TRANSFORMERS

Three isolation transformers, with 50, 150, and 250-VA capacities respectively, have just been announced as new catalog items by Chi-

[Continued on page 30]

MORE FOR YOUR MONEY



Triplet Model 630

\$37.50
Dealer Net

In the relatively short time since Model 630 was introduced to the trade it has steadily risen to the top in sales. The reason is obvious. Here is a Volt-Ohm-Mil-Ammeter that does more . . . has proven components . . . and will give a lifetime of satisfaction. All the engineering skill and facilities of the industries' largest manufacturer of Volt-Ohm-Mil-Ammeters joined forces to make it outstanding in every way. Look over all the features and you too will buy Model 630.

NOTE THESE SENSATIONAL IMPROVEMENTS:

- ★ Individual Scales with separated spacing are easy to read.
- ★ Large 5½ Inch Meter In Special Molded Case Under Panel.
- ★ Resistance Scale Markings from .2 Ohms to 100 Megohms—Zero Ohms Control Flush With Panel.
- ★ Only One Switch—Has Extra Large Knob 2½" Long—Easy To Turn—Flush With Panel Surface.
- ★ Enclosed New Molded Selector Switch and insulated resistor housing in unit construction.
- ★ All Resistors Are Precision Film or Wire Wound Types For Permanent Accuracy.
- ★ Batteries Easily Replaced—Balanced Double-Contact Grip. Spiral Spring—Battery for Ohms test due to low drain insures shelf-life usage.

TECH DATA

D.C. VOLTS: 0-3-12-60-300-1200-6000 at 20,000 Ohms/Volt
 A.C. VOLTS: 0-3-12-60-300-1200-6000 at 5,000 Ohms/Volt
 D.C. MICROAMPERES 0-60 at 250 Millivolts
 D.C. AMPERES 0-12 at 250 Millivolts
 D.C. MILLIAMPERES 0-1.2-12-120, at 250 Millivolts
 OHMS: 0-1000-10,000; (4.4 Ohms and 44 Ohms center scale)
 MEGOHMS: 0-1-100 (4400-440,000 at center scale)
 DECIBELS: -30 to +4, +16, +30, +44, +56, +70
 OUTPUT: Condenser in series with A.C. Volt ranges
 High voltage Probes available, extra; also plug-in shunts for other current measurements to suit special needs.

Laboratory Standard Model 630-A—All scales on this model are hand drawn and hand stepped, used with mirror for extreme accuracies, beyond the average servicing needs of the model 630.

Triplet Model 630-A Dealer Net **\$47.50**

VOMA Jr.—A NEW VOLT-OHM-MIL-AMMETER

Handy "POCKET-SIZE LABORATORY"
By Triplet

VOMA Jr. MODEL 666-R has many of the design features of the popular Model 630:

1. Switch and controls flush with panel.
2. Enclosed molded selector switch.
3. Exclusive Unit construction-resistor housing integral with switch.
4. Resistors Precision wire wound and permanent film type.
5. Resistance Measurements to 3 Megohms.
6. Batteries with spiral spring contacts, easily replaced.

VOMA Jr. MODEL 666-R . . . \$24.50
U.S.A. Dealer Net Price

Note: Model 666-HH The Original Pocket-Size Lab—still a favorite with many. U.S.A. Dealer Net \$22.00.



TECH DATA

D.C. VOLTS: 0-10-50-250-1000-5000, at 1000 Ohms/Volt
 A.C. VOLTS: 0-10-50-250-1000-5000, at 1000 Ohms/Volt
 D.C. MILLIAMPERES: 0-10-100, at 250 Millivolts
 D.C. AMPERES: 0-1, at 250 Millivolts
 OHMS: 0-3000-300,000 . . . (20-2000 at center scale)
 MEGOHMS: 0-3 . . . (20,000 ohms center scale)

Precision first...to Last



TRIPLET ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO, U.S.A.

In Canada: Triplet Instruments of Canada, Georgetown, Ontario

NEW PRODUCTS

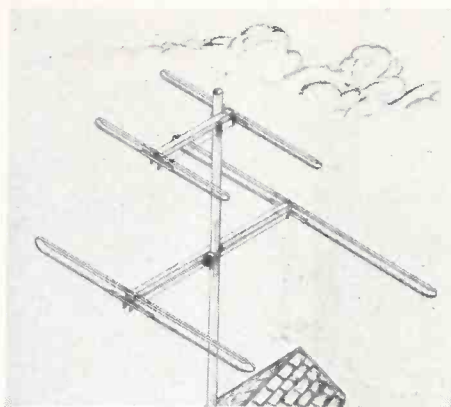
[from page 28]

cago Transformer Division, Essex Wire Corporation., 3051 W. Adison St., Chicago 18, Ill.

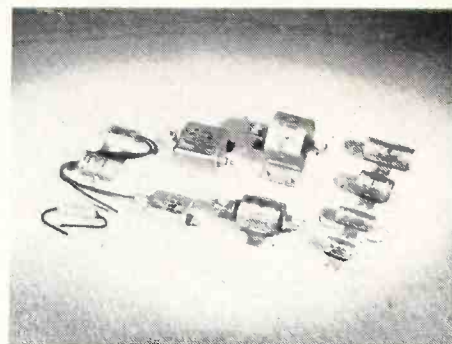
Designed for dual purposes, they are suitable either for (1) adjusting high or low line voltages to operate radio, television, and other equipment on a normal 115 volts, or (2) promoting safer, more efficient servicing or experimental work on electronic gear by isolating chassis grounds from line grounds—particularly useful in eliminating shock hazard on AC-DC television sets.

TV ANTENNA

Communications Measurements Lab., Inc., 120 Greenwich St., N. Y. 6, N. Y., announces



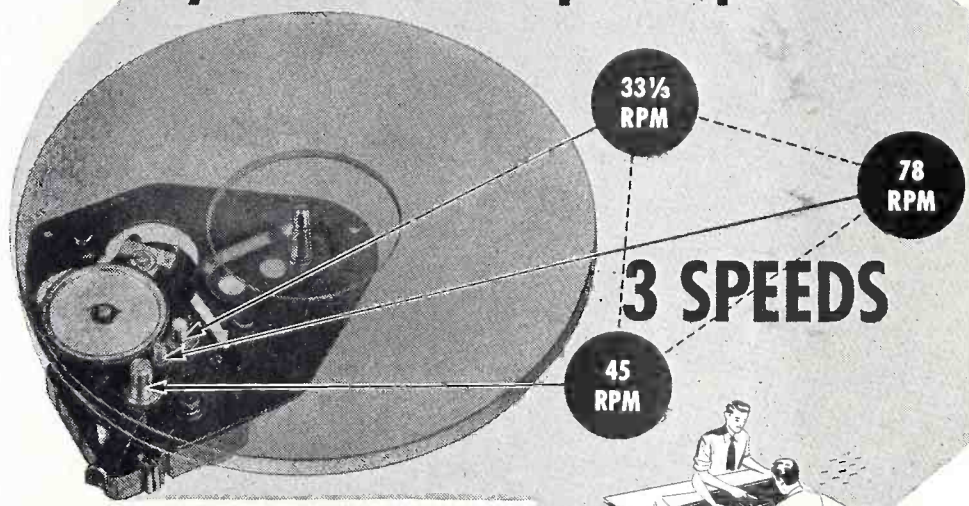
their new Vidi-Master TV antennas which are designed to provide broad band performance and flexibility of operation and adjustment.



TV & RADIO NOISE FILTERS

Four new television and radio noise filters developed for use on motors, generators and R. F. heating equipment, are announced by the Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey. Three of these are intended for low voltage motors and generators. The other—NF-10084—is designed for equipment operation from power lines up to 250 VAC-DC. Current ratings range from 20 to 350 amperes. Also shown above are the NF-10085-88 series of feed-thru capacitive TV and Radio Noise Filters.

Let GI's Smooth Power Line-up solve your record speed problems



MODEL TS—45-78-33 1/2 R. P. M. General Industries' newest rim-drive phonomotor, designed to accommodate all types of records now on the market. Features include standard narrow flange turntable for compact installation, and ingenious speed-change mechanism which is both simple and positive in operation.

Single-speed phonograph motors for 78, 45 or 33 1/2 R. P. M. operation . . . dual-speed motors for any two-speed combination of the above . . . and a low-cost rim-drive motor for all three speeds . . . that's the *complete* General Industries line-up which gives your designers and engineers the solution to their "which speed to use" problems.

And no matter what the choice, you get the same dependable *Smooth Power* motors which have made General Industries a leading name, as well as the oldest name in the phonomotor field. GI *Smooth Power* motors are engineered to meet exacting performance standards, and to provide trouble-free long life for the ultimate user. Every one of the GI motors is dynamically balanced to the degree necessary for excellent reproduction of records.

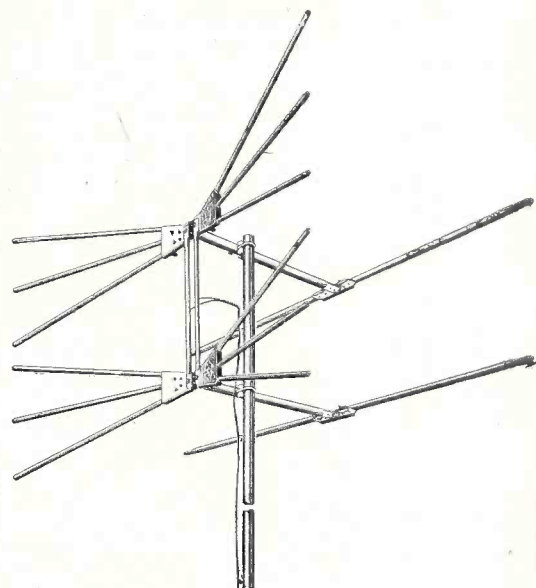
For full details, specifications and dimensions of General Industries' *complete* Smooth Power line of phonograph motors, recorders and record changer-recorders, write *today* for a copy of the latest GI catalog.

TWO-SPEED MOTORS

General Industries offers you a choice of six different dual-speed combinations to take any two of the standard 2-pole rim-drive models, or a 4-pole rim-drive model for use in instruments in which the ultimate in performance standards is desired.

SINGLE-SPEED MOTORS

All five of the famous GI *Smooth Power* single-speed phonograph motors now are available in your choice of 78, 45 and 33 1/2 R.P.M. speeds. Both 2-pole and 4-pole motors afford a complete range of selection to meet every operating requirement.



TV ANTENNA

Channel Master Corp., Ellenville, N. Y. announces the design and production of a new type antenna, the Fan Flector. This is the broad band antenna combining two principles of antenna engineering, fan type elements for uniform high impedance, and Vee type alignment of these elements for narrow lobe, high gain characteristics on the high band.



EASY-UP TOWER MODEL 200

An improved tower for television receiving antennas, the Model 200, has recently been an-



The GENERAL INDUSTRIES Co.

DEPARTMENT K • ELYRIA, OHIO

announced by the Easy-up Tower Company, 3800 Kinzie Ave., Racine, Wisconsin.

The new model is a triangular type, pre-fabricated steel tower designed for either residential or commercial use. Antenna height of 0 feet above rooftop is achieved with the basic 3-section tower anchoring a 10-foot pole. Where still greater height is needed, from one to five 10-foot extension sections can conveniently be added.

TV QUIZ

[from page 20]

- band is grounded for safety.
- Two dark non-conducting lines showing maximum limits, anywhere within which the focus coil may be placed.
 - Acid etched area on the neck of the glass, providing a non-slip placement for the coil. The acid etching is done at the factory after test placement shows proper limits.
 - The coil is slipped on the neck of the tube, then slipped up until it strikes the flare of the tube. Here it is cemented in place. It is impossible to place the focus coil at an improper point under these conditions.
 - None of the above. The coil is slipped along the neck until placed approximately halfway between base and flare, between gun-accelerating anode and deflection coils. (The tube carries no markings for focus coil placement.)

ANSWERS TO TV QUIZ

- Observe Fig. 5. Under the left hand rule the current moving away from the observer generates a magnetic field moving counterclockwise.

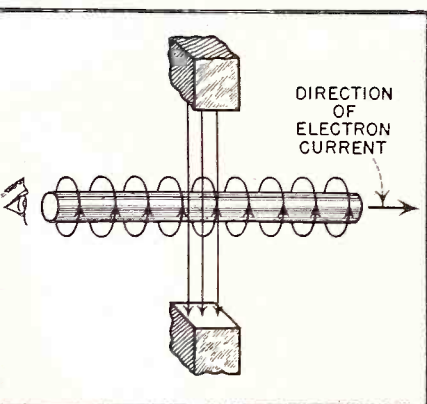


Fig. 5. Direction of generated magnetic field for current shown.

Note eye of observer at left. He would see a counterclockwise magnetic field.

2. There would be no change in the drawing, since an electron beam

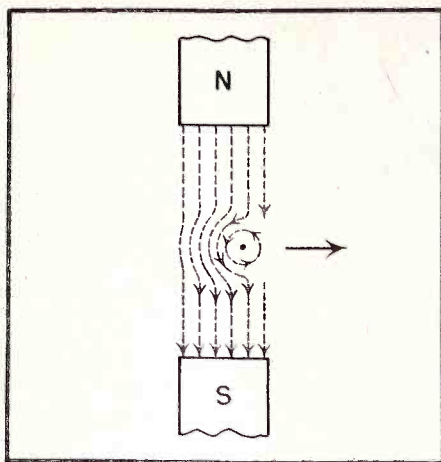


Fig. 6. Magnetic force on conductor

operating in a vacuum acts *exactly* like the drift of electrons along a conductor.

3. Look again at Fig. 5. The picture the observer's eye sees is shown in the side view Fig. 6. Now then, the lines of force of the magnet join certain lines of force of the conductor. This occurs when the lines are in conjunction. (Going the same way.) Certain other lines on the other side of the conductor oppose lines of the magnet, causing cancellation of force there. The result, then, is that the conductor itself (or the electron beam itself, if used) is physically pushed by the co-ordinating lines of

[Continued on next page]

NOW *Astatic Research* AIDS TELEVISION PROGRESS WITH THE

Channel Chief
MODEL AT-1

TELEVISION BOOSTER



LIST PRICE
\$49⁵⁰

New Astatic Booster Has Gain Equivalent to Two Ordinary Boosters

... Covers All 12 Channels with

Very Uniform Gain ... Eliminates Sacrifice

of Good Sound for Good Picture, or Vice Versa, with Dual-Tuning.

ADDITIONAL IMPORTANT FEATURES

- Self-contained power supply operating from 115 volt, 60 cycle AC power line.
- On-off switch allows booster to be switched in or out of the circuit at will.
- Recessed pilot light indicates when booster is on.
- Beautiful, furniture-finish mahogany cabinet (8½" wide x 6½" high x 7¾" deep) to complement fine home furnishings.
- Simple to install and operate—complete instructions with each unit.

ASTATIC RESEARCH— which has led the march of progress in various sound reproduction fields since the company first pioneered in crystal microphones, phonograph pickups, cartridges, parts and accessories— now brings major new advantages in reception and tuning to the television field. The new Astatic device which makes it all possible is the Channel Chief, Model AT-1, a radically improved type of television booster. The common falling of many boosters— showing a "peak" on some channels and "fall-off" on others—has been eliminated. The Channel Chief provides extremely high gain— equivalent of two conventional boosters— uniform on all 12 television channels. Its dual controls allow separate tuning of picture and sound, with no sacrifice of one for the other. Or, if one signal is weak and the other adequate, both controls may be adjusted to the weaker to bring it in strong. A variable gain control permits reduction of signal strength to prevent picture distortion when the signal input is greater than that required for good definition. Altogether, the results are the considerable extension of fringe areas, good reception in areas previously rated as unsatisfactory, easier tuning and added selectivity on any receiver, elimination of the need for expensive outdoor antennas within service areas. The increased selectivity serves to reduce drastically, or eliminate, interference from adjacent channels, amateur and commercial fundamentals and harmonics in the receiver's I.F. range, FM stations and oscillators of nearby FM, TV and short wave receivers. No other booster can do so much ... for your installation and service business, for the television receiver owner. Write for added details.



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Applying Neg. Feedback in Audio Amps.
New Philco FM Circuit
RMA Resist. & Conds. Chart

FEBRUARY 1946

Applying Neg. Feedback in Audio Amps.
Service Market in Industrial Electronics
Ballast Tube & Plug-in Resistor Chart

JULY 1946

Distortion—Determining the Cause, Part 1
Ohmmeters, Cond.-Testers, Cap.-Met. Part 2
Multivibrators

SEPTEMBER 1946

Transconductance-Reading Tube Tests
How Is Your Grid Biased, Part 2
Centralized Radio Servicing

NOVEMBER 1946

The TV Opportunity—Installing & Servicing
Don't Miss "Hidden" Profits, Part 1
Service Market in Industrial Electronics

DECEMBER 1946

Modernizing Sets by Using New Rectifiers
Deflection Generators in TV
Guide for Miniature Electron Tubes
Answers to FM Servicing Problems

MAY 1947

Oscillator & Power Supply Troubles
Ion-Trap in C-R Tubes
P-A System Design & Applications, Part 1

JUNE 1947

Simplified Set Checking
P-A System Design & Applications, Part 2
TV Installing Is A Specialty Business
Servicing 3-Way Portables

JULY 1947

Frequency Modulation, Part 1, antenna fundamentals & signal shifting effects
Automatic Gain Control Circs. in TV Sets
Using Conventional Sig. Gen. for FM Align.

AUGUST 1947

TV R-F Circuits Described
FM, Part 2, receiver circuit fundamentals
TV Antenna Installation Problems

OCTOBER 1947

Add Record-players to Modernize Old Sets
P-A Fundamentals & Complexities
Modern TV Kits

FEBRUARY 1948

High Speed Servicing
Visual Alignment
Income Tax Deductions

MARCH 1948

Know Your Tube Tester
TV Power Supplies
A-C/D-C Battery Set Circuits

APRIL 1948

Video I-F Circuits & Applications
Computing What Price to Charge
Using 'Scopes' For Radio Servicing

MAY 1948

FM Set Alignment Procedure
Video Detectors
How Vectors Simplify Servicing
Significance of Power Factor and ϕ

JUNE 1948

Amplifier Checking by Signal Injection
Applications of Gas Type Tubes
Modern TV Kits

JULY 1948

Television's Service Outlook
Video Amplifiers
Bad Acoustics Cured Electrically

SEPTEMBER 1948

De-emphasis In FM Set Circuits
Video Amplifiers, D-C Restorers
Simple Wattmeter

OCTOBER 1948

Projection TV
Distributed Capacitance
TV Picture Tubes

High Voltage Test Probes

NOVEMBER 1948

Sweep Generators
TV Picture Tubes
155 Loudspeakers, Voltage-Fed

Making Good TV Installations

FM-TV Antenna Mast Support

DECEMBER 1948

Checking Video & Synch Waveforms by CRO.

Magnetic Recording
Projection Television, Part 2

JANUARY 1949

Checking Video & Synch Waveforms by CRO, Part 2

Feedback & Phase Inversion

Tuned Filters

TV Picture Tube Chart*

FEBRUARY 1949

Test Equip. Symposium Issue:
CROs - VTVMs - Sq. Wave Generators -
Markers - Multimeters - Kilovolters -
High Voltage Probes, etc.

MARCH 1949

Test Equip. Symposium Issue:
Signal Generators - Tube Testers - etc.

Markers For Visual Alignment

TV Kilovoltmeter

Signal Generators Chart

Projection TV, Part 3

JUNE 1949

Direct View Enlarging Lens
Modern Tape Recorders, Part 2
Custom Building High Fidelity Circuits,
Part 2

JULY 1949

Picture Tube High Voltage Systems
High Quality Tuner Analysis
Amateur TV Interference

AUGUST 1949

Capacitance Bridges — Operation &
Applications

Legal Opinion on TV Service "Policies"

A New TV & FM Sweep Generator

Transformerless Power Supplies

Ceramic Piezo-Electric Devices

force toward the lines of least resistance (cancelled lines).

Thus, in *Fig. 5* the beam would move toward the reader. In this case solution (e) would be correct. On the other hand, viewed in *Fig. 6* the beam would move toward the right.

In electrical motors the same principle is used to move the wire conductor itself. Since this is connected to the rotor, the whole shaft turns, causing the motor to operate by rotation.

4. In *Fig. 3* the effect of the horseshoe magnetic beam upon the magnetic field of the electron beam, though less, is similar to that occurring in *Fig. 2*. In this case, however, because of the angle a torque, or twisting action is exhibited, effectively diverting the beam as intended.

5. The special angle is zero degrees, or parallel. If the horseshoe magnetic field is parallel to the current beam, no force will be exerted upon the beam. Since the magnetic lines of the two fields would be exactly at right angles to each other, there would be neither addition nor cancellation of lines, hence no interaction.

6. (e) is correct. As long as the focus coil is placed approximately as described it generally suffices, since adjustment of current through the coil completes the final focus. (If focus control range is not wide enough to achieve proper beam-focus, then coil has been improperly placed, and should be moved one way or the other.)

SERVICING P.E.

[from page 22]

the use of a potentiometer which controls the tube grid voltage directly. In such cases the filament, grid, screen and plate voltages may be taken from separate windings of a transformer. However, this is mentioned merely to acquaint you with possible circuit variations, since there is little or no difference in the adjustment procedure. It must be emphasized, though, that the directions given here for sensitivity adjustment are general. If the maker's instructions for adjustment are available they should be followed implicitly.

Assuming that you are adjusting a forward type unit, the general procedure would be somewhat as follows: after setting up the lamp unit and obtaining the maximum amount of light on the target, turn on the amplifier and allow the usual period for warm-up. Cover the phototube so as to block off all light. Now turn the sensitivity adjustment until the re-

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lay contacts just close, then back off the adjustment until they again open. Now remove the cover from the phototube so that full light from the lamp reaches it, and note whether the relay closes properly. Alternately cover and illuminate the phototube and note whether the relay operation is positive. Further adjustment may be needed. If you do not get quick, positive closure of the relay contacts each time the tube is illuminated, advance the sensitivity adjustment slightly; on the other hand, if the relay tends to stick or does not open immediately upon cutting off the light supply, the adjustment has been too close and must be backed off.

In adjusting a reverse type unit, the procedure is exactly opposite from that outlined above. Since the relay is to close in the absence of light on the phototube cathode, the procedure would be to adjust the sensitivity control with the tube illuminated. Turn the adjustment until the relay is energized, then back off the adjustment until the contacts just open. When the tube is then darkened the relay should close properly; if it does not, repeat the adjustment as described in the preceding paragraph.

(To be continued)

TRADE FLASHES

[from page 12]

modern picture tube manufacturing and engineering facilities at Electronics Park, which will be in addition to its picture tube operations at Buffalo, N. Y. To house the new Syracuse tube facilities, the company is converting and adding to an existing building. When completed later this year, the building will have 152,000 square feet of manufacturing space in addition to engineering and office areas.

South River Obtains Patent

South River Metal Products, manufacturers of the Chimney Mount Antenna Base, have recently been assigned U. S. Patent 2,482, 575, patent protecting their chimney mounts.

Rider Announces TV No. 3

Announcement has been received from John F. Rider Publisher, Inc., that the forthcoming Rider Television Manual Volume 3 will be published in a new size—substantially enlarged. The page size will be approximately 12 x 15 inches, a dimension hitherto used only for special double spread pages. This change in binder dimensions will reduce the number of folds

of the giant size pages to a single one, thus making for greater convenience and extended life of the page.

Philco Wall Charts

Giant, blown-up schematics that make perfect wall charts and give your shop that technical, professional appearance are now available at a nominal cost at your Philco distributor.

Four Schematic Wall Charts are available under the following part numbers:

PR 1795, shows Models 50-T1105 and T1106.

PR 1796, shows Model 50-702.

PR 1797, shows Model 49-1278, Code 123.

PR 1798, shows Model 48-1001.

Du Mont UHF-VHF Program

The general public has a larger stake that it realizes in the television hearings held before the Federal Communications Commission September 26, it was stated by Dr. Allen B. Du Mont, President of the Allen B. Du Mont Laboratories.

On the face of it, the purpose of the hearing was to review the allocations outlined by the FCC on July

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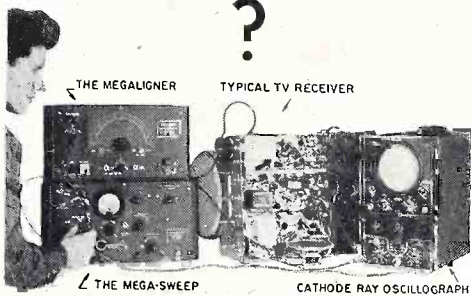
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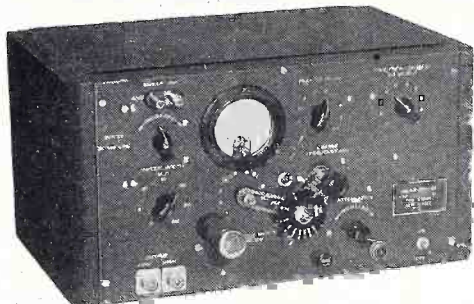
ARE YOU READY FOR UHF



A modern test set-up is shown here in operation . . . With these Megaline instruments you service VHF and are ready for UHF.

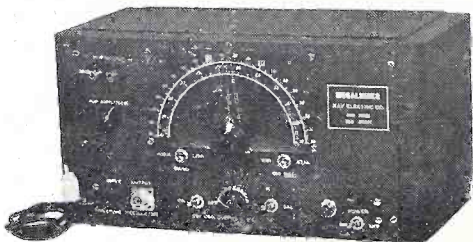
With Megaline instruments you are always ahead in the TV business. Our engineers are constantly working to keep you ahead. This actually saves you money because if you buy Megaline test equipment you will not have to replace it with completely new instruments whenever a new band is announced.

- The Megaline will not be obsolete when new bands are announced.
- A MEGA-SWEEP sweeping oscillator with single dial continuous tuning from 50 kc to 1000 mc.
- An accurate marking device (MEGALIGNER) 19-49 mc pip type mark which cannot overload receiver or disappear in traps.
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THE CALIBRATED MEGA-SWEEP

- Covers Video, I.F., VHF and UHF Television Bands.
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 - Can be used as CW signal source.
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11, and also to look into color television proposals. The Du Mont Program provides for 81 channels and rests on these eight factors:

1. To utilize the twelve present commercial VHF channels to the fullest extent, thereby providing four channels per city for most of the 140 metropolitan districts (as described by the 1940 census).
2. To utilize 48 UHF channels, each six megacycles wide, to assure adequate service to other communities.
3. To reserve twelve additional UHF channels, each six megacycles wide, to protect smaller communities, not yet ready to embrace TV and insure that adequate frequencies will be available when they are ready. These will be assigned on a first-come, first-served basis.
4. To set aside nine further UHF channels for non-commercial educational broadcast applications. These are to be assigned on a first-come, first-served basis and used at full metropolitan power.
5. To allocate VHF and UHF frequencies in such a manner as to provide a minimum of four channels in most metropolitan communities to assure competitive operation and a wide choice of programs.
6. To minimize the intermixture of VHF and UHF assignments to reduce, or eliminate, the need for set owners to buy converters or for station owners to utilize transmitters for two supplementary frequencies.
7. To provide for the best long term operating plan for television, by designating certain cities, now having a limited VHF service, as future UHF cities in the long term plan.
8. Finally, it proposes allocations of UHF channels so as to minimize interference between stations and receivers.

N. Y. Audio Fair

First details have been announced of the program being planned for the technical sessions of the Audio Fair, which will be sponsored by the Society for presentation at the Hotel New Yorker in New York October 27, 28 and 29. At the technical sessions to be held over the three day period of the Fair will be papers of interest to audio engineers and the related fields.

I.R.E. Fall Meeting

The 1949 Radio Fall Meeting, formerly known as the Rochester Fall Meeting, will be held October 31st, November 1st and 2nd at Hotel

Syracuse, Syracuse, New York according to an announcement by Virgil M. Graham, chairman of the Radio Fall Meeting Committee and director of technical relations for Sylvania Electric Products Inc.

Garcelon Joins Hytron

Frederick H. Garcelon has joined the sales force of the Hytron Radio



& Electronics Corp. He will operate out of the New York Hytron office and will contact equipment manufacturers.

New Mobile Service

Formation of the first national network of independent radiotelephone stations for mobile service to the general public was announced recently in a statement filed with the Federal Communications Commission in behalf of the National Mobile Radio System.

Organization of the new interstate system is regarded as one of the most significant of recent radio-communication developments. It will offer a practical and unprecedentedly low-cost means of communication between occupants of automobiles, trucks, buses and other vehicles with offices or homes hundreds of miles distant. The network also has important potentialities as an auxiliary communications system in event of national emergency or disaster.

New Utah Line

Utah, one of the oldest names in the radio industry, announced a complete new line of original equipment and replacement radio speakers and replacement transformers. All Utah products have been re-engineered and changes have been made which make the new line outstanding.

To Manufacture 16 Inch Tube

The manufacture of metal 16-inch TV picture tubes at the new Salt Lake plant of Eitel-McCullough, Inc., was the subject of a disclosure by W. W. Eitel, President of the firm.

ASSOCIATION NEWS

Philadelphia Radio Servicemen's Association, Inc.

As reported in *Field Findings* in this issue, the PRSMA Radio and Television Convention and Exhibit held in Philadelphia, Sept. 18, 19 and 20, was an outstanding success. Attendance figures neared the 5,000 mark. Congratulations to one of the most progressive and aggressive Servicemen's organizations in the U.S.A.

The complete program for the three day convention tells better than all the words that can be written the story of this remarkable achievement.

Dallas Radio Sales & Service Ass'n., Inc.

A clinic featuring Sparton TV was held on August 8. The annual election meeting ushered in a new slate of officers, among which were: Pres., Egon Pflughaupt; Vice-Pres., W. J. Inman, and Sec-Treas., T. P. Robinson.



A surprise shower by fellow members of the Dallas Radio and Service association restocked shelves of H. H. Hirsch after his merchandise and equipment were lost early in June during a flood in Garland, a Dallas suburb. Left to right, E. Pflughaupt, association vice-president, and T. P. Robinson, secretary-treasurer, had Hirsch some of the new equipment presented to him by the organization.

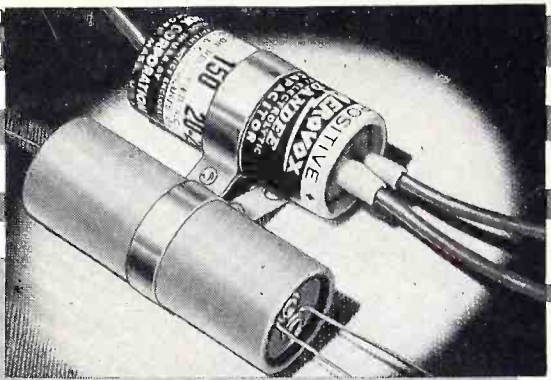
Empire State Federation of Electronic Technicians Associations

A change in the dates of the Rochester Area TV Course meeting was made necessary because of the need for obtaining a meeting place large enough to hold the audience anticipated. The new dates are as follows: 1) Sept. 26, 1949; 2) Oct. 10, 1949; 3) Oct. 24, 1949; 4) Nov. 14, 1949; 5) Nov. 28, 1949; 6) Dec. 12, 1949; 7) Jan. 9, 1950; 8) Jan. 23, 1950;

(Continued on page 36)

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DUAL & TRIPLE DANDEES with the NEW INSULATED- STUD TERMINALS



• Smaller — better. That's why the new Aerovox dual and triple midget-can electrolytics are a smash hit with servicemen.

Stud terminals replace usual riveted terminals. Reduce tubular diameter 40%. Advanced electrolytic capacitor art further reduces bulk. Note comparison between usual dual and new Dual Dandee.

To top it all, insulated wire leads in place of bare wires! Also insulating sleeves over stud terminals. No danger of "shorts" even in tight spots.

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ASSOCIATION NEWS

[from page 35]

9) Feb. 13, 1950; 10) Feb. 27, 1950; 11) Mar. 13, 1950; 12) Mar. 27, 1950; 13) Apr. 10, 1950; 14) Apr. 24, 1950; 15) May 8, 1950; 16) May 22, 1950.

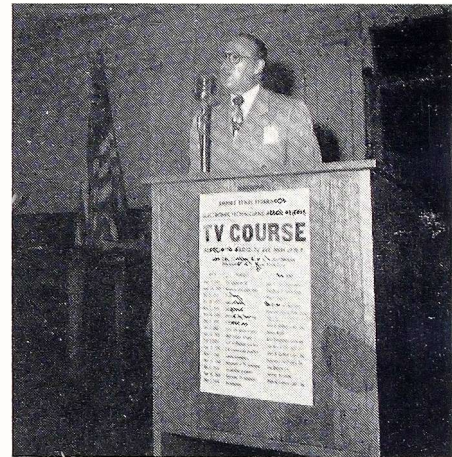
Date changes in the Binghamton-Endicott Area for purposes prevent-

ing conflicts with local functions consist of moving up the Wednesday dates to the Tuesdays preceding. The new dates are tentatively as follows: 3) Philco, Oct. 19, 1949; 4) Westinghouse, Nov. 1, 1949; 5) Emerson, Nov. 15, 1949; 6) R.C.A.-Radio Service Dealer Magazine, Dec. 6, 1949; 7) DuMont, Jan. 3, 1950; 8) Motorola, Jan. 17, 1950; 9) Precision, Jan. 31, 1950; 10) Hickok, Feb. 14, 1950; 11)

DuMont, Feb. 28, 1950; 12) G. E., Mar. 14, 1950; 13) Kay, Apr. 4, 1950; 14) Service Magazine, Apr. 18, 1950; 15) DuMont, May 2, 1950; 16) May 16, 1950.

Associated Radio TV Servicemen of New York

The first of the ESFETA TV Lecture series was held on Sept. 14, John F. Rider shown below delivered a most



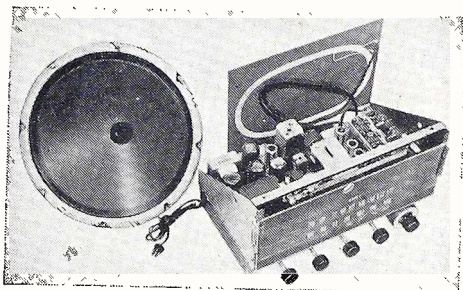
interesting lecture on "The Nature of TV." The second lecture, "Antennas and Transmission Lines," was presented by Messrs. L. H. Finneburgh and L. Klein, of the Ward Products Corp. Very capably presented and well received.

"Did over \$5000 additional business installing ESPEY chassis"

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Supplied ready to operate, complete with tubes, antennas, speaker and all necessary hardware for mounting in a table cabinet or console, including esutcheon. Power requirements 105/125 volts AC, 50/60 cycles. Power consumption—85 watts. Chassis Dimensions: 13½" wide x 8½" high x 10" deep. Carton Dimensions: (2 units) 20 x 14½ x 10¾ inches. Net Weight 16½ pounds each. Sold through your favorite parts distributor.

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FEATURES

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2. Improved Frequency Modulation Circuit, Drift Compensated.
3. 12 tubes plus rectifier and electronic Tuning Indicator.
4. 3 dual purpose tubes.
5. Treble Tone Control.
6. 6-gang tuning condenser.
7. Full-range bass tone control.
8. High Fidelity AM-FM Reception.
9. Automatic volume control.
10. 13 watt (max.) Push-Pull Audio Output.
11. 12 inch PM speaker with Alnico V Magnet, 25 watts rating.
12. Indirectly illuminated Slide Rule Dial.
13. Smooth, flywheel tuning.
14. Antenna for AM and folded dipole antenna for FM Reception.
15. Provision for external antennas.
16. Wired for phonograph operation.
17. Multi-tap output trans., 4-8-500 ohms.
18. Licensed by RCA.
19. Subject to RMA warranty, registered code symbol #174.

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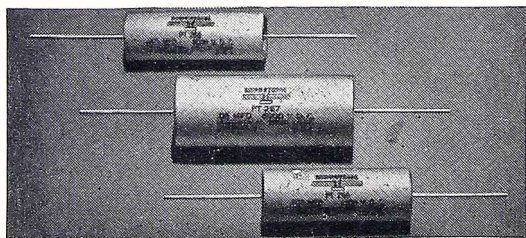
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528 EAST 72nd STREET, NEW YORK 21, N. Y.

CIRCUIT COURT

[from page 25]

of the 2200 ohm and 22K resistors. Only the portion across the 2200 ohm section is applied to the grid as d-c bias. The by-pass capacitor is only .002

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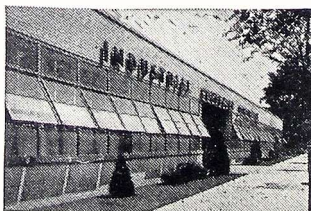
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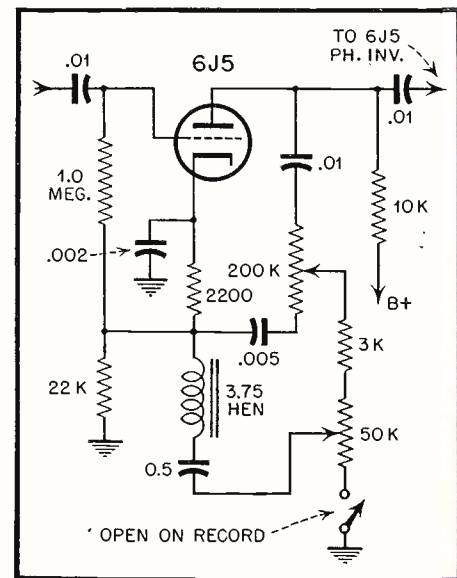
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Hoffman Model C-503, 1st audio

μfd. The plate circuit contains a .01 μfd capacitor as part of the high-frequency tone control. Note that provision is made to disconnect the entire tone control network during recording.

Low frequency compensation is developed by the series LC circuit comprising a 3.7 henry choke and a .5 μ f capacitor. As the bass control is tuned toward the ground end the resonance provided by these components become more effective and boost of the low end of the audio range takes place.

High frequencies are increased as the high frequency control is turned toward the lower end. High cut off takes place as the control moves up toward the .01 μ f capacitor. The combination of the two controls makes any combination of tone boost or attenuation within the range of the audio system possible.

MEGALINER

[from page 19]

ference between the variable oscillator output in the Megaligner and the sweeping output from the Megasweep.

Figure 2 shows the operation of both the Megaligner and Megasweep used together. Assume that a television receiver video i.f. is being aligned and an external oscilloscope is used as the indicating device. The X axis signal or sweep for the oscilloscope is provided from the Sweep Output of the Megasweep. The Input Cable which is a part of the Megaligner is attached to the High Output connector of the Megasweep. This is the jack marked Input (Sweeping Oscillator) on the Megaligner. The Output Jack (Sweeping Oscillator) from the Megaligner goes to the converter tube of the television receiver under test across a 50 ohm resistor to ground. A Y axis signal is provided for the oscilloscope from the detector of the television receiver being tested. The Pip Output from the Megaligner through a low capacity shielded lead or twisted pair goes directly to the Y axis of the oscilloscope. In this manner the test oscilloscope has a sweep time base provided by the Megasweep, a pip connected directly to the signal terminals and a visual trace provided by the sweeping arrangement of the Megasweep.

The CW Oscillator Output controls are important to the operation of this generator. On-Off Switch connects the CW signal either to the Output coaxial connector or to ground. By means of the Increase Control which is a potentiometer in the output of the crystal output circuit, the level of this 4.5 megacycle signal may be adjusted. Output from the variable oscillator is capacitively coupled to the center arm of this potentiometer

Heathkit

TEST EQUIPMENT

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Heathkit AUDIO GEN. KIT \$34.50

Heathkit TELEVISION GENERATOR KIT \$39.50

Heathkit SIGNAL TRACER KIT \$19.50

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NEW Heathkit IMPEDANCE BRIDGE SET \$69.50

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so that this control may adjust the amount of signal output from either the crystal or the variable frequency oscillator. This potentiometer can only be used when the CW Oscillator Output On-Off Switch is on the On position. By this means either of the two oscillators in the Megaligner may be used to provide a radio frequency signal to the output coaxial cable.

A Calibrate Switch is a momentary B supply switch which, when held down, provides plate voltage for both the variable frequency oscillator and the crystal oscillator. This switch is to be used when it is desired to use harmonics of the 4.5 mc crystal oscillator to check calibration of the variable frequency oscillator. As examples, the following check points may be used: the fifth harmonic on the low frequency band is 22.5 mc; the sixth harmonic on the same band is 27.0 mc. On the high band the seventh harmonic is 31.5 mc and the tenth harmonic is 45.0 mc.

This calibration of the variable frequency oscillator is best carried out by using the Megaligner and an oscilloscope. With the Pip Output terminals directly connected to the vertical input terminals of the scope the controls should be set as follows: CW Oscillator Switch in Variable Position, CW Oscillator Output Switch in On position, CW Oscillator Output and Pip Amplitude controls at half open position. The calibrate switch is depressed and the variable frequency oscillator is adjusted to beat with the desired harmonic of the crystal oscillator by tuning the variable frequency oscillator until a visible beat note appears on the oscilloscope. The proper trimming adjustments are best obtained from the manufacturer's data supplied with each instrument.

PA TECHNIQUES

[from page 17]

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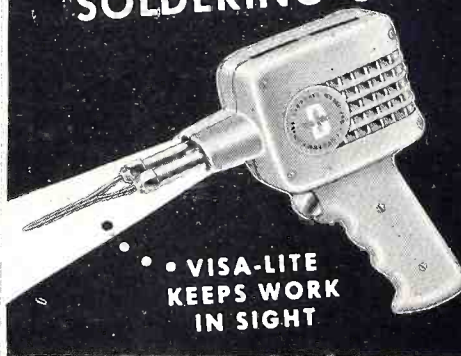
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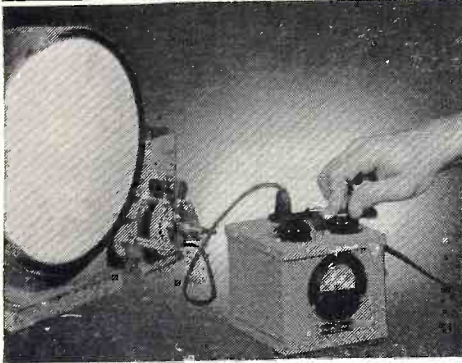


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with identical driving units. From this it can be seen that two efficient directional radiators can best cover a necessarily wider spread requirement.

Installation

A few prime factors cannot be denied as regards assembly and distortion of sound equipment despite the fact that space limitations are often severe. Not listed in their importance these are:

1. Visibility — Clear view of activities to be serviced by an operator is desirable. Where mixing of microphones is required this feature is imperative for customer satisfaction.

2. Accessibility — The rear as well as the front of all components should be readily accessible for maintenance or replacement.

3. In cramped quarters or tropical climates, lack of adequate ventilation may result in costly failures or interruption to service causing a loss of future business. Units should be separated and fans applied when required.

4. Low Level Circuits—All program input circuits must be shielded, grounded and physically isolated from magnetic fields such as those emitted by power transformers, building power lines and your own high level circuits. To avoid ground loops shielding should be insulated from contact with any other equipment or grounded units. One single insulated wire should be run from each unit's ground terminal to one good common ground. It is well to remember that, low impedance lines carry more current for a given power than do high impedance lines; also that the strength of a magnetic field is a function of the current producing it. Furthermore the use of twisted pair for low level circuits often reduces foreign pickup. Induction in one bucks equal voltage induced in the other. Similarly the magnitude of a generated field from power circuits using twisted pair is less than when straight parallel leads are used. Lastly, when balanced input circuits allow longer low level cable runs, costs of lengthy high level transmission lines may be minimized by spotting the amplifiers closer to the loudspeakers. The inclusion of preamplifiers between microphone and main amplifier often cures input ailments otherwise contrary where long mike lines are necessary.

5. High Level Circuits — Properly matched and distributed lines to loudspeakers may usually be run together with control circuits such as switching, relay, or signal control circuits providing these do not carry program material. Usually loudspeaker lines are relatively short in a trans-

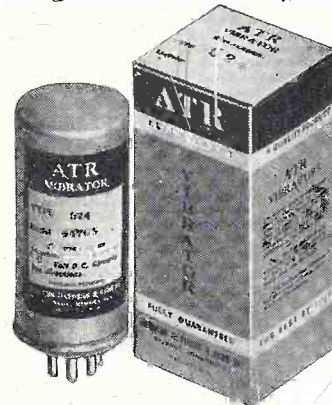
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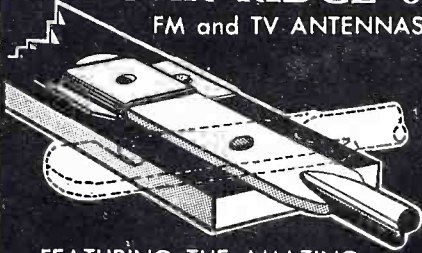
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mission sense, and hence may be considered as a pair of conductors having resistance and capacitance responsible for power losses which must be kept to a minimum. Impedance matching from source to load is a *must*.

To save space and mathematics we reproduce here very practical figures for low impedance lines in *Table 1*. The figures given are distances in feet between driving amplifier and load. A maximum of 15% power loss is allowed as generally satisfactory at these very low impedances. Only short lines and short wire sizes are permissible at the lowest impedance values where as the table shows smaller conductors and longer runs permissible for the higher values included within *Table 1*.

For transmission lines having higher impedance values the reader is referred to the very useful curves of *Fig. 3*. At the higher impedance values no such losses as above are tolerated. These curves are drawn up allowing a maximum loss of 0.5 db. The reason for overlapping discrepancies between

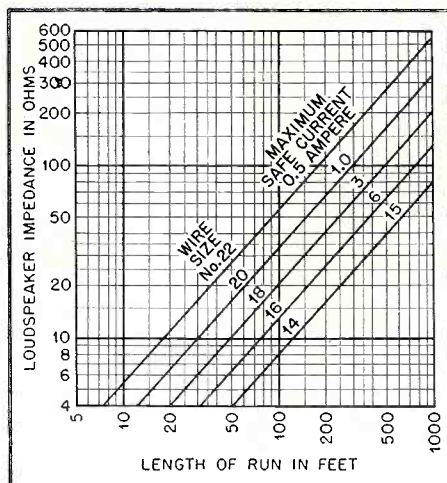


Fig. 3. High impedance values

table and curves is due to more rigid tolerances for the curves which cover values more easily controlled. The reason for strict tolerances is obvious. Even a 3 db loss in these output circuits means one half of the power capacity of the system is sleuced down the drain. Wire size in output circuits means much for two reasons:

1. Fire hazards result when conductors are too small and thus cause overheating.
2. Loss of power due to excessive resistance of inadequate conductors may cause the sound operator to employ over-expensive driving amplifiers.

Again we suggest the reader review the four articles listed at the start of this article. Study of the curves and figures here presented should help save initial costs plus time and monies lost due to trial and error.

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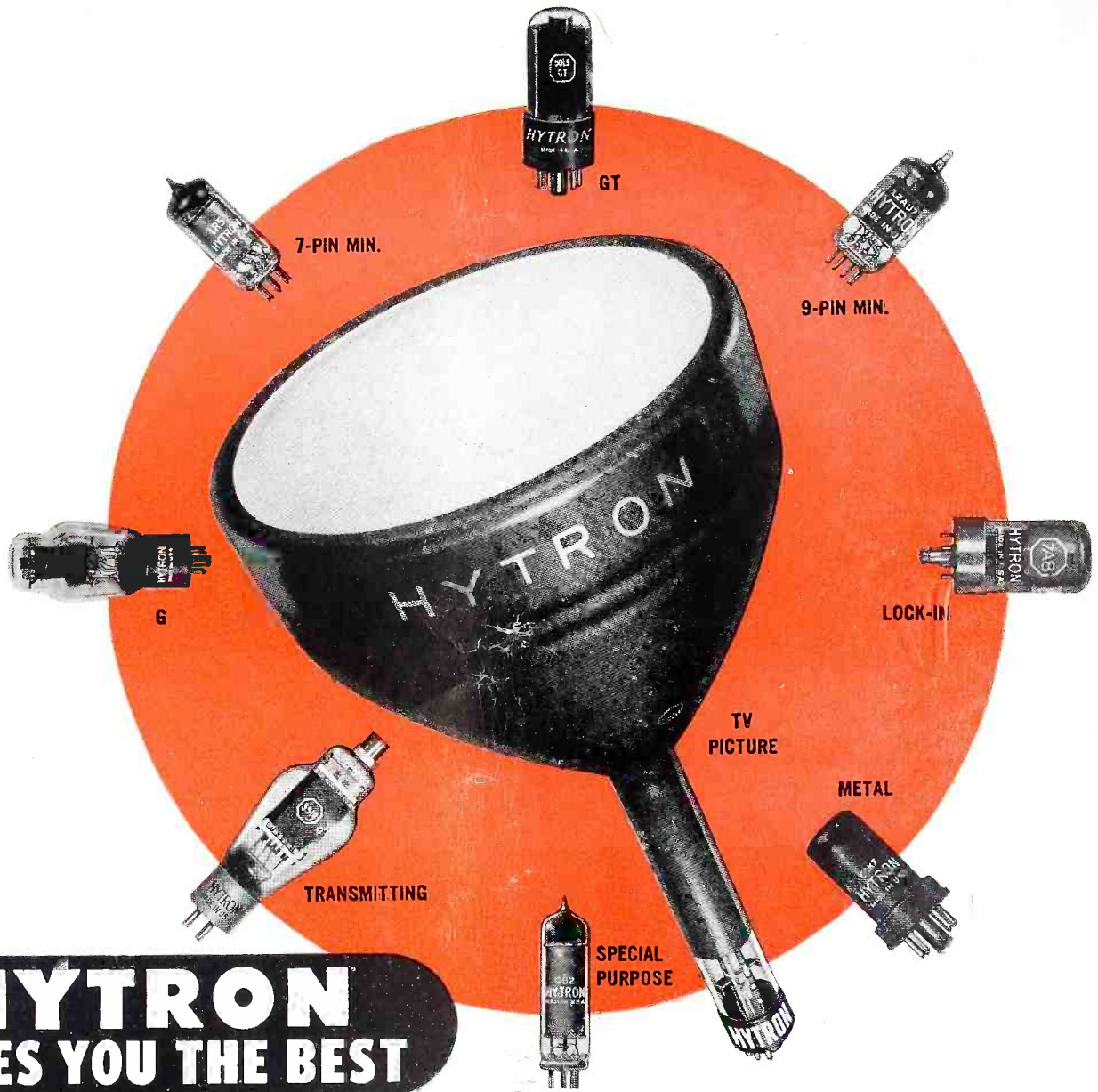
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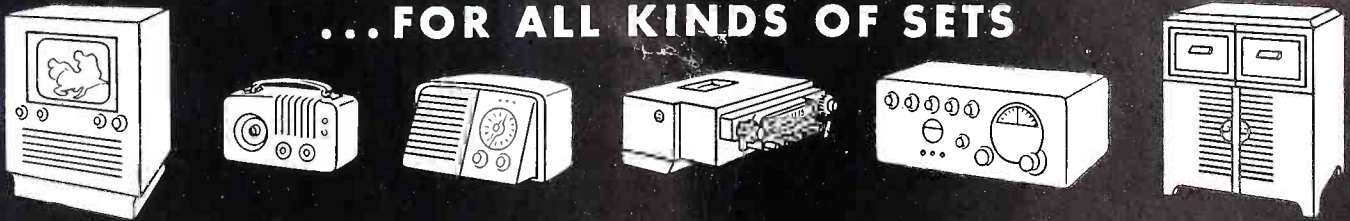
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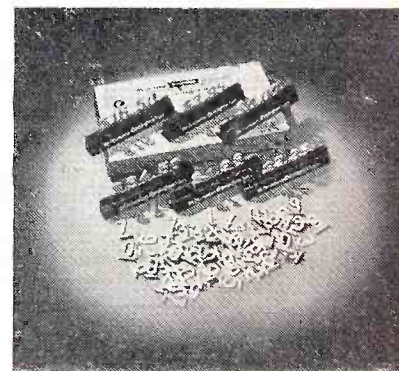
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