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AUGUST, 1949

AM-FM-TV-SOUND

The Professional Radioman's Magazine
The Little Fellow Gets BIG Results!

The Mallory Midgetrol

"Phenomenal!"—that's the only word to describe the lightning-like acceptance of Mallory's revolutionary new standard in volume controls. But its success was a foregone conclusion when you realize what the Mallory Midgetrol offers:

**WIDER APPLICATION**—The small size lets you service portables, auto radios and small AC-DC receivers requiring 15/32" controls.

**SIMPLER INSTALLATION**—The new and unique flat shaft design of the Mallory Midgetrol saves installation time with all types of knobs.

**LESS INVENTORY**—Electrical characteristics allow you to use the Mallory Midgetrol to replace 13/8" as well as 15/32" controls. Since no special shafts are required, you carry fewer controls in stock.

**Quietest and Smoothest by Actual Tests**

And Mallory Midgetrol stays quiet, too. Creative research that has made Mallory the standard in carbon controls has seen to that. In addition, the Mallory Midgetrol offers nine big features all NEW:

- NEW SIZE
- NEW SHAFT
- NEW SWITCH
- NEW DESIGN
- NEW EXTENSION
- NEW ELEMENT
- NEW TERMINAL
- NEW TWO-POINT SUSPENSION

See your Mallory Distributor for this new standard in carbon controls

---

The first 15/32" diameter Replacement Control Line

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P.R. Mallory & Co. Inc. Indianapolis 6, Indiana
Another radio service dealer thanks Sylvania Campaigns for big rise in business

"THE FIRST DAY'S PROFIT FROM THE MAILING PAID FOR THE ENTIRE THREE MONTHS SERVICE!"

Here's your opportunity!

Increase your Business with Sylvania's Fall Campaign—READY NOW!

Sylvania's September, October, November, and December campaigns are available now. Here's what you receive:

- 4 Postal Card Mailings— one for each month.
- 4 Window Displays— one for each month.
- 4 Window Streamers— one for each month.
- 8 Newspaper Ad Mats— two for each month.
- Radio Spot Announcements— several for each month.
- 8 and 12-inch decals for window, door and truck.

Tied up directly with Sylvania's national advertising, these campaigns will boost your business. You pay only the postage on the cards you mail. Sylvania gives you everything else free. Write for full details immediately, or see your Sylvania distributor.

Sylvania Electric

RADIO TUBES: CATHODE RAY TUBES, ELECTRONIC DEVICES, FLUORESCENT LAMPS, FIXTURES, WARNING DEVICES, SIGN TUBING, LIGHT BULBS, PHOTOLAMPS

Sylvania Electric Products Inc.

Advertising Department R 1800
Emporium, Pa.

Gentlemen: Please send me full details on your September, October, November, and December Service Dealer Campaigns.

Name: ________________________________

Company: ________________________________

Address: ________________________________

City: ___________________________ Zone ______

State: ________________________________

RADIO SERVICE DEALER  •  AUGUST, 1949
EDITORIAL

TV "Policy" Bombshell

It is the official opinion of New York State's Attorney General that any and all "TV Service Policies" issued in New York to date are not legal. (See article pages 16 and 17). Many other states have laws similar to New York laws on "policies" so the same situation probably prevails. Of course, so far the Attorney General has only issued an opinion which has not been ruled on in court of law, but the opinion is so far-reaching that the radio-TV industry would be wise to study the situation fully before signing any more policies.

Fundamentally New York State Law prohibits the issuance of a contract on anything that might relate to a "fortuitous event", meaning an event that is purely subject to chance. This distinguishes between a warranty and a policy or service contract. Warranties and guarantees properly executed are legal, but policies such as those which have been issued on possible TV set failure naturally depend upon fate or chance, and thus by being based upon a gamble, fail without the law, and are illegal, according to the A-G. "It's a fairly complex matter, but our "scoop" helps all of you who have issued "policies" to recognize how great a liability has been assumed. Better read pages 16 and 17 and then consult your own legal counsel.

Cards On The Table

That the radio-TV industry is in a bad way is common knowledge. How and why the chaotic condition came about—and constructive criticism showing how to alleviate it—is the subject of "Field Findings" in this issue. We know this article is going to gripe many readers but like a doctor who must prescribe for a sick patient, our prescription is written and the medicine, whether bitter or not, had better be taken, or else.

Landlords Win Another Point

TV set owners have been plagued by landlords who have refused to allow roof antenna installations.

As we have stated time and again, the law is clear on the point that a tenant has no rights to the roof of his house, and if a tenant erects a roof antenna without permission he is guilty of trespass. Now, going a step further, a Brooklyn, N. Y. Supreme Court Justice has ruled that TV owners must get their landlord's permission in writing before they may have a TV antenna installed on their roof, for verbal agreements are not going to be held legal. To this decision we subscribe, but we object to the learned Justice's further comment, when issuing his ruling, that he advocates that building owners should install master antenna systems in buildings and charge tenants for use of same. The judge might have been wiser had he suggested that the laws should be changed so that either landlords must be required to allow tenants the use of their roofs in the event that the landlord fails to provide a master antenna system which the tenant might take advantage of.

Field Findings
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A New TV and FM Sweep Generator, by Allan Lytel
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Circuit Court
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Test Pointers

ON TV RECEIVER ALIGNMENT

Experienced television technicians have learned that the tuned circuits of television receivers must be aligned within a few hundred cycles, or at the most a few thousand cycles, of the manufacturer's specifications, if the alignment procedure is to be handled expeditiously. The operation requires, therefore, a signal generator of correspondingly high accuracy.

To attempt the alignment procedure with a conventional signal generator having an accuracy in the order of ±2% invites all sorts of difficulties in making the rf frequencies, oscillator frequencies, intermediate frequencies, and trap frequencies coordinate properly.

Two per cent error in adjusting an intermediate-frequency system can result in distorted sound, no sound at all, poor picture quality, and unstable sync in weak-signal channels. In addition, the technician may find himself readjusting properly aligned circuits and increasing his troubles. Attempts to cure the intermediate-frequency errors by adjusting the oscillator frequency may succeed, but often the adjustment is inadequate, with the result that he must repeat all of his work. Since time is money in the service shop, it is apparent that an inaccurate generator is expensive at any price.

The operator of an inaccurate signal generator can attempt to estimate the scale error. However, he runs into further difficulty when he tries to switch to an inaccurate generator to the original one; the scale error may be positive in one band, negative in another band.

Such difficulties can be easily avoided by the use of crystal-controlled frequency standards, but the minimum number of crystals required to handle only the RMA standard TV intermediate and trap frequencies, local TV channels, and rf oscillator frequencies, will run to several dozen, with perhaps another dozen or more crystals required to take care of other intermediate frequencies; in all, a rather sizeable investment.

Fortunately, there is a simpler method of providing accurate frequencies. This method employs a variable-frequency oscillator in combination with dual crystal standards and a heterodyne detector which serves to calibrate the oscillator at frequent intervals. For example, the use of a 2.5-Mc crystal and a 0.25-Mc crystal makes it possible to establish crystal calibration points every quarter megacycle over the entire oscillator band. With an oscillator covering a 100-Mc band, the method provides 400 accurate check points.

For TV Servicing...

Indispensable—and in a class by itself!

The RCA WR-39A Television Calibrator

The RCA WR-39A Television Calibrator is the most useful TV servicing instrument money can buy. It's actually three instruments in one:

1. A Fundamental Frequency Signal Generator covering all TV and FM frequencies within the ranges of 19-110 and 170-240 Mc.
2. A Dual-Crystal Frequency Standard providing over 600 crystal-calibrated VFO check points at 0.25 Mc intervals.
3. A Heterodyne Frequency Meter with Audio Amplifier and Speaker.

And here is what the WR-39A Television Calibrator will help you do:

- Accurately adjust all trap circuits.
- Speedily mark any television alignment response curve.
- Easily adjust the rf oscillator to correct frequency for any one of the twelve television channels.
- Peak-align stagger-tuned rf transformers.
- Calibrate any signal generator in your shop to ±0.01% accuracy or better.

- Accurately measure the frequency of any source of rf over the entire range of 250 ke to 240 Mc.

The RCA WR-39A Television Calibrator is temperature-compensated and uses a voltage-regulated power supply to assure frequency stability. It features an easy-to-read band-spread dial, 10 feet long. It is sold complete with all crystals and a terminated cable.

Don't overlook the benefits of using the WR-39A in conjunction with your present TV and FM sweep generators. For a complete and modern television alignment set-up, your best buy is the WR-39A Television Calibrator combined with the WR-59A Television Sweep Generator and the WR-55A Oscilloscope. This "TV Trio" is available in the new WS-17A 3-unit rack.

See your RCA Test Equipment Distributor today for further details... or write RCA, Commercial Engineering, Section 55HX, Harrison, New Jersey.

For Test Equipment you can trust see your RCA Distributor

RADIO CORPORATION of AMERICA
TEST AND MEASURING EQUIPMENT
HARRISON, N.J.
THE entire radio-TV industry has got to "clean house" and find a new method-of-doing-business. Retailers, service organizations, jobbers, replacement parts and test equipment manufacturers, are in the doldrums. All seem to be losing money. The only radio entities now operating at a profit are a few TV set manufacturers and some of their distributors.

Protect The Dealer On Price

As we see it, the only way in which the fast getting worse situation can be corrected is as follows: set manufacturers must price-guarantee their lines for a 6 month period at least. (The so-called 30 day price protection guarantee is meaningless.) TV set makers must cease over-producing models that have excessive sales resistance; they must reduce and stabilize prices and furthermore they must find a method whereby their retailers are absolutely prohibited from selling TV sets below advertised list. This is the crux of the entire mess. TV set price cutting (or discount giving to buyers) MUST be stopped at once. It is the prime reason why the radio-TV industry is in a state of collapse. The public's reluctance to buy any TV set has been brought upon simply because people expect to be able to "buy it cheaper elsewhere" or because people have realized that list prices are dropping hourly.

Realistic Service Policy

Regarding TV installing and servicing, it is obligatory for TV set manufacturers to really start to cooperate with the servicing profession. An educational campaign by TV set makers on TV service techniques is a prime necessity. To date any and all efforts in that direction by RMA and independent TV set makers has merely been window-dressing — a lot of bosh and hokum, spasmotic and meaningless. But, on the other hand, the servicing profession must turn about and cease its complacency. From this point on every old time radio technician who intends to remain in this profession must make it his business to really learn all there is to know about TV. So far, only a few technicians have seriously taken the time and pains to acquire TV know-how. Old-timers in radio servicing who do not protect their positions can and will soon be replaced by an entirely new crop of men, the fellows who are graduating from TV training schools; and those who have learned TV the hard way, by getting their training from factory-controlled TV service companies and then graduating into independent enterprise.

Component Parts

Component parts and test equipment manufacturers have a big stake and responsibility in the future of TV which, to date, many have ignored. Practically the entire output of most parts manufacturers is now solely diverted to TV manufacturers. (Try to buy TV set replacement front or picture tubes at your parts jobber). Unless jobbers can supply independent service dealers with their needs naturally the bulk of TV repair work will always go to the factory-controlled TV service companies who can get needed replacements from their mother company. If factory owned service companies become entrenched they spell the doom of the independent servicing profession.

Jobbers, on the other hand have failed to maintain proper inventories of radio parts and accessories. Every jobber's prime function and duty is to act as the warehouse for local service dealers. But it is common knowledge that most jobbers are order takers who carry no stock and who must buy from a manufacturer to fill most orders except for the most ordinary items. Besides, too many jobbers have insufficient technical knowledge about the radio industry and they don't know how to guide technicians who want

"It was one of John's jokes about television, but he got stuck!"
"KEN-RAD TUBES ARE RELIABLE BUSINESS-BUILDERS!"

"To succeed you have to sell reliable merchandise. That's one thing my years in this business have taught me. "Take Ken-Rad Tubes. I don't mind telling you, I've built a good solid business with these tubes. When I sell Ken-Rad Tubes I know I'm selling dependable tubes that will not let me or the customer down. "I don't know any other item that's done more to establish my reputation and build my business than Ken-Rad Tubes."

"KEN-RAD TUBES HAVE TO BE RELIABLE TO PASS THESE TESTS!"

"There's no tube made that has to undergo more rigid testing than a Ken-Rad Tube. "It's tested at practically every step in its production. "For instance, stems are checked every hour in the polariscope (above, left), an instrument used for detecting strain in glass by means of color or line change. "When the strain pattern is constant, the stems are uniform and one acts like the next in the finished tube. "Result is a final tube that is more uniform, of better quality. "Reliable is the word for Ken-Rad Tubes, all right!"

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J. H. WORTH, Foreman, Miniature Stem Section, is one of the many supervisors concerned with the comprehensive testing of Ken-Rad Tubes. This testing results in a tube unsurpassed for quality.
Trade Flashes

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

Bernreuter Lectures at PRSMA

H. A. Bernreuter, Vice President and General Manager of the Simpson Electric Company, 5900-18 W. Kinzie St., Chicago 14, Illinois, was the principal speaker at the Philadelphia Radio Servicemen’s Association meeting recently. The subject of Bernreuter’s speech was “Testing Television Receivers”.

TV Educational Films

Chairman Robert C. Sprague of the RMA “Town Meetings” Committee to day appointed a sub-committee to direct the preparation of educational films on the care and maintenance of television receivers.

A. T. Alexander, service manager of Motorola Inc. Chicago, who is also chairman of the RMA Service Committee, was appointed chairman of the sub-committee. Other members are Leroy A. Goodwin, Jr., of RCA Victor Division, Camden, N. J., and Harry A. Ehle, of International Resistance Co., Philadelphia, Pa. The sub-committee will work with Howard Browning, public relations consultant, of Philadelphia.

Huge Vet Enrollment in TV

More than 150,000 World War II veterans are studying radio and television in schools and colleges under the G.I. Bill and Public Law 16.

Russ Carson Passes Away

St. Charles, Ill., July 11—Funeral services for Russell “Russ” Carson, 32, advertising director of the Ope- rio Mfg. Company, of this city, who died July 10, were held at Buta-
Allen B. Du Mont gave us the commercialized cathode-ray tube. Starting with a scientific curiosity in 1931, he pioneered the practical television picture tube of today. And Du Mont pioneering has never ceased. Examples? 1 Du Mont chemical research has led to tube screens of various persistencies and intensities precisely matched to any television requirements. 2 Du Mont research and development engineers have always led in large television tubes—those 12½", 15" and 20" Teletrons—because Dr. Du Mont has insisted on "comfortable" televiewing. 3 Du Mont craftsmen, provided with the finest glass-working equipment known, can translate advanced tube designs into greater tube values at lesser prices. 4 And to keep pace with the huge and still growing demands, Du Mont quantity-quality production has steadily stepped up, climaxing by the new Allwood plant. Yes, it's Du Mont Teletrons for the "First with the Finest in Television Tubes."
Service Dealers
Form A Group,
Subscribe to "RSD"—
SAVE Up to $1.00 each.

"The Professional Radioman’s Magazine"—published monthly. All articles are exclusive and timely. Practically every issue is worth what an entire 1 year subscription costs.

Service Dealers Form A Group,
Subscribe to "RSD"—
SAVE Up to $1.00 each.

★ The more in a group the bigger the savings. 6 men in a group save $1.00 each; 4 men groups save $.75 per man. Present "RSD" subscribers may participate in or form a group with co-workers, or even competitors. Still active subscriptions are automatically extended 1 year. Start a Group today! The timely and exclusive technical data appearing in future issues of "RSD" will make this the best investment you ever made. The special Group Rate offer may be withdrawn at any time—so hurry.

Use This Coupon For Convenience
(The coupon below can be used for from 1 to 6 subscription orders. Use it today!)

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In U.S.A. & Canada | Foreign Rates
One 1-year subscription | $2.00 | $3.00
Two 1-year subscriptions, each | 1.75 | 2.75
Three 1-year subscriptions, " | 1.50 | 2.50
Four 1-year subscriptions, " | 1.25 | 2.25
Five 1-year subscriptions, " | 1.10 | 2.00
Six 1-year subscriptions, " | 1.00 | 1.50

RADIO SERVICE-DEALER MAGAZINE
342 Madison Ave., New York 17, N.Y.

Please enter 1 year subscription orders for the names given below. Our remittance is enclosed.

NOTE: If you do not wish to tear this order blank out, just print or type the information on a single sheet of paper, following the style given. Each subscriber's occupation must be clearly described.
TRADE FLASHES

From page 6]

derved right in his own booth at a cafe or restaurant? This is now being investigated by the General Electric Company and AMI Incorporated, a juke box manufacturer, it was announced here today by George F. Metcalf, manager of the G-E Specialty Division, designers of a special individual booth television receiver.

TV Lecture Bureau
Establishment of the Television Technicians Lecture Bureau, to sponsor a nationwide program of non-commercial lectures for radio and television technicians, was announced by Paul H. Wendel, widely known writer, editor and product market analyst. The Bureau will make its headquarters at 55 E. Washington St., Chicago.

Muckley Joins Hallicrafter
Michael Muckley has been appointed to the post of Sales Promotion Manager of The Hallicrafters Company by William J. Halligan, President of the company.

National Radio Week
Advertising executives of 18 RMA set manufacturers were appointed members of the RMA Advertising Committee by RMA President R. C. Cosgrove to serve for the 1949-50 year. The group held its first meeting Tuesday, July 28, at the Statler Hotel, New York City, to draft preliminary plans for industry observance of National Radio Week Oct. 30-Nov. 5.

Philo S-M Convention
A new nationwide program is now under way to assure owners of television receivers, radios and radio-

use telrex "V" BEAM
CONICAL ANTENNAS

...for better reception on all TV and FM channels

A MODEL FOR EVERY TELEVISION REQUIREMENT

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 8X-TV
4 Bay Conical "V" Beam
Broad Band Full Audio and Video Band Pass
Low Vertical Angle, Minimum Reflections
Maximum Signal to Noise Ratio
12 DB Front to Back Ratio, all Frequencies
150 Ohm Constant Center Impedance
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.

OVER 12 DB FRONT TO BACK RATIO—ALL FREQUENCIES
NO HIGH FREQUENCY HEAD NEEDED WITH TELREX

TELREX MODEL 2X-TV
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
Universal Mounting Clamps

ALL TELREX ELEMENTS ARE MADE OF LASTING DURAL

For best results in any TV area, use Telrex—the highest gain antenna with constant center impedance on all channels. Signals received at the antenna are carried to the set with negligible loss and no reflections or ghosts. Actual case records show Telrex antennas receiving satisfactorily 200 miles over land, 300 miles over all-water TV paths. Before you say "too remote", check with Telrex.

We'll give you an impartial, based-on-experience opinion — without obligation.

BEFORE YOU LABEL ANY AREA IN YOUR LOCALITY REMOTE FOR TV—CHECK WITH TELREX!

TELREX-INC
ASBURY PARK 5, NEW JERSEY

AMERICA'S OUTSTANDING TELEVISION BEAM

RADIO SERVICE DEALER  •  AUGUST, 1949
A NECESSARY EXTRA
BRACH LIGHTNING & STATIC ARRESTER #4004

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

SEND FOR BRACH CATALOG NO. D1304

phonographs of better service than ever before, it was announced by James M. Skinner, Jr., vice president—Service and Parts Division, Philco Corporation, in opening a two-day convention in Phila. on July 26 before 250 service managers from the company's wholesale distributors throughout the country.

A feature of the convention was the unveiling of "Aspen", a new self-contained antenna recently developed by Philco. Also shown was the complete new Philco line of TV receivers ranging from a 7" model to a 16" model.

DuMont Network Expands

DuMont Television Network will reach five new markets and provide full nighttime network facilities to its affiliates, stepping up program offerings 80 per cent after September 1 as a result of allocations arranged in joint conferences with the A T & T and other webs during the last two weeks, Commander Mortimer W. Loewi, its director announced.

Packaged TV Components

The Super Electric Products Corp. of Jersey City, New Jersey, announces a new packaged line of replacement television components which includes many of the items now in demand by service and repair organizations.

Mobile TV Unit Tours N.Y.

"Duke" Wellington, Sales Manager, Air King Distributors Corp., New York announced that a mobile television unit showing Air King television sets in operation will tour the New York area.

New Service V.P. For R.C.A.

Charles M. Odorizzi has been appointed Vice President in Charge of Service of the RCA Victor Division of Radio Corporation of America, it was announced by J. G. Wilson, Executive Vice President in Charge of the Division.

Tube Sales Decline

May sales of radio receiving tubes decreased slightly under sales in April, the Radio Manufacturers Association reported. Tube sales in May totalled 13,485,121 compared with 13,583,164 in April and brought the number of tubes sold by RMA member-companies in the first five months of this year to 67,759,929.

Senate Color TV Committee

At the request of Senator Edwin Johnson of Colorado, the National Bureau of Standards has organized a Color Television Committee for the purpose of surveying the present status and future prospects of color television.
How to Service Radios with an Oscilloscope

Sylvania shows you

"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.

The more than 90 illustrations of circuits, 'scope patterns, and set-up arrangements for circuit testing explain over 50 separate oscilloscope applications.

**Get this big 72-page book!**

**More than 90 pictures and diagrams!**

**Written in easy-to-follow servicemen's language!**

**SYLVANIA ELECTRIC**

**FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING: LIGHT BULBS: PHOTOLAMPS: RADIO TUBES: CATHODE RAY TUBES: ELECTRONIC DEVICES**

---

Sylvania Electric Products Inc.
Advertising Dept. R-2918
Emporium, Pa.

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

Name: ...................................................
Address: ...............................................
City: ................................................. Zone: ..............
State: ..............................................
In step with the fast moving TV scene… Radiart engineers have developed to perfection two popular types of antennas especially suited for rotator installations.

The LAZY X “conical” type all channel array, when double-stacked is superior for fringe areas… works as well as a conventional double high and double low array… but has these advantages of being more sturdy… easier to install and is less expensive.

The “strate-line” model 85X is a Hi-Lo antenna mounted on a common “boom”. Ideal for strong signal areas where stations on both high and low channels are received from different directions because of its high front acceptance. And, it is easily installed.

THE RADIART CORPORATION
CLEVELAND 2, OHIO
Manufacturers of the Famous Red Seal Vibrators
CAPACITANCE BRIDGES

By WILLIAM R. WELLMAN

An elementary discussion of the basic principles of operation, and the applications of typical commercial capacitance resistance bridges.

The modern service man has at his command at least three separate methods of measuring capacitance, each of which is fully satisfactory in its particular field. For rapid measurement, the unknown condenser may be connected in series with the a-c supply and an a-c meter; in such an arrangement, the current through the meter will depend upon the capacitance of the condenser. Although not particularly accurate, this method does serve a useful purpose in certain applications. Some type of grid dip oscillator, or the more highly developed Aerovox L C Checker may be used to check condensers by making the unknown a part of a resonant circuit and tuning the oscillator to resonance with this circuit. The capacitance is then read directly from the oscillator dial which has previously been calibrated in terms of both frequency and capacitance. An instrument of this type has several advantages: not only may capacitance be measured, but inductance and frequency as well, and condensers may be measured while still connected in the radio receiver circuit, as for instance, in the case of a cathode bypass condenser. Unfortunately, however, its range is limited.

The bridge method of measuring capacitance has long been recognized as extremely accurate and will cover a very wide range of values. Two types of bridge will be discussed in this article: the McMurdo Silver Model 904 and the Aerovox Model 76.

Basic Principle of the A-C Bridge

The basic circuit of the a-c bridge is illustrated in Fig. 1. As in the ordinary Wheatstone bridge, there are two paths for the flow of current. These are (1) through $R_1$ and $R_2$, and (2) through $C_1$ and $C_2$. The bridge is said to be "balanced" when the currents flowing through these paths are such that the terminals of the indicator, $I$, are at points of equal potential. At such time, the indicator will, of course, read zero. In an actual circuit, the condenser $C_1$ is of known value; in fact, since it is used as a standard, its actual value should not deviate appreciably from its rated value. In some cases, a group of standard condensers takes the place of the single unit, thus making a number of ranges possible. Furthermore, this method makes it unnecessary to vary $C$, which would be rather difficult in the usual case. $R_1$ and $R_2$ are generally made adjustable. The alternating current supplied to the circuit may be taken from an oscillator or from the power line through the medium of a transformer. The indicator may be a pair of headphones, a meter or an electron-ray indicator tube. If $R_1$ and $R_2$ are provided with calibrated dials and the value of $C_1$ is definitely known, then balancing the bridge makes $C_2$ equal to:

$$C_1C_2/R_1R_2$$

In the ordinary bridge, $R_1$ and $R_2$ are decade units which may be varied in steps. Resistance units of this type are generally rather costly, and simpler less expensive bridges have been developed. In one such type, a calibrated potentiometer comprises both ratio arms ($R_1$ and $R_2$) as shown in Fig. 2. If the potentiometer is fitted with a dial which has been calibrated in terms of the ratio existing between the two arms, it is only necessary to multiply the known, standard condenser by this ratio in order to determine the value of the unknown condenser.

McMurdo Silver No. 904 Bridge

A bridge circuit similar to the type described above is used in the McMurdo Silver Model 904 (see Fig. 5). This is a variation of the Carey Foster type of a-c bridge. The balance indicator is a 6E5 tube, coupled to the bridge through a 6SN7 amplifier tube. Four ranges are provided, so that capacitances of 0.001 to 1000 nF may be measured. The bridge is balanced when the 6E5 tube shows maximum shadow width. The potentiometer dial reading is then multiplied by a factor (which is the value of the standard condenser in use) in order to arrive at the value of the con-

Fig. 1. Basic a-c bridge circuit.

Fig. 2. Potentiometer a-c bridge.
censer under test. Voltage for operation of the bridge is provided by the transformer \( T_1 \), and all voltages needed for operation of the 6E5 and 6SN7 are taken from a built-in power supply, not shown in the drawing.

It is usually important to have some idea of the power factor of a condenser. When a-c flows in a circuit containing a condenser, there is, theoretically, a voltage lag of 90 degrees. Actually, however, the lag is somewhat less than 90 degrees, due to the fact that the condenser has resistance as well as capacitance. Power factor is, in effect, a measure of the amount of resistance compared to the amount of capacitance.

If you will examine Fig. 3, you will note the presence of the variable resistor, \( PF \), which was not mentioned in the previous discussion. This unit is provided with a dial calibrated in terms of power factor (expressed in percentages of 0 to 50). Basically, this is the method used in the McMurdo Silver equipment we have been discussing. As you will note, this amounts to introducing a resistor in series with the known condenser to balance the resistance of the unknown condenser. In operating the bridge, it is first balanced to give maximum shadow opening in order to determine capacitance. The power factor dial is then rotated to give still further opening of the shadow. The setting of this dial which yields the widest opening is the correct one, and the power factor of the condenser is then read directly from this dial.

To check electrolytic condensers for leakage the rated voltage is applied to the condenser by closing the switch, \( SW \), shown in Fig. 4. The voltage applied to the condenser under test is controlled by the potentiometer, \( P \), and is taken from a power supply using a type 5Y3 tube. The amount of leakage is determined by the width of shadow opening of the 6E5. The electron ray tube in this test is used as a milliammeter. Two leakage ranges are provided: 10 milliamperes and 100 milliamperes.

The complete circuit diagram of the McMurdo Silver unit is given in Fig. 5. The switch, \( S_1 \), in this illustration, connects the desired standard condenser (0.001, 0.01 or 1.0 \( \mu F \)) into the bridge circuit. Operation of this switch thus provides several capacitance ranges; the first four positions of the switch are used in capacitance measurement. The instrument may also be used for resistance measurement; a total range of 10 ohms to 1000 megohms is provided. The last four positions of switch \( S_1 \) are used in this application. Switch \( S_2 \) controls the operation of the electron ray indicator tube for leakage measurements, and also shifts from bridge measurements to leakage measure-

![Fig. 3. Bridge circuit employed in McMurdo Silver Model 904.](image)

![Fig. 5. Circuit diagram of McMurdo Silver Model 904 C/R bridge.](image)
mments. In the top position of the switch, the tube is connected to the bridge through the 6SN7 amplifier for resistance or capacitance measurements; in the center and lower positions the tube is used as a milliammeter, as mentioned previously, for leakage tests.

Aerovox Model 76 Capacitance and Resistance Bridge.

In the Aerovox Model 76, a slightly different form of bridge is used. Instead of using a potentiometer for the ratio arms, separate resistances are used. As shown in Fig. 6, one arm consists of the bank of standard resistors RA, any one of which may be introduced into the bridge circuit by operating the rotary multiplier switch. The variable resistor RB makes up the second arm. The third arm of the bridge includes the standard condenser Cc and the power factor control Rs. The fourth is made up of the condenser to be measured, X.

When used for capacitance measurements, the unknown condenser is connected to the terminals provided, and the 12-position multiplier switch is rotated to the desired range. Incidentally, six positions of the switch are used for capacitance ranges; the remaining six are for resistance measurement. The bridge may be used to measure resistance values through a range of 10 ohms to 20 megohms. The capacitance range covers 100 ufd to 200 ufd. With the multiplier switch set for the desired range, the power factor adjustment Rs is set to zero and the bridge balanced by turning the control Rt until the 6Es shadow is at maximum. The power factor dial is now adjusted to give still further widening of the shadow, and these two adjustments are repeated until no further widening can be obtained. Multiplying the reading of the balance adjustment Rs (which is calibrated from zero to 20) by the setting of the multiplier switch gives the capacitance of the unknown condenser; the setting of the power factor dial shows the power factor of the condenser in percentage.

For checking leakage, this unit is provided with a calibrated voltage control having a range of zero to 600 volts. This control is R20 in the diagram of Fig. 7. Note that voltage variation is accomplished by controlling the output of the rectifier V4 (type 6Y6). The neon glow-lamp, V5, is used as a short and leakage indicator. Constant glowing of this lamp before the rated voltage of the condenser has been reached indicates either a short or excessive leakage. It is interesting to note that when checking a leaky paper or mica condenser, the neon lamp will flash on and off periodically. This is because the indicator circuit operates as a relaxation oscillator and the frequency of the flash is directly proportional to the leakage. Higher leakage increases the rapidity of the flash. The three point leakage test switch is provided with a neutral center position in which a condenser is automatically discharged through the resistor R22.

Fig. 4. Circuit used to check electrolytic condensers in SM 904.

Fig. 6. Aerovox Model 76 basic bridge circuit.

Fig. 7. Circuit diagram of Aerovox Model 76 C/R bridge.

RADIO SERVICE DEALER  •  AUGUST, 1949  15
The official opinion of the Attorney General of the State of New York with regard to TV service contracts, as issued on July 1, 1949 is of immediate concern to all engaged in TV manufacture, distribution, and service. We cannot stress too strongly

On July 1, 1949 the Attorney General of the State of New York expressed an official opinion of vital importance to all Independent Service Organizations and Service Dealers handling TV sales and service.

At the request of the Superintendent of Insurance this legal opinion was rendered by New York's Attorney General for clarification on installation and service contracts for TV, as well as the renewals thereof.

It appears that the legislature of the State of New York in a far-sighted enactment for the protection of the public (not at the time relating to TV) prohibited certain contracts, as insurance contracts, as would provide for "compensation" for "fortuitous events" meaning events that were purely subject to chance.

It now seems that in the opinion of the Attorney General a failure of TV equipments would constitute such a fortuitous event.

In substance the opinion states that:

"Obligation assumed by maker or seller of television receiver at time of sale to user to keep in normal operating order and replace defective parts for given time constitutes a warranty despite consideration in addition to sale price but subsequent renewals of such agreement or similar undertaking by independent contractor is assumption of fortuitous risk and constitutes an insurance contract as defined in Insurance Law."

The Law

That section of the Insurance Law of the State of New York which defines an insurance contract is embodied in Section 41 subdivision 1 of the New York State Insurance Law which follows:

"41. Meaning of 'insurance contract' and 'doing an insurance business'.

1. The term 'insurance contract,' as used in this chapter, shall, except as provided in subsection two, be deemed to include any agreement or other transaction whereby one party, herein called the insurer, is obliged to confer benefit of pecuniary value upon another party, herein called the insured or the beneficiary, dependent upon the happening of a fortuitous event in which the insured or beneficiary has, or is expected to have at the time of such happening, a material interest which will be adversely affected by the happening of such event. A fortuitous event is any occurrence or failure to occur which is, or is assumed by the parties to be, to a substantial extent beyond the control of either party.

The opinion in learned fashion distinguishes between a contract of insurance and a contract of Warranty, in distinctly clear terms:

"The obligation assumed by a television manufacturer in the contracts in question is frequently, as I have noted, expressly called a warranty. Since it is limited to keeping a receiver in its proper operating condition in the event of failure arising solely from normal use, without intervening external cause, it is necessarily confined

**Typical Commercial Policy**

**Conditions of Admiral Customer Television Policy:**

1. **Normal Antenna and Receiver Installation:** The antenna and reception will be installed in the most advantageous position by the best possible results within the limitations of the customer's premises and the normal guide lines of antenna installation. The Admiral distributor will make a normal reception check of the reception area including installation, location, and reception regarding. A normal installation is defined as one which can be performed to the best of skill and care and cannot improve three and onehalf decibels on the specified program. No reinstallation or remounting in the Admiral antenna kit including a length of 100 feet transmission line not to exceed 75 feet. The site will be thus installed in accordance with all applicable broadcast regulations on the installation connected in this subscriber. Where possible, the customer shall observe written permission from the center of the specified program. in the condition at the time of agreement.

2. **Other Antenna and Receiver Installation:** If the installation be not normal and requires special care and materials such as aerials with larger diameter, more specialized installation or other accessories, the agreement must be in writing to give such supplementary service or equipment to be performed by the customer and the installer.

3. **Installation:** The installer will accept, install and install the television receiver and will carefully instruct the customer or members of the household in the operation and care of the television receiver. One scheduled post-installation instructions and instruction check-up at the receiver will be clearly at the service center.

4. **Maintenance:** The Admiral distributor will operate and maintain the television receiver in proper working order for the period of time agreed to in the agreement. This policy, provided in maintenance and installation is to be considered in urgent nature of the customer's contract. The agreed to service center, the service center will be scheduled at the discretion of the customer. If any maintenance policy is not necessary at the discretion of the customer, the installation will be at the discretion of the customer. This agreement will be renewed as such.

5. **Responsibility of the Distributor:** Admiral distributor is subject to all the terms and conditions of this policy and agrees to perform all the terms and conditions of the agreement with the customer. The distributor agrees to perform all the terms and conditions of the agreement with the customer and agrees to perform all the terms and conditions of the agreement with the customer and agrees to perform all the terms and conditions of the agreement with the customer and agrees to perform all the terms and conditions of the agreement with the customer.

6. **Exclusions:** This policy does not cover any changes which may be necessitated by any future measures of the present victories controlled by the Federal Communications Commission.

7. **Proof of Claim:** This policy does not cover any changes which may be necessitated by any future measures of the present victories controlled by the Federal Communications Commission.

8. **Use of Commercial Service:** The services provided by this policy shall be the exclusive means of receiving and recording the regular working hours of the customary work week. Any reasonable service which may be required under the policies of this service center will be provided by the Federal Communications Commission.

9. **Liability of Admiral Corporation:** Admiral Corporation shall not be liable for failure or damage arising from any strike or other causes of any reasonable service which may be required under the policies of this service center.

10. **Validity of Policy:** This Customer Television Policy shall not be valid unless the Federal Communications Commission has been properly signed and signed and is signed by an authorized representative of the distributor.

Be sure that Registration Record on reverse side is filled out properly and signed.
HITS TV "POLICIES"

the advisability of all parties concerned to acquaint themselves with the important points as set forth in this opinion. In this article, the staff of RSD has gone all out in presenting the issue clearly, and for all to understand.

to defects in material or workmanship in the set itself or in the installation thereof. As such, the obligation assumed is, in my opinion, a true warranty and not insurance. It is merely guaranteed by the maker himself that his machine will operate in the manner for which it was manufactured and sold free from failures inherent in the structure or adjustment of the device itself. These are matters essentially within the control of the maker and it is this element of the statutory definition of "insurance contracts" which is not met by a maker's warranty of the kind in question."

"It is one thing to guarantee the accuracy of one's own work, and quite another to assume the risk of future insolvency."

"Nor do I see any basis for a different result because the manufacturer's warranty may be effectuated by means of a wholly owned subsidiary so long as the transaction is directly related to an original sale and constitutes an agreement to make good with respect to the maker's product, as such."

"The statute declares the plain fact that rendition of service may be as much compensation for loss from a stated event as would be the payment of money." The same conclusion must be reached with respect to the specific language of the definition in Insurance Law § 41. It follows, therefore, that where such an obligation is contingent upon a "fortuitous" event the transaction constitutes an insurance contract."

"I can see no alternative to the conclusion that the independent service contracts concerned involve assumption of a fortuitous risk as defined in Section 41. The independent contractor is a stranger to the manufacturer or selection of the machine involved. He assumes an obligation far beyond responsibility for his own work. It includes repairs or replacement in event of failure as to which he has not, and could not have, exercised any control or assumed any responsibility justified by his relation thereto. He agrees that he will render service and furnish parts contingent upon events wholly fortuitous as to him, and the transaction meets every defined element of prohibited insurance agreements. Service contracts there may be where the exact amount of service contracted for and certain to be required is indefinite and a flat payment is fixed therefor in advance. In the question you present the fee paid does not appear to be for service as such, but for assumption of the fortuitous risk of having to render repair service or furnish replacement parts. The statute stamps this as insurance."

Conclusions

It must be brought to the attention of the reader that this information is strictly the opinion of the Attorney General of the State of New York, and as such, is only an opinion of a capable and well qualified lawyer (the lawyer for the People of the State of New York). The opinion as such is primarily an interpretation of the Insurance Law of New York.

However, the Superintendent of Insurance may now institute, on behalf of the State, such injunctive or penal proceedings as the law provides, including receiverships or an independent service technician may institute proceedings of injunctive or other nature as the law may prescribe to enforce what, in the opinion of the Attorney General, is the Law of the State.

At any rate this opinion should give installation and service organizations, as well as independent service technicians considerable food for thought.

As this magazine, its editors, and counsel, get further information as times goes on, and as the problem resolves itself with its various solutions, further comment will be made.

We are now scouting the possibility that should there be a judicial declaration that such contracts be illegal, then independent servicemen, service organizations, etc., might well become defendants in a multitude of law suits instituted by TV set owners for the recovery of the fees paid for installation and service.

It might be well to suggest that servicemen's groups and service organizations in states outside of New York secure from their respective legislative or state Law Departments, official opinions relative to the Law in their respective states. It is also suggested that these opinions be referred to us or to other interested groups for further dissemination.

We feel, as does our legal counsel, that the many servicing organizations, independent service men and

[Continued on page 31]
A NEW

TV and FM

SWEEP GENERATOR

By ALLAN LYTEL

Another in the series on TV and FM test equipment. In this article the author describes the operation of the Coastwise Electronic Co. Model 720 Television & FM Sweep Generator.

The sweep system is electronic and is available with calibrations from 50 kilocycles to 20 megacycles.

Circuit Description
The circuit uses one 12AT7 as the fixed frequency oscillator (See...
Fig. 2) which drives a 6J6 operating as a push-push frequency doubler. Another 6J6 is used as the push-push mixer tube; the same tube type is used as a 2-section variable frequency oscillator. The 6C4 is an additional high frequency variable oscillator and the other 12AT7 is a marker oscillator in one section and a crystal oscillator in the other section. The main oscillator tube is a fixed frequency oscillator operating on a frequency of 112.5 megacycles. One of the grids of this duo-triode receives a 60 cycle signal and frequency modulates the oscillator output approximately plus or minus 5 megacycles. This swept signal is the link—coupled to both grids of the following 6J6 which has its plates in parallel in order to minimize the fundamental frequency. By this arrangement there is available at the plates of the 6J6 a 225 megacycle signal which has a sweep width of plus or minus 10 megacycles due to the frequency doubling.

By means of a complex impedance coupling, the output of this push-push frequency doubler is connected to one grid of the following 6J6 mixer tube. The plates of the 6J6 are connected in parallel and the other grid of this tube receives a variable frequency signal from any one of 3 separate Colpitts oscillators. The heart of the operation in this model 720 depends upon the relations existing between these three variable frequency oscillators.

A 6-gang tuning condenser using a 5:1 vernier arrangement tunes these separate oscillators. These 6 gangs are arranged two each with a coil thus allowing for lower minimum capacity and a higher L to C ratio.

**Frequency Ranges**

There are 7 bands covering the entire frequency range; these are labeled with letters and cover the following frequencies.

- **Band A** is from 0 to 17 megacycles, plus or minus a 5 megacycle sweep.
- **Band B** is from 20 to 45 megacycles with a plus or minus 10 megacycle sweep.
- **Band C** is from 40 to 130 megacycles with a plus or minus 10 megacycle sweep.
- **Band D** is from 130 to 139 megacycles with a plus or minus 19 megacycle sweep.
- **Band E** is from 191 to 211.5 and has a plus or minus 10 megacycle sweep.
- **Band F** is from 211 to 219 with a plus or minus 10 megacycle sweep.
- **Band G** is from 231 to 239 with a plus or minus 10 megacycle sweep.
- **Band H** is from 238.5 to 259 with the same sweep width.

The band switching and oscillator arrangement are unique in that no band switching is actually required above 95 megacycles. At frequencies higher than this only the B plus voltage of the high frequency oscillator is switched off and on thus allowing for great accuracy in calibration of the high frequency oscillators. There are 3 coils on the band switch and they cover the following frequencies; 6 to 12.5 megacycles; 13 to 34 megacycles; and 34 to 95 megacycles. Each of these coils is separately tuned with the two highest capacity sections of the 6 gang tuning condenser; they are used with one-half of the 6J6 variable frequency oscillator marked L in the drawing. The other section of the 6J6 which is marked R in the drawing has its own integral tank circuit which is made up of 2 other sections of the tuning condenser and an inductance.

[Continued on page 37]
Ceramic piezo-electric devices have increased in number in recent years. In this article the Staff of The Astatic Corporation has made available to us information on the manufacture, electrical characteristics, and applications of this new chemical mixture.

Within the last few years, a new piezo-electric material has been making its entrance into the field of radio and sound equipment. This material has been referred to frequently as "piezo-electric ceramic". It has some properties which make it very useful in certain applications where other piezo-electric materials are unsatisfactory for various reasons. In addition, it has some properties which render it useful in applications for devices working on magnetic principles where they have been too bulky or heavy or otherwise unsatisfactory.

Manufacture
This piezo-electric ceramic material is made from a mixture consisting largely of a chemical known as barium titanate. Various other ingredients are used to obtain the necessary characteristics during processing and in the finished product. The ceramic material is manufactured in a process somewhat similar to that used in making chinaware and pottery. The ingredients are prepared as a "slip" or fluid mixture. This mixture is formed into sheets of the required thickness; see Fig. 1. The sheets are then fired in a kiln under precisely controlled temperature conditions for a pre-determined length of time; see Fig. 2.

After firing, the sheets are ready for the fabrication of ceramic element assemblies. The sheets of ceramic material are now provided with electrode surfaces. The next step is to cut the sheets into pieces of the required shape and size. These pieces are then assembled into the final form, thus making up the sensitive ceramic element assembly. The assembly is then processed to obtain the piezo-electric properties.

The ceramic piezo-electric material, after firing, is quite dense and hard as is chinaware. It is practically immune to temperature and moisture conditions encountered in any ordinary service in the radio and sound equipment field.

Electrical Characteristics
From an electrical standpoint, devices using the ceramic piezo-electric material can be designed to have an electrical impedance value approximately the same as that of the presently used Rochelle Salt crystal devices. Therefore, they may be used in conventional circuits. This characteristic is advantageous since it facilitates the use of ceramic devices with conventional radio and sound equipment. In many cases, ceramic devices may be substituted for crystal or other high impedance devices without circuit alterations.

Applications
Microphones such as the one illustrated in Fig. 3, are now available which employ this new piezo-electric ceramic material as the active ele-

![Fig. 1. Doctor Blade Machine.](image)

![Fig. 2. Precision Kiln](image)

![Fig. 3. Piezo-Electric mike.](image)
1. (p 10) Balanced electrostatic deflection avoids the astigmatism caused by interaction between accelerating anode and deflection plates. To put it another way an isolating program separates the fields of anodes and plates. This calls for separate terminals for each plate, and isolating resistors as well. The result is, as one plate increases in potential its partner decreases by that same potential, making the net field strength unchanged, avoiding beam de-focus. An interesting by-product of this design affects the resultant voltage on these deflecting plates:

(a) Because of their isolation the deflecting plates do not lose voltage with load changes, hence theirs is the highest supply voltage in the set.
(b) Since they are isolated by a resistance network causing voltage drop the deflecting plates never achieve quite the high voltage of the accelerating anode.
(c) The isolating resistors and dividing network have a changing voltage drop, permitting one deflecting plate to have a higher voltage than the accelerating anode, while simultaneously the other plate is lower.
(d) Since the deflecting plates are isolated from the accelerating anode, and supplied by a scanning amplifier output, there is no relationship between deflecting plate voltage and accelerator anode voltage.

2. (p 11) The horizontal and vertical deflection plates scan the screen while a video signal modulates these quickly changing spots of light. Exactly where is this video signal applied to the C-R tube?
(a) To the high voltage terminal through a modulation transformer.
(b) Directly to the control grid.
(c) It depends. By way of the screen grid for grid modulation, and through the suppressor-grid modulation. A new technique for cathode modulation is still experimental.
(d) To the focus anode. Thus the modulation voltage varies the focus, changing the picture accordingly.
(e) To the aquadag coating (highest potential), blocked by a condenser to remove the d-c component, and applied across a choke for Heising modulation.

3. (p 11) Because of mass production techniques a C-R tube with an off-center spot might be installed in a set. Thus, with no voltage applied either horizontal or vertical deflectors (a condition to be avoided for any length of time because of possible spot burning of the screen) the spot will not hit the center of the screen. This can be remedied in the field by adjusting a non-operating back-of-chassis control.

This control is called:
(a) Beam-centering circuit.
(b) Ion trap
(c) Focus control
(d) Spot check
(e) Scanning control

Why is this control set back-of-chassis? Why is it termed non-operating? (Write out answers to these last two queries.)

4. (p 11) See Fig. 1. This is the simplified form of the control referred to in Question 3. It is used for a single pair of deflecting plates. It

Fig. 1. CRT control circuit. See question 4.
THE use of selenium rectifiers in a voltage doubling "B" supply and the heating of the tube cathodes by series connected filaments as incorporated in recent production G-E TV receivers, has resulted in the use of new components and circuits which this article will describe. The advantages to be gained by this type of power supply over the conventional power transformer and tube rectifier circuits are: (1) lighter weight receiver, (2) smaller chassis size, (3) lower cost, (4) lower power consumption.

Practically all of the shortcoming of the transformerless power supply as used in ac-dc receivers has been eliminated in the new design.

"B" Supply

The B+ voltages are developed in a voltage doubling circuit using selenium rectifiers as shown in either Fig. 2 or 3. By this method the normal 117 volt a-c line can be converted to furnish the screen and plate voltages for the operating tubes.

The selenium rectifier has a symbol as shown in Fig. 1. Its equivalent in a vacuum tube rectifier is shown adjacent to it. One of the terminals of the rectifier is marked with a "+" or "K" which corresponds to the cathode of a rectifier tube. Typical electrical characteristics of the rectifier as used in the Model 805 receivers are as follows:

Max. RMS Input Voltage ..... 130
Max. Inverse Peak Voltage ..... 380
Max. Peak Current (M. A.) ..... 2000
Max. RMS Current (M. A.) ..... 625
Max. D.C Current (M. A.) ..... 250

Fig. 1. Selenium rectifier symbol

Approx. Rectifier Voltage Drop... 5
Max. Plate Operating Temp. . . . 75°C

Figure 2 shows a conventional full-wave voltage doubling circuit as used in some of our receivers. Its operation is as follows: When the instantaneous line voltage is such that point "a" is positive with respect to the other side of the line point "b", current will flow as shown by the arrow. This current flow through rectifier X1 charges capacitor C1 to near peak value. No current flows through X2 or into capacitor C2 during this half cycle. During the next half cycle, point "b" becomes instantaneously positive in respect to point "a" and causes current to flow through X2 charging capacitor C2 as shown by the arrow. Assuming that C1 does not discharge when C2 is charging, at the end of a full cycle the voltages across C1 and C2 would add to give approximately twice the peak voltage of the input rms voltage. The charging characteristic is shown in Fig. 2-B with the cumulative voltage of capacitor C1 and C2 shown in Figure 2-C. It will be noted that the ripple voltage frequency (120 cps) is twice the line voltage frequency which gives this circuit its full-wave characteristic.

Figure 3 shows a half-wave doubling circuit as used in most of the G-E TV receivers. The advantage of this circuit over that shown in Fig. 2 is that one side of the line becomes the B- of the power supply. Its operation is as follows: Assuming that the instantaneous line voltage is such that point "a" is positive in respect to point "b", then current will flow through X2 and charges capacitor C with a near peak voltage with polarity as shown. The current flow for this half cycle is shown by the arrow. During the next half cycle as point "b" becomes positive in respect to point "a", the charge on capacitor C will be added to that of the line potential and will cause current to flow through rectifier X1 as shown by the arrow. This will cause the capacitor C2 to charge to a value equivalent to that of the line plus that across C1. This value will be near to twice the peak line voltage. Since capacitor C2 receives its charge at a 60 cycle rate, it is referred to as a half-wave rectifier circuit.

The circuit in Fig. 3 because of its

Fig. 2. Conventional full-wave voltage doubling circuit

Transformerless power supplies in TV receivers is rapidly finding its way into new designs...
MERLESS SUPPLIES

ing increased popularity among the various manufacturers. In

of transformerless circuits in TV receivers are described.

Fig. 3. Half-Wave voltage doubling circuit

60 cycle ripple requires more filtering than the circuit shown in Fig. 2. It

will be noted that the filter capacitors in series across the output provide

a means of obtaining voltage division to furnish the lower voltage needed by

the screen circuits. A resistor of 5 ohms is placed in series with the line voltage supply to the rectifiers in order to limit the peak current.

When servicing a receiver using these transformerless "B" supplies, an isolation transformer should be used to prevent possible injury to the equipment or personnel.

The life of a selenium rectifier should be as great or greater than that of an equivalent vacuum tube. Life is decreased rapidly, however, if the rectifiers are operated above their recommended temperature. Do not obstruct the ventilation holes in the cabinet or locate a receiver in an excessively hot place.

Filament Heating

Figure 4 shows the circuit used to provide the required filament current from the 110 volt power line. Because of the large number of tubes involved, two series strings are made up and then connected in parallel. The picture tube heater is then connected in series with the two strings as the 0.6 ampere current requirements for this tube equals the total current of the two strings (0.3 ampere each).

One of the serious objections in the past to series filament heating from the 110 volt supply was the initial surge of current which results when the tube filaments are first turned open within 20 seconds at a current of 3.5 amperes.

NOTE—When the cut-out opens on an overload, do not reset it for about three minutes, otherwise the heater element may be damaged.
Bendix 75 Series Hum Level Reduction

It has been found possible to reduce the hum level in Bendix Radio Model's 75M5, 75B5, 75W5, 75M8 and 75P6 by installing a choke in the output circuit to the speaker. Procedure for this change is readily accomplished. Refer to schematic diagram in the Preliminary Service Manuals, 75 Series, and to Fig. 1, herewith.

1. Remove capacitor (C35, .02 mfd) connected from pin #3 of 50L6 (V6) tube socket and terminal board.
2. Remove red lead from pin #4 of 50L6 (V6) tube socket and terminal of electrolytic (C18c).

3. Remove resistor (R35, 470 ohms) from pin #6 of 50L6 tube socket and terminal board.
4. Move the pick-up point of brown lead of output transformer (T5) from the terminal board to pin #6 of 50L6 tube socket.
5. Move red lead from terminal (C13a, 40 mfd) to terminal (C13b, 50 mfd) of electrolytic condenser (C13).
6. Drill a hole through the chassis near the electrolytic capacitor for the leads of an added reactor (L16). This choke is available as Bendix Stock Number LF4012.
7. Bend one ear of Reactor (L16) and mount on top of chassis by soldering both ears to the chassis, or holes may be punched in each ear, and the reactor mounted with self tapping screws. Insert the reactor (L16) leads through the hole drilled in step 6.
8. Since leads of capacitor (C35, .02 mfd) are too short, install new capacitor (C35) between pins #3 and #8 of 50L6 (V6), with tubing over the positive lead, and negative capacitor plate attached to pin #3.
9. Connect red lead of added reactor (L16) to terminal (C13b, 50 mfd) of electrolytic capacitor (C13).
10. Connect black lead of added reactor (L16) to terminal (C13b, 50 mfd) of electrolytic capacitor (C13).

Westinghouse Models H-196, H-207 H-217—Alignment

During the preliminary adjustments to the video i-f coils and trims (using a signal generator and VTVM) a fixed bias should be applied to the AGC line as explained in the Service Notes. However, more uniform results can be obtained in the final alignment (using a sweep generator and oscilloscope) by removing the fixed bias and proceeding as follows: Adjust the sensitivity control for 0.6 volt on the video i-f AGC line (in DX Models adjust to the threshold as explained below) with no signal input to the receiver. Then couple the sweep output to the converter grid and adjust the sweep output until 1.5 volts are developed on the video i-f AGC line. At this setting the amplitude of the sweep voltage applied to the receiver will be optimum for visual alignment.

Westinghouse Models H-196DX—Sensitivity Control

The "on the bench" adjustment of the sensitivity control in Model H-196DX differs from the method used for Model H-196. In Model H-196DX, the control must be set to the "threshold" rather than to a fixed value. The correct procedure is to rotate the control completely clockwise, and then slowly rotate the control counterclockwise until the voltage indicated by a VTVM connected between the AGC line and ground no longer decreases. The point at which the voltage stops decreasing is the correct setting. If the voltage does not decrease below 1.0 volt, all the r-f and i-f tubes that are connected to the AGC line should be checked, and the tube that is causing the high contact potential should be replaced.

Since full AGC is applied to DX tuners, the gray lead emerging from the back of the tuner is a convenient place to connect the VTVM during the above adjustment.

The procedure for adjusting the control in the customer's home is described in issue No. 1 of the Service Hints. This method applies to the DX Models as well as the originals.

GE Model 150 Oscillation

Field reports indicate a condition of parasitic oscillation with strong signals and high volume setting, characterized by whistles and distorted output. This was reported on late production in the gray cabinet. It was investigated and the following simple change will correct the described condition.

Change the grid return of the i-f amplifier by moving bus wire lead on #2 lug of first i-f transformer to pin #5 of the r-f amplifier (1T4), instead of pin #5 of the i-f tube. This changes the bias of the i-f amplifier from zero volts to minus 1.4 volts.

Jar-Wheel Dispenser

In many shops; small hardware, such as screws, nuts, and washers, is kept in mayonnaise jars. This is a convenient method of "visible" storage, but the jars tend to become scattered around the shop.
The accompanying drawing (Fig. 2) shows a “jar wheel” which takes very little space above the workbench. It keeps all the parts jars together, while permitting any jar to be selected at will. The wheel is made of wood and can have as many “sides” as there are jars to be held.

The metal lid of each jar is held to the wheel by means of two wood screws. The wheel is rotated to bring the desired jar to the bottom position. The jar then may easily be unscrewed from its lid and the desired number of pieces of hardware poured out. The jar then is replaced by screwing it back into its lid.

To prevent the heaviest jar from hanging continuously in the lowermost position, the shaft is fitted fairly tightly into the thick wooden wheel.

Submitted by
Wayne P. Turner
919 E. 116th Pl.
Los Angeles 2, Calif.

**Philco 46-1213, 48-1270—Artificial Loop**

The need for removing the loop antenna when servicing is eliminated by the use of 6 ft. of 300 ohm transmission line. Form in circle and tie ends so that they form a series loop.

![Artificial loop diagram](image)

See Fig. 3. The two loose ends are then attached to receiver. This method may be used on other model Philips using low impedance loop, but turning of loop should not be changed.

Submitted by
Wayne E. Lemons
Kohler Elec. Co.
Buffalo Missouri

**R.C.A. Models 8BXS5, 8BX54, 8BX55 (RC-1059 RC-1059-A)**

Battery must be in case for proper sensitivity.

The position of the battery pack affects the loop inductance. Therefore, when the battery is removed, the loop inductance will change (increase) and the sensitivity will decrease because of improper electrical tracking of the loop circuit with the heterodyne oscillator.

Where a battery is temporarily unavailable, a sheet of aluminum .035” long x .25” wide and from .020 to .050” thick may be placed in the position occupied by the battery so that it is lying flat down on the bottom of the cabinet. This sheet of aluminum has an effect on the loop inductance similar to the effect caused by the battery and will, therefore, return the performance of the loop to approximately the same as when a battery is installed. If aluminum is not available, brass may be substituted with approximately the same performance. DO NOT USE STEEL OR IRON since the performance will be adversely affected. If desired, the sheet of aluminum may be waxed to the inside bottom of the case. DO NOT PLACE ANY WAX, CEMENT OR OTHER MATERIAL ON THE LOOP WINDINGS.

Battery must be in case for proper alignment.

For the reasons mentioned above, the battery as well as the chassis must be properly installed in the case when realigning the oscillator and antenna circuits. Failure to do this will result in extremely poor performance because of improper tracking. It is, of course, necessary to remove the chassis from the case for i-f alignment.

Follow correct alignment procedure.

Since the first i-f stage employs neutralization (C7), incorrect alignment of T2 primary will result if stage-by-stage alignment procedure is employed. Follow the alignment information contained in Service Data for Model SX85 to assure correct alignment.

**Zenith 3-Way Portable, Chassis 5537**

If set is dead but all voltages and parts check O.K. immediately suspect the metal clad wire wound resistor mounted on top of the chassis. This resistor supplies 6 volts for the filaments of the four 1/2 volt tubes in series. If voltage is found to be less than 6 volts with set on, install new resistor. This resistor develops a high resistance short to metal case, thereby drawing more current through it, causing a larger drop in resistor, and lowering voltage to less than 5 volts.

Submitted by
Frank J. Watt
West Granville, N.Y.

**Housing Miniature Straightener**

The logical place for a straightener for miniature tubes is in the tube tester. See Photo.

Testers having a wood cover as the one illustrated — will accommodate the straightener — by finding a place where it will clear when the tester cover is closed.

Submitted by
H. Leeper
Canton, Ohio

**Use For Pee-Wee Clips**

Many of us service men rework our own speakers, and I discovered that a couple of boxes of No 48-8 Pee-Wee and 48-B universal clips made by Mueller Mfg Co were mighty handy to hold the cones and rings while the cement sets. If a spider buckles and won’t lay down put a Pee-Wee on it. For some of the deeper speakers the No 48 works better than the little fellow. A trial will convince any service man that it is a time saver on the coming job.

Submitted by
I. C. Darby
Carthage, Missouri.

**Demagnetizing Hint**

Here’s a “trick of the trade” I’ve learned. I find the Weller soldering iron has another use besides soldering. It also demagnetizes tools, such as screw drivers, etc. Just place the magnetized tool in bottom of loop and turn on the iron for a few seconds, then withdraw the tool.

Submitted by
A.M. Wardell
Los Angeles, Cal.
Temple G-1430

Among the other interesting features of this thirteen-tube, a-c operated, AM and FM instrument; we find two unusual details in the audio circuits. The accompanying partial schematic shows the features under discussion.

There was a day when the use of a transformer to couple a driver to the push-pull output tube grids was the normal design. Today, however, the use of phase-invertor stages is almost universal. This instrument employs an interstage transformer between the 7A4 and 7C5 stages.

Rather than the usual method of placing the primary of the interstage in the plate circuit of the driver, it appears in the cathode circuit. In this place it provides both an audio load for the triode and bias for the tube. The triode tube is located on the r-f chassis, while the transformer is mounted on the separate audio/power chassis.

Another feature of the set is the use of separate cathode bias resistors in the two 7C5 circuits. The 470 ohm units are each by-passed with 25 μf capacitors. Among advantages of the arrangement is that of being able to readily balance tubes in the stage at full power input. Once the cathode resistors have been checked as having the same value, it is only necessary to check the voltage developed across each resistor at both static and dynamic conditions. The voltages should remain at equal values.

Aircastle WRA1-A

Modern tube and component development have made possible the design and marketing of many compact and efficient electronic devices. A post-war application of these developments has made available a record-playing unit which reproduces through any radio set; the whole assembly scarcely larger than the changer mechanism alone. The complete schematic of the unit is shown.

Only one tube is used in the circuit, a 6BA6 pentode. This tube performs the dual functions of oscillator and modulator. The oscillator circuit, whose frequency is determined by the constants of the L-C circuit, is made up of the cathode, grid and screen elements of the tube. Bias is developed across the 27K ohm leak. The screen is at ground potential for r-f by virtue of the large final filter capacitor, and the feed-back is provided by the cathode being tapped up on the coil.

With the three elements of the oscillator acting as a virtual cathode, the electron stream developed therein is attracted to the plate. Before reaching that element, however, the electrons must pass through the suppressor grid. In the circuit between the suppressor and ground is connected the crystal pickup, across an appropriate resistor.

The audio voltage from the crystal varies the potential of the suppressor grid. The electron stream is modulated by this audio voltage, and when it finally reaches the tube plate the result is a carrier containing amplitude modulation corresponding to the content of the record.

The modulated carrier is coupled to an external antenna connection through a semi-variable coupling capacitor. When connected to, or brought close to, the antenna circuit of a receiver tuned to the frequency of the oscillator, the record intelligence will be reproduced in the receiver output.

An unusual feature of the instrument is the use of a phono motor whose windings are of such type and resistance that it can be connected in series with the heater of the 6BA6 tube.

Power for the plate and screen voltage of the tube are derived from a disc-type rectifier, followed by a dual-section R-C filter.

Majestic 8JL885

This eight-tube, a-c operated, two band AM instrument makes use of an [Continued on page 33]
NEW PRODUCTS

ERRATA
We wish to correct an error made in listing two New Products items in the July, 1949 issue of RSD, page 20. Shown below are the correct descriptions.

NEW TV ANTENNAS
To meet the majority of everyday antenna needs, RCA's new antenna line includes the RCA 12-channel Television Antennas Type 204A1 and Type 206A1.

NEW INDOOR TV ANTENNA
Technical Appliance Corporation, Sherburne, N.Y., pioneer manufacturer of TV antennas has announced the first Taco indoor TV antenna known as Catalog Number 975.

D-C KILOVOLT METER
Hickok Electrical Inst. Co., Cleveland 8, Ohio, announces a new portable size DC Kilovoltmeter is now available for measuring DC voltages in a television receiver as high as 30,000 volts.

NEW SYLVANIA TUBES
Four types of subminiature tubes, have been announced by the Radio Division of Sylvania Electric Products Inc., New York 18, N.Y. The group includes a 1AD5 sharp cut-off r-f pentode; 1E8 pentagrid converter; 1T6 diode pentode; and 1AC5 output pentode.

TV ANTENNA ROTATOR
Crown Controls Company, Inc., New Bremen, Ohio, announces their new product, the Crown antenna rotator. This rotator has been designed to rotate antenna of TV, FM and other high frequency radio installations.

HIGH-FIDELITY SPEAKERS
Permoslux Corporation, announces their new distortion free hi-fidelity speakers. These speakers which range from 6" to 15" sizes and 12½" and 15½" in the Coronet line are now available for immediate delivery, it was announced by Philco Corporation, Phila., Pa.

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HIGH-FIDELITY SPEAKERS
Permoslux Corporation, announces their new distortion free hi-fidelity speakers. These speakers which range from 6" to 15" sizes and 12½" and 15½" in the Coronet line are low distortion wide range single direct radiating speakers, covering from 40 to 12,000 cycles.

Permoslux Corporation, Chicago, Ill.

CONVERTERS
The Radiart Corporation of Cleveland, Ohio, announces a new Vipower line for DC to AC power conversion. These vibrator-powered converters are now available to furnish 110-volt 60 cycle AC current from 6, 12, 32, or 110-volt direct current sources.

AUTO RADIO TOOL
The Hytron Auto Radio Tool is now available—another asked for and wanted tool by the servicemen. It was a Hytron contest winner.


D-C KILOVOLT METER
Hickok Electrical Inst. Co., Cleveland 8, Ohio, announces a new portable size DC Kilovoltmeter is now available for measuring DC voltages in a television receiver as high as 30,000 volts.

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INDOOR TV ANTENNA
An indoor television aerial, shown above, which can be placed anywhere in the room and is completely adjustable as to channel and direction is now available for immediate delivery, it was announced by Philco Corporation, Phila., Pa.
NEW RCA TUBES
RCA has just offered to equipment designers a line of “subminiature” tubes consisting of four types—a power pentode 1AC5, a sharp-cutoff pentode 1AD5, a pentagrid converter 1E8, and a diode-pentode 1T6.

POWER RESISTOR
 Appropriately named the Standee, a new type vertical power resistor for above-chassis mounting, is announced by Clarostat Mfg. Co., Inc., Dover, New Hampshire.

MARKER GENERATOR
A new Marker Generator, Type ST-5A, for television maintenance and development work, has been developed by the Specialty Division of the General Electric Company at Electronics Park, Syracuse, N. Y.

CERAMIC CAPACITORS
Wafer-thin disc ceramic capacitors, just introduced to the service industry by Sprague Products Co., North Adams, Mass., are finding wide application in late model television and radio receivers.

CATHODE RAY TUBE
A new multiple-intensifier-type cathode-ray tube featuring a highly sensitive vertical-deflection system and known as the Type 5XP-2, is announced by Allen B. Du Mont Laboratories, Inc.

TV INDOOR ANTENNA
Tricraft Products Co., Chicago, Ill., announces its newest engineering development—a small, compact Indoor Television Antenna termed the “Vidiette”, Model “700”.

PARTS CABINET
A new all-staked 10-drawer “cabinet of a thousand uses” has been announced by the Model Box & Cabinet Co., Chicago 6, Ill.

SOLDERING GUN
A new model soldering gun capable of handling 250 watts has just been announced by Weller Manufacturing Co., Easton, Pa.

TV ANTENNA
Illustrated in the accompanying photo is the Oak Ridge Model "HLF-4. The insert shows the Snap Lock principle in this all-new Six Line. Oak Ridge Antennas, N. Y. 35, N. Y.

NEW MULTI-SIGNAL TRACER
Servicemen and engineers will find a useful instrument in the new EICO Model 145 Multi-Signal Tracer. Designed for audible signal tracing of RF, IF, FM, audio and video circuits. Electronic Instrument Co. Inc., Brooklyn, N. Y.

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TV ANTENNA
TriCraft Products Company, Chicago, announces a new outdoor antenna which is installed in one minute. This new model No. "850", is factory assembled, has no loose hardware, just swing elements into place and tighten—"that's all".

SOLDERING GUN
A new model soldering gun capable of handling 250 watts has just been announced by Weller Manufacturing Co., Easton, Pa.
"Nothing like having servicing data direct from the factory when it comes to 'fixing' any kind of radio, TV or public address system. John F. Rider's Manuals have these facts, and I am glad to say that I'm making use of them constantly. Rider Manuals give me the greatest possible coverage, too. And with so many models and makes in existence today that coverage is an absolute necessity."

Charles R. Price
L.S.K. Radio and Television Co.
104 N. Spring St., Elgin, Illinois

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RIDER TELEVISION MANUALS present all servicing information needed to properly service all television receivers and parts lists are represented in Volume 2. Giant, Triple and Double Spread pages.

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Applying Neg. Feedback in Audio Amps.
New Philco FM Circuit
RMA Resist. & Cond. 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
Servicing 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

FEBRUARY 1947
Simple Methods to Determine Impedances
Servicing Record-Changers
How To Block Interference

MARCH 1947
Antenna Multicouplers
Servicing P.A. Installations
Trade Standards for TV Installations
Industrial Maintenance

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

NOVEMBER 1947
TV Antennas—Their Characteristics & Applications
Bookkeeping Simplified
Make A Universal Test Speaker
Eliminating Cathode Heater Hum from Audio Amplifiers

DECEMBER 1947
A New TV Set Servicing Technique
Ratio Detection & Its Applications
External Cross Modulation—Its Cause 
& Cure

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 Q

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 - Kilovolts - High Voltage Probes, etc.

MARCH 1949
Test Equip. Symposium Issue:
Signal Generators - Tube Testers - etc.

TV ANTENNAS
The Radiata Corporation of Cleveland, Ohio, announces the addition of two new antennas to their television and FM line, Model 85X and TS65X, shown above, an all channel TV antenna, and Model STHTV and TSHTV a stacked uni-directional array.

SOLDERING IRON
Introducing the new Super Instant Soldering Iron, a new instant heating iron, Product of the Instant Tool Corporation, New York City, N. Y.

[Continued on page 32]
NEW TV SWEEP GENERATOR-MARKER

Covers All TV Picture and Sound I.F. and F.M. Ranges

MIRROR-SCALED for ACCURACY!

Two Built-in Markers Can Be Used Simultaneously Giving Facilities for Faster Identification of Bandpass of Curves Without Constant Tuning of Marker

The new Triplet TV-FM Sweep Generator-Marker, with two built-in Markers and large mirrored dial, was "Tailored For Television" with YOU in mind! The two Markers can be used simultaneously ... gives you the facilities for faster identification of bandpass of curves without constant tuning of Marker. Marker has both pip and absorption dip control. The large Marker dial is mirrored for easy reading and greater reset accuracy. Straight line frequency tuning condensers used to provide linear scale markings.

No gaps in frequency ... continuously variable Sweep width control. Audio output for quick check on video and sound amplifiers. Expertly-engineered shielding ... all critical circuits enclosed. Copper plated steel construction.

Contained in attractive black suede finish steel case, size 15-11/32" x 11-1/32" x 8¼" ... leather handle ... copper-plated feet for grounding when working on metal work bench top ... panel is black, white and red etched on aluminum.

For Detailed Information
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TRIPLETT ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO, U.S.A.

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Model 3434
Only $14950
Suggested USA Dealer Net (crystals not supplied)

TECH DATA

<table>
<thead>
<tr>
<th>Frequency Coverage:</th>
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<tbody>
<tr>
<td>SWEEP CENTER FREQUENCY</td>
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<tr>
<td>Range 1 - 0-60 MC</td>
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<tr>
<td>Range 2 - 60-120 MC</td>
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<tr>
<td>Range 3 - 120-240 MC</td>
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<tr>
<td>SWEEP WIDTH:</td>
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<tr>
<td>0-12 MC (Continuously Variable)</td>
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<tr>
<td>MARKER FREQUENCY</td>
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<tr>
<td>19.5 to 40 MC (Fundamental)</td>
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<td>39 MC to 240 MC (Harmonics)</td>
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<td>CRYSTAL FREQUENCIES</td>
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<td>Te 20 MC on Fundamentals. Harmonics up to 216 MC. (Crystals Not Furnished)</td>
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<td>MODULATION</td>
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<td>400 Cycle on both Crystal and Marker Frequencies</td>
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<td>AUDIO</td>
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<td>400 cycles</td>
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Above also furnished in separate units ... Sweep Generator ... Variable Marker ... Crystal Marker.

Precision first... to Last

TRIPLETT
NEW H-V TV CAPACITORS
A new series of high-voltage super-dielectric capacitors, oil-immregnated and encased in molded phenolic housings is now available from Sprague Products Co., North Adams, Mass. The new capacitors, rated at 6,000 and 10,000 volts d-c working, are known as Sprague Type TVM Telecaps.

TV KIT
The easy to follow, step-by-step instructions make it a simple matter to complete the assembly of the Philmore TV Kit. When assembled according to instructions the set will operate and give good pictures and sound.

MANUFACTURED BY
Philmore Mfg. Co., Inc., 113 University Pl., N.Y. 13, N.Y.

DEPEND ON IRC
FOR TELEVISION SERVICING

Television servicing requires replacements of absolute dependability. Otherwise, you risk expensive call-backs. Be positive of that dependability in resistors and controls... always buy "IRC"! Produced by the largest resistor manufacturer in the world, IRC parts are standard equipment in the finest television sets.

New, Advanced Type BT Resistors are IRC engineered to meet the rigorous requirements of television. They surpass Army-Navy Specification Jan-R-11. Small, fully insulated and cool-operating, Advanced BT's are supplied in 1/2, 1 and 2 watt sizes.

Every requirement of television servicing has been considered in the design of IRC's new, compact /16" volume controls. Revolutionary Interchangeable Fixed Shaft feature means faster and better servicing. Resilient retaining ring cushions the turn; your customers can feel the difference.

New IRC PRECISTORS are ideal as low cost replacements for wire wound precision and strings of insulated resistors. These deposited carbon units combine accuracy, stability and economy. Guaranteed accuracy 1%, in 2 sizes and a wide range of values.

For vertical or horizontal centering, IRC Type W Wire Wound Controls are furnished with a center tap. Tight, uniform windings insure accurate focusing.


INTERNATIONAL RESISTANCE CO.
Wherever the Circuit Says - IRC -

ADVANCED TYPE BT's
BT means Better Television! Tiny 1/8, 1 and 2 watt resistors are JAN approved.

NEW INTERCHANGEABLE FIXED SHAFT CONTROLS
quiet operating, compact 1/16" design.

CLOSE TOLERANCE PRECISTORS
guaranteed accuracy 1%.

CENTERING CONTROLS
for accurate horizontal or vertical focusing IRC Type W Control.

WINDOW ANTENNA
The new Telex "Superex" Antenna is designed for apartment home installations in areas of high signal strength where roof antennas are not allowed. Telex, Inc., Asbury Park, N.J.

BATTERY TESTER
The new Triplet Handi Pocket-Size Model 688 Battery Tester gives quick, accurate tests, under actual load, of all Dry Batteries (1.5 to 90 volts) used in hearing aids, portable radios and other equipment. The condition of any battery is shown instantly on the LOW-GOOD three-color scale, and actual voltage readings may be made on the calibrated scales.

TV-FM ANT. BRACKETS
Bud Radio, Inc. is now producing 4 styles of aerial mounting brackets. Style No. AM-73 for side of house or building; AM-74 for chimney pipe and AM-76 for coping tile.
TV WALL BRACKETS
South River Metal Products Company, Inc. of South River, New Jersey announces the availability of its new Duo-18 Adjustable Wall Brackets, which are used to support television and FM antennas.

TWIN LINE CONNECTOR
An extremely simple twin line connector for television receivers and accessories has just been announced by Grayhill, Chicago manufacturers of electronic components.

CIRCUIT COURT
[From page 26]

unusual arrangement to provide a-v-c voltage. A 6SA7 tube serves as pentagrid convertor, followed by a single 455 kc i-f stage employing a 6SK7. Demodulation and audio amplification takes place in a 6SQ7, while a 6J5 stage provides phase-inversion to feed the 6K6 output tubes.

As shown in the accompanying partial schematic, a-v-c potential is developed by a triode-connected 6J5 tube. Following the signal from the last i-f transformer, we find that it connects directly to one diode plate of the 6SQ7. The other end of the transformer secondary connects to an i-f filter, composed of a 220 µuf capacitor and 47K ohm resistor. The circuit then returns to ground through a 470K ohm load resistor.

The audio voltage developed across the diode load is coupled to the triode section of the 6SQ7. To return to the i-f stage, the plate of the 6SK7, in addition to feeding voltage to the last transformer, is coupled through a 100 µuf capacitor to the grid of the a-v-c tube. The plate and cathode of this tube are at ground potential, forming a diode.

The grid of the diode returns to ground through a one megohm resistor, so a d-c voltage is developed across this resistor varying with the intensity of the i-f signal. The voltage so developed is applied to the signal grids of the 6SA7 and 6SK7 stages, via a filter consisting of 1 meg. and .01 µf.

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TRADE LITERATURE

**Booklets**

RCA Television Components for Kinescope RCA-16AP4, Radio Corporation of America, Tube Department, Harrison, N. J.

What's The Idea Behind RCA Victor's New Record and Player, Radio Corp. of America, Harrison, N. J.


Charts & Data Sheets

New Type "AN" Desk Chart, Cannon Electric Development Co., 3209 Humboldt St., Los Angeles, Cal.


Output Transformer Chart, Standard Transformer Corp., 3650 Eleston Ave., Chicago 18, Ill.

Conical Antennas, Telrex, Inc., Ruthtford at Neptune Avenue, Asbury Park, N. J.

**Books**


Rider's Volume XIX, John F. Rider Publisher, Inc., 480 Canal St., New York 16, N. Y.


Amplification and Distribution of Sound, by A. E. Greenlees, Sherwood Press, P.O.B. 566, Paoloma, California.

The Cathode Ray Tube and Typical Applications, Allen B. Dumont Laboratories, Inc., Instrument Division, Clifton, N. J.

**New Catalogs**


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**TV QUIZ**

(from page 21)

Can readily be seen that this forms a bridge circuit with resistors Ra/Rb controlling the balance. How does this circuit operate to locate the beam at the desired center-point, without affecting other circuits?

5. Note that the positive side of the high voltage connection in the drawing Fig. 1 is connected to ground. Is this unusual? Explain.

6. (p 10, 12) Because of the proximity of horizontal deflecting plates to the vertical ones, it is possible the field might interact, causing defocus or distortion of the beam. Some tubes have a ring or element placed between these pairs of plates, connected to the accelerating anode to avoid this trouble.

This ring is called:

(a) Barrier anode
(b) Defocus ring
(c) Beam emulifier
(d) Deflection neutralizer
(e) Divorce ring

---

**ANSWERS TO TV QUIZ**

1. (c) With no deflecting voltage applied, and no current drawn by

---

Public Address Speaker Users

will be interested in PERMOFLUX’S

September Announcement
the deflecting plates there would be no voltage drop across their isolating resistance; hence their voltage would equal that of the accelerating anode. With saw-tooth voltage applied the voltage on the plates would vary as described by (c).

2. (b) This is so fundamental that it may be brought to your attention again later. It should be memorized.

3. (a) Like the other controls the name describes the function pretty well. Memorize it. It is set on the apron back-of-chassis so that it won't be monkeyed with by the customer, trying to improve the performance of the set. It is termed non-operating because once set it does not have to be altered till a major change is made in the set, or the tube ages or is replaced.

4. The beam-centering circuit operates as a bridge. When point $X$ is set at the half-way point, so that $R_a = R_b$, a balance is set, since $R_i = R_b$. With the bridge balanced there will be a null or zero potential at the output of the bridge (indicated by the arrows) to the deflecting plates. If the spot on the screen is too much to one side, the point $X$ is adjusted, moved experimentally to one side or the other (generally by operating a screw-slot potentiometer). This upsets the balance of the bridge, applying a d-c potential to the deflecting plates, moving the spot as much as desired to the proper point. There are two of these circuits, one for the horizontal plates and one for the vertical plates, assuring positive centering of the beam.

5. Different from AM receivers (which almost universally operate the negative d-c point at ground potential), TV receivers may ground either positive or negative terminal. The reason for grounding the negative terminal in TV is the same as that for AM receivers—convenience and low voltage drop across metallic shielding components, with safety as a by-product since the chassis may be connected to a common physical ground, making zero voltage drop across any two pieces of radio equipment.

On the other hand, in TV equipment, where the C-R tube (the glass itself) may well take on the potential of the accelerating anode by direct connection to the aquadag coating, a real threat of static shock exists when the serviceman works on the tube, finding it necessary to make frequent adjustments to the chassis, which might thus be several thousand volts negative to the tube voltage. Also the newer 'all metal' C-R tubes (actually a metal cone set between glass face and glass neck) bear the literal high

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35
voltage on the metal flared section. In such cases, certain TV receivers have the high-voltage (therefore the C-R tube) at chassis potential, grounding the B+ to chassis. No hard and fast rule has been set at this writing. Check the diagram. Of course, the grounded positive side places the negative end at high-potential to the chassis—but then, you can’t have everything, you know!

6. (a) Keep it up. You’re memorizing TV terms!

CERAMIC DEVICES
(from page 20)

of microphones have been either partly or totally unsatisfactory. For example, the relative immunity of the ceramic material to effects of temperature extremes qualifies ceramic type microphones for applications where high temperatures cause failure or unsatisfactory performance. This would be true in many public address installations where the microphone is exposed to direct sunlight as is often the case in outdoor systems and mobile equipment.

Since the ceramic material is not affected by extreme dryness or high relative humidity, the ceramic type microphones may be used in lake or seashore localities or wherever a humid climate prevails. As an additional advantage, it should be pointed out that the ceramic material in microphones affords freedom of trouble from temperature and moisture conditions without being unduly expensive or heavy and bulky. Furthermore, the ceramic microphones have no external magnetic field which would tend to interfere with the operation of sensitive electrical instruments, or would tend to attract particles of magnetic material which might interfere with operation. The relatively light weight of ceramic type microphones is advantageous in portable equipment where weight must be kept to a minimum.

From a performance standpoint, ceramic microphones have excellent characteristics. Their sensitivity is adequate for operation with most amplifiers and electronic equipment designed for use with high impedance microphones. In addition, many observers have commented on the smooth reproduction afforded by ceramic type microphones.

A pickup cartridge (see Figs. 4 and 5) is available which uses the piezo-electric ceramic material. The same advantages with respect to relative immunity to temperature and moisture conditions that are obtained in ceramic type microphones are found also in the ceramic type pickup cartridge. This cartridge has excellent sensitivity and frequency response characteristics. Output voltage is rated at .5 volt. Frequency range is 50 to 10,000 cycles. This cartridge is ideally suited as a replacement cartridge in regions where the climate or operating conditions are unfavorable for other types of cartridges. It has a fixed sapphire needle, and is capable of being installed in the great majority of phonographs made in recent years.

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LEGAL BOMBSHELL
(from page 17)

service dealers which have made heavy investments in plants, trucks, accessories, raw materials, and expensive test equipment, would do well to consult their own legal counsel as to how best they can protect their considerable investments, and avoid unwitting violation of the law. In the final analysis they should follow this procedure in order to avoid being left holding the proverbial bag.
TV & FM SWEEP
[from page 19]

which may
with an
these sections are used
whose
which
which may be combined in the output
we have a center frequency of 112.5
megacycles which is swept plus or minus 5 megacycles. This is doubled
to produce a frequency of 225
megacycles, and this is swept plus or minus 10 megacycles. There are three ad-
tional separate variable frequency oscillators; one has 3 bands. These
bands are from 6 to 13.5 megacycles, from 13 to 34 megacycles, and from
34 to 95 megacycles. The second variable frequency oscillator is between
185 and 205 megacycles and the third oscillator is between 95 and 156
megacycles. These are combined in the following manner.

Band A; 0-17 megacycles (swept plus or minus 10 megacycles).

is the frequency difference between
the 6C4 oscillator and the 112.5
megacycle signal.

Band B; 20-45 megacycles (swept
plus or minus 10 megacycles). This is the frequency difference between
the 225 megacycle signal and the half of the 6J6 which is tuned from
185 to 205 megacycles.

Band C; 40-130 megacycles (swept
plus or minus 10 megacycles) This
is the frequency difference between
the 225 megacycle signal and the 6C4
oscillator.

Band D; 130-185 megacycles (swept
plus or minus 10 megacycles). This
is the frequency difference between
the 225 megacycle signal and the 6C4
oscillator from 34 to 95 megacycles.

Band E; 191-211.5 megacycles
(swept plus or minus 10 megacycles).
This is the 225 megacycle signal minus
the 6J6 which tunes from 13 to
34 megacycles.

Band F; 211-219 megacycles (swept
plus or minus 10 megacycles). This
is the 225 megacycle signal minus
the 6J6 oscillator from 6 to 13.5
megacycles.

This represents the sum of the 225
megacycle oscillator plus the 6 to 13
megacycle variable frequency oscillator.

---

TV & FM SWEEP

AUGUST, 1949

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becomes less with use. The unit has a 2-
watt rating with a good safety factor.

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Band II; 2385.5 -25.9 megacycles (swept plus or minus 10 megacycles). This is the sum of the 255 megacycle signal plus the 6J6 oscillator which tunes from 13 to 34 megacycles.

**Push Button Circuits**

The 6 push buttons are arranged to operate only the high voltage in order to prevent r-f drift. These push buttons operate as follows:

1. **XL** This is the crystal push button and operates in conjunction with the crystal input jacks on the front panel. If it is desired to produce a crystal frequency between 2.5 and 10 megacycles the desired crystal will be plugged in and this push button depressed. The crystal signal will be obtained from the r-f output terminal and may be used as a marker frequency. (This push button should not be used unless a crystal has been inserted due to the excessive current drawn by the 12AT7 oscillator without proper bias.)

2. **MARK ABS**; This controls an Absorption Marker which may be adjusted at the Marker Frequency Dial on the front panel.

3. **R.F.** This push button controls the radio frequency output by connecting the high voltage to the master oscillator. An unmodulated output from 0 to 200 megacycles will be obtained whose level is approximately 1 volt. This level may be adjusted by means of the step Attenuator or the Fine Attenuator or by means of both. With the Sweep Width control in zero position there is no frequency modulation of the signal. By rotating this control the desired amount of frequency modulation may be obtained from the calibrations.

4. **MARK CW**; This push button controls the marker oscillator which is calibrated on the Marker Frequency Dial. This is usually used with the r-f master oscillator.

5. **MARK MOD**; This push button will modulate the marker oscillator internally.

6. **STAND-BY**; Depressing this push button removes the high voltage from all of the oscillators and prevents the radiation of any signal from the Model 720.

The Radio Frequency Output is obtained by using the R.F. push button along which will provide a frequency modulated radio frequency signal. If it is desired to produce a frequency modulated signal and the CW marker at the same time, these are simultaneously depressed. The combination of Radio Frequency Signal and Crystal Marker may be obtained by depressing these simultaneously. The Radio Frequency Signal and the Absorption Marker are obtained at the same time by depressing these push buttons together.

The Phasing Jack will provide a 60 cycle voltage and may be used for a synchronized sweep for the test oscilloscope. The Phasing Control is used to obtain a single sweep. The External Modulation Jack is available.

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**Radio servicemen will be interested in PERMOFLUX'S September announcement**

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The versatility of this instrument provides several different choices of signals for Television and Frequency Modulation Visual Alignment. The fundamental frequency is used on all Radio Frequency outputs and the available markers make this a valuable addition to the radio service man's test bench.

FIELD FINDINGS
[from page 4]

to buy intricate items like 'scopes and other test instruments.

Test Equipment
Most test equipment being used by the bulk of this country's retailers and servicemen is old and obsolete. The pity of it is that service dealers want to buy new instruments but haven't sufficient cash because they have too long underpriced their services and thus failed to lay aside monies needed for shop improvements. Jobbers could alleviate this problem by working out time-payment deals with reliable customers. That is a normal function of a jobber, but most of them aren't financed properly and too many others just don't know their own business. Besides, many so-called jobbers are nothing more than a glorified radio service outfit. Parts manufacturers would do well to house-clean their jobbing setups. Ask any sales manager: "How many legitimate jobbers there are in this country?" and he'll say between 700 and 800. He'll also say that of these there are about 500 who are financially sound. Yet, according to some self-designated experts, (publishers of jobber's magazines), there are upwards of 3500 jobbers in this country. It's too silly to deserve further comment. I'll wager there aren't 500 financially sound, true parts jobbers in business. Are there any takers?

Getting back to test equipment manufacturers, they owe the radio and TV servicing profession a debt — or rather an obligation, namely that of giving radio-TV technicians a lot more education about the proper use of test equipment. Thousands of cathode ray 'scopes are gathering dust in service shops simply because the owners were never taught how to use them. Actually, in large measure, this lack of knowledge about the use of CRO's can be blamed on jobbers who sold the instruments in spite of the fact they never knew anything about them and how they were to be used.

TV Service Companies
Finally, we'll get to the last class of radio men who are in trouble. The specializing TV service company, factory controlled and independents alike are referred to. These so-called TV service specialists are, as a whole,
going broke in droves and their failure to render proper service to the TV set owner public who has paid retailers in advance for service warranty is causing great reflection upon the independent servicing profession unjustly. The entire mess may be relayed back to the retailers who, after making a sale and signing a service policy, sigh with relief and gladly "wash their hands of the entire transaction from that point on." Here again, it's a ridiculous situation. Never, in the history of good business management, has it ever been deemed proper for a seller to simply pocket the money gotten from a sale and then not have to take on the responsibility of seeing to it that his customer got complete satisfaction. So, this goes back to the TV set manufacturer who had no right in the first place to ever start a vicious cycle of non-responsibilities — by letting dealers merely set as order takers for service which they themselves have no part in.

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