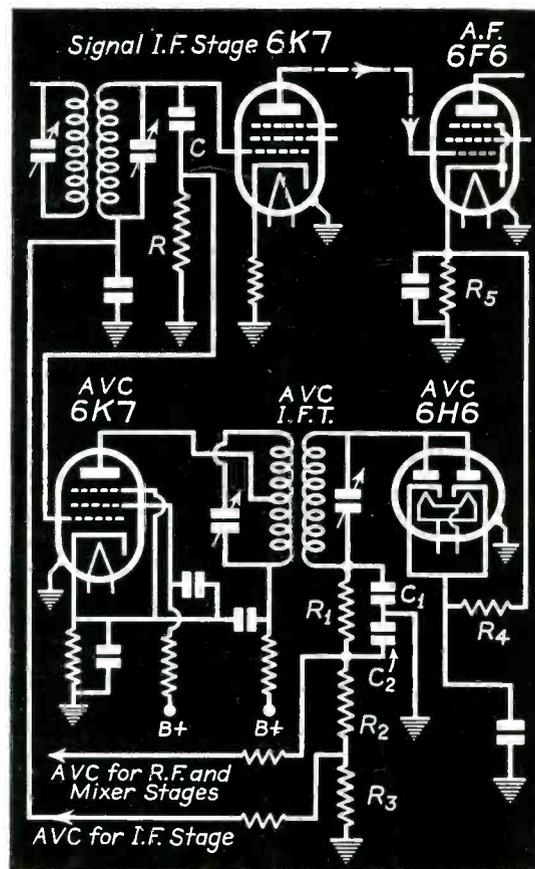


SERVICE

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AVC Amplifier Circuit
(See Page 10)

JANUARY
1936

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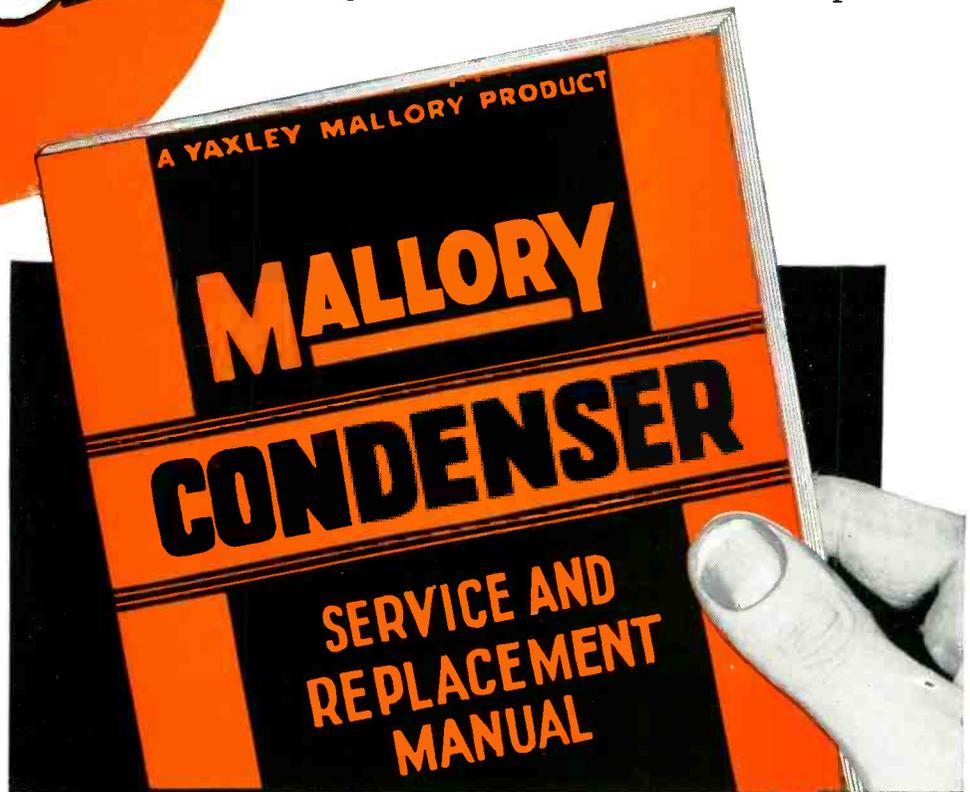
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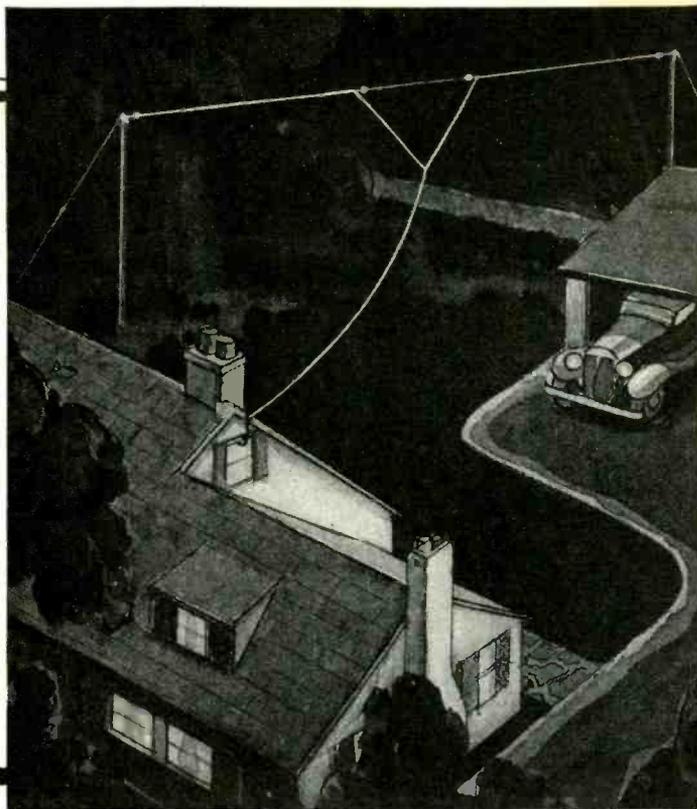
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INDIANAPOLIS, INDIANA

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pioneered or developed by Mallory are incorporated
in Mallory Condensers wherever they add to quality.*

G-E
"V-DOUBLET"
ANTENNA SYSTEM
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FOR SERVICE MEN



Every community offers good money-making opportunities for the enterprising service man to sell and install short-wave antenna systems.

If you are a service man working for a radio retailer, recommend the installation of a G-E "V-Doublet" antenna system with every radio you install. If you are in business for yourself, sell a G-E "V-Doublet" antenna system to all owners of short-wave receivers now using inadequate aerial systems.

All-wave antenna sales and installations not only bring in extra income for service men but also provide them with a means of making new contacts for other types of radio and electrical service work. You'll find this rich market waiting right at your door.

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See your G-E Radio Distributor for additional information or write to Section R-781, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

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SERVICE

A Monthly Digest of Radio and Allied Maintenance
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Most Complete Transformer
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QUALITY · RELIABILITY

Build up your profits and prestige with UTC Chromshield Amplifier kits.

Four Popular Chromshield Amplifier kits chosen for wide adaptability, outstanding performance and low cost.

**CK-7 METAL TUBE
PREAMPLIFIER KIT**

The CK-7 preamplifier kit uses two metal 6C5 tubes in cascade amplification. A 6C5 is used as a rectifier. Careful placement of parts and shielded components is responsible for the extremely low hum and noise level in the CK-7 preamplifier. The overall gain is 55 DB.



	List	Net
CK-7 transformer kit mounted on chassis	\$16.00	\$9.60
AK-7 accessories includes all necessary resistors, condensers, sockets, AC cord and plug, hardware, wire	6.00	3.60

**CK-8 METAL TUBE SUPER
POWER AMPLIFIER**

35 watts undistorted output; will handle up to 20 dynamic speakers. 8 tubes used: 3-6C5 triodes, 4-6F6's in Pentode A prime connection. 1-5Z3 rectifier. 95 DB gain. Input of amplifier will match crystal or ribbon mike outputs, also adapted for carbon or dynamic mikes through external transformer input.



	List	Net
CK-8 transformer kit mounted on chassis	\$31.75	\$20.10
AK-8 accessory kit for above —includes all necessary resistors, condensers, sockets, terminal strips, AC cord and plug, hardware, wire	11.00	6.60

Do you know ??

that all transformers used in UTC chromshield amplifier kits are housed in heavy chromium plated welded shields, thus adding a professional note to the appearance of the finished amplifier.

that all chromshield audio filter and power coils are fully clamped internally in their respective chrome shields. This added precaution prevents vibrations and annoying buzzy noises. The result is quiet, silent operation of audio and power units.

that all transformers are vacuum treated and then poured with humidity-proof compound to assure long lasting satisfaction in all climates the world over.

that all output transformers are designed for a variety of impedance matching applications—for high impedance lines, broadcast lines or mixed voice coil lines. True universality at moderate cost.

All chromshield transformers are symmetrical in appearance and similar in mounting dimensions thus permitting quick and easy amplifier assembly.

Compare

Write for CSI bulletin giving full details on chromshield components and amplifier kits.

CK-2 AMPLIFIER KIT

The CK-2 amplifier kit is designed for use with crystal microphones. The gain is in excess of 100 DB and the power output is 10 watts. Only four tubes are used, including the rectifier. The plates of the first 6A6 tube are cascaded to permit very high amplification and stable voltage transfer to the second 6A6 driver tube. The final 6A6 is arranged in push pull class B operation.



	List	Net
CK-2 transformer kit with CS-35 output, including chassis	\$19.50	\$11.70
AK-2 accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire	10.50	6.30

CK-4 AMPLIFIER KIT

The CK-4 amplifier kit commends itself for its high power output and its simplicity in actual constructional details. The 45 and 2A3 power tubes are used in A prime amplification and the highest possible undistorted output is made available through the use of a separate rectifier to apply fixed C bias to the output stage. Self bias is used on the first and second stages to eliminate instability. A peak power of 40 watts and a normal power of 30 watts is available.



	List	Net
CK-4 transformer kit, with CS-452 output, including chassis	\$33.50	\$20.10
AK-4 accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire	\$11.00	\$6.60

UNITED TRANSFORMER CORP.

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NEW YORK, N. Y.

EXPORT DIVISION - 15 LAIGHT STREET, NEW YORK, N. Y.

THE ANTENNA . . .

HEADPHONE JACKS

THERE ARE VERY FEW household all-wave receivers manufactured that have jacks for headphones. The reason for this is simple enough—the majority of listeners wouldn't think of using headphones.

Nevertheless, there are thousands of people who like to hunt for DX, who would find headphones of great assistance when attempting to read weak signals. Then there are people who wish to listen in late at night but who do not because it would disturb other people. Here again, headphones are handy.

Most of these people have never been told about headphones, but if they have, they probably do not realize that headphones can be used with any type of radio receiver.

Installing a headphone jack is a job for the Service Man. Acquainting people with headphones is also a job for the Service Man to our way of thinking, since this is a service in itself.

Why not carry a pair of headphones and a headphone adapter with you when you go out on service calls? Then it will be an easy matter to stage a demonstration of the effectiveness of headphones under certain conditions. We bet you will find numerous customers who will want installations made.

• • •

PRETTY PICTURES

SOME TIME AGO, we referred to the advantages of displaying your cathode-ray oscillograph equipment in the homes of your customers. This is good business in itself, but the real advantage comes when you use the cathode-ray equipment to show the customer that his receiver requires alignment.

If you just tell the customer his set needs a bit of tuning up, he is not apt to have the work done, because to him the receiver probably sounds all right. But, if you show him pretty pictures on the oscilloscope, he can see for himself that things aren't quite what they should be.

We realize that such tests are not easy to make in the customer's home, but they can be made readily enough by the use of adapters even if the results aren't quite what they should be. After all, if you get the alignment job, you'll do the work in your own shop, under proper conditions.

Seeing is believing, and you can show the customer a lot without going to much trouble. A preliminary test of this sort ought to bring in a lot more business.

• • •

HOW DO YOU CHARGE?

HOW DO YOU ESTIMATE the cost of a job? Do you quote the total, or break it down into an itemized form?

Customers quite often kick about charges just because they haven't the remotest idea as to how much work may be involved. You ought to let them know—then they

can better appreciate how you arrived at the total cost.

This is no new idea. It has been mentioned before—but there is one point in connection with it that has not been mentioned, and that is, all-wave receivers.

In so far as the customer is concerned, he won't appreciate that an alignment job on an all-wave receiver calls for more work than an alignment job on a standard broadcast receiver. Maybe his neighbor had an alignment job done on a broadcast receiver the week before, and your customer knows just what his neighbor paid for having the work done. Then, if your price for the all-wave job is higher—as it certainly should be—the customer is going to yell. You can show him to his own satisfaction that more work is involved and in the end he will understand why his job is going to cost more than the job his neighbor had done—but, and it is a big but, you have placed your customer in a bad frame of mind.

When you make an estimate on an all-wave alignment job, *break it down into so much per waveband*. The customer will understand that right off, and it will save you a lot of trouble and possibly the loss of a job.

• • •

SERVICE CHARGES

IN PRACTICALLY ALL business enterprises, prices automatically stabilize at a level which provides a company with a fair profit and at the same time gives the purchaser value for his money. There are, of course, many factors that will disturb the price level in a business—a factor such as the necessity for increased wages, or increased taxes, that will boost prices; or a factor such as increased demand, which often reduces prices in the long run because of increased production.

Since production, sales, distribution and advertising costs are computed much in the same way in all businesses, it turns out that there is a definite relation in "dollar value" between the products of one industry and those of another. Thus an automobile is no more "expensive" than, say, a radio set.

The same sort of price level usually applies to businesses and professions where the individual or organization charges for a given service. But here again the price level may go up one year and down the next, depending upon demand and upon the general financial condition of the nation.

Men of all professions and businesses have gone through lean years. Prices and charges for services dropped off, but many of these prices and charges are now rising nearer to a level established some years back.

It is time that service charges followed the general increase in other fields; it is warranted in view of the fact that radio entertainment is more in demand today than it was two and three years ago, and because the finances of the average man have improved considerably.

One thing the Service Man should attempt to impress upon his customers before he mentions higher charges, is that the modern radio receiver is as delicate in adjustment as a fine watch. Most people know what poor work can do to a good watch, and it is about time that they realized what poor work can do to a radio.



NEW
**THE MOST IMPORTANT
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- . . . **Smaller—Quieter—More accurate.**
- . . . **Opens prevented.** Wire leads permanently contacted to resistance element inside molded insulation.
- . . . **Rugged—Strong—Vibration-proof—Light in weight.**
- . . . **Both color coded AND imprinted with resistance value.**

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 unit (List value
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 are. Write today
 for catalog S-88
 and sample resistor.

Never before has a resistance development received the widespread approval accorded IRC Type "B" **INSULATED METALLIZED** Resistors. . . . And never have resistors warranted greater praise. For here are truly modern units—fully sealed and insulated, compact, quiet and more accurate than ever—designed to meet the most exacting de-

mands imposed by the finer, more sensitive radio equipment of today. These unique **NEW IRC** Resistors incorporate every famous Metallized advantage plus many new ones besides. Already used by leading manufacturers for two years. . . . Now sold by jobbers. Two sizes, B-1/2 (1/2-watt) and B-1 (1-watt) meet every need.



(Above) **IRC RESIST-O-CHEST**—handiest container for resistors and other parts. Get it free with your order for 56 Insulated Resistors. Ask your jobber.

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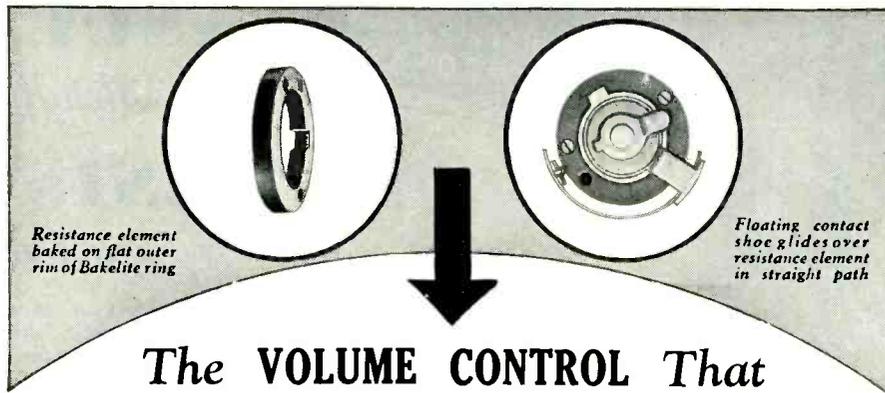
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ELECTRAD

RESISTOR SPECIALISTS IN RADIO AND ELECTRICAL INDUSTRY SINCE 1923



The VOLUME CONTROL That Uses FUSED CARBON for QUIETNESS and SMOOTHNESS, And ONE MOVING UNIT for SIMPLICITY and LONG LIFE

YOU can actually *feel* the efficiency of the Electrad Carbon Volume Control. The glide of the self-cleaning, special-alloy shoe *directly* on the carbon resistance element has a gentle "pull" which indicates perfect contact over the entire resistance surface. No short cuts in current path to cause early breakdown. No skipping or stuttering.

As the control is used the resistance element grows smoother and quieter—more and more efficient.

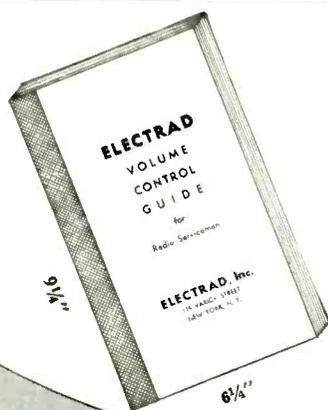
With nothing but established electrical materials—Metal, Bakelite and Carbon—in its construction, the Electrad Volume Control is immune to changes in resistance caused by temperature, water, salt air or humidity.

Standard end covers are instantly interchangeable with a new-type power-switch assembly, approved by underwriters. Long, aluminum shafts are easily cut to desired length.

Use an Electrad and be *sure* of volume control satisfaction. *Electrad unconditionally guarantees trouble-free performance.*

Write For This

FREE New
VOLUME
CONTROL
GUIDE



100 pages, listing in alphabetical order all receiver models for which Electrad standard or special replacement controls are made. Gives names of receiver manufacturers, model numbers, resistance values and list prices.

Mailed **FREE** if you send us the flap (showing specification and resistance) from any new-type Electrad Carbon Volume Control carton, together with your business letterhead or card. Address Dept. S-1.

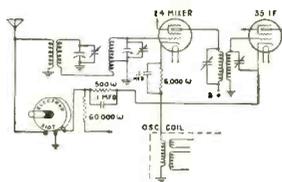


Special Application of ELECTRAD CONTROL No. 2107 To STEWART-WARNER RECEIVERS 102-A, B and E

Due to the obsolete system of control used in the Stewart-Warner 102-A, B and E Receivers, it has hitherto been impossible to obtain satisfactory volume control operation.

By utilizing the specially-designed 2107 control and making several circuit modifications as shown below, all difficulties can be eliminated and entirely satisfactory operation assured.

ORIGINAL CIRCUIT



MODIFIED CIRCUIT

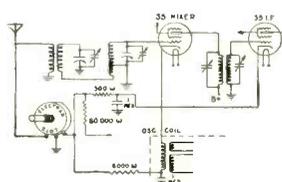


Diagram shows one of many special applications described in the **ELECTRAD VOLUME CONTROL GUIDE**. (See free offer on this page.)

CIRCUIT MODIFICATIONS

- (1)—Replace 24 mixer tube by a 35 tube.
- (2)—Remove 6000 ohm resistor and .1 mfd. condenser between mixer cathode and oscillator coupling coil and connect these points together.
- (3)—Disconnect ground end of oscillator coupling coil and connect to the 6000 ohm resistor and .1 resistor just removed (second step).
- (4)—Ground the other side of .1 mfd. condenser. Connect the remaining terminal of the 6000 ohm resistor to No. 3 terminal of the Electrad control.
- (5)—The return end of the I. F. trimming condenser is removed from the cathode of the I. F. tube and grounded.

(6)—Disconnect the low side of the .1 mfd. condenser which is connected from the cathode of the I. F. tube to the far side of the 500 minimum bias resistor and connect to ground. This by-passes the cathode directly to ground.

(7)—Align I. F. at 177.5 K.C.

RESISTOR SPECIALISTS

Featuring:
QUIET CARBON VOLUME CONTROLS
VITREOUS RESISTORS
TRUVOLT RESISTORS
POWER RHEOSTATS

Write Dept. S-1 for 1936 Catalog

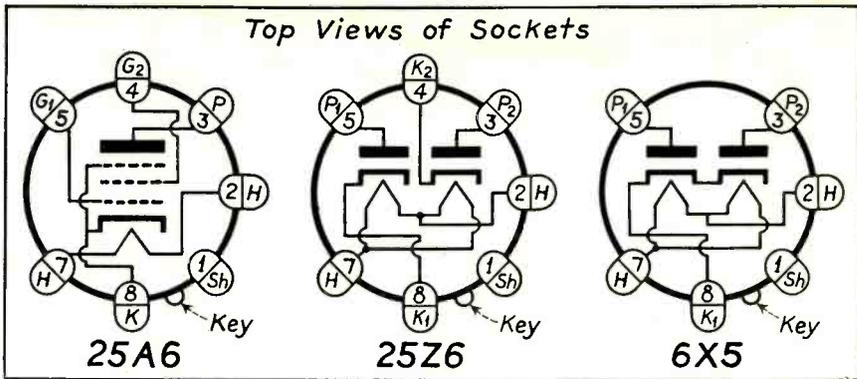
full-scale deflection. It will be noted from the diagram that the negative side of the line cord must be connected with the grounded side of the a-c line. If this is not done, body capacity will tend to alter readings; and it will be difficult to obtain a zero adjustment.

The model shown in the photographs has been designed to mount on a special angle-iron rack, together with a Clough-Brengle oscillator and a condenser analyzer. However, it may be easily adapted to mount in a metal or wood box for portable use. If a cheaper but less sensitive device is desired, a 0-10 mil tuning meter may be used. In this case the 75 tube is replaced with an 85.

New Metal Tubes (6X5, 25A6, 25Z6)

Three new type metal tubes have been announced by the Raytheon Production Corp., of Newton, Mass.

These new-types include two tubes specially designed for use in a-c, d-c combinations. The new 25A6 corresponds in characteristics to the type



Socket connections for the three new metal tubes as they appear from the top.

43. The new 25Z6 has characteristics like those of the 25Z5.

The third new metal tube is the type 6X5, a narrow space, high-vacuum rectifier designed primarily for automobile receiver use.

Each of these three tubes is manufactured in the same type steel shell used for the types 6F6 and 5Z4.

The detailed characteristics of the new tubes are given in the accompanying tables.

AVC AMPLIFIER CIRCUIT

(See Front Cover)

The General Electric Model A-125 metal-tube receiver uses a separate channel for supplying amplified and delayed automatic volume control to the r-f, mixer and i-f tubes. This channel is composed of a 6K7 tube operating at the i-f frequency of the receiver, an i-f transformer and a type 6H6 diode.

Referring to the circuit on the front cover, signal voltage is picked off the signal i-f stage and is fed to the control grid of the 6K7 avc tube through the coupling condenser C. The return circuit for the grid of this tube is through the resistor R to ground.

The signal is amplified by the 6K7 avc tube, the plate circuit of which is connected to a tap on the primary of the avc i-f transformer. Both primary and secondary of this transformer are tuned, the 6H6 avc rectifier being connected across the entire secondary.

The selectivity of the avc i-f channel is slightly less than that of the signal i-f channel. This avoids distortion and overloading as stations are being tuned in, because the avc action is able to function before the point of full resonance is reached, which would not be so were the avc i-f channel too selective.

An initial negative voltage of about 11 volts, obtained from the cathode bias resistor R-5 of the second a-f amplifier, is maintained on the diode plates of the 6H6 avc tube. This provides delayed avc action, which prevents attenuation of weak signals and gives a flat avc characteristic on strong signals.

The avc voltage is developed across the diode load resistors R-1, R-2 and R-3. The resistor R-1 and the condensers C-1 and C-2 form a filter. The avc for the r-f and mixer tubes is tapped off at the junction of R-1 and R-2, while automatic bias voltage for the i-f tube is tapped off at the junction of R-2 and R-3.

Through the use of this system, with amplified and delayed avc, the output of the receiver will not vary more than a few percent over variations in signal input of 100,000 to 1.

TYPE 6X5 FULL-WAVE RECTIFIER

Heater		
Voltage	6.3 volts	
Current	0.6 ampere	
Maximum Overall Length		3 1/4"
Maximum Overall Diam.		1-5/16"
Base		Small Octal 6-Pin
A-C Voltage per Plate		350 volts max.
Peak Inverse Voltage		1,250 volts max.
D-C Load Current ..		75 ma max.
Peak Plate Current ..		375 ma max.

TYPE 25Z6 RECTIFIER-DOUBLER

Heater		
Voltage	25.0 volts	
Current	0.3 ampere	
Maximum Overall Length		3 1/4"
Maximum Diam.		1-5/16"
Base		Small Octal 7-Pin
A-C Voltage per Plate		125 v. max.
D-C Load Current as Voltage Doubler ..		85 ma max.
D-C Load Current as Rectifier		85 ma max.
Peak Plate Current ..		500 ma per plate

TYPE 25A6 POWER PENTODE

Heater				
Voltage	25.0 volts			
Current	0.3 ampere			
Maximum Overall Length		3 1/4"		
Maximum Diameter		1-5/16"		
Base		Small Octal 7 Pin		
Class A Amplifier Operating Conditions and Characteristics				
Heater	25.0	25.0	25.0	volts
Plate	95	135	180	max. volts
Screen	95	135	135	"
Grid	-15	-20	-20	volts
Amplification Factor	90	99	96	
Plate Resis.	45,000	42,000	40,000	ohms
Mutual Cond.	2,000	2,350	2,400	umhos
Plate Current	20	39	40	ma
Screen Current	4	8.5	8.0	ma
Load Resis.	4,500	4,000	5,000	ohms
Power Output	0.9	2.0	2.75	watts
Distortion	11%	9%	10%	

General Data . . .

Sparton Model 966 Receiver

This receiver uses a 6K7 in the r-f stage, followed by a 6A7 mixer oscillator. The 456-kc output from the mixer section feeds a two-stage i-f amplifier using 6K7 tubes. The output of the second i-f stage is fed to the 6H6 diode detector and avc tube. The a-f signal component is picked off the volume-control potentiometer and fed to the grid of the 6C5 a-f voltage amplifier. This tube is auto-transformer coupled to a pair of 42 pentodes in push-pull. The power rectifier is a 5Z3.

The receiver includes a type 6E5 tuning-indicator tube, which operates from the avc feed line.

The cathodes of the r-f and mixer tubes, and the two i-f tubes, are connected directly to ground. Bias is provided by terminating the avc feed line at a point that is negative with respect to ground; namely, the center tap of the power transformer which is in turn

connected to the grounded resistor R-11. The paralleled cathodes of the 6H6 tube are also returned to this point, but since the diode plates are common to the same connection, there is no voltage difference between the two.

The 6C5 a-f tube is biased by the cathode resistor R-17, while the type 42 pentodes are biased by cathode resistor R-20.

ALIGNMENT

For the proper alignment of this chassis, the procedure should be followed in the same order given.

In the following procedure, the broadcast band will be termed band No. 1; the first short-wave band (green section of the dial), band No. 2; the second short-wave band (red section of the dial), band No. 3; the third short-wave band (blue section of the dial), band No. 4. The dial pointer should be exactly parallel with the horizontal line of the kilocycle scale when the con-

denser plates are fully meshed. If the pointer does not read correctly, loosen the set screws in the large brass collar directly between the dial lights, hold the rotor plates fully meshed with the stator plates and set the pointer so that it is parallel with the horizontal lines on the kilocycle scale, then tighten the set screws.

A. I-F Alignment: Turn on receiver and test oscillator and allow both to operate several minutes before attempting to adjust any condensers.

Turn the band selector switch to the No. 1 position and turn the station selector knob until the rotor plates are completely out of mesh with the stator plates.

Connect antenna lead of test oscillator to the grid cap of the 6A7 tube and the ground connection to the chassis frame of the receiver. Connect the output meter "low tap" across the voice coil of the speaker.

Tune test oscillator to obtain a signal of 456 kc.

Turn the volume control of the receiver on full and adjust i-f condensers C4, C3 and C2 which are reached from the top of the chassis (See Figs. 2 and

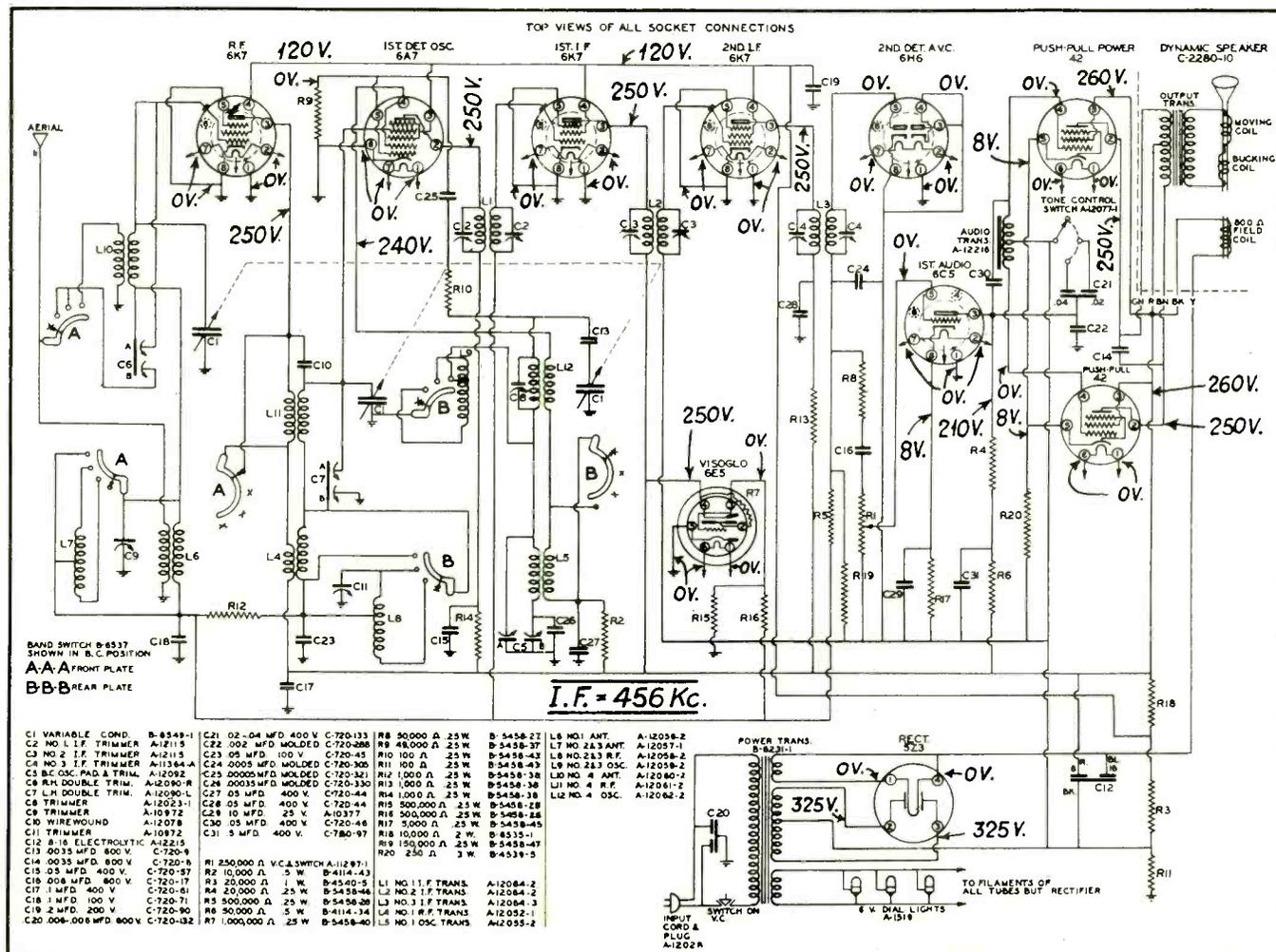


Fig. 1. Circuit, with voltage and parts values, of Sparton Model 966.

GENERAL DATA—continued

3). Since the i-f circuits are quite selective, care must be taken to insure proper adjustment.

B. Broadcast Band: Disconnect antenna lead of test oscillator from grid cap of 6A7 tube and connect it in series with a 150-mmfd condenser dummy antenna to the antenna terminal of the chassis.

Tune test oscillator to obtain a signal of 1350 kc.

Turn the station selector of the receiver to 1350 kc and without disturbing the setting of the test oscillator or the station selector, adjust condensers C5A, C7B and C9 in the order given.

Tune the test oscillator and receiver to 600 kc and adjust condenser C5B, at the same time the station selector knob is moved back and forth to obtain maximum deflection of the output meter.

Retune test oscillator and receiver to 1350 kc and check the adjustments of condensers C5A, C7B and C9.

Calibration of the broadcast band should also be checked at 900 kc and 600 kc.

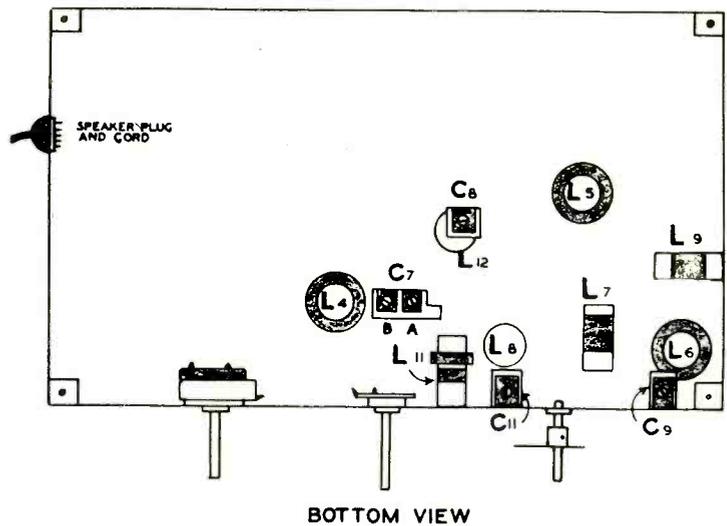
C. Band No. 4: Turn the band selector switch to band No. 4.

Disconnect antenna lead of test oscillator from antenna terminal, remove the 150-mmfd condenser and replace with a 400-ohm non-inductive resistor dummy antenna and connect to grid cap of the 6K7 r-f tube.

Tune test oscillator and receiver to 18 mc and adjust condensers C8 and C7A in the order given.

CAUTION: On this band care must be taken to adjust the various condensers to the fundamental of the signal and not to the image. The image signal is equal to the fundamental minus twice the intermediate frequency of the re-

Fig. 3. Bottom view of Sparton Model 966, showing location of trimmers and coils.



ceiver. A set that is adjusted to the image frequency instead of to the fundamental may be detected by tuning over the band and checking the sensitivity at various points. If a dead spot appears near the center of the band, the adjustable condensers for that band have probably been adjusted to the image instead of the fundamental.

This type of mis-alignment may also be detected by tuning the test oscillator to a frequency of 15 mc and the station selector to approximately 15,900 kc. If a strong signal is found approximately at this frequency, it indicates that the band has been adjusted to the image frequency. The normal image frequency for 15,000 kc would be 15,000 kc minus twice 456 kc, or approximately 14,100 kc. Therefore a signal of this frequency may be found with the test oscillator generating a 15,000 kc signal.

Disconnect the antenna lead of the test oscillator from the grid cap of the

6K7 r-f tube and, using the 400-ohm resistor in series, connect to the antenna terminal.

Adjust condenser C6A. (Due to the interaction between the various circuits, it is necessary to move the station selector knob slightly while adjusting these trimmers in order to realize the maximum possible gain.)

Retune the test oscillator and receiver to 9 mc and check sensitivity and calibration.

D. Band No. 3: Turn the band selector switch to band No. 3.

Tune test oscillator and receiver to 7.2 mc.

Adjust condenser C11 and C6B.

Tune test oscillator and receiver to 3.6 mc and check calibration and sensitivity.

E. Band No. 2: There are no adjustable condensers for this band. However, it is advisable to check the calibration of the dial and the general operation of the receiver at both 1.7 mc and 3 mc. All adjustments should be rechecked to assure accuracy and stability of adjustment and calibration.

VOLTAGE READINGS

Voltage values are given in the diagram of Fig. 1. These are based on a line voltage of 115, and should be read with the antenna disconnected, volume control on full and band selector switch in the broadcast position.

It is not possible to read the voltage values for the control grids with the usual analyzer.

Kadette (2 tube)

Inoperative: Frequently caused by an open 3000-ohm resistor (R-328) located just under the 12A7 tube.

E. M. Prentke

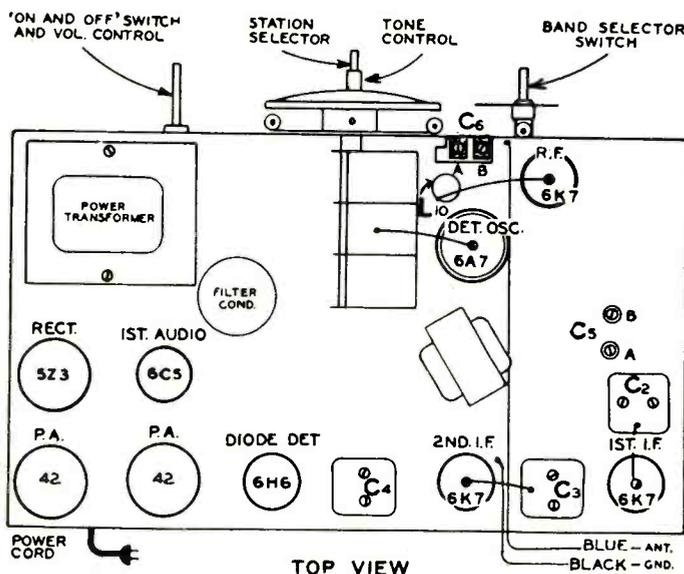


Fig. 2. Top view of Sparton Model 966, showing padder locations.

GENERAL DATA—continued

Silvertone Models 1922, 1932, 1982, 1992

These receivers are six-tube, battery-powered superheterodynes. The Models 1922 and 1982 are table models; the Models 1932 and 1992 are console models. In addition to the broadcast range they have a short-wave range covering the band from 5700 kc to 16000 kc. These models do not incorporate avc.

Tubes And Their Functions:

- 951—Translator
- 230—Oscillator
- 951—I-F
- 232—Detector
- 233—Output
- 1A2—Filament Ballast

BATTERY EQUIPMENT

Three 45-volt "B" batteries, one 4½-volt "C" battery tapped at —3 volts, and a 3-volt dry "A" battery are supplied with the receiver. A type 1A2 filament ballast tube maintains the filament voltage at its proper value, 2 volts, during the useful life of the "A" battery. If a two-volt storage battery is used for

"A" supply the type 1A2 ballast tube should be replaced with a 4-prong plug having its grid and plate prongs and the filament prong opposite the plate prong all connected together. The total "A" battery drain is .5 ampere. The total "B" battery drain is 18 milliamperes.

CAUTION

The receiver should be turned off before removing any tubes. Otherwise, due to the action of the ballast tube, the voltage across the remaining tubes will rise with the possibility of damaging them.

The volume control is a 35-ohm rheostat that varies the filament voltage of the 951 tubes. A control of this type has a slight time lag in its operation.

ALIGNMENT PROCEDURE

I-F Alignment: Connect the output meter across the loudspeaker terminals. Connect the ground lead of the test oscillator, in series with a .1-mfd condenser, to the receiver chassis. Connect the other lead of the test oscillator to the control grid of the 951 translator

tube. This is the 951 that is next to the variable condenser.

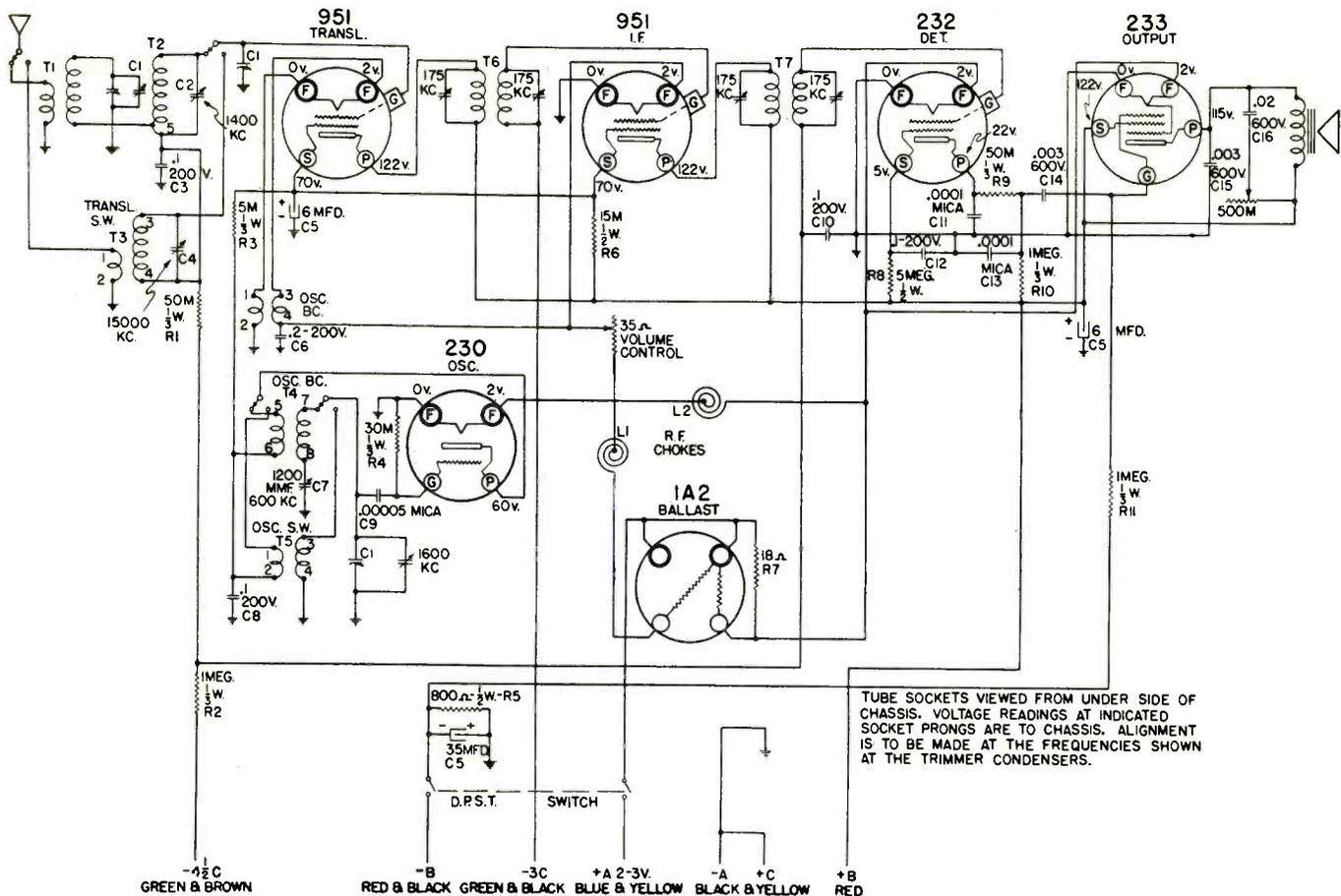
Set the test oscillator to 175 kc and adjust the i-f output transformer for maximum output meter reading. The i-f output transformer is the one nearer the rear of the chassis.

Leave the test oscillator connected as before and adjust the i-f input transformer for maximum output meter reading.

Repeat the adjustments to secure greater accuracy.

R-F Alignment; Broadcast: Leave the ground lead of the test oscillator connected to the chassis, through a .1-mfd condenser, as for i-f alignment. Connect the "hot" lead of the test oscillator to the antenna lead of the receiver, in series with a .00025-mfd mica condenser. Fully mesh the variable condenser and see that the dial pointer is horizontal.

Set the test oscillator to 1600 kc. Open the variable condenser plates all the way and adjust the oscillator trimmer for maximum output meter reading. The oscillator trimmer is the one on the



Circuit of Silvertone Models 1922, 1932, 1982 and 1992.

GENERAL DATA—continued

strip being higher than that of the air it displaces, results in an increase of capacity. Open the variable condenser just enough to indicate two or three points below maximum signal. As the feeler is inserted the meter reading should indicate increasing signal and then decreasing as the feeler is inserted farther. This procedure should be followed on both sections. Should the meter fail to show an increase in signal as the strip is inserted in one section, this indicates too great a capacity for the section. This may be corrected by bending the outside rotor plates at the point where they begin to mesh with the stator.

After checking the alignment at 1000 kc, repeat the process at 600 kc.

INTERSTAGE COUPLING CONDENSER

The interstage coupling condenser connected between the plate of the r-f

tube and grid of detector tube should be adjusted so there is slight oscillation at the high-frequency end of the band when the volume control is in full-on position. Slight oscillation may be noticed also at the low-frequency end.

Atwater Kent Models 317, 337

The circuit used in these models is shown below. There are seven metal-type tubes in all, as follows: 6K7 r-f, 6A8 mixer-oscillator, 6K7 i-f, 6H6 second detector and avc, 6F5 a-f, 6F6 power pentode and 5Z4 full-wave rectifier.

There are three waveband positions in this receiver. The waveband switch is shown in the short-wave position and it will be noted that when so set, the avc is taken off the 6K7 r-f tube. In the other two positions there is auto-

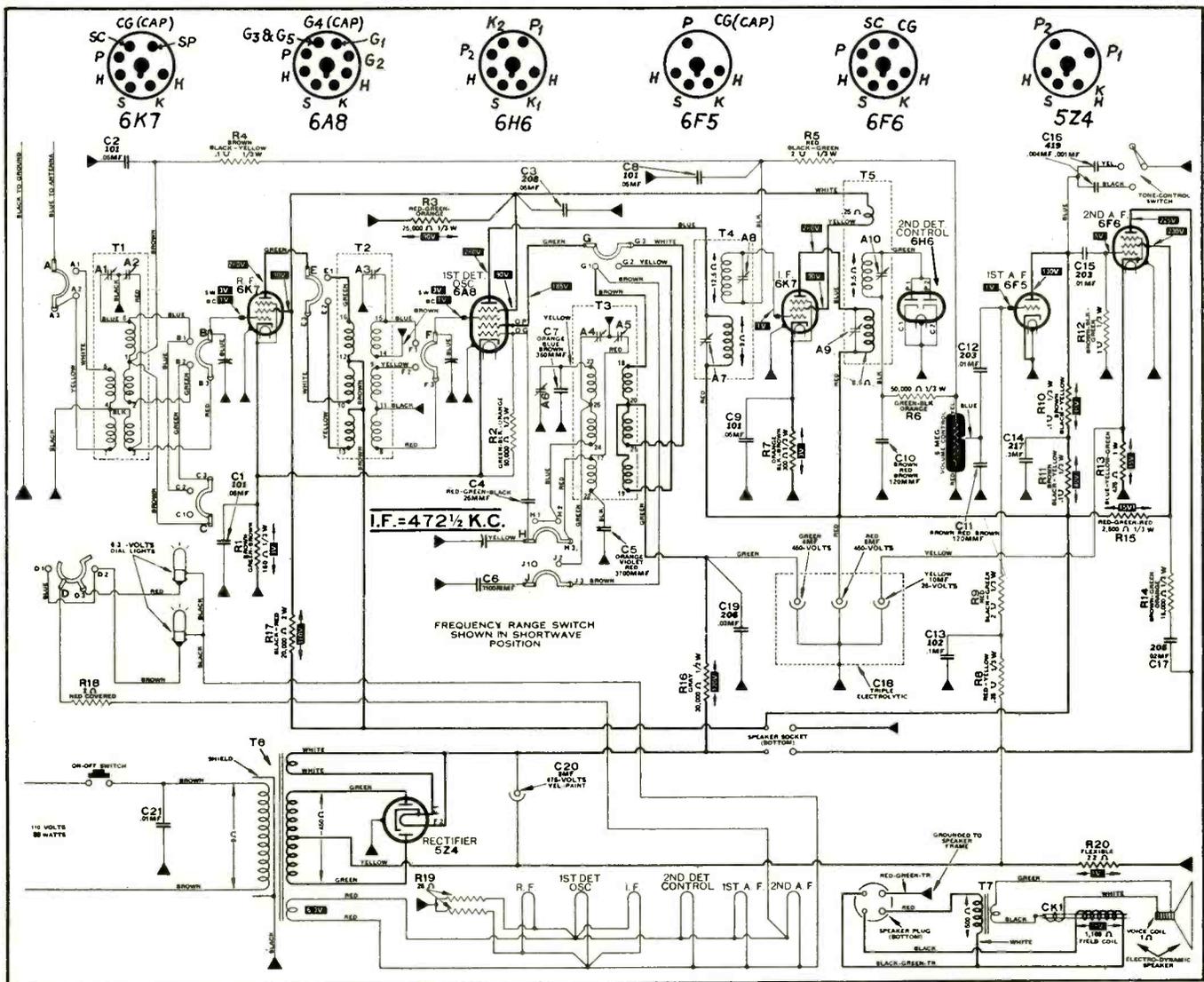
matic bias on both the r-f and the i-f tubes.

Initial bias for the 6K7 r-f tube and the 6A8 mixer-oscillator tube is supplied by a common bias resistor (R-1). Initial bias for the 6K7 i-f tube is supplied by the cathode resistor R-7. The paralleled diodes of the 6H6 tube are not biased. The 6F5 a-f tube receives bias from the voltage drop across resistor R-20 which is connected between the center tap of the power transformer and ground. The 6F6 power pentode is biased by the voltage drop across the cathode resistor R-12.

All voltage readings and parts values are given in the accompanying diagram.

Grunow 6HB Chassis

The 6HB Chassis is used in receiver Models 620 and 621. This is a 6-volt battery set with the following frequency



Circuit of Atwater Kent Models 317 and 337.

GENERAL DATA—continued

ranges: 550 to 1750 kc; 1700 to 5680 kc; 5.4 to 18 mc.

THE CIRCUIT

The circuit is shown in Fig. 1. The 1C6 tube is used as combination mixer-oscillator. The output of the mixer section is fed to an i-f stage using a type 34 tube. The output of this tube is fed to a type 30 tube which is connected to function as a diode rectifier, the plate and grid being connected together. The diode load circuit contains the volume-control potentiometer. This feeds a type 32 pentode which functions as the a-f voltage amplifier. The output of this tube is resistance-coupled to the type 30 a-f driver which supplies the necessary power for driving the push-pull Class B stage using a type 19 tube.

Initial bias for the mixer and i-f tubes is supplied by the voltage difference between the grid circuits and the series-connected filament circuits of these two tubes. Bias for the type 32 and type 30 a-f tubes is supplied by separate "C" bias cells connected in series with the respective grid circuits. There is no bias on the output tube.

Aside from functioning as the second detector, the diode-connected type 30 tube also supplies avc to the mixer and i-f tubes.

Note from the schematic of Fig. 1 that the Model 620 receiver employs an 8-inch magnetic speaker and the Model 621 receiver employs a 10-inch permanent-magnet dynamic speaker. Both types are shown.

ALIGNMENT

The receiver should be aligned in a location free from noise caused by motors, flashers, etc., as high-frequency disturbances will cause difficulties when the short-wave section is being adjusted. (A screened room is recommended.)

Dial Setting: Turn dial knob until condensers are fully meshed. The dial pointer (hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 o'clock. The minute hand should be at 12 o'clock or in a vertical position.

I-F Alignment: Connect signal lead of test oscillator to grid of 1C6 tube through a 0.25-mfd condenser. Connect the ground lead to the chassis.

Set dial pointer at 1400 kc and range switch on position A.

Place test oscillator in operation at 465 kc. Turn receiver volume control and tone control to maximum.

Attenuate test oscillator output to lowest value consistent with obtaining

a readable indication on the output meter.

Then adjust the four i-f trimmers, A1, A2, A3 and A4 located on the i-f transformers on top of the chassis, as shown in Fig. 2, until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustments.

1400-KC Alignment: Connect signal lead of test oscillator through a 200-mmf condenser to antenna binding post on chassis.

Connect the test oscillator ground lead to the ground connection of the chassis. Then proceed as follows:

Place test oscillator in operation at 1400 kc and turn dial on receiver to same frequency setting. Turn range switch to position A.

Then adjust broadcast oscillator trimmer A5 (see Fig. 2) to maximum output. Follow by adjusting the first detector trimmer A6 to maximum output.

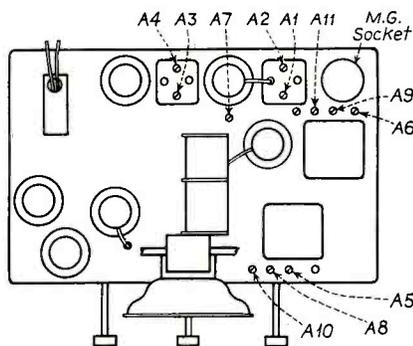


Fig. 2. The Grunow 6HB Chassis, showing location of padders, etc.

600-KC Alignment: Place test oscillator in operation at 600 kc and tune in signal to maximum (this point does not have to be exactly at 600 kc on the dial setting).

Then adjust the 600-kc padding condenser A7 in direction of signal increase. At the same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

Follow this procedure by rechecking at 1400 kc.

5-MC Alignment: Set range switch at position B and place test oscillator in operation at 5 mc. Also turn receiver dial to 5 mc.

Then adjust the oscillator trimmer A8 for maximum and follow this by adjusting the detector trimmer A9 for maximum.

8 to 18-MC Alignment: Connect signal lead of test oscillator through a 400-ohm resistor to the antenna binding post of the chassis. Connect the ground lead to the ground connection on the chassis.

Set range switch to position C and turn dial pointer to 18 mc. Then place test oscillator in operation at 18 mc.

Adjust set oscillator trimmers A10 for maximum and follow by adjusting the detector trimmers A11 for maximum.

On the 18-mc alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for the alignment point; that is, the setting giving the most capacity or the point at which the trimmer screw is farthest in.

Zenith 5513 Chassis

The 5513 chassis is used in receiver models 5-S-29 and 5-S-56. Export chassis 5513A is used in receiver models 5-S-29A and 5-S-56A. The circuit changes for models using chassis 5513A are given in Fig. 1.

Referring to the schematic diagram, it will be seen that either the metal or metal-glass tubes may be used in this chassis. If a change is made from one to the other type of tube, it is preferable to re-align the set.

THE CIRCUIT

The antenna is both inductively and capacitively coupled to the input transformer. The coils comprising this circuit function as a band-pass filter when the receiver is in the standard broadcast band position. For the short-wave bands, the antenna is inductively coupled to the grid circuit of the first detector through the primary of transformer 10. For the intermediate short-wave position, a portion of coil 1 is shorted out. For the shortest wave band (16 meters) all of coil 1 is shorted out and only the transformer 10 is in use.

The 6A8 is coupled to the 6K7 i-f tube through a double-tuned i-f transformer. A second double-tuned i-f transformer couples the output of the i-f tube to the paralleled diodes of the 6B6 tube. The diodes function as the second detector and also provide automatic bias for the first detector and i-f tubes.

The triode section of the 6B6 tube is used as an a-f amplifier and this is resistance coupled to a 6F6 power pentode which in turn feeds the dynamic speaker.

The tone control, consisting of vari-

GENERAL DATA—continued

able resistor R-9 and condenser C-10, is connected in the output circuit of the 6F6 pentode. Note that it is shunted across the plate and screen of this tube and, though at high voltage with respect to ground, actually has only 20 volts across it—the difference between the screen and plate voltages. It is, therefore, less subject to breakdown.

Initial bias for the first detector and

i-f tubes is supplied by the common cathode resistor R-2. The cathode of the 6B6 tube is made 1.5 volts positive by connecting it to a point on the voltage divider R-8. Since the paralleled diode plates are returned to the cathode directly, they are not biased. The grid of the triode section of the tube, however, is returned to ground and is therefore 1.5 volts negative with respect to

the cathode. Bias for the grid of the 6F6 power pentode is obtained by returning the grid circuit to a point on the voltage divider R-8 which is negative with respect to ground. This is the 250-ohm section of the divider which is seen to be connected between ground and the center tap of the power transformer which also has the speaker field in series with it.

VOLTAGES

All voltages are given in the diagram of Fig. 1. They are based on a line voltage of 110 and should be read with the antenna and ground disconnected from the set.

ALIGNMENT

Balance the i-f transformers at 252.5 kc with test oscillator connected to control grid of 6A8 and ground.

Next turn the band switch to C Band and connect test oscillator to antenna and ground leads. Set test oscillator at 15 mc and adjust oscillator trimmer

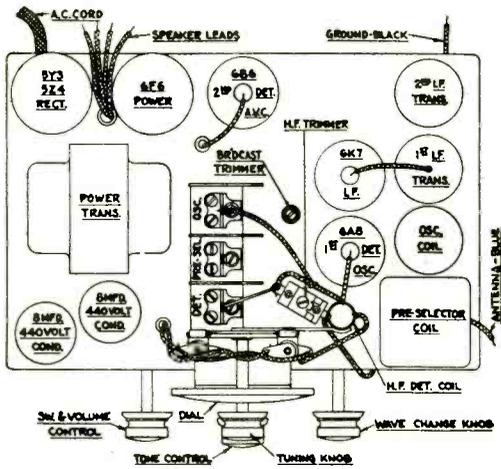
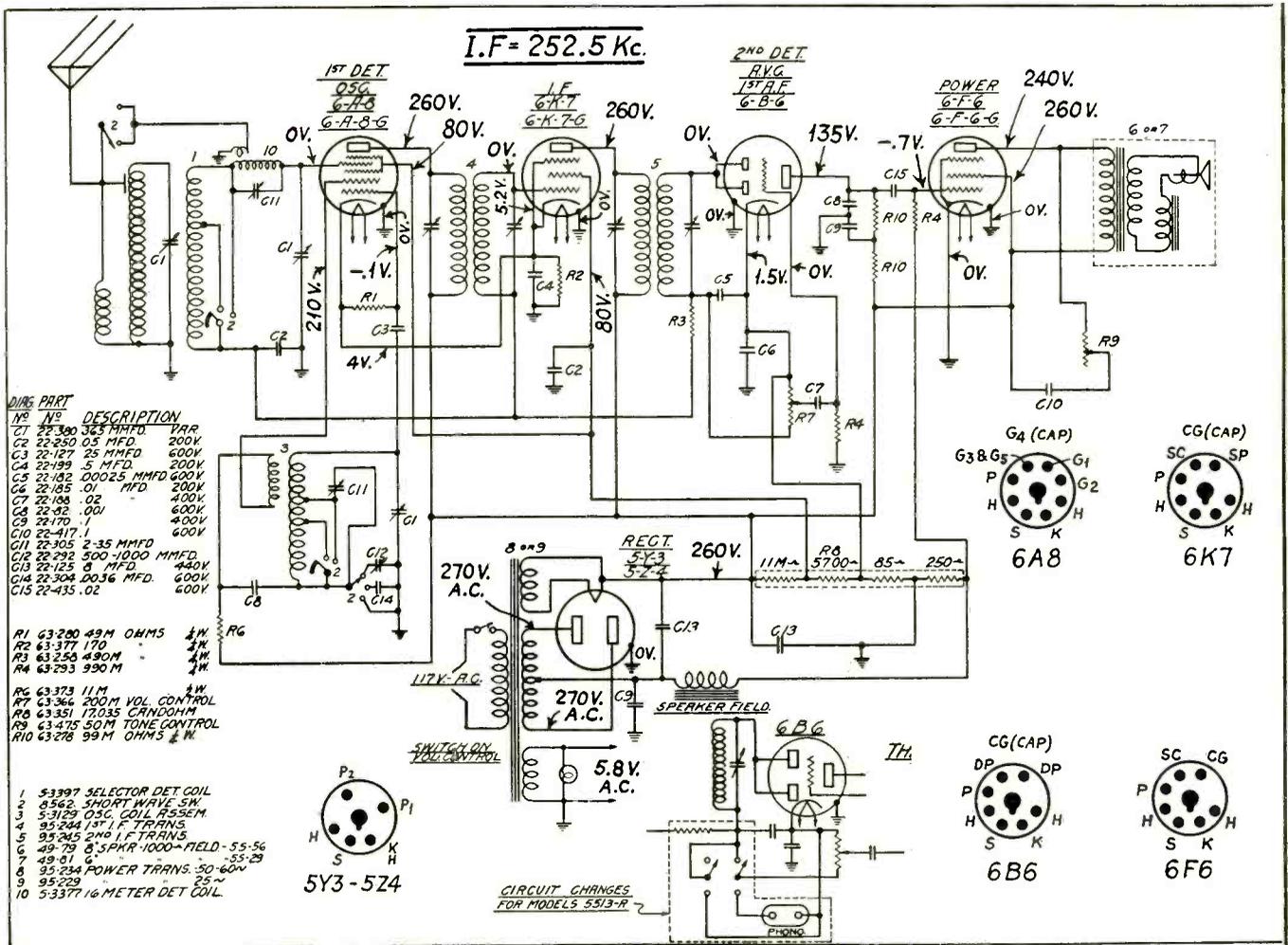


Fig. 1 (below). Circuit, with voltage and parts values, of Zenith 5513 Chassis, used in receiver models 5-S-29 and 5-S-56. Fig. 2 (left). Chassis layout of the Zenith 5513, showing location of padders, i-f transformers, etc.



GENERAL DATA—continued

on gang condenser for correct dial reading (see Fig. 2).

Adjust detector trimmer (located on top of chassis between front section of gang condenser and coil) for maximum output.

Now turn band switch to A Band and adjust oscillator trimmer (located on right side underneath chassis) for correct dial reading at 1400 kc; also adjust preselector and detector trimmers on gang for maximum output.

Follow this by adjusting the oscillator padder (next to oscillator section of gang on top of chassis) while rocking pointer back and forth past 600 kc to the combination giving greatest output.

The circuits should then be rechecked at 1400 kc. Then repeat entire procedure.

Fada Model 192

The Fada Model 192 is a metal-tube receiver of the a-c, d-c type. Referring to the diagram of Fig. 1, there is a 6K7 r-f tube feeding a type 6A8 mixer-oscillator. The 456-kc output of this tube is fed to a 6K7 i-f amplifier through a triple-section i-f transformer. The plate circuit of the 6K7 i-f tube is coupled through a second triple-section i-f transformer to diode P-1, of the 6H6 tube, which is used for detection only, and through the capacity (30) to diode P-2 which is used for providing automatic bias control to the r-f and mixer tubes.

All tubes are cathode-biased. The bias on the 6K7 i-f tube is controlled by the potentiometer (48) which is in tandem with the a-f volume-control potentiometer (48). Thus i-f and a-f gain are increased or decreased simultaneously.

The a-f signal component in the load circuit of diode P-1 in the 6H6 tube is impressed on the control grid of the 6C5 a-f amplifier. The plate circuit of this tube is of the parallel-feed type, plate voltage being fed to the tube through the resistor (6). The output of the 6C5 is fed through the capacity (43) to the center-tapped impedance (20) which develops signal voltages equal but opposite in phase for the grids of the two type 43 power pentodes connected in push-pull.

Tone is controlled by a variable condenser (34) shunted across the push-pull input impedance (20). Phonograph connections (30) are provided across the grid resistor (8) of the 6C5 a-f tube.

Two type 25Z5 rectifier tubes are used in the power-supply unit; one for

supplying voltage to the speaker field and the other for supplying voltage for the receiver tubes.

ADJUSTMENT OF I-F CONDENSERS

The six intermediate-frequency condensers are located as shown in the sketch of Fig. 2.

Disconnect the outside antenna system from the receiver.

In order to adjust accurately the various trimmer condensers of the receiver in accordance with the following instructions, it is essential to use a shielded signal generator capable of giving a modulated carrier which can be attenuated at 456 kc, 600 kc, 1500 kc, 6 mc and 15 mc.

This receiver is equipped with an automatic volume control which necessitates setting the manual volume control of the receiver to its maximum position to insure accuracy in alignment. To control the signal output of the receiver it will be necessary to use the attenuator control of the signal generator.

Disconnect the control-grid lead from the 6A8 tube.

Connect the high-potential lead of the signal generator to the control grid of the 6A8 tube, and the low potential side to the receiver "ground" lead.

Place an output meter (copper oxide type) across the speaker voice coil terminals so that variations in signal output can be noted.

Place the signal generator in operation and adjust the carrier output to 456 kc. Regulate the attenuator control of the signal generator so that the output signal is low enough to insure ac-

curacy in adjusting the i-f condensers.

With the aid of a bakelite type screwdriver, adjust the six i-f condensers to resonance. From a fidelity standpoint the best procedure for aligning the i-f system is to adjust the i-f condenser connected across the secondary winding feeding into the diode (2nd detector), then the link circuit condenser and finally the primary circuit. The same procedure is to be followed in adjusting the 1st i-f transformer. Do not adjust the i-f condensers at random but follow the above procedure of alignment carefully.

ADJUSTMENT OF S. W. SHUNT COMPENSATORS

The compensators are located as indicated in the sketch of Fig. 2.

Remove the signal generator connection from the control grid of the 6A8 tube and replace the control-grid lead.

Connect the antenna wire of the receiver chassis through a 400-ohm carbon resistor to the high-potential side of the signal generator. The ground wire should remain connected to the signal generator.

Adjust the carrier frequency output of the signal generator to 15 mc.

Turn the waveband selector switch to the left—short-wave position—set the calibrated dial of the receiver to read 15 mc.

Adjust the S. W. oscillator shunt compensator for maximum signal output. If two peaks are noted on this adjustment, the proper one is that with the compensator farthest "in". To determine that this compensator has not

(Continued on page 22)

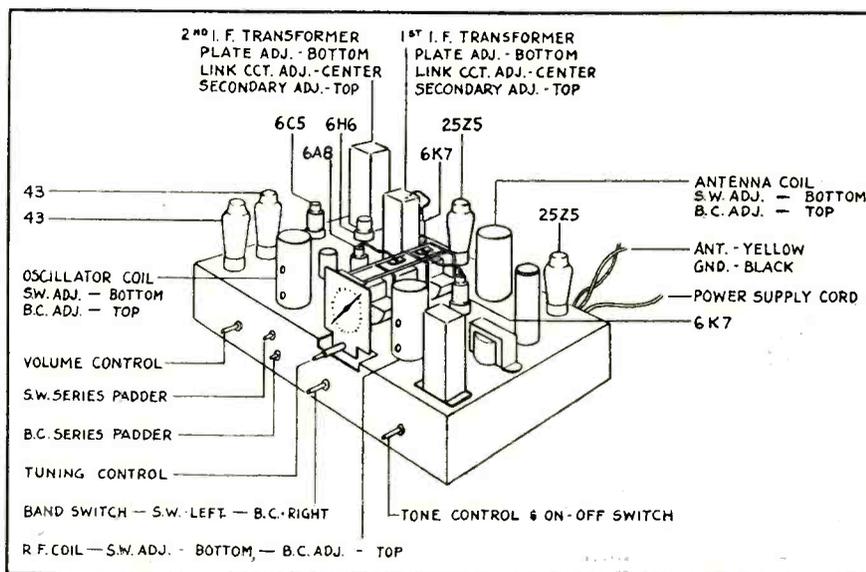
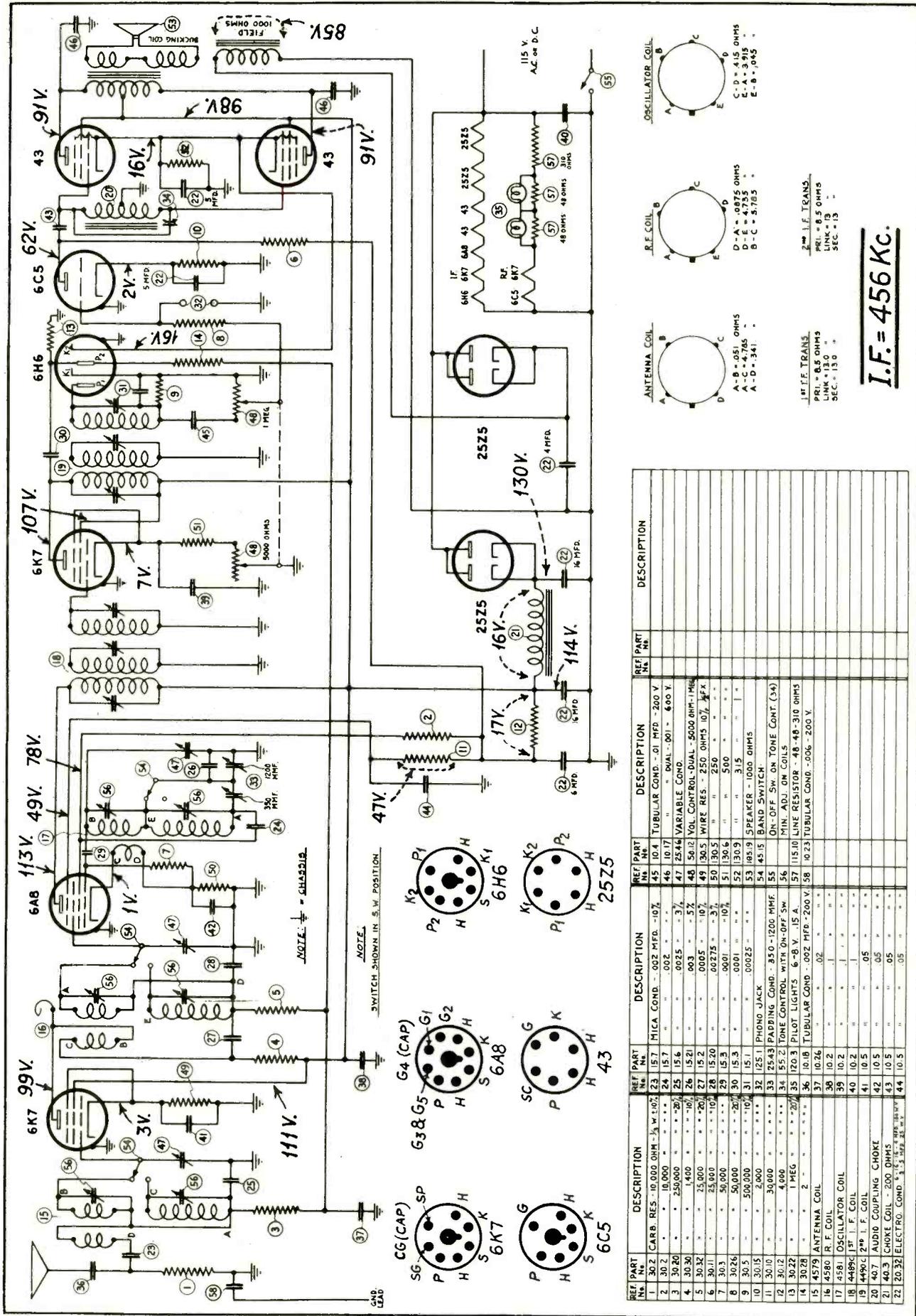


Fig. 2. Chassis of Fada Model 192 showing locations of tubes, padders, etc.

GENERAL DATA—continued



I.F. = 456 Kc.

Fig. 1. Complete circuit diagram of Fada Model 192. All parts and voltage values are given. Point-to-point resistance values are also given for the antenna, r-f, and oscillator coils, as well as the i-f transformers. See lower right of diagram for this data.

Auto-Radio . .

Chrysler Philco Model CT11

The circuit is shown in Fig. 1. There are two antenna connections—one for use with the type of antenna used in a metal-top car and the other for use with the antenna in a fabric-top car.

Note that the cathode circuit of the r-f tube contains, aside from the usual "initial bias" resistor, a sensitivity control. This is adjusted to meet usual reception and noise conditions and may also be completely shorted out by the "Local—Distance" switch. When this switch is closed, the bias on the r-f tube is reduced and the gain consequently increased.

Automatic bias control is placed on the r-f and mixer tubes. The volume control is of the compensated type with a tap on the resistance to which is connected an additional resistance and condenser in series which acts as a bypass circuit.

The tone control is in the plate circuit of the type 41 pentode and con-

sists of a fixed condenser grounded through a variable resistor.

The triode of the type 75 tube is biased by running the cathode to a point on the voltage divider which is positive with respect to ground. This places the grid at a negative potential with respect to the cathode. Bias for the 41 pentode is obtained by returning the grid to the center tap of the power transformer which is negative with respect to ground by an amount equal to the voltage drop across the choke (68).

ADJUSTMENT NOTES

The output meter must be connected by means of an adapter to the plate of the type 41 pentode and to the receiver chassis.

With the receiver and signal generator set up for operation at the prescribed frequency, turn the receiver volume control on full and set the signal generator attenuator so that a half-scale reading is obtained on the output meter. The

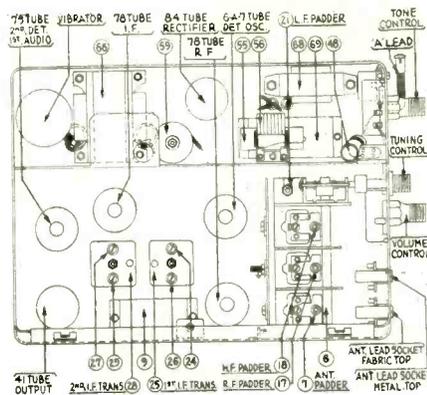


Fig. 2. Chassis layout of Chrysler Philco Model CT11, showing padder locations.

signal in the speaker should be audible but not loud.

The shielding on the signal generator output lead must be connected to the receiver housing.

The sensitivity switch must be in the "distance" position. The tone control should be turned to the brilliant position.

I-F ADJUSTMENTS

Adjust the signal generator to exactly 260 kc. Connect the generator lead to the grid cap of the 78 i-f tube in series with 0.1-mfd. condenser.

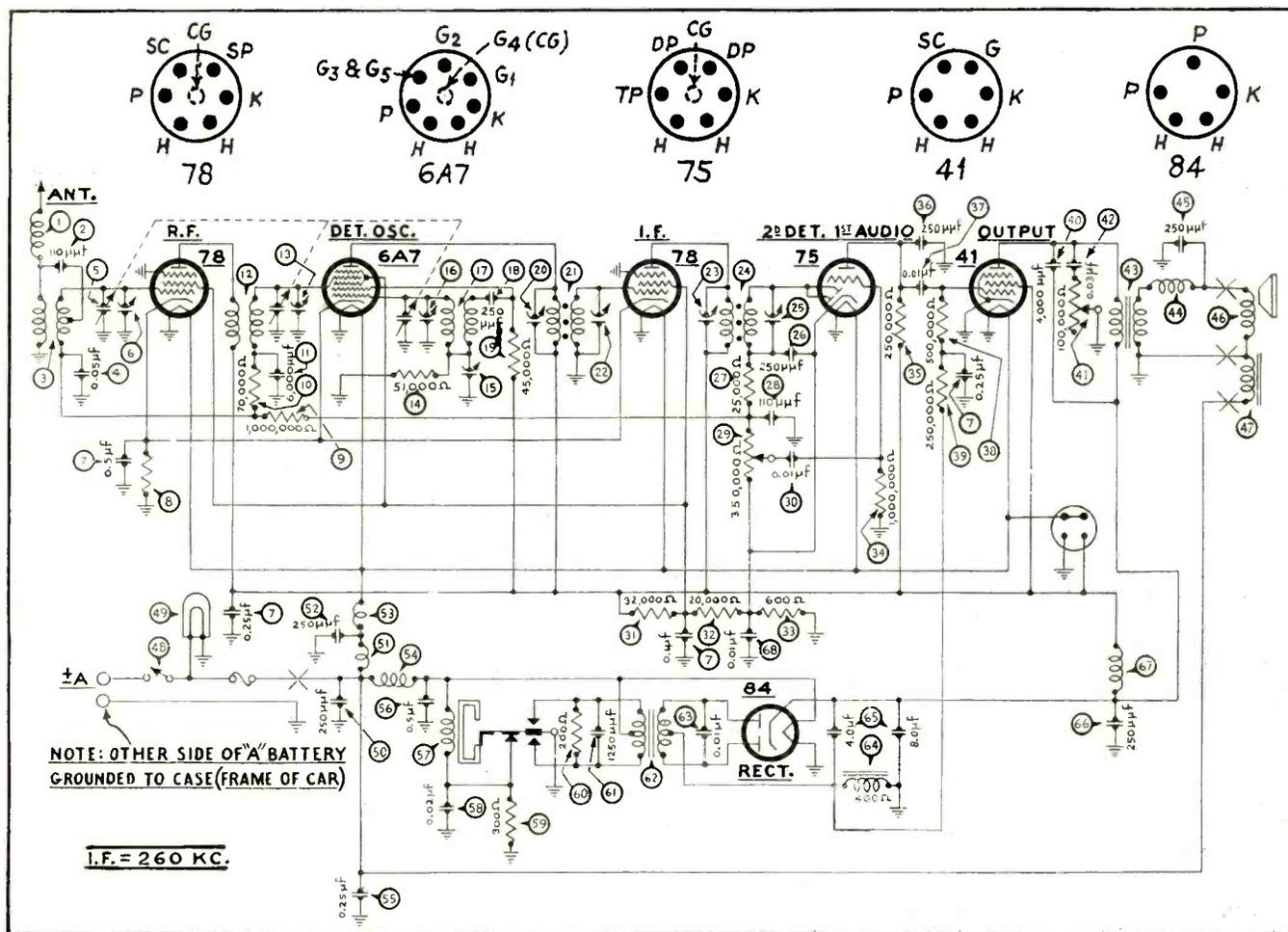


Fig. 1. Circuit of Chrysler Philco Model CT11.

Adjust the secondary screw padder (29) on the second i-f transformer for maximum reading on the output meter. Then adjust the primary screw padder (27) for maximum reading. Padder locations are given in Fig. 2.

Remove the generator lead from the 78 tube.

Connect the generator lead to the grid cap of the 6A7 tube in series with a 0.1-mfd condenser. Adjust the secondary screw padder (26) on the first i-f transformer for maximum. Then adjust the primary screw padder (24) for maximum.

HIGH-FREQUENCY ADJUSTMENTS

After padding the first i-f stage remove the generator lead from the 6A7 tube.

Adjust the signal generator to 1600 kc and then connect the generator lead to the grid cap of the 78 r-f tube in series with a 0.1-mfd condenser.

Turn the tuning condenser plates out of mesh as far as they will go. With the tuning condenser in this position, adjust the high-frequency padder (18)

and the r-f padder (17) until maximum reading is obtained on the output meter. This is the true setting for 1600 kc, 160 on the dial.

LOW-FREQUENCY ADJUSTMENTS

Turn the tuning condenser plates in mesh to approximately 580 kc, 58 on dial, and adjust the signal generator to 580 kc. Roll the tuning condenser and adjust the low-frequency screw padder (21) for maximum.

H-F RE-ADJUSTMENT

Turn the tuning condenser plates out of mesh as far as they will go and adjust the signal generator to 1600 kc. Then adjust the high-frequency padder (18) again for maximum reading on the output meter.

ANTENNA ADJUSTMENTS

Connect the generator lead to the antenna cable assembly (made up of Part No. L1915 loom and 40 inches of 16 strand No. 30 wire), using a 110-mmfd condenser in series between the two leads. Plug the cable into the antenna socket marked "fabric top."

Turn the tuning condenser to 1400 kc and set the signal generator to the same frequency. Adjust the padders (17) and (7) for maximum.

When the antenna stage adjustment is made with the receiver installed in the car, the receiver antenna lead must be connected to the car antenna in the usual manner. The signal generator output lead should be connected to a wire placed near the car antenna but not connected to it.

Majestic 490, 491, 493

Notes: Occasionally blows C-15 next to rectifier. This usually ruins the 6Y5 rectifier. Have experienced considerable difficulty with set when used in damp places. Persistent blowing of fuses generally means a shorted 6Y5, a shorted filter condenser or defective vibrator. Cutting out when voltage supply drops slightly usually means a poor 6Y5 or 6A7—or both.

F. C. Wolven

FADA MODEL 192

(Continued from page 19)

been adjusted to the image frequency, turn the receiver dial to approximately 15.9 mc. If no signal can be heard at this setting even with a greater signal generator output, the S. W. oscillator shunt compensator has been improperly adjusted and it will be necessary to re-adjust to the proper peak. After re-adjusting, check to see that the image frequency comes in at 15.9 mc. It is well to bear in mind throughout these adjustments that with the same signal input to the receiver, the image response point should be weaker than the original reading.

Having determined the correct peak, and maximum setting, for the S. W. oscillator shunt compensator, adjust the S. W. r-f stage shunt compensator and the S. W. detector shunt compensator for maximum signal output. Turn the receiver dial to the image point (15.9 mc) to determine that both compensators have been adjusted to the correct peak (See paragraph above).

ADJUSTMENT OF S. W. OSCILLATOR SERIES TRIMMER

Adjust the carrier frequency output of the signal generator to 6 mc.

Turn the calibrated dial of the receiver to pick up this 6-mc signal.

With the aid of a bakelite type screwdriver, adjust the S. W. oscillator series trimmer (see sketch) until a maximum output signal is indicated on the out-

put meter. To insure perfect alignment it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output.

Having determined the maximum peak of the S. W. oscillator or series trimmer, re-adjust the carrier frequency of the signal generator to 15 mc. Turn the calibrated dial to 15 mc, and re-adjust S. W. oscillator shunt compensator, and then, S. W. r-f stage shunt compensator and S. W. detector shunt compensator for maximum signal output.

ADJUSTMENT OF BC SHUNT COMPENSATORS

The compensators are located as indicated in the sketch.

Remove the 400-ohm resistors from the high-potential side of the signal generator and insert a 250-mmfd mica condenser in its place.

Turn the waveband selector switch to the right—broadcast position.

Adjust the carrier frequency to 1500 kc.

Set the calibrated dial of the receiver to read 1500 kc.

Adjust the BC oscillator shunt compensator for maximum signal output.

Adjust the BC r-f stage shunt compensator and the BC detector shunt compensator for maximum signal output.

ADJUSTMENT OF BC OSCILLATOR SERIES TRIMMER

Adjust the carrier-frequency output of the signal generator to 600 kc.

Turn the calibrated dial of the receiver to pick up this 600 kc signal.

With the aid of a bakelite type screwdriver, adjust the BC oscillator series trimmer (see sketch) until a maximum signal is indicated on the output meter. To insure perfect alignment it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output.

Having determined the maximum peak of the BC oscillator series trimmer, re-adjust the carrier frequency of the signal generator to 1500 kc. Turn the calibrated dial to 1500 kc and re-adjust BC oscillator shunt compensator, and then, BC r-f stage shunt compensator and BC detector shunt compensator for maximum signal output.

Arvin I-F Peaks

In the following list are given the i-f peaks for the 1936 models of the Arvin (Noblitt-Sparks) line of home radio sets.

<i>Model</i>	<i>I-F Peak</i>
41	456
51	456
51B	456
61	456
61B	175
61M	456
62	456
62B	175
62M	456
81	456
81M	456



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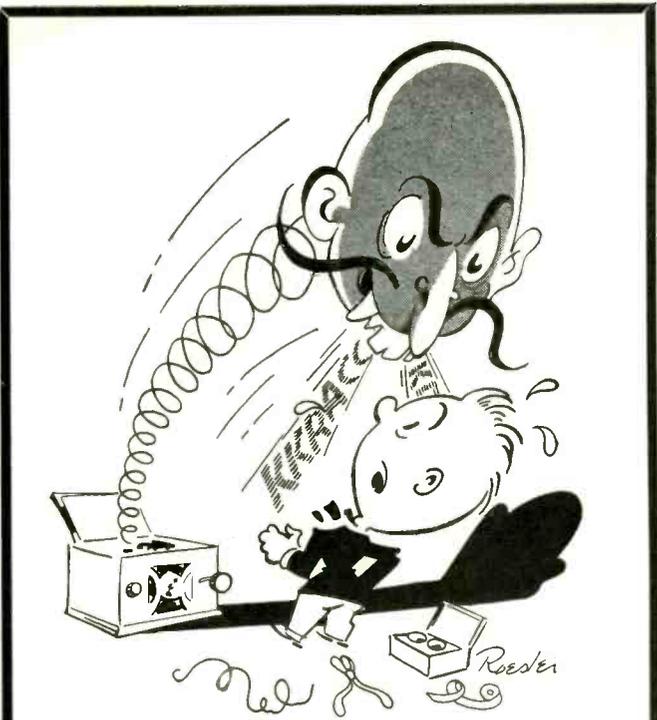
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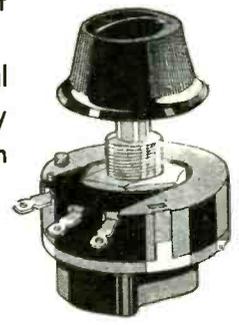
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RECEIVER CASE HISTORIES

Airline AE-11

Low volume, broad tuning: Caused by sections of variable condenser being out of alignment. Remove whole assembly and adjust plates until spacing appears uniform. Replace and check alignment with tuning wand. Try for best average alignment, as exact alignment over entire scale is difficult to obtain.

Oscillation: If set oscillates at 1500 kc, check the neutralization. The neutralizing condensers are metal angles mounted on the stators of the tuning condenser and placed close to each other. If oscillation persists, bend the long bus-bar grid leads closer to the chassis to reduce interaction. The 1500-kc trimmers are the flexible metal shields between stators.

Coil shields: It is not unusual to find one or more loose coil shields.

Slippage of dial drive: If the dial drive slips, wedge the friction drive open, loosen the set screw holding the tuning drum and turn the drum half a turn. Tighten the set screw and make sure the drum engages properly with the friction drive.

Note: This set is not listed in most manuals but the circuit is almost identical with that of the U. S. Apex 41, 42, 43, 44, 60, 60A of 1929. The only major difference lies in the fact that the Apex sets use an output impedance with 45's in the output while the Airlines omit the impedance and use 71-A's.

F. C. Wolven

B.O.P. Air Mate

Distortion and high, thin tone at high volume: All condensers in electrolytic block tested 25 percent below normal rating. It is better to replace these four units with emergency type units than to order new block. Never replace only one section.

F. C. Wolven

Colonial 36 AC and 36 P

Notes: When servicing these models it is well to replace the 350-ohm black bias resistor connected from the first and second r-f cathodes to the chassis. Use a 1-watt carbon resistor. Also, replace the two 400,000-ohm leaks in the output tube grid circuits, as well as the 60,000- and the 100,000-ohm voltage divider. A more remote cause of lack of sensitivity is an open antenna winding in the first r-f coil, or a broken flexible lead to this winding.

E. M. Prentke

Crosley 163

Low volume: Plate voltage of second detector (77) should be about 5 volts. Check for open plate load resistors. These units should be replaced with 3,000,000- and 300,000-ohm resistors.

Vito F. Daidone

G. E. K-62

Motorboating: Caused by leaky bypass condensers in plate and grid circuits of tube. All bypass and filter condensers are in one can which should be replaced. Late production models have an extra condenser in the can. Care must be used to select proper condensers for AVC circuit or difficulty will be experienced with this circuit. The extra condenser should not be used on early production models.

Failure of AVC: Due to one of resistors which form voltage divider across speaker field. Normal value of this resistor is 190,000 ohms but was found to be only 50,000 ohms.

H. J. Hicks

G. E. K-62, S-132

Oscillation when correctly aligned: Caused by loss of capacity in condenser across output of rectifier. An oil-treated electrolytic replacement can be cemented to the end of the tuning condenser and connected at terminal board. Apparent "forced" oscillation is often due to dirty or dry rotors, however, so check for this condition first.

F. C. Wolven

Graybar GB-9

Motorboating: (See G.E. K-62.)

Grunow Models 470, 580, 581, 640, 641

Code interference: Due to interference caused by commercial code stations in some locations, it has been necessary to use two i-f frequencies for the receiver models listed above—one of 490 kc where code interference is in the neighborhood of 455 kc, and an i-f of 465 kc where the interfering stations are operating near 500 kc.

The i-f frequency used is stamped on the rear of the chassis. If there is any

doubt as to i-f peaking, it is only necessary to apply a variable i-f signal to the i-f amplifier and maximum output will indicate resonance, or frequency at which the i-f transformers are peaked.

Howard 1936 A-C, D-C Models

Possible hum: The pilot-light leads running from the sockets to the resistor should be kept high and away from all nearby wires to avoid pick-up hum.

Kadette Model 72

Oscillation or microphonic howl: Oscillation may be caused if the grid leads of the 106 and 34 tubes are not kept separated.

A microphonic condition may be caused by the 25S tube.

Majestic 460 Series

Noise with antenna and ground shorted, low sensitivity and selectivity. Primary (lower) trimmer on first intermediate transformer refused to peak properly indicating considerable resistance in the circuit. The trouble was due to a defective i-f transformer.

Tip: The quickest way to show up a doubtful or intermittent coil is to very quickly short the plate to ground. While this will not harm a good coil it will show up weak spots.

Emergency i-f transformer replacement: Although exact replacements are preferable, I have found that in emergencies a good section from a blown Radiola 80 i-f transformer will serve nicely. To use this substitute, break the wax coating and unwrap the paper. (The coils are wound on the same form with waxed paper between the layers, the paper extending across both coils.) Cut the form of the Radiola unit about $\frac{1}{8}$ inch from the coil and fasten it to the good section with sealing wax. Connect the inside terminal to B plus and the outside to plate. Fasten the entire assembly in place between the two fibre strips and reassemble in shield can. Realign.

F. C. Wolven

Philco Model H-122

Fading, with set becoming inoperative when jarred: Replacing the 0.0006-mfd condenser, No. 30-4125, cured the fading. The intermittent operation was caused by a hex nut on the side of the receiver which, when jarred, would short one of the plates of the 79 to ground.

Vito F. Daidone

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RECEIVER CASE HISTORIES—continued

Philco Model T6—Ford

Fading and low sensitivity: The resistance of the oscillator coil should be about 4 ohms under normal conditions, but when set faded the resistance of this coil was found to be 45 ohms. Replace and realign receiver.

Vito F. Daidone

Philco 54

Low volume, low voltages: If tubes check OK, test for open filter condenser (41). The replacement should be a 12-mfd unit.

Vito F. Daidone

Philco 111A

Fluctuating volume: Voltage test indicated the voltage on the 27 audio tube to be 10 percent low, while the grid voltages of the 45 were 33-1/3 percent down. Condition due to opens in both windings of input transformer.

Gerald A. Gauntlett

Radiola R-11

Oscillation when correctly aligned: (See G. E. K.-62, S-132.)

Radiola R-50

Lack of sensitivity and off calibration at low-frequency end of dial: Suspected loss of capacity in oscillator padding condenser. Since it was impossible to compensate for drop with trimmer, shunted a small mica unit across this condenser. The heat from solder on lugs brought condenser back on normal as judged by dial calibration. However, capacity was lost after set was in operation for short period. Replacement necessary.

F. C. Wolven

Radiola 18

Intermittent frying and crackling: Due to high-impedance primary winding in r-f coil burning out. Try shorting plate prong to chassis very quickly.

Pentode tubes, especially 47's may cause distortion, cutting off, etc., due to secondary emission from the control grid. This is very prevalent in sections with high line voltage.

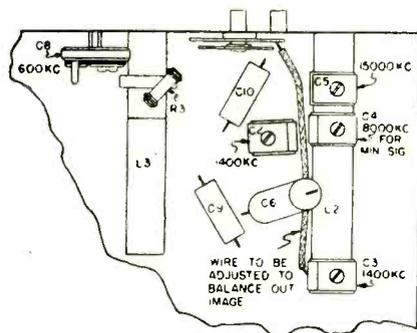
F. C. Wolven

RCA R-11

Motorboating: (See G.E. K-62.)

Silvertone 1905, 1915, 1955, 1965

Reducing image response: In locations that are near powerful broadcasting stations difficulty may be experienced from image response. That is, the sta-



tion may be picked up at its proper frequency and also at its image, 350 kc lower. This image response may cause an objectionable heterodyne whistle with some other station that comes in at nearly the same point on the dial.

Turn the variable selectivity and tone control to its sharpest position (all the way left) and turn the volume control all the way on. Couple a test oscillator, adjusted to 1000 kc, to the antenna lead of the receiver and tune in its signal. The test oscillator must be adjusted to give high output.

Leaving the receiver tuned to 1000 kc, change the test oscillator frequency to approximately 1350 kc. Carefully adjust the test oscillator frequency so that its signal (the image) will be heard loudest in the receiver.

There is a wire that runs from the stator of the trimmer, C-3 to a lug on the wave switch. Using a piece of bakelite or wood, to prevent hand capacity effects, push this wire up under the coil, L-2. The wire should be made to hug the coil closely. By pushing just the right amount of this lead under the coil, the image response can be balanced out.

It is not necessary to change any of the alignment adjustments of the receiver.

If a test oscillator is not available and a strong station of about 1350 kc can be tuned in, this adjustment to eliminate image can be made as follows:

Turn the volume control of the receiver all the way on and turn the variable selectivity control to its sharpest position, as before. Tune in the image of the station at a frequency 350 kc lower than the assigned frequency of the station. For example, if a station's assigned frequency is 1350 kc, tune in its image at a dial setting of 1000 kc on the receiver and balance out the image by shifting the wire in the same manner as described above for the method using a test oscillator.

Sparton 737

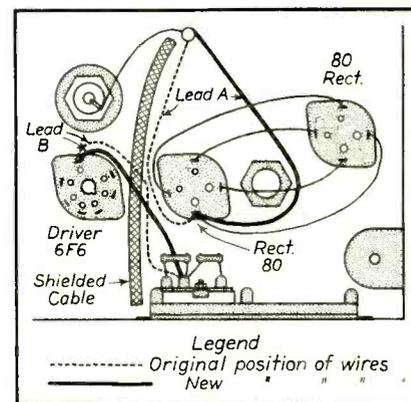
Low volume, poor selectivity: Low plate voltage and abnormal plate cur-

rent on fifth r-f tube caused by open secondary in fourth r-f coil. It is well to resolder each terminal of the coils when servicing one of these receivers.

Vito F. Daidone

Wells-Gardner Series 2CM

Excessive a-c hum: In some of these sets the 6F6 driver control grid lead is alongside the lead between the choke and the 80 socket nearest the center of the chassis. The latter carries a-c and there is inductive pickup by the control-grid lead of the 6F6 driver. In the accompanying illustration are shown the original positions of these two leads and



correct positions to which they should be moved.

Hum may also be caused by an unbalanced plate-current condition in the output-stage 6F6 tubes. The plates of these tubes should preferably balance within 5 milliamperes and in no case should they differ by over 10 milliamperes. Try several 6F6 tubes in the output-stage socket if a-c hum is encountered.

Westinghouse WR-15

Motorboating: (See G.E. K-62.)

12Z3 Rectifiers

Sets using 12Z3 rectifiers have an ailment that I have never experienced in any other type. Alternating-current voltage will be found on the plate of the 12Z3 but no d-c voltage will be found on the cathode. The ribbon lead from the cathode (within the tube) often burns off close to the cathode. Due to the construction of the tube plate-to-cathode shorts are common and the low-impedance of the filter condenser to a-c causes this unique failure.

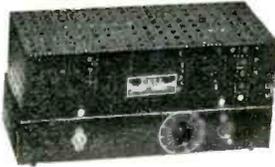
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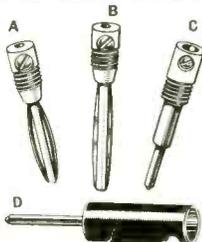
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"417 THINGS EVERY SERVICE MAN SHOULD KNOW"

Alfred A. Ghirardi, author of the world-famous *Radio Physics Course*, has discovered, in gathering material for his newly-published *Modern Radio Servicing*, that the up-and-coming radio Service Man of today uses four hundred and seventeen different kinds of specialized information in his work, and that he has to have all this mass of information available at a moment's notice.

"Competition has brought about a state of affairs," says Mr. Ghirardi, "where a Service Man's success today may be directly measured by his supply of information. Unless this information were made available in one quickly accessible source, a Service Man would have to change himself into a walking encyclopedia."

Among the 417 things every Service Man should know about, Mr. Ghirardi lists Test Instruments, Latest Test Methods, Latest Repair Methods, AVC and QAVC Circuits, Intermittent Reception, Hum, Distortion, Aligning Receivers, The Cathode-Ray Oscilloscope, Auto-Radio, All-Wave Receivers, Sales and Advertising Methods, Intermediate Frequencies, "Case Histories," and Auto Reference Data.

The entire list of 417 is available without charge from the publishers of *Modern Radio Servicing*,—Radio & Technical Publishing Co., 45-S Astor Place, New York City.

PR SMA SERVICE COURSE

The slogan of the Philadelphia Radio Service Men's Association, "Better Radio Repairs; Improved Radio Reception," is rapidly becoming the by-word among Service Men in Philadelphia. This expression is not merely a slogan of words, but rather one of *action*. The officers and Advisory Board of this association realized the necessity for keeping PRSMA members thoroughly efficient in the fundamen-

tals and theory of radio, and maintaining their knowledge and information abreast with modern innovations in the industry. With this necessity in mind they devised a new schedule of procedure . . . a *Servicing Course!*

This course, together with the excellent educational lectures which are presented to PRSMA members by representatives of the industry's leading manufacturers, will furnish Philadelphia Service Men the finest technical information obtainable and available.

Presenting this course is the result of long formulated plans, ideas, and extensive preparation by a hard-working special committee. It will be released in pertinent sections, each section covering thoroughly one phase of radio service. The sections will follow in fine continuity and lay the groundwork for the following ones.

The course has been prepared with the paramount idea in mind to make it entirely interesting; not merely cold lectures, but thorough presentations, anticipating questions and answering them. Thus when each section has been delivered, the Service Men will know the *How, Why, When, and Where* of what it was all about.

And, we announce proudly that this service course has been prepared, and will be presented entirely by authoritative members of PRSMA. Recognized radio Service Men in the Philadelphia area who are interested in securing the benefits of this timely instruction course should contact the writer for invitation particulars.

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Chairman, Publicity Committee,
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NEW YAXLEY REPLACEMENT MANUAL AND SERVICE GUIDE

The Yaxley Manufacturing Division of P. R. Mallory & Co., Inc., Indianapolis, Indiana, have recently released for distribution to radio Service Men and techni-

cians, the 1936 edition of the Yaxley Replacement Volume Control Manual and Service Guide. Company executives report that twenty-four months were devoted to the preparation of the material in this new manual. Five radio service engineers, especially trained for the task, compiled, checked and rechecked the tremendous amount of data it contains.

The first edition of the Yaxley Replacement Volume Control Manual, issued in 1934, was recognized as the most complete and comprehensive of its kind ever published. The new edition is even better. It lists over five thousand set models. It provides more factual data and contains a complete catalog of Yaxley approved radio products.

Any authorized radio Service Man can obtain a copy of this new manual, containing 159 pages of valuable data and information, by addressing the Yaxley Division of P. R. Mallory & Co., Inc., Indianapolis, Indiana.

AMERICAN CONDENSER OPENS FACTORY

The American Condenser Corporation have opened a factory at 2508 South Michigan Avenue, Chicago, Illinois, for the manufacture of electrolytic and paper condensers. Mr. Irving Menschik, long associated with the radio industry, has been placed in charge of the manufacturing.

ANDRUSS RECEIVES APPOINTMENT

Bell Sound Systems, Incorporated, of Columbus, Ohio, have announced the appointment of N. F. Andruss of San Francisco, Calif., as their Pacific Coast Representative. Mr. Andruss plans to introduce a new style in sound truck presentation and is equipping his automobile while at the "Bell" factory. In addition to the sound equipment, Mr. Andruss will continue his work with Hickok test units and will pioneer the "Presto" New York line of sound recording equipment.

CHANGE IN NAME

The Alloy Transformer Company, Incorporated, 136 Liberty Street, New York City, manufacturers of a complete line of transformers, have changed their name to Aalloy Transformer Company, Incorporated.

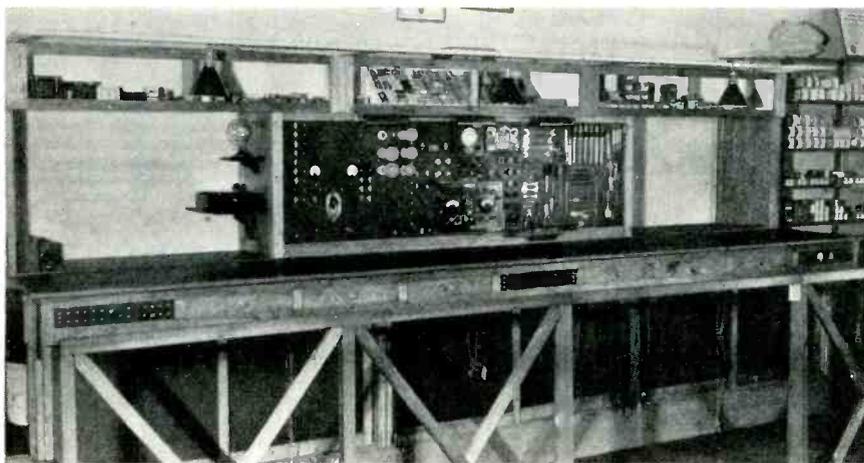
NEW NATIONAL BULLETIN

The National Company, Inc., Malden, Mass., has released for distribution Bulletin No. 250, listing details and prices on the latest National products.

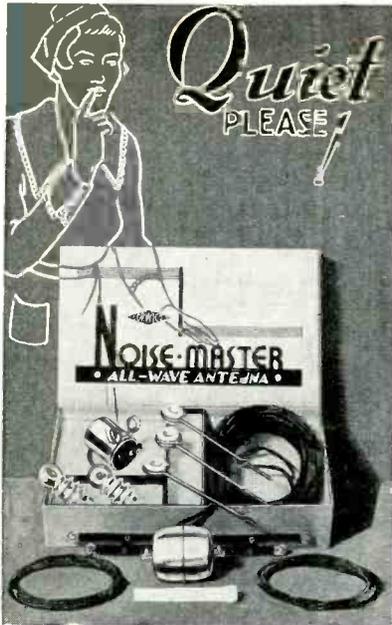
Of special interest in this bulletin is the data on the new National "One-Ten" Ultra-High Frequency Receiver, using Acorn and Metal tubes, and the Ultra H-F Tuning Unit.

G. E. OSCILLOGRAPH BULLETIN

General Electric Company, Schenectady, N. Y., has issued a bulletin on the G. E. Type HC-10-B1 Cathode-Ray Oscillograph. The technical details of the complete unit are provided.



The service bench at the Walton Radio & Electric Company, Sabetha, Kansas. Small panel on left is for battery radios. Small panel on right is for 32-volt sets. The large panel that contains all of the modern test equipment is so made that it may be moved at will from one end of the bench to the other by a reversible motor which saves duplication of equipment. The upper display shelf has glass panels. The lower shelves are for servicing manuals and radio data.



"NOISE-MASTER"

Makes every receiving set a BETTER set

Electrically AUTOMATIC in operation

LIST PRICE \$6.75

Also available with special transformers for European broadcast bands . . . list \$7.00

Eliminates static on both broadcast and shortwave bands.



QUIET is what the set-owner craves, and here's the way to give 'em what they want. This A.A.K. licensed product, designed and engineered with typical CORWICO thoroughness, needs no manual operation after a qualified service-man has adjusted it. It eliminates noise and improves reception EVERYWHERE. Use it on your next installation!

Write for descriptive literature on this and other CORWICO units.

Cornish Wire Co., Inc.

30 Church Street

New York City



New and Better CARBON RESISTORS

They sure look good! And they're just as good as they look. Ideal for applications requiring non-inductive resistance dissipating 1 watt or less. Superior . . . yet cost no more.

- Solid molded carbon element. Positive conduction. Non-fluctuating. "Noiseless."
- Accurate resistance values (well within 10%) as plainly stamped on body, and R.M.A. color coded.
- Non-inductive (no appreciable change at h.f.). Non-hygroscopic (unaffected by moisture). Withstand severe punishment.
- In 1/3, 1/2 and 1 watt ratings. All standard resistance values.

DATA New catalog, just issued, covers entire line of condensers and resistors. Sent on request, with sample copy of Research Worker. Meanwhile, contact local AEROVOX jobber for those better radio parts.



CORPORATION

80 Washington St.

Brooklyn, N. Y.

UTAH

VIBRATORS



Tear out this ad and pin to your letter-head for FREE copy of the NEW UTAH General Catalog of vitalized radio parts

UTAH RADIO PRODUCTS CO.,
Orleans St., Chicago

IF IT'S SOUND WEBSTER-CHICAGO MAKES IT

NOW! A COMPLETE P.A. SYSTEM WITH FULL 8-WATT OUTPUT CRYSTAL MICROPHONE; SINGLE OR DUAL SPEAKERS MIXES MICROPHONE AND PHONOGRAPH.

MODEL P.A. 308 has full 8-watt undistorted output. It is equipped with 8" dynamic speakers, has fifty feet of extension cord, and is housed in a strong leatherette covered case. Fully portable, net weight with single speaker 27 lbs.



MODEL P.A. 308

Model P.A. 308 is also available for fixed installation. System is complete, speaker furnished with baffle.

Price is surprisingly low. Write for details.

WEBSTER-CHICAGO

manufactures a complete line of public address systems, sound equipment amplifiers and accessories of all kinds.

SEE YOUR JOBBER OR WRITE FOR CATALOG

THE WEBSTER COMPANY
Section J5
3825 W. Lake St.
Chicago, Illinois

Please send me full details on Model PA-308 . Send complete accessory catalogue .

Name

Address

City

State

HIGHLIGHTS . . .

"MICROPHONE HEADQUARTERS" ENLARGES FACTORY AND LABORATORY FACILITIES

Continued increase in the demand for Shure microphones has necessitated a considerable enlargement of both factory and laboratory facilities of Shure Brothers Company, 215 W. Huron Street, Chicago, according to a recent announcement by Mr. S. N. Shure, President. Factory and laboratory space has been actually doubled to take care of present production and design schedules.

A particularly interesting addition is an improved low-reverberation sound room for acoustic measurements. In it has been installed a new hybrid sound-reproducing system, designed by Shure engineers, which affords a precision sound source useful over the unusually wide frequency range from 20 to 20,000 cycles.

HAMMARLUND CATALOG "36"

The Hammarlund Manufacturing Company, Incorporated, 424-438 West 33rd Street, New York City, now have available their new Catalog "36". The 12-page catalog covers condensers, coil forms, sockets, transformers, chokes, shields, and other products for ultra-short-wave, short-wave, and broadcast receiving and transmitting use. The numerous items are illustrated, technical descriptions, charts, diagrams, curves, and the like, being included.

ALLIED RADIO SHOW

An impressive demonstration of intense interest in radio progress was revealed at the recent opening of the new Salesrooms of the Allied Radio Corporation, 833 W. Jackson Blvd., Chicago. In the course of the three day celebration, more than 11,000 Radio Dealers, Service Men, Amateurs and Sound Men from a number of Middle West states, crowded around the many interesting and educational displays.

Exhibiting manufacturers, among them R. C. A., Raytheon, Clough-Brengle, National, Triplett, Thordarson, Jefferson, Supreme, Weston, Meissner, Hallicrafters, etc. voiced their enthusiastic praise at the gratifying response. "By far the most successful radio show of its kind ever held," was the general opinion of both visitors and

exhibitors, it is said. Attending representatives and engineers, demonstrating their lines and answering thousands of questions, expressed their pleasure at the remarkably high interest and intelligence displayed by the visitors.

This unusual response was undoubtedly due to the unique presentation which permitted each visitor to operate the equipment personally and to secure authoritative answers to questions. The entire three day show proved so successful that it is the plan of Allied Radio to stage a similar event annually and to supplement it with weekly displays and demonstrations of new equipment.

SUPREME OFFERS BOOKLET ON EVOLUTION OF TUBE TESTERS

To those readers who are interested in test-instrument design or who are making their livelihood from the repair of radio receivers, the Supreme Instruments Corporation of Greenwood, Mississippi, manufacturers of Radio Test Instruments, offers a 16-page booklet "The Evolution of Tube Testing."

This very interesting and instructive booklet is crammed full of technical data on various types of tube-testing circuits and is supplemented by numerous diagrams. The reader is taken through the thousands of tests necessary to the design of a commercially acceptable tube tester much the same as if he were actually present in the laboratory during the preceding years of patient research.

This is really the first time that such information has been made available to the general radio industry. You can obtain a free copy by writing Supreme Instruments Corporation, Greenwood, Mississippi, using your business letterhead or enclosing your business card and mentioning this publication.

"THE PEDDLERS"

"The Peddlers", an organization of radio salesmen, has changed its name to "The Representatives of Radio Parts Manufacturers".

The following officers were elected at a recent meeting: J. B. Price, President; Earl Dietrich, Vice-President; David Son-

kin, Secretary and Treasurer. The Membership Committee is composed of D. R. Brittan, 27 Park Place, New York, N. Y., Martin Camber, c/o Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y., and H. C. Gawler, c/o Raytheon Production Corp., 30 E. 42nd St., New York, N. Y.

The Membership Committee invites all representatives of radio parts manufacturers to communicate with reference to their joining the organization.

It is the hope of the organization to become national in scope, and that local chapters will eventually be organized in various leading centers.

CENTRALAB PURCHASES PERFEX CO.

According to information received from Mr. H. E. Osmun, Vice President of Centralab, Milwaukee, Wis., manufacturers of volume controls, sound projection controls and fixed resistors, this firm has purchased the Perfex Controls Co., of Milwaukee, Wis., line of wave-change switches and other radio products.

While Centralab have been working on their own switch development, this move seemed the quickest and most logical way of entering this business, so closely allied, in these days of short-wave radio to their own business.

The Perfex Switches enjoyed considerable acceptance and were approved and used by leading radio manufacturers, it is said. These switches under the Centralab banner will be included in the line and will be advertised along with Centralab's other products.

A number of the sales personnel and engineering staff of the Perfex organization will be retained by Centralab.

ROSS TURNER APPOINTED N. U. DISTRICT MANAGER

Mr. F. J. Wessner, General Sales Manager of National Union Radio Corporation recently announced the appointment of Mr. Ross Turner as District Manager, in charge of N. U. sales in the States of Texas and Louisiana. Mr. Turner will make his headquarters at 512 Medical Arts Building, Fort Worth, Texas.

"1936 SUPREME INSTRUMENTS"

"1936 Supreme Instruments" is the title of a catalog recently issued by the Supreme Instruments Corporation, Greenwood, Mississippi. This catalog contains full-page illustrations and technical descriptions of the following Supreme instruments: 385 Automatic, 339 Deluxe Analyzer, 339 Standard Analyzer, 391 P-A Analyzer, 89 Deluxe Tube Tester, 89 Standard Tube Tester, 89 Counter Display Tube Tester, and 189 Signal Generator.

I-F PEAK REFERENCE INDEX

Mr. J. V. Clark, of Clark Radio Service, Granville, Ohio, has compiled a little 38-page index booklet listing the issues and page numbers of *SERVICE* and *Radio Retailing*, containing special receiver service notes and receiver i-f peaks.

Inquiries regarding copies of this booklet should be addressed to Mr. Clark.



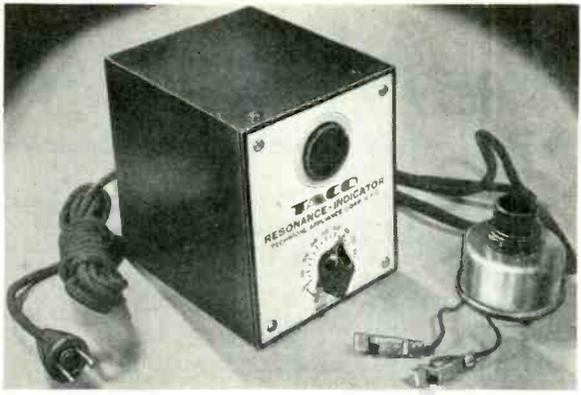
Huge gathering of Service Men at the recent opening of the new Salesrooms of the Allied Radio Corporation, Chicago.

**GOOD SOUND
RESOLUTIONS!
TO START THE NEW YEAR**



- ADD ONE NEW CUSTOMER EACH WEEK
- KEEP ON THE RIGHT SIDE OF THE LEDGER
- MAKE MORE MONEY
- USE CORNELL-DUBILIER ELECTROLYTICS

**CORNELL-DUBILIER
CORPORATION**
4375 BRONX BOULEVARD
NEW YORK



Indispensable!

- Uses two 6H6 metal tubes and 6E5 Electron Eye.
- Ideal for aligning r.f. and l.f. stages. Checks tuning and audio gain.
- Tests transformers and condensers for "opens" and "shorts."
- CALIBRATED CONTROL FOR ACCURATE SETTINGS

Because the TACO Resonance Indicator is a dozen service instruments in one. ● Employs famous cathode-ray ELECTRON EYE for its dial ● Whether you have many instruments or none, you simply *must have* this latest time, labor and patience saver. ● *Only \$11.50 list*, without tubes, less trade discounts.

DATA Send for bulletin describing this latest boon to service men. Your local TACO jobber will demonstrate it.

● TECHNICAL APPLIANCE CORP.
17 EAST 16th STREET NEW YORK CITY



**PUBLIC ADDRESS
WILL PAY YOU BIG
PROFITS THIS SUMMER**
If You Take This Tip.

It's not too early to plan on Summer public address profits right NOW! Just check the calendar and make a canvass of your local chamber of commerce, churches, social organizations, athletic clubs, etc. You'll find dozens of organizations laying plans NOW for summer events. Why not plan WITH them; urge them to install a P. A. system for these various functions?

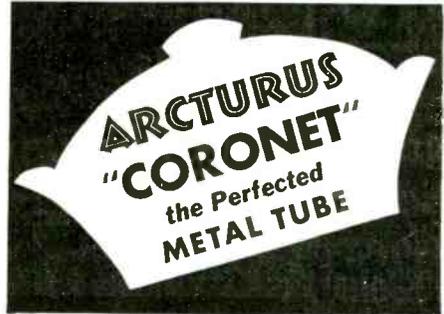


Our P. A. Service Department will be glad to explain to you how to make money on Public Address this summer . . . if you'll write us today.

Of course you'll want to use Lafayette Equipment not only because of its proven quality but because there's just the right type of equipment of all round versatility to meet YOUR requirements at a price you can afford to pay.

Address Dept. S-16 for complete information and catalog No. 59 listing complete lines of Lafayette P. A. Equipment

WHOLESALE RADIO SERVICE CO.
NEW YORK, N.Y.
100 SIXTH AVE.
CHICAGO, ILL. 901 W. JACKSON BLVD.
ATLANTA, GA. 430 W. PEACHTREE ST. NW
BRONX, N.Y. 542 E. FORDHAM RD.
NEWARK, N.J. 219 CENTRAL AVE.



The advantages of the Arcturus "Coronet" are:

1. Superior in capacitances;
2. Dependable vacuum;
3. Free from gas troubles;
4. Eliminating possibility of shorts to ground;
5. Rugged structure;



6. Quiet operation: no metallic sleighbells;
7. Long life.
From everywhere manufacturers, distributors, dealers, servicemen, engineers have acclaimed the Arcturus "Coronet" as the *perfected* metal tube.

You who use and sell tubes cannot be satisfied with less than the best. Today—the Arcturus "Coronet" is the metal tube that assures you the kind of service you should expect.
Get the details of this remarkable new improvement today. ARCTURUS RADIO TUBE COMPANY, Newark, N. J., U. S. A.

DATA BULLETIN on Arcturus "Coronet" Tubes sent free on request. Use coupon below.



ARCTURUS RADIO TUBE CO., Newark, N. J. Please send me your bulletin on Arcturus "Coronet" Tubes.

My Name

Address

City

My Jobber

THE MANUFACTURERS . . .

HICKOK OSCILLOGRAPH

The Hickok Electrical Instruments Company, Cleveland, Ohio, have announced a new oscillograph, the Model R. F. O.-1. This unit is complete with horizontal and vertical amplifiers, Thyatron sweep circuit, external and internal locking controls and all necessary associated equipment. It will also contain a built-in frequency-modulated oscillator with width of sweep variable from 5 to 30 kc.

A descriptive circular is available from the above organization.

HOYT SQUARE METERS

The new Hoyt square meter is shown in the accompanying illustration. This meter is said to feature an unusually long scale. It has been especially designed for



mounting on test panels. For full information write to the Burton-Rogers Company, 755 Boylston Street, Boston, Mass.

DAYRAD PORTABLE TESTER

The Dayrad Portable Tester Series 20 has been designed to provide a complete tube check and a quick point-to-point analysis. This unit features the "New Dayrad Index System" whereby a turn of the index wheel is said to give complete settings for the tube under test.

This portable tester incorporates the Dayrad 4-inch square-type meter. This meter is designed with strong bridge construction with a d'Arsonval movement.

The Series 20 will test both the metal and "G" tubes.

This portable tester is completely described in Bulletin 52. Address The Radio Products Company, Dayton, Ohio.

EXACT DUPLICATE REPLACEMENT ELECTROLYTIC CONDENSERS

For that fussy trade that insists on restoring inoperative radios to original factory status, including precisely matched replacements, there now exists a wide assortment of exact duplicate electrolytic condensers covering the needs of every standard set. In fact the latest Aerovox catalog, just issued, lists four pages of replacement electrolytics, arranged according to name of set, set manufacturer's part number, capacity, d-c working voltage, type of container, dimensions and list prices. New items are constantly being added to the already extensive line, as

demand warrants. While the replacements are precisely matched in mechanical and electrical characteristics to those replaced, the present units are said to incorporate improvements and refinements providing for longer trouble-proof service than the original equipment. The latest catalog, as well as subsequent exact duplicate replacement listings, may be obtained by writing Aerovox Corporation, 70 Washington St., Brooklyn, N. Y.

KEN-RAD NEW METAL TUBES

The Ken-Rad 6Q7, introduced some time ago, is enjoying excellent acceptance by set manufacturers. Judging from the volume of orders received to date, it will be a very popular tube during the coming season, it is said.

Another new metal tube developed by Ken-Rad is the 6X5, a rectifier for automobile receivers. Much interest has been shown in it, and orders are coming in daily.

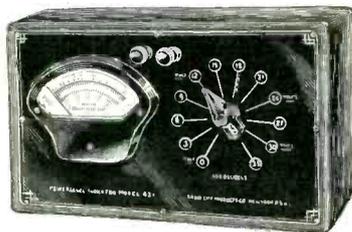
It is too early to estimate the volume on types 25A6 and 25Z6, but the requests for samples, all of which are being satisfied immediately, indicate widespread enthusiasm for these numbers. They are intended for use in a-c, d-c sets, and generally speaking, can be considered comparable in characteristics to the glass types 43 and 25Z5.

POWER-LEVEL INDICATOR

The power-level indicator or decibel meter Model 421, shown in the accompanying illustration, is used chiefly for measuring power levels in lines carrying audio-frequency current. This applies to transmission lines, audio amplifiers, public-address systems, etc. It also serves as a visual indicator for the monitoring of circuits in broadcast studios, theatres and the like.

A five-inch bakelite case fan-type meter provides a scale which can be easily read. The total range of power levels that can be read on the meter is from minus 12 to plus 43 decibels. The meter scale is calibrated from down 12 to up 10 decibels.

Calibration is for 500-ohm lines or pads,



but the instrument may be readily used for indication on other impedances. A uniform scale from 0-50 is provided on the meter and a chart is furnished with the instrument which shows actual readings on the scale for various power levels of different impedance lines.

Four a-c voltage ranges are included: 0-5, 0-20, 0-80, and 0-160 volts. Attenuator positions are indicated for direct reading of each of these scales. The full-scale movement of the meter is 500 microamperes.

Complete information may be obtained from the Radio City Products Company, 88 Park Place, New York City.

ACRATEST 30-WATT AMPLIFIER

The Acratest 30-watt amplifier is shown in the accompanying illustration. This 12-tube, Class AB unit is said to feature the following: Low-hum shield, four input circuits, all-metal tubes mounted on rubber, high gain, and a separate rectifier for bias supply.

This amplifier, possessing five stages of amplification, makes it possible to obtain a 30-watt output when feeding directly from dynamic, crystal, or velocity microphones, it is stated. By means of extra



terminals provided on the input terminal connector strip the gain can be decreased from 119.5 db to 79.5 db. This adjustment is provided so that no overload will result in the event that it is desired to use the amplifier on comparatively high-gain inputs.

A separate plate and filament transformer is said to assure against voltage fluctuations that might be encountered if only a single transformer were used.

For complete information write to Federated Purchaser, Inc., 23-25 Park Place, New York City.

CONSOLIDATED FILTRON ROBOTROL AUTO-RADIO NOISE SUPPRESSOR

Auto-radio Dealers and Service Men will find the New Consolidated Filtron Robotrol of great assistance in the sale of new auto radios and the servicing of sets already installed. The new device has been perfected by engineers of the Consolidated Wire & Associated Corporations, working with automobile engineers. Previous devices for the elimination of auto-radio noise have been designed with sole consideration for the radio, and to considerable detriment to proper performance of the auto ignition system, it is said. The result has been; greatly increased gas consumption, "motor drag", hard starting with increased battery wear and other motor difficulties. This has proven a genuine sales hazard which has limited the market for auto radios.

The new Filtron Robotrol operates on the Phase-Inverter principle by which a counter disturbance of adjustable intensity is set up and balances out completely the ignition interference but does not in any way impair the automobile motor efficiency, it is stated. It entirely eliminates the use of spark plug suppressors.

NEW ELECTRAD ATTENUATOR

The new Electrad Type BN Attenuator has been designed to replace their Types TN, LN and U. This new attenuator is said to have the advantages of greater at-

This is the Portable P. A. SYSTEM

that is making money



*No. 60 Operadio

for RADIO MEN

This Portable Public Address System incorporates the same high quality reproduction as in a permanent installation, and yet is flexible in its uses and foolproof in operation. Low in price, with a nice profit margin, you will find a large market for this unit.

*If you are already stocking this model, you will be interested to know that by using our Model 70 Power Booster you can approximately triple the power of No. 60.

HIGHLIGHTS

Incorporates a very powerful Glass "A" Amplifier having 12 watts power output; a heavy duty 10" Electrodynamic Speaker, a high grade two-button Carbon Hand Type Microphone, an ingeniously designed Control Box and the necessary connection cords for the speaker and microphone. Comes mounted in a single leatherette covered carrying case.

OPERADIO

MANUFACTURING COMPANY

ST. CHARLES, ILLINOIS

Export Division—347 Madison Ave., New York, N. Y.

THE LAST STEP in TUBE TESTER DESIGN

POWER OUTPUT

DYNAMIC CONDUCTANCE

COMPOUND CIRCUITS

MUTUAL CONDUCTANCE

EMISSION TESTERS

by **TRIPLETT**



MODEL 1500
\$36.67

This power output circuit checks all types of tubes under load, approximating actual conditions in a radio set.

TRIPLETT MANUFACTURES

a complete line of electrical measuring instruments for radio, electrical and general industrial purposes both standard and custom built. See them at your jobbers. If you have an electrical instrument problem, write to TRIPLETT.

Model 1500 is housed in attractive modernistic case with removable cover, suitable for portable or counter use. Dealer Net Price, \$36.67.

Model 1501, the new Triplett Multi-Purpose Tube Tester, combines 10 instruments in one. Housed in same case as 1500. Dealer Net Price, \$46.67.

The Triplett Electrical Instrument Co. 171 Harmon Drive, Bluffton, Ohio
Please send me more information on
 Model 1500, 1501.
 Send 1936 Catalogue.

Name.....
Address.....
City..... State.....

Every Job's a SNAP!



"I USE ALLIED SERVICE EQUIPMENT"

"This one looked like a terror—but it turned out to be a set-up. The toughest job in the world can't faze me when I use ALLIED Service Equipment. My customers like the way I locate haywire spots in a hurry. I give them speedy repair service because short-cut methods are every day stuff to me. My reputation is built on ALLIED Test Equipment and on ALLIED parts. That's why I say—every job is a snap when you've got ALLIED behind you."

SEND FOR FREE 1936 CATALOG, Dept. N



ALLIED RADIO
833 W. JACKSON BLVD.
CHICAGO, ILLINOIS

X Marks the Spot...



Here's where a low wattage resistor killed a service man's profits . . . and crippled his reputation!

Play safe with BROWN DEVILS. Being wire-wound, these units maintain constant resistance values and never get noisy. The exclusive Ohmite vitreous enamel coating locks each turn of wire in place and protects against extreme weather conditions. 1½ inch solidly anchored tinned lead wires make for easy installation. BROWN DEVILS are made in 10 and 20 watt sizes, and resistance values through 100,000 ohms. Ask your jobber or write for Catalog 14 listing all values.

OHMITE

MANUFACTURING CO.

4827 Flournoy St., Chicago, Ill.

Send me your free 12-page Catalog 14 listing resistors, voltage dividers, Rheostats, potentiometers, etc.



Mail Today!

MANUFACTURERS—continued

tenuation, true logarithmic attenuation, and lower noise level.

The attenuator involves a principle in design which makes it possible to obtain a substantially constant-impedance unit whose attenuation is linear in db and continuously variable over the entire range, it is stated. The attenuation is accomplished by means of an infinitely-variable ladder network consisting of a series element on which the control rides, and which has a shunt element connected to it along its entire length.

Further information is available from Electrad, Incorporated, 173-175 Varick Street, New York City.

WET ELECTROLYTICS INGENIOUSLY VENTED

An ingenious vent, in combination with a rugged unit construction for anode and stem support, is featured in Aerovox wet electrolytic condensers recently made available to the general trade. The same units had previously been available to manufacturers.

Instead of a bit of gauze for venting purposes, which arrangement generally fails to prevent seepage of liquid electrolyte and subsequent corrosion of condenser and chassis components, Aerovox "wets" are provided with a double-sealed vent. Any gas pressure built up within the can escapes through a pinhole in a soft rubber diaphragm and through offset holes in the dome cap. However, if electrolyte presses against the diaphragm, the latter instantly presses against the offset holes in the dome,



sealing same securely. There can be no seepage or corrosion.

Another distinctive feature is the unit anode and stem construction. A three-wing (instead of usual two-wing) anode is mounted on a rugged stem spun-rieveted to the hard-rubber cap fitting into bottom of can. The can edge is spun over on to a soft-rubber gasket and the cap, forming a leak-proof seal. This is in contrast to a stem pinched in a rubber-bushed crimped can bottom. The unit construction permits permanent and positive centering in can, lower power factor and absolute uniformity of these "wets."

Usual advantages such as high capacity for minimum bulk, ability to take severe punishment, self-healing and low cost, are retained in these new units now offered by Aerovox Corporation, Brooklyn, N. Y.

HIGH-GAIN 4-STAGE AMPLIFIER

Announcement is made by The Webster Company, 3829 West Lake St., Chicago, of a new high-gain 4-stage amplifier. Webster-Chicago engineers have embodied in this unit scientific engineering principles that have contributed to the development of many of their units, it is said. These principles relate to the design of sound equipment that is complete in one unit.

This new product is self-contained and completely enclosed. Specifications as

given by the manufacturer include several features. It provides field excitation for two dynamic speakers. Its output is 17 watts. It has tapped output transformer. It embodies a fader control system. Speaker and microphone connections terminate in polarized plugs. Tubes include one 6C6, one 53, three 2A5's, one 5Z3. It is suitable for crystal microphone or phonograph. It is adaptable for general public-address work and party call systems. Complete details will be sent by manufacturer on request.

ARCTURUS ADDS 6Q7 AND 6X5 TO 'CORONET' LINE

To round out its 'Coronet' Metal Tube line, the Arcturus Radio Tube Company, Newark, N. J. announces the addition of the types 6Q7 and 6X5 tubes.

The 6Q7 Coronet, a double-diode triode, is the first dual-purpose tube to be built in metal. The diode is similar to that in the type 75. The triode section, having an amplification factor of 70, makes this a desirable tube for avc applications. By using a 3-volt grid bias, instead of 2 volts, the possibilities of positive grid current are minimized.

The 6X5 Coronet is a full-wave vacuum rectifier, indirectly heated type, for automotive use. Its characteristics are similar to the type 84.

Additional types in the 'Coronet' line are now being developed, Arcturus engineers state.

TACO RESONANCE INDICATOR

Of outstanding usefulness to Service Men and laboratory workers but also attractive to set owners, is the Taco Resonance Indicator now offered by Technical Appliance Corp. 17 E. 16 St. N. Y. C.

Making use of a 6E5 electron ray tube, this compact metal cased device serves several important functions. First and foremost, state the makers, it indicates the degree of resonance which allows accurate tuning of a set or any individual r-f or i-f circuit. Thus it becomes an ideal means of aligning r-f and i-f stages. It may also be used as an output meter. It also checks for "opens" or "shorts" in component parts and circuits. In fact, it permits of matching condensers and indicates capacity values. It checks audio fidelity. As a bridge indicator, in place of a galvanometer, it eliminates the danger of burn-outs yet provides visual indication.

The Taco Resonance Indicator uses two 6H6 tubes in conjunction with the 6E5. One 6H6 is used in a voltage-doubling circuit to supply the necessary plate power



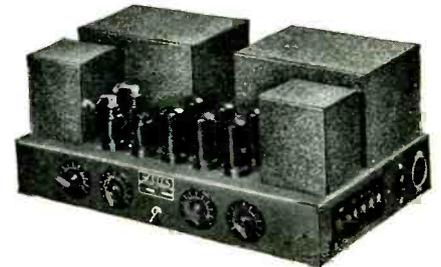
for the 6E5. The other 6H6 operates as a linear diode detector. The rectified signal from the diode is amplified by the triode section of the 6E5 and applied to the control element of the electron-ray section of the 6E5. The three tubes, transformer, control and other components are housed in an attractive metal case measuring 4 1/2 x 5 3/8 x 5 3/8 inches. The luminous disc with variable dark segment of the 6E5 tube is seen through a recessed shadow-box opening of the handsome face plate. Below is the knob controlling sensitivity.

Indispensable in servicing and laboratory work, the resonance indicator may be applied to any set as a precision tuning aid. This application will appeal to short-wave radio fans.

NEW METAL-TUBE AMPLIFIER

Morlen Electric Company, Inc., 100 Fifth Ave., New York, N. Y., announces the first of a complete line of amplifiers with metal tubes in all stages, including the output. In addition to the basic advantages of the all-metal tubes, the new line uses the exclusive Morlen "Power-Driver" circuit. This new development, applied to metal tubes, gives maximum power output over the widest frequency range of any known system, it is said. Such performance is a proven requirement for high-fidelity reproduction.

The new MC38 amplifier now available uses two 6F5 and two 6C5 triodes in the



voltage amplifier, two 6F6 triodes as "Power-Drivers" and four 6F6 output tubes. The amplifier will deliver 38 watts a-f normal and 45 watts in continuous heavy-duty speech service. The amplifier includes a two-position input mixer with universal impedance, main gain control, tone control, a-c switch, a-c convenience outlet and dual output of 500 ohms and 15 ohms tapped at 8 and 4. An input coupler is also available for adapting low-impedance microphones such as velocity and dynamic types to the input.

The MC38 can be used in practically every class of p-a service.

MASTER ANTENNA SYSTEM FOR MULTIPLE-SET DWELLINGS

An entirely new principle is the basis for a master antenna system which, in deference to present-day all-wave sets, is equally effective for short-wave and broadcast reception. As many as twenty-five sets may be operated on a single aerial and downlead. Taking the place of the usual jungle of individual aerials, this single master aerial provides maximum signal strength, it is said.

OWN A BURTON TUBE TESTER



ASK YOUR DEALER ABOUT THE NEW 90-DAY PAYMENT PLAN.

ACCURATE! SIMPLE!
FAST!

\$31.50

Model 20

Will test 8-prong and all metal tubes. Built-in condenser test for all electrolytic units. Accurate meter test for each tube element. Neon tube detection of shorts and leakage. Lighted meter for testing in dark places. Black and silver finish in quartered oak case.

BURTON-ROGERS CO.

755 Boylston St., Boston, Mass.

SALES DIVISION OF HOYT ELECTRICAL INSTRUMENT WORKS



UNIVERSAL 5-METER HAND SET

A new, 15 ounce, compact hand set—Designed for 5-meter transmitters and 5-meter transceivers—Highly polished, moulded bakelite units—2000 ohm uni-polar receiver—High output, single-button Universal microphone of 200 ohms—6 ft. 4 conductor cord with color-coded phone tips—List Price, Single-Button microphone, \$8.00.

UNIVERSAL MICROPHONE CO., LTD.

424 Warren Lane, Inglewood, Calif., U. S. A.

MANY SERVICEMEN

are finding Profit in
Trimm group hearing
aid equipment, are you?

Designed for highest quality performance and simplicity of installation.

Write to Dept S-1 for full information

TRIMM RADIO MANUFACTURING CO.
1770 Berteau Ave. - Chicago

Cardinals

**ARMORED
WIRE WOUND
RESISTORS**

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Name

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MANUFACTURERS—continued

Offered by Technical Appliance Corp., 17 East 16th St., New York City, the Taco Master Antenna System is available in any combination of components for any size and kind of installation. Also available for conduit type wiring in new buildings, or exposed wiring in old buildings. The system comprises: (1) Antenna unit connecting doublet antenna with (2) downlead transmission line, which in turn connects with individual (3) set coupler for each set to be operated on system.

The transmission line comprises a twisted-pair rubber-covered cable. To make it most inconspicuous against outdoor or indoor walls, a neutral buff covering is now available. The transmission line can be strung along the outside wall, or through conduit in a new building.

Each set coupler is located with reference to a radio set. In conduit wiring, the coupler fits within a standard outlet box provided with a polarized plug face plate. In exposed wiring, the coupler is encased in an attractive foreign brown finished base with black bakelite top carrying terminal screws for connection with antenna and ground terminals of set. A twisted pair connects with the transmission line.

The system may be readily installed by the experienced contractor or Service Man by simply following Taco Instructions.

DU MONT ELECTRONIC SWITCH

The Type 150 Electronic Switch is a new development recently announced by the Allen B. DuMont Laboratories of Upper Montclair, New Jersey, which greatly increases the value of the cathode-ray oscillograph by permitting simultaneous observation of any two voltage or current phenomena. Thus this device can be used to inspect and compare the waveform and phase of two voltages or currents from different parts of the same circuit, or compare the waveform of a standard wave and any other wave. For example, it is possible to see the input and output waveform and phase displacement of an amplifier. In a perfect amplifier the input and output waves cover one another, while even a slight distortion or phase shift will noticeably display the two oscillograms. Another useful application is to apply a timing wave in conjunction with the wave under observation. For example in testing switches or relays it is possible to inspect the length of time it takes to complete the switching if both the switched potential and a timing wave originating from an a-c source of known frequency are present on the oscillograph screen.

The number of different applications of this device are too numerous to mention. All measurements and tests are comparisons and there is no better way to compare two oscillograms than by placing them right on top of each other.

The device has no mechanically moving or vibrating parts. It consists of a switching tube and two amplifiers, one amplifier for each phenomena applied. The switching tube operates to cut in one amplifier, then the other at such a rate that the phenomena appear at the same time. In addition to switching the device also amplifies.

Controls are provided on the unit for adjusting the gain of the amplifiers for varying the speed of switching.

The unit is completely self-contained and sold with tubes so that it is only necessary to apply 110-120 volts 60 cycle a-c to it to start operation.

AMPHENOL MICROPHONE CONNECTOR

A recent development for the sound-equipment field, a microphone plug embody-



ing the latest developments of the AmpHENOL contacts and molded bakelite, has been announced by the American Phenolic Corporation, 500 South Throop Street, Chicago.

The heavy brass outer shell of this unit is finished in black enamel and chrome, giving the connector a rich, modern appearance. This shell is locked together by a threaded brass collar that holds the male and female sections tight and prevents embarrassing disconnection, so often encountered in outdoor pickups. The heavy shell may be safely walked on while in use without danger of breakage or noise. Snow, rain and slush will not interrupt programs going through AmpHENOL microphone connectors, it is stated.

The gasket cap at each end of the connector contains a para rubber ring which expands against the cable when the cap is tightened and seals the plug against the entrance of moisture and dirt, around the cable.

The third contact (most widely spaced from the two remaining) is grounded to the brass shell of the connector with a flush screw, automatically grounding it and the microphone ring and stand. In connecting the cable, care should be used to see that the shield (in two-wire circuits) and the grounded neutral wire (in three-wire circuits) is always connected to this contact.

For further information write to the American Phenolic Corporation.

LINE VOLTAGE DROPPING RESISTOR TUBE

Resistance elements for use in series with tubes and pilot lamps operated on 110-volt circuits, are offered in a convenient unit developed by Clarostat Mfg. Co., Inc., 285 N. 8th St., Brooklyn, N. Y. The unit has a perforated metal housing similar to the 5Z4 metal tube, and fits in the new octal socket.

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Units available in different resistance values, providing voltage drops for taking care of one to seventeen 6.3-volt 0.3 ampere tubes on 117.5-volt lines. Units can be provided with sections taking care of 6-8-volt 0.25-ampere pilot lights. Other combinations and ratings on special order.

NEW SUPREME ANALYZER

The Supreme Instruments Corporation of Greenwood, Mississippi announces their Model 491 Theater, P-A and Radio Analyzer which supersedes their Model 391. The 491 is a newly developed instrument built primarily to take care of the needs of Theater Projectionists and P-A Engineers.

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Public Ad Inc., 2015 East 65 Street, Cleveland, Ohio, announces the Type 103-A Public Ad high-gain amplifier with bridged T type attenuator. This unit is intended for broadcast-studio, recording-studio, public-address, remote-pickup, and amateur-phone applications.

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NEW CARTER POWER PLANTS

The new Carter power plants, one of which is shown in the accompanying illustration, are for use with sound trucks and transmitters, two-way police radio and test equipment. These units are said to be reliable and economical B power supplies for operating Class A or B portable amplifiers from 6- or 12-volt batteries. The



motor is specially designed for high-voltage output and the filter is unusually large. It is supplied with quiet running ball bearings that require no oiling. The brushes are extra heavy.

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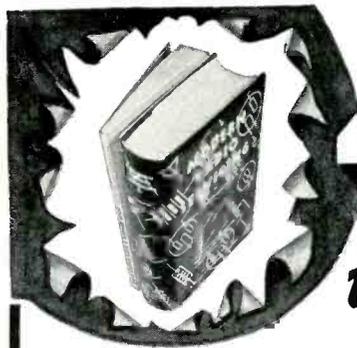
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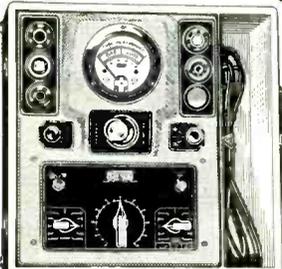
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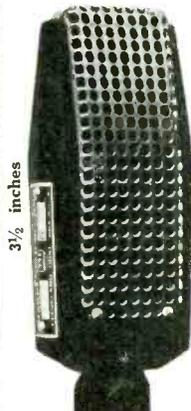
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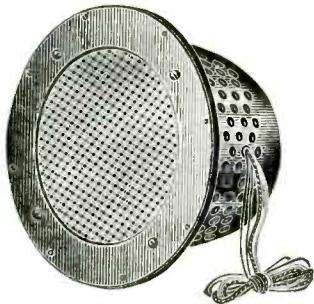
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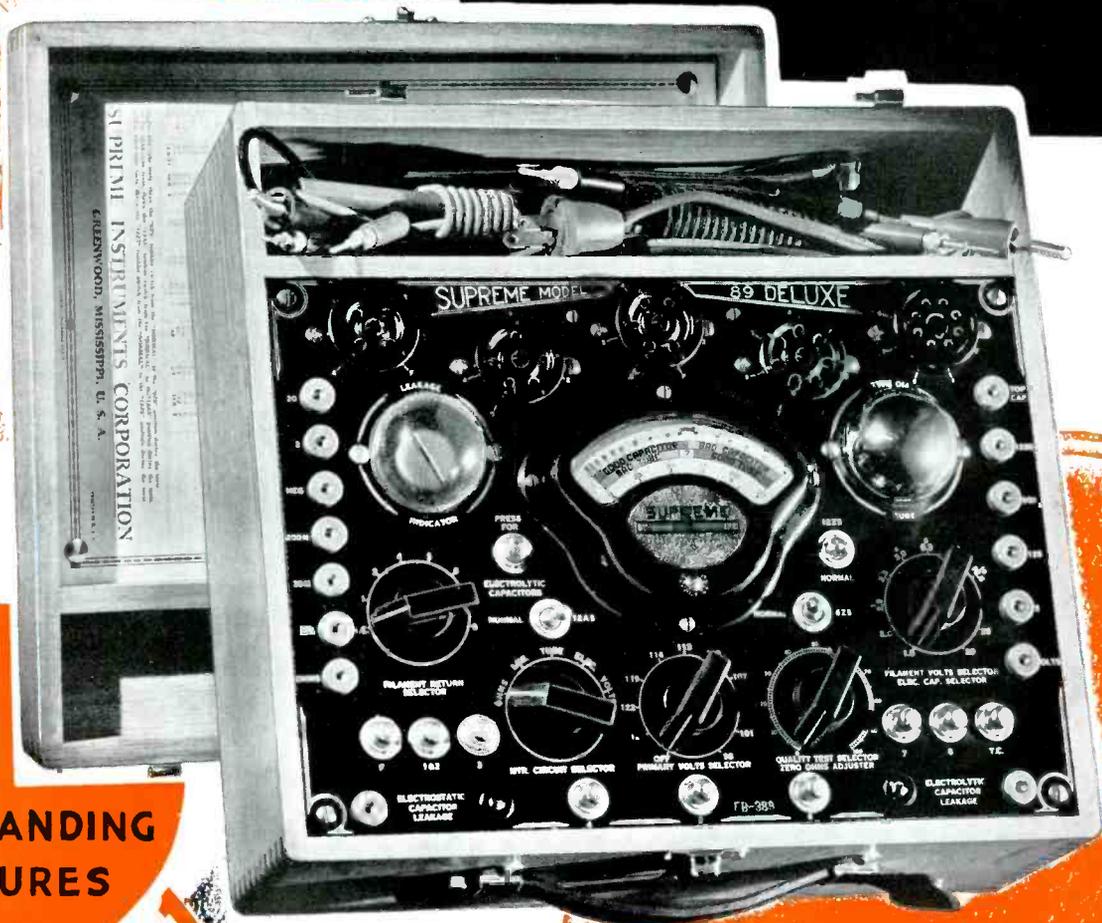
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22

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FEATURES

7 INSTRUMENTS IN 1

SUPREME \$45.95
• 89 DELUXE •
TUBE TESTER

Dealer Net Cash
Wholesale Price

Mr. Serviceman, 1936 is your big year of opportunity. More public purchasing power than at any time in the last six years. A Presidential election, when millions of additional listening hours will be added to the wear and tear of time. Your service equipment must keep as up-to-date as the newest radio sets and tubes.

In 1935 the Radio Service Industry had reason again to appreciate the advanced engineering design of Supreme Instruments. 1936 designs were inbuilt with facilities for all the metal tubes, and available with the same suddenness as the announcement of this great revolution in radio design. Supreme 89 DeLuxe speaks for itself—and as a result jobbers are recommending it as the No. 1 utility instrument. 22 outstanding features, 7 instruments in 1. Send for your free copy of "Evolution of Tube Testing" which gives you word detail and illustrated diagrams of this master service tool, which can be for you in 1936, what it has been to thousands of your colleagues in 1935, THE KEY TO SERVICE SUCCESS. See your jobber.



THE *Inside* STORY
DIAGRAMMED

Supreme Instruments Corp., Greenwood, Miss., U.S.A.

• Export Dept., Associated Exporters Co., 145 West 45th St., New York City, N. Y. Cable Address, LOPREH, N. Y. •



Build A PROFITABLE BUSINESS *with the* RCA 3-POINT SERVICE SYSTEM

HERE is exactly what you need to make more money: *First*, more business; *Second*, quicker handling of the business as it comes in; *Third*, accurate calculation of your costs, so you can make the correct charges and get a profit from each job. RCA now offers you the RCA 3-Point Service System, an invaluable aid in these three vital phases of your business. You can get this unique collection of business helps on such terms that the increased profit from a single job will pay for the entire System!

RCA 3-Point Service System

Point 1. "101 Sales Ideas for Service Men." Contains 101 actually tried and proved sales plans to increase your volume of service business.

Point 2. "The RCA Radio Service Tip File." Consists of a high-quality steel card file, containing 200 cards,

3" x 5", each bearing a practical servicing tip contributed by a reader of RCA Service News. Cards are indexed by make and model. Room for one thousand additional cards. New tips supplied in packets of 20 cards each.

Point 3. "Radio Service Business Methods," by John F. Rider and J. Van Newenhizen. Includes the meat of Rider's lectures on the subject. Enables you to put your operations on a sound business basis, determine the proper charges, make the money you are entitled to make on every job.

This is unquestionably the most progressive, valuable and all-inclusive Service System ever offered. It is worth hundreds, even thousands of dollars to you every year—yet you can obtain it for less than you would pay for the steel filing case alone! Ask your RCA Parts Distributor how you can obtain the RCA 3-Point Service System.

Ask your distributor for date of next RCA Service Meeting.



RCA PARTS DIVISION

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