

Service Hints

COMPILED AND PUBLISHED BY

Hygrade Sylvania
CORPORATION

SERVICE HINTS



COMPILED AND PUBLISHED BY

Hygrade Sylvania
CORPORATION

MANUFACTURERS OF

Sylvania "SET-TESTED" Radio Tubes
Electronic Devices and Hygrade Lamps

EMPORIUM, PENNA.

SALEM, MASS. NEW YORK CLIFTON, N. J.

F O R E W O R D

THIS compilation of service hints is dedicated to the thousands of Service Men who conscientiously render good service and thereby make an important contribution to the radio industry as a whole.

If this little book helps them to be better Service Men or makes their work more pleasant and more profitable, it will have fulfilled its mission.

To the editors of *Radio Servicing* and *Service* magazines, who have made important contributions to the knowledge of radio servicing, we express our appreciation for their permission to use material from their columns.

HYGRADE SYLVANIA CORPORATION

TABLE OF CONTENTS

General Engineering Information *Pages 4-6*

SERVICE HINTS (By Makes of Receivers)

	Page		Page
Airline	7	Kellogg	22
Amrad	7-8	Kennedy	22
Apex	8	Knight	22
Arborphone	9	Kolster	22-23
Atwater Kent	9-12	Lyric	23
Audiola	12	Majestic	23-27
Bosch	12	Motorola	28
Brunswick	12-13	Peerless	28
Clarion	13-14	Philco	28-32
Colonial	14	Radiola	32-33
Columbia	15	RCA-Victor	33-36
Crosley	15-17	Silver Marshall	36-37
Edison	17-18	Silvertone	37
Erla	18	Sparton	37-38
Eveready	18	Sterling	38
Fada	18-19	Stewart Warner	38-40
Freshman	19	Stromberg	40
General Electric	19-20	US Radio	40
General Motors	20-21	US Washington	40
Gloritone	21	Victor	40-41
Grebe	22	Zenith	41-42
Gulbransen	22		

MISCELLANEOUS INFORMATION

Amplifiers	43	Transformers	48
Auto Radios	44	Tubes-Miscellaneous	49-50
Condensers	45-46	Interchangeable Tube	
Receivers	46-48	Chart	51-55
Resistors	48		

GENERAL ENGINEERING INFORMATION

Ohm's Law. Ohm's law is the one formula which is most used by electrical workers. It may be expressed in three ways, depending upon which quantity is unknown—commonly it is expressed as:

$$E=IR$$

Where E= voltage in volts.

I= current in amperes.

R= resistance in ohms.

Other ways of expressing it are by transposing the above expression as:

$$I=E/R$$

$$R=E/I$$

Examples of how this may be used:

If the screen current for a certain tube is 2 milliamperes (.002 amperes) and it is desired to reduce the screen voltage to 90 volts from the plate voltage of 250 volts, what value of resistance should be used. Voltage drop in resistor=250-90=160 volts.

$$R=E/I=\frac{160}{.002}=80,000 \text{ ohms required.}$$

Power: Power or energy expended in a circuit is expressed as:

$$P=EI$$

Where P= power in watts.

E= voltage in volts.

I= current in amperes.

Other ways of expressing power are: $P=E^2/R$ and $P=I^2R$.

An example of how this may be used in ordinary service work would be to determine the wattage rating of the resistor which was calculated in the above problem.

$$P = EI = 160 \times .002 = .320 \text{ watts}$$

Use .5 watt resistor.

Calculation of value of resistors in series and parallel connection:

The total resistance for resistors connected in series is the sum of the component resistors, viz:

$$R_t = R_1 + R_2 + R_3$$

Where R_t = total resistance in ohms.

The total resistance for resistors in parallel is expressed as:

$$R_t = \frac{R_1 R_2}{R_1 + R_2}$$

When R_t = total resistance in ohms.

Calculation of value of resistance required for self-biasing:

$$R = \frac{\text{grid bias in volts} \times 1000}{\text{Total cathode current in milliamperes times number of tubes.}}$$

For triodes, total cathode current is the plate current.

For tetrodes and pentodes, total cathode current is the sum of plate and screen current. For example: We wish to use 2 Type 42 tubes with 250 volts applied to the plate. Data from Sylvania Characteristic sheet gives:

Grid bias = 16.5 volts

Plate current = 34 ma

Screen current = 7.5 ma

Total cathode current = $34 + 7.5 = 41.5$ ma.

$$R = \frac{16.5 \times 1000}{41.5 \times 2} = \frac{16,500}{83} = 198 \text{ ohms required for self-biasing.}$$

Resistor Color Code:

For First or Second Significant Figure		Number of Ciphers After the Significant Figures
Black	0	None
Brown	1	0
Red	2	00
Orange	3	000
Yellow	4	0000
Green	5	00000
Blue	6	000000
Violet	7
Gray	8
White	9

Condensers in series and parallel.

When two condensers are connected in series, the resulting capacity may be expressed as:

$$C_t = \frac{C_1 C_2}{C_1 + C_2}$$

Where C_t = total effective capacity.

When two or more condensers are connected in parallel, the resulting capacity is equal to the sum of all the component capacities.

S E R V I C E H I N T S

Airline. Fluctuating filament voltages in older models using 26's, or failure of R.F. tubes to light at all. Caused by loosening of riveted junction between binding posts and power transformer lead soldering lugs, due to shrinkage of mounting strip. Remove transformer and flood riveted junction with solder. Some local-distance switches test all right on 110 volts but fail to make contact when in actual use. Clean hardened flux or grease from contacts.—Radio Retailing

Airline "Challenger." Complaint: "Radio smokes." Replace burned 4,000 ohm carbon resistor with a wire-wound type. Replace shorted 1 mfd. condenser with a new 400 volt type.—Radio Retailing

Airline 62-11, 12. Lack of sensitivity may be corrected by removing the filter choke and 25 mfd. shunt condenser entirely from the circuit then removing the second dry-electrolytic filter condenser and replacing this with a 4 mfd., 450 volt type.—Radio Retailing

Airline 64. Inoperative tuning meter and weak signals. Place finger on control grid cap of first R.F. 58. If volume increases meter is burned out. It may be shorted without affecting set operation until a replacement can be obtained.—Radio Retailing

Airline 811. Inoperative volume control is caused by alteration in value of 25,000 ohm carbon resistor. Replace with one of higher wattage.—A. W. Inglis, Elmhurst, Ill.

Amrad 81. If hum develops after about 30 minutes of operation replace the two 18 mfd. electrolytic sections with paper condensers. The breakdown rating need not be high as this circuit feeds only screens and the detector plate. Reforming the electrolytic rarely gives permanent results as the voltage is not high enough to keep it active.—Radio Retailing

Amrad 84. A rather common trouble developing in the Amrad 84 series is a whistling oscillation on either side of the carrier wave on all stations and is very troublesome in tuning in. I have successfully eliminated this trouble by removing the box shield around

the condensers and tubes and sandpapering all places where contact to chassis is made. Then remove the three rotor springs from the condensers and clean contact surfaces with sandpaper; solder a wire about three inches long to each one and bring all three wires to a soldering lug to be clamped to chassis when the shield is put in place. This process removes coupling between the tuned R. F. circuits caused by long ground circuits in the shielding and greatly improves operation of the sets.—Eugene Whitaker, 3341 Penn St., St. Joseph, Mo.

Apex 8 Series. Weak reception and excessive plate voltage on 27 oscillator tube, caused by broken down 50M ohm plate carbon series resistor. Replace with a 2 watt resistor instead of the original 1 watt.—Arnold Wightman, Greene, N. Y.

Apex 8-A Series. Set O. K. until after being in operation for about 30 minutes when distorted reproduction takes place and the 47 tube grid gets extremely red. Check the 47 filament center-tap for an intermittent open. Best remedy is to connect a 20 ohm center-tapped resistor across the filament winding using the center-tap of resistor in place of the transformer center-tap.—C. H. Ramm, Chicago, Ill.

Apex 8 and 10 Series. AVC Superheterodynes. If volume suddenly drops or increases, especially when a light is turned on in the house, trouble is due to opening up of 0.5 mfd. condenser connected between R. F. Cathode and grid return of R. F. and I. F. coils. Replace with a good 0.5 mfd. 400 volt condenser.

Apex 10B. Center tap of the filament transformer of the 47 tubes had become shorted to one side of the high voltage. Disconnected center-tap and the trouble disappeared. Checked grid-bias resistor for the 47 tubes and found it to be burned out. Replaced this resistor with a new 425 ohm resistor which Apex uses for grid-bias between center-tap and ground for chassis.—Bill Lewandowski, Lakeview, Mich.

Apex 27. Intermittent oscillation. Increase the R.F. by-pass condenser from $\frac{1}{2}$ to 1 mfd.—Radio Retailing

Apex 41, 42. Oscillation over entire scale. Try 2,000 ohm resistor in second R.F. grid lead.—Radio Retailing

Arborphone. Weak volume together with steady frying, crackly sounds. The weak volume being traced to corroded chassis connections of the R.F. grid return leads. A common ground wire connected to all grid return leads brought back the volume. But the frying noises still remained, after suspecting and changing all carbon resistors it was finally traced to the primary of the first A. F. trans., which due to the dampness of this particular house caused the fine wires of the prim. to corrode, causing this steady nerve racking noise.—Hoge Radio Service, 15217 Ridpath Ave., Cleveland, Ohio.

Atwater Kent. Noisy wire wound volume controls. Clean contact arm and winding with alcohol. Using No. 1 soft lead pencil, fill in spaces between windings at contact edge until surface appears level and smooth.—Radio Retailing

AK 30, 40. A common headache is shorting of the wire-wound resistor beneath the chassis to ground. The fibre base warps, causing the trouble, which can be corrected by sliding a piece of fibre under the unit. No reception: Check the speaker filter condenser.—Radio Retailing

AK 37 to 60. When dial belts are not obtainable use heavy dial cable. Anchor to pulley-pins, spot with drop of solder. Move condenser to take up slack.—Radio Retailing

AK 37. Found to tune broadly in the lower end of the dial. The situation stood thus: no trimmer condenser, tuning condensers lined up as perfectly as possible, but interference bad. In the grid circuit of the 2nd and 3rd R. F. tubes are 800 ohm resistances, which if cut down perhaps half, produces a certain amount of oscillation in that part of the wave band. This gives greater selectivity and solves the problem.—F. G. Hedge, Los Angeles, Calif.

AK 37, 38, 40, 42. Use of a 1 mfd., 400 volt condenser between the filament of the 280 where it connects to the first choke and ground increases pep and reduces hum. Try it next time it is necessary to rip open one of the cans.—Radio Retailing

AK 37, 38, 40, 42, 46. Fading is often caused by a fluctuation of the filament current supplied to the 26 tubes. There are two terminal boards, in the power supply box, which are held down by nuts. The nuts on the top board may be tight while those on the lower board may be loose. This is possibly caused by the brass bolts stretching. In any case tightening these nuts will

usually correct this difficulty. In these same models occasionally the volume control will "peak" at other than the position of maximum volume. The antenna transformer, which is located just under the tuning condenser, will usually be found to have the section which is connected across the volume control shorted. A new transformer remedies this trouble.—D. N. Simpson, 137 S. State St., Marion, Ohio.

AK 37. Intermittent reception and rasping. Press rear of chassis. If this causes noise insulate shielded antenna cable leading from rear of metal cabinet to front of chassis. It frequently touches the bare ends of the power cable.—Radio Retailing

AK 37-60. New, double-spring contact arms are available at the factory and make it unnecessary to change entire volume controls unless the wire is shot. Clean the winding with alcohol.—Radio Retailing

AK 40. When biasing resistor strip under terminal board is defective and original replacements can not be obtained use one 750 and one 3,500-ohm type.—Radio Retailing

AK 55. A common cause of poor tone is a change in either of the two resistors shunting the speaker field. The resistors supply the C bias to the power tubes.—Geo. V. Sangree, 1522 Vernon St., Harrisburg, Pa.

AK 55, 60. Fading can often be traced to loose rivets on wire-wound resistors. In most cases re-clamping them with pliers effects a repair. Check particularly bleeder No. 1, R.F. bias and 1st A.F. bias units, as these work loose more often than other units at the rivets.—Radio Retailing

AK 55, 60, 60C—Loss of volume and sensitivity in these popular models is a common occurrence and in some cases the trouble does not show up on an analyzer or continuity test. The above mentioned tests failing, the shield of the first R.F. stage should be removed and the R. F. transformer primary very carefully inspected—preferably by removing from chassis and applying continuity tests. In many cases this winding will be found to be open—caused in some cases by lightning, climatic changes, etc. The remedy of course, is to either substitute a transformer or to rewind the primary with slightly heavier wire, about No. 28 or No. 26 enamel covered. Primaries rewound thus will seldom, if ever, develop trouble again. After replacing the R. F. transformer and shield can align the R. F. amplifier and detector stage with the

aid of a good oscillator per usual practice.—Gordon E. Hunt, Rangeley, Me.

AK 80. When volume controls become noisy raise the end of the contact with long-nosed pliers and bend in toward the winding slightly, then clean the strip with alcohol.—Radio Retailing

AK 83, 85. Poor tone, low volume and little response with tone control turned to bass. Look for open R.F. choke in pentode control grid circuit. Analyzers miss this one.—Radio Retailing

AK 85. Unusually sharp volume control cut-off in model 85 can generally be remedied by trying several 24's in the AVC socket. No detector plate voltage on the 37 is most frequently caused by shorting of the plate to ground by-pass condenser and not burnt out series resistor or transformer primary. "Choppy" reception in model 38 is commonly traceable to shorting of the audio output condenser. Unsolder green wire with yellow tracer from bottom terminal strip and connect a new condenser in series. Noisy volume control operation in the same model is often due to a broken lead of the R.F. coil primary near the lug.—Radio Retailing

AK 85. A great improvement may be had in the operation of the volume control by making a careful selection of tubes to be used in the AVC socket. With some tubes the control is critical, the volume falling to nothing within a fraction of a turn of the knob.—Bill Lewandowski, Box 208 Lakeview, Mich.

AK 89. If glow in neon tuning light gradually disappears while set is tuned to a local station, remove first I. F. shield and carefully scrape away the black sealing compound between the plate and grid I. F. coil. Scrape compound clear down to the cardboard tube on which I. F. coils are wound.—George Mason, Santa Ana, Calif.

AK 99. High potential on one control grid cap. Remove I.F. cans, insulate resistors which touch coil forms. Trouble causes neon light to be inoperative and kills all signals.—Radio Retailing

AK 627. On several of these sets I have found the low frequency end of the dial to be "dead." The trouble is not as one would suppose, shorted tuning condenser plates, but is to be found inside the oscillator coil can. The 1,450 m.m.f. condenser located at the side of the coil is grounded with two small rivets which have loosened. Oscillation and inaccurate dial settings are indicative

of this fault. The best remedy is to run a special lead, (grounded) to mounting of this condenser unless the condenser either leaks or is open.—Clyde P. Carter, Canisteo, N. Y.

Audiola. Oscillation when tone control is in treble position. Replace .01 mfd. condenser connected from plate to filament.—Radio Retailing

Bosch 28 or 29. In replacing volume control it will be noticed that it is located in the extreme left end of chassis, controlled by a pulley arrangement to the control knob in center of chassis. This original Bosch wire wound control is placed at the end of the chassis instead of at the rear of the point of control to eliminate oscillation. To replace this is impossible in some towns without sending to the factory, with consequent delay.

A standard Centralab replacement unit 3 72-102 (25,000 ohms) can be used instead, to be placed at the point of the chassis where the former control knob was located. This does away with the necessity for control cables and pulleys. Oscillation will not take place if the metal cover on the rear of the replacement unit is grounded to the frame of the chassis.—A. W. Sprenger, Milwaukee, Wis.

Bosch 28. Easy volume control replacement. Remove all old drive gear. Install standard 250,000 ohm unit and hook in circuit so that it will vary B plus voltage to R.F. plates. B plus lead from pack is the one going to one end of the resistor in clips near 26. Hook 1,500 ohm grid suppressor resistor from grid of first R.F. to stator of first variable gang condenser in place of original control. Result: greater sensitivity, easier to neutralize.—Radio Retailing

Bosch 31. Suspect a faulty 300,000 ohm resistor in the I.F. stage when fading occurs.—Radio Retailing

Bosch 60. Loss of volume and distortion may often be traced to poor contact at the phono switch which is supposed to cut out the R.F. when the tuning condenser plates are disengaged.—Radio Retailing

Brunswick Panatropo 3KR8. Low volume from phone pickup may be due to a poor contact at phono switch points.—Lanternman Radio Service, Edwardsville, Ill.

Brunswick 15. Full reception when set is first turned on, gradually fading out. Look for open 25,000 ohm orange resistor in screen-grid supply circuit.—Radio Retailing

Brunswick 15. Reduced volume accompanied by low screen voltages and abnormally high plate can be corrected by replacing the 35,000 ohm orange resistor in the front of the chassis.—Radio Retailing

Brunswick 15, 22, 42. Noisy volume controls. Unsolder the pigtail from the second R.F. variable condenser stator, remove the rubber sleeve and blow out the powderlike substance found in it. Wipe powder off pigtail and replace sleeve, resoldering.—Radio Retailing

Brunswick 83. Hum and reduced B voltage. Either shorted 45 C bias resistor or charred braided tubing on push-pull transformer leads to resistor strips, forming high resistance shorts to chassis. Lack of sensitivity. Found principally in sets with serial numbers below 80,000, especially those with brown crackle finish. Voltages check O.K. Signal can be built up by reducing screen grid cathode 100 ohm wire wound resistor to 25 or 50 ohms, by heating wax off and reversing R.F. choke and antenna loading coil leads to position of maximum signal strength or, by re-aligning condenser gang. Motor-boating. Caused by open circuit in small .1 mfd. tubular condenser mounted under R.F. section. Open circuited $\frac{1}{2}$ mfd. unit causes oscillation. Well over 50 per cent of trouble in the 83 is due to shorted or grounded pigtailed carbon resistors.—Radio Retailing

Clarion 60, 61. No reception. Check A.F. transformer primary, replace with factory original to insure good tone. Noise, intermittent signals, examine local-dx switch for loose contacts.—Radio Retailing

Clarion 61. No detector plate voltage. Usually due to open push-pull input transformer. Repair of this special unit often possible. Remove transformer and take off wrapper. Corrosion generally breaks lead from winding.—Radio Retailing

Clarion 100 Series. Failure to tune down to 1,500 kc. after few months use. Substitute 2,000 ohm resistor for 4,000 ohm unit in cathode circuit of oscillator-1st detector.—Radio Retailing

Clarion 320. If motor-boating develops in these models connect the suppressor grid of the 58 I. F. tube to the cathode instead of (early models) to ground.—C. H. Ramm, Chicago, Ill.

Clarion 320. Intermittent reception. Replace fixed condenser in 57 oscillator-detector cathode lead with .0008 mica.—Radio Retailing

Colonial Model 28. If set is dead, the screen grid resistor (165,000 ohms tapped) may be open. When replacing the resistor make return direct to chassis to avoid long leads. This will also reduce couplings and improve performance.—Thos. McClean, 56 St. Johns Pl., Brooklyn, N. Y.

Colonial 31 DC. Set plays with switch off. Disconnect ground lead. If set cuts out trouble is shorted condenser in series with this lead. It is one of three capacities at left of chassis when set is turned upside down on bench with back of set forward.—Radio Retailing

Colonial 32. Open section of the 4-section by-pass unit in the first can and loose lugs on the outside of volume control frequently cause fading.—Radio Retailing

Colonial 33, 34. Failure of the tapped 121,000 ohm resistor, comprising an 11,000 ohm section supplying R. F. plate voltage, 60,000 ohm section supplying screens and 50,000 ohm section is chief cause of trouble. Replace it with one of higher wattage.—Radio Retailing

Colonial 35 AC. Failure of this model to tune between 550 and 500 kc. is due to shorting out of the phono switch by the dial itself. Loosen the nuts holding the switch and push it farther back.—Radio Retailing

Colonial C-995. A hi-lo sensitivity switch, which will cut down interstation noise when tuning locals with this AVC model, may be added by removing wire lead between lugs 1 and 2 of the Candohm resistors, connecting a 100 ohm type between the lugs, cutting the ground connection to lug 1 and grounding lug 2. Drill a hole in the right side of the cabinet to receive a switch and connect the switch across the new 100 ohm resistor so that it may be either shorted out or placed in the circuit.—Radio Retailing

Columbia S. G. 8 (nickname Temple) Fading or intermittent operation is often due to an open R. F. choke in the first R. F. stage. It is a good policy to check all chokes in this set, as this trouble is quite often encountered.

When reception performs O. K., but very loud crackling noise takes place during operation, check the lugs and connections on the three R. F. chokes, an open will cause much of this annoyance.—Carl H. Ramm, 5409 Agatite Ave., Chicago, Ill.

Crosley (All models with Crosley's own dynamic speaker) Rattling sound as if the tube is working at wrong c-bias may be caused by a loose voice coil winding. To cure, remove diaphragm assembly and dip voice coil winding in thinned shellac (good grade). Thin sufficiently so that shellac will penetrate into the bottom layer of winding. Allow to harden completely, then repeat for second coat.—Vincent J. Cortese, Jr., Hazelton, Pa.

Crosley 40S—3. Cut off when shaken by passing traffic. Set checked O. K. Shaking the bathtub tuning condensers caused the set to stop. On second check, touching the control grid bias resistor of the screen grid tubes caused set to resume playing. Further tests showed the trouble to lie in this resistor, which is wound on a bakelite strip, with resistance wire clamped to soldering lug by rivets. Loosening two turns of this wire and soldering the ends directly to the lugs remedied the trouble.—Wm. Buescher, Cincinnati, Ohio.

Crosley 40S. When tone is bad, pep lacking and an analyzer check shows positive bias on the first audio tube, replace the by-pass condenser connected between the detector and the first audio grid.—Radio Retailing

Crosley 42S and 33S. Excessive hum is due to defective Mershon Condenser.—H. E. Massie, Stephens City, Va.

Crosley 42 and 33. Low volume and poor quality reception is often caused by defective coupling condensers between detectors and first audio tube. This condenser develops a high resistance when in operation, and will invariably test O. K. when removed from the chassis.—George E. Hohman, Baltimore, Md.

Crosley Model 120 8-tube super. A very loud cracking similar to static, and a building up of volume, then cutting off sharp and clearing up, can be traced to a small midget .02 con-

denser placed between the 24 and 27 tubes, shoved under the resistor strip. This trouble is quite frequent in these models, and hard to find.—M. S. Benson, Thornton, Ill.

Crosley 124. Fading. Look for cold-soldered joint on I. F. transformer lug.—Radio Retailing

Crosley 124. Intermittent reception, temporarily cured by touching by-pass condensers or resistors, is the fault of an intermittent open in the 0.1 mfd. condenser connected between screens and ground. While the set is inoperative a small increase in first R. F. plate current will be noted.—Radio Retailing

Crosley 124. Fading. Check .01 mfd. by-pass units for intermittent opens. Replace entire three or four section units W22412 or W23736 in which defective condenser is found for permanent repair.—Radio Retailing

Crosley 127. Sudden drop in volume accompanied by failure of the tuning meter. Partial short in the I. F. transformers.—Radio Retailing

Crosley 148. If set cuts out or works poorly on low line voltage replace 2.5 volt pilot with a 6-volt bulb. The pilot is wired across the 6.3 volt tube circuit and sometimes reduces heater voltage to below normal.—Radio Retailing

Crosley 148. Periodic drop in volume, distortion. See if the twin cub condenser in resistance-coupling network between detector and A. F. is reversed. The .03 should be the coupling condenser between 57 plate and 42 input grid. One terminal of the .001 should be grounded and the other connected to the detector plate. Some condensers have wrong markings and the .001 is incorrectly connected between ground and A. F. tube grid.—Radio Retailing

Crosley Model 425. An unusual case was encountered recently in servicing one of these receivers. Reception was intermittent. Moving the last R. F. tube would bring it back. Investigation showed that the plate voltage on all R. F. tubes would drop when the tube was moved. The trouble was soon traced to internal shorting in the untuned R. F. transformer, one leg of which was soldered to the plate prong of the last R. F. tube.—Wallace A. Depp, Arrowsmith, Ill.

Crosley 425. These models are equipped with a range switch or sensitivity control which often becomes noisy after several months of service. The remedy for this trouble is to solder a flexible wire from the wiper on the switch to the ground. This eliminates the wipe contact and no more trouble will be had. It is a positive fact that wiper contacts give the service man more trouble than he ever thinks.—Herbert Firmstone, Honesdale, Wayne Co., Pa.

Crosley 425. The speakers of this model will often rattle and sound as if the voice coil was not centered properly. Examination will show that it is O. K. but the rattle still persists. The remedy for this is to remove the cone from the speaker and paint the joints (inside and out) where the voice coil is fastened to the cone, with Sticks All, a glue which can be gotten at any Grant store. This same glue is used in the building of model airplanes and sold under various other trade names. At the same time notice if the windings for the voice coil are loose, if they are, paint the whole voice with a thin coat of glue also. This glue can be used to repair a break in the cone, such as might come from sticking a screw driver through it, which can happen, and often does.—Herbert Firmstone, Honesdale, Wayne Co., Pa.

Crosley 601. Filament rheostat shaft shorts to metal panel, heating wire and destroying fibre insulation without damaging wire itself. Equip shaft with insulating bushing, fill in between wire turns where charred with heat resisting cement and pulverized asbestos, smearing mixture on wire to hold it firmly. When dry, scrape mixture from contact surface with knife.—Radio Retailing

Crosley 706-60. Excessive hum despite O. K. circuit check. Replace 27 detector with a 56 and connect 1/10 mfd., 200 volt condenser from chassis to detector heater at fourth terminal from front of chassis on brass strip connecting pack with chassis.—Radio Retailing

Edison, Splitdorf. When double-section carbon volume controls connected across two plate coils fail a good replacement repair can be made by grounding the center arm of a 10,000 ohm, variable-taper potentiometer, connecting the off-side point to the antenna post through a shielded lead and the on-side point to the end of the 600 ohm bias resistance on the 226's which formerly went direct to ground. The leads to the plate coils

from the original controls should be cut off and taped. Then the regeneration switch control should be converted into a local-distance switch, throwing a .003 condenser across antenna and ground to provide control on loud locals.—Radio Retailing

Edison R4 and R5. In cases of lack of volume and distance look for one or two open R. F. by-pass condensers—a three terminal unit can be located in the rear of the set underneath the chassis.—Joseph A. Kotchey, Pittsburgh, Pa.

Edison. Where 24's and 27's have subnormal plate voltages check back from them to resistor terminals and remove the R.F. amplifier can with its associated resistors. Open can and isolate shorted by-pass condenser. Reassemble unit and rewire. Connect a tubular .1 or .5 mfd. condenser from the high side of the resistor to ground.—Radio Retailing

Erla, Brandes. Cutting out often caused by defective local-distance switch. Contact material becomes loose in spring. Put contact in tapered hole and centerpunch around edge to retighten.—Radio Retailing

Eveready 1, 2, 3. No voltage on R.F. tubes. Look at large Pyrohm in B lead. Volume controls may be replaced without using the old pulley and cable arrangement by placing the new control where the old control arm was fastened, lengthening the leads and re-neutralizing.—Radio Retailing

Fada Model 10. If the power transformer heats up, and the pitch melts out, don't blame it on a defective transformer right away. As the 280 is only $\frac{3}{8}$ " away from the transformer, the heat from this tube thus heats up the pitch and it runs out. When this condition occurs you get a bad "A.C." hum in the receiver. The remedy for this is—unsolder all the connections from transformer and melt the pitch back—by putting the transformer in a slow oven. Then allow same to cool for at least five hours. Put the transformer back and solder all connections to their proper places. Make an asbestos case between the transformer and the type 80. This will end your trouble.—Joseph Gigliotti 219 Locust Street, Ambler, Pa.

Fada. Slipping dials are the pet weakness of some of the older models. Remove the drum from the condenser shaft and lay

it flat on its wide side. File about $\frac{1}{16}$ of an inch of metal off the flat side of the dial "neck" which normally rests against the spacing collar. When replacing it push it hard against the spacing collar before tightening the set-screws. This causes the edge of the drum to be firmly wedged in between the plates of the drive assembly.—Radio Retailing.

Fada 42 (KA 60). The set would cut off at very infrequent intervals. All voltages checked normal, and all condensers were O. K. Trouble was finally isolated in the .005 mfd. coupling condenser between the grid of the "Det. Amp." tube and the output of the '24 detector. Pushing or pulling or prying on this condenser caused the set to cut off and on very erratically. Remedy, replace with good condenser. This is a round tubular condenser mounted on a bakelite panel in the front right-hand corner of the set, just to the right of the dial.—N. L. Havermale, Havermale Radio & Electric Co., 711 Maine St., Quincy, Ill.

Fada Model 42 "Flashograph." Fading or cutting off may be due to .01 coupling condensers between plate of detector amplifier and first audio grid, or det. AVC plate and det-amp. grid. Also check phono sw contacts. Local-distance switch connected through .005 cond to ANT and GND binding posts sometimes develops poor contact and causes fading. Replace switch. Flickering "flashograph" pilot can be cured by cleaning the contacts of the spring switch located behind the small panel below the tuning dial.—J. Block, Brooklyn, N. Y.

Fada 43. Distortion can be traced as a rule, to lowering in value of the 125,000 ohm resistor from screen-grid to chassis. Replace with exact value.—Radio Retailing

Freshman, Clarion. Use of certain 57's and 58's on some models frequently causes trouble as these tubes are slightly higher than other makes and the caps short to shields. Glue a piece of blotting paper to the inside of the shields.—Radio Retailing

General Electric 40 and RCA 40 Auto Sets. Cleaning up motor interference. The triangular plate which is mounted on rubber, to which the tuning control sheath is attached, should be grounded to the side of the set by a piece of flexible copper sheath. The cable sheath picks up the interference and passes it to the tuning cable which is connected to the variable condenser rotors.—A. L. Hissong, Rockford, Ill.

GE K40A. If there is fading, dive first for the coupling condenser between the plate of the detector and grid of the output tubes. If this condenser is at fault replace with .01 mfd. capacitor. This set is AC-DC and employs a 25Z5 as a voltage doubler. There is a switch in the rear of the set which should be thrown to the right (as you face the back of the set) when operating on A. C. and to the left for D. C.—John R. Shiliano, Pittsburgh, Pa.

GE K62 and S132. Oscillation in these models is regularly caused by gassy 35 tubes used in R.F. and I.F. stages. The reverse current flowing through the de-coupling resistors causes the grid bias on these tubes to be reduced to so low a value that oscillation sets in. These sets usually oscillate when turned from station to station. When the set is tuned to a station the AVC tube increases the grid bias on these 35's and they do not oscillate, but as soon as the set is turned off the station the grid bias is removed and the set again oscillates.

Tests for gas in tubes may be made in several ways. A micro-meter placed in the control grid leads of the 35 will show current if the tube is gassy. (Note: This is done with the set operating off a station.)

Another cause of oscillation in these sets is dirty contact wipers on the variable condensers. This kind of oscillation is usually accompanied by a noise when the dial is turned, but not always, so be sure that these wipers are clean. I take them out, bend them so they will make a better contact and clean them where they contact the rotors, with fine sandpaper and alcohol.—Bruce J. Woodward, Bethany, Pa.

GE, RCA. In AVC equipped models locals sometimes snap in and out as they are tuned-through. Substitute a new 35 for those in R.F. and I.F. stages until the trouble is found.—Radio Retailing

GE, J75, J79. The machine will tune very badly with a lot of noise when the condensers are turned, and will also tend to oscillate. The remedy is to solder a wire from the contact spring on the condenser to the chassis of the set.—J. W. Shade, Shamokin, Pa.

General Motors. When hum is encountered in this receiver and everything apparently checks O. K. it will pay to short out the fuse in the chassis. If the hum stops, replace the fuse.—J. B. Montero, Delagua, Colo.

GM. Where tone quality of models using horizontal tuning dials is bad although plate potentials on final 45's checks O. K. do not condemn the push-pull transformer. Look for a defective tone control variable resistor. Replace it with a 500,000 ohm unit.—Radio Retailing

Oscillation in GM Receivers. When oscillation troubles are experienced in General Motors Models A and B chassis inspect all connections to the frame of the chassis. Re-solder all "cold" or poorly soldered joints. Solder a pigtail from the condenser rotor shaft in the middle section of the gang to the chassis frame. Solder a pigtail from the brass hub from each rotor section to the corresponding wiper. If not already connected, solder a piece of bare wire from the bottom of each wiper to the base of the chassis. In extreme cases of excessive regeneration, connect a 25,000-ohm resistor from the screen grid terminal of the third R.F. tube to the frame of the chassis. The last named remedy applies only to Models 120, 130 and 140 receivers, chassis Models A and B with serial numbers below 62,100-A and 1964-B.—"Service"

GM. 220. Maximum volume regardless of volume control setting. Replace the 27 AVC tube. This tube may check O.K. in a tube checker, but will not function as an AVC tube.—James Reed, Jr., Elizabeth, Pa.

Gloritone Model 26. A set analysis showed the lack of screen grid voltage on the three 24 tubes. This voltage is obtained by a 2,460 ohm tap on the 5,500 ohm speaker field winding. The ohm meter showed the field coil to be O. K. but the 2,460 ohm tap open. A 25,000 ohm resistor connected from the field coil to the screen grid circuit made it unnecessary to rewind the coil.—Chas. R. Sharbough, Main Street, Carroltown, Pa.

Gloritone 26. Cutting in and out, accompanied by oscillation or howling. Usually caused by open screen-grid or cathode resistor by-passes. These are all in one can beneath R.F. coil shields. Cut old leads off to condensers and mount separate .25 mfd. unit between R.F. cathodes and screen to frame. When making this repair it will be necessary to run a new wire direct between cathode terminals on the sockets and another wire between screens on sockets.—Radio Retailing.

Gloritone Model 27. If set oscillates and condensers test O. K. the trouble sometimes may be remedied by regrounding the R.F. coils to the chassis instead of the shield cans, as poor contact is

often made between cans and chassis.—G. L. Riehel, 57 E. 4th Ave., Columbus, Ohio.

Grebe SK-4. If these sets fade on locals and are brought back by turning up the volume control or vice versa (if station comes in very loud and the volume control has to be turned down) during the first few minutes the set is turned on the trouble is gassy 24 tubes. Such tubes will often check O. K. in a tube tester, but new tubes will remedy the trouble.—George Mason, Santa Ana, Calif.

Grebe SK4. Oscillation between 550 and 750 kc. Tighten all contact clips on variable condenser rotor shaft down all the way. If this cures the trouble release them enough to permit easy operation of the dial. Clean with pipe-cleaner dipped in alcohol and align.—Radio Retailing

Gulbransen 9. Fading is usually due to defective local-dx switch. Move the wires leading to it and if fading occurs replace switch.—Radio Retailing

Kellogg 533-536. Sudden or gradual decline in volume, returning to normal with sharp click. Check small blocking condensers mounted on variable condenser gang. Replace with identical values.—Radio Retailing

Kennedy 52. Low voltage on the 47. The detector is resistance coupled to the 47. Coupling condenser .006 mfd. opens after being in operation for a few minutes.—“Sylvania News”

Knight Superset. Complete fading of signals, which after many hours of work was traced to the intermediate transformers. The first two intermediate transformers being the faulty ones. Riveted connections to one side of the trimmers being corroded caused the capacity of the trimmer cond. to change, thereby shifting the frequency of the I.F. transformer, hence the fading.—Hoge Radio Service, 15217 Ridpath Ave., Cleveland, Ohio.

Kolster—International Model. If the receiver fades after a few minutes of operation, look for the resistor located near the volume control shorting to one of the volume control terminals—John A. Honser, 41 Child Street, Rochester, N. Y.

Kolster K20-21. Lack of volume and weak reception caused by a shorted trimmer condenser which cuts out one R.F. stage in effect. The condenser is located at the end of the condenser gang near the 27 detector tube. The trouble is caused by the mica falling out, thus allowing the plates to short.—Stanley C. Maegly, Bromley, Ky.

Kolster 43. Fading is generally traceable to an open 0.6 mfd. by-pass in the screen grid circuit.—Radio Retailing

Kolster K45. Distortion at high volume level is sometimes due to loosened voice-coil windings, these rubbing against the field coil core.—Radio Retailing

Lyric 90, 96. Excessive plate current in the push-pull stage is often caused by the socket prongs shorting to chassis. Analysis generally fails to show up this trouble as the tester plug pushes the lug away from the metal. The 0.5 mfd. section in the by-pass can beneath the chassis usually fails before others. Intermittent or noisy reception is generally due to an unsoldered lead from R.F. choke to plate prong on socket, or to unsoldered grid leak lead to detector grid prong.—Radio Retailing

Majestic—All Models. When installing a dial cable on Majestics, I find the simplest and best way of holding the shaft while fastening the cable is to use a $\frac{3}{4}$ inch rubber cork, cut off so as to be about $\frac{5}{8}$ inch long, between the shaft and the chassis. Time for installation and adjustment about five minutes. Who hasn't worked an hour or more?—Glen Heffron, Hutchinson, Minn.

Majestic. Models using pilot as resonance indicator. Set dead or distorted. Look for open or shorted winding on center leg of indicator transformer in R.F. and I.F. plate circuits. Replace. For temporary repair short out winding by bridging two outside terminals and using 3.2 volt pilot.—Radio Retailing

Majestic. (All supers) Gradual fade-out is sometimes caused by the oscillator tube operating at too high a heater voltage. Reduce heater voltage, to this tube only, to 2.35 volts at a line voltage of 120.—Vincent J. Cortese, Jr. Hazleton, Pa.

Majestic Model 50-52. When this plays satisfactorily for a few minutes and then dies out or stops playing altogether, usually

the .04 mfd. condenser between the cathode of the first detector and the top of the grid coil of the oscillator is defective.—George W. Morrow, Washingtonville, Ohio.

Majestic Model 55. If set has suddenly developed a steady hum of low volume, check pilot light socket for a short to ground. This readily happens when chassis bolts are not securely fastened.—J. E. Noskey, 8299 Misner Ave., Detroit, Mich.

Majestic 60. Set stops playing suddenly, tuning meter pointer swings clear over to stop. Cause is shorting of by-pass condenser in plate circuit of I.F. tube. Unsolder leads from I.F. transformer, remove it from chassis and heat to melt wax. Remove can and melt wax from red lead with iron. Cut this lead, re-assemble the transformer with it projecting from case and mount replacement by-pass unit externally.—Radio Retailing

Majestic 60 and 160 series. In the Majestic 60 and 160 series sets (61-62-163) fading and poor sensitivity are caused by the 5,700 ohm carbon resistor mounted on the resistor stick and the two .067 mfd. cond. acting as grid returns to the R. F. tube and the 1st Det. and some to the set wiring. To cure, replace the resistor with a wirewound, replace the condenser acting as grid return to the first R. F. tube on an .022 cond. and one acting as grid return for the detector with an .067. These condensers must be the finest obtainable and have rubber covered leads. These condensers replace the orange wire running from AVC tube plate to the small terminal board near the second detector socket, (there is an R. F. choke on this terminal board) with a rubber covered wire. Replace the leads from the coils to condenser gang (except the osc. section) with rubber covered wire. These can be found by looking under cond. gang. Replace leads from the condenser gang to tube caps with rubber covered wire. Replace with rubber covered wire the black lead connected from the first I.F. transformer to the same lug on the small terminal board mentioned before to which the orange wire was connected. Replace the grid lead connecting the 1st I.F. transformer to grid I.F. tube with rubber wire. On the two grid leads coming from the chassis remove the shielding or push it down as far as it will go. Only the finest rubber covered leads can be used as the leakage through the insulation of the old braid covered leads was the chief cause of the lack of sensitivity. A complete alignment of cond. gang and I.F. transformers is necessary after this is done. On some of these sets the changes were made by distributors but many were not.—B. F. Zinser, 935 E. 53rd St., Chicago, Ill.

Majestic 66. No screen voltages. Check 10,000 ohm resistor just below 6E7 and 6C7 and if burned out replace with one having higher wattage rating. Plate and screen voltages below normal. Check center tapped filter choke (underneath set about an inch away from the A battery female cable connector). If grounded side is open or partially open there is no grid return to ground for the output tube and lack of bias boosts plate current to point where drop through choke becomes abnormally great.—Radio Retailing

Majestic 70. By substituting a 56 tube for the 27 the annoying hum in this receiver is greatly reduced.—Clifford Collins, Highland, Ill.

Majestic 70. In putting on dial cables a lot of time and also sweating and cursing can be saved by this method. After can is removed from over gang condensers there are five solder joints that hold the condensers on. Take the soldering iron and remove these connections and the gang condensers will swing away from the cable drum and you can put the cable on. Total time on the whole job, fifteen minutes.—Joseph W. Bishop, Philadelphia, Pa.

Majestic Model 90B. Intermittent operation in this model is often caused by a defective choke coil in their R.F. Plate leads. Simply shorting across this choke cures the trouble and the performance of the set is not hindered by doing this.—Glenn Heffron, Hutchinson, Minn.

Majestic 90 series. Loss of volume and extreme distortion often indicate an open in the R. F. choke in the antenna stage. Indicated further by the absence of grid bias on the first R. F. tube (a 27) with resulting high plate current. The antenna trimmer functions normally.—James Reed, Jr. Elizabeth, Pa.

Majestic 90. Carrier hum. Remove receptacle plate on floor outlet from which set gets power and fasten ground lead to Gem B box by means of mounting screw. Such a ground is a positive remedy where iron conduit is well grounded.—Radio Retailing

Majestic Model 90 Series. Made during production there was a 2,000 ohm choke built into the condenser bank one side of which connected to the junction of the second filter choke and speaker field while the other side connected to the positive B lead feeding the detector plate. The condenser bank lugs to which this choke is connected are the one next to the bottom

and the one next to the top; the one next to the top being the lug connecting the detector positive B. After this set was out of production it was found advisable to change this choke to a resistor of about 35,000 ohms. The chances of the detector B section of the filter condenser blowing are lessened quite a bit if the resistor is used. To make the change disconnect the wire from the next to the top lug third from the top. The detector B lead is left connected to this third lug from the top also. All replacement condenser banks made by Grigsby-Grunow Co. now contain the resistor instead of the choke.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 90B, 100B. Noise, motor-boating. Generally traceable to defective .5 mfd. R.F. by-pass condenser.—Radio Retailing

Majestic 90, 91, 92. If analysis shows no detector plate voltage clip the wire between the second and third lugs from the top of the condenser block for a temporary repair with slightly reduced volume.—Radio Retailing

Majestic 91, 92. Motor-boating. Inspect flexible lead soldered to sliding arm attached to trimmer cup. After a time this wire wears, breaks.—Radio Retailing

Majestic 91-92 using the 90 Chassis, 90-91-92-93 using the 90B chassis, 101 using the 100 chassis, and 102-103 using the 100B chassis: Fading is often due to the volume compensator on the end of the tuning condenser shaft being defective. This can easily be checked by setting the volume control at maximum, connecting an ohmmeter between the cathode hole in any of the first three R. F. sockets and chassis. Erratic motion of the ohmmeter needle as the tuning knob is turned shows the volume compensator defective.—B. F. Zinser, Chicago, Ill.

Majestic 100B. Cutting in and out. Check by-pass condensers across cathode resistors to ground. There are two in metal containers. Replace defectives with 1 mfd. units. —Radio Retailing

Majestic 130-A Set. Considerable profanity was spent to no advantage upon a completely dead set, even to local stations, even with all voltages and condensers perfect. Tubes all O. K., everything O. K., except set would not play. Trouble finally located in a shorted .002 mfd. condenser connected in series with a 100,000 ohm resistor from plate to detector to cathode. This machine had this condenser connected to the Cathode of

the Det. tube, instead of the ground as shown in Rider's manual, and about 60 volts on the cathode of the detector. Remedy, replace with a good 400 volt .002 condenser.—N. L. Havermale, Havermale Radio & Electric Co., 711 Maine Street, Quincy, Illinois.

Majestic Model 130 Series. A common fault is fading, slight faltering of the signal, and poor sensitivity. All of these faults are invariably caused by failure of the .04 mfd. condensers furnishing the coupling for the band pass tuner. There are three of these condensers mounted on the verticle upright on which the condenser gang is mounted. Look close or you won't find them. The only satisfactory repair is to replace all three of these condensers at once for the work is worth a whole lot more than the condensers. The whole R. F. unit must be removed to make this replacement but this isn't such a job as it appears at first. Nothing but a neon oscillator condenser tester will show the faulty condensers so don't bother to test them.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 201. Oscillation, or sharp whistle, when adjusting the volume control near its low position is tracable to the bolt holding the speaker to the baffle. The bolt extends too near the spray-shield of the first A. F. 35. Cut it off close to the nut and, if necessary, pull the tube away with a rubber band. Trouble does not occur when the chassis is out of the cabinet.—Radio Retailing

Majestic Model 290 Series. Erratic operation and extreme distortion are usually caused by leakage between the 7 mfd. and 10 mfd. electrolytic condensers that are built into the same case. This is the small dual condenser. Disconnect the lead to the 10 mfd. section and replace with a good quality 10 mfd. tubular condenser by connecting one end to the common lug on the old dual condenser and the other end to the lug on the resistor mounting board to which the old lead you removed was connected. This simply separates the two condensers and cures the fault. Watch polarity when connecting the new condenser.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 381. Poor selectivity, volume. Many men remove the metal shield on the bottom of the chassis. Oscillation is kept under control by proper use of the volume adjustment.—Radio Retailing

Motorola 44. Installing in 1933 Plymouth—by placing a Motorola Dome-light filter in series with the dome light lead which is on the left hand front post all interference is readily eliminated, and spark plug suppressors are not necessary. Distributor suppressor is needed, however.—Anthony R. Satullo, Cleveland, Ohio

Peerless Cowier 65. Low volume and erratic performance may be caused by the blue and white resistors supplying screen grid voltage, shifting in value, permitting the screen voltage to rise to 160 volts. Replacing these resistors with two 5,000 ohm 5 watt wire wound resistors will cure this difficulty.—Thos. McClean, 56 St. Johns Pl., Brooklyn, N. Y.

Philco. When "Shadowgraph" tuning indicators fail to indicate check up on the antenna. If it is too short, or so inefficient that it does not pick up strong signals this will happen.—Radio Retailing

Philco. High and low frequency trimmers can be adjusted without an output meter on sets equipped with Shadowgraph tuning indicators by first tuning a station operating on 1,400 kc. and adjusting for narrow shadow and then repeating the process on a low-frequency signal.—Radio Retailing

Philco. Where dial cables show a tendency to slip at several points smear the cable with rosin.—Radio Retailing

Philco. 5. No volume, eliminator output only 95 volts. Push down on upper vibrator contact so that spacing is equal between armature and both contacts. Erratic vibrator action. Make sure resistor across contacts is 50 ohms. Buzz, for which vibrator is not responsible. Replace 2A7.—Radio Retailing

Philco 5. Frying or crackling in early serial numbers. If not in eliminator remove grid clip from 6A7 cap and remove lead from clip. Using same size stranded wire with good insulation wind R. F. choke for five turns on clip, reconnect lead. For obstinate cases wind thirty turns number 16 solid, cc wire around pencil. Withdraw pencil and place choke so formed in A lead between low voltage R. F. choke and heater terminal of 84. Keep choke in the vibrator section of base. Solder and tape splices. Late serial numbers have these chokes.—Radio Retailing

Philco Model 20. This one had a bad hum, especially with a carrier tuned in, and acted as though there were no filter condenser. After heating the can and sliding out the filter condenser block it was found that the B-jumper was poorly connected to the condensers. This jumper is on that end of the block opposite from the leads.—H. R. Anderson, 6038 Telegraph Ave., Oakland, Calif.

Philco Model 20. A Model 20 Philco tuned broad and oscillated with volume control on full. By-pass condensers were all checked O. K. The screws holding the variable condenser to the frame seemed tight, but a wire connected from the condenser gang to the chassis cleared the trouble.—Leo Zimmer, 63 Russell St., Canisteo, N. Y.

Philco 20. Bad tone, pitched higher than normal. Replace old cone using solidified disc with new spider type cone.—Radio Retailing

Philco 20. Intermittent reception is usually due to fine wires coming from by-pass condensers encased in small bakelite cases making and breaking connections. About the easiest way of finding the one causing the trouble is to probe at the lugs with a sharp-pointed instrument. An ice-pick serves quite well.—E. Sosnoski, Waverly, N. Y.

Philco 20, 70, 90, 112, 91, 71. Noisy when chassis is struck or moved. This condition is only experienced with an incoming signal. Check coil shields for solid contact with chassis, also check coil bracket supports for the same condition. Incidentally this trouble will correct itself while your searching for it if you turn the chassis up-side down. Keep chassis in a verticle position until the trouble is located.—George E. Hohman, Baltimore, Md.

Philco 41DC. Pronounced nasal quality and choppy reception. Replace 500,000-ohm first audio stage grid coupling resistor with 100,000-ohms and insert a 3,000 current-limiting resistor in series with the primary winding of the push-pull input transformer.—Radio Retailing

Philco Model 41-42. Intermittent reception can sometimes be traced to a defective .05 mfd. condenser connected from the ground binding post to the chassis. In these models if hum is present it can be greatly reduced by connecting a 2 mfd. condenser

from the screen grid of the detector tube to the chassis.—D. Piacentini, 403 W. 18th St., New York City

Philco 70. It is generally claimed that cutting off of reception in Philco receivers is due to defective coupling condensers that couple the audio stages. I had to repair a Philco 70 receiver which was troubled by fading, and the first thing that I did, after the tubes had been tested, was to remove the coupling condenser and substitute a new one. But that did not do any good, and after careful testing the trouble was located, and was due to a defective condenser in the cathode circuit of the oscillator tube. This condenser is a double .09 mfd. and in the diagram it is numbered as No. 12. It can be replaced with a .1 mfd.—Frank Photiades, Highland Park, Mich.

Philco Model 76. Set dead. Check speaker socket, making sure the socket makes good connection with the prongs on the plug. The pin hooked to the field often causes trouble.—J.E. Noskey, 8299 Misner Ave., Detroit, Mich.

Philco Model 81. In a receiver of this type there was a strange case of microphonics. All usual causes were checked. Finally it was traced to the Long and Short Wave switch. This switch has two end bearings, of which the front bearing is grounded while the rear one is not. At times the shaft would vibrate, making and breaking contact with the rear bearing.—John Shiliano, 2914 Mullen St., Pittsburgh, Pa.

Philco 90. Oscillation between 1,100 and 1,500 kc. when trimmers are adjusted to resonance. Shunt an 0.1 mfd. 200, volt condenser across first R. F. (24) and oscillator (27) 5,000-ohm cathode resistor.—Radio Retailing

Philco 90-X. "Cutting off" of reception is due either to use of poor tube as oscillator or to cathode resistor. Change the resistor from 15,000 to 10,000 ohms.—Radio Retailing

Philco AVC. "Cutting off" of reception is caused by the bakelite condenser that is used as a coupling condenser between the 2nd detector and audio. The number is 3903-M or 3903-R.—W. Hartmen, Chicago, Ill.

Philco 90. Intermittent noise and crackling when the set is jarred may sometimes be traced to poor electrical contact between R. F. tube shields and chassis. Bonding these with short lengths of wire remedies the trouble.—Radio Retailing

Philco 90. "Cutting off" of reception I have found is usually caused by opening of condensers in the audio plate circuit. To test, momentarily short across condenser, which will cause same to break down. Replace condenser with new type which has stranded wire from condenser to eyelet in lug. (Note: in sets with serial numbers above 237,001 these condensers are numbered 18, 23, and 28.)—Louis E. Lange, Chicago, Ill.

Philco Model 91X. In the Philco Model 91X which incorporates shadow tuning, if the set is dead, and all that is visible in window of shadow box is a straight line about the width of a pencil mark, look for open coil in Vane Type Milli-ammeter. This meter is located in the B supply lead to the plates of the R. F. and I. F. tubes, and above condition indicates these tubes are drawing no plate current. While these coils may be repaired or rewound it doesn't pay if time is taken into consideration, as a new unit is not expensive. To make a temporary repair with the loss of the shadow tuning feature, simply cut both wires to meter and connect together. A series resistor to compensate for coil resistance is not necessary.—Allen Beers, 724-6th Ave., San Francisco, Calif.

Philco Model 91X. Another condition in these models also located in the Vane Type M. L. is set dead, shadow in window of shadow box extending full across window indicating excessive current through meter. Look for a ground where the lead from meter to plates of R. F. and I. F. leaves the coil box. The insulation has been found to be cut through and grounded to the sharp edge of coil box, causing a short to chassis. This lead comes direct from the high potential lead of power pack, therefore if grounded to chassis acts the same as a short in power pack, making it advisable to check power transformer, choke coil resistors and rectifier tube to be sure no damage to these units has resulted from the overload.—Allen Beers, 724-6th Ave., San Francisco, Calif.

Philco 95, 96, 111, 112. Blasting at full volume, either continuously or intermittently, with a seemingly inoperative volume control is not due to the volume control. Nor is it due to the 70,000 ohm resistor leading to C—. It is due to an open one-half mfd. condenser connected to the junction of the volume control and the 70,000 ohm resistor. This is located in the filter condenser bank and inconspicuously connected to the volume control. Cut this lead off and solder a one-half mfd. condenser, with a cartridge or metal-cased, between this point and the

ground, and the trouble is cured.—Anthony Hitzzenhammer, Chicago, Ill.

Philco 96. A loud intermittent howl is often traced to a defective carbon volume control.—J. E. Noskey, Detroit, Mich.

Radiola R15. Trouble is frequently met in lack of volume, intermittent reception, and inability to neutralize. The trouble will be found to be in the shield cans covering the four 224 tubes and the four coils. After a time the part of the shield making contact with the chassis becomes oxidized, resulting in a poor contact, and one poor contact anywhere in the shielding of this set will throw the entire set out of balance. The remedy is to remove the shield cans and thoroughly clean the contact surfaces with emery cloth and coat with a very thin layer of vaseline. Also inspect the wiping contacts to the rotors of the tuning condensers, and if trouble is suspected there apply the same remedy. This one point is imperative. The shield cans must make good contact for proper performance of the R15.—Gordon E. Hunt, Rangely, Maine

Radiola 21, 22. Apparent short between red and maroon B plus lead and chassis. If short develops when tube is inserted and disappears when the tube is removed from 22 sockets look at plate prongs to see if these touch chassis. Screws holding sockets down loosen due to speaker vibration and sockets shift.—Radio Retailing

Radiola 21 and 22. These models are made for use with 6 volt tubes. To convert these models to use the 2 volt tubes is a simple matter. There is a 3 resistor at the back bottom of the chassis. These are the filament resistors used for 6 volt operations. Short each of these resistors with a piece of wire, do not unsolder any connections. Insert a No. 5512-75 M. A. pilot light in the dial socket. Use 232 tubes in place of 222 tubes. Use 230 tubes in place of 112-A tubes. Use 231 tubes in place of 171-A tubes. Use a small 2.2 ohm resistor in series with the 2 volt A positive lead. Special kits can be obtained.—M. J. Planoosky, 3111 Keene Ct. S. W., Cleveland, Ohio

Radiola 44, 46 AC. Low, or no plate voltage. Often due to grounded coupling reactor in detector plate circuit. This is in small, brown housing beneath tuning unit and is insulated by thin pitch coating. Slip insulation between choke and chassis.—Radio Retailing

Radiola 44 and 46. If difficulty in aligning these receivers is experienced, the cause may be found due to shorted turns on the small universal wound plate coil. Replacing this coil cures the difficulty.—Roy Novell, Rice, Texas

Suggestion for Radiolas 50 and 55. The suggestion is made to remove the series combination of the 18,000 ohm resistor and .005 mfd. fixed condenser connected between the plates of the two push-pull pentodes in the Radiolas 50 and 55. This slight operation improves the tone quality.—“Service”

Radiola Model 66. If this receiver is completely dead except for a loud hum, usually the by-pass condenser across the plate and cathode lugs underneath the socket of the second detector tube is shorted. This should be replaced with a .0024 mfd. condenser.—R. F. Lambert, 11-10 Ohio Ave., Detroit, Mich.

RCA-Victor. All models using a 27 as AVC. Fading away of signals after set has been turned on indicates failure of the AVC to function. It has been suggested that low filament voltage on the AVC tubes may cause this trouble. Check this, and try a 56 tube in place of the 27. We have found that in some instances certain 27 tubes will not function in this socket for any length of time even though the filament voltages are correct. The only thing to do is to install a brand new 27. One that has been used in any other socket will not do, so don't try to swap tubes around.—John F. Bivans, High Point, N. C.

RCA. Many recent models using Bradleyometer variable resistors. If these become noisy remove the covers, with cloth, apply vaseline.—Radio Retailing

RCA R-4 and Edison Screen Grid. Oscillation and noise resulting from dirty contact wipers on variable condensers. This trouble I have found can not always be permanently cured by cleaning or scraping the wiper arm, as recommended last month in connection with G. E. K62 and S132. It is always good policy, if repeat calls are to be eliminated, to solder “pig tail” leads to the rotor and wiper arm, and ground. Copper braid may be used and bent around the shaft in the direction of the rotor plates. It is desirable to encase the braid in spaghetti tubing.—P. J. McGee, President, IRSM.

RCA Victor Model R-5. Often in this receiver, it is impossible

to control volume, even with aerial disconnected. The volume control, in this model, is across the antenna and ground with the center arm coupled to the primary of the R. F. transformer. The pick-up of the coil is sufficient to nullify the effect of the volume control. Shielding the R. F. coil assembly will assist greatly.—A. J. Borden, 1225 So. Pearl St., Denver, Colo.

RCA Victor R-12. Poor tone quality. Analysis will reveal incorrect plate and grid voltages on 47 tube. This is due to the bleeder resistors changing their value. In one case they changed from 16,000 to 700 ohms and 8,000 to 2,000 ohms.—George E. Hohman, Baltimore, Md.

RCA Victor Model M30. When the receiver plays without any control of volume, often the green wire in the cable that runs from the set to the control unit, will be broken inside the cable. This disconnects the cathode of the AVC tube.—Leo Zimmer, 63 Russell St., Canisteo, N. Y.

RCA M34. Vibration loosens mounting. Secure two pieces of rubber or felt about $\frac{1}{2}$ inch thick. Place these behind set on bolt, one each side of bulkhead, compressing tightly with nut. On Chevrolets and other cars having light bulkheads which permit shimmying of chassis place 6 by 8 inch steel plate under smaller one furnished by manufacturer, holding it in place with 8/32 bolts passed through holes drilled in four corners.—Radio Retailing

RCA M34, GE B40. Speaker rattle or sizzle. Try centering cone. Remove from case and look for filings at pole pieces. If there is no hole in screen for centering punch one $\frac{3}{8}$ " before re-installing as drawing speaker up with nuts on face of chassis may twist frame and throw cone off center. If voice coil glue loosens don't try repair. Replace. Vibrator works O.K. but set is dead. Place paper scraps between all contacts and check from each side to ground on chassis. Shorts indicate blown condensers across contacts. If found, replace vibrator base. If no blown condensers check for one between B plus lead on speaker (2nd from right looking into back of set) and chassis ground. If dead short is found trouble is usually in intermediate cans shorting to coils or blown 4 mike in pack. To insulate cans, glue cardboard discs inside covers. Rattle. Tighten eyelet in center of speaker screen. Unstable vibrator operation. Check small rivets holding armature to channel section of springs and tighten by pounding if loose,

removing armature for job. Field current and pilot current on but tubes don't light. Poor soldered joint between small R. F. choke L12 and field wire lead.—Radio Retailing

RCA 42, 48. Defective volume control. Check R.F. 24's for plate to screen short to avoid repetition of the trouble. Such shorts put abnormal current through the controls but otherwise affect reception very little.—Radio Retailing

RCA-44. If set oscillates as station selector is turned take off the two copper shields and clean the edges with fine sandpaper. When replacing make sure the shields make good contact with the condenser shaft.—J. E. Noskey, Detroit, Mich.

RCA 44, 46. Loss of volume, selectivity, sensitivity after several years of use. If voltages and tubes check O.K. trouble is usually caused by wear in the gang condenser, permitting the rotor sections to shift. Re-align these by means of the adjusting screws at each end of the stator sections. Select a station between 600 and 650 kc. and adjust for maximum volume. Then adjust the trimmers at the 1,500 kc. end and repeat both operations once again. A 235 in the 2nd R.F. stage will improve tone on local stations and low volume settings.—Radio Retailing

RCA 48. Cutting in and out of reception is sometimes caused by sluffing off of the plating on tuning condensers. Hum, noticeable only when records are played, is cured by a 5,000 ohm resistor shunted across the secondary of the pickup input transformer.—Radio Retailing

RCA 48. Fading, intermittent signals are most often caused either by a burnt-out section of the volume control or corroded variable condenser clips.—Radio Retailing

RCA Victor Model RE57, 39-35. A very loud and annoying noise in these receivers occurs with jarring of the receiver. I found the cause to be in the second radio frequency condenser and coil shield can under the chassis. There is a fixed condenser connected to the end of the coil, and the coil is fastened to a plate; this plate is riveted to the chassis; but the end of the plate does not make good contact with the chassis, and any jarring of the receiver will cause this fixed condenser to touch the shield can causing a loud noise. By just merely drilling a hole through plate and chassis near the end of the plate and inserting a screw and nut, making sure that the fixed condenser does not strike the shield can, this

trouble will be overcome permanently.—George Feser, 986A Lafayette Ave., Brooklyn, New York.

RCA 60, 62. Low volume. Check for decline in value of the 20,000 ohm bleeder resistor located beneath the pack.—Radio Retailing

RCA Victor R-78 and RAE-84. Intermittent and erratic reception and oscillation or motor-boating between stations is usually caused by dirty wiping contacts on the variable condensers. Cleaning these usually remedies this situation.—H. B. Kirkhart, 151 East Second St., Pomona, Calif.

RCA Victor R. E. 80. I have found that the most frequent cause of the trouble of this receiver is oscillation, no AVC action, loud volume and motor-boating, most frequently on the higher frequencies. The trouble is this:—the pilot light socket almost touches the shield on the front panel, that is used to shield the antenna coil from the controls on the panel, the vibration of the set causes the socket lugs to short to the shield, the filament of the pilot is connected with the filament of the power amplifier, the shorted pilot light socket will short out the power amplifier bias resistor as well as remove the negative potential from the cathode of the -55 tube. This will result in distorted reproduction, no AVC action, oscillation, and loud volume, it is simple to twist the lugs back in place and also wrap tape around the lug to prevent the same trouble again.—John Tafra, 1041 Geyer Ave., St. Louis, Mo.

RCA 80-82. Loss of volume and poor tone. Examine black enamelled bias resistor for 45's, under chassis, for bad soldered joint.—Radio Retailing.

RCA 106 Speaker. The AC model can be used with single pentode output tube models with considerable improvement in tone. The field is about 450 ohms. Use it as the bias resistor.—Radio Retailing

Silver Marshall A-18. When set squeals with volume wide open on distant stations, try changing oscillator tube. Also check for too high screen grid voltage.—Lanterman Radio Service, Edwardsville, Ill.

SM 30. When there is no reception look for a punctured filter condenser, usually the green lead coming out of the can.—Radio Retailing

Silver Marshall 724. A common cause of fading or cutting off is found to be due to a defective mica tuning condenser in the last I.F. transformer. Pressure on it with a small screw will show it up.—Geo. V. Sangree, Harrisburg, Pa.

Silvertone 110, 111. Defective volume control. Replace with 10,000-ohm unit and ground through 5 or 10 watt, 500-ohm resistor in series with the cathode circuit to give better control on locals.—Radio Retailing

Sparton models using 485 tubes. It is a common fault for these models to oscillate, howl and motor-boat when first turned on. This continues for about a minute and then clears up. A check-up will reveal the trouble to lie chiefly in the Radio Frequency and Detector stages. Replace tubes with new ones. If trouble still persists pull out chassis, leave the cover on, power on maximum, and tap tubes gently. Change with other tubes, or replace any tubes that oscillate or howl under this treatment.—Andrews Janis, McKees Rocks, Pa.

Sparton 79. Set would suddenly burst into full volume, with volume control turned low, and would play so with the volume control removed from the circuit. Finally figured it had to be the cathode by-pass condenser leaking and applying just the needed bias for full volume. A new condenser did the trick.—Everett Palmer, Bandon, Ore.

Sparton 89A, 79A. R.F. oscillation in serial numbers using 485 tubes. Readjust trimmers to exact resonance. If trouble persists replace .5 mfd. B by-pass in R.F. amplifier with .25 mfd., 400 volt tubular unit. Some late chassis have it.—Radio Retailing

Sparton 301. If this model plays with a steady hum, look for poor contact in the phonograph pick-up jack A-4136. Replacing the jack will generally cure the trouble.—J. T. Maza, E. Chicago, Ind.

Sparton 410 and 9A. Can be stepped up in volume considerably by substituting a .002 of similar condenser volume for the .006 between the power transformer primary and the ground. In these push-pull, two power tube models, a very agreeable tone control can be effected by connecting the plates of the power tubes through a .002 condenser. Of course, cut into this and bring out the two insulated wires to an outside switch (insulated

from the chassis) and mount on the back of the chassis.—L. E. Neuffer, Topeka, Ind.

Sparton 410. No plate voltage on I.F. tubes and oscillator. Replace tubular condenser attached to front panel with .5 or 1 mfd. 400 volt capacity.—Radio Retailing

Sparton 410 and 420 DC Sets. Intermittent operation—sometimes stop and start by jarring. Trouble found in loose connections on resistor block holding parts A-4363 or A-5889. The wire connections are worn away from the screws due to heat. Solder for permanent job.—Murray M. Gartner, New York City.

Sparton 740. A pin, fitting into a small socket, connects the band-pass unit to the R.F. amplifier. Corrosion at this point is a common cause of fading.—Radio Retailing

Sparton 930, 931, 589. When plates of the 485's show low or no potential, remove screw at side tab of cylindrical condenser at rear left of amplifier can. Remove responsible condenser by unscrewing with upward twist. Replace. Job can be done in 10 minutes without removing chassis from cabinet.—Radio Retailing

Sparton 931. Intermittent reception, loud hum, fading and low volume is often due to the .6 ohm balancing control, located between the 182B power tubes having high resistance (6-7 ohms). This cuts down the filament current to the power tubes, decreasing volume. The control may be left out entirely, or a new one substituted.—E. Sosnoski, Waverly, N. Y.

Sparton 931. Thin tone and oscillation accompanied by high plate voltage readings and low speaker field current. 15,000 ohm bleeder has increased in value due to age. Replace with 10 to 25 watt unit.—Radio Retailing

Sparton 931, 301, Hum is generally caused by nothing more serious than poorly matched push-pull 182's—Radio Retailing

Sterling Model F. Cutting off of signals and erratic signals has been traced very often to defective volume control.—H. E. Massie, Stephens City, Va.

Stewart Warner S. W. Converter. The S. W. converter may be found very insensitive even tho all circuits and tubes check O.K.

Converts of this type may be made to operate satisfactorily by "resoldering every soldered connection in the converter tho they may seem O.K." A poorly soldered connection may have sufficient high resistance to materially affect performance on short waves, yet not high enough to show up on a simple continuity test.—M. J. Planoosky, 3111 Keene Ct. S. W., Cleveland, Ohio.

Stewart Warner Model 102. To improve Pentode tube performance on these receivers, make the following changes, (a) Cut the connection made by the small green 500,000 ohm resistor, to the control grid of the pentode at the grid terminal. (b) Cut the connection made by the No. 67299 .02 mfd. coupling condenser to the corner lug of the terminal strip (this being the same lug to which the other connection of the green resistor is made.) (c) Connect loose end of the resistor to the loose end of the .02 condenser, connect the control grid of the pentode to lug on mentioned resistor terminal strip. This change removes the 500,000 ohms from the grid circuit of the pentode tube at the same time retaining the R.F. suppressing action for which the resistor was used.—M. J. Planoovsky, 3111 Keene Ct. S. W., Cleveland, Ohio

Stewart Warner 950. The screen voltage in this set is bled through a 20,000 ohm, 2 watt purple resistor, and is controlled by the volume control. Almost invariably, the purple resistor drops gradually to about 2,000 ohms, and burns out the volume control. When replacing the volume control, replace the purple resistor also, or the new volume control will go the way of the old.—James Reed Jr., Elizabeth, Pa.

Stewart Warner 950, R100. Poor sensitivity and low volume. Check red resistor 66326 for low value or charring. This resistor shunts R.F. plates to minimize effect of variation in plate current when different tubes are used and if low increases load and reduces screen voltages.—Radio Retailing

Stewart Warner 950. Oscillation at low frequencies. Clean variable condenser contact clips and bend them to increase pressure. Oscillation at high frequencies. Look for open .25 mfd. R.F. by-pass condenser located close to R.F. coils. Tone distorted, set oscillates. Try replacing .25 mfd. R.F. grid by-pass condenser. If set oscillates when quick-heater tubes are used replace .25 mfd. screen-grid by-pass with .5 mfd. or more.—Radio Retailing

Stewart Warner 950 Series. If the plate voltage is slightly low and the screen voltage on the three radio frequency tubes is

high, this is usually caused by failure of the 3 watt, 20,000 ohm purple resistor.—M. W. Kikkebusch, 1806 S. 8th Ave., Meywood, Ill.

Stromberg 654. A leaky 0.3 mfd. cathode by-pass section in the first R.F. stage is often at the bottom of fading trouble.—Radio Retailing

Stromberg Carlson 846-848. A mean form of motor-boating may be experienced after the set has seen considerable use. This motor-boating shows up between stations, generally being worst at the low frequency end of the dial. Sometimes changing volume controls effects it. The cause is not in the audio system as might be expected but is due to poor grounds between the condenser rotor to its frame. Cleaning these grounding springs will cure the trouble, but pigtails from each rotor section to a nearby point on the frame will permanently eliminate this trouble.—B. F. Zinser, 935 E. 53rd St., Chicago, Ill.

US Radio 10. Jumpy volume control. Look for gassy 27 in first A.F. socket.—Radio Retailing

US Washington 34. Intermittent reception. Change 200,000 ohm grid filter resistor between 35 grid and AVC tube plate to 100,000 ohms.—Radio Retailing

Victor R-15. The volume control is the greatest cause of oscillation and intermittent reception. When using the regular RCA replacement control reserve the two wires which go to the outside terminals of the screen connections, also remove the gray 12,000 ohm resistor connected across the screen portion of the control. (Note: The screen section on the new control has a different value than the original.)—F. L. Dearth, Dearth's Radio Service, Kensington, Ohio

Victor R32, Distortion and poor tone quality—look for speaker cone broken close to the voice coil.—Chas. B. Hast, Grand Rapids, Mich.

Victor R32. Have had several sets in service recently because of shorted filter condensers. By removing the extra AC line connection plug in power pack chassis, which is not used in most cases, an opening is left in which an inverted electrolytic condenser

can be installed. This makes a first class repair job with little work, and is applicable to other models and makes as well.—H. M. Cowles, Salamanca, N. Y.

Victor R32—RE45. AC hum can often be traced to a loose arm on the hum control.—J. E. Noskey, Detroit, Mich.

Victor 35. Low volume or no reception. Turn on set and permit tubes to warm up, setting dial on strong local. Remove detector and then replace quickly. If set plays for few seconds and then fades out replace detector screen resistor.—Radio Retailing

Victor R35. Weak reception. Commonly either open detector screen resistor or first A.F. plate resistor. The first is located under resistor board on chassis. To replace connect pigtail unit of $1\frac{1}{2}$ megohms to two inside lugs on side of board toward the center of chassis. To replace A.F. unit loosen pack but do not remove and tip up bottom sufficiently to clip out green and red pigtail resistor on terminal strip, replacing with 70,000 ohms.—Radio Retailing

Victor RE45, 52, 75. Chassis shorts. Often caused by steel needles falling down from phonograph compartment and shorting socket lugs to ground.—Radio Retailing

Zenith 50. This model generally hums in spite of 36 mfd. of filter. This hum can be greatly reduced by filtering the 24 detector plate and screen with 100,000 and 500,000 ohm resistors, respectively, and .1 mfd. by-passes. It can be further reduced by increasing the size of the plate coupling condenser in the first A.F. stage. .05 to .1 mfd. seems about right. A larger condenser spoils the bass response.—H. R. Anderson, 6038 Telegraph Ave., Oakland, Calif.

Zenith 50 Series. A loud hum when all parts and tubes check O.K. can be cured by connecting a 250,000 ohm resistor across the grid of second A.F. 27 tubes, which are connected in push-pull.—Stanley C. Maegly, Bromley, Ky.

Zenith 70. Fading or intermittent reception. Look for open or shorted .25 mfd. dual plate by-pass condenser located on the first and second R.F. stages, or .03 mfd. by-pass condenser located between the plate of the first A.F. tube and the primary of the first A.F. transformer. If signals vary from weak to normal suspect the first. If they are always weak check the second.

Zenith 91. Fading, accompanied by tricky local switch operation, is usually caused by trouble in the 2,800 and 3,600 ohm resistors in series across the DC voltage output. Replace with higher wattage types.—Radio Retailing

Zenith 750 Model. The first trouble evident is that the set breaks into oscillation with a constant "put-put" sound. The remedy is to replace the double conds. 5 mfd. across the cathodes of first Det. and Inter-transformer tubes.—Valentine Obal, 4215 So. 29 St., Omaha, Neb.

MISCELLANEOUS INFORMATION

AMPLIFIERS

Direct Coupled Amplifiers. I have found the most frequent cause of trouble is in the resistors that go from the center tap of the 45 filament winding to ground, and from cathode of the 24A or 57 to ground. If these are carbon replace with high watt wire-wound, adjustable resistors, preferably using one resistor with taps to obtain suitable resistance values.

If there is considerable hum try center tapped resistors in place of center taps on filament windings.

If the amplifier is dead either the 45 filament wire is grounded or a leaky or shorted by-pass condenser is the trouble. If filament winding is grounded replace transformer. Test all condensers for leaks or shorts and replace, if necessary, with I.M.F. 400V condensers. Voltage rating is necessary.—O. M. Brady, Chicago, Ill.

Amplifier Couplers. For several years I have been experimenting with different devices to couple radio tuners to audio power amplifiers, and some methods were fairly satisfactory, but usually costly, involving transformers, etc. I have found that by placing in series with the plate terminal of either the detector or first audio tube of the tuner and the input of the amplifier, a small (.05 mfd.) by-pass condenser and running a wire from ground to the other input terminal of the amplifier, I get the best results. The value of this condenser does not seem to be very critical.

I have installed this condenser system on several Electrolas which were formerly energized by a battery set. Most Electrolas have only one stage of audio for the radio input, making it necessary for the tap to be taken off of the first audio amplifier tube of the radio.

I have also found that by using a pair of head-phones in series with the same condenser from plate of the detector or first audio to ground I am able to locate hum and distortion noises in radio receivers, stage by stage, quickly.—Franklin W. Young, Easton, Pa.

AUTO RADIOS

Auto Radio. Interference from the high tension circuit in the 1933 Chevrolet is practically unavoidable when the radio is mounted on the bulkhead on the right side of the car. The ignition coil with associated electrolock cable, mounted on the motor side of the bulkhead, is so closely coupled that despite all the shielding and tuned filtering, there is still bound to be coupling. I have found that the only sure remedy is to mount the radio on the left side of the bulkhead and keep the battery leads as far removed from the coil leads as possible. Changing the radio position rather than the coil-electrolock cable is more practical and satisfactory.—Clyde P. Carter, Canisteo, N. Y.

Checking Auto B Units. A hint of rapidly isolating the trouble in car radios with power units combined is the releasing of the B plus power lead from the power unit and attaching it to the B plus of an extra B power unit and completing the circuit by connecting B minus of the temporary unit to B minus of the car set which is usually the chassis. If the radio is O.K., it will operate from the added power unit and the trouble will be isolated to the set's power unit which is sometimes hard to check for non-operation.

Positive conclusion on which end of the radio the trouble is and rapid service to your customer is the merit of this hint.—C. L. Fairchild, 620 Wright Ave., Elgin, Ill.

1933 Chevrolet. Remove ignition coil from bulkhead and fasten to motor using valve inspection plate bolt.—Radio Retailing

1933 Pontiac. On this and all other cars having shielded lead down right side post and requiring set installation on driver's side carry extended antenna lead in shielding under floor boards rather than under dash to complete noise suppression.—Radio Retailing

1933 Ford. To get suppression at coil remove the three screws and terminals nut and take the coil off. Pull out the carbon brush and spring, saving the spring and discarding the brush. Make a suppressor from a 40,000 ohm one watt carbon resistor of good quality by cutting it to the same length as the old brush. Clean off paint and file recess in one end to accommodate the spring and re-assemble the coil, using the suppressor as a brush. 40,000 ohms is recommended, as the resistance is reduced by cutting and filing.—Radio Retailing

CONDENSERS

Condenser Measurements. It is a simple task to measure the various condensers in use from .1 mfd. and up; but when one wants to measure the smaller ones, such as .00025 mfd. it is a difficult task unless a capacity bridge or grid dip meter which is calibrated for such work is available.

To get around this difficulty, use neon glow lamps with ratings of a quarter watt, one watt and two watts connected across the 110 Volt AC line with a pair of test prods in series with the lamp. These three sizes of lamps will cover the usual capacity range needed in service work.

To use this method, have a capacity block consisting of enough small condensers to cover the desired range. By noting the brilliancy of the light when the unknown condenser is under test and comparing it with a condenser of known value, one can very easily determine the value of the unknown.—Wilbert L. Misner, Vintondale, Pa.

Electrolytic Condensers. When replacing a 3 unit wet electrolytic condenser, remove the copper can, break the hard rubber cover, remove the old insides and wash out thoroughly. Place three 8 mfd. dry (paper container type) in the can with the terminals up. Solder a stiff piece of copper wire to all the negative terminals and to the can at two points opposite. This serves to hold the condensers in place and forms the negative connection. Connect the 3 wires to the positive connections on the condensers, replace the cap on the can and the job looks and works like the original.—Geo .W. Ewing, San Bernardo, Calif.

Condenser Test. An excellent and inexpensive service shop accessory is a neon lamp to test condensers. The one I have is about the dimensions of a 50 watt lamp globe. Leaking condensers can be readily detected by applying DC to the condenser in series with the lamp. Leak is manifested by intermittent flashing of the lamp, the rate of the flashes indicating greater leak and steady glow indicating shorted condenser. AC of course will go through a condenser; therefore use AC to test for open or intermittent operation.—W. C. Libbey, Spokane, Wash.

Condenser Kink. In melting out defective condensers from condenser banks, I use a large pot full of boiling water, and suspend the block in the water just enough so that all the pitch or tar melts. I can then remove the condensers and reassemble them without

moving the outside cover. (Note: care should be taken that the block is not too deeply immersed in the water.)—W. Hartmann, Chicago, Ill.

Condenser Check. When a by-pass condenser goes dead, short the two ends of the resistor that it is connected with. This short should be done very quickly and only for an instant. This short will produce a spark and the by-pass condenser will either be O.K. again or must be replaced.—“Sylvania News.”

Cleaning Tuning Condensers. To clean the dust from a gang condenser, disconnect all leads to the stator sections and connect the leads from a power pack supplying about 600 volts DC across each section in turn. While the high voltage is connected, turn the rotor slowly and blow into the plates. This is the only way a condenser having cadmium coated plates can be cleaned of the microscopic fuzz which develops on them. Slight shorts will also be easily located in this manner.—B. F. Zinser, 935 East 63d St., Chicago, Ill.

Paper Filter Condensers. Many paper filter condensers when tested show an “open” but are really not open since the wire that connects them from the can terminals to the condenser is broken. This can be quickly and easily repaired by taking the condenser out of the can and resoldering the wire.—Lyman Greene, 459 Needham St., Fredericton, N. B.

RECEIVERS

AC, DC Receiver Hint. When the owner of a universal AC-DC set using a 37 as rectifier brings his tubes in to be tested, and the 37 lights but tests dead, look out for a shorted filter condenser. The cathode emission of a 37 rectifier is quickly killed by overload, and putting in a new 37 with a filter condenser shorted is invariably fatal to the tube.—James Reed, Jr., Manager, Reed Radio Service, 712 Second Ave., Elizabeth, Pa.

Air Cell Receiver Corrosion. On certain battery radios using the Air Cell Battery to light the filaments, it has been found that the fumes from the Air Cell will corrode and damage any wires or coils which it may contact. If the service man cares to avoid repeated service calls, on which he would have to replace a wire or some more expensive part, it would be wise to extend the battery wires enough to allow him to place the Air Cell completely

outside the cabinet, so that the fumes will not pass over any part of the chassis or speaker.—H. L. Wilson, McRae, Ga.

Adding Tone Control. There are two types of tone controls commonly used in receivers. These are the switch-controlled series of fixed condensers and the series combination of a variable resistance and fixed capacity. The latter circuit is more easily applied to a finished receiver. Its usual position is across the input or output circuits of the output tubes. In the case of pentodes, the majority of manufactured receivers employ tone control across the plate-to-ground, in single tube output systems, and from one plate to ground in push-pull systems, or across the two plates in push-pull systems. 100,000 ohms maximum and .04 mfd. makes a good combination between the two plates of a pair of 45's in a push-pull output stage. A resistor of from 100,000 ohms to 200,000 ohms maximum and condenser of .04 mfd. to .05 mfd. makes a good combination between the plate of a single pentode tube and ground.—“Service”

Cabinet Finishing. A large number of real good service men now remove scratches from the cabinet and polish it after they have finished with the chassis repair. A dollar or more can be made in a large number of homes by soliciting touch up work on other furniture. A kit for doing this work rapidly and well can be obtained for a few dollars and it will pay for itself many times over.—H. L. Wilson, McRae, Ga.

Curing Oscillation. One of the bugaboos to voltage measurement upon sensitive receivers is that the effect of the plug-cable attachment of the tester causes excessive coupling in the circuits and sustained oscillation is the result. Such excessive regeneration causes a change in readings. It is possible to stop oscillation in such circuits by touching the control grid of the tube with the finger tip.—“Service”

Extending Magnetic Speakers. When extending a magnetic speaker circuit some distance, such as to a nearby building, a good ground connection at each speaker will serve in place of one lead, with a considerable saving in wire.—Radio Retailing

Motor-boating. Motor-boating or fluttering as many people call it, is frequently due to the first detector and oscillator tubes, which vary greatly from standard values. In receivers which use electrolytic condensers, defective condensers (high leakage and

low capacity) will also cause this type of trouble. Imperfect R.F. or 1st detector screen-grid by-pass condensers are also apt to cause this type of trouble.—“Service”

Noisy House Wiring. Instead of taking off plates of wall receptacles, canopies, and sockets in finding faulty house wiring connections, an electric heater may be used that will draw about 6 amps. by connecting it to each outlet while having an AC voltmeter plugged across the line watching any fluctuation on the meter while the heater is plugged in. In one case, three canopies, where the joints should have been soldered, were found badly corroded, thus causing noise.—H. S. Keller, 1312 Erie Street, Chicago, Ill.

RESISTORS

Increasing Resistor Values. Resistors that lack several hundred ohms in value can easily be brought up by filing or grinding a little off of one side between the two end caps. A little practice will make it possible for anyone to file a resistor of, for example, 500 ohms and bring it up to 600 or 700 ohms in value. Resistors too hard to file can be ground on an emery wheel.—Carl E. Schneider, Indianapolis, Ind.

Point-to-Point Resistance Testing. When testing by the point-to-point resistance method in a receiver with electrolytic condensers (particularly receivers a few years old) be sure to have the polarity of the ohmmeter correspond to that of the condensers in parallel with the circuit. The condenser leakage current will indicate a lower resistance if this polarity is not correct.—Harry Bangerter, Service Engineer, Sherwood Radio Supply Company, 117 North Fourth, Albuquerque, New Mexico.

TRANSFORMERS

Transformer Substitute. When a receiver goes dead and the continuity check shows an open primary or secondary winding in the audio transformer, the first thought is a new transformer. Suitable replacement transformers are not always available, but a satisfactory repair may be made quickly with a fixed condenser and a fixed resistor.

An open primary is shunted with a 25,000-ohm fixed resistor. The same idea applies to the open secondary but the resistor value

should be 75,000-ohms. In both instances, a .08 mfd. fixed condenser is shunted across the plate and grid terminals of the transformer.

This makes a satisfactory repair and the job is as good as it was before.—Richard Martin, 2417 West 32d Avenue, Denver, Colo.

TUBES

Testing All Tubes. This is not an original idea while its application to the service field may be new. In my opinion it is one sure way for testing the efficiency of tubes and in some cases will aid sales.

Connect an oscillator and output meter to the receiver in the conventional manner and turn on both the oscillator and receiver. Tune in the signal from the oscillator and adjust its output for a low reading on the output meter (the volume control on most receivers should be at maximum). Note the reading on output meter. Then insert new tubes one at a time and note the reading after they are at operating temperature. A noticeable increase in the output meter reading indicates that the old tube is defective. I have found in a number of cases that readings or tests made on conventional tube checkers or regular set analyzers are not nearly so reliable as the method above outlined. I can see that Sylvania's method of testing tubes in the factory is of great value to their customers.—H. L. Wilson, McRae, Ga.

Output Tubes. Used as Class B amplifiers in auto-radio receivers must be of identical characteristics. For that matter, all such systems irrespective of their use, in automobiles or otherwise must use tubes with operating characteristics which differ as little as possible.—“Service”

Removing Tubes. Often a tube is very difficult to remove from a socket, especially when the parts are crowded. Make a lasso out of a foot or two of hook-up wire and slip the noose over the bulb. With one hand over the bulb a slight tug on the wire will remove the tube. I came across a set with tubes glued in their sockets (auto-radio) and after a lot of trying used this stunt.—W. Jackson, Laurium, Mich.

Spray Shield Tubes. When using these to replace other types be sure tube does not touch metal can or other projecting metal as this grounds cathode and removes bias.—Radio Retailing

Tube Shielding. The 24A in the new ST-14C bulb has the same overall size as the original bulb. The maximum diameter is exactly the same but it falls near the center of the tube, while on the older tubes it was nearly at the top of the tube. In a few receivers having half shields, the new bulb may strike the shield, in which case it will be necessary to cut the shield to the proper length, replace with new shields or add an adapter to raise the tube for clearance.

Metal Tube Shields. When interchanging several spray shield tubes in a receiver, it will be necessary to equip the receiver with metal tube shields.

OF INTEREST TO YOU: In addition to its acknowledged position as a leader in the field of receiving tubes, Hygrade Sylvania has now gained a position of prominence through its Electronics Department, which was established early this year at Clifton, N. J.

This new division manufactures:

- Radio Transmitting Tubes
- Industrial Power Tubes
- Special Radio Receivers
- Broadcast Speech Equipment
- Custom-Built Electronic Devices
- Radio Transmitters
- Sound Amplifiers
- Phototubes

We invite inquiries regarding the products of our receiving tube and electronics divisions, as well as the incandescent lamp division.

SYLVANIA INTERCHANGEABLE TUBE CHARTS

The purpose of this Chart is to furnish information as to which types of SYLVANIA SET-TESTED TUBES will satisfactorily replace tube types of other manufacturers having similar, or different, type designations.

As a rule, the last two digits of a type number are the designating numerals. In interchanging tubes, this rule may be followed except on special types and on tubes recently announced, bearing the new RMA system of type numbers. Except on Special Types all Sylvania tubes heretofore designated by a symbol and three numerals have been changed to conform to later designations. For example, SX-201A is now 01A, SY-227 is now 27, et cetera. Many of the Sylvania tubes recently introduced bear type numbers assigned under the new RMA system, which is characterized by a letter appearing between two digits (Example: 5Z3). The first digit indicating the filament voltage class, the latter being assigned arbitrarily, and the second digit indicating the number of useful elements in the tube.

*Indicates types not directly interchangeable with Sylvania Set-Tested Tubes.

‡Only when used in Auto Receivers or AC Receivers not having series filament.

†When receiver's transformer will stand one ampere additional filament current.

NOTE:—When interchanging several spray shield tubes in a receiver, it will be necessary to equip the receiver with metal tube shields.

Type No.	Description	Replace with Sylvania Type
'00-'00A	Special Detector	00A
'01-'01A-'01AA	Detector-Amplifier	01A
1-KR1	Mercury Rectifier	1-V
2	Ballast	*
G-2	Special Detector	*
3	Ballast	*
4	Ballast	*

Type No.	Description	Replace with Sylvania Type
G-4	Special Detector	*
5	Ballast	*
KR5	Power Amplifier	6A4
6	Ballast	*
7	Ballast	*
8	Ballast	*
9	Ballast	*
'10	Power Amplifier	10
WD-11	Detector-Amplifier	*
'12-'12A	Power Amplifier	12A
WD-12	Detector-Amplifier	*
'13	Full-wave Rectifier	80
14	Detector-Amplifier	*
15	Detector-Oscillator	15
'16-'16B	Half-wave Rectifier	81
17	Detector-Amplifier	*
18	Power Amplifier	18
19	Class B Amplifier	19
'20	Power Amplifier	20
KR20	Special Detector	*
'22	Amplifier	22
KR22	Special Detector	*
'24-'24A	Detector-Amplifier	24A
KR25	Power Amplifier	2A5
25S	Detector-AVC	*
'26	Amplifier	26
'27	Detector-Amplifier	27
'27HM	High Mu Amplifier	56
28	General Purpose	*
29	Special Detector	29
'30	Detector-Amplifier	30
'31	Power Amplifier	31
'32	Amplifier	32
'33	Power Amplifier	33
'34	Amplifier	34
'35	Amplifier	35 or 51
'36-'36A	Detector-Amplifier	36
'37-'37A	Detector-Amplifier	37
'38-'38A	Power Amplifier	38
'39-'39A	Amplifier	39 or 44
'40	Voltage Amplifier	40

Type No.	Description	Replace with Sylvania Type
41	Power Amplifier	41
42	Power Amplifier	42
43	Power Amplifier	43
44	Detector-Amplifier	44 or 39
'45	Power Amplifier	45
46	Power Amplifier	46
'47	Power Amplifier	47
48	Power Amplifier	48
49	Power Amplifier	49
'50	Power Amplifier	50
'51	Amplifier	51 or 35
52	Class B Amplifier	*
53	Class B Amplifier	53
55	Detector-AVC	55
56	Detector-Amplifier	56
57	Detector-Amplifier	57
57A-S	Detector-Amplifier	6C6
58	Amplifier	58
58A-S	Amplifier	6D6
59	Power Amplifier	59
59B	Power Amplifier	*
64-64A	Detector-Amplifier	36†
65-65A	Amplifier	39†
67-67A	Detector-Amplifier	37†
68-68A	Power Amplifier	38†
69	Special Detector	69
70	Detector-AVC	*
'71-'71A-'71B	Power Amplifier	71A
75	Detector-AVC	75
76	Detector-Amplifier	76
77	Detector-Amplifier	77
78	Amplifier	78
79	Class B Amplifier	79
'80	Full-wave Rectifier	80
80M	Full-wave Rectifier	83
'81-81M	Half-wave Rectifier	81
82	Full-wave Rectifier	82
83	Full-wave Rectifier	83
84	Full-wave Rectifier	84
G84	Half-wave Rectifier	*
85	Detector-AVC	85

Type No.	Description	Replace with Sylvania Type
88	Full-wave Rectifier	83†
89	Power Amplifier	89
90	Special Detector	*
91	110 Volt Converter	*
92	Special Detector	*
95	Power Amplifier	2A5
96	Half-wave Rectifier	*
98	Full-wave Rectifier	84
'X99	Detector-Amplifier	X99
'V99	Detector-Amplifier	V99
1A6	Detector Oscillator	1A6
2A3	Power Amplifier	2A3
2A5	Power Amplifier	2A5
2A6	Detector-AVC	2A6
2A7	Detector-Oscillator	2A7
2B6	Power Amplifier	*
2B7	Detector-Amplifier	2B7
5Z3	Full-wave Rectifier	5Z3
6A4	Power Amplifier	6A4
6A7	Detector-Oscillator	6A7
6B7	Detector-Amplifier	6B7
6C6	Detector-Amplifier	6C6
6C7	Detector	*
6D6	Amplifier	6D6
6D7	R. F. Amplifier	*
6E7	R. F. Pentode	*
6F7	Detector-Oscillator	6F7
6Y5	Full-wave Rectifier	*
6Z3	Half-wave Rectifier	1-V
6Z4	Full-wave Rectifier	84
6Z5	Full-wave Rectifier	*
12A5	Power Amplifier	12A5
12Z3	Half-wave Rectifier	12Z3
14Z3	Half-wave Rectifier	12Z3
25Z3	Half-wave Rectifier	*
25Z5	Voltage Doubler	25Z5
182B	Power Amplifier (Sparton)	182B
183	Power Amplifier (Sparton)	183
211	Power Amplifier	211
291	Triple Twin Tube	*
293	Triple Twin Tube	*

Type No.	Description	Replace with Sylvania Type
295	Triple Twin Tube	*
401	Amplifier (Sparton)	*
402	Amplifier (Sparton)	*
482A	Power Amplifier (Sparton)	71A
482B	Power Amplifier (Sparton)	182B
483	Power Amplifier (Sparton)	183
484	Detector-Amplifier (Sparton)	485
485	Detector-Amplifier (Sparton)	485
486	Detector-Amplifier (Sparton)	*
585	Power Amplifier (Sparton)	50
586	Power Amplifier (Sparton)	50
P-861	Full-wave Rectifier	84
864	Detector-Amplifier	864
866	Half-wave Rectifier	866
874	Voltage Regulator	*
876	Ballast Tube	*
886	Ballast Tube	*
985	Auto Rectifier	*
986	Full-wave Rectifier	83†
AD	Half-wave Rectifier	1-V
AF	Full-wave Rectifier	82
AG	Full-wave Rectifier	83
BA	Special Rectifier	*
BH	Special Rectifier	*
BR	Special Rectifier	*
GA	Power Amplifier	*
LA	Power Amplifier	6A4
PZ	Power Amplifier	47
PZH	Power Amplifier	2A5
Wunderlich	Special Detector	*

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

HYGRADE SYLVANIA CORPORATION

EMPORIUM, PENNA.

Sec. 962, P. L. 85-5.

U. S. POSTAGE

PAID

Emporium, Pa.

Permit No. 1.

T. A. Koc
623 Thurt
Columbus,

Service Hints

COMPILED AND PUBLISHED BY

Hygrade Sylvania
CORPORATION

SERVICE HINTS



COMPILED AND PUBLISHED BY

Hygrade Sylvania
CORPORATION

MANUFACTURERS OF

*Sylvania "SET-TESTED" Radio Tubes
Electronic Devices and Hygrade Lamps*

EMPORIUM, PENNA.

SALEM, MASS. NEW YORK CLIFTON, N. J.

F O R E W O R D

THIS compilation of service hints is dedicated to the thousands of Service Men who conscientiously render good service and thereby make an important contribution to the radio industry as a whole.

If this little book helps them to be better Service Men or makes their work more pleasant and more profitable, it will have fulfilled its mission.

To the editors of *Radio Retailing* and *Service* magazines, who have made important contributions to the knowledge of radio servicing, we express our appreciation for their permission to use material from their columns.

HYGRADE SYLVANIA CORPORATION

TABLE OF CONTENTS

General Engineering Information *Pages 4-6*

SERVICE HINTS (By Makes of Receivers)

	Page		Page
Airline	7	Kellogg	22
Amrad	7-8	Kennedy	22
Apex	8	Knight	22
Arborphone	9	Kolster	22-23
Atwater Kent	9-12	Lyric	23
Audiola	12	Majestic	23-27
Bosch	12	Motorola	28
Brunswick	12-13	Peerless	28
Clarion	13-14	Philco	28-32
Colonial	14	Radiola	32-33
Columbia	15	RCA-Victor	33-36
Crosley	15-17	Silver Marshall	36-37
Edison	17-18	Silvertone	37
Erla	18	Sparton	37-38
Eveready	18	Sterling	38
Fairchild	18-19	Stewart Warner	38-40
Freshman	19	Stromberg	40
General Electric	19-20	US Radio	40
General Motors	20-21	US Washington	40
Gloritone	21	Victor	40-41
Grebe	22	Zenith	41-42
Gulbransen	22		

MISCELLANEOUS INFORMATION

Amplifiers	43	Transformers	48
Auto Radios	44	Tubes-Miscellaneous	49-50
Condensers	45-46	Interchangeable Tube	
Receivers	46-48	Chart	51-55
Resistors	48		

GENERAL ENGINEERING INFORMATION

Ohm's Law. Ohm's law is the one formula which is most used by electrical workers. It may be expressed in three ways, depending upon which quantity is unknown—commonly it is expressed as:

$$E=IR$$

Where E = voltage in volts.
 I = current in amperes.
 R = resistance in ohms.

Other ways of expressing it are by transposing the above expression as:

$$I=E/R$$
$$R=E/I$$

Examples of how this may be used:

If the screen current for a certain tube is 2 milliamperes (.002 amperes) and it is desired to reduce the screen voltage to 90 volts from the plate voltage of 250 volts, what value of resistance should be used. Voltage drop in resistor=250-90=160 volts.

$$R=E/I=\frac{160}{.002}=80,000 \text{ ohms required.}$$

Power: Power or energy expended in a circuit is expressed as:

$$P=EI$$

Where P = power in watts.
 E = voltage in volts.
 I = current in amperes.

Other ways of expressing power are: $P=E^2/R$ and $P=I^2R$.

An example of how this may be used in ordinary service work would be to determine the wattage rating of the resistor which was calculated in the above problem.

$$P = EI = 160 \times .002 = .320 \text{ watts}$$

Use .5 watt resistor.

Calculation of value of resistors in series and parallel connection:

The total resistance for resistors connected in series is the sum of the component resistors, viz:

$$R_t = R_1 + R_2 + R_3$$

Where R_t = total resistance in ohms.

The total resistance for resistors in parallel is expressed as:

$$R_t = \frac{R_1 R_2}{R_1 + R_2}$$

When R_t = total resistance in ohms.

Calculation of value of resistance required for self-biasing:

$$R = \frac{\text{grid bias in volts} \times 1000}{\text{Total cathode current in milliamperes times number of tubes.}}$$

For triodes, total cathode current is the plate current.

For tetrodes and pentodes, total cathode current is the sum of plate and screen current. For example: We wish to use 2 Type 42 tubes with 250 volts applied to the plate. Data from Sylvania Characteristic sheet gives:

Grid bias = 16.5 volts

Plate current = 34 ma

Screen current = 7.5 ma

Total cathode current = 34 + 7.5 = 41.5 ma.

$$R = \frac{16.5 \times 1000}{41.5 \times 2} = \frac{16,500}{83} = 198 \text{ ohms required for self-biasing.}$$

Resistor Color Code:

For First or Second Significant Figure		Number of Ciphers After the Significant Figures
Black	0	None
Brown	1	0
Red	2	00
Orange	3	000
Yellow	4	0000
Green	5	00000
Blue	6	000000
Violet	7
Gray	8
White	9

Condensers in series and parallel.

When two condensers are connected in series, the resulting capacity may be expressed as:

$$C_t = \frac{C_1 C_2}{C_1 + C_2}$$

Where C_t = total effective capacity.

When two or more condensers are connected in parallel, the resulting capacity is equal to the sum of all the component capacities.

S E R V I C E H I N T S

Airline. Fluctuating filament voltages in older models using 26's, or failure of R.F. tubes to light at all. Caused by loosening of riveted junction between binding posts and power transformer lead soldering lugs, due to shrinkage of mounting strip. Remove transformer and flood riveted junction with solder. Some local-distance switches test all right on 110 volts but fail to make contact when in actual use. Clean hardened flux or grease from contacts.—Radio Retailing

Airline "Challenger." Complaint: "Radio smokes." Replace burned 4,000 ohm carbon resistor with a wire-wound type. Replace shorted 1 mfd. condenser with a new 400 volt type.—Radio Retailing

Airline 62-11, 12. Lack of sensitivity may be corrected by removing the filter choke and 25 mfd. shunt condenser entirely from the circuit then removing the second dry-electrolytic filter condenser and replacing this with a 4 mfd., 450 volt type.—Radio Retailing

Airline 64. Inoperative tuning meter and weak signals. Place finger on control grid cap of first R.F. 58. If volume increases meter is burned out. It may be shorted without affecting set operation until a replacement can be obtained.—Radio Retailing

Airline 811. Inoperative volume control is caused by alteration in value of 25,000 ohm carbon resistor. Replace with one of higher wattage.—A. W. Inglis, Elmhurst, Ill.

Amrad 81. If hum develops after about 30 minutes of operation replace the two 18 mfd. electrolytic sections with paper condensers. The breakdown rating need not be high as this circuit feeds only screens and the detector plate. Reforming the electrolytic rarely gives permanent results as the voltage is not high enough to keep it active.—Radio Retailing

Amrad 84. A rather common trouble developing in the Amrad 84 series is a whistling oscillation on either side of the carrier wave on all stations and is very troublesome in tuning in. I have successfully eliminated this trouble by removing the box shield around

the condensers and tubes and sandpapering all places where contact to chassis is made. Then remove the three rotor springs from the condensers and clean contact surfaces with sandpaper; solder a wire about three inches long to each one and bring all three wires to a soldering lug to be clamped to chassis when the shield is put in place. This process removes coupling between the tuned R. F. circuits caused by long ground circuits in the shielding and greatly improves operation of the sets.—Eugene Whitaker, 3341 Penn St., St. Joseph, Mo.

Apex 8 Series. Weak reception and excessive plate voltage on 27 oscillator tube, caused by broken down 50M ohm plate carbon series resistor. Replace with a 2 watt resistor instead of the original 1 watt.—Arnold Wightman, Greene, N. Y.

Apex 8-A Series. Set O. K. until after being in operation for about 30 minutes when distorted reproduction takes place and the 47 tube grid gets extremely red. Check the 47 filament center-tap for an intermittent open. Best remedy is to connect a 20 ohm center-tapped resistor across the filament winding using the center-tap of resistor in place of the transformer center-tap.—C. H. Ramm, Chicago, Ill.

Apex 8 and 10 Series. AVC Superheterodynes. If volume suddenly drops or increases, especially when a light is turned on in the house, trouble is due to opening up of 0.5 mfd. condenser connected between R. F. Cathode and grid return of R. F. and I. F. coils. Replace with a good 0.5 mfd. 400 volt condenser.

Apex 10B. Center tap of the filament transformer of the 47 tubes had become shorted to one side of the high voltage. Disconnected center-tap and the trouble disappeared. Checked grid-bias resistor for the 47 tubes and found it to be burned out. Replaced this resistor with a new 425 ohm resistor which Apex uses for grid-bias between center-tap and ground for chassis.—Bill Lewandowski, Lakeview, Mich.

Apex 27. Intermittent oscillation. Increase the R.F. by-pass condenser from $\frac{1}{2}$ to 1 mfd.—Radio Retailing

Apex 41, 42. Oscillation over entire scale. Try 2,000 ohm resistor in second R.F. grid lead.—Radio Retailing

Arborphone. Weak volume together with steady frying, crackly sounds. The weak volume being traced to corroded chassis connections of the R.F. grid return leads. A common ground wire connected to all grid return leads brought back the volume. But the frying noises still remained, after suspecting and changing all carbon resistors it was finally traced to the primary of the first A. F. trans., which due to the dampness of this particular house caused the fine wires of the prim. to corrode, causing this steady nerve racking noise.—Hoge Radio Service, 15217 Ridpath Ave., Cleveland, Ohio.

Atwater Kent. Noisy wire wound volume controls. Clean contact arm and winding with alcohol. Using No. 1 soft lead pencil, fill in spaces between windings at contact edge until surface appears level and smooth.—Radio Retailing

AK 30, 40. A common headache is shorting of the wire-wound resistor beneath the chassis to ground. The fibre base warps, causing the trouble, which can be corrected by sliding a piece of fibre under the unit. No reception: Check the speaker filter condenser.—Radio Retailing

AK 37 to 60. When dial belts are not obtainable use heavy dial cable. Anchor to pulley-pins, spot with drop of solder. Move condenser to take up slack.—Radio Retailing

AK 37. Found to tune broadly in the lower end of the dial. The situation stood thus: no trimmer condenser, tuning condensers lined up as perfectly as possible, but interference bad. In the grid circuit of the 2nd and 3rd R. F. tubes are 800 ohm resistances, which if cut down perhaps half, produces a certain amount of oscillation in that part of the wave band. This gives greater selectivity and solves the problem.—F. G. Hedge, Los Angeles, Calif.

AK 37, 38, 40, 42. Use of a 1 mfd., 400 volt condenser between the filament of the 280 where it connects to the first choke and ground increases pep and reduces hum. Try it next time it is necessary to rip open one of the cans.—Radio Retailing

AK 37, 38, 40, 42, 46. Fading is often caused by a fluctuation of the filament current supplied to the 26 tubes. There are two terminal boards, in the power supply box, which are held down by nuts. The nuts on the top board may be tight while those on the lower board may be loose. This is possibly caused by the brass bolts stretching. In any case tightening these nuts will

usually correct this difficulty. In these same models occasionally the volume control will "peak" at other than the position of maximum volume. The antenna transformer, which is located just under the tuning condenser, will usually be found to have the section which is connected across the volume control shorted. A new transformer remedies this trouble.—D. N. Simpson, 137 S. State St., Marion, Ohio.

AK 37. Intermittent reception and rasping. Press rear of chassis. If this causes noise insulate shielded antenna cable leading from rear of metal cabinet to front of chassis. It frequently touches the bare ends of the power cable.—Radio Retailing

AK 37-60. New, double-spring contact arms are available at the factory and make it unnecessary to change entire volume controls unless the wire is shot. Clean the winding with alcohol.—Radio Retailing

AK 40. When biasing resistor strip under terminal board is defective and original replacements can not be obtained use one 750 and one 3,500-ohm type.—Radio Retailing

AK 55. A common cause of poor tone is a change in either of the two resistors shunting the speaker field. The resistors supply the C bias to the power tubes.—Geo. V. Sangree, 1522 Vernon St., Harrisburg, Pa.

AK 55, 60. Fading can often be traced to loose rivets on wire-wound resistors. In most cases re-clamping them with pliers effects a repair. Check particularly bleeder No. 1, R.F. bias and 1st A.F. bias units, as these work loose more often than other units at the rivets.—Radio Retailing

AK 55, 60, 60C—Loss of volume and sensitivity in these popular models is a common occurrence and in some cases the trouble does not show up on an analyzer or continuity test. The above mentioned tests failing, the shield of the first R.F. stage should be removed and the R. F. transformer primary very carefully inspected—preferably by removing from chassis and applying continuity tests. In many cases this winding will be found to be open—caused in some cases by lightning, climatic changes, etc. The remedy of course, is to either substitute a transformer or to rewind the primary with slightly heavier wire, about No. 28 or No. 26 enamel covered. Primaries rewound thus will seldom, if ever, develop trouble again. After replacing the R. F. transformer and shield can align the R. F. amplifier and detector stage with the

aid of a good oscillator per usual practice.—Gordon E. Hunt, Rangeley, Me.

AK 80. When volume controls become noisy raise the end of the contact with long-nosed pliers and bend in toward the winding slightly, then clean the strip with alcohol.—Radio Retailing

AK 83, 85. Poor tone, low volume and little response with tone control turned to bass. Look for open R.F. choke in pentode control grid circuit. Analyzers miss this one.—Radio Retailing

AK 85. Unusually sharp volume control cut-off in model 85 can generally be remedied by trying several 24's in the AVC socket. No detector plate voltage on the 37 is most frequently caused by shorting of the plate to ground by-pass condenser and not burnt out series resistor or transformer primary. "Choppy" reception in model 38 is commonly traceable to shorting of the audio output condenser. Unsolder green wire with yellow tracer from bottom terminal strip and connect a new condenser in series. Noisy volume control operation in the same model is often due to a broken lead of the R.F. coil primary near the lug.—Radio Retailing

AK 85. A great improvement may be had in the operation of the volume control by making a careful selection of tubes to be used in the AVC socket. With some tubes the control is critical, the volume falling to nothing within a fraction of a turn of the knob.—Bill Lewandowski, Box 208 Lakeview, Mich.

AK 89. If glow in neon tuning light gradually disappears while set is tuned to a local station, remove first I. F. shield and carefully scrape away the black sealing compound between the plate and grid I. F. coil. Scrape compound clear down to the cardboard tube on which I. F. coils are wound.—George Mason, Santa Ana, Calif.

AK 99. High potential on one control grid cap. Remove I.F. cans, insulate resistors which touch coil forms. Trouble causes neon light to be inoperative and kills all signals.—Radio Retailing

AK 627. On several of these sets I have found the low frequency end of the dial to be "dead." The trouble is not as one would suppose, shorted tuning condenser plates, but is to be found inside the oscillator coil can. The 1,450 m.m.f. condenser located at the side of the coil is grounded with two small rivets which have loosened. Oscillation and inaccurate dial settings are indicative

of this fault. The best remedy is to run a special lead, (grounded) to mounting of this condenser unless the condenser either leaks or is open.—Clyde P. Carter, Canisteo, N. Y.

Audiola. Oscillation when tone control is in treble position. Replace .01 mfd. condenser connected from plate to filament.—Radio Retailing

Bosch 28 or 29. In replacing volume control it will be noticed that it is located in the extreme left end of chassis, controlled by a pulley arrangement to the control knob in center of chassis. This original Bosch wire wound control is placed at the end of the chassis instead of at the rear of the point of control to eliminate oscillation. To replace this is impossible in some towns without sending to the factory, with consequent delay.

A standard Centralab replacement unit 3 72-102 (25,000 ohms) can be used instead, to be placed at the point of the chassis where the former control knob was located. This does away with the necessity for control cables and pulleys. Oscillation will not take place if the metal cover on the rear of the replacement unit is grounded to the frame of the chassis.—A. W. Sprenger, Milwaukee, Wis.

Bosch 28. Easy volume control replacement. Remove all old drive gear. Install standard 250,000 ohm unit and hook in circuit so that it will vary B plus voltage to R.F. plates. B plus lead from pack is the one going to one end of the resistor in clips near 26. Hook 1,500 ohm grid suppressor resistor from grid of first R.F. to stator of first variable gang condenser in place of original control. Result: greater sensitivity, easier to neutralize.—Radio Retailing

Bosch 31. Suspect a faulty 300,000 ohm resistor in the I. F. stage when fading occurs.—Radio Retailing

Bosch 60. Loss of volume and distortion may often be traced to poor contact at the phono switch which is supposed to cut out the R.F. when the tuning condenser plates are disengaged.—Radio Retailing.

Brunswick Panatrop 3KR8. Low volume from phone pickup may be due to a poor contact at phono switch points.—Lanternman Radio Service, Edwardsville, Ill.

Brunswick 15. Full reception when set is first turned on, gradually fading out. Look for open 25,000 ohm orange resistor in screen-grid supply circuit.—Radio Retailing

Brunswick 15. Reduced volume accompanied by low screen voltages and abnormally high plate can be corrected by replacing the 35,000 ohm orange resistor in the front of the chassis.—Radio Retailing

Brunswick 15, 22, 42. Noisy volume controls. Unsolder the pigtail from the second R.F. variable condenser stator, remove the rubber sleeve and blow out the powderlike substance found in it. Wipe powder off pigtail and replace sleeve, resoldering.—Radio Retailing

Brunswick 83. Hum and reduced B voltage. Either shorted 45 C bias resistor or charred braided tubing on push-pull transformer leads to resistor strips, forming high resistance shorts to chassis. Lack of sensitivity. Found principally in sets with serial numbers below 80,000, especially those with brown crackle finish. Voltages check O.K. Signal can be built up by reducing screen grid cathode 100 ohm wire wound resistor to 25 or 50 ohms, by heating wax off and reversing R.F. choke and antenna loading coil leads to position of maximum signal strength or, by re-aligning condenser gang. Motor-boating. Caused by open circuit in small .1 mfd. tubular condenser mounted under R.F. section. Open circuited $\frac{1}{2}$ mfd. unit causes oscillation. Well over 50 per cent of trouble in the 83 is due to shorted or grounded pigtailed carbon resistors.—Radio Retailing

Clarion 60, 61. No reception. Check A.F. transformer primary, replace with factory original to insure good tone. Noise, intermittent signals, examine local-dx switch for loose contacts.—Radio Retailing

Clarion 61. No detector plate voltage. Usually due to open push-pull input transformer. Repair of this special unit often possible. Remove transformer and take off wrapper. Corrosion generally breaks lead from winding.—Radio Retailing

Clarion 100 Series. Failure to tune down to 1,500 kc. after few months use. Substitute 2,000 ohm resistor for 4,000 ohm unit in cathode circuit of oscillator-1st detector.—Radio Retailing

Clarion 320. If motor-boating develops in these models connect the suppressor grid of the 58 I. F. tube to the cathode instead of (early models) to ground.—C. H. Ramm, Chicago, Ill.

Clarion 320. Intermittent reception. Replace fixed condenser in 57 oscillator-detector cathode lead with .0008 mica.—Radio Retailing

Colonial Model 28. If set is dead, the screen grid resistor (165,000 ohms tapped) may be open. When replacing the resistor make return direct to chassis to avoid long leads. This will also reduce couplings and improve performance.—Thos. McClean, 56 St. Johns Pl., Brooklyn, N. Y.

Colonial 31 DC. Set plays with switch off. Disconnect ground lead. If set cuts out trouble is shorted condenser in series with this lead. It is one of three capacities at left of chassis when set is turned upside down on bench with back of set forward.—Radio Retailing

Colonial 32. Open section of the 4-section by-pass unit in the first can and loose lugs on the outside of volume control frequently cause fading.—Radio Retailing

Colonial 33, 34. Failure of the tapped 121,000 ohm resistor, comprising an 11,000 ohm section supplying R. F. plate voltage, 60,000 ohm section supplying screens and 50,000 ohm section is chief cause of trouble. Replace it with one of higher wattage.—Radio Retailing

Colonial 35 AC. Failure of this model to tune between 550 and 500 kc. is due to shorting out of the phono switch by the dial itself. Loosen the nuts holding the switch and push it farther back.—Radio Retailing

Colonial C-995. A hi-lo sensitivity switch, which will cut down interstation noise when tuning locals with this AVC model, may be added by removing wire lead between lugs 1 and 2 of the Candohm resistors, connecting a 100 ohm type between the lugs, cutting the ground connection to lug 1 and grounding lug 2. Drill a hole in the right side of the cabinet to receive a switch and connect the switch across the new 100 ohm resistor so that it may be either shorted out or placed in the circuit.—Radio Retailing

Columbia S. G. 8 (nickname Temple) Fading or intermittent operation is often due to an open R. F. choke in the first R. F. stage. It is a good policy to check all chokes in this set, as this trouble is quite often encountered.

When reception performs O. K., but very loud crackling noise takes place during operation, check the lugs and connections on the three R. F. chokes, an open will cause much of this annoyance.—Carl H. Ramm, 5409 Agatite Ave., Chicago, Ill.

Crosley (All models with Crosley's own dynamic speaker) Rattling sound as if the tube is working at wrong c-bias may be caused by a loose voice coil winding. To cure, remove diaphragm assembly and dip voice coil winding in thinned shellac (good grade). Thin sufficiently so that shellac will penetrate into the bottom layer of winding. Allow to harden completely, then repeat for second coat.—Vincent J. Cortese, Jr., Hazelton, Pa.

Crosley 40S—3. Cut off when shaken by passing traffic. Set checked O. K. Shaking the bathtub tuning condensers caused the set to stop. On second check, touching the control grid bias resistor of the screen grid tubes caused set to resume playing. Further tests showed the trouble to lie in this resistor, which is wound on a bakelite strip, with resistance wire clamped to soldering lug by rivets. Loosening two turns of this wire and soldering the ends directly to the lugs remedied the trouble.—Wm. Buescher, Cincinnati, Ohio.

Crosley 40S. When tone is bad, pep lacking and an analyzer check shows positive bias on the first audio tube, replace the by-pass condenser connected between the detector and the first audio grid.—Radio Retailing

Crosley 42S and 33S. Excessive hum is due to defective Mershon Condenser.—H. E. Massie, Stephens City, Va.

Crosley 42 and 33. Low volume and poor quality reception is often caused by defective coupling condensers between detectors and first audio tube. This condenser develops a high resistance when in operation, and will invariably test O. K. when removed from the chassis.—George E. Hohman, Baltimore, Md.

Crosley Model 120 8-tube super. A very loud cracking similar to static, and a building up of volume, then cutting off sharp and clearing up, can be traced to a small midget .02 con-

denser placed between the 24 and 27 tubes, shoved under the resistor strip. This trouble is quite frequent in these models, and hard to find.—M. S. Benson, Thornton, Ill.

Crosley 124. Fading. Look for cold-soldered joint on I. F. transformer lug.—Radio Retailing

Crosley 124. Intermittent reception, temporarily cured by touching by-pass condensers or resistors, is the fault of an intermittent open in the 0.1 mfd. condenser connected between screens and ground. While the set is inoperative a small increase in first R. F. plate current will be noted.—Radio Retailing

Crosley 124. Fading. Check .01 mfd. by-pass units for intermittent opens. Replace entire three or four section units W22412 or W23736 in which defective condenser is found for permanent repair.—Radio Retailing

Crosley 127. Sudden drop in volume accompanied by failure of the tuning meter. Partial short in the I. F. transformers.—Radio Retailing

Crosley 148. If set cuts out or works poorly on low line voltage replace 2.5 volt pilot with a 6-volt bulb. The pilot is wired across the 6.3 volt tube circuit and sometimes reduces heater voltage to below normal.—Radio Retailing

Crosley 148. Periodic drop in volume, distortion. See if the twin cub condenser in resistance-coupling network between detector and A. F. is reversed. The .03 should be the coupling condenser between 57 plate and 42 input grid. One terminal of the .001 should be grounded and the other connected to the detector plate. Some condensers have wrong markings and the .001 is incorrectly connected between ground and A. F. tube grid.—Radio Retailing

Crosley Model 425. An unusual case was encountered recently in servicing one of these receivers. Reception was intermittent. Moving the last R. F. tube would bring it back. Investigation showed that the plate voltage on all R. F. tubes would drop when the tube was moved. The trouble was soon traced to internal shorting in the untuned R. F. transformer, one leg of which was soldered to the plate prong of the last R. F. tube.—Wallace A. Depp, Arrowsmith, Ill.

Crosley 425. These models are equipped with a range switch or sensitivity control which often becomes noisy after several months of service. The remedy for this trouble is to solder a flexible wire from the wiper on the switch to the ground. This eliminates the wipe contact and no more trouble will be had. It is a positive fact that wiper contacts give the service man more trouble than he ever thinks.—Herbert Firmstone, Honesdale, Wayne Co., Pa.

Crosley 425. The speakers of this model will often rattle and sound as if the voice coil was not centered properly. Examination will show that it is O. K. but the rattle still persists. The remedy for this is to remove the cone from the speaker and paint the joints (inside and out) where the voice coil is fastened to the cone, with Sticks All, a glue which can be gotten at any Grant store. This same glue is used in the building of model airplanes and sold under various other trade names. At the same time notice if the windings for the voice coil are loose, if they are, paint the whole voice with a thin coat of glue also. This glue can be used to repair a break in the cone, such as might come from sticking a screw driver through it, which can happen, and often does.—Herbert Firmstone, Honesdale, Wayne Co., Pa.

Crosley 601. Filament rheostat shaft shorts to metal panel, heating wire and destroying fibre insulation without damaging wire itself. Equip shaft with insulating bushing, fill in between wire turns where charred with heat resisting cement and pulverized asbestos, smearing mixture on wire to hold it firmly. When dry, scrape mixture from contact surface with knife. —Radio Retailing

Crosley 706-60. Excessive hum despite O. K. circuit check. Replace 27 detector with a 56 and connect 1/10 mfd., 200 volt condenser from chassis to detector heater at fourth terminal from front of chassis on brass strip connecting pack with chassis. —Radio Retailing

Edison, Splittorf. When double-section carbon volume controls connected across two plate coils fail a good replacement repair can be made by grounding the center arm of a 10,000 ohm, variable-taper potentiometer, connecting the off-side point to the antenna post through a shielded lead and the on-side point to the end of the 600 ohm bias resistance on the 226's which formerly went direct to ground. The leads to the plate coils

from the original controls should be cut off and taped. Then the regeneration switch control should be converted into a local-distance switch, throwing a .003 condenser across antenna and ground to provide control on loud locals.—Radio Retailing

Edison R4 and R5. In cases of lack of volume and distance look for one or two open R. F. by-pass condensers—a three terminal unit can be located in the rear of the set underneath the chassis.—Joseph A. Kotchey, Pittsburgh, Pa.

Edison. Where 24's and 27's have subnormal plate voltages check back from them to resistor terminals and remove the R.F. amplifier can with its associated resistors. Open can and isolate shorted by-pass condenser. Reassemble unit and rewire. Connect a tubular .1 or .5 mfd. condenser from the high side of the resistor to ground.—Radio Retailing

Erla, Brandes. Cutting out often caused by defective local-distance switch. Contact material becomes loose in spring. Put contact in tapered hole and centerpunch around edge to retighten.—Radio Retailing

Eveready 1, 2, 3. No voltage on R.F. tubes. Look at large Pyrohm in B lead. Volume controls may be replaced without using the old pulley and cable arrangement by placing the new control where the old control arm was fastened, lengthening the leads and re-neutralizing.—Radio Retailing

Fada Model 10. If the power transformer heats up, and the pitch melts out, don't blame it on a defective transformer right away. As the 280 is only $\frac{3}{8}$ " away from the transformer, the heat from this tube thus heats up the pitch and it runs out. When this condition occurs you get a bad "A.C." hum in the receiver. The remedy for this is—unsolder all the connections from transformer and melt the pitch back—by putting the transformer in a slow oven. Then allow same to cool for at least five hours. Put the transformer back and solder all connections to their proper places. Make an asbestos case between the transformer and the type 80. This will end your trouble.—Joseph Gigliotti 219 Locust Street, Ambler, Pa.

Fada. Slipping dials are the pet weakness of some of the older models. Remove the drum from the condenser shaft and lay

it flat on its wide side. File about $\frac{1}{16}$ of an inch of metal off the flat side of the dial "neck" which normally rests against the spacing collar. When replacing it push it hard against the spacing collar before tightening the set-screws. This causes the edge of the drum to be firmly wedged in between the plates of the drive assembly.—Radio Retailing.

Fada 42 (KA 60). The set would cut off at very infrequent intervals. All voltages checked normal, and all condensers were O. K. Trouble was finally isolated in the .005 mfd. coupling condenser between the grid of the "Det. Amp." tube and the output of the '24 detector. Pushing or pulling or prying on this condenser caused the set to cut off and on very erratically. Remedy, replace with good condenser. This is a round tubular condenser mounted on a bakelite panel in the front right-hand corner of the set, just to the right of the dial.—N. L. Havermale, Havermale Radio & Electric Co., 711 Maine St., Quincy, Ill.

Fada Model 42 "Flashograph." Fading or cutting off may be due to .01 coupling condensers between plate of detector amplifier and first audio grid, or det. AVC plate and det-amp. grid. Also check phono sw contacts. Local-distance switch connected through .005 cond to ANT and GND binding posts sometimes develops poor contact and causes fading. Replace switch. Flickering "flashograph" pilot can be cured by cleaning the contacts of the spring switch located behind the small panel below the tuning dial.—J. Block, Brooklyn, N. Y.

Fada 43. Distortion can be traced as a rule, to lowering in value of the 125,000 ohm resistor from screen-grid to chassis. Replace with exact value.—Radio Retailing

Freshman, Clarion. Use of certain 57's and 58's on some models frequently causes trouble as these tubes are slightly higher than other makes and the caps short to shields. Glue a piece of blotting paper to the inside of the shields.—Radio Retailing

General Electric 40 and RCA 40 Auto Sets. Cleaning up motor interference. The triangular plate which is mounted on rubber, to which the tuning control sheath is attached, should be grounded to the side of the set by a piece of flexible copper sheath. The cable sheath picks up the interference and passes it to the tuning cable which is connected to the variable condenser rotors.—A. L. Hissong, Rockford, Ill.

GE K40A. If there is fading, dive first for the coupling condenser between the plate of the detector and grid of the output tubes. If this condenser is at fault replace with .01 mfd. capacitor. This set is AC-DC and employs a 25Z5 as a voltage doubler. There is a switch in the rear of the set which should be thrown to the right (as you face the back of the set) when operating on A. C. and to the left for D. C.—John R. Shiliano, Pittsburgh, Pa.

GE K62 and S132. Oscillation in these models is regularly caused by gassy 35 tubes used in R.F. and I.F. stages. The reverse current flowing through the de-coupling resistors causes the grid bias on these tubes to be reduced to so low a value that oscillation sets in. These sets usually oscillate when turned from station to station. When the set is tuned to a station the AVC tube increases the grid bias on these 35's and they do not oscillate, but as soon as the set is turned off the station the grid bias is removed and the set again oscillates.

Tests for gas in tubes may be made in several ways. A micro-meter placed in the control grid leads of the 35 will show current if the tube is gassy. (Note: This is done with the set operating off a station.)

Another cause of oscillation in these sets is dirty contact wipers on the variable condensers. This kind of oscillation is usually accompanied by a noise when the dial is turned, but not always, so be sure that these wipers are clean. I take them out, bend them so they will make a better contact and clean them where they contact the rotors, with fine sandpaper and alcohol.—Bruce J. Woodward, Bethany, Pa.

GE, RCA. In AVC equipped models locals sometimes snap in and out as they are tuned-through. Substitute a new 35 for those in R.F. and I.F. stages until the trouble is found.—Radio Retailing

GE, J75, J79. The machine will tune very badly with a lot of noise when the condensers are turned, and will also tend to oscillate. The remedy is to solder a wire from the contact spring on the condenser to the chassis of the set.—J. W. Shade, Shamokin, Pa.

General Motors. When hum is encountered in this receiver and everything apparently checks O. K. it will pay to short out the fuse in the chassis. If the hum stops, replace the fuse.—J. B. Montero, Delagua, Colo.

GM. Where tone quality of models using horizontal tuning dials is bad although plate potentials on final 45's checks O. K. do not condemn the push-pull transformer. Look for a defective tone control variable resistor. Replace it with a 500,000 ohm unit.—Radio Retailing

Oscillation in GM Receivers. When oscillation troubles are experienced in General Motors Models A and B chassis inspect all connections to the frame of the chassis. Re-solder all "cold" or poorly soldered joints. Solder a pigtail from the condenser rotor shaft in the middle section of the gang to the chassis frame. Solder a pigtail from the brass hub from each rotor section to the corresponding wiper. If not already connected, solder a piece of bare wire from the bottom of each wiper to the base of the chassis. In extreme cases of excessive regeneration, connect a 25,000-ohm resistor from the screen grid terminal of the third R.F. tube to the frame of the chassis. The last named remedy applies only to Models 120, 130 and 140 receivers, chassis Models A and B with serial numbers below 62,100-A and 1964-B.—"Service"

GM. 220. Maximum volume regardless of volume control setting. Replace the 27 AVC tube. This tube may check O.K. in a tube checker, but will not function as an AVC tube.—James Reed, Jr., Elizabeth, Pa.

Gloritone Model 26. A set analysis showed the lack of screen grid voltage on the three 24 tubes. This voltage is obtained by a 2,460 ohm tap on the 5,500 ohm speaker field winding. The ohm meter showed the field coil to be O. K. but the 2,460 ohm tap open. A 25,000 ohm resistor connected from the field coil to the screen grid circuit made it unnecessary to rewind the coil.—Chas. R. Sharbough, Main Street, Carroltown, Pa.

Gloritone 26. Cutting in and out, accompanied by oscillation or howling. Usually caused by open screen-grid or cathode resistor by-passes. These are all in one can beneath R.F. coil shields. Cut old leads off to condensers and mount separate .25 mfd. unit between R.F. cathodes and screen to frame. When making this repair it will be necessary to run a new wire direct between cathode terminals on the sockets and another wire between screens on sockets.—Radio Retailing.

Gloritone Model 27. If set oscillates and condensers test O. K. the trouble sometimes may be remedied by regrounding the R.F. coils to the chassis instead of the shield cans, as poor contact is

often made between cans and chassis.—G. L. Riehel, 57 E. 4th Ave., Columbus, Ohio.

Grebe SK-4. If these sets fade on locals and are brought back by turning up the volume control or vice versa (if station comes in very loud and the volume control has to be turned down) during the first few minutes the set is turned on the trouble is gassy 24 tubes. Such tubes will often check O. K. in a tube tester, but new tubes will remedy the trouble.—George Mason, Santa Ana, Calif.

Grebe SK4. Oscillation between 550 and 750 kc. Tighten all contact clips on variable condenser rotor shaft down all the way. If this cures the trouble release them enough to permit easy operation of the dial. Clean with pipe-cleaner dipped in alcohol and align.—Radio Retailing

Gulbransen 9. Fading is usually due to defective local-dx switch. Move the wires leading to it and if fading occurs replace switch.—Radio Retailing

Kellogg 533-536. Sudden or gradual decline in volume, returning to normal with sharp click. Check small blocking condensers mounted on variable condenser gang. Replace with identical values.—Radio Retailing

Kennedy 52. Low voltage on the 47. The detector is resistance coupled to the 47. Coupling condenser .006 mfd. opens after being in operation for a few minutes.—“Sylvania News”

Knight Superset. Complete fading of signals, which after many hours of work was traced to the intermediate transformers. The first two intermediate transformers being the faulty ones. Riveted connections to one side of the trimmers being corroded caused the capacity of the trimmer cond. to change, thereby shifting the frequency of the I.F. transformer, hence the fading.—Hoge Radio Service, 15217 Ridpath Ave., Cleveland, Ohio.

Kolster—International Model. If the receiver fades after a few minutes of operation, look for the resistor located near the volume control shorting to one of the volume control terminals—John A. Honser, 41 Child Street, Rochester, N. Y.

Kolster K20-21. Lack of volume and weak reception caused by a shorted trimmer condenser which cuts out one R.F. stage in effect. The condenser is located at the end of the condenser gang near the 27 detector tube. The trouble is caused by the mica falling out, thus allowing the plates to short.—Stanley C. Maegly, Bromley, Ky.

Kolster 43. Fading is generally traceable to an open 0.6 mfd. by-pass in the screen grid circuit.—Radio Retailing

Kolster K45. Distortion at high volume level is sometimes due to loosened voice-coil windings, these rubbing against the field coil core.—Radio Retailing

Lyric 90, 96. Excessive plate current in the push-pull stage is often caused by the socket prongs shorting to chassis. Analysis generally fails to show up this trouble as the tester plug pushes the lug away from the metal. The 0.5 mfd. section in the by-pass can beneath the chassis usually fails before others. Intermittent or noisy reception is generally due to an unsoldered lead from R.F. choke to plate prong on socket, or to unsoldered grid leak lead to detector grid prong.—Radio Retailing

Majestic—All Models. When installing a dial cable on Majestics, I find the simplest and best way of holding the shaft while fastening the cable is to use a $\frac{3}{4}$ inch rubber cork, cut off so as to be about $\frac{5}{8}$ inch long, between the shaft and the chassis. Time for installation and adjustment about five minutes. Who hasn't worked an hour or more?—Glen Heffron, Hutchinson, Minn.

Majestic. Models using pilot as resonance indicator. Set dead or distorted. Look for open or shorted winding on center leg of indicator transformer in R.F. and I.F. plate circuits. Replace. For temporary repair short out winding by bridging two outside terminals and using 3.2 volt pilot.—Radio Retailing

Majestic. (All supers) Gradual fade-out is sometimes caused by the oscillator tube operating at too high a heater voltage. Reduce heater voltage, to this tube only, to 2.35 volts at a line voltage of 120.—Vincent J. Cortese, Jr. Hazleton, Pa.

Majestic Model 50-52. When this plays satisfactorily for a few minutes and then dies out or stops playing altogether, usually

the .04 mfd. condenser between the cathode of the first detector and the top of the grid coil of the oscillator is defective.—George W. Morrow, Washingtonville, Ohio.

Majestic Model 55. If set has suddenly developed a steady hum of low volume, check pilot light socket for a short to ground. This readily happens when chassis bolts are not securely fastened.—J. E. Noskey, 8299 Misner Ave., Detroit, Mich.

Majestic 60. Set stops playing suddenly, tuning meter pointer swings clear over to stop. Cause is shorting of by-pass condenser in plate circuit of I.F. tube. Unsolder leads from I.F. transformer, remove it from chassis and heat to melt wax. Remove can and melt wax from red lead with iron. Cut this lead, re-assemble the transformer with it projecting from case and mount replacement by-pass unit externally.—Radio Retailing

Majestic 60 and 160 series. In the Majestic 60 and 160 series sets (61-62-163) fading and poor sensitivity are caused by the 5,700 ohm carbon resistor mounted on the resistor stick and the two .067 mfd. cond. acting as grid returns to the R. F. tube and the 1st Det. and some to the set wiring. To cure, replace the resistor with a wirewound, replace the condenser acting as grid return to the first R. F. tube on an .022 cond. and one acting as grid return for the detector with an .067. These condensers must be the finest obtainable and have rubber covered leads. These condensers replace the orange wire running from AVC tube plate to the small terminal board near the second detector socket, (there is an R. F. choke on this terminal board) with a rubber covered wire. Replace the leads from the coils to condenser gang (except the osc. section) with rubber covered wire. These can be found by looking under cond. gang. Replace leads from the condenser gang to tube caps with rubber covered wire. Replace with rubber covered wire the black lead connected from the first I.F. transformer to the same lug on the small terminal board mentioned before to which the orange wire was connected. Replace the grid lead connecting the 1st I.F. transformer to grid I.F. tube with rubber wire. On the two grid leads coming from the chassis remove the shielding or push it down as far as it will go. Only the finest rubber covered leads can be used as the leakage through the insulation of the old braid covered leads was the chief cause of the lack of sensitivity. A complete alignment of cond. gang and I.F. transformers is necessary after this is done. On some of these sets the changes were made by distributors but many were not.—B. F. Zinser, 935 E. 53rd St., Chicago, Ill.

Majestic 66. No screen voltages. Check 10,000 ohm resistor just below 6E7 and 6C7 and if burned out replace with one having higher wattage rating. Plate and screen voltages below normal. Check center tapped filter choke (underneath set about an inch away from the A battery female cable connector). If grounded side is open or partially open there is no grid return to ground for the output tube and lack of bias boosts plate current to point where drop through choke becomes abnormally great.—Radio Retailing

Majestic 70. By substituting a 56 tube for the 27 the annoying hum in this receiver is greatly reduced.—Clifford Collins, Highland, Ill.

Majestic 70. In putting on dial cables a lot of time and also sweating and cursing can be saved by this method. After can is removed from over gang condensers there are five solder joints that hold the condensers on. Take the soldering iron and remove these connections and the gang condensers will swing away from the cable drum and you can put the cable on. Total time on the whole job, fifteen minutes.—Joseph W. Bishop, Philadelphia, Pa.

Majestic Model 90B. Intermittent operation in this model is often caused by a defective choke coil in their R.F. Plate leads. Simply shorting across this choke cures the trouble and the performance of the set is not hindered by doing this.—Glenn Heffron, Hutchinson, Minn.

Majestic 90 series. Loss of volume and extreme distortion often indicate an open in the R. F. choke in the antenna stage. Indicated further by the absence of grid bias on the first R. F. tube (a 27) with resulting high plate current. The antenna trimmer functions normally.—James Reed, Jr. Elizabeth, Pa.

Majestic 90. Carrier hum. Remove receptacle plate on floor outlet from which set gets power and fasten ground lead to Gem B box by means of mounting screw. Such a ground is a positive remedy where iron conduit is well grounded.—Radio Retailing

Majestic Model 90 Series. Made during production there was a 2,000 ohm choke built into the condenser bank one side of which connected to the junction of the second filter choke and speaker field while the other side connected to the positive B lead feeding the detector plate. The condenser bank lugs to which this choke is connected are the one next to the bottom

and the one next to the top; the one next to the top being the lug connecting the detector positive B. After this set was out of production it was found advisable to change this choke to a resistor of about 35,000 ohms. The chances of the detector B section of the filter condenser blowing are lessened quite a bit if the resistor is used. To make the change disconnect the wire from the next to the top lug third from the top. The detector B lead is left connected to this third lug from the top also. All replacement condenser banks made by Grigsby-Grunow Co. now contain the resistor instead of the choke.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 90B, 100B. Noise, motor-boating. Generally traceable to defective .5 mfd. R.F. by-pass condenser.—Radio Retailing

Majestic 90, 91, 92. If analysis shows no detector plate voltage clip the wire between the second and third lugs from the top of the condenser block for a temporary repair with slightly reduced volume.—Radio Retailing

Majestic 91, 92. Motor-boating. Inspect flexible lead soldered to sliding arm attached to trimmer cup. After a time this wire wears, breaks.—Radio Retailing

Majestic 91-92 using the 90 Chassis, 90-91-92-93 using the 90B chassis, 101 using the 100 chassis, and 102-103 using the 100B chassis: Fading is often due to the volume compensator on the end of the tuning condenser shaft being defective. This can easily be checked by setting the volume control at maximum, connecting an ohmmeter between the cathode hole in any of the first three R. F. sockets and chassis. Erratic motion of the ohmmeter needle as the tuning knob is turned shows the volume compensator defective.—B. F. Zinser, Chicago, Ill.

Majestic 100B. Cutting in and out. Check by-pass condensers across cathode resistors to ground. There are two in metal containers. Replace defectives with 1 mfd. units. —Radio Retailing

Majestic 130-A Set. Considerable profanity was spent to no advantage upon a completely dead set, even to local stations, even with all voltages and condensers perfect. Tubes all O. K., everything O. K., except set would not play. Trouble finally located in a shorted .002 mfd. condenser connected in series with a 100,000 ohm resistor from plate to detector to cathode. This machine had this condenser connected to the Cathode of

the Det. tube, instead of the ground as shown in Rider's manual, and about 60 volts on the cathode of the detector. Remedy, replace with a good 400 volt .002 condenser.—N. L. Havermale, Havermale Radio & Electric Co., 711 Maine Street, Quincy, Illinois.

Majestic Model 130 Series. A common fault is fading, slight faltering of the signal, and poor sensitivity. All of these faults are invariably caused by failure of the .04 mfd. condensers furnishing the coupling for the band pass tuner. There are three of these condensers mounted on the verticle upright on which the condenser gang is mounted. Look close or you won't find them. The only satisfactory repair is to replace all three of these condensers at once for the work is worth a whole lot more than the condensers. The whole R. F. unit must be removed to make this replacement but this isn't such a job as it appears at first. Nothing but a neon oscillator condenser tester will show the faulty condensers so don't bother to test them.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 201. Oscillation, or sharp whistle, when adjusting the volume control near its low position is tracable to the bolt holding the speaker to the baffle. The bolt extends too near the spray-shield of the first A. F. 35. Cut it off close to the nut and, if necessary, pull the tube away with a rubber band. Trouble does not occur when the chassis is out of the cabinet.—Radio Retailing

Majestic Model 290 Series. Erratic operation and extreme distortion are usually caused by leakage between the 7 mfd. and 10 mfd. electrolytic condensers that are built into the same case. This is the small dual condenser. Disconnect the lead to the 10 mfd. section and replace with a good quality 10 mfd. tubular condenser by connecting one end to the common lug on the old dual condenser and the other end to the lug on the resistor mounting board to which the old lead you removed was connected. This simply separates the two condensers and cures the fault. Watch polarity when connecting the new condenser.—B. F. Zinser, 935 East 53rd St., Chicago, Ill.

Majestic 381. Poor selectivity, volume. Many men remove the metal shield on the bottom of the chassis. Oscillation is kept under control by proper use of the volume adjustment.—Radio Retailing

Motorola 44. Installing in 1933 Plymouth—by placing a Motorola Dome-light filter in series with the dome light lead which is on the left hand front post all interference is readily eliminated, and spark plug suppressors are not necessary. Distributor suppressor is needed, however.—Anthony R. Satullo, Cleveland, Ohio

Peerless Cowier 65. Low volume and erratic performance may be caused by the blue and white resistors supplying screen grid voltage, shifting in value, permitting the screen voltage to rise to 160 volts. Replacing these resistors with two 5,000 ohm 5 watt wire wound resistors will cure this difficulty.—Thos. McClean, 56 St. Johns Pl., Brooklyn, N. Y.

Philco. When "Shadowgraph" tuning indicators fail to indicate check up on the antenna. If it is too short, or so inefficient that it does not pick up strong signals this will happen.—Radio Retailing

Philco. High and low frequency trimmers can be adjusted without an output meter on sets equipped with Shadowgraph tuning indicators by first tuning a station operating on 1,400 kc. and adjusting for narrow shadow and then repeating the process on a low-frequency signal.—Radio Retailing

Philco. Where dial cables show a tendency to slip at several points smear the cable with rosin.—Radio Retailing

Philco. 5. No volume, eliminator output only 95 volts. Push down on upper vibrator contact so that spacing is equal between armature and both contacts. Erratic vibrator action. Make sure resistor across contacts is 50 ohms. Buzz, for which vibrator is not responsible. Replace 2A7.—Radio Retailing

Philco 5. Frying or crackling in early serial numbers. If not in eliminator remove grid clip from 6A7 cap and remove lead from clip. Using same size stranded wire with good insulation wind R. F. choke for five turns on clip, reconnect lead. For obstinate cases wind thirty turns number 16 solid, cc wire around pencil. Withdraw pencil and place choke so formed in A lead between low voltage R. F. choke and heater terminal of 84. Keep choke in the vibrator section of base. Solder and tape splices. Late serial numbers have these chokes.—Radio Retailing

Philco Model 20. This one had a bad hum, especially with a carrier tuned in, and acted as though there were no filter condenser. After heating the can and sliding out the filter condenser block it was found that the B-jumper was poorly connected to the condensers. This jumper is on that end of the block opposite from the leads.—H. R. Anderson, 6038 Telegraph Ave., Oakland, Calif.

Philco Model 20. A Model 20 Philco tuned broad and oscillated with volume control on full. By-pass condensers were all checked O. K. The screws holding the variable condenser to the frame seemed tight, but a wire connected from the condenser gang to the chassis cleared the trouble.—Leo Zimmer, 63 Russell St., Canisteo, N. Y.

Philco 20. Bad tone, pitched higher than normal. Replace old cone using solidified disc with new spider type cone.—Radio Retailing

Philco 20. Intermittent reception is usually due to fine wires coming from by-pass condensers encased in small bakelite cases making and breaking connections. About the easiest way of finding the one causing the trouble is to probe at the lugs with a sharp-pointed instrument. An ice-pick serves quite well.—E. Sosnoski, Waverly, N. Y.

Philco 20, 70, 90, 112, 91, 71. Noisy when chassis is struck or moved. This condition is only experienced with an incoming signal. Check coil shields for solid contact with chassis, also check coil bracket supports for the same condition. Incidentally this trouble will correct itself while your searching for it if you turn the chassis up-side down. Keep chassis in a verticle position until the trouble is located.—George E. Hohman, Baltimore, Md.

Philco 41DC. Pronounced nasal quality and choppy reception. Replace 500,000-ohm first audio stage grid coupling resistor with 100,000-ohms and insert a 3,000 current-limiting resistor in series with the primary winding of the push-pull input transformer.—Radio Retailing

Philco Model 41-42. Intermittent reception can sometimes be traced to a defective .05 mfd. condenser connected from the ground binding post to the chassis. In these models if hum is present it can be greatly reduced by connecting a 2 mfd. condenser

from the screen grid of the detector tube to the chassis.—D. Piacentini, 403 W. 18th St., New York City

Philco 70. It is generally claimed that cutting off of reception in Philco receivers is due to defective coupling condensers that couple the audio stages. I had to repair a Philco 70 receiver which was troubled by fading, and the first thing that I did, after the tubes had been tested, was to remove the coupling condenser and substitute a new one. But that did not do any good, and after careful testing the trouble was located, and was due to a defective condenser in the cathode circuit of the oscillator tube. This condenser is a double .09 mfd. and in the diagram it is numbered as No. 12. It can be replaced with a .1 mfd.—Frank Photiades, Highland Park, Mich.

Philco Model 76. Set dead. Check speaker socket, making sure the socket makes good connection with the prongs on the plug. The pin hooked to the field often causes trouble.—J.E. Noskey, 8299 Misner Ave., Detroit, Mich.

Philco Model 81. In a receiver of this type there was a strange case of microphonics. All usual causes were checked. Finally it was traced to the Long and Short Wave switch. This switch has two end bearings, of which the front bearing is grounded while the rear one is not. At times the shaft would vibrate, making and breaking contact with the rear bearing.—John Shiliano, 2914 Mullen St., Pittsburgh, Pa.

Philco 90. Oscillation between 1,100 and 1,500 kc. when trimmers are adjusted to resonance. Shunt an 0.1 mfd. 200, volt condenser across first R. F. (24) and oscillator (27) 5,000-ohm cathode resistor.—Radio Retailing

Philco 90-X. "Cutting off" of reception is due either to use of poor tube as oscillator or to cathode resistor. Change the resistor from 15,000 to 10,000 ohms.—Radio Retailing

Philco AVC. "Cutting off" of reception is caused by the bakelite condenser that is used as a coupling condenser between the 2nd detector and audio. The number is 3903-M or 3903-R.—W. Hartmen, Chicago, Ill.

Philco 90. Intermittent noise and crackling when the set is jarred may sometimes be traced to poor electrical contact between R. F. tube shields and chassis. Bonding these with short lengths of wire remedies the trouble.—Radio Retailing

Philco 90. "Cutting off" of reception I have found is usually caused by opening of condensers in the audio plate circuit. To test, momentarily short across condenser, which will cause same to break down. Replace condenser with new type which has stranded wire from condenser to eyelet in lug. (Note: in sets with serial numbers above 237,001 these condensers are numbered 18, 23, and 28.)—Louis E. Lange, Chicago, Ill.

Philco Model 91X. In the Philco Model 91X which incorporates shadow tuning, if the set is dead, and all that is visible in window of shadow box is a straight line about the width of a pencil mark, look for open coil in Vane Type Milli-ammeter. This meter is located in the B supply lead to the plates of the R. F. and I. F. tubes, and above condition indicates these tubes are drawing no plate current. While these coils may be repaired or rewound it doesn't pay if time is taken into consideration, as a new unit is not expensive. To make a temporary repair with the loss of the shadow tuning feature, simply cut both wires to meter and connect together. A series resistor to compensate for coil resistance is not necessary.—Allen Beers, 724-6th Ave., San Francisco, Calif.

Philco Model 91X. Another condition in these models also located in the Vane Type M. L. is set dead, shadow in window of shadow box extending full across window indicating excessive current through meter. Look for a ground where the lead from meter to plates of R. F. and I. F. leaves the coil box. The insulation has been found to be cut through and grounded to the sharp edge of coil box, causing a short to chassis. This lead comes direct from the high potential lead of power pack, therefore if grounded to chassis acts the same as a short in power pack, making it advisable to check power transformer, choke coil resistors and rectifier tube to be sure no damage to these units has resulted from the overload.—Allen Beers, 724-6th Ave., San Francisco, Calif.

Philco 95, 96, 111, 112. Blasting at full volume, either continuously or intermittently, with a seemingly inoperative volume control is not due to the volume control. Nor is it due to the 70,000 ohm resistor leading to C—. It is due to an open one-half mfd. condenser connected to the junction of the volume control and the 70,000 ohm resistor. This is located in the filter condenser bank and inconspicuously connected to the volume control. Cut this lead off and solder a one-half mfd. condenser, with a cartridge or metal-cased, between this point and the

ground, and the trouble is cured.—Anthony Hitzenhammer, Chicago, Ill.

Philco 96. A loud intermittent howl is often traced to a defective carbon volume control.—J. E. Noskey, Detroit, Mich.

Radiola R15. Trouble is frequently met in lack of volume, intermittent reception, and inability to neutralize. The trouble will be found to be in the shield cans covering the four 224 tubes and the four coils. After a time the part of the shield making contact with the chassis becomes oxidized, resulting in a poor contact, and one poor contact anywhere in the shielding of this set will throw the entire set out of balance. The remedy is to remove the shield cans and thoroughly clean the contact surfaces with emery cloth and coat with a very thin layer of vaseline. Also inspect the wiping contacts to the rotors of the tuning condensers, and if trouble is suspected there apply the same remedy. This one point is imperative. The shield cans must make good contact for proper performance of the R15.—Gordon E. Hunt, Rangely, Maine

Radiola 21, 22. Apparent short between red and maroon B plus lead and chassis. If short develops when tube is inserted and disappears when the tube is removed from 22 sockets look at plate prongs to see if these touch chassis. Screws holding sockets down loosen due to speaker vibration and sockets shift.—Radio Retailing

Radiola 21 and 22. These models are made for use with 6 volt tubes. To convert these models to use the 2 volt tubes is a simple matter. There is a 3 resistor at the back bottom of the chassis. These are the filament resistors used for 6 volt operations. Short each of these resistors with a piece of wire, do not unsolder any connections. Insert a No. 5512-75 M. A. pilot light in the dial socket. Use 232 tubes in place of 222 tubes. Use 230 tubes in place of 112-A tubes. Use 231 tubes in place of 171-A tubes. Use a small 2.2 ohm resistor in series with the 2 volt A positive lead. Special kits can be obtained.—M. J. Planoosky, 3111 Keene Ct. S. W., Cleveland, Ohio

Radiola 44, 46 AC. Low, or no plate voltage. Often due to grounded coupling reactor in detector plate circuit. This is in small, brown housing beneath tuning unit and is insulated by thin pitch coating. Slip insulation between choke and chassis.—Radio Retailing

Radiola 44 and 46. If difficulty in aligning these receivers is experienced, the cause may be found due to shorted turns on the small universal wound plate coil. Replacing this coil cures the difficulty.—Roy Novell, Rice, Texas

Suggestion for Radiolas 50 and 55. The suggestion is made to remove the series combination of the 18,000 ohm resistor and .005 mfd. fixed condenser connected between the plates of the two push-pull pentodes in the Radiolas 50 and 55. This slight operation improves the tone quality.—“Service”

Radiola Model 66. If this receiver is completely dead except for a loud hum, usually the by-pass condenser across the plate and cathode lugs underneath the socket of the second detector tube is shorted. This should be replaced with a .0024 mfd. condenser.—R. F. Lambert, 11-10 Ohio Ave., Detroit, Mich.

RCA-Victor. All models using a 27 as AVC. Fading away of signals after set has been turned on indicates failure of the AVC to function. It has been suggested that low filament voltage on the AVC tubes may cause this trouble. Check this, and try a 56 tube in place of the 27. We have found that in some instances certain 27 tubes will not function in this socket for any length of time even though the filament voltages are correct. The only thing to do is to install a brand new 27. One that has been used in any other socket will not do, so don't try to swap tubes around.—John F. Bivans, High Point, N. C.

RCA. Many recent models using Bradleyometer variable resistors. If these become noisy remove the covers, with cloth, apply vaseline.—Radio Retailing

RCA R-4 and Edison Screen Grid. Oscillation and noise resulting from dirty contact wipers on variable condensers. This trouble I have found can not always be permanently cured by cleaning or scraping the wiper arm, as recommended last month in connection with G. E. K62 and S132. It is always good policy, if repeat calls are to be eliminated, to solder “pig tail” leads to the rotor and wiper arm, and ground. Copper braid may be used and bent around the shaft in the direction of the rotor plates. It is desirable to encase the braid in spaghetti tubing.—P. J. McGee, President, IRSM.

RCA Victor Model R-5. Often in this receiver, it is impossible

to control volume, even with aerial disconnected. The volume control, in this model, is across the antenna and ground with the center arm coupled to the primary of the R. F. transformer. The pick-up of the coil is sufficient to nullify the effect of the volume control. Shielding the R. F. coil assembly will assist greatly.—A. J. Borden, 1225 So. Pearl St., Denver, Colo.

RCA Victor R-12. Poor tone quality. Analysis will reveal incorrect plate and grid voltages on 47 tube. This is due to the bleeder resistors changing their value. In one case they changed from 16,000 to 700 ohms and 8,000 to 2,000 ohms.—George E. Hohman, Baltimore, Md.

RCA Victor Model M30. When the receiver plays without any control of volume, often the green wire in the cable that runs from the set to the control unit, will be broken inside the cable. This disconnects the cathode of the AVC tube.—Leo Zimmer, 63 Russell St., Canisteo, N. Y.

RCA M34. Vibration loosens mounting. Secure two pieces of rubber or felt about $\frac{1}{2}$ inch thick. Place these behind set on bolt, one each side of bulkhead, compressing tightly with nut. On Chevrolets and other cars having light bulkheads which permit shimmying of chassis place 6 by 8 inch steel plate under smaller one furnished by manufacturer, holding it in place with 8/32 bolts passed through holes drilled in four corners.—Radio Retailing

RCA M34, GE B40. Speaker rattle or sizzle. Try centering cone. Remove from case and look for filings at pole pieces. If there is no hole in screen for centering punch one $\frac{3}{8}$ " before re-installing as drawing speaker up with nuts on face of chassis may twist frame and throw cone off center. If voice coil glue loosens don't try repair. Replace. Vibrator works O.K. but set is dead. Place paper scraps between all contacts and check from each side to ground on chassis. Shorts indicate blown condensers across contacts. If found, replace vibrator base. If no blown condensers check for one between B plus lead on speaker (2nd from right looking into back of set) and chassis ground. If dead short is found trouble is usually in intermediate cans shorting to coils or blown 4 mike in pack. To insulate cans, glue cardboard discs inside covers. Rattle. Tighten eyelet in center of speaker screen. Unstable vibrator operation. Check small rivets holding armature to channel section of springs and tighten by pounding if loose,

removing armature for job. Field current and pilot current on but tubes don't light. Poor soldered joint between small R. F. choke L12 and field wire lead.—Radio Retailing

RCA 42, 48. Defective volume control. Check R.F. 24's for plate to screen short to avoid repetition of the trouble. Such shorts put abnormal current through the controls but otherwise affect reception very little.—Radio Retailing

RCA-44. If set oscillates as station selector is turned take off the two copper shields and clean the edges with fine sandpaper. When replacing make sure the shields make good contact with the condenser shaft.—J. E. Noskey, Detroit, Mich.

RCA 44, 46. Loss of volume, selectivity, sensitivity after several years of use. If voltages and tubes check O.K. trouble is usually caused by wear in the gang condenser, permitting the rotor sections to shift. Re-align these by means of the adjusting screws at each end of the stator sections. Select a station between 600 and 650 kc. and adjust for maximum volume. Then adjust the trimmers at the 1,500 kc. end and repeat both operations once again. A 235 in the 2nd R.F. stage will improve tone on local stations and low volume settings.—Radio Retailing

RCA 48. Cutting in and out of reception is sometimes caused by sluffing off of the plating on tuning condensers. Hum, noticeable only when records are played, is cured by a 5,000 ohm resistor shunted across the secondary of the pickup input transformer.—Radio Retailing

RCA 48. Fading, intermittent signals are most often caused either by a burnt-out section of the volume control or corroded variable condenser clips.—Radio Retailing

RCA Victor Model RE57, 39-35. A very loud and annoying noise in these receivers occurs with jarring of the receiver. I found the cause to be in the second radio frequency condenser and coil shield can under the chassis. There is a fixed condenser connected to the end of the coil, and the coil is fastened to a plate; this plate is riveted to the chassis; but the end of the plate does not make good contact with the chassis, and any jarring of the receiver will cause this fixed condenser to touch the shield can causing a loud noise. By just merely drilling a hole through plate and chassis near the end of the plate and inserting a screw and nut, making sure that the fixed condenser does not strike the shield can, this

trouble will be overcome permanently.—George Feser, 986A Lafayette Ave., Brooklyn, New York.

RCA 60, 62. Low volume. Check for decline in value of the 20,000 ohm bleeder resistor located beneath the pack.—Radio Retailing

RCA Victor R-78 and RAE-84. Intermittent and erratic reception and oscillation or motor-boating between stations is usually caused by dirty wiping contacts on the variable condensers. Cleaning these usually remedies this situation.—H. B. Kirkhart, 151 East Second St., Pomona, Calif.

RCA Victor R. E. 80. I have found that the most frequent cause of the trouble of this receiver is oscillation, no AVC action, loud volume and motor-boating, most frequently on the higher frequencies. The trouble is this:—the pilot light socket almost touches the shield on the front panel, that is used to shield the antenna coil from the controls on the panel, the vibration of the set causes the socket lugs to short to the shield, the filament of the pilot is connected with the filament of the power amplifier, the shorted pilot light socket will short out the power amplifier bias resistor as well as remove the negative potential from the cathode of the -55 tube. This will result in distorted reproduction, no AVC action, oscillation, and loud volume, it is simple to twist the lugs back in place and also wrap tape around the lug to prevent the same trouble again.—John Tafra, 1041 Geyer Ave., St. Louis, Mo.

RCA 80-82. Loss of volume and poor tone. Examine black enamelled bias resistor for 45's, under chassis, for bad soldered joint.—Radio Retailing.

RCA 106 Speaker. The AC model can be used with single pentode output tube models with considerable improvement in tone. The field is about 450 ohms. Use it as the bias resistor.—Radio Retailing

Silver Marshall A-18. When set squeals with volume wide open on distant stations, try changing oscillator tube. Also check for too high screen grid voltage.—Lanternman Radio Service, Edwardsville, Ill.

SM 30. When there is no reception look for a punctured filter condenser, usually the green lead coming out of the can.—Radio Retailing

Silver Marshall 724. A common cause of fading or cutting off is found to be due to a defective mica tuning condenser in the last I.F. transformer. Pressure on it with a small screw will show it up.—Geo. V. Sangree, Harrisburg, Pa.

Silvertone 110, 111. Defective volume control. Replace with 10,000-ohm unit and ground through 5 or 10 watt, 500-ohm resistor in series with the cathode circuit to give better control on locals.—Radio Retailing

Sparton models using 485 tubes. It is a common fault for these models to oscillate, howl and motor-boat when first turned on. This continues for about a minute and then clears up. A check-up will reveal the trouble to lie chiefly in the Radio Frequency and Detector stages. Replace tubes with new ones. If trouble still persists pull out chassis, leave the cover on, power on maximum, and tap tubes gently. Change with other tubes, or replace any tubes that oscillate or howl under this treatment.—Andrews Janis, McKees Rocks, Pa.

Sparton 79. Set would suddenly burst into full volume, with volume control turned low, and would play so with the volume control removed from the circuit. Finally figured it had to be the cathode by-pass condenser leaking and applying just the needed bias for full volume. A new condenser did the trick.—Everett Palmer, Bandon, Ore.

Sparton 89A, 79A. R.F. oscillation in serial numbers using 485 tubes. Readjust trimmers to exact resonance. If trouble persists replace .5 mfd. B by-pass in R.F. amplifier with .25 mfd., 400 volt tubular unit. Some late chassis have it.—Radio Retailing

Sparton 301. If this model plays with a steady hum, look for poor contact in the phonograph pick-up jack A-4136. Replacing the jack will generally cure the trouble.—J. T. Maza, E. Chicago, Ind.

Sparton 410 and 9A. Can be stepped up in volume considerably by substituting a .002 of similar condenser volume for the .006 between the power transformer primary and the ground. In these push-pull, two power tube models, a very agreeable tone control can be effected by connecting the plates of the power tubes through a .002 condenser. Of course, cut into this and bring out the two insulated wires to an outside switch (insulated

from the chassis) and mount on the back of the chassis.—L. E. Neuffer, Topeka, Ind.

Sparton 410. No plate voltage on I.F. tubes and oscillator. Replace tubular condenser attached to front panel with .5 or 1 mfd. 400 volt capacity.—Radio Retailing

Sparton 410 and 420 DC Sets. Intermittent operation—sometimes stop and start by jarring. Trouble found in loose connections on resistor block holding parts A-4363 or A-5889. The wire connections are worn away from the screws due to heat. Solder for permanent job.—Murray M. Gartner, New York City.

Sparton 740. A pin, fitting into a small socket, connects the band-pass unit to the R.F. amplifier. Corrosion at this point is a common cause of fading.—Radio Retailing

Sparton 930, 931, 589. When plates of the 485's show low or no potential, remove screw at side tab of cylindrical condenser at rear left of amplifier can. Remove responsible condenser by unscrewing with upward twist. Replace. Job can be done in 10 minutes without removing chassis from cabinet.—Radio Retailing

Sparton 931. Intermittent reception, loud hum, fading and low volume is often due to the .6 ohm balancing control, located between the 182B power tubes having high resistance (6-7 ohms). This cuts down the filament current to the power tubes, decreasing volume. The control may be left out entirely, or a new one substituted.—E. Sosnoski, Waverly, N. Y.

Sparton 931. Thin tone and oscillation accompanied by high plate voltage readings and low speaker field current. 15,000 ohm bleeder has increased in value due to age. Replace with 10 to 25 watt unit.—Radio Retailing

Sparton 931, 301, Hum is generally caused by nothing more serious than poorly matched push-pull 182's—Radio Retailing

Sterling Model F. Cutting off of signals and erratic signals has been traced very often to defective volume control.—H. E. Massie, Stephens City, Va.

Stewart Warner S. W. Converter. The S. W. converter may be found very insensitive even tho all circuits and tubes check O.K.

Converts of this type may be made to operate satisfactorily by "resoldering every soldered connection in the converter tho they may seem O.K." A poorly soldered connection may have sufficient high resistance to materially affect performance on short waves, yet not high enough to show up on a simple continuity test.—M. J. Planoosky, 3111 Keene Ct. S. W., Cleveland, Ohio.

Stewart Warner Model 102. To improve Pentode tube performance on these receivers, make the following changes, (a) Cut the connection made by the small green 500,000 ohm resistor, to the control grid of the pentode at the grid terminal. (b) Cut the connection made by the No. 67299 .02 mfd. coupling condenser to the corner lug of the terminal strip (this being the same lug to which the other connection of the green resistor is made.) (c) Connect loose end of the resistor to the loose end of the .02 condenser, connect the control grid of the pentode to lug on mentioned resistor terminal strip. This change removes the 500,000 ohms from the grid circuit of the pentode tube at the same time retaining the R.F. suppressing action for which the resistor was used.—M. J. Planoovsky, 3111 Keene Ct. S. W., Cleveland, Ohio

Stewart Warner 950. The screen voltage in this set is bled through a 20,000 ohm, 2 watt purple resistor, and is controlled by the volume control. Almost invariably, the purple resistor drops gradually to about 2,000 ohms, and burns out the volume control. When replacing the volume control, replace the purple resistor also, or the new volume control will go the way of the old.—James Reed Jr., Elizabeth, Pa.

Stewart Warner 950, R100. Poor sensitivity and low volume. Check red resistor 66326 for low value or charring. This resistor shunts R.F. plates to minimize effect of variation in plate current when different tubes are used and if low increases load and reduces screen voltages.—Radio Retailing

Stewart Warner 950. Oscillation at low frequencies. Clean variable condenser contact clips and bend them to increase pressure. Oscillation at high frequencies. Look for open .25 mfd. R.F. by-pass condenser located close to R.F. coils. Tone distorted, set oscillates. Try replacing .25 mfd. R.F. grid by-pass condenser. If set oscillates when quick-heater tubes are used replace .25 mfd. screen-grid by-pass with .5 mfd. or more.—Radio Retailing

Stewart Warner 950 Series. If the plate voltage is slightly low and the screen voltage on the three radio frequency tubes is

high, this is usually caused by failure of the 3 watt, 20,000 ohm purple resistor.—M. W. Kikkebusch, 1806 S. 8th Ave., Meywood, Ill.

Stromberg 654. A leaky 0.3 mfd. cathode by-pass section in the first R.F. stage is often at the bottom of fading trouble.—Radio Retailing

Stromberg Carlson 846-848. A mean form of motor-boating may be experienced after the set has seen considerable use. This motor-boating shows up between stations, generally being worst at the low frequency end of the dial. Sometimes changing volume controls effects it. The cause is not in the audio system as might be expected but is due to poor grounds between the condenser rotor to its frame. Cleaning these grounding springs will cure the trouble, but pigtailed from each rotor section to a nearby point on the frame will permanently eliminate this trouble.—B. F. Zinser, 935 E. 53rd St., Chicago, Ill.

US Radio 10. Jumpy volume control. Look for gassy 27 in first A.F. socket.—Radio Retailing

US Washington 34. Intermittent reception. Change 200,000 ohm grid filter resistor between 35 grid and AVC tube plate to 100,000 ohms.—Radio Retailing

Victor R-15. The volume control is the greatest cause of oscillation and intermittent reception. When using the regular RCA replacement control reserve the two wires which go to the outside terminals of the screen connections, also remove the gray 12,000 ohm resistor connected across the screen portion of the control. (Note: The screen section on the new control has a different value than the original.)—F. L. Dearth, Dearth's Radio Service, Kensington, Ohio

Victor R32, Distortion and poor tone quality—look for speaker cone broken close to the voice coil.—Chas. B. Hast, Grand Rapids, Mich.

Victor R32. Have had several sets in service recently because of shorted filter condensers. By removing the extra AC line connection plug in power pack chassis, which is not used in most cases, an opening is left in which an inverted electrolytic condenser

can be installed. This makes a first class repair job with little work, and is applicable to other models and makes as well.—H. M. Cowles, Salamanca, N. Y.

Victor R32—RE45. AC hum can often be traced to a loose arm on the hum control.—J. E. Noskey, Detroit, Mich.

Victor 35. Low volume or no reception. Turn on set and permit tubes to warm up, setting dial on strong local. Remove detector and then replace quickly. If set plays for few seconds and then fades out replace detector screen resistor.—Radio Retailing

Victor R35. Weak reception. Commonly either open detector screen resistor or first A.F. plate resistor. The first is located under resistor board on chassis. To replace connect pigtail unit of $1\frac{1}{2}$ megohms to two inside lugs on side of board toward the center of chassis. To replace A.F. unit loosen pack but do not remove and tip up bottom sufficiently to clip out green and red pigtail resistor on terminal strip, replacing with 70,000 ohms.—Radio Retailing

Victor RE45, 52, 75. Chassis shorts. Often caused by steel needles falling down from phonograph compartment and shorting socket lugs to ground.—Radio Retailing

Zenith 50. This model generally hums in spite of 36 mfd. of filter. This hum can be greatly reduced by filtering the 24 detector plate and screen with 100,000 and 500,000 ohm resistors, respectively, and .1 mfd. by-passes. It can be further reduced by increasing the size of the plate coupling condenser in the first A.F. stage. .05 to .1 mfd. seems about right. A larger condenser spoils the bass response.—H. R. Anderson, 6038 Telegraph Ave., Oakland, Calif.

Zenith 50 Series. A loud hum when all parts and tubes check O.K. can be cured by connecting a 250,000 ohm resistor across the grid of second A.F. 27 tubes, which are connected in push-pull.—Stanley C. Maegly, Bromley, Ky.

Zenith 70. Fading or intermittent reception. Look for open or shorted .25 mfd. dual plate by-pass condenser located on the first and second R.F. stages, or .03 mfd. by-pass condenser located between the plate of the first A.F. tube and the primary of the first A.F. transformer. If signals vary from weak to normal suspect the first. If they are always weak check the second.

Zenith 91. Fading, accompanied by tricky local switch operation, is usually caused by trouble in the 2,800 and 3,600 ohm resistors in series across the DC voltage output. Replace with higher wattage types.—Radio Retailing

Zenith 750 Model. The first trouble evident is that the set breaks into oscillation with a constant "put-put" sound. The remedy is to replace the double conds. 5 mfd. across the cathodes of first Det. and Inter-transformer tubes.—Valentine Obal, 4215 So. 29 St., Omaha, Neb.

MISCELLANEOUS INFORMATION

AMPLIFIERS

Direct Coupled Amplifiers. I have found the most frequent cause of trouble is in the resistors that go from the center tap of the 45 filament winding to ground, and from cathode of the 24A or 57 to ground. If these are carbon replace with high watt wire-wound, adjustable resistors, preferably using one resistor with taps to obtain suitable resistance values.

If there is considerable hum try center tapped resistors in place of center taps on filament windings.

If the amplifier is dead either the 45 filament wire is grounded or a leaky or shorted by-pass condenser is the trouble. If filament winding is grounded replace transformer. Test all condensers for leaks or shorts and replace, if necessary, with I.M.F. 400V condensers. Voltage rating is necessary.—O. M. Brady, Chicago, Ill.

Amplifier Couplers. For several years I have been experimenting with different devices to couple radio tuners to audio power amplifiers, and some methods were fairly satisfactory, but usually costly, involving transformers, etc. I have found that by placing in series with the plate terminal of either the detector or first audio tube of the tuner and the input of the amplifier, a small (.05 mfd.) by-pass condenser and running a wire from ground to the other input terminal of the amplifier, I get the best results. The value of this condenser does not seem to be very critical.

I have installed this condenser system on several Electrolas which were formerly energized by a battery set. Most Electrolas have only one stage of audio for the radio input, making it necessary for the tap to be taken off of the first audio amplifier tube of the radio.

I have also found that by using a pair of head-phones in series with the same condenser from plate of the detector or first audio to ground I am able to locate hum and distortion noises in radio receivers, stage by stage, quickly.—Franklin W. Young, Easton, Pa.

AUTO RADIOS

Auto Radio. Interference from the high tension circuit in the 1933 Chevrolet is practically unavoidable when the radio is mounted on the bulkhead on the right side of the car. The ignition coil with associated electrolock cable, mounted on the motor side of the bulkhead, is so closely coupled that despite all the shielding and tuned filtering, there is still bound to be coupling. I have found that the only sure remedy is to mount the radio on the left side of the bulkhead and keep the battery leads as far removed from the coil leads as possible. Changing the radio position rather than the coil-electrolock cable is more practical and satisfactory.—Clyde P. Carter, Canisteo, N. Y.

Checking Auto B Units. A hint of rapidly isolating the trouble in car radios with power units combined is the releasing of the B plus power lead from the power unit and attaching it to the B plus of an extra B power unit and completing the circuit by connecting B minus of the temporary unit to B minus of the car set which is usually the chassis. If the radio is O.K., it will operate from the added power unit and the trouble will be isolated to the set's power unit which is sometimes hard to check for non-operation.

Positive conclusion on which end of the radio the trouble is and rapid service to your customer is the merit of this hint.—C. L. Fairchild, 620 Wright Ave., Elgin, Ill.

1933 Chevrolet. Remove ignition coil from bulkhead and fasten to motor using valve inspection plate bolt.—Radio Retailing

1933 Pontiac. On this and all other cars having shielded lead down right side post and requiring set installation on driver's side carry extended antenna lead in shielding under floor boards rather than under dash to complete noise suppression.—Radio Retailing

1933 Ford. To get suppression at coil remove the three screws and terminals nut and take the coil off. Pull out the carbon brush and spring, saving the spring and discarding the brush. Make a suppressor from a 40,000 ohm one watt carbon resistor of good quality by cutting it to the same length as the old brush. Clean off paint and file recess in one end to accommodate the spring and re-assemble the coil, using the suppressor as a brush. 40,000 ohms is recommended, as the resistance is reduced by cutting and filing.—Radio Retailing

CONDENSERS

Condenser Measurements. It is a simple task to measure the various condensers in use from .1 mfd. and up; but when one wants to measure the smaller ones, such as .00025 mfd. it is a difficult task unless a capacity bridge or grid dip meter which is calibrated for such work is available.

To get around this difficulty, use neon glow lamps with ratings of a quarter watt, one watt and two watts connected across the 110 Volt AC line with a pair of test prods in series with the lamp. These three sizes of lamps will cover the usual capacity range needed in service work.

To use this method, have a capacity block consisting of enough small condensers to cover the desired range. By noting the brilliancy of the light when the unknown condenser is under test and comparing it with a condenser of known value, one can very easily determine the value of the unknown.—Wilbert L. Misner, Vin-tondale, Pa.

Electrolytic Condensers. When replacing a 3 unit wet electrolytic condenser, remove the copper can, break the hard rubber cover, remove the old insides and wash out thoroughly. Place three 8 mfd. dry (paper container type) in the can with the terminals up. Solder a stiff piece of copper wire to all the negative terminals and to the can at two points opposite. This serves to hold the condensers in place and forms the negative connection. Connect the 3 wires to the positive connections on the condensers, replace the cap on the can and the job looks and works like the original.—Geo .W. Ewing, San Bernardo, Calif.

Condenser Test. An excellent and inexpensive service shop accessory is a neon lamp to test condensers. The one I have is about the dimensions of a 50 watt lamp globe. Leaking condensers can be readily detected by applying DC to the condenser in series with the lamp. Leak is manifested by intermittent flashing of the lamp, the rate of the flashes indicating greater leak and steady glow indicating shorted condenser. AC of course will go through a condenser; therefore use AC to test for open or intermittent operation.—W. C. Libbey, Spokane, Wash.

Condenser Kink. In melting out defective condensers from condenser banks, I use a large pot full of boiling water, and suspend the block in the water just enough so that all the pitch or tar melts. I can then remove the condensers and reassemble them without

moving the outside cover. (Note: care should be taken that the block is not too deeply immersed in the water.)—W. Hartmann, Chicago, Ill.

Condenser Check. When a by-pass condenser goes dead, short the two ends of the resistor that it is connected with. This short should be done very quickly and only for an instant. This short will produce a spark and the by-pass condenser will either be O.K. again or must be replaced.—“Sylvania News.”

Cleaning Tuning Condensers. To clean the dust from a gang condenser, disconnect all leads to the stator sections and connect the leads from a power pack supplying about 600 volts DC across each section in turn. While the high voltage is connected, turn the rotor slowly and blow into the plates. This is the only way a condenser having cadmium coated plates can be cleaned of the microscopic fuzz which develops on them. Slight shorts will also be easily located in this manner.—B. F. Zinser, 935 East 63d St., Chicago, Ill.

Paper Filter Condensers. Many paper filter condensers when tested show an “open” but are really not open since the wire that connects them from the can terminals to the condenser is broken. This can be quickly and easily repaired by taking the condenser out of the can and resoldering the wire.—Lyman Greene, 459 Needham St., Fredericton, N. B.

RECEIVERS

AC, DC Receiver Hint. When the owner of a universal AC-DC set using a 37 as rectifier brings his tubes in to be tested, and the 37 lights but tests dead, look out for a shorted filter condenser. The cathode emission of a 37 rectifier is quickly killed by overload, and putting in a new 37 with a filter condenser shorted is invariably fatal to the tube.—James Reed, Jr., Manager, Reed Radio Service, 712 Second Ave., Elizabeth, Pa.

Air Cell Receiver Corrosion. On certain battery radios using the Air Cell Battery to light the filaments, it has been found that the fumes from the Air Cell will corrode and damage any wires or coils which it may contact. If the service man cares to avoid repeated service calls, on which he would have to replace a wire or some more expensive part, it would be wise to extend the battery wires enough to allow him to place the Air Cell completely

outside the cabinet, so that the fumes will not pass over any part of the chassis or speaker.—H. L. Wilson, McRae, Ga.

Adding Tone Control. There are two types of tone controls commonly used in receivers. These are the switch-controlled series of fixed condensers and the series combination of a variable resistance and fixed capacity. The latter circuit is more easily applied to a finished receiver. Its usual position is across the input or output circuits of the output tubes. In the case of pentodes, the majority of manufactured receivers employ tone control across the plate-to-ground, in single tube output systems, and from one plate to ground in push-pull systems, or across the two plates in push-pull systems. 100,000 ohms maximum and .04 mfd. makes a good combination between the two plates of a pair of 45's in a push-pull output stage. A resistor of from 100,000 ohms to 200,000 ohms maximum and condenser of .04 mfd. to .05 mfd. makes a good combination between the plate of a single pentode tube and ground.—“Service”

Cabinet Finishing. A large number of real good service men now remove scratches from the cabinet and polish it after they have finished with the chassis repair. A dollar or more can be made in a large number of homes by soliciting touch up work on other furniture. A kit for doing this work rapidly and well can be obtained for a few dollars and it will pay for itself many times over.—H. L. Wilson, McRae, Ga.

Curing Oscillation. One of the bugaboos to voltage measurement upon sensitive receivers is that the effect of the plug-cable attachment of the tester causes excessive coupling in the circuits and sustained oscillation is the result. Such excessive regeneration causes a change in readings. It is possible to stop oscillation in such circuits by touching the control grid of the tube with the finger tip.—“Service”

Extending Magnetic Speakers. When extending a magnetic speaker circuit some distance, such as to a nearby building, a good ground connection at each speaker will serve in place of one lead, with a considerable saving in wire.—Radio Retailing

Motor-boating. Motor-boating or fluttering as many people call it, is frequently due to the first detector and oscillator tubes, which vary greatly from standard values. In receivers which use electrolytic condensers, defective condensers (high leakage and

low capacity) will also cause this type of trouble. Imperfect R.F. or 1st detector screen-grid by-pass condensers are also apt to cause this type of trouble.—“Service”

Noisy House Wiring. Instead of taking off plates of wall receptacles, canopies, and sockets in finding faulty house wiring connections, an electric heater may be used that will draw about 6 amps. by connecting it to each outlet while having an AC voltmeter plugged across the line watching any fluctuation on the meter while the heater is plugged in. In one case, three canopies, where the joints should have been soldered, were found badly corroded, thus causing noise.—H. S. Keller, 1312 Erie Street, Chicago, Ill.

RESISTORS

Increasing Resistor Values. Resistors that lack several hundred ohms in value can easily be brought up by filing or grinding a little off of one side between the two end caps. A little practice will make it possible for anyone to file a resistor of, for example, 500 ohms and bring it up to 600 or 700 ohms in value. Resistors too hard to file can be ground on an emery wheel.—Carl E. Schneider, Indianapolis, Ind.

Point-to-Point Resistance Testing. When testing by the point-to-point resistance method in a receiver with electrolytic condensers (particularly receivers a few years old) be sure to have the polarity of the ohmmeter correspond to that of the condensers in parallel with the circuit. The condenser leakage current will indicate a lower resistance if this polarity is not correct.—Harry Bangerter, Service Engineer, Sherwood Radio Supply Company, 117 North Fourth, Albuquerque, New Mexico.

TRANSFORMERS

Transformer Substitute. When a receiver goes dead and the continuity check shows an open primary or secondary winding in the audio transformer, the first thought is a new transformer. Suitable replacement transformers are not always available, but a satisfactory repair may be made quickly with a fixed condenser and a fixed resistor.

An open primary is shunted with a 25,000-ohm fixed resistor. The same idea applies to the open secondary but the resistor value

should be 75,000-ohms. In both instances, a .08 mfd. fixed condenser is shunted across the plate and grid terminals of the transformer.

This makes a satisfactory repair and the job is as good as it was before.—Richard Martin, 2417 West 32d Avenue, Denver, Colo.

TUBES

Testing All Tubes. This is not an original idea while its application to the service field may be new. In my opinion it is one sure way for testing the efficiency of tubes and in some cases will aid sales.

Connect an oscillator and output meter to the receiver in the conventional manner and turn on both the oscillator and receiver. Tune in the signal from the oscillator and adjust its output for a low reading on the output meter (the volume control on most receivers should be at maximum). Note the reading on output meter. Then insert new tubes one at a time and note the reading after they are at operating temperature. A noticeable increase in the output meter reading indicates that the old tube is defective. I have found in a number of cases that readings or tests made on conventional tube checkers or regular set analyzers are not nearly so reliable as the method above outlined. I can see that Sylvania's method of testing tubes in the factory is of great value to their customers.—H. L. Wilson, McRae, Ga.

Output Tubes. Used as Class B amplifiers in auto-radio receivers must be of identical characteristics. For that matter, all such systems irrespective of their use, in automobiles or otherwise must use tubes with operating characteristics which differ as little as possible.—“Service”

Removing Tubes. Often a tube is very difficult to remove from a socket, especially when the parts are crowded. Make a lasso out of a foot or two of hook-up wire and slip the noose over the bulb. With one hand over the bulb a slight tug on the wire will remove the tube. I came across a set with tubes glued in their sockets (auto-radio) and after a lot of trying used this stunt.—W. Jackson, Laurium, Mich.

Spray Shield Tubes. When using these to replace other types be sure tube does not touch metal can or other projecting metal as this grounds cathode and removes bias.—Radio Retailing

Tube Shielding. The 24A in the new ST-14C bulb has the same overall size as the original bulb. The maximum diameter is exactly the same but it falls near the center of the tube, while on the older tubes it was nearly at the top of the tube. In a few receivers having half shields, the new bulb may strike the shield, in which case it will be necessary to cut the shield to the proper length, replace with new shields or add an adapter to raise the tube for clearance.

Metal Tube Shields. When interchanging several spray shield tubes in a receiver, it will be necessary to equip the receiver with metal tube shields.

OF INTEREST TO YOU: In addition to its acknowledged position as a leader in the field of receiving tubes, Hygrade Sylvania has now gained a position of prominence through its Electronics Department, which was established early this year at Clifton, N. J.

This new division manufactures:

- Radio Transmitting Tubes
- Industrial Power Tubes
- Special Radio Receivers
- Broadcast Speech Equipment
- Custom-Built Electronic Devices
- Radio Transmitters
- Sound Amplifiers
- Phototubes

We invite inquiries regarding the products of our receiving tube and electronics divisions, as well as the incandescent lamp division.

SYLVANIA INTERCHANGEABLE TUBE CHARTS

The purpose of this Chart is to furnish information as to which types of SYLVANIA SET-TESTED TUBES will satisfactorily replace tube types of other manufacturers having similar, or different, type designations.

As a rule, the last two digits of a type number are the designating numerals. In interchanging tubes, this rule may be followed except on special types and on tubes recently announced, bearing the new RMA system of type numbers. Except on Special Types all Sylvania tubes heretofore designated by a symbol and three numerals have been changed to conform to later designations. For example, SX-201A is now 01A, SY-227 is now 27, et cetera. Many of the Sylvania tubes recently introduced bear type numbers assigned under the new RMA system, which is characterized by a letter appearing between two digits (Example: 5Z3). The first digit indicating the filament voltage class, the latter being assigned arbitrarily, and the second digit indicating the number of useful elements in the tube.

*Indicates types not directly interchangeable with Sylvania Set-Tested Tubes.

‡Only when used in Auto Receivers or AC Receivers not having series filament.

†When receiver's transformer will stand one ampere additional filament current.

NOTE:—When interchanging several spray shield tubes in a receiver, it will be necessary to equip the receiver with metal tube shields.

Type No.	Description	Replace with Sylvania Type
'00-'00A	Special Detector	00A
'01-'01A-'01AA	Detector-Amplifier	01A
1-KR1	Mercury Rectifier	1-V
2	Ballast	*
G-2	Special Detector	*
3	Ballast	*
4	Ballast	*

Type No.	Description	Replace with Sylvania Type
G-4	Special Detector	*
5	Ballast	*
KR5	Power Amplifier	6A4
6	Ballast	*
7	Ballast	*
8	Ballast	*
9	Ballast	*
'10	Power Amplifier	10
WD-11	Detector-Amplifier	*
'12-'12A	Power Amplifier	12A
WD-12	Detector-Amplifier	*
'13	Full-wave Rectifier	80
14	Detector-Amplifier	*
15	Detector-Oscillator	15
'16-'16B	Half-wave Rectifier	81
17	Detector-Amplifier	*
18	Power Amplifier	18
19	Class B Amplifier	19
'20	Power Amplifier	20
KR20	Special Detector	*
'22	Amplifier	22
KR22	Special Detector	*
'24-'24A	Detector-Amplifier	24A
KR25	Power Amplifier	2A5
25S	Detector-AVC	*
'26	Amplifier	26
'27	Detector-Amplifier	27
'27HM	High Mu Amplifier	56
28	General Purpose	*
29	Special Detector	29
'30	Detector-Amplifier	30
'31	Power Amplifier	31
'32	Amplifier	32
'33	Power Amplifier	33
'34	Amplifier	34
'35	Amplifier	35 or 51
'36-'36A	Detector-Amplifier	36
'37-'37A	Detector-Amplifier	37
'38-'38A	Power Amplifier	38
'39-'39A	Amplifier	39 or 44
'40	Voltage Amplifier	40

Type No.	Description	Replace with Sylvania Type
41	Power Amplifier	41
42	Power Amplifier	42
43	Power Amplifier	43
44	Detector-Amplifier	44 or 39
'45	Power Amplifier	45
46	Power Amplifier	46
'47	Power Amplifier	47
48	Power Amplifier	48
49	Power Amplifier	49
'50	Power Amplifier	50
'51	Amplifier	51 or 35
52	Class B Amplifier	*
53	Class B Amplifier	53
55	Detector-AVC	55
56	Detector-Amplifier	56
57	Detector-Amplifier	57
57A-S	Detector-Amplifier	6C6
58	Amplifier	58
58A-S	Amplifier	6D6
59	Power Amplifier	59
59B	Power Amplifier	*
64-64A	Detector-Amplifier	36†
65-65A	Amplifier	39†
67-67A	Detector-Amplifier	37†
68-68A	Power Amplifier	38†
69	Special Detector	69
70	Detector-AVC	*
'71-'71A-'71B	Power Amplifier	71A
75	Detector-AVC	75
76	Detector-Amplifier	76
77	Detector-Amplifier	77
78	Amplifier	78
79	Class B Amplifier	79
'80	Full-wave Rectifier	80
80M	Full-wave Rectifier	83
'81-81M	Half-wave Rectifier	81
82	Full-wave Rectifier	82
83	Full-wave Rectifier	83
84	Full-wave Rectifier	84
G84	Half-wave Rectifier	*
85	Detector-AVC	85

Type No.	Description	Replace with Sylvania Type
88	Full-wave Rectifier	83†
89	Power Amplifier	89
90	Special Detector	*
91	110 Volt Converter	*
92	Special Detector	*
95	Power Amplifier	2A5
96	Half-wave Rectifier	*
98	Full-wave Rectifier	84
'X99	Detector-Amplifier	X99
'V99	Detector-Amplifier	V99
1A6	Detector Oscillator	1A6
2A3	Power Amplifier	2A3
2A5	Power Amplifier	2A5
2A6	Detector-AVC	2A6
2A7	Detector-Oscillator	2A7
2B6	Power Amplifier	*
2B7	Detector-Amplifier	2B7
5Z3	Full-wave Rectifier	5Z3
6A4	Power Amplifier	6A4
6A7	Detector-Oscillator	6A7
6B7	Detector-Amplifier	6B7
6C6	Detector-Amplifier	6C6
6C7	Detector	*
6D6	Amplifier	6D6
6D7	R. F. Amplifier	*
6E7	R. F. Pentode	*
6F7	Detector-Oscillator	6F7
6Y5	Full-wave Rectifier	*
6Z3	Half-wave Rectifier	1-V
6Z4	Full-wave Rectifier	84
6Z5	Full-wave Rectifier	*
12A5	Power Amplifier	12A5
12Z3	Half-wave Rectifier	12Z3
14Z3	Half-wave Rectifier	12Z3
25Z3	Half-wave Rectifier	*
25Z5	Voltage Doubler	25Z5
182B	Power Amplifier (Sparton)	182B
183	Power Amplifier (Sparton)	183
211	Power Amplifier	211
291	Triple Twin Tube	*
293	Triple Twin Tube	*

Type No.	Description	Replace with Sylvania Type
295	Triple Twin Tube	*
401	Amplifier (Sparton)	*
402	Amplifier (Sparton)	*
482A	Power Amplifier (Sparton)	71A
482B	Power Amplifier (Sparton)	182B
483	Power Amplifier (Sparton)	183
484	Detector-Amplifier (Sparton)	485
485	Detector-Amplifier (Sparton)	485
486	Detector-Amplifier (Sparton)	*
585	Power Amplifier (Sparton)	50
586	Power Amplifier (Sparton)	50
P-861	Full-wave Rectifier	84
864	Detector-Amplifier	864
866	Half-wave Rectifier	866
874	Voltage Regulator	*
876	Ballast Tube	*
886	Ballast Tube	*
985	Auto Rectifier	*
986	Full-wave Rectifier	83†
AD	Half-wave Rectifier	1-V
AF	Full-wave Rectifier	82
AG	Full-wave Rectifier	83
BA	Special Rectifier	*
BH	Special Rectifier	*
BR	Special Rectifier	*
GA	Power Amplifier	*
LA	Power Amplifier	6A4
PZ	Power Amplifier	47
PZH	Power Amplifier	2A5
Wunderlich	Special Detector	*

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

**Use this Page for Attaching New Service Hints
Clipped from “Sylvania News”**

**Use this Page for Attaching New Service Hints
Clipped from "Sylvania News"**

HYGRADE SYLVANIA CORPORATION
EMPORIUM, PENNA.

Sec. 562, P. L. 85-6

U. S. POSTAGE
PAID

Emporium, Pa.
Permit No. 1

T. A. Koc
623 Thurt
Columbus,