

HOME-RADIO

POCKET TROUBLE SHOOTER

"Gadget"

By ALFRED A. GHIRARDI

PRICE 50c

(Postpaid in the U.S.A.)

HOW TO USE THIS TROUBLE SHOOTER

Notice the various radio receiver Trouble Symptoms ("Dead Receiver, Intermittent Reception, etc.") printed on the tabs at the top. Pick out the card whose tab carries the trouble symptom you have detected in the radio receiver. Pull it over to the right so its ruled lines line up with those in the "Possible Trouble Sources." Considering each source in turn (that is: ANTENNA SYSTEM, etc.) you will read on your horizontal parallel lines, all the different possible troubles that may be causing the trouble symptom, the tests to make to definitely "spot" the trouble, and the remedy for it. If the part or unit is to be replaced, or the remedy is obvious, none is specified. In most cases, you will find these troubles continued on the back of the Symptom card, in the same relative position.



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Possible
Trouble
Sources

ANTENNA
SYSTEM

"A" BATTERY
(If used)

"B" BATTERY
(If used)

TUBES

RECEIVER
CIRCUITS
PROPER

POWER
UNIT

LOUD
SPEAKER

GENERAL

1. Ground wire or connection "broken." *Examine.*
2. Lead-in "disconnected" at receiver. *Examine.*
3. "Ant." binding post in receiver "grounded" to chassis. *Ohmmeter test.*

4. Lead-in window strip "broken" in mid-section. *Examine; continuity test.*
 5. Lightning arrester "shorted." *Continuity test.*
- (Continued on other side).*

1. Battery "exhausted." *Hydrometer test (storage batt.). Voltage test (dry or Air-Cell batt.).*
2. "Dead" cell. *Hydrometer or voltage test.*

3. Storage battery needs water. *Examine; refill.*
4. Broken or corroded "A" lead contacts at battery. *Inspect; clean; tighten. (Cont'd. over).*

1. Battery "exhausted." (Replace 45-volt "B" battery units when their voltage drops to

about 35 volts under load.) *Voltmeter test with radio turned "on" full. (Cont'd. over).*

1. Grid cap and tube shield "shorting" to each other (touching). *Examine.*
2. Tube "burned out," "shorted." *Tube checker.*

3. High "contact resistance" at grid prong or cap of oscillator tube. *Clean and tighten.*
- (Continued on other side).*

1. "On-off" switch "defective," "Wiggle" switch control while checking voltage at switch.
2. Voltage-divider "open." *Check voltage, cont.*
3. Plate or grid resistor "open." *Check voltage; ohmmeter test.*
4. A.F. transformer (prim. or sec.) "open." *Check voltage, continuity.*
5. Bias resistor "open" or shorted. *Voltage*

- test; check continuity.
6. Diode load-resistor "open." *Check voltage; ohmmeter test.*
7. Bypass cond. "shorted." *Condenser tester.*
8. "Coupling," or "isolating" condenser in a-f amplif. "open" or shorted. *Cond. tester.*
9. Grid-return condenser "open" (receivers with AVC). *Condenser tester. (Cont'd over).*

1. Line plug "out," or "reversed" (d-c receiver). *Examine; reverse line plug.*
2. No power at line-supply receptacle—or receiver line cord "open." *Check voltages.*

3. Fuse "blown." *Examine fuse; check cont.*
4. Fuse "blows repeatedly." *Condenser tester for "shorted" buffer or filter condenser. Ohmmeter test for (Cont'd. on other side).*

1. Loud speaker "disconnected." *Examine.*
2. Voice (or hum-buck) coil "open." *Ohmmeter.*
3. Output transformer prim. winding "open," or

- sec. winding "open" or "shorted." *Ohmmeter.*
4. Output choke "open" or "shorted." *Ohmmeter.*
5. Output cond. "open" or "shorted." *Cond. tester.*

1. Receiver not turned "on." *Examine.*
2. Wrong type of current for receiver (ac instead of dc). *Voltmeter test.*

3. S.O.S. on air. *Try neighbor's set.*
4. Station not broadcasting. *Try tuning over the entire range of dial.*

6. Antenna "grounded." *Ohmmeter test.*
7. Lead-in wire "broken." *Examine; continuity test.*
8. Aerial wire "down." *Examine.*
9. For more detailed information on Test Instru-

ments and the methods of Testing & Repairing radio receiver circuits & parts, see Ghirardi's "MODERN RADIO SERVICING & "RADIO FIELD SERVICE DATA" books!

5. "A" battery connections "reversed." *Examine; voltmeter test for battery polarity.*
6. Rectifier in "A" eliminator needs replace-

- ment. *Output voltage test with receiver "on."*
7. Filter system in "A" eliminator "open." *Voltage and continuity tests.*

2. Broken or corroded connections to battery. *Voltage test; examine; clean; tighten.*

3. Battery connections "reversed." *Examine; voltmeter test for battery polarity.*

4. Tube prong contacts "faulty." *Examine.*
5. Oscill. tube "flat" (not oscillating). *Substitute.*
6. Series-connected pilot lamp "burned out."

4. Make continuity test.
7. Ballast resistor or tube burned out (ac-dc receivers). *Continuity test.*

10. Tone-control resistor or condenser "shorted." *Continuity test; condenser tester.*
11. Wire or connection "broken." *Examine all wiring; test continuity of circuits.*
12. Insulation damaged, wire "grounding" to chassis. *Examine; ohmmeter test.*
13. R-F, i-f, or oscillator coil "open." *Check voltage, continuity.*

14. Coil lugs "shorting" to shield or chassis. *Examine; ohmmeter test.*
15. Gang condenser section, trimmer, or padder "shorted." *Continuity test.*
16. "No reception" over part of dial. *Examine waveband-switch wipers for dirty contacts. Check oscillator bias-resistor value.*
17. Oscill. circuit out of alignment. *Align. test.*

- shorted power transformer winding.
5. Ballast-lamp or line-resistor "open" (ac-dc receiver). *Check voltage, continuity.*
6. Rectifier tube "inoperative." *Tube checker, or substitution.*
7. Rectifier tube socket "fused," or contacts "loose." *Examine.*
8. Filter choke "open." *Check "B" voltage, continuity.*
9. "Filter" or "buffer" condenser "shorted." *Check "B" voltage; condenser tester.*
10. H.V. winding of power transformer "open"

- or "shorted." *Voltage test; ohmmeter test.*
11. Voltage-divider section "open," or terminal "grounded." *Check voltage; ohmmeter test.*
12. Bias resistor "open." *Check voltage, cont.*
13. Wires or terminal lugs "grounding" to chassis, connection "open" or "loose." *Examine; continuity test.*
14. Vibrator points "dirty" or "sticking" (batt. receiver). *Check "B" voltage; examine; substitute.*
15. Vibrator unit not in socket securely (battery receiver). *Check "B" voltage; examine.*

1. Ground-clamp "loose." Examine; clean; tighten.
2. Lead-in wire "grounding" to receiver chassis. Examine.
-
1. "Loose" or "corroded" connection to battery. Examine; clean; tighten.
2. Intermittent "open" or "short" in battery
-
1. "Loose" or "corroded" connections to battery. Examine; clean; tighten.
2. Intermittent "open" or "short" in battery cable. *Shake and pull wires of battery cable with ohmmeter connected to each in turn and between leads.* **(Continued on other side).**
-
1. Tube shields "shorting" to control-grid caps or leads. Examine.
2. Tube elements "loose" or "shorting." *Tap*"
-
1. "On-off" switch defective. *Wiggle* switch control while checking voltage at switch.
2. Voltage-divider (or other resistor) "open-circuiting." *Voltage check; ohmmeter.*
3. Wire-wound resistor terminal rivets "loose," element warped and "shorting" to metal enclosure or chassis. Examine; ohmmeter.
4. Resistors, or leads "shorting" together, or to
-
1. Line-plug contact "poor." Examine; "wiggle" the line plug; adjust contacts.
2. Fuse-clip contact "poor." Examine; clean.
3. Rectifier tube "defective." *Tube checker.*
-
1. Speaker plug making "poor contact" with socket. Examine; "wiggle" plug while making continuity test; adjust contacts.
2. "Loose connection" to voice coil, field coil, or output transformer. Examine; ohmmeter test. **(Continued on other side).**
-
1. Interrupted power supply. Check line-voltage with set plugged in and turned "on."
2. Fault of broadcasting station. Try tuning in
-
3. Aerial or lead-in wire "grounding" or "shorting" to a nearby aerial or grounded object. Examine both the aerial and lead-in; Ohmmeter test. **(Cont'd. over).**
3. "Imperfect contacts" at tube prongs or grid **(Continued on other side).**
-
- chassis. Examine; continuity tests.
5. Audio trans. winding "open-circuiting." *Voltage check; continuity and ohmmeter.*
6. Leads "shorting" to chassis (insulation cut by sharp edges of holes in chassis where wires run through). Examine.
7. Contacts or soldered connections "loose." Examine; tighten, re-solder. **(Cont'd. over).**
-
4. Rectifier tube socket prong-contacts "poor." Examine; clean; tighten.
5. Filter condenser "shorts." Check "B" voltage; condenser tester. **(Continued on other side).**
-
3. different stations, or try another receiver.
3. Natural "fading." Try other stations, or another receiver. **(Cont'd. over).**

4. "Loose" or "corroded" joint between lead-in and aerial wires. Examine; clean; tighten.

5. Lead-in window strip "broken" in mid-section.—or wires loose. Examine; continuity test.

For more detailed instructions and information on Test Instruments, and the Methods of Testing and Repairing radio receiver circuits and parts, see Ghirardi's "MODERN RADIO SERVICING"—and "RADIO FIELD SERVICE DATA" books!

Shake and pull wires of batt. cable, with ohmmeter connected to each in turn, and between leads.

3. "Defective" internal cell-connection. Voltage test; earphone test across battery (for "noise").

- caps. Examine; clean; tighten.
4. Tube heater "opening" intermittently. Look for light while receiver goes "dead"; tube;

- checker.
5. "Flat" oscillator tube (tube not oscillating properly). Substitution.

8. "Ant." binding post "shorting" to chassis. Examine; ohmmeter test.
9. Bypass cond. "shorts," "leaky." Cond. tester.
10. Audio "coupling" or "isolating" condenser "shorting," "opening," "leaky." Cond. tester.
11. Tuning condenser plates "peeling." Examine; scrape, or burn out with high voltage.
12. Condenser rotor-wiping fingers dirty or cor-

- roded. Examine; clean; adjust.
13. Trimmer or padder condenser insulation "defective." Examine; ohmmeter test.
14. Wave-band-switch contacts "dirty," "corroded" solder-splashed. Examine; clean.
15. Oscillator not functioning correctly (intermittent operation over a part of the dial). Lower the value of the oscillator bias resistor.

6. Filter choke "opens." Check voltage, continuity.
7. Voltage-divider resistor section "opens." Check voltage; continuity.

8. Vibrator points "dirty" or "sticking" (in battery-operated receiver). Check "B" voltage; examine; substitute new vibrator.

3. Field coil or voice coil "shorting" or "opening." Ohmmeter test.
4. Voice coil "grounding" against pole-piece.

Examine for correct centering. Disconnect voice coil; check with ohmmeter from voice coil to pole-piece. Varnish voice coil; re-center.

4. B-X electric light cables in house (usually in basement or cellar) not grounded properly, not clamped securely at outlet boxes, touch

gas, water, or heating pipes. Examine all B-X wiring carefully; tighten all B-X connectors, insulate from all pipes at cross-overs.

1. Ground clamp "loose." Examine; clean; tighten.
2. Lead-in wire "grounding" to receiver chassis. Examine.
3. Aerial or lead-in wire "grounding" or "short-

1. Battery connections "loose" or "corroded." Examine; clean; tighten.
2. Battery needs water. Examine; refill.

1. "Defective cell" in batt. *Voltage check* (with receiver turned "on") when fading occurs.

1. Grid caps or clips "corroded or "loose." Examine; clean; tighten.
2. "Corroded," or "loose" contacts between tube

1. "On-off" switch "defective." *"Wiggle"* switch control while checking voltage at switch.
2. Resistors "shorting" to one another, or "grounding" to chassis. Examine.
3. Open-circuiting resistor in AVC circuit. *Check voltages; ohmmeter test.*
4. "High-resistance" leaks. *Ohmmeter test.*
5. Volume-control contacts "dirty" or "cor-

1. "Poor contact" in line plug. Examine; "wiggle" line plug while set fades; adjust contacts.
2. Line voltage "fluctuates widely." *Check voltage at outlet during fading, with all house*

1. Speaker plug making "poor contact" with socket. Examine; "wiggle" plug while making continuity test; adjust contacts.

1. Line voltage "fluctuates widely." *Check voltage at wall receptacle during fading (with all house lights on and receiver turned "on").*

ing" to a nearby aerial or grounded object. Examine; *ohmmeter test.*

4. Lead-in window strip "broken" in mid-section—or "wires loose." Examine; continuity. (*Cont'd. over.*)

3. Battery fairly well "exhausted." *Hydrometer test, or voltage test (with receiver turned "on"), when fading occurs.*

2. Battery "exhausted" (a 45-volt "B" battery unit) (*Continued on other side.*)

- shields and bases or chassis. Examine; clean.
3. "Imperfect contacts" at tube prongs. Examine; clean; tighten. (*Continued on other side.*)

- roded." Examine; *ohmmeter test.*
6. Bypass cond. "shorts," "leaky." *Cond. tester.*
7. Grid-return bypass condensers in AVC circuits "open" or "leaky." *Condenser tester.*
8. Audio "coupling" or "isolating" cond. "shorting," "opening," or "leaky." *Condenser tester.*
9. Condenser rotor-wiping fingers "dirty" or "corroded." *Clean; adjust. (Cont'd. over.)*

- lights on & radio plugged in & turned "on."
3. Fuse clip contacts "poor." Examine; clean.
4. Power-unit terminal strip nuts "loose." Examine; tighten. (*Continued on other side.*)

2. Field coil "shorting" or "opening." *Check voltages with radio turned "on"; ohmmeter.* (*Continued on other side.*)

2. "Natural fading" (due to atmospheric conditions). *Try other stations, or another receiver.* (*Continued on other side.*)

5. Lead-in wire "snapped." *Examine.*
6. "Loose," "swinging" aerial wire. *Examine; tighten.*

7. "Loose" or "corroded" joint between lead-in and aerial wires. *Examine; clean; tighten.*

For more detailed instructions and information on Test Instruments, and the Methods of Testing and Repairing radio receiver circuits and parts, see Ghirardi's "MODERN RADIO SERVICING"—and "RADIO FIELD SERVICE DATA" books!

should be replaced when its voltage has dropped to about 35 volts under load). *Check battery voltage*

with receiver turned "on" full.

4. Tube elements "loose," or "shorting." *"Tap" test; tube checker.*
5. Tube heater "opening" intermittently. *Examine for light as receiver fades; tube checker.*
6. Cathode-heater "leakage." *Tube checker.*
10. Trimmer or padder condenser insulation "defective." *Examine; ohmmeter test.*
11. "Tuning" or "compensating" condenser rivets "loose." *Examine; tighten.*
12. Mounting screws on stator sections of gang condenser "loose." *Examine; tighten.*
13. Coil windings "snapped" at lugs of coils. *Examine; ohmmeter test.*
14. Coil-shield "grounding" contacts "corroded" or "loose." *Examine; clean; tighten.*
15. Grid leads "opening." *Examine; cont. test.*
16. "Local-distance" (or "sensitivity") switch or control-contacts "corroded." *Ohmmeter test.*
17. Waveband-switch contacts "dirty" or "corroded." *Examine; clean; adjust.*
18. Oscillator-tube bias resistor "too high." *Lower.*
5. Filter condenser "shorting." *Check "B" voltage; condenser tester.*
6. Filter or bypass condenser "dried out," or "leaky." *Condenser capacity tester.*
7. Vibrator points "pitted" (in battery-operated receiver). *Check "B" voltage before and during "fading" period. Substitute new vibrator.*
3. Voice coil "grounding" against pole-piece. *Examine for correct centering. Disconnect voice coil and check with ohmmeter from coil to pole-piece. Varnish, and re-center.*
4. Cone-apex "loose" ("magnetic" spk'r). *Tighten.*
5. Armature "sticks." *Examine. Free armature.*
3. B-X electric light cables in house (usually in basement or cellar) not grounded properly, not clamped securely at outlet boxes, touch gas, water, or heating pipes. *Examine all B-X wiring carefully, tighten B-X connectors, insulate from all pipes at cross-overs.*

1. No ground wire. Examine; test receiver with a "ground."
2. Ground clamp contact "loose." Examine; clean; tighten.
1. "Loose" or "corroded" connections to battery. Examine; clean; tighten.
2. Water level "low." Examine; add water; re-
1. Battery "exhausted" (a 45-volt "B" battery unit should be replaced when its voltage has dropped to about 35 volts under load). Check battery voltage with receiver turned "on" full. (Cont'd. over).
1. "High-resistance" contact at grid prong or cap of tube (especially oscill. tube). Examine; clean.
2. "Wrong type" tubes. Examine; check type numbers.
1. Voltage-divider resistors "open" or "changed value." Check voltages; ohmmeter test.
2. Grid or plate resistor or suppressor "open" or "grounded." Check voltages; ohmmeter test.
3. Diode load resistor "changed value." Ohmmeter.
4. Plate choke "open" or "shorted." Check voltage; ohmmeter test.
5. A-F transformer winding "open." Check voltage;
1. Line voltage "too low." Check line voltage with all house lights and receiver turned "on."
2. Fuse clip contacts "poor." Examine; clean.
3. Rectifier tube "weak" or "gaseous." Check "B"
1. Speaker plug contact "poor." Examine; "wiggle" plug while making continuity test; adjust contacts.
2. Speaker "out of adjustment." Examine.
1. Receiver sensitivity "too low" for location, or for permissible aerial installation. Check conditions; test with another set of known high sensitivity.
3. Lead-in wire "grounding" to chassis. Examine.
4. Aerial or lead-in "grounded" or "shorted" to nearby aerial or grounded object. Examine; ohmmeter test.
- (Cont'd. over).
- charge.
3. Battery "exhausted." Hydrometer test; voltage (Continued on other side).
3. "Imperfect" contacts at tube prongs. Examine; clean; tighten all contacts.
4. Weak or "gassy" tubes. Tube checker. (Cont'd.).
- ohmmeter test.
6. Bypass condenser "shorted," "open," "leaky." Check voltages; condenser tester.
7. Grid-return condensers (AVC receivers) "open." Condenser tester.
8. Audio "coupling" or "isolating" cond. "shorted," "open," or "leaky." Cond. tester.
9. "Ant." post "grounded" (Cont'd. over).
- voltage; tube checker; substitute.
4. Power - transformer winding "partially shorted." Check voltages; ohmmeter test.
5. Bias resistor "open." Ohmmeter. (Cont'd.).
3. No voltage supplied to field. Check voltage.
4. Field-supply rectifier "weak." Check voltage output; tube checker. (Cont'd. over).
2. Line voltage "too low." Check line voltage with all house lights and receiver turned "on."

5. Lightning arrester "shorted." *Continuity test.*
6. Lead-in window strip "broken" in mid-section—or wires loose. *Examine; continuity test.*
7. "Loose" or "corroded" joint between lead-in and

- test with receiver turned "on."*
4. "Dead" cell. *Hydrometer test; voltage test with receiver turned "on."*

8. Aerial wire "down"; too near large "grounded" metallic object; "too short"; in "shielded" location. *Examine.*

5. Charger "not functioning properly." *Check charger for output voltage under load.*

2. "Intermediate," and "high" voltage, connections to battery "reversed." *Examine.*

5. Cathode-heater "leakage." *Tube checker.*
6. "Flat" oscillator tube (does not oscillate). *Substitute a new tube.*

- to chassis. *Ohmmeter.*
10. R-F or i-f coil "open" or "shorted." *Ohmmeter test for proper resistance values.*
 11. R-F, oscill., or i-f tuned stages "out of alignment." *Resonance check; follow realignment procedure.*
 12. Condenser rotor-wiping fingers "dirty" or "corroded." *Examine; clean; adjust.*
 13. Trimmer, padder, or neutralizing condenser in-

7. For more detailed servicing information, see Ghirardi's "MODERN RADIO SERVICING—and RADIO FIELD SERVICE DATA books!"

6. Voltage-divider resistor "open," "carbonized," or "changed value." *Check voltages; ohmmeter test.*
7. Filter cond. "shorted" or "leaky." *Check voltage; condenser tester.*

- sulation "defective." *Examine; ohmmeter test.*
14. Trimmer adjust screw "stripped." *New cond.*
 15. Tuning belts "loose." *Tighten; apply rosin.*
 16. Coil-switch contact points "dirty," "corroded," or "insufficient pressure." *Examine; clean; adjust.*
 17. "Moisture" in r-f, oscillator, or i-f coils. *Check leakage between terminal lugs on coil form. Replace (or remove, bake, and moisture-proof them).*

8. "Low filament voltage" at tubes due to "loose nuts" on terminal strip. *Examine; check filament voltage at each tube socket; tighten nuts.*

5. Field coil partially or fully "shorted," or "open." *Check voltages; ohmmeter test.*
6. Voice coil (or output transformer secondary) "partially shorted." *Ohmmeter test.*
7. "High-resistance" connection somewhere. *Ohmmeter test.*
8. Magnet "weak" (permanent-magnet type

- speaker). Substitute a similar "good" speaker, or check receiver output with earphones or an output meter.
9. Speakers "out of phase" (multiple-speaker receivers). *Check "phasing." Reverse "either" the voice coil or the field coil connection on one of the speakers.*

1. No "ground" connection; "loose" ground clamp; or an otherwise "poor" ground. Try a "ground" on radio. Examine; clean; tighten gnd. connections.
2. Hum pick-up by receiver "grounding" system.

Remove ground wire. If hum stops, operate receiver without a ground, or install a "doublet" antenna system (for which no ground wire is necessary). **(Continued on other side).**

1. Battery charger operating while receiver is in operation. Examine.
2. Battery "exhausted." Hydrometer test; check volt-

- age with receiver "on" full.
3. "Defective cell." Hydrometer test; check voltage with receiver "on" full. **(Cont'd. over).**

1. Battery "exhausted" (a 45-volt "B" battery unit should be replaced when its voltage has dropped

to about 35 volts under load). Check voltage with receiver turned "on" full.

1. Rectifier tube "weak" or "defective." Tube checker.
2. Cathode-heater "leakage." Check all tubes with tube checker.

3. "Short" in heater-type tube. Tube checker.
4. Push-pull power tubes "unmatched." Tube checker.

1. Hum-control or "balancer" out of adjustment. Examine; readjust.
2. Center-tapped, or other "hum-control" resistor, "open." Ohmmeter test.
3. R-F or i-f coil secondary (or grid lead) "open." Check control-grid voltage; ohmmeter test.
4. Grid lead "too close" to a-c filament or pilot-light lead ("tunable" hum). Examine; re-route a-c

- leads.
5. Bias resistor or bypass condenser "shorted." Check bias voltage; ohmmeter test; condenser tester.
6. Bypass condenser of insufficient capacity "tunable" hum). Try condensers of larger capacity.
7. Screen or cath. bypass cond. "open." Cond. tester.
8. A-F transf. sec. winding (or grid lead) "open." Check grid voltage; ohmmeter. **(Cont'd. over).**

1. Line hum. Try reversing line plug.
2. Line bypass condenser "open" ("tunable" hum). Condenser tester.
3. Line bypass condenser has "insufficient capacity"

- ("tunable" hum). Substitute larger capacity.
4. "Tunable" hum in ac-dc (Universal) receivers. Connect a 0.2 mfd. condenser across power line, **(Continued on other side).**

1. Dry rectifier "needs replacement." Check voltage output; replace.
2. Hum-bucking coil "shorted." Ohmmeter test.

3. Hum-bucking coil "grounded" (in receivers having an ungrounded voice-coil circuit). Ohmmeter test. **(Cont'd. over).**

1. Lamp or electric clock on top of radio cabinet. Examine; re-locate, or remove from radio.
2. Hum from phonograph motor (in "phono-radio"

combinations). Notice if hum is present when operating receiver on "RADIO." "Ground" phono pickup **(Cont'd. over).**

3. Aerial or lead-in wires too close (or parallel to) power lines. *Examine; re-locate.*
4. Aerial or lead-in wires too close to those of an oscillating receiver. *Examine; re-locate.*
5. Lead-in wire too close (or parallel to) line-supply cord at receiver. *Examine; re-locate.*
6. Aerial or lead-in wires striking grounded object. *Examine; ohmmeter test.*

4. "Poor connections" to battery. *Examine; clean; tighten all battery connections.*

POWER UNIT—(Cont'd.)

- or from one side of the line to "ground." Connect a 0.1 mfd. mica condenser from each rectifier tube plate to rectifier filament.
5. Buffer condenser across H.V. winding of power transformer "open." *Condenser tester.*
 6. Rectifier tube "weak" or "defective." *Tube checker.*
 7. Power transf. or filter-choke laminations "loose." *Examine; squeeze together; tighten clamps.*
 8. Electrostatic shield of power transformer "un-grounded." *Examine; ohmmeter test.*
 9. Inductive coupling between power transformer and receiver wiring. *Try moving transformer away, or turning it around 90 degrees.*
 10. Filter condenser, or its connections, "open" or otherwise faulty. *Condenser tester; continuity test.*
 11. Filter choke resonating condenser "shorted" or "open." *Condenser tester.*
 12. Insulated case of "can" type of condenser "grounded." *Ohmmeter test.*
 13. Filter choke "shorted." *Check voltage; ohmmeter.*
 4. Voice coil "rubbing against pole-piece." *Examine; re-center voice coil.*
 5. One section of push-pull output transf. primary

arm and phonograph motor frame and chassis.

3. Electrical apparatus operating nearby. Notice if hum disappears when both aerial "lead-in" and

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9. Push-pull input trans. sec. "unbalanced." *Substit.*
10. One section of push-pull output trans. primary "open." *Check plate voltages; ohmmeter test.*
11. Pilot-light "shorted." *Ohmmeter test.*

POWER UNIT—(Cont'd.)

14. Filter choke air-gap "too small." *Short out filter choke and note amount of hum increase.*
15. Vibrator unit "not securely in socket" (battery receiver). *Examine.*
16. Vibrator "defective" (battery receivers). *Check "B" voltage; substitute new vibrator.*
17. "Ground" between vibrator and chassis "imperfect" (batt. receivers). *Examine; ohmmeter test.*

- "open." *Check plate voltages; ohmmeter test.*
6. Filter condenser "open." *Condenser tester.*

- "ground" wires are disconnected from receiver.
4. Station modulation "poor." *Try tuning receiver to different stations.*

1. No "ground" connection; "loose" ground clamp; or an otherwise "poor" ground. *Try a "ground" on radio. Examine; clean; tighten gnd. connections.*
2. Aerial wire "too short." *Examine; lengthen.*
3. Aerial or lead-in wires "too close" to those of another re-radiating antenna. *Examine; re-route.*
-
1. Battery "exhausted." *Hydrometer test; voltage test with receiver turned "on" full.*
2. *For more detailed information on Test Instruments and Methods of Testing, see Ghirardi's "MODERN RADIO SERVICING" book!*
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1. Battery "exhausted" (a 45-volt "B" battery unit should be replaced when its voltage has dropped to about 35 volts under load). *Check voltage with radio turned "on" full. (Cont'd. on other side).*
1. Tube shields "not making good contact" with "chassis." *Examine; clean; tighten.*
2. "Wrong type" tubes. *Check "type" numbers.*
3. "Gassy," "high-emission" tubes. *Tube checker.*
-
1. Audio oscillation ("howl"). *Tuning condenser not floating freely in its rubber mountings. "Free" the condenser.*
2. Code signals breaking through. *Adjust wave trap —or install one.*
3. "Wrong tube" in socket. *Check "type" numbers.*
4. Tuned circuits "not aligned properly." *Resonance test, follow alignment procedure.*
5. Tuned circuits "adjusted to tune too sharply." *Resonance test; re-adjust.*
6. Condenser rotor-wiping fingers "dirty" or "corroded." *Examine; clean; adjust.*
7. Tube or coil shields "not making good contact" with "chassis." *Examine; clean; tighten.*
8. R-F circuits "not neutralized." *Re-neutralize the receiver.* *(Continued on other side).*
-
1. Filter condenser "open" or "dried out" (lost capacity). *Capacity tester.*
2. Voltage-divider resistor "carbonized" or otherwise changed in value. *Ohmmeter test.*
3. Vibrator "defective" (battery receiver). *Check "B" voltage; substitute.*
-
1. "Audio howl" caused by loud speaker leads being too close to chassis, or otherwise out of position. *Examine; separate speaker leads away from receiver chassis and all other wires.*
2. Field coil partially "shorted." *Check voltages; ohmmeter test.*
-
1. Two stations broadcasting at, or near, same frequency. *Try different station; make sure tuned circuits are aligned properly.*
2. "Oscillating receiver" nearby. *Try operating a midget radio receiver from the same aerial and ground.*

For more detailed instructions and information on Test Instruments, and the Methods of Testing and Repairing radio receiver circuits and parts, see Ghirardi's "MODERN RADIO SERVICING"—and "RADIO FIELD SERVICE DATA" books!

(Descriptive literature giving the detailed contents of each of these books will be sent "free" upon request to: RADIO & TECHNICAL PUBLISHING CO., 45 Astor Place, New York City.)

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- 2. "Defective cell" in battery. *Shunt a 1-mfd. condenser directly across the battery terminals.*
 - 3. "Det." or "Int." "B" voltage "too high." *Try lower voltages.*
-

For more detailed instructions and information on Test Instruments, and the Methods of Testing and Repairing radio receiver circuits and charts, see Ghirardi's "MODERN RADIO SERVICING"—and "RADIO FIELD SERVICE DATA" books!

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- 9. "Open" circuit in neutralizing system. *Ohmmeter test.*
 - 10. Grid-suppressor resistors "shorted." *Ohmmeter test.*
 - 11. Grid leads "too close" to plate leads. *Examine; re-route wires.*
 - 12. Condenser-can "grounding" contact surfaces "corroded" or "loose." *Examine; clean; tighten.*
 - 13. Voltage-divider resistor "carbonized." *Check voltages; ohmmeter test.*
 - 14. Plate or screen voltages "too high." *Check voltages; try reducing them.*
 - 15. Plate, screen or cathode bypass condenser "open." *Condenser tester.*
 - 16. "Chassis grounds" poorly made. *Examine. Tighten or re-solder all suspicious connections.*
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- Test antenna system for "noise pickup" by disconnecting both lead-in and ground wires from set. If this stops (or reduces) the noise, at least part of it is being picked up by the antenna system.

- Battery "exhausted" and "sulphated." Hydrometer test; voltage test under load.

- Battery "exhausted" (a 45-volt "B" battery unit should be replaced when its voltage has dropped

- Tubes "noisy." "Tap" test.
- Tube shields not making firm contact with chassis. Examine; clean; tighten.

- Tuning condenser plates "burred," "peeling" or "shorting." Examine; clean; adjust.
- Tuning condenser rotor-wiping fingers "dirty" or "corroded." Examine; clean; adjust.
- Waveband switch contacts "loose," "dirty," or splashed with solder. Examine; clean; adjust.
- Tube or coil shields "not making good contact with chassis." Examine; clean; tighten.

- "On-off" switch contacts "corroded" or "loose." "Wiggle" the switch control—listen for noise.
- Fuse clips "corroded" or "loose." Examine; clean.
- Line-bypass condenser "leaky." Condenser tester.

- Iron filings or dirt between voice coil and pole piece. Examine; clean out.
- Voice coil "scraping" against pole piece. Check cen-

- Audio "howl." Be sure wooden chassis-spacer strips are removed, receiver shafts or knobs do not touch cabinet, and tuning condenser unit "floats" freely.

Shorten aerial wire if it is too long; re-locate aerial and lead-in out of zone of electrical disturbances; install a noise-reducing antenna system if necessary.

(Continued on other side).

- Water level "low." Examine; add distilled water.
- Terminals "corroded." Examine; clean; tighten.

to about 35 volts under load). Check voltage with radio turned "on" full. (Cont'd. on other side).

- Contacts at tube socket prongs or grid caps "loose" or "corroded." Examine; clean; tighten.
- Tubes "weak." Tube checker. (Cont'd. over.).

- Tube socket contacts "dirty" or "corroded." Examine; clean; adjust.
- Grid leads "broken." Examine; ohmmeter test.
- Carbon resistor "noisy." "Noise test"; substitute.
- Wire-wound resistor "sparking." Examine; ohmmeter test; substitute another resistor.
- Volume control resistor "noisy." Examine; clean & adjust—or replace. (Cont'd. on other side).

- Power transf. H.V. winding "sparking-over" to shield. Look for sparking in dark; substitute.
- Buffer condensers across H.V. winding "leaky" or "open." Condenser tester. (Cont'd. over).

- tering; re-center voice coil.
- Voice-coil wires "loose" ("buzzing"). Examine. Push turns of coil carefully together (Cont'd. over.).

- "Loose" line fuses, lamp fixtures, electrical connections, electrical wiring in building. Examine; clean; tighten all splices and connections. (Cont'd. on other side).

and causes "distortion" and "rattling"). aerial wire, or insert a 0.00005 mfd. series er in lead-in.

ions to battery "corroded" (signals weak & l). Examine; clean; tighten.

under load). Check voltage with receiver "on" full

"Tap" test; tube checker. prongs "dirty," "corroded." Examine; clean. (Cont'd. on other side).

Check voltages; ohmmeter test. tage grid resistor "open." Check grid voltmeter test. -divider resistors "carbonized" (or other-angled). Check voltages; ohmmeter. control "defective." Examine; ohmmeter. bias condenser "shorted." Check condenser tester. (Cont'd. over).

ster. bias condenser "shorted." Check bias voltmeter. (Cont'd. on other side).

clean out. iter," or armature of magnetic type speak- Examine; re-center. (Cont'd. over).

eter" or "eye" where possible. speaker "overloaded." Operate at lower setting. Explain to owner. (Cont'd. over).

For more detailed instructions and information on Test Instruments, and the Methods of Testing and Repairing radio receiver circuits and parts, see Ghirardi's "MODERN RADIO SERVICING"—and "RADIO FIELD SERVICE DATA" books!

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5. "Gassy," "high-emission" tubes. *Tube checker.*
6. Tubes "weak" (especially power tubes). *Tube checker.*
7. Cathode-heater "leakage." *Tube checker.*

9. Audio "coupling" or "isolating" condenser "leaky" or "open." *Condenser tester.*
10. A-F transf. sec. "open." *Check grid volts; ohmmeter.*
11. Push-pull input transf. sec. "unbalanced." *Substitute.*
12. Pilot-light socket or wiring "shorting" to chassis.

5. Bias resistor "shorted" or "open." *Check bias voltages; ohmmeter test.*

4. Voice-coil wires "loose" ("buzzing"). *Cement wires.*
5. Cone out of round, warped, torn, seam open, spider broken. *Examine; repair or replace; re-center voice coil.*

6. Speaker "overloaded," or not matched to output. *Check for distortion at low volume.*
7. Field coil energizing voltage "low." *Check voltage.*

3. Two stations "interfering," or station modulation "poor." *Try other stations.*

8. Detector tube needs replacement. *Tube checker.*
9. Output push-pull tubes "mis-matched." *Tube checker.*

13. "Rattling" at high volume. *Check chassis, tuning dial plate, etc. for loose screws.*
14. Output stage "overloading." *Check plate current of output tube for "distortion."*

6. Voltage-divider resistor "open" or "carbonized" (or otherwise changed). *Check voltages; ohmmeter test.*

8. Field rectifier "weak." *Check voltage output under load.*
9. Push-pull output transformer primary section "open." *Check plate voltages; ohmmeter test.*

Possible Trouble Sources	ANTENNA SYSTEM	"A" BATTERY (If used)	"B" BATTERY (If used)	TUBES	RECEIVER CIRCUITS PROPER	POWER UNIT	LOUD SPEAKER	GENERAL
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Ghirardi's
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ce of interference.

1. Test antenna system for "noise pickup" by disconnecting both lead-in and ground wires from set. If this stops (or reduces) the noise, at least part of it is being picked up by the antenna system.

Shorten aerial wire if it is too long; re-locate aerial and lead-in out of zone of electrical disturbances; install a noise-reducing antenna system if necessary.
(Continued on other side).

1. Battery "exhausted" and "sulphated." *Hydrometer test; voltage test under load.*

1. Battery "exhausted" (a 45-volt "3" battery unit should be replaced when its voltage has dropped

2. Water level "low." *Examine; add distilled water.*
3. Terminals "corroded." *Examine; clean; tighten.*

1. Tubes "noisy." *Tap test.*

2. Tube shields not making firm contact with chassis. *Examine; clean; tighten.*

1. Tuning condenser plates "burred," "peeling" or "shorting." *Examine; clean; adjust.*

2. Tuning condenser rotor-wiping fingers "dirty" or "corroded." *Examine; clean; adjust.*

3. Waveband switch contacts "loose," "dirty," or splashed with solder. *Examine; clean; adjust.*

4. Tube or coil shields "not making good contact with chassis." *Examine; clean; tighten.*

1. "On-off" switch contacts "corroded" or "loose." *"Wiggle" the switch control—listen for noise.*

2. Fuse clips "corroded" or "loose." *Examine; clean.*

3. Line-bypass condenser "leaky." *Condenser tester.*

1. Iron filings or dirt between voice coil and pole piece. *Examine; clean out.*

2. Voice coil "scraping" against pole piece. *Check cen-*

1. Audio "howl." *Be sure wooden chassis-spacer strips are removed, receiver shafts or knobs do not touch cabinet, and tuning condenser unit "floats" freely.*

to about 35 volts under load). Check voltage with radio turned "on" full. (Cont'd. on other side).

3. Contacts at tube socket prongs or grid caps "loose" or "corroded." *Examine; clean; tighten.*

4. Tubes "weak." *Tube checker.* (Cont'd. over.).

5. Tube socket contacts "dirty" or "corroded." *Examine; clean; adjust.*

6. Grid leads "broken." *Examine; ohmmeter test.*

7. Carbon resistor "noisy." *"Noise test"; substitute.*

8. Wire-wound resistor "sparking." *Examine; ohmmeter test; substitute another resistor.*

9. Volume control resistor "noisy." *Examine; clean & adjust—or replace.* (Cont'd. on other side).

4. Power transf. H.V. winding "sparking-over" to shield. *Look for sparking in dark; substitute.*

5. Buffer condensers across H.V. winding "leaky" or "open." *Condenser tester.* (Cont'd. over).

tering; re-center voice coil.

3. Voice-coil wires "loose" ("buzzing"). *Examine. Push turns of coil carefully together* (Cont'd. over.).

2. "Loose" line fuses, lamp fixtures, electrical connections, electrical wiring in building. *Examine; clean; tighten all splices and connections.* (Cont'd. on other side).

2. Lightning arrester "defective." Substitute.
3. "Ground" clamp "loose". Examine; clean; tighten.
4. Lead-in window strip "broken" at center, or "loose" connection. Examine; ohmmeter test.

5. "Loose" or "corroded" connection somewhere in aerial and lead-in line. Examine; clean; tighten.
6. Aerial or lead-in "leaking" or "grounding" to nearby aerial or grounded object. Examine; ohmmeter.

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2. "Defective" internal connection. Make earphone test of each section for "noise"; substitute.
3. "Dead" or "noisy" cell. Check voltage under load; earphone test.

5. Tube elements "shorting." *Tube checker.*

10. Bypass or tone-control cond. "leaky." Cond. tester.
11. "Coupling" or "isolating" condenser in a-f amplifier "leaky." Condenser tester.
12. A-F transformer winding "noisy." Substitute.

6. Rectifier tube "noisy." *Tap* test; substitute.
7. Rectifier tube socket "carbonized," or prongs "corroded" or "loose." Clean; tighten; or replace.
8. Filter or bypass condenser punctured and "sparking-through." Examine; condenser tester.
9. Voltage-divider (or other carbon resistor) "porous" and sparking ("noisy"). Make "noise test"; substitute.

6. Cathode-heater "leakage." *Tube checker.*

13. "High-resistance" (poorly soldered) connections—especially in the r-f and grid circuits, and chassis soldered "grounds." Examine; tighten or re-solder.
14. Shielding of set-wiring "inadequate." Examine.

10. Voltage-divider resistor "open" and "sparking-over." Ohmmeter test; substitute.
11. High-voltage wires "sparking" to chassis. Examine.
12. Screws in housing of power supply unit (in batt. operated receiver) "loose." Tighten all screws.
13. Vibrator contacts "worn" (battery-operated receiver). Examine; substitute new vibrator.

and apply coil cement to hold them in place.

4. Cone torn, worn, seam open, loose around edges, spider "broken." Examine; repair or replace; re-center voice coil.
5. Connection "loose" or "poorly soldered." Examine.
6. Intermittent "open" in speaker cable wires. Ohmmeter test

3. B-X electric light cables in house (usually in basement or cellar) not grounded properly, not clamped securely at outlet boxes, touch gas, water or heating pipes. Examine all B-X wiring carefully, tighten all B-X connectors, insulate from all gas, water and heating pipes at cross-overs.

while "jerking" cable wires.

7. Mounting screws and nuts "loose." Tighten.
8. Armature of magnetic type speaker not "centered," driving rod "loose" or "snapped," cone apex "loose." Examine; repair the part; re-center the armature.

4. Natural atmospheric "static." Try a "midget" receiver connected to the same antenna system.
5. Man-made "interference," due to electrical devices. Track down source of interference.

1. Antenna system has "insufficient signal pickup" (weak "distorted" reception). *Lengthen aerial wire, or re-locate for better signal pickup.*
2. Antenna signal "pickup too great" ("overloads"

receiver and causes "distortion" and "rattling"). *Shorten aerial wire, or insert a 0.00005 mfd. series condenser in lead-in.*

1. Battery exhausted (signals weak & distorted). *Hydrometer test; check voltage with receiver turned "on" full.*

2. Connections to battery "corroded" (signals weak & distorted). *Examine; clean; tighten.*

1. Battery exhausted (a 45-volt "B" battery unit should be replaced when its voltage has dropped to about

35 volts under load). *Check voltage with receiver turned "on" full*

1. "Wrong type" tubes. *Check "type" numbers.*
2. "Rattling" caused by "loose" tube shields. *Tighten.*
3. "Microphonic" tubes, or "shorting" elements in

1. tubes. *"Tap" test; tube checker.*
2. Tube prongs "dirty," "corroded." *Examine; clean.*
(Continued on other side).

1. "Wrong tube" in socket. *Check "type" numbers.*
2. "C" (bias) cell (where used) needs replacement. *Substitute a similar "new" cell, or check plate current of tube and compare with that when a similar bias from a dry cell "C" battery is applied.*
3. Bias resistor "shorted," "open," or "too high." *Check bias voltages; ohmmeter test.*
4. AVC resistors (where used) "open" or "changed"

1. value." *Check voltages; ohmmeter test.*
2. Audio stage grid resistor "open." *Check grid voltage; ohmmeter test.*
3. Voltage-divider resistors "carbonized" (or otherwise changed). *Check voltages; ohmmeter.*
4. Volume-control "defective." *Examine; ohmmeter.*
5. Bias-resistor bypass condenser "shorted." *Check bias voltages; condenser tester. (Cont'd. over).*

1. Rectifier tube "weak." *Tube checker.*
2. Vibrator "defective" (battery receiver). *Check "B" voltage; substitute new vibrator.*
3. Filter condenser "open" or "dried out" (lost capac-

1. ity). *Capacity tester.*
2. Bias resistor bypass condenser "shorted." *Check bias voltages; condenser tester.*
(Continued on other side).

1. "Rattling" caused by "loose screws" in speaker. *Examine; tighten all screws.*
2. Iron filings or dirt between voice coil and pole-

1. piece. *Examine; clean out.*
2. Voice coil "off-center," or armature of magnetic type speaker not "centered." *Examine; re-center. (Cont'd. over).*

1. Owner does not tune receiver to "exact" resonance point. *Note tone when station is tuned in "exactly."* *Instruct owner in proper method of tuning, or in-*

1. stall a tuning "meter" or "eye" where possible.
2. Output stage or speaker "overloaded." *Operate at lower volume-control setting. Explain to owner. (Cont'd. over).*

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| 5. "Gassy," "high-emission" tubes. <i>Tube checker.</i> | 8. Detector tube needs replacement. <i>Tube checker.</i> |
| 6. Tubes "weak" (especially power tubes). <i>Tube checker.</i> | 9. Output push-pull tubes "mis-matched." <i>Tube checker.</i> |
| 7. Cathode-heater "leakage." <i>Tube checker.</i> | |
| | |
| 9. Audio "coupling" or "isolating" condenser "leaky" or "open." <i>Condenser tester.</i> | Examine. |
| 10. A-F transf. sec. "open." <i>Check grid volts; ohmmeter.</i> | 13. "Rattling" at high volume. <i>Check chassis, tuning dial plate, etc. for loose screws.</i> |
| 11. Push-pull input transf. sec. "unbalanced." <i>Substitute.</i> | 14. Output stage "overloading." <i>Check plate current of output tube for "distortion."</i> |
| 12. Pilot-light socket or wiring "shorting" to chassis. | |
| | |
| 5. Bias resistor "shorted" or "open." <i>Check bias voltages; ohmmeter test.</i> | 6. Voltage-divider resistor "open" or "carbonized" (or otherwise changed. <i>Check voltages; ohmmeter test.</i> |
| 4. Voice-coil wires "loose" ("buzzing"). <i>Cement wires.</i> | 8. Field rectifier "weak." <i>Check voltage output under load.</i> |
| 5. Cone out of round, warped, torn, seam open, spider broken. <i>Examine; repair or replace; re-center voice coil.</i> | 9. Push-pull output transformer primary section "open." <i>Check plate voltages; ohmmeter test.</i> |
| 6. Speaker "overloaded," or not matched to output. <i>Check for distortion at low volume.</i> | |
| 7. Field coil energizing voltage "low." <i>Check voltage.</i> | |
| 3. Two stations "interfering," or station modulation "poor." <i>Try other stations.</i> | |

<i>Possible Trouble Sources</i>	<i>ANTENNA SYSTEM</i>	<i>"A" BATTERY (If used)</i>	<i>"B" BATTERY (If used)</i>	<i>TUBES</i>	<i>RECEIVER CIRCUITS PROPER</i>	<i>POWER UNIT</i>	<i>LOUD SPEAKER</i>	<i>GENERAL</i>
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